



National Transportation Safety Board Aviation Accident Final Report

Location:	BECKLEY, WV	Accident Number:	NYC99FA091
Date & Time:	04/17/1999, 1451 EDT	Registration:	N400VG
Aircraft:	Raytheon Corporate Jets BE-400A	Aircraft Damage:	Substantial
Defining Event:		Injuries:	6 Serious, 2 Minor
Flight Conducted Under:	Part 91: General Aviation - Executive/Corporate		

Analysis

The airplane touched down about 1/3 beyond the approach end of Runway 28, a 5,000 foot-long, asphalt runway. The PIC stated, 'as usual,' he applied 'light' braking and attempted to actuated the airplane's thrust reverser (TR) system; however, the TR handles could not be moved beyond the 'Deploy-Reverse-Idle' position. After the PIC cycled the levers two or three times, he began to apply maximum braking. A passenger in the airplane stated he looked out of the cockpit window, saw the end of the runway, and the airplane seemed like it was still moving 'pretty fast.' As the airplane approached the end of the runway, he could see smoke, which he believed was coming from the airplane's tires. He then sensed the airplane was falling. The co-pilot stated he had no memory at all of the accident flight. Review of the CVR revealed the co-pilot said that the airplane was 'Vref plus about twenty,' when the airplane was 100 feet over the runway threshold. The PIC could not recall the airplane's touchdown speed, however, he stated that it seemed like the airplane was still traveling 50 to 60 knots when it departed the end of the runway. A pair of parallel tire marks were observed 3,200 feet beyond the approach end of the runway. The tire marks extended past the end of the runway and onto a 106 foot-long grass area. The airplane came to rest on a plateau about 90 feet below the runway elevation. Examination of the airplane, including the optional TR system did not reveal any pre-impact malfunctions. The airplane's estimated landing distance was calculated to be about 3,100 feet. The PIC reported about 4,700 hours of total flight experience, of which, 107 hours were in make and model. The PIC stated he had never performed a landing in the accident airplane without using the TR system. Winds reported at the time of the accident were from 290 degrees at 15 knots, with 21 knot gusts.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot-in-command misjudged his altitude and airspeed which resulted in an overrun. Contributing to the accident were the pilot's lack of total flight experience in make and model, the pilot's reliance on the airplane's optional thrust reverser system and his inability to engage the airplane's thrust reverser system for undetermined reasons.

Findings

Occurrence #1: OVERRUN

Phase of Operation: LANDING - ROLL

Findings

1. (F) WEATHER CONDITION - GUSTS
2. (C) ALTITUDE - MISJUDGED - PILOT IN COMMAND
3. (C) AIRSPEED - MISJUDGED - PILOT IN COMMAND
4. (F) LACK OF TOTAL EXPERIENCE IN TYPE OF AIRCRAFT - PILOT IN COMMAND
5. (F) THRUST REVERSER - UNDETERMINED
6. (F) EXPECTANCY - PILOT IN COMMAND

Occurrence #2: ON GROUND/WATER ENCOUNTER WITH TERRAIN/WATER

Phase of Operation: LANDING - ROLL

Findings

7. TERRAIN CONDITION - ROUGH/UNEVEN

Factual Information

HISTORY OF FLIGHT

On April 17, 1999, about 1451 Eastern Daylight Time, a Raytheon BE-400A, a BeechJet, N400VG, was substantially damaged while landing at the Raleigh County Memorial Airport (BKW), Beckley, West Virginia. Two flight crew members, and four passengers were seriously injured. Two passengers sustained minor injuries. Visual meteorological conditions prevailed and an instrument flight rules flight plan had been filed for the flight that departed Palm Beach International Airport (PBI), West Palm Beach, Florida, about 1310. The corporate flight was conducted under 14 CFR Part 91.

According to the pilot-in-command (PIC), he and the co-pilot flew from BKW, to PBI, the day before the accident. They arrived back at the airplane the following day about 1.5 to 2.0 hours prior to departure. The PIC described the return flight to BKW as uneventful. During the descent into the Beckley area, they received the automated weather observation system (AWOS) information and the PIC noted that there were some "pretty stiff winds;" however, he was not concerned, and asked the co-pilot to "bump up" the "Vref speed" an additional 5 knots.

The PIC said he conducted a visual approach to Runway 28, a 5,000 foot long, 100 foot wide, asphalt runway, and he utilized the runway's visual approach slope indicator (VASI) lights until the airplane reached "short final." He said that the final approach was extremely bumpy, but the airplane made a smooth, normal touchdown on the runway, and did not bounce. Additionally, he commanded deployment of the airplane's speed brakes, which was acknowledged by the co-pilot. The PIC stated he did not verify deployment of the speed brakes; however, he felt certain that the speed brakes did deploy. The PIC could not recall the airplane's touchdown speed or the touchdown point; however, he stated, he usually landed on the first 1,000 feet of the runway. The PIC further stated that "as usual," he applied "light braking" after touchdown and initiated the airplane's thrust reversers (TR); however, he was unable to actuate the TR system. The TR handles moved to a point which was determined to be the "Deploy Idle Position," and could not be moved further. He did not recall if the TRs deployed. The PIC "cycled" the TR levers two or three times, and then went from applying light braking to max braking. The PIC stated he was "standing on the brakes," however, it did not feel like the airplane was slowing down, and it seemed like the airplane was still traveling 50 to 60 knots when it departed the end of the runway. When asked if he thought about performing a "go-around," the pilot said "no," because he felt the airplane would stop before the end of the runway.

The co-pilot stated he had no memory at all of the accident flight.

A witness who landed in a Mooney 20E, about 5 or 10 minutes prior to the accident stated he was standing on the ramp near the Fire Rescue building and observed the airplane over the runway threshold about 100 feet above ground level. During the landing flare, the airplane looked like it was "floating in ground effect for a while" and it touched down about 1/3 down the runway. He did not hear any sound of thrust reversers and as the airplane continued towards the end of the runway, he saw smoke coming from the tires. The airplane then disappeared from his view.

In a telephone interview, the passenger who was seated on the right side of the airplane, in the second row, stated it was very windy and it seemed like the pilot was having a difficult time

getting the airplane on the ground. At some point after the touchdown, he looked out of the cockpit window and saw the end of the runway. He said the airplane seemed like it was still moving "pretty fast." As the airplane approached the end of the runway he could see smoke, which he believed was coming from the tires. The airplane entered the grass area beyond the runway, and he then sensed the airplane was falling.

A passenger who was seated on the right side of the airplane, in the last row, stated he saw the runway while the airplane was on approach to the airport. He said that he did not pay much attention to the landing; however, within a second or two, he knew the airplane had reached the middle of the runway. As the airplane continued down the runway, he thought the airplane would not be able to stop before the end of the runway. He felt the airplane enter the grass area. The airplane then became airborne, pitched down, and impacted the ground.

A third passenger stated that he felt the airplane touchdown just after it passed the terminal building. After touchdown, he did not recall feeling the thrust reverser system or any hard braking.

A fourth passenger stated that after the airplane touched down, he did not hear the airplane's thrust reverser system and did not feel the airplane slowing down. He felt the airplane depart the end of the runway, "still traveling at a great rate of speed."

The accident occurred during the hours of daylight approximately 37 degrees, 47 minutes north latitude, and 81 degrees, 7 minutes west longitude.

PERSONNEL INFORMATION

The PIC and co-pilot were hired on December 7, 1998, and January 1, 1999, respectively. Both pilots attended a training program for the BE-400, at Flight Safety International, Wichita, Kansas. They began flying the accident airplane in January 1999.

The PIC held an airline transport pilot certificate with a multi-engine land rating and a BE-400 type rating. He also held a commercial pilot rotorcraft rating. The PIC's most recent Federal Aviation Administration (FAA) first class medical certificate was issued on June 6, 1998. Review of the PIC's logbook revealed he had accumulated about 4,700 hours of total flight experience, of which, 107 hours were in the make and model of the accident airplane, which included about 50 hours during the 30 days prior to the accident.

The co-pilot held an airline transport pilot certificate with a multi-engine land rating and a BE-400 type rating. He also held a commercial pilot rotorcraft rating. The co-pilot's most recent FAA first class medical certificate was issued on October 27, 1998. Review of the co-pilot's logbook revealed he had accumulated about 6,250 hours of total flight experience, of which, 148 hours were in the make and model of the accident airplane, which included about 50 hours during the 30 days prior to the accident.

According to the PIC, he and the co-pilot were involved in 18 landings at BKW, with the accident airplane. The PIC was not certain exactly how many landings he performed at BKW; however, both pilots stated that they alternated between Flying Pilot and Non-Flying Pilot every other leg. The PIC stated that if he estimated that he performed 9 landings at BKW, a minimum of 3 were on Runway 28.

AIRCRAFT INFORMATION

Review of the airplane's maintenance records revealed it was maintained under an FAA

approved manufacturer inspection program. The airplane's most recent inspection was an "A Inspection," which was performed on April 11, 1999. The airplane had been operated about 3 hours since the inspection.

METEOROLOGICAL INFORMATION

The weather reported at BKW, at the time of the accident, was: Wind from 290 degrees at 15 knots, with gusts to 21 knots; Visibility 10 statute miles; Scattered Clouds at 6,000 and 7,500 feet; Temperature 48 degrees F; Dewpoint 23 degrees F; Altimeter 29.81 in/hg.

FLIGHT RECORDERS

The airplane was equipped with a Fairchild A100S cockpit voice recorder (CVR). A CVR group convened on May 5, 1999, and a transcript was prepared for the last 13:38 minutes of the 31:00 minute recording.

At 1448:29, the crew received the airport's automatic weather observation system (AWOS) information which stated the winds were from 270 degrees at 15 knots with peak gusts to 29 knots.

At 1449:17, the PIC asked the co-pilot to add 5 knots onto the airplane's "V ref speed."

At 1449:50, the co-pilot transmitted that airplane was on "short final" to Runway 28.

At 1450:10, the co-pilot stated "okay you're ref plus about twenty."

At 1450:22, the co-pilot stated "'kay coming over a hundred feet. Looking good. Ref plus about twenty."

At 1450:29, the co-pilot stated "...landing check complete."

At 1450:36, the PIC stated "come on baby get down."

At 1450:38, the co-pilot stated "boards are out."

At 1450:39, the PIC stated "boards."

At 1450:44, the PIC stated "got no reversers."

At 1450:59, a sound similar to a decision height/altitude alert tone was heard, which was followed by the end of the recording.

WRECKAGE INFORMATION

A pair of parallel tire marks, which were about 9 feet 4 inches apart from each other, were observed to begin 3,200 feet beyond the approach end of Runway 28. Some of the tire marks contained a series of equal spaces in between the tire mark. The tire marks extended past the end of the runway and onto a grass area.

The grass area at the end of Runway 28, extended about 106 feet. The terrain then sloped down about a 45 degree angle for approximately 90 feet, then reached a plateau. This area contained small trees, bushes, rocks and several previously cut trees. Beyond the plateau was a wooded area with continued down sloping terrain.

On scene examination of the wreckage revealed the airplane came to rest on the plateau, upright, and on a magnetic course of approximately 250 degrees. All major components of the airplane were accounted for at the accident scene.

The airplane's nose section was buckled slightly and crushed upward. The tail-cone was partially separated and canted to the left. The area near the tail cone was crushed upward. The left wing sustained minor damage. The right wing leading edge near the wing tip and an area near the wing root sustained impact damage. There was no scuffing or scratches observed on the underside of the fuselage or wings.

The airplane's left main landing gear was found extended. The right main landing gear was collapsed outboard near the right flap, and the nose gear was collapsed and crushed into the forward cockpit area. The tread on the main landing gear tires exhibited even wear, and no "flat spots" were observed. Additionally, the left and right main landing gear brake wear pins were measured and found to be within limits.

Flight control continuity was confirmed from the elevator, rudder, and left spoiler control surfaces to the forward cockpit area. Damage to the forward cockpit area precluded a check of the right spoiler.

The airplane's thrust reversers were found partially deployed. The left thrust reverser was canted slightly to the right. There was impact damage noted on the bottom of the left reverser, and the left forward actuating arm was broken. It was noted that the portion of the engine cowling where the left thrust reverser bucket mated against the engine, was not damaged. Additionally, several small pieces of shrapnel were found in the left thrust reverser "bucket." The right thrust reverser was not damaged and could be moved freely.

Electrical continuity of the airplane's left and right main landing gear air/ground safety switches; thrust reverser deploy/stow control and arming switches located in the throttle quadrant; and the left and right deploy limit switches located on the thrust reverser assemblies was confirmed with the use of a multi-meter.

The left and right engines were not damaged. Both engine compressor fans were free of foreign object damage, and mechanical continuity was confirmed between the low pressure compressor and low pressure turbine. The accessory gear boxes of both engines were able to be rotated by use of the starter motors. One igniter plug was removed from each engine and both exhibited little evidence of erosion. Additionally, fuel was found in the fuel pump inlet lines of both engines.

The airplane's air data computers, brake system components, thrust reverser control box, annunciator panel, and thrust reverser emergency stow switches were retained for further examination.

MEDICAL AND PATHOLOGICAL INFORMATION

Toxicological testing performed by hospital personnel on the PIC and co-pilot was negative for drugs and alcohol.

TESTS AND RESEARCH

Examination of the airplane's antiskid brake components was conducted at Crane Hydro-Aire, Burbank, California, under the supervision of an FAA inspector. Testing performed on the brake control unit, brake control valve, wheel speed transducers, and hub caps, did not reveal any discrepancies that would have interfered with proper function of the airplane's braking system.

Examination of the airplane's air data computer was conducted at Rockwell Collins, Cedar

Rapids, Iowa, on June 21, 1999, under the supervision of an FAA inspector. Examination of the air data computer revealed it had sustained significant impact damage and no useable information could be extracted from the unit.

On February 23, 2000, the airplane's thrust reverser control box was examined at Lee Air, Wichita, Kansas, under the supervision of an FAA aerospace engineer. No discrepancies were noted and the control box passed all functional checks required of a new unit.

On February 24, 2000, the airplane's left and right emergency stow switches were examined at Eaton Aerospace Controls Division, Costa Mesa, California, under the supervision of an FAA inspector. Examination of switches did not reveal any pre-accident malfunctions which would have precluded their normal operation.

Examination of the annunciator panel lights by the NTSB Materials Laboratory, Washington, DC, revealed no evidence of filament "stretching;" however, it was noted that the glass bulbs were intact and contained no evidence of impact damage.

ADDITIONAL INFORMATION

Airplane Performance

The pilot was not certain of the airplane's landing weight; however, he believed the airplane's landing weight was about 13,500 lbs.

According to the landing distance chart found in the BeechJet 400A Pilot's Operating Manual, at a landing weight of 13,500 lbs., the airplane's target Vref speed was 108 knots, and the estimated landing distance was about 3,100 feet. It was noted that the landing distance was predicated on the Vref speed, and the use of maximum braking. The use of the thrust reverser system was not considered in the airplane's landing distance chart.

The pilot stated that he did not calculate the airplane's landing distance prior to the accident, and that he typically experienced landing distances of 3,000 to 3,200 feet.

Thrust Reverser System

The airplane was equipped with an optional four-bar linkage, external target type, hydraulically operated thrust reverser system. Both pilots stated they had not experienced any problems with the airplane's thrust reverser system prior to the accident, and the PIC stated he performed a successful ground functional check of the thrust reverser system prior to departing PBI.

According to a representative of the airplane manufacturer, and the airplane's maintenance manual, the thrust reverser (TR) levers' motion was separated into three positions. Position 1 "STOWED," position 2 "DEPLOY - REVERSE IDLE," and position 3 "FULL REVERSE POWER." When the power levers are at the idle position, and the TR levers are moved from position 1 to position 2, the TR deploy/stow and arming switches located in the throttle quadrant are activated. These switches energize the TR hydraulic isolation and control valves. The isolation valves then open, and provide hydraulic pressure to the control valves. In order for the control valves to open, the TR emergency stow switches must not have been activated, and one of the airplane's two air/ground safety switches must be in the "ground" mode. The control valves would then direct hydraulic pressure to the deploy side of the TR actuators, which would cause the actuator's to start moving. This movement unlocks the TR linkage mechanisms and drives the TR's to the deployed position. When the TR's are fully deployed,

the deploy limit switches are activated, which completes the deployment cycle.

The BeechJet 400A Pilot's Operating Handbook, Thrust Reverser System, Normal Operation, stated in part:

"When the deployment cycle is completed, 28V DC is supplied through the deploy limit switch to the thrust interlock solenoid (LH or RH) which releases the reverser lever interlock. The pilot may then move the reverser lever(s) further upward, driving the thrust linkage from IDLE to any desired reverse setting [position 2 to position 3]."

The airplane was equipped with a left and right "TR ARM," "UNLOCKED," and "DEPLOY" annunciator light which illuminate during the TR deploy cycle. According to airplane manufacturer, excessive pressure on the TR levers before illumination of the "DEPLOY" lights can prevent the interlock solenoids from retracting.

The BeechJet 400A Airplane Flight Manual (AFM), Normal Landing Checklist stated:

1. Thrust-----Idle 2. Brakes (after touchdown)-----Apply 3. Speed Brakes-----Extend 4. Thrust Reversers-----Deploy 5. Reverser Lights-----Verify 6. Reverse Power-----As Required

The PIC stated he could not recall if he observed any lights associated with the TR system. Additionally, the pilot said that he had never performed a landing in the BeechJet 400A without using the airplane's thrust reverser system.

Speed Brake System

The airplane uses spoilers for both roll control and as a speed brake. According to a representative of the airplane manufacturer and the airplane's maintenance manual, the "speed brake" function is not available if the airplane's flaps were set to a position greater than 10-degrees or if a power lever was at a position greater than 85 percent. During a normal landing, the flaps are set to 30-degrees (full-down), and the speed brake system can be activated as a "lift dump system." When the speed brake switch is placed in the extend (EXT) position the speed brakes will deploy and the switch will be electrically held in the EXT position, provided that the airplane has "weight on wheels," and the emergency retract cover switch was not in the "EMERG" position. The speed brake would automatically retract if a power lever was advanced to a position greater than 85-percent, or if "weight on wheels" was lost. Additionally, when the speed brakes are extended the "SPD BRAKE EXTEND" annunciator light, located in front of the co-pilot would illuminate.

Refueling

Fueling records revealed the airplane was fueled with 371 gallons of Jet-A fuel before it departed PBI. The fuel receipt indicated that both wing fuel tanks were topped off, and 244 gallons was added to the fuselage tank.

Wreckage Release

The airplane wreckage was released on April 23, 1999, to a representative of the owners insurance company.

Pilot Information

Certificate:	Airline Transport; Commercial	Age:	42, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	Helicopter	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane; Helicopter	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	Last Medical Exam:	06/29/1998
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:	4719 hours (Total, all aircraft), 107 hours (Total, this make and model), 2185 hours (Pilot In Command, all aircraft), 122 hours (Last 90 days, all aircraft), 52 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	Raytheon Corporate Jets	Registration:	N400VG
Model/Series:	BE-400A BE-400A	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	RK-113
Landing Gear Type:	Retractable - Tricycle	Seats:	8
Date/Type of Last Inspection:	04/11/1999, Continuous Airworthiness	Certified Max Gross Wt.:	16100 lbs
Time Since Last Inspection:	3 Hours	Engines:	2 Turbo Fan
Airframe Total Time:	1215 Hours	Engine Manufacturer:	P&W Canada
ELT:	Not installed	Engine Model/Series:	JT15D-5
Registered Owner:	VECELLIO AND GROGAN	Rated Power:	2965 lbs
Operator:	VECELLIO AND GROGAN	Air Carrier Operating Certificate:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	BWK, 2504 ft msl	Observation Time:	1451 EDT
Distance from Accident Site:	0 Nautical Miles	Direction from Accident Site:	0°
Lowest Cloud Condition:	Scattered / 6000 ft agl	Temperature/Dew Point:	9° C / -5° C
Lowest Ceiling:	None / 0 ft agl	Visibility	10 Miles
Wind Speed/Gusts, Direction:	15 knots/ 21 knots, 290°	Visibility (RVR):	0 ft
Altimeter Setting:	29 inches Hg	Visibility (RVV):	0 Miles
Precipitation and Obscuration:			
Departure Point:	WEST PALM BEACH, FL (PBI)	Type of Flight Plan Filed:	IFR
Destination:	(BKW)	Type of Clearance:	IFR
Departure Time:	1310 EDT	Type of Airspace:	Class E

Airport Information

Airport:	RALEIGH COUNTY MEMORIAL (BKW)	Runway Surface Type:	Asphalt
Airport Elevation:	2504 ft	Runway Surface Condition:	Dry
Runway Used:	28	IFR Approach:	None
Runway Length/Width:	5000 ft / 100 ft	VFR Approach/Landing:	Full Stop; Straight-in

Wreckage and Impact Information

Crew Injuries:	2 Serious	Aircraft Damage:	Substantial
Passenger Injuries:	4 Serious, 2 Minor	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	6 Serious, 2 Minor	Latitude, Longitude:	

Administrative Information

Investigator In Charge (IIC):	LUKE SCHIADA	Adopted Date:	09/28/2000
Additional Participating Persons:	DAVE L BURGESS; CHARLESTON, WV PAUL E YOOS; WICHITA, KS PAUL F CROSBY; BRIDGEPORT, WV		
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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