National Transportation Safety Board
Aviation Accident Final Report

Location:	Rome, Georgia	**Accident Number:**	ERA16LA131
Date & Time:	March 14, 2016, 15:08 Local	**Registration:**	N465FL
Aircraft:	RAYTHEON AIRCRAFT COMPANY 400A	**Aircraft Damage:**	Substantial
Defining Event:	Runway excursion	**Injuries:**	2 Minor
Flight Conducted Under:	Part 91: General aviation - Positioning		

Analysis

The pilots of the business jet were conducting a cross-country positioning flight. According to the pilot flying (PF), the flight was uneventful until the landing. While completing the descent checklist and while passing through 18,000 ft mean sea level (msl), the pilot monitoring (PM), received the automated weather report from the destination airport and briefed the PF that the wind was variable at 6 knots, gusting to 17 knots. The PF then programmed the flight management system for a visual approach to runway 7 and briefed the reference speed (Vref) as 107 knots and the go-around speed as 129 knots based on an airplane weight. The PF further reported that he knew the runway was over 4,400 ft long (the runway was 4,495 ft long) and he thought that the airplane needed about 2,900 ft of runway to safely land.

During the left descending turn to the base leg of the traffic pattern, the PF overshot the final approach and had to turn back toward the runway centerline as the airplane was being “pushed by the winds.” About 500 ft above ground level (agl), both pilots acknowledged that the approach was “stabilized” while the airspeed was fluctuating between 112 and 115 knots. About 200 ft agl, both pilots noticed that the airplane was beginning to descend and that the airspeed was starting to decrease. The PF added power to maintain the descent rate and airspeed. The PF stated that, after adding power and during the last 200 ft of the approach, the wind was “gusty,” that a left crosswind existed, that the ground speed seemed “very fast,” and that excessive power was required to maintain airspeed. When the airplane was between about 75 and 100 ft agl, the PF asked the PM for the wind information, and the PM responded that the wind was variable at 6 knots, gusting to 17 knots. Both pilots noted that the ground speed was “very fast” but decided to continue the approach. Neither pilot reported seeing the windsock located off the right side of the runway.

Review of weather data recorded by the airport’s automated weather observation system revealed that about 3 minutes before the landing, the wind was from 240° at 16 knots, gusting to 26 knots, which would have resulted in a 3- to 5-knot crosswind and 16- to 26-knot tailwind. Assuming these conditions,

the airplane's landing distance would have been about 4,175 ft per the unfactored landing distance performance chart.

Tire skid marks were found beginning about 1,000 feet from the approach end of runway 7. The PF stated that the airplane touched down "abruptly at Vref+5 and he applied the brakes while the PM applied the speed brakes. Neither pilot felt the airplane decelerating, so the PF applied harder pressure to the brakes with no effect and subsequently applied full braking pressure. When it was evident that the airplane was going to depart the end of the runway, the PM applied the emergency brakes, at which point he felt some deceleration; however, the airplane overran the end of the runway and travelled through grass and mud for about 370 feet before stopping.

Examination of the airplane revealed that the nose landing gear (NLG) had collapsed, which resulted in the forward fuselage striking the ground and the airframe sustaining substantial damage. Although the pilots reported that they never felt the braking nor antiskid systems working and that they believed that they should have been able to stop the airplane before it departed the runway, postaccident testing of the brake and antiskid systems revealed no evidence of preaccident mechanical malfunctions or failures that would have precluded normal operation, and they functioned as designed. Given the tire skid marks observed on the runway following the accident, as well as the postaccident component examination and testing results, the brakes and antiskid system likely operated nominally during the landing.

Based on the available evidence, the pilots failed to recognize performance cues and use available sources of wind information that would have indicated that they were landing in significant tailwind conditions and conduct a go-around. Landing under these conditions significantly increased the amount of runway needed to stop the airplane and resulted in the subsequent runway overrun and the collapse of the NLG.

Probable Cause and Findings

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

The pilots' failure to use available sources of wind information before landing and recognize cues indicating the presence of the tailwind and conduct a go-around, which resulted in their landing with a significant tailwind and a subsequent runway overrun.

Findings

Personnel issues	Lack of action - Flight crew
Environmental issues	Tailwind - Awareness of condition
Environmental issues	High wind - Awareness of condition

Factual Information

On March 14, 2016, at 1508 eastern standard time, a Raytheon 400A, N465FL, was substantially damaged when it was involved in an accident at Richard B. Russell Regional Airport (RMG), Rome, Georgia. The two pilots sustained minor injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 positioning flight.

According to the pilot flying (PF), the flight was uneventful until the landing. While completing the descent checklist, and while passing through 18,000 ft mean sea level (msl), the pilot monitoring (PM) received the 1449 Automated Surface Observing System (ASOS) weather at the destination airport and briefed the PF that the wind was variable at 6 knots, gusting to 17 knots. He also noted that he had selected a visual approach to runway 7. The flight was later cleared for the approach by air traffic control. The PF stated that he then programmed the flight management system for a visual approach to runway 7 with a 3-mile final approach leg before he briefed the reference speed (Vref) as 107 knots and the go-around speed as 129 knots based on the airplane's weight.

As the airplane approached the airport between about 2,000 and 2,100 ft msl, the crew entered the downwind leg of the airport traffic pattern for runway 7 at an airspeed of about 200 knots. The PF slowed the airplane to about 170 knots and called for 10° of flaps. The PF mentioned that the airplane's flightpath was near high terrain, so the PM pressed the "Terrain Inhibit" button to inhibit any possible nuisance alarms. The PF then called for 20° of flaps, started descending from the traffic pattern altitude, and began a left descending turn to the base leg of the traffic pattern with 30° of flaps. The PM stated that the gear down and before landing checklists had been complete abeam the numbers for runway 07. The PF stated that he overshot the final approach and had to turn back toward the final runway centerline as the airplane was "pushed by the winds." Additionally, the PF described the presence of moderate turbulence during the final approach. About 500 ft above ground level (agl), both pilots acknowledged that the approach was "stabilized" while the airspeed was fluctuating between 112 and 115 knots.

When the airplane was about 200 ft agl, both pilots noticed that it was beginning to descend and the airspeed was starting to decrease. The PM told the PF to "add power." The PF added power, and noted that, during the last 200 ft of the approach, the wind was "gusty," that a left crosswind existed, that the ground speed seemed "very fast," and that considerable power was required to maintain airspeed. Between about 75 and 100 ft agl, the PF asked the PM for the wind information, and the PM stated that the wind was variable at 6 knots, gusting to 17 knots. Neither pilot reported seeing the windsock located off the right side of the runway.

Both pilots noticed that the ground speed was "very fast," but they chose to continue the approach. The PF stated that, when the airplane "abruptly" touched down, it was at an airspeed about 5 knots above Vref and that the airplane was "well within the touchdown zone." Upon touchdown, the PF applied normal braking while the PM applied the speed brakes. Neither pilot felt the airplane decelerating, so the PF applied harder pressure to the brakes with no effect. Subsequently, the PM said, "max brakes," and started applying full braking pressure. However, they still did not feel the airplane decelerate or the antiskid system activate. When it was evident that the airplane was going to depart the end of the

runway, the PM applied the emergency brakes, at which point, he felt some deceleration. However, the airplane overran the end of the runway, travelled through grass and mud for several hundred feet, and then skidded to a stop.

The airplane was manufactured in 2005 and in July 2014, it underwent a supplemental type certificate design change to modify the airplane from a 400A to a 400XT model, which included replacement of the engines, removal of the thrust reversers, and several other avionic, aerodynamic, airframe and cabin interior enhancements. The main landing gear wheels were equipped with hydraulic disc brakes, which could be actuated from either the pilot's or copilot's rudder pedals. The airplane was also equipped with an antiskid system powered through a switch in the cockpit.

A review of the operator's maintenance records revealed that, between December 2014 and March 2016, three discrepancies related to the airplane's antiskid and brake systems were reported. The discrepancies that were reported included: 1) In December 2014, "no initial braking after landing" for about 3 to 5 seconds, although the braking during taxi operations was reported to "seem normal." The corrective action included inspection, troubleshooting, and brake bleeding. Air was found in the left brake system and bled out. 2) In December 2015, "on landing the antiskid was cycling on/off excessively," the airplane "would not slow down," although the braking during taxi operations was reported to "be normal". The corrective action noted an operation check with no defects discovered. 3) In January 2016, "antiskid not modulating/braking action poor". The corrective action included bleeding the brake system and performing a taxi test. No further defects were noted.

At 1449, about 20 minutes before the accident, the recorded ASOS weather at RMG included, in part, wind variable at 6 knots, gusting to 17 knots, which is the information the pilots received while passing through 18,000 ft msl during their descent to the airport. At 1505, about 3 minutes before the accident, the reported weather at RMG included, in part, winds from 240° at 16 knots, gusting to 26 knots. Assuming these conditions, a 3- to 5-knot crosswind and 16- to 26-knot tailwind existed about the time of the landing on runway 7.

Following the accident, the PF reported that he believed that the airplane needed 2,900 ft of runway to safely land. Review of the airplane's unfactored landing distance performance chart reveal that assuming the weather conditions reported 3 minutes before the accident, and an airplane weight of 12,600 lbs, the landing distance needed was about 4,175 ft.

During a postaccident examination of the runway, tire skid marks were found beginning about 1,000 ft from the approach end of the runway 7. The tire marks swerved slightly toward the right about 20 ft right of the centerline and then slightly left toward the centerline and extended to the runway end. Further down the runway, the tire marks became increasingly more pronounced, flattened out, and widened. The tire marks continued and veered left through grass and mud for another 370 ft past the departure end of the runway, where the airplane came to rest (see figure 1).

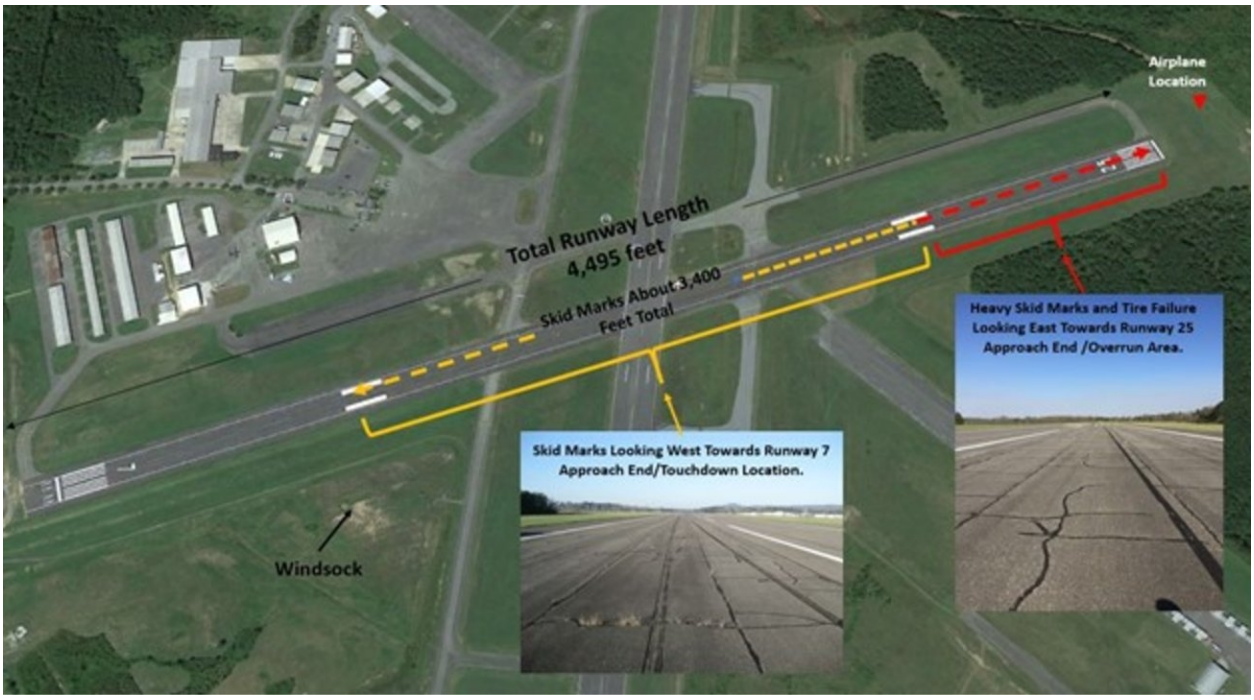

Figure 1 - Overhead view of runway layout showing the approximate measurements of the skid marks and the airplane's final resting location.

Postaccident examination of the airplane revealed that the nose landing gear (NLG) had collapsed, and the forward portion fuselage of the fuselage was substantially damaged. A review of the engines' full authority digital electronic control data revealed that no faults pertinent to the accident were recorded. The hydraulic brake system was bled, and no gas bubbles were found in the fluid. The antiskid control box was bench tested, and it passed all performed tests. The power brake control valve was bench tested. Plots generated by the left and right and servo modulation tests and power brake valve test showed results outside of the limits for a new production valve. The left tests were repeated, and the results improved. Overall, the plots were consistent with a functioning, in-service valve with no anomalies observed that would not have affected braking or antiskid operations. Fluid samples from the left and right brake ports and pressure port were within acceptable limits. The unit passed all other performed tests.

The left wheel speed transducer was bench tested, and it passed all performed tests. The right wheel speed transducer was also bench tested, and it failed the test at the lowest speed setting of 100 Hz. The transducer was then tested at the highest speed setting of 1,200 Hz, and it functioned as expected. The noted anomaly likely would only have impacted braking at speeds below about 10 knots. Overall, examination and testing of the brake and antiskid systems revealed no evidence of any preaccident mechanical malfunctions or failures that would have precluded normal operation during the landing.

History of Flight

Approach	Other weather encounter
Landing-landing roll	Landing gear collapse
Landing-landing roll	Runway excursion (Defining event)

Pilot Information

Certificate:	Airline transport	**Age:**	45,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	November 13, 2015
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	November 25, 2015
Flight Time:	10393 hours (Total, all aircraft), 6174 hours (Total, this make and model), 9638 hours (Pilot In Command, all aircraft)		

Co-pilot Information

Certificate:	Airline transport	**Age:**	45,Male
Airplane Rating(s):	Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):		**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):		**Toxicology Performed:**	No
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	September 23, 2015
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	November 11, 2015
Flight Time:	6036 hours (Total, all aircraft), 407 hours (Total, this make and model), 2560 hours (Pilot In Command, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	RAYTHEON AIRCRAFT COMPANY	**Registration:**	N465FL
Model/Series:	400A A	**Aircraft Category:**	Airplane
Year of Manufacture:	2005	**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	RK-426
Landing Gear Type:	Retractable - Tricycle	**Seats:**	10
Date/Type of Last Inspection:	February 2, 2016 Continuous airworthiness	**Certified Max Gross Wt.:**	16300 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo fan
Airframe Total Time:	7061 Hrs at time of accident	**Engine Manufacturer:**	Williams
ELT:	Installed, not activated	**Engine Model/Series:**	FJ-44-3AP
Registered Owner:		**Rated Power:**	3050 Lbs thrust
Operator:		**Operating Certificate(s) Held:**	Fractional ownership

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	RMG,644 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	15:08 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Broken / 4400 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	16 knots / 26 knots	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	240°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	29.75 inches Hg	**Temperature/Dew Point:**	23°C / 13°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	JACKSON, MI (JXN)	**Type of Flight Plan Filed:**	IFR
Destination:	Rome, GA (RMG)	**Type of Clearance:**	IFR
Departure Time:	13:45 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	RICHARD B RUSSELL REGIONAL - JRMG	**Runway Surface Type:**	Asphalt
Airport Elevation:	644 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	07	**IFR Approach:**	Visual
Runway Length/Width:	4495 ft / 100 ft	**VFR Approach/Landing:**	Traffic pattern

Wreckage and Impact Information

Crew Injuries:	2 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	2 Minor	**Latitude, Longitude:**	34.353054,-85.151107

Administrative Information

Investigator In Charge (IIC):	Mccarter, Lawrence		
Additional Participating Persons:	John Palmer; FAA/FSDO; Atlanta, GA David Gerlach; FAA-AVP-100; Washington DC, DC Ernest Hall; Textron/Beech; Wichita, KS Todd Anguish; Flight Options; Cleveland, OH Michael Minellono; IBT Local 1108; Cleveland, OH		
Original Publish Date:	May 6, 2021	**Investigation Class:**	3
Note:	The NTSB did not travel to the scene of this accident.		
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=92847		

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

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.