NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

February 6, 2014

AIRWORTHINESS GROUP CHAIRMAN'S FACTUAL REPORT

ERA13MA139

A. ACCIDENT

Location:	Thomson-McDuffie Regional Airport, Thomson, Georgia
Date:	February 20, 2013
Time:	8:06 PM EST
Aircraft:	Beechcraft 390 Premier 1A, N777VG

B. AIRWORTHINESS GROUP

Chairman:	Adam Huray National Transportation Safety Board Washington, DC
Member:	Ernest Hall Beechcraft Coordinator Wichita, KS

C. SUMMARY

On February 20, 2013, at 20:06 Eastern Standard Time, a Beechcraft 390 Premier 1A, N777VG, was destroyed following a collision with a utility pole, trees, and terrain following a go-around at Thomson-McDuffie Regional Airport (HQU), Thomson, Georgia. The airline transport-rated pilot and co-pilot were seriously injured, and five passengers were fatally injured. The airplane was registered to the Pavilion Group LLC and was operated by the pilot under the provisions of 14 Code of Federal Regulations Part 91 as a business flight. Night visual meteorological conditions prevailed, and an instrument flight rules flight plan was filed. The flight originated at John C. Tune Airport (JWN), Nashville, Tennessee, about 18:28 Central Standard Time.

D. DETAILS OF THE INVESTIGATION

D.1 Aircraft Description:

Operator:	Pavilion Group LLC
Registration number:	N777VG
Aircraft Serial Number:	RB-208
Aircraft Manufacturer:	Beechcraft
Model/Series:	390 Premier 1A
Engine Manufacturer:	Williams International
Model:	FJ44- 2A
Aircraft Build Year:	2007

D.2 Accident Site:

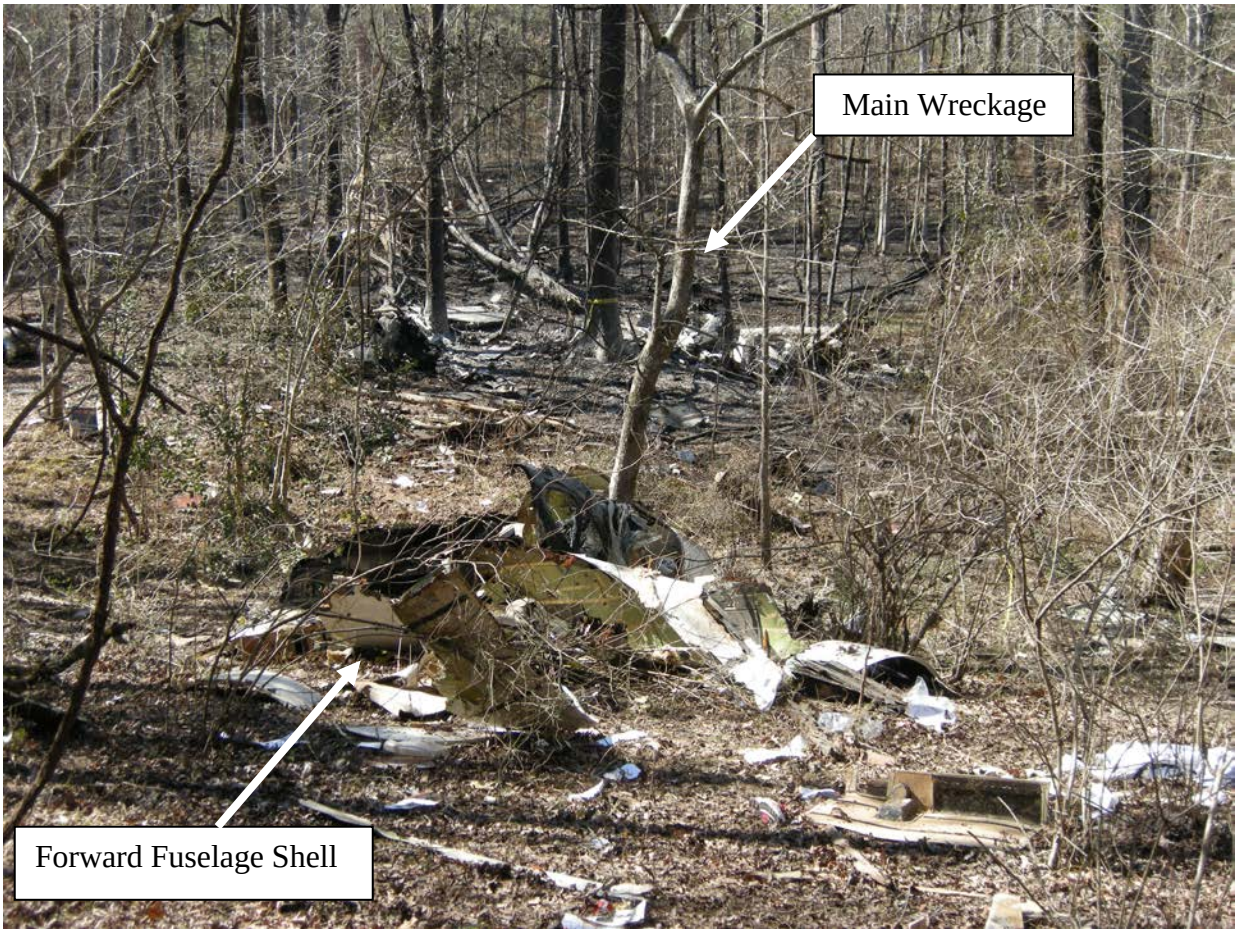

Figure 1: Accident Site with Forward Fuselage Wreckage in Foreground and Center Wing Area/Empennage Wreckage in Background

The aircraft impacted a utility pole that was approximately 72 feet tall and was located approximately 1835 feet from the runway 28 threshold. The airplane struck the pole approximately 58 feet above ground level and sections of the pole and attached power lines were found along the debris path. The ground in the immediate vicinity of the impacted pole was burned and charred. Remnants of the left main landing gear outboard door and the outboard tip of the left elevator were found relatively close to this pole. The wreckage debris path was oriented from west to east on an approximate magnetic heading of 085°. The left wing was completely severed about 13 feet inboard from the wing tip and exhibited no fire damage. The wing section was located approximately 320[1] feet past the utility pole and just to the right of the debris path.

Various fragments of the airplane structure were found along the debris path to the main wreckage site located approximately 925[1] feet from the pole in a densely wooded forest. Multiple trees were severed in the impact zone. A large tree (approximately 2 feet in diameter at the base) was uprooted and severed about 35 feet up from its base. The main wreckage consisting of the center wing section, a portion of the right wing, main landing gear, baggage compartment, ELT rack, and empennage came to rest against a tree line formed by a small service trail approximately 50 feet past the base of the uprooted tree. The main wreckage was severely damaged by fire and contained melted aluminum and burnt composite. An approximately 13 foot section of the forward fuselage shell containing portions of the radome, nose avionics compartment, cockpit, and cabin was damaged by fire and came to rest about 60[1] feet beyond the main wreckage. The right engine was found to the right side of the debris path between the main wreckage and the forward fuselage shell. The left engine was severed into two sections with the compressor, turbine, and exhaust portion located in a pond to the left of the debris path. A large portion of the ground in the vicinity of the accident site was charred and burned by fire. See Figure 1.

The runway was examined for tire marks. There were no marks that could be positively identified as being created by the accident aircraft.

The GPS coordinates of various points of interest are mapped below. See Figure 2.

[1] These distances were estimated using GPS points and mapping software. They are approximations and should be used for reference only.

Figure 2: GPS Points of Interest for the Accident Location

Waypoint 1: 33.529355,-82.507608 Runway 10 End of Pavement
Waypoint 2: 33.529332,-82.502596 Power Pole Struck By Airplane
Waypoint 3: 33.529294,-82.501719 Corner Power Pole
Waypoint 4: 33.529155,-82.502411 Tip of Left Elevator
Waypoint 5: 33.529133,-82.501582 Section of Left Outboard Wing with Aileron
Waypoint 6: 33.529342,-82.501736 Flap Actuator (P/N: 390-381402-17; S/N G0471)
Waypoint 7: 33.529339,-82.502092 Spoiler Panel (P/N: 391-130004-0001; S/N: 0086)
Waypoint 8: 33.529509,-82.499735 Base of Uprooted Tree Separated 35 Feet Above Ground Level
Waypoint 9: 33.529573,-82.499381 Left Engine Compressor and Turbine Section (In Pond)
Waypoint 10: 33.529422,-82.499430 Forward Fuselage Shell

D.3 Flight Controls and Systems:

D.3.1 Flap System:

The flap system is electronically controlled and electrically operated. Two single-slotted fowler-type flaps (outboard and inboard) are installed on each wing. Eight electric actuators drive the flaps in response to signals from a flap control unit. The flaps are designed to retract from 30 degrees to 20 degrees in 4 seconds and from 20 degrees to 10 degrees in 4.4 seconds under design loads.

Flap position is selected by moving a flap lever mounted on the cockpit pedestal. Four detent positions are available: UP, 10, 20, and DN (30 degrees). The flap handle was found in the 10 degree detent.

The flap actuator lengths were measured from the base of the cylinder (beginning of chrome extension) to the center of the rod end. Beechcraft provided the following approximated flap surface positions for each flap actuator measurement:

Location or S/N	Approximate Measurement	Approximate Surface Position
Unknown	7 3/4”	15°
Unknown	7 3/4”	15°
Left #3	7 3/4”	15°
Left # 4	4 ¾”	15°
Right #1	6 1/4”	Actuator Damaged
Unknown	7 3/4”	15°
Right #3	7 3/4”	15°
Right #4	4 5/8 ”	15°

Figure 3: Approximate Flap Actuator Measurements and Surface Positions

The approximated 15 degree surface positions are not a selectable position for the flap system.

D.3.2 Horizontal Stabilizer Trim:

The horizontal stabilizer trim actuator is electrically actuated. It was located with the empennage in the main wreckage. The actuator extension measured 16.38 inches from the centers of the two attachment points. This measurement corresponded to a horizontal stabilizer position of approximately 3.6 degrees leading edge down. Normal takeoff range is 3.15 degrees leading edge down to 4.39 degrees leading edge down.

D.3.3 Lift Dump/Spoiler Blowdown/Roll Control Actuators:

The spoiler system provides roll augmentation and air speed braking during flight, and a lift dump function on the ground. There are three electronically controlled and hydraulically actuated spoiler panels mounted on each wing. All panels are utilized for lift dump, while only the outboard and middle panels are used for roll, speed brake, and mixed roll/speed brake functions. The outboard and middle panels are mechanically linked together via a pushrod for simultaneous operation by one actuator. The actuators are linked to the panels by pushrods and bellcranks.

A spoiler control unit provides position control of the spoiler panels in response to airplane status inputs, control wheel inputs, speed brake switch, and lift dump control commands. The outboard and middle spoiler panels are controlled by the roll/speedbrake/spoiler control actuator via a closed loop positioning system. The inboard spoiler panel is controlled by a lift dump actuator that has only two positions: retracted and fully extended. Hydraulic pressure to the actuator is supplied via solenoid valves within the hydraulic spoiler control module. Lift dump commands override roll spoiler commands. By design the lift dump panel and the spoiler panels will operate together when the lift dump handle has been placed into the EXT position on the pedestal. When the roll/speed brake/spoiler actuator is extended, it retracts the roll/speed brake/spoiler panels. When the actuator is retracted it extends the panels.

There are two blow down actuators; one per wing. They are located in the outboard dry bay area and are mounted on the number six spar. Each actuator includes an integral nitrogen gas reservoir, a gas service port, pneumatic gas pressure sensor, and a linear actuator. In the event of a loss of electrical power or hydraulic power, the blow down actuator will automatically pull down the middle and outboard roll/speed brake/spoiler panels and hold them in the retracted position.

There are two lock down assemblies; one per wing. They are mounted on the inboard auxiliary spar, next to the lift dump actuator. The lock down assembly is an independent mechanical lock that is spring-loaded in the locked position to prevent the inboard spoiler panel from moving until commanded to do so. The lock is released by a hydraulically operated uplock release actuator that is controlled by the hydraulic spoiler control module.

Two lift dump actuators, two roll/speedbrake/spoiler control actuators, and two spoiler blowdown actuators were recovered from the wreckage. All six actuators were examined in detail by Moog, Beechcraft, and the NTSB. The findings can be found in Moog Report MRE39952, Rev A, dated 2/3/2014. This report can be found in the public docket for this accident.

During the on-scene investigation both roll/speedbrake/spoiler control actuators measured approximately 3.5 inches from the center line of the rod end (center of attachment bolt) to the cylinder housing (face plate). The roll/speed brake/spoiler actuator full retract position is 2.042 inches from the center line of the rod end to the cylinder housing (face plate). The full actuator extension position is 3.422 to 3.722 inches from the center line of the rod end to the cylinder housing (face plate).

The left wing blow down actuator extension measured 2.25 inches from the cylinder housing (face plate) to the center of the rod end nut. The actuator piston rod was bent. The right wing blow down actuator appeared to be in the fully retracted position.

The left and right lift dump actuators were identified after the wreckage was moved to the recovery site. The actuator rod end was missing from one actuator and the other actuator remained attached to remnants of its respective attachment points. The intact actuator was examined. It measured approximately 9 5/8 inches from the center line of the actuator attachment fitting to the center line of the rod end. For reference, the lift dump actuator full retract position is 8.200 inches from the center line of the actuator attachment fitting to the center line of the rod end. The full extension position is 10.100 to 10.380 inches from the center line of the actuator attachment fitting to the center line of the rod end.

The left lift dump lock down assembly was found separated from structure and in the spring loaded locked position. The right lift dump lock down assembly remained attached to the wing in the spring loaded locked position.

D.3.4 Aileron Trim:

The aileron trim actuators are electrically actuated. The Premier 1A is equipped with a Roll Trim switch located on the center pedestal. When the switch is set to NORM and the trim switch is depressed and held to LWD (left wing down) or RWD (right wing down), the trim actuator will move the roll trim surface on the left aileron. When additional roll trim authority is required, the Roll Trim switch may be set to AUX, causing the trim surfaces on both ailerons to operate. The Aux Roll Trim annunciator illuminates any time auxiliary roll trim is active or the right aileron trim tab is out of neutral. The Roll Trim switch was found in the NORM position. The switch exhibited thermal and impact damage.

The left aileron trim actuator extension measured approximately 2.75 inches from the cylinder housing (face plate) to the center of the rod end. This measurement corresponds to a left aileron trim surface position of approximately 2 to 3 degrees trailing edge down.

The right aileron trim actuator extension measured approximately 2 and 7/8 inches from the cylinder housing (face plate) to the center of the rod end. This measurement corresponds to a right aileron trim surface position that was approximately neutral.

D.3.5 Landing Gear:

The main landing gear retract actuators are two-position, cylinder-type, locking hydraulic actuators with a downlock mechanism and downlock switch. The actuators primarily function to hydraulically extend or retract the main landing gear. In the down-and-locked position, they also serve as a side brace. Once in the down-and-locked position hydraulic pressure is required to release the downlock mechanism prior to gear retraction. Main gear downlocks are part of the retract actuators.

All three landing gear assemblies were identified on scene. The left and right main landing gear actuators separated from the landing gear, but remained attached to wing structure. Both left and right main landing gear actuators measured approximately 21” from the cylinder housing (face plate) to the center of the eye end. The actuator measurements corresponded to the main landing gear actuators in the extended position.

The nose landing gear retract actuator is a two-position, hydraulically operated actuator that extends or retracts the nose landing gear. The nose landing gear retract actuator was recovered from the wreckage and the piston extension measured 5.5 inches from the cylinder housing (face plate) to the center of the rod end. The piston rod was bent. By design the actuator measures 2.11 inches from the cylinder housing (face plate) to the center of the rod end in the fully retracted position and 8.01 +/- .06 inches from the cylinder housing (face plate) to the center of the rod end in the fully extended position.

The two-piece nose landing gear drag brace assembly includes upper and lower drag braces. The upper drag brace secures to the forward nose keels by two drag brace pins. The lower drag brace fastens to the strut. A hook assembly locks the drag brace in an extended or locked position to secure the nose gear in a down-and-locked position. The mating side of the external down lock

mechanism could not be located.

D.3.6 Anti-skid System:

The anti-skid system was not examined due to the damaged condition of the aircraft and anti-skid system components.

D.4 Engines:

D.4.1 Left Engine:

Williams International FJ 44- 2A
Serial Number – 105327

Figure 4: Left Engine

The left engine separated from the aircraft and pieces were distributed along the debris path. The engine exhaust casing was found just to the left of the main wreckage containing the empennage and was separated from the compressor, turbine and exhaust sections which were located in a pond just to the left of the main debris field. See Figure 4. The compressor/nose section separated at the impeller area and the tie shaft broke from impact forces. A few sections of separated fan blades were discovered at the wreckage scene. Vegetation and tree material were imbedded into the first stage compressor and case. The compressor and turbine were damaged to the point of no rotation. See the Powerplant Group Chairman's Factual Report for details of the engine teardown and examination. The report can be found in the public docket for this accident.

D.4.2 Right Engine:

Williams International FJ 44- 2A
Serial Number – 105326

Figure 5: Right Engine

The right engine was found intact between the main wreckage and the forward fuselage shell on the right side of the debris field. See Figure 5. The engine was verified to be the Number 2 engine per aircraft build records and by examination of the engine mounts. The inboard side of the exterior of the engine, the fuselage attachment area, and the bottom side of the inlet area contained various degrees of damage. There were vegetation and carbon materials in the inlet area downstream of the first stage compressor. The engine shaft (compressor and turbine) rotated freely. Nicks were identified on some of the fan blade leading edges and scraping/gouging was identified on the inside of the engine inlet shroud in the plane of fan blade rotation. See the Powerplant Group Chairman's Factual Report for details of the engine teardown and examination. The report can be found in the public docket for this accident.

D.5 Flight Deck:

Figure 6: Flight Deck

The flight deck was mostly destroyed by fire (See Figure 6). The remaining glass on the following standby flight instruments was removed and the following parameters were recorded:

Standby Altimeter: 980 feet, no altimeter setting visible
Attitude Indicator: 135° right bank, pitch could not be determined
Airspeed Indicator: 269 knots, barber pole at 322 knots

Most switch positions could not be determined due to the damaged condition of the flight deck. The Stabilizer, Left Windshield, and Right Windshield switches on the Ice Protection Subpanel were in the off position. The flaps handle was in the 10 degree detent. The landing gear handle was found in the gear down detent with the J-hook engaged on the handle. The roll trim switch was found in the "NORM" position. The lift dump switch was not found.

The pilot's side circuit breaker panel was examined after the aircraft was removed to the salvage storage location. The following breakers were found to be open:

Pitch Control on Left Main Bus
Left Stall Warn on Essential Bus
Left Low Fuel on Essential Bus
Right Low Fuel on Essential Bus
#1 ANN on Essential Bus
Left Oil Press on Standby Bus

D.6 Maintenance Records Review:

Aircraft Serial Number:	RB-208
Airworthiness Certification:	Issued 10/25/2007
Airframe Total Time:	Unknown (635.4 as of 01/04/2013 per Hawker Beechcraft Services service record)
Airframe Total Cycles:	Unknown (657 as of 10/09/2012 per Hawker Beechcraft Services service record)

The aircraft maintenance logbook could not be found and it was reported that the logbook was possibly in the aft cargo hold at the time of the accident. Pavilion Group LLC subscribed to CAMP Systems as their maintenance management provider. All service records that were reported to CAMP Systems were reviewed. Service records were also obtained directly from Hawker Beechcraft Service Center (Fulton County, GA) dating back to June, 2012 and directly from Pavilion Group LLC for any recent records not reported to CAMP Systems. Select Federal Aviation Administration records were also reviewed.

The following relevant records were identified for the past year:

Maintenance invoice dated 1/29/2013: Aeronautical Services of Greenwood replaced the left and right main tires, touched up exterior paint, and performed a battery capacity check. This is the most recent maintenance record available. Aircraft and engine total time and cycle information was not present.

Service log dated 01/04/2013: Hawker Beechcraft Services Fulton County installed a new oil breather hose on engine #1, replaced the nose landing gear actuator, replaced the nose tire, and serviced tire pressures and consumables among other tasks. Airframe total time was 635.4 hours.

Service log dated 12/11/2012: Hawker Beechcraft Services Fulton County removed and replaced the #2 Flight Guidance Computer and performed compressor wash on both engines.

Service log dated 10/09/2012: Hawker Beechcraft Services Fulton County reinstalled original right engine which was repaired by Williams International. Performed 200 Hour Engine Idle Speed and Leak Check on both engines. Airframe total cycles were 657.

Service log dated 09/10/2012: Hawker Beechcraft Services Fulton County removed and replaced the left and right main tires and the left and right brake assemblies. They also performed main landing gear strut filling and inflation procedures for the left and right main landing gear struts. (549.5 Total Time).

Service log dated 08/28/2012: Hawker Beechcraft Services Fulton County removed the right engine for repair. Engine total time was 540 hours. The left engine throttle cable was also replaced.

Service log dated 07/03/2012: Hawker Beechcraft Services Fulton County serviced the spoiler blow down actuators, rebonded the left flap follow up door seal, and replaced the #2 Attitude Heading Computer.

FAA Form 8050-64 signed 06/27/2012: Aircraft Registration Number changed from N430GW to N777VG.

Service log dated 06/22/2012: Hawker Beechcraft Services Fulton County performed Check 1 Inspection on both engines and 200 hour Takeoff Configuration Warning System Operational Check

FAA Form 8050-2 dated 06/15/2012: Aircraft Bill of Sale transferring ownership to Pavilion Group, LLC

Service log dated 06/15/2012: Hawker Beechcraft Services Fulton County performed 600 Hour Scheduled A Inspection (503.3 Total Time, 565 Total Cycles) and engine borescope and oil analysis for both engines

Service log dated 04/20/2012: Hawker Beechcraft Services San Antonio removed and replaced the #2 Attitude Heading Computer and Maintenance Diagnostic Computer.

D.7 Component Examinations:

D.7.1 Enhanced Ground Proximity Warning System:

The label information for the Enhanced Ground Proximity Warning System (EGPWS) was as follows:

Honeywell Enhanced Ground Proximity Warning System
Part Number: 965-0976-040-210-210
Serial Number: 25720
Modification Status: 09
Application Software Version: 210.2
Configuration Software Version: 210
Terrain Database Version: 464

The non-volatile memory in the EGPWS was downloaded by Honeywell and witnessed by the NTSB. See the EGPWS Factual Report located in the public docket for this accident for details regarding the download.

When reviewing the data in the EGPWS Factual Report the following should be noted:

- "Gr Dn" is Gear Down (1 = gear in down position)
- "Flp Sel" is Flap Select (1 = flaps configured above 25 degrees at the selector handle, 0 = flaps configured below 25 degrees at the selector handle).
- "InAir" is In Air Mode (1 = In Air). This discrete requires airspeed to go below 60 kts to transition to In Air False (0 = In Air False).

A status marker is logged when the aircraft goes above 25 feet radio altimeter altitude during a typical take-off. For this accident, a second take-off status marker was not recorded when the aircraft left the runway at HQU because the logic did not go into "In Air False" during the touchdown. The aircraft speed must go below 60 kts for the logic to determine "In Air False". The following status marker was logged for the event flight when it determined take-off from JWN.

FLIGHT LEG 793
EGPWS Total Operating Time: 1063:04:11
Lat/Long: 36.17901 / -86.88778
True Hdg: -167.34
GPS Alt: 492.00
Airport: KJWN

A status marker for a typical landing event is logged when the aircraft goes below 50 ft radio altimeter altitude. The following status marker was logged for the landing event at HQU:

FLIGHT LEG 793
EGPWS Total Operating Time: 1063:43:23
Lat/Long: 33.53010 / -82.52740
True Hdg: 94.22
GPS Alt: 508.00
Airport: KHQU

The EGPWS monitors only gear position and flaps position for determining aircraft configuration warnings. Spoilers and lift dump surfaces are not monitored. Obstacles in the database are obtained from the National Oceanic and Atmospheric Administration and must be at least 100 ft tall to be included in the database.

D.7.2 Spoiler Control Unit:

The label information for the Spoiler Control Unit (SCU) was as follows:

Moog Spoiler Control Unit
Part Number: 390-384011-0019
Serial Number: 0270

The non-volatile memory in the SCU was downloaded by Moog and witnessed by the NTSB. See the Spoiler Control Unit Factual Report located in the public docket for this accident for details regarding the download.

D.7.3 Flight Management Computer, Maintenance Data Computer, and Air Data Computers:

The label information for the Flight Management Computer (FMC), Maintenance Data Computer (MDC), and two Air Data Computers (ADC) were as follows:

Rockwell Collins Flight Management Computer (FMC-3000)
Part Number: 822-0883-703
Serial Number: 208LC

Rockwell Collins Maintenance Data Computer (MDC-3110)
Part Number: 822-1987-005
Serial Number: 1YLCF

(Right) Rockwell Collins Air Data Computer (ADC-3000)
Part Number: 822-1109-016
Serial Number: 2FWFL

(Left) Rockwell Collins Air Data Computer (ADC-3000)
Part Number: 822-1109-016
Serial Number: 2FWBP

The non-volatile memory downloads and functional testing of these units was performed by Rockwell Collins and witnessed by the NTSB and Beechcraft. The examination occurred at the Rockwell Collins facility in Cedar Rapids, IA, on 7/29/2013. See Rockwell Collins Final Summary Report for the FMC-3000, Rockwell Collins Final Summary Report for the MDC-3110, and Rockwell Collins Final Summary Report for the ADC-3000 which can be found in the public docket for this accident for details of these examinations.

Adam Huray
Mechanical Engineer