



National Transportation Safety Board Aviation Accident Final Report

Location:	Key West, FL	Accident Number:	ERA12FA056
Date & Time:	10/31/2011, 1942 EDT	Registration:	N480JJ
Aircraft:	GULFSTREAM G150	Aircraft Damage:	Substantial
Defining Event:	Runway excursion	Injuries:	1 Serious, 3 Minor
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

The airplane was approaching the destination airport in night visual meteorological conditions. After losing sight of the runway once and going around, they continued the approach, even though the pilot in command (PIC) stated that he thought they were going to land long. The PIC stated that the main landing gear touched down near the 1,000-foot marker of the 4,801-foot-long runway, about the landing reference speed (V_{ref}) of 120 knots. The PIC stated that he then applied the brakes but thought they were not working; he had not yet activated the thrust reversers. He alerted the second in command (SIC), who also depressed the brake pedals with no apparent results. The PIC suggested a go-around, but the SIC responded that it was too late. The airplane subsequently traveled off the end of the runway, struck a gravel berm, and came to rest about 816 feet beyond the end of the runway. During the impact, one of the passenger seats dislodged from its seat track and was found on the cabin floor, with the passenger still in it.

Review of cockpit voice recorder, video, and performance data revealed that the main landing gear touched down at V_{ref} and about 1,650 feet beyond the approach end of the runway. The nosegear then touched down 2.4 seconds later and about 2,120 feet beyond the approach end of the runway, with about 2,680 feet of runway remaining. Digital electronic engine control data revealed that about 8 seconds after weight-on-wheels, the power levers were advanced from the idle position to the takeoff position. The power levers were then returned to the idle position 6 seconds later. The power levers were moved to the reverse thrust position 8 seconds after that and remained in that position for the duration of the accident sequence; both thrust reversers deployed when commanded. Examination and testing of the airplane systems did not reveal any evidence of preimpact mechanical malfunctions with the wheels brakes or any other systems.

Although armed, the airbrakes did not deploy upon touchdown; the data available was inconclusive to determine what position the throttles were in at touchdown and why the airbrakes did not deploy. It is likely that the pilots did not detect the wheel braking because its effect was less than expected with the airplane at full power and with the airbrakes stowed.

Landing distance data revealed that the airplane required about 2,551 feet to stop at its given weight in the given weather conditions. With a runway distance of 2,680 feet remaining, the airplane could have stopped or gone around uneventfully with appropriate use of all deceleration devices. The landing procedure stated to activate the thrust reversers after nosewheel touchdown and then apply the brakes, as necessary; however, the PIC only applied the brakes. Further, no callouts were made to verify ground spoiler or reverse thrust deployment. The PIC then stated that he was going to go around, but the SIC said it was too late, so the thrust levers were brought back to idle and the reversers were deployed. The PIC's delayed decision to stop or go around resulted in about a 22-second delay in thrust reverser activation, which resulted in the runway overrun. Additionally, the procedure for a (perceived) failed brake system would have been to activate the emergency brake, which neither pilot did.

Examination of the seats revealed that a forward-facing seat was installed in the aft-facing position and an aft-facing seat was installed in the forward-facing position. Additionally, the ejected seat's shear plungers were found in the raised position. Had the seat been installed correctly, the plungers would have been in the lowered position, in the seat track. The improper installation most likely resulted in the passenger's seat separating from the seat track and exacerbating his injuries.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot in command's failure to follow the normal landing procedures (placing engines into reverse thrust first and then brake), his delayed decision to continue the landing or go-around, and the flight crew's failure to follow emergency procedures once a perceived loss of brakes occurred. Contributing to the seriousness of the passenger's injury was the improper securing of the passenger seat by maintenance personnel.

Findings

Aircraft	Seat/cargo attach fitting - Incorrect service/maintenance (Factor)
Personnel issues	Use of policy/procedure - Pilot (Cause) Decision making/judgment - Pilot (Cause) Use of checklist - Flight crew (Cause) Installation - Maintenance personnel (Factor)

Factual Information

HISTORY OF FLIGHT

On October 31, 2011, about 1942 eastern daylight time, a Gulfstream G150, N480JJ, operated by Hendrick Motorsports Aviation, was substantially damaged during a landing overrun at Key West International Airport (EYW), Key West, Florida. The two airline transport pilots and one passenger reported minor injuries, while a second passenger was seriously injured. Night visual meteorological conditions prevailed and an instrument flight rules flight plan was filed for the flight that departed Witham Field Airport (SUA), Stuart, Florida, at 1900. The personal flight was conducted under the provisions of 14 Code of Federal Regulations Part 91.

The pilot-in-command (PIC) stated that air traffic control cleared the flight for a visual approach to runway 27, which was 4,801 feet long. The PIC did not call for the checklist due to radio chatter, but observed the copilot (CP) complete the before landing checks, with the landing gear and flaps extended. The airplane entered the airport traffic pattern on a right base leg for runway 27. The flightcrew lost sight of the runway due to some low stratus clouds and discontinued the approach. The controller then instructed them to overfly the airport and enter a right downwind leg for runway 27, which they did. During the second approach, they again temporarily lost sight of the runway due to clouds, while turning from the base to final leg; however, they were able to visually reacquire the runway on final approach.

The PIC further stated that he continued the approach and touched down about the landing reference speed (V_{ref}) of 120 knots, just past the 1,000-foot touchdown marker on runway 27. The PIC applied brakes and was just about to activate the thrust reversers when he realized the brakes were not working. He stated "no brakes" and the CP also depressed the brake pedals with negative results. The PIC suggested a go-around to the CP, but the CP responded that it was too late. The airplane subsequently traveled off the end of the runway and struck a gravel berm. During the impact, one of the passengers' seat dislodged from its seat track and was found on the cabin floor, with the passenger still in it. The PIC added that maintenance had been performed on the brakes within 10 days of the accident.

The CP's statement was consistent with the PIC's statement. When asked why they did not utilize the emergency brake system, both pilots stated that there was not enough time.

The passenger in the left forward facing seat stated they did not land on the first attempt and the flightcrew did not provide any information. They were in a fairly quick traffic pattern. It was dark with clouds and he could not see very much because the airplane was in a bank and he was concerned about the missed approach. The airplane touched down near the fixed base operator and he did not feel any braking action. This caused more concern because he knew the runway was short. He did not remember hearing the ground spoilers deploy or if the engines spooled up or down. There was no warning from the flightcrew that the airplane was going to depart the runway. He heard someone in the cockpit state, "oh no" right before the airplane departed the runway. There was a big bump, jolt and his seat came out of the seat track and he went forward in the seat. The airplane came to a stop and his wife and the CP came to his assistance and they evacuated the airplane through the cabin door.

PERSONNEL INFORMATION

The PIC, age 47, held an airline transport pilot certificate, with ratings for airplane single-engine land, airplane multiengine land, and instrument airplane, issued on May 6, 2011. He

also held a flight instructor certificate, with ratings for airplane single and multiengine, issued on December 22, 2009. His most recent first-class medical certificate was issued on September 6, 2011, with the limitation, "Must have available glasses for near vision." The PIC's last flight review was conducted in a Gulfstream 500 on October 6, 2011. The PIC estimated that he had about 11,000 total flight hours; of which, 290 hours were in the Gulfstream G150, and about 9,050 hours were in multiengine airplanes. He had about 6,230 hours as PIC; of which, 155 hours were in the G150 and 4,950 hours were in multiengine airplanes. He had flown about 66 hours and 27 hours during the 90 days and 30 days preceding the accident, respectively.

The CP, age 55, held an airline transport pilot certificate, with ratings for airplane single-engine land, airplane multiengine land, and instrument airplane, issued on May 28, 2011. He also held a flight instructor certificate, with ratings for airplane single and multiengine, issued on November 13, 1981. His most recent first-class medical certificate was issued on July 19, 2011, with the limitation, "Must have available glasses for near vision." The CP's last flight review was conducted in a Gulfstream 500 on April 25, 2011. The CP estimated that he had about 13,500 total flight hours; of which, 75 hours were in the Gulfstream G150, and about 12,300 hours were in multiengine airplanes. He had about 13,000 hours as PIC; of which, 35 hours were in the G150, and 12,000 hours were in multiengine airplanes. He had flown about 75 hours and 7 hours during the 90 days and 30 days preceding the accident, respectively.

Both pilots received training from FlightSafety for normal and abnormal procedures relating to the hydraulic system. The pilots stated in postaccident interviews that they received training on brake failures during landing in the G150, but it was always associated with a hydraulic failure or hydraulic problem in flight. In the simulator, they would follow the procedure in the Quick Reference Handbook and would set the brakes to emergency while in flight. They did not recall training for an unexpected brake failure after landing, which required engaging of the emergency brakes.

AIRCRAFT INFORMATION

The Gulfstream G150, serial number 241, manufactured in 2007, was a nine-place airplane with a retractable tricycle landing gear. It was equipped with two Honeywell TFE731-40AR-2006 engines, each providing 4,420 pounds of thrust. Review of maintenance records revealed that the airplane was maintained under a manufacturer's approved inspection program and its most recent inspection was completed by Gulfstream on December 15, 2010. The airplane had 867.7 hours and 657 cycles at the time of that inspection. The Hobbs meter at the time of the accident was 1,189.8 hours. The airplane had flown 322.1 hours since the last inspection. The transponder, altimeter, encoder, and static system tests were completed on January 5, 2010.

Further review of maintenance records revealed that 4 days prior to the accident, the No. 4 brake swivel was leaking hydraulic fluid. The No. 4 swivel was resealed by a mechanic for the operator in accordance with the Gulfstream G150 maintenance manual. Following the resealing, the brakes were operationally checked. Additionally, the flightcrew did not report any anomalies with braking during their previous landing at SUA.

The airplane was last refueled with 225 gallons of Jet A fuel prior to departure from SUA, on October 31, 2011.

METEOROLOGICAL INFORMATION

The EYW 1953 surface weather observation was: wind 360 degrees at 12 knots, gusting to 17 knots; visibility 10 miles; ceiling broken at 1,000 feet; ceiling broken at 1,400 feet; ceiling broken at 5,000 feet; temperature 26 degrees C; dew point 23 degrees C; altimeter 29.96 inches of mercury.

The PIC stated that he checked the weather several times and had print outs from his preflight weather briefing. He wanted to make sure a line of weather would not affect the flight.

The U. S. Naval Observatory Astronomical Applications department reported the sunset was at 1848 and civil twilight was at 1911. The moon was a waxing crescent with 29 percent of the moon's visible disk illuminated.

AIRPORT INFORMATION

The EYW airport was owned and operated by Monroe County, Florida. The airport had a single runway and was a 14 CFR Part 139 Class 1, Index B airport. Runway 9/27 was 4,801 feet long, 100 feet wide, and consisted of grooved asphalt in good condition. An engineered material arresting system (EMAS), 340 feet in length and 120 feet in width, was installed at the departure end of runway 9 in October 2010. The safety area at the departure end of runway 27 was extended to 400 feet wide and 600 feet long in May 2011. The safety area at the departure end of runway 27 did not have EMAS installed.

The EYW airport manager stated that due to prevailing wind, 80 percent of the flights land on runway 9 and 20 percent of the flights land on runway 27. There was concern, and a lack of data, for an EMAS at the departure end of runway 27 (approach end of runway 9). Specifically, the concern was that of the 80 percent traffic landing on runway 9, if one airplane were to land short, it would land in an EMAS. There was thought that such an event could be catastrophic; however, there has since been more data of aircraft landing in an EMAS that has not been catastrophic. Subsequently, and after this accident, the airport manager submitted a preapplication with the FAA for an EMAS at the departure end of runway 27.

Four days after the accident with N480JJ, a Cessna 550 airplane, N938D, landed on runway 9 at EYW and was unable to stop prior to overrunning the runway. The airplane entered the EMAS and came to rest about 148 feet into the EMAS. The airplane received minor damage and the two pilots and three passengers were not injured. See NTSB accident number ERA12IA060.

FLIGHT RECORDERS

Cockpit Voice Recorder

The airplane was equipped with a Universal Cockpit Voice Recorder-120 (CVR), serial number 1954. The CVR had not sustained any heat or impact damage and audio information was extracted normally without difficulty. A CVR group was convened at the NTSB Vehicle Recorders Laboratory, Washington, DC, and a partial transcript was completed of the last 13 minutes of the recording.

At 1930, the airplane was descending to 10,000 feet, about 30 miles north of EYW and the flightcrew was in radio contact with Key West Approach. The CP advised the controller that they had the current automated terminal information service, which was Victor. The controller then told the flightcrew to expect a visual approach to runway 27, and offered them the option of a right base over the channel or a 5 to 6-mile final approach.

At 1931, the PIC deferred to the CP, and the CP elected the right base leg entry to the airport traffic pattern. The flight was then cleared down to 8,000 feet, about 25 miles from the airport.

At 1932, the flight was cleared to 1,600 feet and provided vectors for the visual approach. During the next 3 minutes, the PIC helped the CP program the flight management system for the visual approach.

At 1936, the controller asked the flightcrew if they had EYW in sight. The CP responded that he did not have it in sight due to some "puffy" clouds in front of them, but he did see the airport beacon. The controller then cleared the flight for the visual approach and instructed the flightcrew to contact the EYW tower, which they did. The PIC had the CP select 12 degrees of flap extension and the EYW tower controller cleared the flight to land on runway 27. The controller also advised that the wind was from 360 degrees at 13 knots. The PIC remarked to the CP that until they get through the clouds, he was going to stop the descent at 1,600 feet.

At 1937, the CP advised the PIC that the airplane was 4 miles from the airport and the PIC instructed the CP to extend the flaps to 20 degrees, followed by extending the landing gear, followed by extending the flaps to 40 degrees. The PIC remarked that he was making the approach "blind." The CP stated that they would "pop out" in a second.

At 1938, the PIC stated that he had the nearby Navy base in sight; however, the CP replied that he needed to descend more and was probably going to miss EYW. The PIC then saw the airport, but agreed that they were going to miss it as the airplane was too high. The CP advised the controller that they were too high due to a cloud between them and the airport and requested to re-enter the traffic pattern. The controller instructed the flightcrew to overfly the airport and enter a right downwind leg for runway 27, which the CP acknowledged.

At 1939, the PIC flew a right crosswind for runway 27 and descended down to 800 feet to get below the clouds and maintain visual contact with the runway.

At 1940, the controller again cleared the flight to land on runway 27 and advised that the wind was from 360 degrees at 12 knots. The airplane then turned onto a base leg for runway 27.

At 1941, the CP asked the PIC if he saw the runway and he stated not yet as he had to turn too steep. The PIC subsequently saw it and thought that he was flying too fast, but the CP replied that the flight was on speed. About 20 feet above the runway, the PIC also stated that he was "long."

At 1942:00, sounds were recorded consistent with main landing gear touchdown. About 2 seconds later, the CP remarked that the speed was 110 knots.

At 1942:02, a sound was recorded similar to nosewheel touchdown. About 4.5 seconds later, the CP stated that the PIC needed to get "hard" on the brakes and the PIC replied that he was, but they were not working.

At 1942:10, the PIC stated twice that he was going around, but the CP stated no, it was too late for a go-around.

At 1942:19, there was a decreased in sound, similar to the airplane no longer on the ground, followed by the sound of impact at 19:42:24.

There were no aural warnings on the CVR. According to the aircraft manufacturer, a loss of hydraulic pressure would generate a master caution light, which would be accompanied by an aural warning.

Flight Data Recorder

The airplane was not, nor was it required to be equipped with a flight data recorder.

Maintenance Diagnostic Computer

The Rockwell Collins Maintenance Diagnostic Computer MDC-311030C9B was downloaded and contained numerous unrelated fault and service messages for the event flight; however, the unit did not have the capability to record faults with the braking system. The unit was able to record faults in the hydraulic system and there were no hydraulic related maintenance messages recorded.

Enhanced Ground Proximity Warning System

The Honeywell MKV EGPWS EMK5-28457 was downloaded and a data point was recorded during the approach, at a system time of 2127:10:13, about 50 feet above ground level, which was when the airplane was approximately over the runway threshold. The data point included position, time, and heading. A terrain alert was subsequently recorded at a system time of 2127:14:10, approximately 4 minutes after the landing record. All of the position data in that record was invalid and unusable.

Digital Electronic Engine Controls

Data from the Honeywell Digital Electronic Engine Controls (DEEC) 67-BC0083 and 67-BC0086 were downloaded. Review of the data revealed that approximately 8 seconds after weight on wheels, the power levers were advanced from the idle position to the takeoff position. The power levers were then returned to the idle position 6 seconds later. The power levers were moved to the reverse thrust position 8 seconds after that, and remained in that position for 127 seconds. The data also confirmed that both thrust reversers deployed when commanded.

WRECKAGE INFORMATION

The wreckage was located off the departure end of runway 27 at EYW. The airplane crossed over a grassy area, coral rock overrun area, and encountered a 3 to 5-foot ditch located 660 feet from the departure end of the runway. The airplane jumped the ditch and impacted an embankment at a dirt airport service road, which separated the lower section of the nose landing gear. There was also a significant impact mark in the embankment in the area of the right main landing gear. The airplane continued forward and crossed over the dirt airport service road and collided with the western end of a ditch/pond where it came to rest on a heading of approximately 240 degrees magnetic, about 816 feet from the end of the runway and 20 feet from the airport security fence. The left main landing gear was located aft of the left wing adjacent to the fuselage, with several hydraulic lines connecting it to the wing structure. The right main landing gear remained attached to the airplane. The nose radome was separated from the airplane and found forward of the airplane outside of the airport fence.

Postcrash examination revealed damage to the lower nose section, forward of the cockpit pressure bulkhead. The radar dome and radar antenna were completely separated from their attaching structure. The lower section of the nose, located below the avionics shelf, was crushed and the right aft section of the right nose landing gear door remained attached. The lower section of the nose landing gear had separated and was located near the dirt service road. The remaining section of the nose landing gear remained attached to the fuselage, was rotated rearward, and had punctured the pressure vessel at the airplane centerline. There was evidence

of external buckling of the fuselage skin at several locations between the first cabin window and the forward pressure bulkhead. The cabin door revealed no discernible damage and its operation appeared to be normal.

Examination of the right wing revealed minor damage. The spoilers remained attached at all hinge attachment points. The leading edge of the right wing and slats were not damaged. The upper and lower wing skins were not damaged. The right aileron remained attached at all hinge points and was not damaged. The flaps and slats were not damaged and remained attached at their respective hinge points. The flaps and slats were in the extended position. The right main fuel tank was not damaged and approximately 160 to 170 gallons of fuel was defueled from the tank. Large pieces of gravel and rock were found wedged between the wing to body fairing and the upper wing surface, which resulted in the separation of the fairing from the underlying structure. Examination of the fuselage revealed skin buckling aft of the flight deck pressure bulkhead, aft of the flight deck, and aft of the right hand emergency exit.

Examination of the left wing revealed damage to the aft spar, the wing skin and trailing edge structure. The spoilers remained attached at all hinge and actuator attach points. The leading edge and slats of the wing were damaged. The upper and lower wing skins were damaged. The left aileron remained attached at all hinge points and was damaged. The flaps remained attached at the hinge and actuators attach points. The flaps and slats were damaged and extended. The left main fuel tank was ruptured and no fuel was present in the tank. The rear wing spar and adjoining wing structure near the left main landing gear sustained damage.

The bottom of the fuselage incurred damage to the antennas and underside skin. The vertical fin was not damaged. The rudder was not damaged and remained attached to the fuselage. The right horizontal stabilizer was not damaged. The right elevator remained attached at all hinge points and was not damaged. The left horizontal stabilizer was not damaged. The left elevator remained attached at all hinge points and was not damaged.

Both engines remained attached to their respective mounts and did not appear to be damaged. They were removed by maintenance personnel and shipped to an independent facility for internal inspection and preservation. The inspection revealed that the engines' intake and exhaust areas were contaminated with salt water and/or soil debris, consistent with entry during the accident.

Examination of the cockpit revealed the power levers were in the off position. The thrust levers were stowed and the flaps/slats were extended 40-degrees. The Park/Emergency Brake was slightly forward of the neutral position.

The seats installed in the cabin were B/E Aerospace G150 Strata's Single Passenger Fixed Base seats. The fixed base seat was designed to attach to the floor track with four lower fitting housings. To install the seats, the shear plunger is raised to maximum height to allow for positioning the seat track fastener studs into the seat track. The seat is then slid forward or aft 1/2 inch and the shear plunger is tightened so that it is at or below the top surface of the lower fitting housing. The shear plunger is required to be tightened to a torque value of 30 to 40 inch pounds.

The left seat in row 2 (L/H No. 2) separated from the seat track during the accident sequence. Examination of the seat revealed the seat plungers at each of the four lower fitting housings were in the raised position. Seat L/H No. 2's forward inboard and rear outboard floor fitting showed evidence of wear on the bottom of the studs and plunger. Corresponding wear was

observed on the top of the seat track. Maintenance records indicated that seat L/H No. 2 was removed and reinstalled in the same cabin position during work completed at the Gulfstream facility in Savannah, Georgia, on January 5, 2010.

The other five seats were installed in their respective seat track, oriented correctly, with the shear plungers tightened at or below the top surface of the lower fitting housing.

The seats in rows 1 and 2 were not installed in accordance with the Gulfstream Seat Installation Drawing, which resulted in aft-facing seats being installed in the forward-facing direction and forward-facing seats installed in the aft-facing direction. The design of an aft-facing seat differs from a forward-facing seat as the aft-facing seat has two backrest locks and a forward-facing seat has one backrest lock. According to a representative from the seat manufacturer, two locks are needed for an occupied aft-facing seat to accommodate the occupied seat loading.

Components of the left and right brake system were removed and examined under the supervision of an NTSB Systems Engineer. The power brake valve was removed and examined at Israel Aerospace Industries LTD, Israel; the antiskid control unit was removed and examined at Projects Unlimited, Inc. Dayton, Ohio; the antiskid valves were removed and examined at Meggitt Aircraft Braking Systems, Akron, Ohio; the three airbrake (spoilers) selector solenoid valves were removed and examined at EATON Aerospace, Glendale, California. The examinations did not reveal any anomalies that would have resulted in a loss of or reduced performance of wheel braking or air braking. Additionally, no anomalies were noted that would have prevented the airbrakes from deploying.

The airbrake control switch was found in the land position. The system was designed for the airbrakes to deploy automatically, assuming both throttle levers were less than 18 degrees and one of the main landing gear had weight on wheels. A review of DEEC data was inconclusive in determining if the throttles were less than the required 18 degrees for activation. The data showed that the throttles were in the Idle to 40 degrees range after touchdown and before the throttles were advanced. According to Honeywell, this could mean the throttles were between 7 and 40 degrees. DEEC data indicated the air-ground logic was operational on both main landing gear. With hydraulic pressure available, there was no evidence to suggest that the airbrakes would not operate normally.

Examination of the pilot and copilot brake pedals and linkage did not identify any obstructions, corrosion, or potential binding of the linkage to the power brake valve. Visual inspection of the brakes did not reveal any anomalies and there was sufficient braking material.

The auxiliary power unit (APU) did not appear to be externally damaged. The APU was removed and shipped to the manufacturer's facility for evaluation, which did not reveal any anomalies.

ADDITIONAL INFORMATION

Performance/Video/CVR Sound Spectrum Study

A video study was completed, utilizing images captured from a surveillance camera at EYW. A performance study was then completed, utilizing data from the CVR and the video study. The performance study showed that main gear touchdown occurred approximately 1,650 feet past the runway 27 approach threshold (about 3,150 feet of runway remaining) at a ground speed near 119 knots, based on the correlation of available EGPWS, CVR, DEEC, and G150 aircraft performance data. The CVR evidence indicated that nose gear touchdown occurred about 2.4

seconds later at 114 knots (with about 2,680 feet of runway remaining, based on the distance traveled over 2.4 seconds, assuming an average ground speed of 116.5 knots between main gear and nose gear touchdown).

According to airplane performance calculations, the PIC's management of engine forward and reverse thrust during the event precluded a stop on the improved surface, with or without spoilers deployed, unless actual wheel braking capability significantly exceeded the level expected from a committed emergency wheel brake application. In fact, periods of sustained maximum manual wheel brake inputs would be required to stop the airplane on the runway based on the event engine power lever angle (PLA) history recorded on the DEEC. An evaluation of alternate deceleration device configuration indicates that the airplane could likely be stopped or slowed to a safe taxi speed in 3,150 feet or less by deploying spoilers and using emergency wheel brake and emergency reverse thrust procedures. This scenario assumes ground spoilers are deployed within one second after main gear touchdown, a 9-second lag between main gear touchdown and initial emergency wheel brake application (with sustained but metered brake pressure to avoid blown main gear tires), and both engines spool up to maximum reverse thrust at the 50 percent N1 limit within 10 seconds after main gear touchdown (with maximum reverse thrust sustained until the airplane stops or slows to a safe taxi speed).

Aircraft performance calculations using the engine forward and reverse thrust levels documented by the DEEC suggested that the PIC report that "the brakes were not working" may be consistent with the significantly reduced deceleration expected with spoilers stowed and maximum (or less aggressive) manual wheel brake inputs (see annotated plot in Performance Study in docket).

Performance calculations also indicated that the airplane could not decelerate as quickly during the accident sequence (based on the CVR sound spectrum analysis of nose wheel ground speed) unless some level of wheel braking (or some other undetermined failure) occurred to provide a retarding force in addition to the forces available from engine thrust and spoilers. The reported no wheel brakes was inconsistent with the CVR-based airplane ground speed evidence, particularly after the time period that forward thrust was added in response to the PIC throttle push (see for example, simulation Cases 31-34 in Performance Study in docket).

Operational Procedures

Hendrick Motorsports Aviation Flight Operations Manual paragraph 4.7 Flows and Checklists Philosophy states, "most procedures are accomplished by a flow check combination. After a flow is completed, the checklist will serve to verify critical items/procedures have been accomplished." The Hendrick Motorsports G150 Standard Operating Procedure states in paragraph 1.0 Suggested flows/checklist procedures, "All checklists should be done based on the concept of flows. First complete your flow for the appropriate checklist, and then perform the checklist."

The G150 standard operating procedures (SOPs) stated in paragraph 6.1 Stabilized Approaches, "The aircraft should be established on a glide path from approximately 5 miles out." The SOPs further stated in paragraph 14.4 Touchdown..."Immediately after touchdown, lower the nose to the runway. Use reverse thrust, ground airbrakes, and brakes as necessary to

bring the aircraft to a stop."

The Gulfstream G150 Quick Reference Handbook Emergency Brake Operation, airplane flight manual Section III stated, "Failure of the main hydraulic system or normal brake system requires emergency brake operation by placing EMERG BRAKE lever in EMERG position and using the brake pedals."

Review of landing distance data, for the approximate weather conditions and a Vref of 117 knots, revealed that at a landing weight of 17,800 pounds, the dry – unfactored landing distance was 2,551 feet.

History of Flight

Landing-flare/touchdown	Landing area overshoot
Landing-landing roll	Runway excursion (Defining event) Collision with terr/obj (non-CFIT) Landing gear collapse

Pilot Information

Certificate:	Airline Transport; Flight Instructor; Commercial	Age:	47, 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:	Yes
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	Toxicology Performed:	No
Medical Certification:	Class 1 Without Waivers/Limitations	Last Medical Exam:	09/11/2011
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	10/06/2011
Flight Time:	11000 hours (Total, all aircraft), 290 hours (Total, this make and model), 6230 hours (Pilot In Command, all aircraft), 66 hours (Last 90 days, all aircraft), 44 hours (Last 30 days, all aircraft)		

Co-Pilot Information

Certificate:	Airline Transport; Flight Instructor; Commercial	Age:	55, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Right
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine	Toxicology Performed:	No
Medical Certification:	Class 1 With Waivers/Limitations	Last Medical Exam:	07/17/2011
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	04/25/2011
Flight Time:	13800 hours (Total, all aircraft), 75 hours (Total, this make and model), 13000 hours (Pilot In Command, all aircraft), 75 hours (Last 90 days, all aircraft), 7 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	GULFSTREAM	Registration:	N480JJ
Model/Series:	G150	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Transport	Serial Number:	241
Landing Gear Type:	Retractable - Tricycle	Seats:	9
Date/Type of Last Inspection:	12/15/2011, Continuous Airworthiness	Certified Max Gross Wt.:	26100 lbs
Time Since Last Inspection:	322 Hours	Engines:	2 Turbo Fan
Airframe Total Time:	1190 Hours	Engine Manufacturer:	Honeywell
ELT:	C91 installed, activated, did not aid in locating accident	Engine Model/Series:	TFE731-40AR
Registered Owner:	JIMMIE JOHNSON RACING II INC	Rated Power:	4420 lbs
Operator:	HENDRICK MOTORSPORTS AVIATION	Air Carrier Operating Certificate:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Night/Dark
Observation Facility, Elevation:	EYW, 3 ft msl	Observation Time:	1953 EDT
Distance from Accident Site:		Direction from Accident Site:	
Lowest Cloud Condition:		Temperature/Dew Point:	26 °C / 23 °C
Lowest Ceiling:	Broken / 1000 ft agl	Visibility	10 Miles
Wind Speed/Gusts, Direction:	12 knots/ 17 knots, 360°	Visibility (RVR):	
Altimeter Setting:	29.96 inches Hg	Visibility (RVV):	
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Stuart, FL (SUA)	Type of Flight Plan Filed:	IFR
Destination:	Key West, FL (EYW)	Type of Clearance:	IFR
Departure Time:	1900 EDT	Type of Airspace:	Class B

Airport Information

Airport:	Key West International Airport (EYW)	Runway Surface Type:	Asphalt
Airport Elevation:	3 ft	Runway Surface Condition:	Dry
Runway Used:	27	IFR Approach:	None
Runway Length/Width:	4801 ft / 100 ft	VFR Approach/Landing:	Traffic Pattern

Wreckage and Impact Information

Crew Injuries:	2 Minor	Aircraft Damage:	Substantial
Passenger Injuries:	1 Serious, 1 Minor	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Serious, 3 Minor	Latitude, Longitude:	24.556111, -81.759444 (est)

Administrative Information

Investigator In Charge (IIC):	Carrol A Smith	Adopted Date:	08/29/2013
Additional Participating Persons:	Arlander D Barker; FAA/FSDO; Miramar, FL David A Dudley; Hendrick Motor Sports; Charlotte, NC Rick Trusis; Gulfstream Aerospace Corporation; Savannah, GA		
Publish Date:	08/29/2013		
Investigation Docket:	http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=82210		

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.

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