NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, DC 20594

Systems Group Chairman's Factual Report

April 5, 2016

A. ACCIDENT CEN16MA036

Location:	Akron, Ohio
Date:	November 10, 2015
Time:	1452 Local Time
Aircraft:	ExecuFlight flight number 1526, a British Aerospace HS 125-700A, registration N237WR

B. GROUP

On-Scene Investigation, November 12-13, 2015:

Chairman:	Tom Jacky National Transportation Safety Board Washington, D.C.
Member:	Julio Galarza, Jr. Federal Aviation Administration New Olmsted, Ohio
Member:	Henry Soderlund Textron Aviation Wichita, Kansas
Member:	David Studtmann Honeywell Aerospace Phoenix, Arizona

Hillsboro, Ohio Wreckage Examination, December 15, 2015:

Chairman:	Tom Jacky National Transportation Safety Board Washington, DC
Member:	Julio Galarza, Jr. Federal Aviation Administration New Olmsted, OH

Member: Henry Soderlund
Textron Aviation
Wichita, KS

Member: David Studtmann
Honeywell Aerospace
Phoenix, AZ

Flight Instrument Examination, Washington, D.C. March 8, 2016:

Chairman: Tom Jacky
National Transportation Safety Board
Washington, DC

Member: Jeff Guzzetti
Federal Aviation Administration
Washington, DC

Member: Danny Lewkowicz
ExecuFlight, Inc.
Fort Lauderdale, FL

Member: Henry Soderlund
Textron Aviation
Wichita, KS

C. SUMMARY

On November 10, 2015, about 1452 eastern standard time (EST), ExecuFlight flight 1526, a British Aerospace HS 125-700A, N237WR, departed controlled flight while on approach to land at the Akron Fulton International Airport (AKR) and impacted a 4-plex apartment building in Akron, Ohio. The pilot, co-pilot, and seven passengers were fatally injured; there were no reported ground injuries. The airplane was destroyed by impact and postimpact fire. The airplane was registered to Rais Group International NC LLC., and operated by ExecuFlight, as a Title 14 Code of Federal Regulations Part 135 on-demand charter flight. Instrument meteorological conditions prevailed at the time of the accident, and the flight was operated on an instrument flight rules (IFR) flight plan. The flight originated from Dayton-Wright Brothers Airport (MGY), Dayton, Ohio, at 1413 EST and was destined for AKR.

The group met at the Akron, Ohio accident site from November 12 – 13, 2015 to document the powerplants and relevant airplane systems.

The group met at the Hangar 6, Inc. facility in Hillsboro, Ohio on December 15, 2015 to remove additional components and search for the Terrain Avoidance and Warnings System unit. At the conclusion of the activity ten flight instruments and one circuit card assembly were removed from the wreckage and held by the NTSB.

At the end of the on-scene and subsequent wreckage examination, the following airplane components were removed and retained by the National Transportation Safety Board for further examination:

1. Captain's Altimeter
2. Cabin Pressure Indicator
3. First Officer's Altimeter
4. Captain's Horizontal Situation Indicator
5. First Officer's Horizontal Situation Indicator
6. Angle of Attack Indicator (Located on Captain's side of instrument panel)
7. Captain's Combined Mach/Airspeed Indicator
8. Captain's Attitude Indicator
9. Captain's Radio Magnetic Indicator
10. Stand by Altimeter
11. Stand by Airspeed indicator
12. Stand by Attitude indicator
13. First Officer's Combined Mach/Airspeed Indicator
14. First Officer's Attitude Indicator
15. Two circuit cards, tentatively identified from a Digital Electronic Engine Control (DEEC) Unit

The Airworthiness Group met at the NTSB Materials Laboratory in Washington, D.C. on March 8, 2016 to examine and document the flight instruments that were recovered from the accident airplane during the on-scene and Hangar 6 group activities. Each of the examined instruments was identified and documented for assessment of indication.

At the conclusion of each group activity, all pertinent documentation and photographs were provided to each of the parties.

The group did not determine any evidence of a systems malfunction during the investigation.

D. DETAILS OF INVESTIGATION

The airplane was identified as:

Serial Number:	NA-0252
Year of Manufacture:	1979

For the investigation, the group identified and documented relevant systems of the airplane. Documentation of the airplane was limited due to accident impact and post-crash fire, which consumed portions of the airplane's systems. Some system components were identified for further documentation and examination. The relevant airplane systems and on-scene Powerplants were documented according to the following categories:

1.0 Equipment & Furnishings

Two avionics racks were noted in the wreckage. The individual avionic boxes were thermally damaged and could not be identified. See Figure 1.

Figure 1 - Avionic Racks and Installed Units

2.0 Flight Controls

In general, most components of the airplane's flight control systems were consumed by post-impact fire.

2.1 Primary Flight Control Systems

The flight deck primary flight control inputs were not located. In addition, the flight deck control cable attach points were consumed by fire, for all flight controls.

For details regarding the flight control surfaces, please see the Structures Group Factual Report.

2.1.1 Pitch Control System

In general, the pitch control system cables, from the flight deck to empennage area, were accounted for.

The elevator trim chains, for both elevators, were found intact and located in the aft wreckage.

2.1.2 Roll Control System

In general, the roll control system cables, from the flight deck to the cable turn out area of the fuselage, were accounted for. The cables were connected at the aileron bellcranks inside each wing.

2.1.3 Yaw Control System

In general, the yaw control system cables, from the flight deck to the empennage, were accounted for.

The two rudder bias actuators were noted intact with each actuator having an equal amount of shaft showing.

The rudder trim chains were located near the rudder bias actuators, and were noted as intact.

2.2 Secondary Flight Control Systems

2.2.1 Trailing Edge Flaps

The airplane was fitted with two trailing edge flaps, one on each wing. Each flap has two attach points to the associated wing – inboard with a ball screwjack assembly and an outer attach point with a roller connector.

The flaps are controlled by a flight deck selector lever mounted on the center pedestal. Inside the pedestal the lever is connected to a spring strut and operating drum. Control cables from the operating drum are routed to a spring drum in the fuselage's center wing area. The spring drum is connected to the flap control unit, which translates the flight deck selector lever movement into hydraulic power, through torque tubes, out to each trailing edge flap gearbox, and flap screwjack.

The left flap ball screwjack assembly was separated into two pieces, with the wing side attached to structure near the left main gear and the flap side found at back of wreckage. The two pieces of the left flap ball screwjack actuator were held in their correct orientation and a measurement of the actuation was accomplished. According to Textron Aviation (125 Series Overhaul Manual), the measurement (~13 inches) corresponded to an approximately 45 degree flap extension.

The right flap was found near the main fuselage and post-crash fire location. The entire right flap ball screwjack assembly was attached to the right wing structure near the right main landing gear. The actuation of the right flap ball screwjack actuation was measured. According to Textron Aviation (125 Series Overhaul Manual), the measurement (~13 inches) corresponded to an approximately 45 degree flap extension.

2.2.2 Air Brakes

The airplane was fitted with two airbrakes, one on each wing. The airbrakes are hydraulically actuated using a flight deck control lever. The lever is typically located in one of three positions – SHUT, OPEN, and DUMP, although intermediate positions between SHUT and OPEN will provide intermediate airbrake positions.

Lifting and moving the lever to DUMP opens the airbrakes and extends the trailing edge flaps from 45° to 75°.

A warning horn operates when both throttles are opened to obtain above 50% N1 rpm, with the airbrakes open, and landing gear down and locked.

Both airbrake actuators were located in the wreckage. Both actuators were noted as near the stowed stop.

3.0 Instruments

Each instrument exhibited both post-crash fire and impact damage. In most cases, the flight instrument face was cleared of soot before an indication assessment could be accomplished.

3.1 On-Scene Documentation

The flight deck instrument panels were documented on-scene as follows:

Center Console

- L and R LP Cocks - Both open
- Wing Fuel Crossfeed/Transfer - Normal
- Flap Handle: 45° Position
- L and R HP Cocks - Open
- Airbrake Selector Lever - “Open”
- Aileron Trim: 1.75 units right
- Rudder Trim: One mark left
- Elevator Trim Position - 2 (inside takeoff band)
- Wheel Brake – Emergency
- Rudder bias – Guards up, switches “middle” and not movable

- Radio Master – Forward
- OAT - Full left of scale at -60°C

- Left Throttle Lever: ¾" aft of the forward end of the throttle lever travel slot
- Right Throttle Lever: ½" aft of the forward end of the throttle lever travel slot
- Radios - Damaged by fire, no assessment
- Auto pilot switches – Both down, everything else fire damaged
- Landing Gear Handle - Down

Captain's (Left) Side Panel

- Horizontal Situation Indicator – Position degrees unreadable – guidance line 1 needle-width left of course
- Altimeter – Case partially melted
- All other flight instruments fire damaged

Center Instruments Panel

- Left N2: 97% - flag shows "off"
- Thermally Damaged:
  - L and R fuel quantity
  - L and R fuel flow
  - L and R N1
  - L and R ITT
  - L and R oil temperature
  - L and R oil pressure
  - Right N2
- Flap indicator: ~7°

First Officer's Right Side Panel

- All flight instruments fire damaged
- Cabin dump valve closed

At the conclusion of the on-scene investigation, four flight instruments were removed from the airplane wreckage and retained by the NTSB for further examination. See Section 3.3 for further details.

3.2 Flight Instrument Recovery at Hillsboro, Ohio

The group met at the airplane wreckage storage facility in Hillsboro, Ohio to remove additional components, including flight instruments. Flight instruments were removed from the forward instrument panel. In addition, the group identified any loose flight instruments in the airplane wreckage.

At the conclusion of the activity an additional ten flight instruments, tentatively identified as from either the left-hand, right-hand, or center instrument panels, were removed from the wreckage and retained by the NTSB for further examination.

The instruments were packaged and shipped to NTSB Headquarters (in Washington, D.C.) for further examination. See Section 3.3.

3.3 Examination of Flight Instruments at NTSB

The Airworthiness Group met on March 8, 2016 at the NTSB headquarters Materials Laboratory in order to document readings from the instruments that were recovered from the accident airplane.

Each instrument recovered is identified below with corresponding findings. Each instrument exhibited both post-crash fire and impact damage. Most of the instruments required the face plate to be removed in order to complete the examination.

a) Angle of Attack Indicator (Located on the Captain's side of instrument panel): The Angle of Attack indicator was examined. The glass face was removed from the instrument. The AOA bug appeared to be set at 1.3 degrees (9:00 position). The indicator needle was at the approximately 2:00 position. See Figure 2.

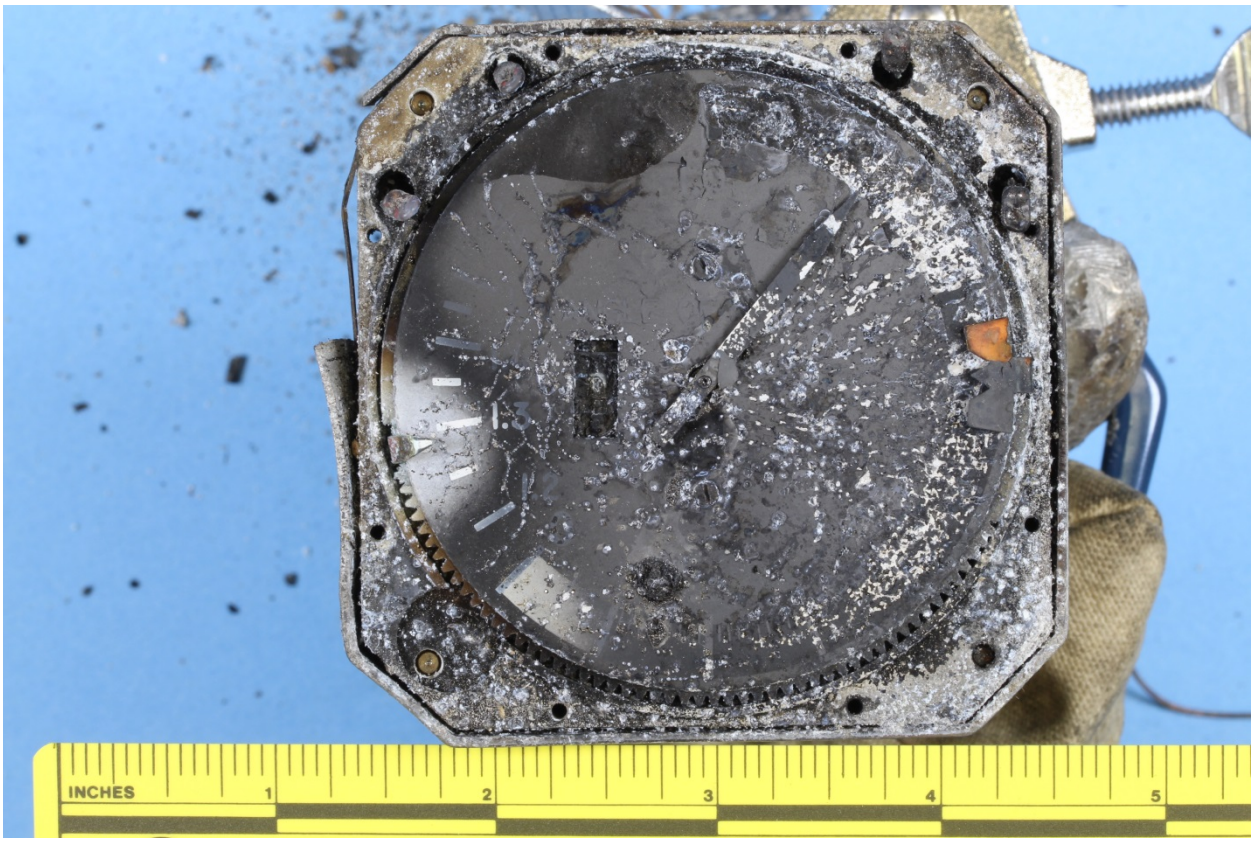

Figure 2 - Angle of Attack Indicator

b) Cabin Pressure Indicator: The cabin pressurization indicator required a high speed cutting wheel in order to gain access. The indicator contained three needles (pointers). No discernable assessment could be made.

c) Captain's Combined Mach/Airspeed Indicator: The captain's Mach Speed (Airspeed) Indicator indicated either 5 or 50 in the top Mach window. The second needle on the indicator was oriented at approximately the 2:00 position, or 110 knots. See Figure 3.

Figure 3 - Captain's (Left-Hand) Mach Speed Indicator

d) Captain's Attitude Indicator: The Captain's Attitude Indicator (ADI) was examined. The command bars were not found and the silk screen background was consumed by fire. No discernable assessment could be made.

e) Captain's Radio Magnetic Indicator: The Captain's Radio Magnetic Indicator (RMI) examination determined that no discernable assessment could be made.

f) Captain's Altimeter: Examination of the Captain's Altimeter showed a bar was slightly visible from the top of the altitude window. The bar was not in the fully retracted position. The needle was found protruding from the instrument face and bent. The needle was oriented at approximately the 7:30 o'clock position or approximately 600 feet. See Figure 4.

Figure 4 - Captain's (Left-side) Altimeter

After further cleaning and examination, the Captain's Altimeter setting was found to be "4184". See Figure 5.

Figure 5 - Close up of Captain's Altimeter

g) Captain's Horizontal Situation Indicator: Examination of the Captain's Horizontal Situation Indicator (HSI) found that one bug was visible which was believed to be the heading select bug. Navigation pointers were approximately at the 9:00 and 3:00 positions. The heading selector was approximately at the 2:00 position. The localizer bar was bent but appeared to be centered or slightly left of center. The back plate was rotated approximately 60 degrees clockwise. After cleaning the position of the heading ring could be determined based on the numbers observed on the ring.

h) Standby Airspeed Indicator: The examination of the Standby Airspeed Indicator revealed that numbers were visible but no discernable assessment could be made. See Figure 6.

Figure 6 - Stand-by Airspeed Indicator

i) Standby Attitude Indicator: No discernable assessment could be made of the Standby Attitude Indicator.

j) Standby Altimeter: The Standby Altimeter indicated approximately 14,140 feet on the dial. The rotating drum indicated 14,000 feet with the needle pointing approximately at 140 for an altitude reading of 14,140 feet. See Figure 7.

Figure 7 - Stand-by Altimeter

Further examination indicated a setting of 29.95 in the Kohlsman window. See Figure 8.

Figure 8 - Close-up of Stand-by Altimeter

k) First Officer's Horizontal Situation Indicator: The First Officer's Horizontal Situation Indicator (HSI) was examined. The heading needle indicated 191 degrees with the course selector bug at 249 degrees. The course deviation needle was centered. The right window selected course could only determine the first two of three digits to be 25x. The third digit (x) could not be determined.

In addition, the Captain's and First Officer's HSIs were compared. The two HSIs' back plates appeared to be rotated to the same orientation - 60 degrees clockwise. See Figure 9.

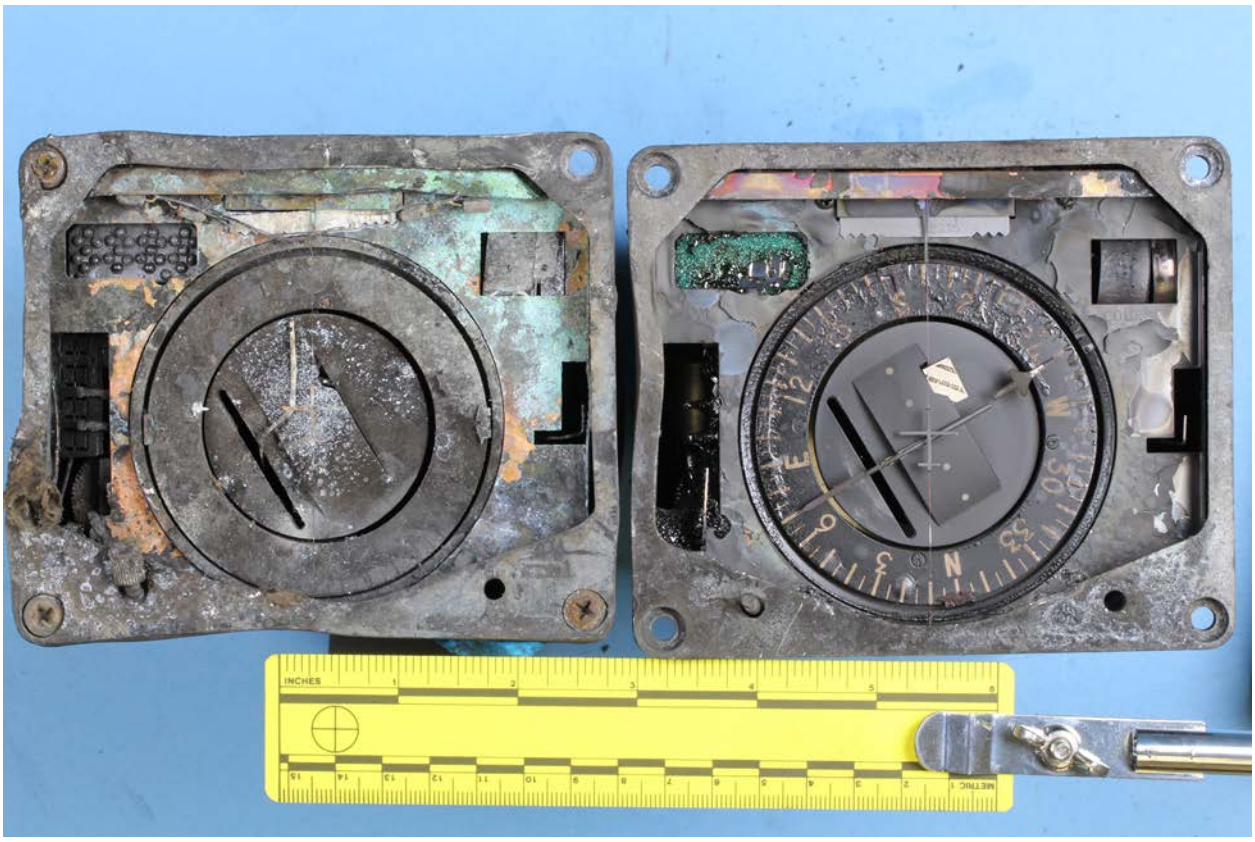

Figure 9 - Comparison of the Captain's (left-side) and First Officer's (right-side) Horizontal Situation Indicators

l) First Officer's Attitude Indicator: The First Officer's Attitude Indicator was examined. A 58 degree left bank was indicated. A 5-degree nose up pitch angle was also indicated. See Figure 10.

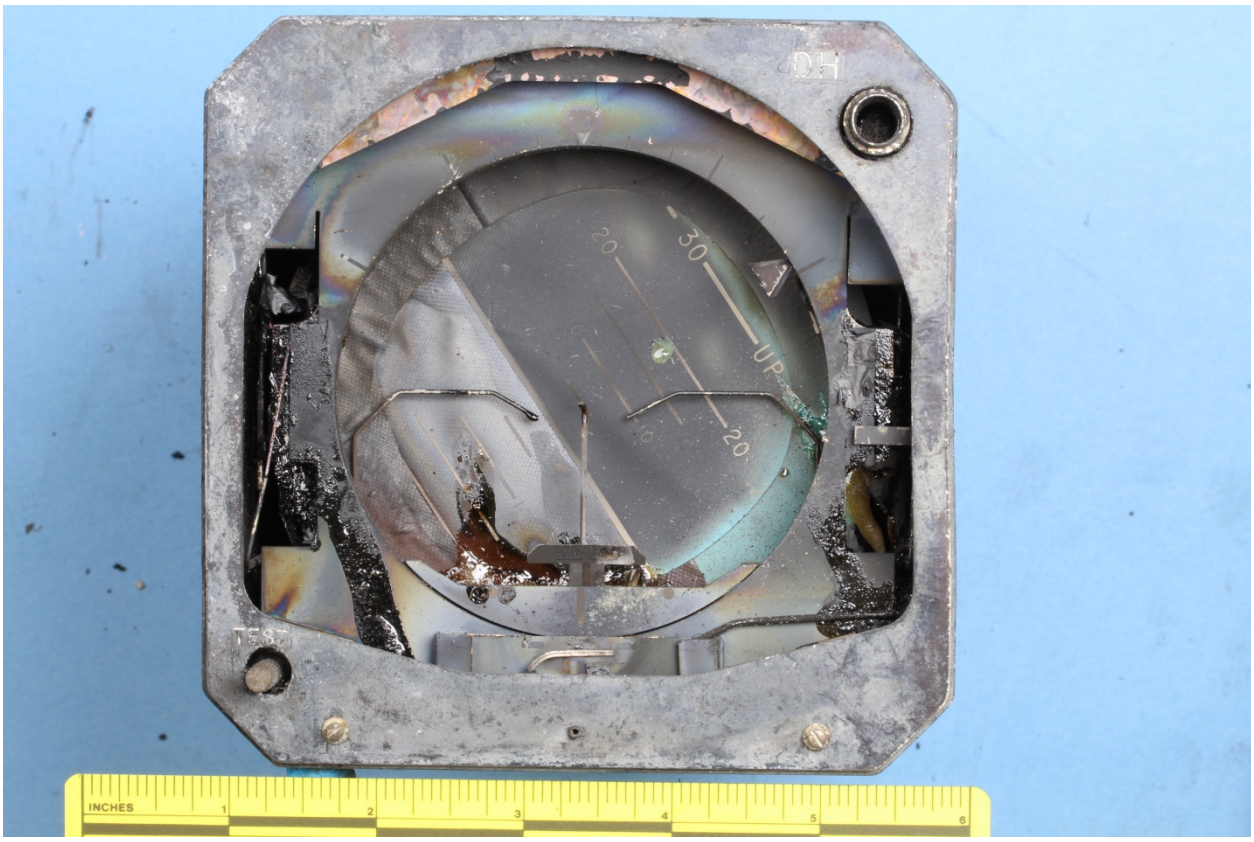

Figure 10 - Right-hand (first officer's) Attitude Indicator

m) First Officer's Altimeter: The First Officer's Altimeter was examined. The bar was in view. The digital output needle was about the 4:00 position (towards the knob located on the lower right hand corner of the instrument). See Figure 11.

Figure 11 - Right-hand (first officer's) Altimeter

In addition, after cleaning of the face and examination under magnification, the altimeter setting was indicated as “2995”. See Figure 12.

Figure 12 - Close Up of First-Officer's Altimeter

o) First Officer's Combined Mach/Airspeed Indicator: The First Officer's Combined Mach/Airspeed Indicator was examined, but no discernable indication was noted.

4.0 Landing Gear

The airplane was fitted with a nose and main landing gear systems. All three landing gears, and associated tires, were located at the accident site, detached from the airplane. The main gears were found with associated structure still attached.

In each case, the landing gears were assessed as down and locked at initial impact.

4.1 Nose Landing Gear

The nose landing gear structure was located underneath a portion of the right wing, in the airplane debris field. The nose gear was completely separated from the nose gear bay structure. The nose gear downlock was noted as fractured.

4.2 Left Main Landing Gear

Left main gear structure was located in the basement of the impacted apartment complex. The gear was noted in the down and locked position.

4.3 Right Main Landing Gear

The right main gear structure was located next to the impacted apartment complex, in the area between two of the apartment complex buildings. The downlock was fractured.

5.0 Navigation

5.1 Altimetry

The airplane's altimetry system uses pitot pressure, static pressure, and total temperature to provide outputs to the Combined Mach/Airspeed Indicators, Barometric Altimeters, Vertical Speed Indicators, Temp/TAS indicator, the airplane's Warning System, Navigation System, and Flight Control System.

The air data computer is a rack-mounted avionics unit that computes air data into electrical outputs for the other systems. The unit has ports for the input pressure lines and electrical connections in the back.

5.2 Stall Warning System

The airplane's stall warning system consisted of two stall detectors and a stick shaker motor connected to the left-hand control column. The stall detectors are supplied pitot, static and vent pressure and determine stall based on pre-determined factors. When the stall conditions are met, contacts within the detector are closed, a relay is energized and power is supplied to the stick shaker unit.

5.3 Terrain Avoidance and Warning System

According to documentation from ExecuFlight, the airplane was fitted with a Honeywell Model KGP-860 Enhanced Ground Proximity Warning System (EGPWS) Terrain Avoidance and Warnings System (TAWS) unit. The unit was located in an avionics rack beneath the right-hand (First Officer's) flight deck seat.

A search for the airplane's Terrain Avoidance and Warning System unit was conducted at the accident site. However, no evidence of the unit was noted.

During the December 15, 2015 group activity at Hillsboro, Ohio, the wreckage was again searched for the airplane's TAWS unit. No evidence of the unit was noted.

6.0 Airborne Auxiliary Power

The airplane's auxiliary power unit (APU) was located in the wreckage. See Figure 13.

Figure 13 - Auxiliary Power Unit On-Site (Circled)

No examination of the APU was conducted.

7.0 Airplane Powerplants

The airplane was fitted with 2 powerplants, mounted on each side of the aft fuselage.

At the accident site, the left and right engines were identified by their positions, relative to the fuselage as found. The identification data plates for each engine were not located.

Both engines showed visual evidence of thermal (fire) damage.

The engines and aircraft mounting pylons were found separated from the fuselage, with both engines still attached to the pylons.

The engines were removed from the accident site and relocated to a hangar at the Akron Fulton International Airport. The group conducted an initial inspection of each engine inside the hangar. During the inspection the aircraft mounting pylons and tail cones were removed from the engines. Following the inspections the engines were packed into wooden crates, and the removed components set aside for further disposition.

For further information regarding the airplane's powerplants, please see the Powerplants Group Chairman's Factual Report of Investigation.

8.0 Engine Controls

Due to impact and post-crash fire damage, the continuity of the engine control cables was not confirmed for either engine.

8.1 Search for Digital Electronic Engine Controls Units

A search for the airplane's Digital Electronic Engine Controls (DEEC) units (one for each engine) was conducted at the accident site. Two circuit cards pieces were located and initially identified as a DEEC circuit card (See Figure 14). The pieces were significantly damaged by fire. The pieces were retained by the NTSB for further investigation. No other DEEC units or circuit cards (or pieces) were identified.

Figure 14 – Pieces of a Suspected DEEC Board at Accident Site.

During the December 15, 2015 group activity at Hillsboro, Ohio, the wreckage was searched for the airplane's second DEEC unit. A circuit card assembly, initially identified as from one of the airplane's two DEEC units, was recovered from the wreckage and retained by the NTSB for further examination.

8.2 Examination of DEEC Circuit Cards by Honeywell

Both tentatively-identified DEEC circuit cards were examined at Honeywell facility in Tucson, Arizona on March 29, 2016 for further assessment and download of the non-volatile memory (NVM) on the cards.

The attempted download of non-volatile memory was unsuccessful for either board. For one board, the integrated circuit with NVM was too damaged to successfully download readable flight data. The integrated circuit on the other board was missing from the circuit card. See Attachment 1 for Honeywell's report of further details.

Tom Jacky
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