# NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Aviation Engineering Division
Washington, DC 20594

November 22, 2010

## AIRWORTHINESS GROUP CHAIRMAN FACTUAL REPORT

**ACCIDENT:** CEN10FA443

**LOCATIONS:** Oshkosh, Wisconsin

**DATE/TIME:** July 27, 2010

**AIRCRAFT:** Hawker Beechcraft Model 390, N6JR

### B. GROUP MEMBERS:

Chairman: Robert L. Swaim
Washington, DC

Member: Raymond P. Yank II
Federal Aviation Administration
Milwaukee, Wisconsin

Member: Robert Ramey
Hawker Beechcraft
Wichita, Kansas

### C. SUMMARY:

On July 27, 2010, at approximately 1816 Central Daylight Time (CDT), a Hawker Beechcraft Model 390 (N6JR) arriving from Detroit, Michigan, struck the ground and was substantially damaged near runway 18 at Wittman Regional Airport (KOSH), Oshkosh, Wisconsin. The airplane was owned and operated by Roush Fenway Racing LLC under the provisions of 14 Code of Federal Regulations (CFR) Part 91. The pilot had canceled an instrument clearance before entering the general Oshkosh area, and was proceeding to KOSH under visual flight rules. Day visual meteorological conditions prevailed at the time of the accident. The airline transport certificated pilot and passenger sustained serious injuries.

## D. DETAILS OF THE INVESTIGATION:

AIRPLANE IDENTIFICATION:

Hawker Beechcraft Model: 390, marketed by the name Premier IA.

Manufacturer Serial Number: RB-161,

> Note: Previous names for the airplane manufacturer have been Beech Aircraft Company and Raytheon Aircraft Company.

FAA Registration: N6JR

Engines: Williams International Turbo-Fan Engine Model FJ44-2A, Serial Numbers 105233 and 105232, respectively for the left and right.

ACCIDENT PATH:

The arrival at Oshkosh took place during the 2010 Experimental Aircraft Association Airventure in front of numerous witnesses and cameras.[1] Photos subsequently posted on the internet from multiple sources show the airplane arrive from the northeast, turn to the runway heading (south), fly on a runway heading, then depart controlled flight with the right wing down. Using the surveyed impact position, as well as photographed background buildings as references, the airplane departed controlled flight prior to reaching the mid-point of the 8,000 foot main runway and impacted with the elevator at or near the full airplane nose-up (ANU) position.

A fragment of carbon fiber from the right wing tip was the first fragment of airplane and was found in the first ground contact mark. (See Figure 1) This contact point was located two to three feet from the west edge of a closed runway 18/36 and at the beginning of ground scars leading through the grass toward the resting airplane. The closed parallel runway (18/36) is to the west of the main north/south runway.

1 Photographs copied from various internet sources depicting the flight and impact sequence are attached as Addendum 1.

Figure 1. View toward the airplane from left and right main landing gear tire marks. The first point of ground contact by the wingtip was at the right edge of the photo and is not visible in this view.

A WAAS-enabled GPS and TotalStation® survey equipment used by the Winnebago County Sherriff's Department provided positional data about the debris trail.[2] The location of the first fragment and ground contact was about 4,300 feet from the southern end of the pavement for the main runway that the airplane had been traveling toward. (See Figure 2)

[2] Winnebago County reference: S.O.10-2829, Putzer W20

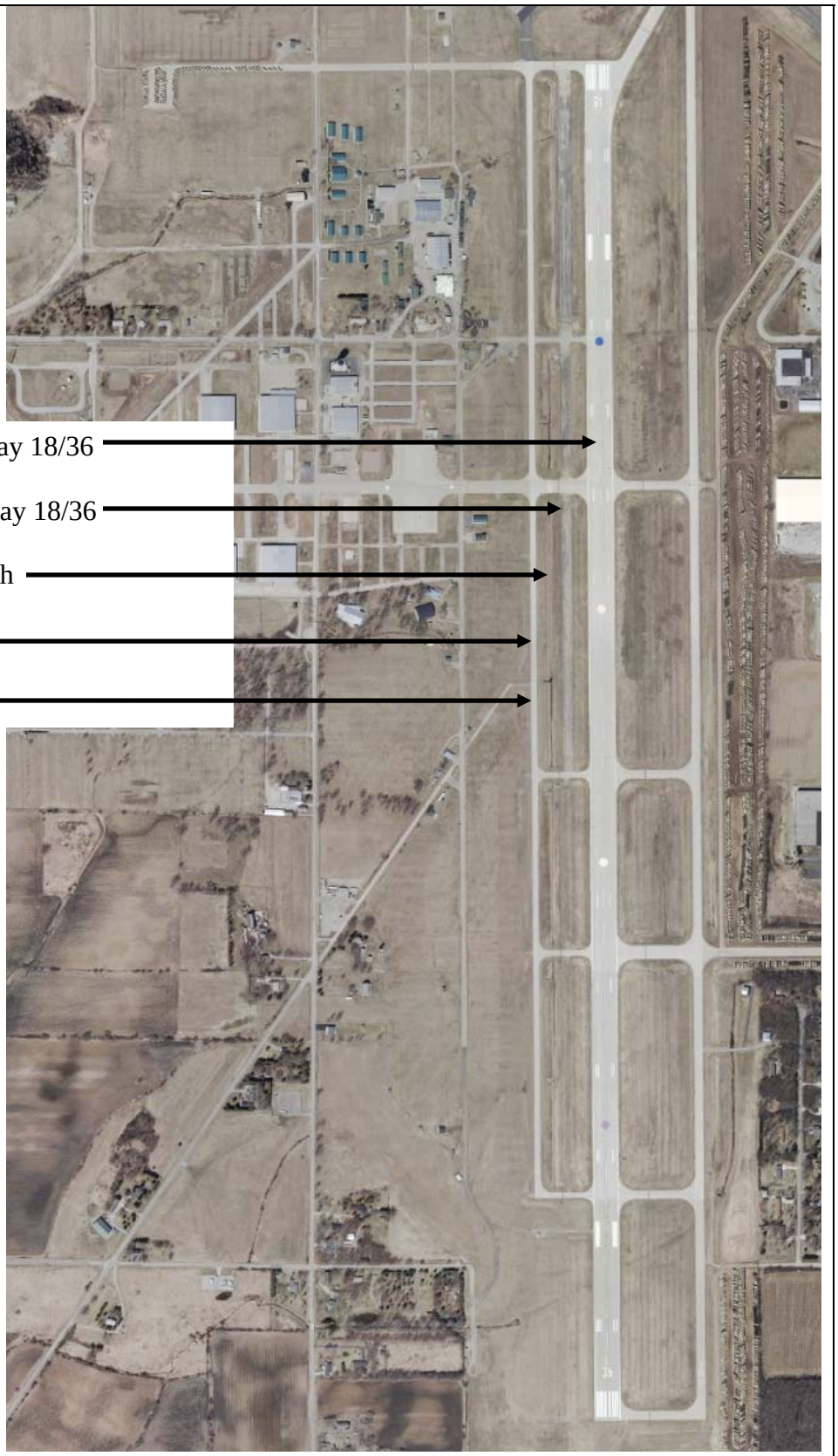


Figure 2. Location of airplane with relation to airport features.

The surveyed point of first ground contact was found to be:

43 degrees 58.55 minutes North
88 degrees 33.45 minutes West

Note: The Group Chairman and Hawker Beechcraft representative assisted the Winnebago County Sherrif's Department conduct the TotalStation survey of the ground markings. Part descriptions entered into the survey were expedited due to impending arrival of severe weather and were later refined, so this report will take precedence in descriptions about parts. When in conflict with this report about survey data, the TotalStation information will take precedence.

The heading of ground scars from the initial impact was 215 degrees. The southwest path of the ground markings and debris from the closed runway led through a low drainage ditch, up a short embankment, and to edge of Taxiway P. Photographs showed that the taxiway had been in use at the time by at least two Cessna 170 airplanes. The accident airplane came to rest in the grass on the east edge of the taxiway, with the nose of the airplane facing the point of first ground contact. (See Figure 3)

Figure 3. Total Station data superimposed upon aerial photo of the airport. The pavement of the active runway is the right edge of the photo and the airplane faces northeast, toward the first marks at the edge of the closed runway 18/36. The tail of the airplane is at Taxiway P. The dashed vertical green lines denote a water-filled drainage ditch. See Appendices for additional detail.

In general, the debris from the left and right sides of the airplane were found on the appropriate left and right sides of the travel path until where the ground was deeply

disturbed on the upslope/downtrack side of the drainage ditch. The nose landing gear doors were found slightly to the left of the centerline of the path near the ditch. Downtrack from the ditch, photos from the accident show the airplane rotate and then move tail first. Corresponding physical debris was the right main landing gear on the left side of the path and the left upper nose baggage door was on the right side of the path.

The order of the following description generally follows the path along the ground.

Perpendicular to the direction of travel and about five to six feet south (to the left) of the first cut was a parallel second cut that also began in the grass. In the second cut was an underwing aerodynamic device that Hawker Beechcraft identified as a vortilon. The vortilons on the accident airplane were only damaged at the outermost installations of the leading edge of the right wing.

The third point of contact with the ground was a comma-shaped tire mark on the edge of the closed runway. The mark led into and displaced gravel that had been at the edge of the closed runway.

> Note: The third and fourth points were east of the first point and on the pavement, but still downtrack of the initial impact. These contacts with the closed runway to the east of the first ground contact were due to the width of the debris trail on the angle away from the main runway. See the survey data for more clarity.

Continuing in order along the path, the fourth mark along the ground path was a Z-shaped tire skid, to the left of the centerline of the path toward the resting airplane. This mark on the asphalt had aluminum transfers near the edge of the pavement. To the right of the downtrack end of this mark and in the grass was fairing material from the belly of the airplane, that had been forward of the wing, and marked with part number 390-110198-6025, 7193209. The manufacturer nomenclature for the part number was “Fairing Assembly, Underwing, RH.”

Along the path from the runway to the drainage ditch were the right wingtip and light assemblies to the right of center, to the left of center were the left main landing gear door fairing and then the retraction actuator in the grass near the edge of the runway, the belly rotating beacon and surrounding fairing material, to the right were the right wing ice inspection light and landing light, the nose landing gear doors near the centerline of the path, then to the left was the left main landing gear and tire assembly. The wheel and tire assembly from the nose landing gear were found in the drainage ditch.

To the west of the drainage ditch, the upslope dirt had been displaced toward where the airplane was resting on the belly surface. A flap fairing was found, followed by the right main landing gear to the left of the path, and the left nose baggage compartment door on the right side of the path.

AIRPLANE:

The airplane was found laying on the belly and left wing. Attached to the airframe were the engines, nose radome, tail position light, and left wing tip. No evidence of fire was found. (See figures 4 and 5)

Figure 4. Left side of airplane.

Figure 5. Right side of airplane.

FUSELAGE:

The majority of the structure was carbon fiber composite material and the following description is generally from forward to aft.

The nose of the airplane had compression damage and tearing near the forward pressure bulkhead, generally oriented between the leading edges of the windshields to the aft end of the nose landing gear box. The right side of the nose had a second compression buckle ahead of this larger damage. The upper portion of the nose landing gear strut remained attached and had been displaced so that the bottom was to the right of the airplane centerline.

The fuselage had been constructed as a large carbon fiber tubular shape and had been mounted above the wing assembly. The tube had bent downward ahead of the wing and near the main cabin door.

The fuselage generally remained intact through the lower portion of the structure. The upper structure had broken apart between the leading edges of the engine pylons, aft of the rear pressure bulkhead.

WINGS:

The structural mounting of the fuselage to the wing had been four metal links. The forward two links were visible from the exterior and both were found broken. The fuselage tube was found resting on the wing center section. When the fuselage was lifted with a crane for removal from the grass, the forward edge of the wing hung about a foot lower than normal from the fuselage. (See Figure 6) The bottoms of the wings had scrape marks and black embedded asphalt marks that was similar to the closed runway. (The primary Oshkosh north/south runway is concrete.)

Figure 6. Separated leading edge of left wing root beneath fuselage. (Nose is to the left)

The right wingtip was found on the east side of the drainage ditch and had separated from the wing structure along the rib line that had been immediately inboard of the position light components. The wing had an upward bend at the outboard corner of the outboard flap cutout, to where the second underwing vortilon had been mounted, just inboard of the overwing fuel cap. The vortilon was found in the second of the ground contact scars.

The right wing midflap fairing was not attached to the wing. The part was found on the downtrack/east side of the drainage ditch. The spoilers were found in the stowed positions. The outboard flap and aileron were attached to their respective control and hinge points. The majority of the inboard right flap remained, other than the most inboard portion, which was found on the west side of the drainage ditch.

The left wing, flaps, aileron, and spoiler panels were found relatively intact, other than impact damage to and around the inboard end of the inboard flap.

FLIGHT CONTROLS:

Photographs of the airplane prior to ground contact show the flaps down, elevators in the airplane nose up orientation (trailing edge up), and ailerons in the roll-left orientations. The rudder position was initially to the left of center and then near neutral. The wing spoilers were in the stowed positions when photographed in flight.

The elevators were found trailing edge down. The pitch controls could be moved from the cockpit after the accident. There was friction in movement of the elevators and the cockpit control yoke did not freely return to the forward stop when released. The cable route was found impeded by impact damage to surrounding structure in the fuselage. The cables were routed beneath the cockpit floor and exterior examination found where the fuselage had damage from the wing impact along the sub-floor route. The route was also not intact where the tail had separated from the cabin at the leading edge of the engines.

An external indication for pitch trim position in the Model 390 is shown by the relative positions of the horizontal stabilizer with a black painted mark on the vertical stabilizer. The leading edge of the stabilizer was found about a half inch above the center of the black mark, which is an approximate take-off trim setting.

The rudder was found to move freely by hand and the rudder pedals were used to move the rudder fully to the right. Moving toward left from the full right position, the control cables went slack at the break in the fuselage near the engines and disruption of the cable path was found. Holding the cables to account for the broken fuselage, the pedals stopped before reaching the centered position, such that the right pedal remained slightly forward of the left pedal. Further examination found the pedals connected indirectly to the nose steering link assembly at the top of the broken nose landing gear. The steering assembly had broken through the structure of the nose landing gear box and the impeded travel was the stopping point of the rudder pedal movement. (See Figure 7)

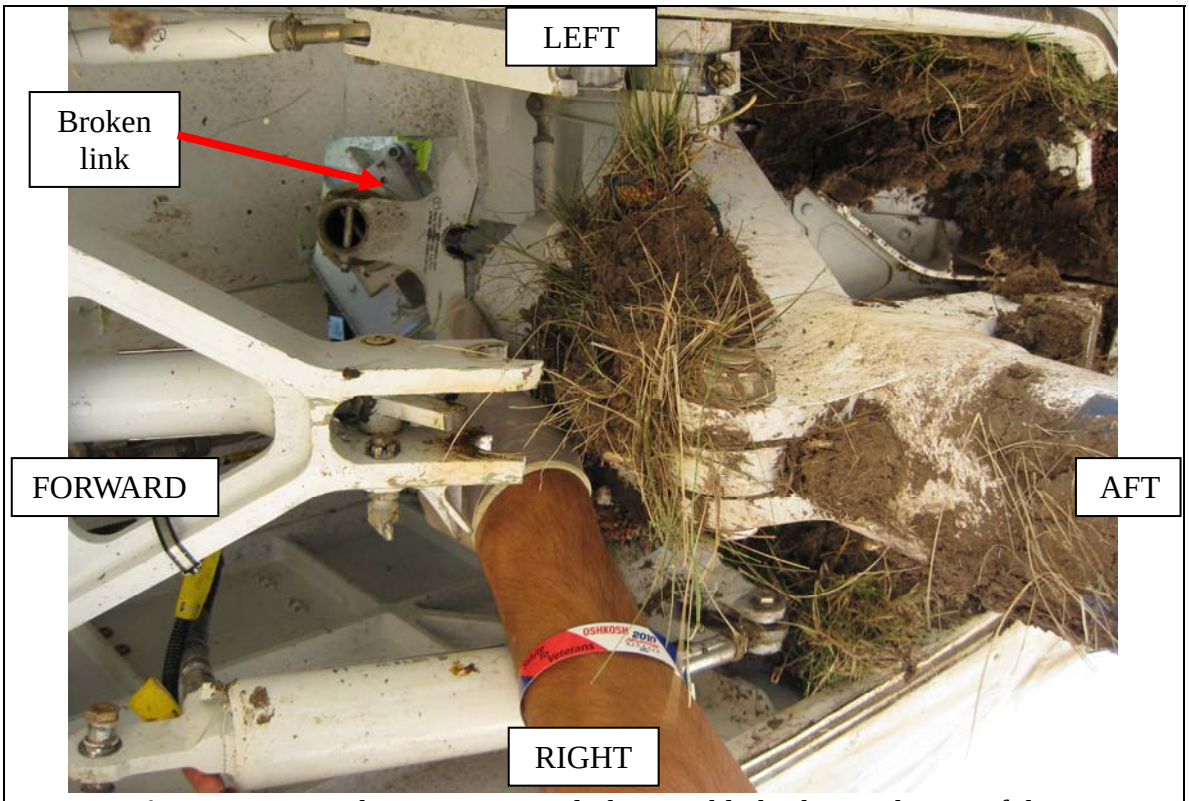

Figure 7. Arrow points to the nose steering link assembly broken at the top of the nose landing gear structure. View looks upward.

The rudder trim was found near the faired position when the rudder was centered.

The roll control system was found broken where the wing had separated from the fuselage. The cockpit control yoke could not be moved from slightly left of center. From the left main landing gear well, a slight rocking could be seen at the aileron control quadrant that was crushed between the fuselage and wing. A bellcrank arm was seen broken at the transition to the control tubing in the wing center section. The tube connecting the left and right wing roll controls was intact and the system had continuity through the wings. The left aileron was found near the faired position. The control path was pinched at the upward bend in the right wing and the right aileron was found trailing edge up.

The left aileron trim actuator measured 1.31 inches from the actuator to the bolt centerline. The right aileron trim actuator measured 1.37 inches from the actuator to the bolt centerline. According to Hawker Beechcraft:

> When the ROLL TRIM switch on the pedestal is set to NORM and the TRIM switch is depressed and held, the left aileron roll trim surface will move. When the ROLL TRIM switch is set to AUX and the TRIM switch is depressed and held, both aileron roll trim surfaces will move. The pictures taken onsite show the ROLL TRIM switch set to NORM, and the right aileron roll trim surface appears faired. So assuming the right aileron roll trim surface is at 0 degrees, and the

difference in roll trim actuator extension measured is 1/16 inch, the following is determined:

Left Aileron Tab: 3.1 degrees down (left aileron up / left wing down)

The cockpit indicators for the trim and flap positions were electronic and had no indication without power. Power was not applied to the airplane electrical systems, due to the broken wires and leaking fuel.

The wing flaps were found in the fully extended positions (31.8 +/-1.7 degrees nominal) and impact marks were found in the tracks at the fully extended alignments with the flap rollers. The cockpit flap control was found in the fully extended position. The wing flap actuators were measured with the following extensions to the bolt centers. Hawker Beechcraft related the measurements into degrees of flap extension, which came to fully extended flap, as shown by the set of numbers on the right:

| | Left flaps: (inches/degrees) | Right flaps: (inches/degrees) |
|---|---|---|
| Outboard flap, outboard actuator: | 5.75”/31.79 degrees | 5.69”/ 30.53 degrees |
| inboard actuator: | 9.25 | 9.25 |
| Inboard flap, outboard actuator: | 9.25”/ 32.77 degrees | 9.25”/ 32.77 degrees |
| inboard actuator: | Damage area | Broken |

The wing spoilers were found in the stowed positions and the cockpit lift dump handle was not found extended.

ELECTRICAL AND AVIONIC:

In the right nose avionics compartment, the slot was empty for Flight Management Computer #2, an option that this airplane had not been delivered with. The compartment did contain a Honeywell Enhanced Ground Proximity Warning System (EGPWS) with the following markings and summary information from the EGPWS is attached:

Mark V
Part number 965-0976-040-210-210
Serial number 22054
Loadable databases: Terrain, Envelope Modulation
Mod Status: 1 through 8
Sticker 132690-12

All cockpit circuit breakers were found the closed (operational) positions.

Extensive wiring damage was seen in the exposed areas where the fuselage was broken between the engines and near the wing.

In the compartment beneath the right engine, a firefighter disconnected the battery. The emergency locator transmitter (ELT) could not be reached at first, so the antenna coax cable was cut and both cables broken to limit transmissions. The switch was turned off at 1:20 am on July 28. Circuit breakers found open were labeled for the:

HYD PRESS IND
STROBE LT
L LNDG

The cockpit voice recorder was a Fairchild Model FA2100, marked with:

Part number 2100-1010-51,
Serial number 000352608,
MFR 06141
DMF 112005

Hardware modifications 010, 020, 050

Software PN 840-E1663-040

ENGINES:

In multiple amateur videos of the accident, at least one engine can be heard running after the accident. The longest recording heard lasted for 25 seconds after the airplane coming to rest. The engine(s) sounds can be heard shutting down while the main cabin door is shut. The engine power levers were found in the Idle Cut Off (ICO) positions.

Both engines turned freely in the wind as a storm approached. Feeling the rotation by hand, no grinding was felt. No debris was found in either inlet or exhaust and no damage, or discoloration was seen in either exhaust. Both engines had fire fighting foam in the inlets and exhausts when first seen. Neither engine had case ruptures or other penetrations. Both cowlings were found intact, closed, and unremarkable.

After the accident, the inlet of the right engine had small soft body impact marks near the 6 and 12 o’clock positions. Flecks of dirt were adhered to fan blades and one had light scratches that had a brighter look than the surrounding material.

SURVIVABILTY, DOORS, AND WINDOWS:

Internet photos and videos show the main cabin door handle ajar after the first impact and a firefighter opening the main cabin door by pulling on the aft edge. The door normally does not have space for fingers along the edges. The pilot comes to the door from the aft cabin area and can be seen to have injuries near his left eye. The pilot exited the airplane

through the main cabin door. Firefighters and other personnel then helped the female passenger from the cockpit.

The main cabin door was open when investigators arrived within a half hour, and the open door could not be fully closed. The top edge of the door was displaced forward and the door did not align with the door opening. The direction of displacement was consistent with the damage to the hinge assembly, along the bottom of the fuselage.

Photos show the overwing exit from the right side of the airplane was closed in flight and open after the initial ground contact. (See Figure 8) The hatch was found inside of the cabin, on the left side second passenger seat, with the latch in the stowed orientation. (See Figure 9)

Figure 8. Cropped section of photo shows the overwing escape hatch opening during the impact sequence.

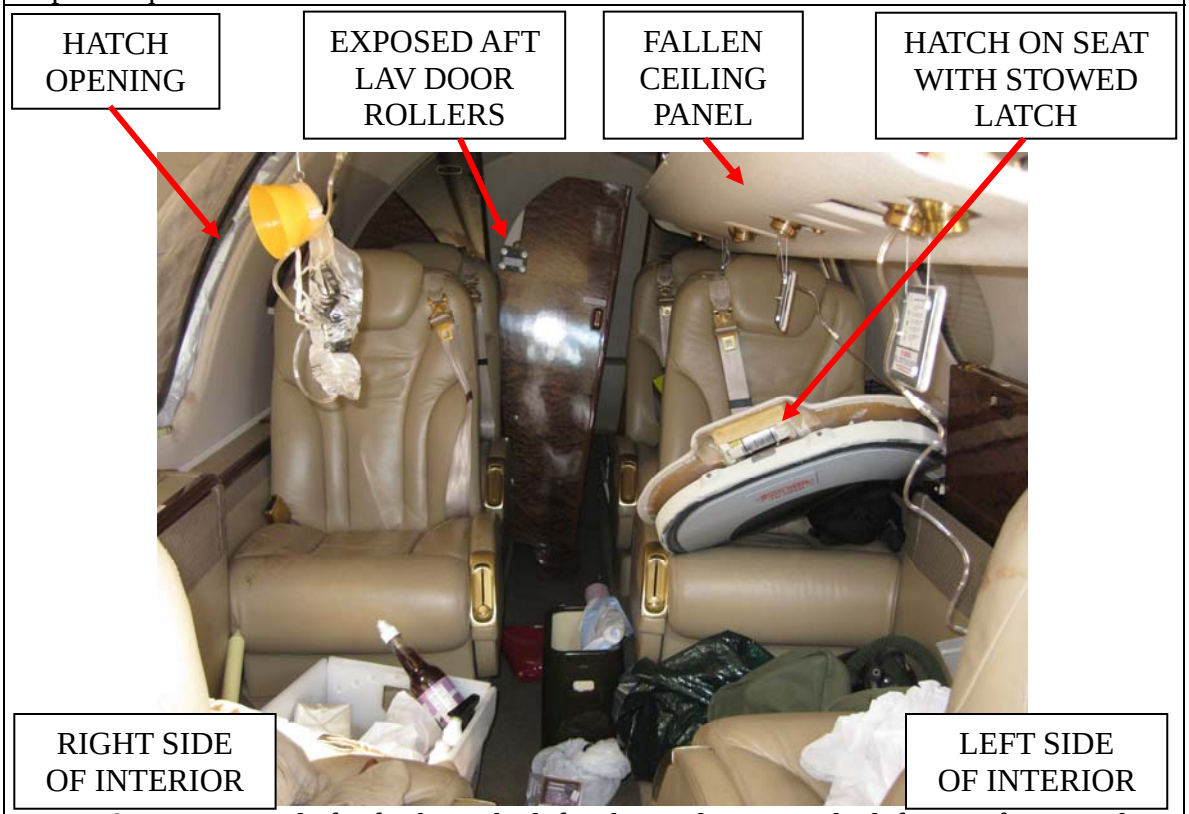


Figure 9. View toward aft of cabin. The left cabin ceiling is on the left row of seats. The skewed door to the aft lavatory is visible between the seats and the rollers which are normally concealed by the wall are visible. The overwing hatch is visible on a seat.

Prior to this accident, Hawker Beechcraft received reports about opening of overwing exits during ground operations. The hatches are held firmly shut by pressurization during flight. Company review into the previous openings resulted in Premier 1A Communiqué #27, dated August 2010. The communiqué points out that revision A30 of the Premier Airplane Maintenance Manual provides additional rigging instructions.

Both the cockpit and aft lavatory interior doors were designed to slide to one side for concealment behind a side panel (also known as a pocket door style). Each of the interior doors was found off of the rollers and each had to be physically lifted and rattled to move. The cockpit doors had been in the open positions and the aft lav door was in the near shut position, from which it needed to be picked up to open.

The left cabin ceiling had fallen into the occupiable head space of the left cabin seats. (See Figure 9)

COCKPIT SEATS:

The cockpit seats were left in the airplane and were not disassembled. Visual inspections to the assemblies beneath and behind the seats revealed no bent components or tubes. The seat positions were measured from the aft corner of the center pedestal. The vertical measurement was to the top of the pan that supports the cushion. The aft measurement was to the centerline of the chrome shafts and seat jackscrews. The cockpit seat adjustment measurements were:

| | Vertical: | Aft: |
|---|---|---|
| Captain seat: | .75 inches above | 9.69 inches |

P/N: 390-530151-008 FO 7 (The 8 and 7 were slightly illegible),
Manufactured: 6/7/2006 (or 2008)

| | Vertical: | Aft: |
|---|---|---|
| First Officer seat: | 3 inches below | 11 inches aft |

P/N: 390-530151-008 FO 7 (The 8 and 7 were slightly illegible),
Manufactured: 6/7/2006 (or 2008)

Detailed examination of exterior photos in the impact sequence showed the cockpit interior through the windshield. The male occupant of the captain seat can be seen with an arm stretched forward of his shoulder. The person in the first officer seat is not similarly visible. (See Figure 10)

Figure 10. Cropped section of an attached photo that shows the airplane colliding with the drainage ditch, showing the captain's arm stretched forward of the shoulder. The person in the first officer seat is not similarly visible. Also shown are displacement of the main cockpit door handle and a fuselage fracture near the forward pressure bulkhead.

The shoulder harness set for the seat of the captain was found to be locked, so that neither strap would extend further when lightly pulled. Each of the harness straps for the captain was brought to the belt buckle and the extensions were about correct to pass over a pilot's shoulders. (See Figure 11)

The shoulder harness on the side of the first officer was not locked, the straps had a fold that was not creased into the material, and the buckles were inverted from a usable orientation. (See Figures 12) None of the shoulder harness sets were disassembled to examine for stretch marks in the webbing.

Figure 11. Shoulder harness of captain seat.

Figure 12. Shoulder harness of first officer seat.

On the ground and in a level attitude, using the shoulder harnesses as a vertical reference, the position of an investigator's head placed the eye level vertically near the center of the windshield. At this vertical position, the view out of the side window placed the eye level near the top of the side window and the top of the head near the track for the window shade. A similar head position can be seen in a marketing photo of the airplane. (See Figure 13)

Figure 13. Cropped marketing photo that shows pilot head positions with respect to the side windows and window track components for orientation in the next two photos.

The sun visor assembly was found oriented vertically, along the aft edge of the window pillar. Blood distribution had silhouetted the visor in the position where it was found. The round adjustment knob for the pilot's sun visor was the highest point at which blood was found. Radiating from this point was a pattern down and forward. (See Figure 14)

Figure 14. Sun visor mounting assembly and adjustment knob, side view, with spray pattern forward of adjustment knob.

At the head position found with the shoulder harnesses and seat adjustment, the sun visor mounting assembly and adjustment knob was approximately in front of the pilot's forehead, near the hairline and above the left eye. (See Figure 15)

Figure 15. Sun visor mounting assembly and adjustment knob, as viewed aft and from above the centerline of the control yoke. The photo is slightly rotated and the dashed line has been added to provide vertical orientation, as copied from the door frame.

A pair of men's prescription sunglasses were found on the floor under the pilot's left knee position and the pair resembled a pair that the pilot was wearing in a newspaper photo. The left lens was found near the captain's cup holder and had blood on it. The frame had the left nose piece crushed and the left hinge was displaced aft.

Across the aisle from the main cabin door was an unused "Airline First Aid Kit," manufactured by DME Corporation, with the following markings:

P/N S6-01-005-312
Alternate P/N P8-02-0004-307
Inspected 10/23/08

COCKPIT DOCUMENTATION:

Following this are switch and control positions, as well as indications found in the cockpit, generally using the markings nomenclature that was found.

Left radio panel:

Transmit 1

MIC – NORM
AUTO – COM
SPEAKER – Selected upward
DME – BOTH
AUDIO – NORM
MARKER – LOW
DG - NORM
CDU – NORM (centered)
AHRS – NORM (centered)
PFD/MFD – NORM (centered)

STATIC SOURCE:
Normal

Ice protection panel:
STALL WARN – OFF
STABILIZER – AUTO
WING ICE – (both) OFF
PITOT – (both) ON
ENGINE ICE – (both) OFF
WINDSHIELD – OFF

Landing gear handle – down
Antiskid – NORM
Electrical panel – All switches to OFF and rotary switch to EXT (external)
Alternate gear selector red T-handle found extended.

Fuel panel:
Rotary selector – OFF
BOOST PUMPS – (both) AUTO

Environmental control panel:
Cabin altitude display – Approximately 800 feet
Differential pressure – zero
BLEED AIR – NORM
TEMP selector – CABIN
TEMP controller (rotational clock nomenclature) – 12:30 position
Cockpit and cabin blowers – LOW

Right radio panel:
MIC – (both) NORM
COM – OFF
SPKR – OFF
DME – BOTH
DG - NORM

All three electronic flight displays appear to be intact.
The Collins NAV/COM radio selector switches found at COM and STDBY
The pressurization found set to AUTO

Standby airspeed indicator overspeed (barber pole) observed at about 322 knots. Standby attitude indicator OFF flag is in view, with the display at about 10 degrees right roll and 25 degrees down.

Standby altimeter displayed 665 feet and 29.75 Hg.

Across the top of the instrument panel are five push buttons that control the engine fire protection system and firewall shutoff valves. None of the clear covers were displaced or otherwise different than the set in a new Premier that was examined.

The autopilot panel has the engagement switch at the disconnect position.

Of the overhead panel rocker switches, all were found set at OFF, with the following exceptions (ON):

LIGHTS MASTER
LANDING LIGHT
RECOGNITION
BEACON
STROBE

Center pedestal:

Ignition switches – (both) ARM
ECU – (both) ON
SYNC – SYNC
PITCH TRIM – NORM
Lift dump toggle at UNLOCK
Lift dump handle stowed
Flaps handle at full down
Throttles at Idle Cut OFF, with the left lever found slightly ahead of the right.
Rudder boost - NORM
Rudder trim – NORM
Roll Trim – NORM

MAINTENANCE RECORDS:

The manufacturer built the airplane with registration N71761 applied and the Standard Airworthiness Certificate was dated September 20, 2006. The airplane was repainted to enter service with Roush/Fenway Racing LLC (also known as Roush Aviation) on March 26, 2007, with 223.4 flight hours and 146 landing cycles.

The N6JR Certificate of Registration was dated July 18, 2007.

A log page found in the airplane showed that at on July 25, 2010, the airplane had 1264.8 flight hours and the last landing had been number 930. According to the Director of Maintenance for Roush Fenway Racing LLC, the last record at the hangar for the airplane showed 1255 flight hours and 925 takeoff/landing cycles.

The basis of maintenance is defined by 14 CFR Part 91.409. With the exception of unscheduled replacements, such as tires and individual instruments, the majority of the scheduled maintenance was performed by Raytheon Aircraft / Hawker Beechcraft service centers. The majority of the unscheduled items were also released by signatures associated with the service centers or Roush Aviation. No outstanding AD items were found for the time of the accident. The logbook showed compliance with numerous service bulletins, including those not categorized as Mandatory or Recommended.

The airplane logbooks showed the following took place within the six months prior to the accident:

| Date | Hours | Cycles | Item |
|---|---|---|---|
| July 17, 2010 | 1255.0 | | Last log entry. Replacement of tires. |
| May 12, 2010 | 1223.0 | 899 | Replaced autopilot elevator servo. |
| Feb 16, 2010 | 1163.1 | 847 | HawkerBeechcraft Services performed 6 pages of inspections and maintenance, including checks specified by the maintenance manual for 200, 400, 600, and 1200 flight hours.<br>Cable tensions were checked and reset. The pitot-static and avionics systems tests were completed for FAR 91.411 and the transponder to 91.413. The standby altimeter was replaced and a pitot-static leakdown test was completed.<br><br>Also performed was a Williams Check 1 and Check 2, per FJ44-2A, MM 05-20-00, Table 601. The left engine fuel flow transmitter fittings were retorqued and following seals were replaced: hydraulic pump drive carbon seals (p/n 73312, 66846, and 73312), and Garlock seal (p/n 66846). |

The Certification of Conformance was dated March 2, 2006 for each engine. The engines had the same hours and cycles as the airframe.

# APPENDIX A
## PHOTOGRAPHS OF IMPACT SEQUENCE

The following photographs are a collection of samples abut the impact sequence that were found on the internet. Where known, attribution has been provided for the original source. However, most are available on multiple websites, so the original source is not known.


The Smile in the Sky!


Photo by Brian Flanagan


Photo by Brian Flanagan


ORION


N27970


N8JR

# APPENDIX B

## ENGINE PERFORMANCE RECORDS
## (INCLUDES ACCELERATION TIMES)

FJ44-2A TURBOFAN ENGINE
ACCEPTANCE TEST PERFORMANCE SUMMARY
WILLIAMS INTERNATIONAL CO., L.L.C.

| | | | |
|---|---|---|---|
| Eng P/N: 56000 | Eng S/N: 105233 | Eng Bld: 1 | Test Date: 03/01/06 |
| Prog Ver: CP173.04 | Date: 06/04/02 | Acq Ver: CP169.03 | Date: 06/15/00 |
| Bellmouth - | Sn: 9314 | Cd: 0.987 | Dia: 18.80 |
| ATP Doc: 59624 Rev.E | Exh Noz: icn10462 | Thrust Tare: 0.8 | Test Cell O5 |
| Fuel Type: JETA | Oil Type: mobil jet 2 | Pc1: 2.0010 | Pc2: 2.0200 |
| LHV: 18598 | Spec Grav: 0.7942 | Temp Slope: 0.00040800 | Dir: 0603010751 |

ELECTRONIC MODE

TAKEOFF THRUST @ 85 deg PLA (+/- 2 deg., Uncorrected, Uninstalled)

| PARAMETER | ACTUAL | ALLOWABLE | DEVIATION |
|---|---|---|---|
| Measured N1 | 17949 rpm | 17895 (min) (fig 5) | 0 |
| Recovered FN | 2270.7 lbf | 2213.8 (min) (fig 6) | 0.0 |
| | | 2324.5 (max) | 0.0 |
| ECU TT2 (CED_TT2) | 45.0 F | N/A | N/A |
| ECU Pamb (CED_P0) | 12.600 psia | N/A | N/A |

PERFORMANCE @ 17800 rpm N1 (Referred to Sea Level, Static, 72F Dry Day, Uninstalled)

| PARAMETER | ACTUAL | ALLOWABLE | DEVIATION |
|---|---|---|---|
| Referred ITT | 1840 R | 1880 (max) | 0 |
| Referred FN | 2416.5 lbf | N/A | N/A |
| Referred WA | 68.4 lbm/sec | N/A | N/A |
| Referred N2 | 39891 rpm | N/A | N/A |

PERFORMANCE @ 2339 lbf RATED THRUST (Referred to Sea Level, Static, 72F Dry Day, Uninstalled)

| PARAMETER | ACTUAL | ALLOWABLE | DEVIATION |
|---|---|---|---|
| Referred SFC | 0.498 lbm/hr/lbf | 0.522 (max) | 0.000 |
| Referred N1 | 17605 rpm | N/A | N/A |

GROUND IDLE THRUST

| PARAMETER | ACTUAL | ALLOWABLE | DEVIATION |
|---|---|---|---|
| Recovered FN | 123.7 lbf | 140.0 (max) | 0.0 |

ACCELERATION TIME

| PARAMETER | ACTUAL | MAX ALLOWABLE | DEVIATION |
|---|---|---|---|
| Corrected Time | 5.4 seconds | 5.7 (fig 14) | 0.0 |
| Inlet Temp. | 45.6 F | N/A | N/A |
| Test Cell Pressure | 12.612 psia | N/A | N/A |

MECHANICAL SYSTEMS PERFORMANCE (Steady-State)

| PARAMETER | ACTUAL | ALLOWABLE | DEVIATION |
|---|---|---|---|
| Max Main Oil Temp | 170.4 F | 275.0 | 0.0 |
| Min Main Oil Press | 41.5 psig | 35.0 | 0.0 |
| Max Main Oil Press | 73.5 psig | 90.0 | 0.0 |

FJ44-2A TURBOFAN ENGINE
ACCEPTANCE TEST PERFORMANCE SUMMARY
WILLIAMS INTERNATIONAL CO., L.L.C.

| | | | |
|---|---|---|---|
| Eng P/N: 56000 | Eng S/N: 105233 | Eng Bld: 1 | Test Date: 03/01/06 |
| Prog Ver: CP173.04 | Date: 06/04/02 | Acq Ver: CP169.03 | Date: 06/15/00 |
| Bellmouth - | Sn: 9314 | Cd: 0.987 | Dia: 18.80 |
| ATP Doc: 59624 Rev.E | Exh Noz: icn10462 | Thrust Tare: 0.8 | Test Cell O5 |
| Fuel Type: JETA | Oil Type: mobil jet 2 | Pc1: 2.0010 | Pc2: 2.0200 |
| LHV: 18598 | Spec Grav: 0.7942 | Temp Slope: 0.00040800 | Dir: 0603010751 |

MECHANICAL MODE

TAKEOFF THRUST (Referred to Sea Level, Static, 72F Dry Day, Uninstalled)

| PARAMETER | ACTUAL | MIN ALLOWABLE | DEVIATION |
|---|---|---|---|
| Referred N1 | 18252 rpm | N/A | N/A |
| Referred FN | 2630.3 lbf | 2522.7 (fig 10) | 0.0 |

IDLE N2 SPEED - PLA in idle detent (17.5 +/- 2 deg)

| PARAMETER | ACTUAL | MAX ALLOWABLE | DEVIATION |
|---|---|---|---|
| Measured N2 | 23761 rpm | 24468 (fig 11) | 0 |
| Inlet Temp. | 46.4 F | N/A | N/A |
| Test Cell Pressure | 12.612 psia | N/A | N/A |

ACCELERATION TIME

| PARAMETER | ACTUAL | MAX ALLOWABLE | DEVIATION |
|---|---|---|---|
| Corrected Time | 3.7 seconds | 5.7 (figure 14) | 0.0 |
| Inlet Temp. | 44.8 F | N/A | N/A |
| Test Cell Pressure | 12.611 psia | N/A | N/A |

MECHANICAL SYSTEMS PERFORMANCE (Steady-State)

| PARAMETER | ACTUAL | ALLOWABLE | DEVIATION |
|---|---|---|---|
| Max Main Oil Temp | 172.7 F | 275.0 | 0.0 |
| Min Main Oil Press | 45.4 psig | 35.0 | 0.0 |
| Max Main Oil Press | 74.3 psig | 90.0 | 0.0 |

FJ44-2A TURBOFAN ENGINE
ACCEPTANCE TEST PERFORMANCE SUMMARY
WILLIAMS INTERNATIONAL CO., L.L.C.

| | | | |
|---|---|---|---|
| Eng P/N: 56000 | Eng S/N: 105233 | Eng Bld: 1 | Test Date: 03/01/06 |
| Prog Ver: CP173.04 | Date: 06/04/02 | Acq Ver: CP169.03 | Date: 06/15/00 |
| Bellmouth - | Sn: 9314 | Cd: 0.987 | Dia: 18.80 |
| ATP Doc: 59624 Rev.E | Exh Noz: icn10462 | Thrust Tare: 0.8 | Test Cell 05 |
| Fuel Type: JETA | Oil Type: mobil jet 2 | Pc1: 2.0010 | Pc2: 2.0200 |
| LHV: 18598 | Spec Grav: 0.7942 | Temp Slope: 0.00040800 | Dir: 0603010751 |

VIBRATION SURVEY (PEAK LEVELS)

| PARAMETER | ACTUAL | MAX ALLOWABLE | DEVIATION |
|---|---|---|---|
| Max 1E HP rad vib | 0.28 ips @ 37515 rpm | 0.85 | 0.00 |
| Max 1E LP rad vib | 0.15 ips @ 17913 rpm | 0.37 | 0.00 |
| Max 1E LP tan vib | 0.38 ips @ 16083 rpm | 1.00 | 0.00 |
| Max OA Rear Mt rad vib | 0.54 ips @ 17951 rpm | 2.50 | 0.00 |

| PARAMETER | ACTUAL | ALLOWABLE | DEVIATION |
|---|---|---|---|
| Oil Consumption | .008 gal/hr | 0.023 (max) | 0.0 |
| Engine Dry Weight | 505.0 lbm | 510.5 (max) | 0.0 |

TOTAL ENGINE RUN TIME 2:31

TOTAL ENGINE CYCLES 6.10

PTE 1 WI

ENGINEERING [redacted] Date 3·2·06

Q. A. [redacted] Date 3/2/06

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FJ44-2A TURBOFAN ENGINE
ACCEPTANCE TEST PERFORMANCE SUMMARY
WILLIAMS INTERNATIONAL CO., L.L.C.

| | | | |
|---|---|---|---|
| Eng P/N: 56000 | Eng S/N: 105232 | Eng Bld: 1 | Test Date: 03/01/06 |
| Prog Ver: CP173.04 | Date: 06/04/02 | Acq Ver: CP169.03 | Date: 06/15/00 |
| Bellmouth - | Sn: 9314 | Cd: 0.987 | Dia: 18.80 |
| ATP Doc: 59624 Rev.E | Exh Noz: icn10462 | Thrust Tare: 0.0 | Test Cell O5 |
| Fuel Type: JETA | Oil Type: mobil jet 2 | Pc1: 2.0010 | Pc2: 2.0200 |
| LHV: 18598 | Spec Grav: 0.7942 | Temp Slope: 0.00040800 | Dir: 0602282004 |

ELECTRONIC MODE

TAKEOFF THRUST @ 85 deg PLA (+/- 2 deg., Uncorrected, Uninstalled)

| PARAMETER | ACTUAL | ALLOWABLE | DEVIATION |
|---|---|---|---|
| Measured N1 | 17948 rpm | 17895 (min) (fig 5) | 0 |
| Recovered FN | 2329.4 lbf | 2267.9 (min) (fig 6) | 0.0 |
| | | 2381.3 (max) | 0.0 |
| ECU TT2 (CED_TT2) | 35.5 F | N/A | N/A |
| ECU Pamb (CED_P0) | 12.573 psia | N/A | N/A |

PERFORMANCE @ 17800 rpm N1 (Referred to Sea Level, Static, 72F Dry Day, Uninstalled)

| PARAMETER | ACTUAL | ALLOWABLE | DEVIATION |
|---|---|---|---|
| Referred ITT | 1821 R | 1880 (max) | 0 |
| Referred FN | 2420.7 lbf | N/A | N/A |
| Referred WA | 68.4 lbm/sec | N/A | N/A |
| Referred N2 | 39840 rpm | N/A | N/A |

PERFORMANCE @ 2339 lbf RATED THRUST (Referred to Sea Level, Static, 72F Dry Day, Uninstalled)

| PARAMETER | ACTUAL | ALLOWABLE | DEVIATION |
|---|---|---|---|
| Referred SFC | 0.496 lbm/hr/lbf | 0.522 (max) | 0.000 |
| Referred N1 | 17598 rpm | N/A | N/A |

GROUND IDLE THRUST

| PARAMETER | ACTUAL | ALLOWABLE | DEVIATION |
|---|---|---|---|
| Recovered FN | 123.9 lbf | 140.0 (max) | 0.0 |

ACCELERATION TIME

| PARAMETER | ACTUAL | MAX ALLOWABLE | DEVIATION |
|---|---|---|---|
| Corrected Time | 5.5 seconds | 5.7 (fig 14) | 0.0 |
| Inlet Temp. | 39.4 F | N/A | N/A |
| Test Cell Pressure | 12.560 psia | N/A | N/A |

MECHANICAL SYSTEMS PERFORMANCE (Steady-State)

| PARAMETER | ACTUAL | ALLOWABLE | DEVIATION |
|---|---|---|---|
| Max Main Oil Temp | 158.6 F | 275.0 | 0.0 |
| Min Main Oil Press | 44.3 psig | 35.0 | 0.0 |
| Max Main Oil Press | 73.1 psig | 90.0 | 0.0 |

FJ44-2A TURBOFAN ENGINE
ACCEPTANCE TEST PERFORMANCE SUMMARY
WILLIAMS INTERNATIONAL CO., L.L.C.

| | | | |
|---|---|---|---|
| Eng P/N: 56000 | Eng S/N: 105232 | Eng Bld: 1 | Test Date: 02/28/06 |
| Prog Ver: CP173.04 | Date: 06/04/02 | Acq Ver: CP169.03 | Date: 06/15/00 |
| Bellmouth - | Sn: 9314 | Cd: 0.987 | Dia: 18.80 |
| ATP Doc: 59624 Rev.E | Exh Noz: icn10462 | Thrust Tare: 0.0 | Test Cell O5 |
| Fuel Type: JETA | Oil Type: mobil jet 2 | Pc1: 2.0010 | Pc2: 2.0200 |
| LHV: 18598 | Spec Grav: 0.7942 | Temp Slope: 0.00040800 | Dir: 0602282004 |

MECHANICAL MODE

TAKEOFF THRUST (Referred to Sea Level, Static, 72F Dry Day, Uninstalled)

| PARAMETER | ACTUAL | MIN ALLOWABLE | DEVIATION |
|---|---|---|---|
| Referred N1 | 18315 rpm | N/A | N/A |
| Referred FN | 2660.9 lbf | 2549.4 (fig 10) | 0.0 |

IDLE N2 SPEED PLA in idle detent (17.5 +/- 2 deg)

| PARAMETER | ACTUAL | MAX ALLOWABLE | DEVIATION |
|---|---|---|---|
| Measured N2 | 23424 rpm | 24485 (fig 11) | 0 |
| Inlet Temp. | 40.6 F | N/A | N/A |
| Test Cell Pressure | 12.553 psia | N/A | N/A |

ACCELERATION TIME

| PARAMETER | ACTUAL | MAX ALLOWABLE | DEVIATION |
|---|---|---|---|
| Corrected Time | 3.6 seconds | 5.7 (figure 14) | 0.0 |
| Inlet Temp. | 39.6 F | N/A | N/A |
| Test Cell Pressure | 12.558 psia | N/A | N/A |

MECHANICAL SYSTEMS PERFORMANCE (Steady-State)

| PARAMETER | ACTUAL | ALLOWABLE | DEVIATION |
|---|---|---|---|
| Max Main Oil Temp | 165.1 F | 275.0 | 0.0 |
| Min Main Oil Press | 40.7 psig | 35.0 | 0.0 |
| Max Main Oil Press | 72.1 psig | 90.0 | 0.0 |

FJ44-2A TURBOFAN ENGINE
ACCEPTANCE TEST PERFORMANCE SUMMARY
WILLIAMS INTERNATIONAL CO., L.L.C.

| | | | |
|---|---|---|---|
| Eng P/N: 56000 | Eng S/N: 105232 | Eng Bld: 1 | Test Date: 02/28/06 |
| Prog Ver: CP173.04 | Date: 06/04/02 | Acq Ver: CP169.03 | Date: 06/15/00 |
| Bellmouth - | Sn: 9314 | Cd: 0.987 | Dia: 18.80 |
| ATP Doc: 59624 Rev.E | Exh Noz: icn10462 | Thrust Tare: 0.0 | Test Cell O5 |
| Fuel Type: JETA | Oil Type: mobil jet 2 | Pc1: 2.0010 | Pc2: 2.0200 |
| LHV: 18598 | Spec Grav: 0.7942 | Temp Slope: 0.00040800 | Dir: 0602282004 |

VIBRATION SURVEY (PEAK LEVELS)

| PARAMETER | ACTUAL | MAX ALLOWABLE | DEVIATION |
|---|---|---|---|
| Max 1E HP rad vib | 0.48 ips @ 39154 rpm | 0.85 | 0.00 |
| Max 1E LP rad vib | 0.08 ips @ 17749 rpm | 0.37 | 0.00 |
| Max 1E LP tan vib | 0.24 ips @ 17353 rpm | 1.00 | 0.00 |
| Max OA Rear Mt rad vib | 0.72 ips @ 17905 rpm | 2.50 | 0.00 |

| PARAMETER | ACTUAL | ALLOWABLE | DEVIATION |
|---|---|---|---|
| Oil Consumption | .004 gal/hr | 0.023 (max) | 0.0 |
| Engine Dry Weight | 506.0 lbm | 510.5 (max) | 0.0 |

TOTAL ENGINE RUN TIME 3:31

TOTAL ENGINE CYCLES 8.63

PTE 1 WI

ENGINEERING [redacted] Date 3-1-06

Q. A. [redacted] Date 3/2/06

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# APPENDIX C
## DOCUMENTATION FOUND IN AIRPLANE

# AIRCRAFT FLIGHT LOG

| A/C MAKE AND MODEL | A/C UNIT NO. | A/C REGISTRATION NO. | OPERATOR OF AIRCRAFT | MAINTENANCE BASE |
|---|---|---|---|---|
| [redacted] | 261 | N617R | ROUSH | FMO/YIP |

| DATE | FLIGHT FROM → TO | FLT. DUR HRS/THS | ACCUMULATION TOTAL TIME AIRCRAFT HRS. | AIRCRAFT THS. | ENG. NO.1 SER. NO. HRS. | ENG. NO.1 SER. NO. THS | ENG. NO.2 SER. NO. HRS | ENG. NO.2 SER. NO. THS. | LANDINGS THIS FLIGHT | ACCUMULATED TOTAL LANDINGS | ENG. 1 CYCS. | ENG. 2 CYCS | CREW PILOT/COPILOT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ACCUM. TOTALS BROUGHT FORWARD→ | | | 1249 | 7 | 1249 | 7 | 1249 | 7 | | 920 | 920 | 920 | |
| 7/1 | YIP-DAB | | 1251 | 6 | 1251 | 6 | 1251 | 6 | | 921 | 921 | 921 | ROUSH |
| 7/4 | DAB-JQF | | 1252 | 8 | 1252 | 8 | 1252 | 8 | | 922 | 922 | 922 | ROUSH |
| 7/7 | JQF-LOT | | 1254 | 3 | 1254 | 3 | 1254 | 3 | | 923 | 923 | 923 | ROUSH |
| 7/10 | LOT-JQF | | 1255 | 9 | 1255 | 9 | 1255 | 9 | | 924 | 924 | 924 | ROUSH |
| 7/13 | JQF-YIP | | 1257 | 1 | 1257 | 1 | 1257 | 1 | | 925 | 925 | 925 | ROUSH |
| 7/15 | YIP-MIV | | 1258 | 4 | 1258 | 4 | 1258 | 4 | | 926 | 926 | 926 | ROUSH |
| 7/16 | MIV-LOT | | 1260 | 0 | 1260 | 0 | 1260 | 0 | | 927 | 927 | 927 | ROUSH |
| 7/18 | LOT-JQF | | 1262 | 2 | 1262 | 2 | 1262 | 2 | | 928 | 928 | 928 | ROUSH |
| 7/21 | JQF-YIP | | 1263 | 5 | 1263 | 5 | 1263 | 5 | | 929 | 929 | 929 | ROUSH |
| 7/22 | YIP-GYO | | 1264 | 2 | 1264 | 2 | 1264 | 2 | | 930 | 930 | 930 | ROUSH |
| 7/25 | GYO-YIP | | 1264 | 8 | | | | | | | | | ROUSH |

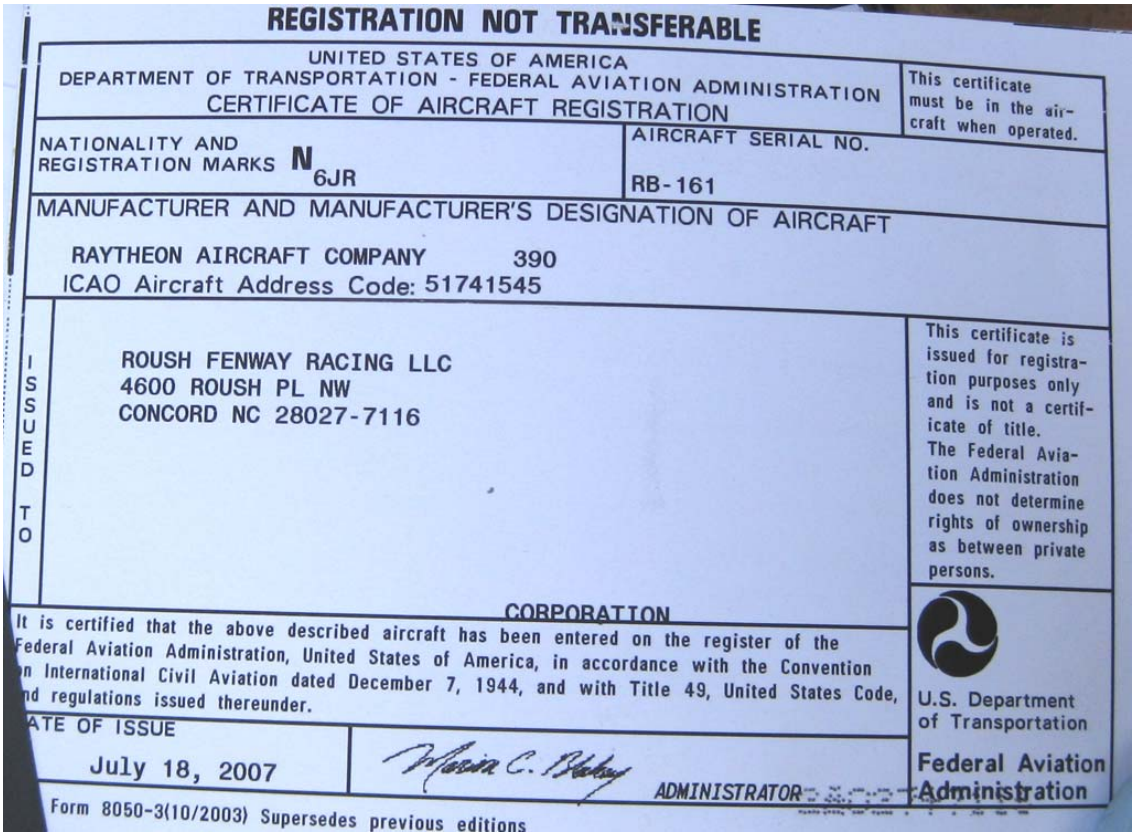
VOR RECEIVER OPERATION CHECKED IN ACCORDANCE WITH FAR 91.171

| DATE | BEARING ERROR VOR 1 | VOR 2 | PLACE | SIGNATURE |
|---|---|---|---|---|
| 7/1 | 267° | 267° | YIP Smo FLW 170 | [redacted] |

COMMENTS

SPECIALIZED CYCLES

FLIGHT LOG SECTION 1 PAGE 49



REGISTRATION NOT TRANSFERABLE

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION - FEDERAL AVIATION ADMINISTRATION
CERTIFICATE OF AIRCRAFT REGISTRATION

This certificate must be in the aircraft when operated.

NATIONALITY AND REGISTRATION MARKS N 6JR

AIRCRAFT SERIAL NO. RB-161

MANUFACTURER AND MANUFACTURER'S DESIGNATION OF AIRCRAFT

RAYTHEON AIRCRAFT COMPANY 390
ICAO Aircraft Address Code: 51741545

ISSUED TO

ROUSH FENWAY RACING LLC
4600 ROUSH PL NW
CONCORD NC 28027-7116

CORPORATION

This certificate is issued for registration purposes only and is not a certificate of title. The Federal Aviation Administration does not determine rights of ownership as between private persons.

It is certified that the above described aircraft has been entered on the register of the Federal Aviation Administration, United States of America, in accordance with the Convention on International Civil Aviation dated December 7, 1944, and with Title 49, United States Code, and regulations issued thereunder.

U.S. Department of Transportation
Federal Aviation Administration

DATE OF ISSUE
July 18, 2007

ADMINISTRATOR

Form 8050-3(10/2003) Supersedes previous editions

Certificate of Aircraft Registration from airplane.

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION—FEDERAL AVIATION ADMINISTRATION

STANDARD AIRWORTHINESS CERTIFICATE

| 1 NATIONALITY AND REGISTRATION MARKS | 2 MANUFACTURER AND MODEL | 3 AIRCRAFT SERIAL NUMBER | 4 CATEGORY |
|---|---|---|---|
| N6JR | Raytheon Aircraft Company 390 | RB-161 | Normal |

5. AUTHORITY AND BASIS FOR ISSUANCE
This airworthiness certificate is issued pursuant to the Federal Aviation Act of 1958 and certifies that, as of the date of issuance, the aircraft to which issued has been inspected and found to conform to the type certificate therefor, to be in condition for safe operation, and has been shown to meet the requirements of the applicable comprehensive and detailed airworthiness code as provided by Annex 8 to the Convention on International Civil Aviation, except as noted herein.
Exceptions
EXEMPTION #6558 Landing Gear Loads
#7190 Partial exemption from the requirements of 23.181 (b)

6. TERMS AND CONDITIONS
Unless sooner surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator, this airworthiness certificate is effective as long as the maintenance, preventative maintenance, and alterations are performed in accordance with Parts 21, 43, and 91 of the Federal Aviation Regulations, as appropriate, and the aircraft is registered in the United States.

| DATE OF ISSUANCE | FAA REPRESENTATIVE | DESIGNATION NUMBER |
|---|---|---|
| R 09/20/2006 | Mark W. Hanly | GL23 |

Any alteration, reproduction, or misuse of this certificate may be punishable by a fine not exceeding $1,000, or imprisonment not exceeding 3 years, or both. THIS CERTIFICATE MUST BE DISPLAYED IN THE AIRCRAFT IN ACCORDANCE WITH APPLICABLE FEDERAL AVIATION REGULATIONS.

FAA Form 8100-2 (8-82) U.S. GOVERNMENT PRINTING OFFICE 2006-553-548

Standard Airworthiness Certificate from airplane.

# APPENDIX D

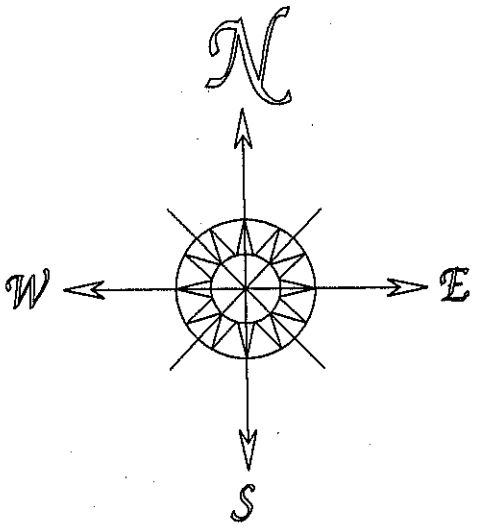
TotalStation Data

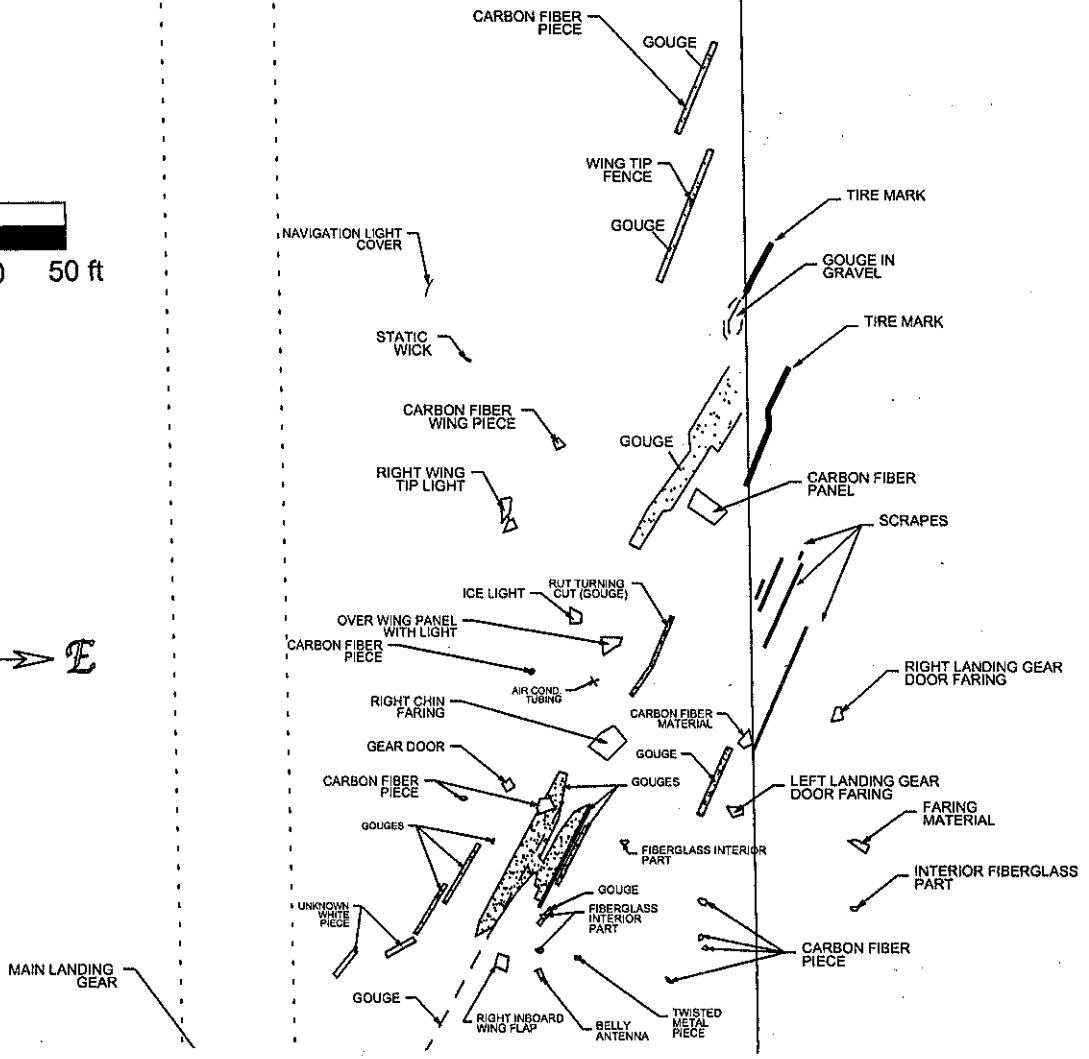
| Pt | North | East | Elev | Description | RawDat |
|---|---|---|---|---|---|
| 1 | 0.000 | 0.000 | 0.000 | Inst Point | I:54.504,R:0.000,D: |
| 2 | 25.015 | 0.000 | -0.251 | REF | I:54.504,R:0.000,D:006 |
| 3 | 232.229 | 98.529 | -4.568 | t | I:54.504,R:60.000,D:006 |
| 4 | 230.252 | 100.156 | -4.524 | t | I:54.504,R:60.000,D:006 |
| 5 | 227.693 | 97.727 | -4.645 | t | I:54.504,R:60.000,D:006 |
| 6 | 229.408 | 95.298 | -4.650 | t | I:54.504,R:60.000,D:006 |
| 7 | 231.140 | 96.800 | -4.595 | t | I:54.504,R:60.000,D:006 |
| 8 | 232.236 | 98.446 | -4.628 | t | I:54.504,R:60.000,D:006 |
| 9 | 237.876 | 95.679 | -4.579 | u | I:54.504,R:60.000,D:006 |
| 10 | 241.288 | 96.868 | -4.650 | v | I:54.504,R:60.000,D:006 |
| 11 | 243.682 | 96.480 | -4.651 | v | I:54.504,R:60.000,D:006 |
| 12 | 243.711 | 99.140 | -4.515 | v | I:54.504,R:60.000,D:006 |
| 13 | 242.743 | 98.863 | -4.556 | v | I:54.504,R:60.000,D:006 |
| 14 | 242.487 | 98.258 | -4.549 | v | I:54.504,R:60.000,D:006 |
| 15 | 241.319 | 96.847 | -4.600 | v | I:54.504,R:60.000,D:006 |
| 16 | 245.409 | 93.808 | -4.649 | w | I:54.504,R:60.000,D:006 |
| 17 | 245.345 | 92.396 | -4.640 | w | I:54.504,R:60.000,D:006 |
| 18 | 247.382 | 92.376 | -4.632 | w | I:54.504,R:60.000,D:006 |
| 19 | 246.588 | 93.807 | -4.583 | w | I:54.504,R:60.000,D:006 |
| 20 | 245.468 | 93.837 | -4.567 | w | I:54.504,R:60.000,D:006 |
| 21 | 223.874 | 86.024 | -4.702 | x | I:54.504,R:60.000,D:006 |
| 22 | 223.137 | 84.929 | -4.654 | x | I:54.504,R:60.000,D:006 |
| 23 | 224.137 | 84.291 | -4.667 | x | I:54.504,R:60.000,D:006 |
| 24 | 224.836 | 85.270 | -4.679 | x | I:54.504,R:60.000,D:006 |
| 25 | 223.864 | 85.940 | -4.667 | x | I:54.504,R:60.000,D:006 |
| 26 | 222.466 | 90.579 | -4.866 | y | I:54.504,R:60.000,D:006 |
| 27 | 222.351 | 89.272 | -4.675 | y | I:54.504,R:60.000,D:006 |
| 28 | 221.117 | 88.870 | -4.647 | y | I:54.504,R:60.000,D:006 |
| 29 | 220.445 | 89.283 | -4.881 | y | I:54.504,R:60.000,D:006 |
| 30 | 221.200 | 91.247 | -4.745 | y | I:54.504,R:60.000,D:006 |
| 31 | 222.451 | 90.579 | -4.843 | y | I:54.504,R:60.000,D:006 |
| 32 | 217.134 | 100.266 | -3.861 | z | I:54.504,R:60.000,D:006 |
| 33 | 206.972 | 90.298 | -4.575 | aa | I:54.504,R:60.000,D:006 |
| 34 | 202.481 | 89.722 | -4.431 | bb | I:54.504,R:60.000,D:006 |
| 35 | 200.031 | 89.787 | -4.503 | cc | I:54.504,R:60.000,D:006 |
| 36 | 198.659 | 90.406 | -4.458 | cc | I:54.504,R:60.000,D:006 |
| 37 | 201.637 | 94.740 | -4.385 | dd | I:54.504,R:60.000,D:006 |
| 38 | 180.491 | 95.503 | -4.206 | ee | I:54.504,R:60.000,D:006 |
| 39 | 180.761 | 92.893 | -4.311 | ee | I:54.504,R:60.000,D:006 |
| 40 | 178.324 | 92.588 | -4.350 | ee | I:54.504,R:60.000,D:006 |
| 41 | 177.840 | 95.213 | -4.282 | ee | I:54.504,R:60.000,D:006 |
| 42 | 180.383 | 95.503 | -4.229 | ee | I:54.504,R:60.000,D:006 |
| 43 | 164.796 | 99.444 | -4.112 | ff | I:54.504,R:60.000,D:006 |
| 44 | 160.925 | 98.207 | -4.119 | ff | I:54.504,R:60.000,D:006 |
| 45 | 156.979 | 90.673 | -4.304 | gg | I:54.504,R:60.000,D:006 |
| 46 | 156.236 | 90.547 | -4.354 | gg | I:54.504,R:60.000,D:006 |
| 47 | 155.922 | 91.453 | -4.341 | gg | I:54.504,R:60.000,D:006 |
| 48 | 156.154 | 91.808 | -4.353 | gg | I:54.504,R:60.000,D:006 |
| 49 | 156.303 | 92.228 | -4.299 | gg | I:54.504,R:60.000,D:006 |
| 50 | 157.042 | 90.754 | -4.293 | gg | I:54.504,R:60.000,D:006 |
| 51 | 201.875 | 84.503 | -4.517 | hh | I:54.504,R:60.000,D:006 |
| 52 | 200.186 | 84.122 | -4.490 | hh | I:54.504,R:60.000,D:006 |
| 53 | 199.585 | 85.611 | -4.538 | hh | I:54.504,R:60.000,D:006 |
| 54 | 201.464 | 85.839 | -4.429 | hh | I:54.504,R:60.000,D:006 |
| 55 | 201.830 | 84.468 | -4.510 | hh | I:54.504,R:60.000,D:006 |
| 56 | 184.154 | 75.084 | -4.822 | ii | I:54.504,R:60.000,D:006 |
| 57 | 183.427 | 74.492 | -4.619 | ii | I:54.504,R:60.000,D:006 |
| 58 | 182.872 | 75.136 | -4.662 | ii | I:54.504,R:60.000,D:006 |
| 59 | 183.422 | 75.456 | -4.858 | ii | I:54.504,R:60.000,D:006 |
| 60 | 184.122 | 75.217 | -4.783 | ii | I:54.504,R:60.000,D:006 |
| 61 | 156.494 | 70.993 | -4.658 | jj | I:54.504,R:60.000,D:006 |
| 62 | 158.972 | 69.816 | -4.731 | jj | I:54.504,R:60.000,D:006 |
| 63 | 158.361 | 68.926 | -4.784 | jj | I:54.504,R:60.000,D:006 |
| 64 | 157.868 | 68.379 | -4.788 | jj | I:54.504,R:60.000,D:006 |
| 65 | 158.105 | 68.095 | -4.790 | jj | I:54.504,R:60.000,D:006 |
| 66 | 157.826 | 67.500 | -4.811 | jj | I:54.504,R:60.000,D:006 |
| 67 | 155.434 | 68.636 | -4.837 | jj | I:54.504,R:60.000,D:006 |
| 68 | 156.629 | 71.023 | -4.640 | jj | I:54.504,R:60.000,D:006 |
| 69 | 158.941 | 69.825 | -4.743 | jj | I:54.504,R:60.000,D:006 |
| 70 | 162.563 | 65.570 | -3.790 | kk-hub | I:54.504,R:60.000,D:006 |
| 71 | 165.053 | 64.057 | -4.987 | kk-end | I:54.504,R:60.000,D:006 |
| 72 | 201.798 | 65.914 | -4.838 | ll | I:54.504,R:60.000,D:006 |
| 73 | 201.423 | 66.398 | -4.834 | ll | I:54.504,R:60.000,D:006 |
| 74 | 197.971 | 63.895 | -4.916 | ll | I:54.504,R:60.000,D:006 |
| 75 | 198.449 | 63.344 | -4.892 | ll | I:54.504,R:60.000,D:006 |
| 76 | 201.808 | 65.945 | -4.879 | ll | I:54.504,R:60.000,D:006 |
| 77 | 200.753 | 70.275 | -4.676 | mm | I:54.504,R:60.000,D:006 |
| 78 | 201.491 | 69.997 | -4.688 | mm | I:54.504,R:60.000,D:006 |
| 79 | 203.631 | 73.457 | -4.604 | mm | I:54.504,R:60.000,D:006 |
| 80 | 203.102 | 73.890 | -4.597 | mm | I:54.504,R:60.000,D:006 |
| 81 | 200.825 | 70.268 | -4.652 | mm | I:54.504,R:60.000,D:006 |
| 82 | 222.078 | 79.388 | -4.466 | nn | I:54.504,R:60.000,D:006 |
| 83 | 238.900 | 87.635 | -4.579 | oo | I:54.504,R:60.000,D:006 |
| 84 | 209.644 | 110.585 | -3.716 | pp | I:54.504,R:60.000,D:006 |
| 85 | 205.018 | 110.526 | -3.665 | qq | I:54.504,R:60.000,D:006 |
| 86 | 203.556 | 111.155 | -3.640 | rr | I:54.504,R:60.000,D:006 |
| 87 | 199.216 | 106.576 | -3.985 | ss | I:54.504,R:60.000,D:006 |
| 88 | 229.890 | 113.473 | -4.044 | GOU15 | I:54.504,R:60.000,D:006 |
| 89 | 221.040 | 109.892 | -3.971 | GOU15 | I:54.504,R:60.000,D:006 |
| 90 | 216.627 | 83.348 | -4.571 | GOU16 | I:54.504,R:60.000,D:006 |
| 91 | 216.137 | 81.569 | -4.670 | GOU17 | I:54.504,R:60.000,D:006 |
| 92 | 208.297 | 77.425 | -4.628 | GOU17 | I:54.504,R:60.000,D:006 |
| 93 | 210.733 | 77.425 | -4.622 | GOU18 | I:54.504,R:60.000,D:006 |
| 94 | 204.087 | 73.784 | -4.604 | GOU18 | I:54.504,R:60.000,D:006 |
| 95 | 172.284 | 64.381 | -4.940 | GOU19 | I:54.504,R:60.000,D:006 |
| 96 | 181.260 | 69.862 | -4.763 | GOU19 | I:54.504,R:60.000,D:006 |

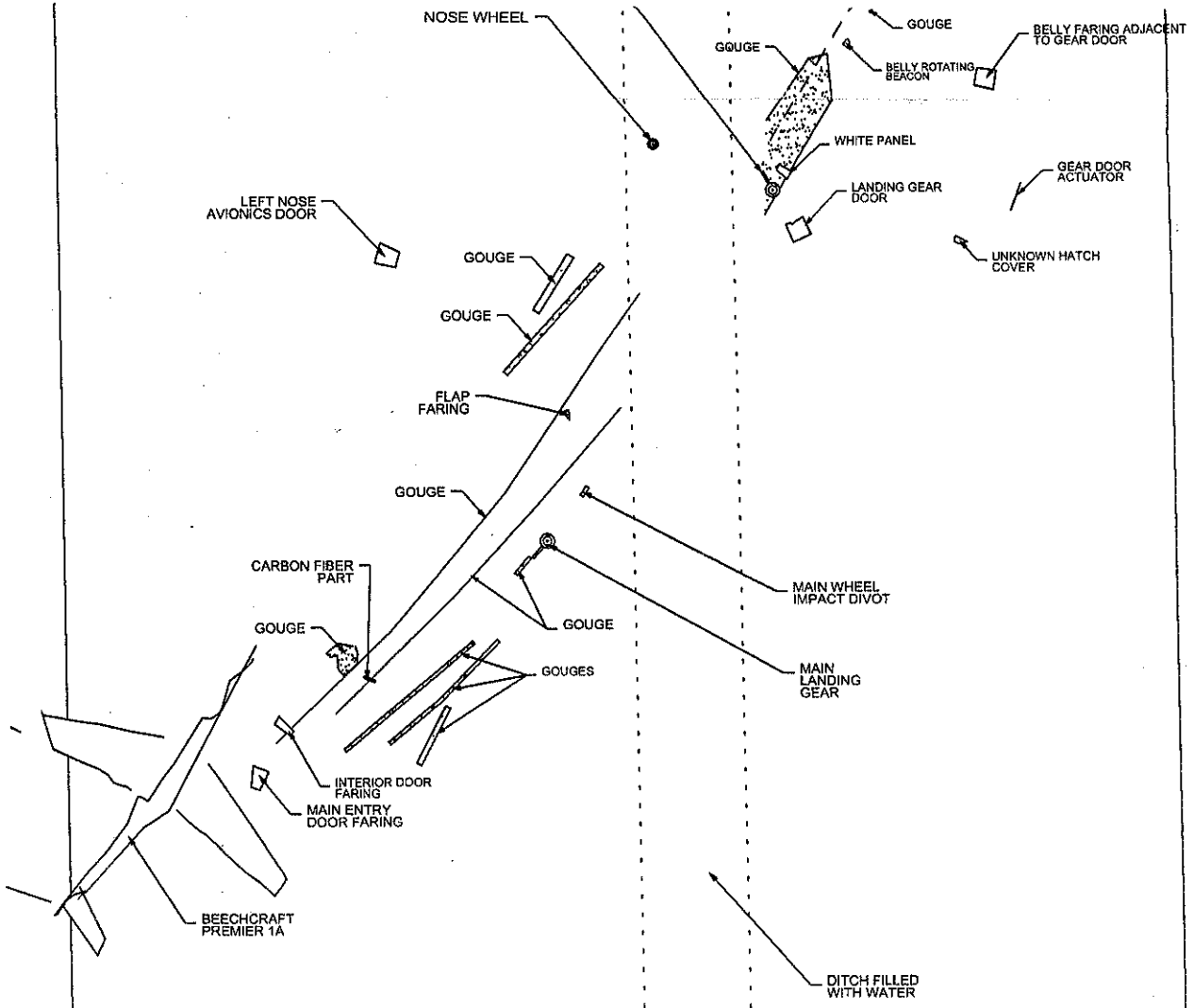
| | | | | | |
|---|---|---|---|---|---|
| 97 | 181.983 | 72.369 | -4.679 | GOU19 | I:54.504,R:60.000,D:006 |
| 98 | 175.475 | 73.268 | -4.732 | GOU19 | I:54.504,R:60.000,D:006 |
| 99 | 159.009 | 64.558 | -4.994 | GOU19 | I:54.504,R:60.000,D:006 |
| 100 | 165.316 | 68.054 | -4.862 | tt | I:54.504,R:60.000,D:006 |
| 101 | 166.200 | 66.321 | -4.957 | tt | I:54.504,R:60.000,D:006 |
| 102 | 165.428 | 66.013 | -4.984 | tt | I:54.504,R:60.000,D:006 |
| 103 | 164.144 | 67.534 | -4.908 | tt | I:54.504,R:60.000,D:006 |
| 104 | 165.216 | 68.102 | -4.825 | tt | I:54.504,R:60.000,D:006 |
| 105 | 188.291 | 78.271 | -4.695 | GOU20 | I:54.504,R:60.000,D:006 |
| 106 | 208.118 | 91.111 | -4.556 | GOU21 | I:54.504,R:60.000,D:006 |
| 107 | 205.866 | 89.507 | -4.572 | GOU21 | I:54.504,R:60.000,D:006 |
| 108 | 208.263 | 89.621 | -4.564 | GOU22 | I:54.504,R:60.000,D:006 |
| 109 | 221.745 | 95.836 | -4.663 | GOU22 | I:54.504,R:60.000,D:006 |
| 110 | 418.243 | 107.451 | -4.635 | road_edge | I:54.504,R:60.000,D:006 |
| 111 | 169.622 | 119.366 | -3.515 | road_edge | I:54.504,R:60.000,D:006 |
| 112 | 19.656 | 126.805 | -3.286 | road_edge | I:54.504,R:60.000,D:006 |
| 113 | 18.872 | 124.293 | -3.512 | road_edge | I:54.504,R:60.000,D:006 |
| 114 | -30.787 | 125.618 | -3.199 | road_edge | I:54.504,R:60.000,D:006 |
| 115 | -31.158 | 128.735 | -3.165 | road_edge | I:54.504,R:60.000,D:006 |
| 116 | -111.752 | 132.579 | -2.787 | road_edge | I:54.504,R:60.000,D:006 |
| 117 | -202.881 | 137.504 | -2.282 | road_edge | I:54.504,R:60.000,D:006 |
| 118 | -252.979 | 139.764 | -0.563 | road_edge | I:54.504,R:60.000,D:006 |
| 119 | -257.087 | 139.958 | -0.437 | road_edge | I:54.504,R:60.000,D:006 |
| 120 | -262.520 | 138.639 | -0.156 | road_edge | I:54.504,R:60.000,D:006 |
| 121 | -267.028 | 136.041 | 0.014 | road_edge | I:54.504,R:60.000,D:006 |
| 122 | -269.491 | 133.069 | 0.154 | road_edge | I:54.504,R:60.000,D:006 |
| 123 | -270.370 | 130.080 | 0.189 | road_edge | I:54.504,R:60.000,D:006 |
| 124 | -270.735 | 128.957 | 0.189 | road_edge | I:54.504,R:60.000,D:006 |
| 125 | -272.531 | 128.987 | 0.192 | road_edge | I:54.504,R:60.000,D:006 |
| 126 | -274.220 | 97.818 | 0.262 | road_edge | I:54.504,R:60.000,D:006 |
| 127 | -276.679 | 44.138 | 0.629 | road_edge | I:54.504,R:60.000,D:006 |
| 128 | -274.689 | 43.950 | 0.621 | road_edge | I:54.504,R:60.000,D:006 |
| 129 | -275.376 | 31.091 | 0.853 | road_edge | I:54.504,R:72.000,D:006 |
| 130 | -273.513 | 23.435 | 0.918 | road_edge | I:54.504,R:72.000,D:006 |
| 131 | -269.937 | 15.709 | 1.000 | road_edge | I:54.504,R:72.000,D:006 |
| 132 | -264.798 | 7.955 | 1.156 | road_edge | I:54.504,R:72.000,D:006 |
| 133 | -256.795 | -0.423 | 1.250 | road_edge | I:54.504,R:72.000,D:006 |
| 134 | -248.978 | -5.765 | 1.259 | road_edge | I:54.504,R:72.000,D:006 |
| 135 | -240.947 | -10.257 | 1.249 | road_edge | I:54.504,R:72.000,D:006 |
| 136 | -237.436 | -11.099 | 1.210 | road_edge | I:54.504,R:72.000,D:006 |
| 137 | -230.746 | -11.543 | 1.253 | road_edge | I:54.504,R:72.000,D:006 |
| 138 | -221.791 | -11.796 | 1.148 | road_edge | I:54.504,R:72.000,D:006 |
| 139 | -221.977 | -13.960 | 1.038 | road_edge | I:54.504,R:72.000,D:006 |
| 140 | -162.380 | -16.924 | 1.158 | road_edge | I:54.504,R:72.000,D:006 |
| 141 | -97.931 | -20.016 | 0.978 | road_edge | I:54.504,R:72.000,D:006 |
| 142 | 43.250 | -26.755 | 0.508 | road_edge | I:54.504,R:72.000,D:006 |
| 143 | 251.671 | -36.796 | -0.102 | road_edge | I:54.504,R:72.000,D:006 |
| 144 | 407.485 | -44.327 | -0.613 | road_edge | I:54.504,R:72.000,D:006 |
| 145 | 168.393 | 49.016 | -4.889 | uu | I:54.504,R:72.000,D:006 |
| 146 | 221.881 | 95.557 | -4.743 | GOU23 | I:54.504,R:72.000,D:006 |
| 147 | 220.791 | 93.670 | -4.650 | GOU23 | I:54.504,R:72.000,D:006 |
| 148 | 217.885 | 91.758 | -4.725 | GOU23 | I:54.504,R:72.000,D:006 |
| 149 | 214.070 | 89.956 | -4.678 | GOU23 | I:54.504,R:72.000,D:006 |
| 150 | 214.580 | 89.437 | -4.659 | GOU23 | I:54.504,R:72.000,D:006 |
| 151 | 219.862 | 91.726 | -4.646 | GOU23 | I:54.504,R:72.000,D:006 |
| 152 | 225.679 | 92.641 | -4.669 | GOU23 | I:54.504,R:72.000,D:006 |
| 153 | 225.979 | 91.627 | -4.721 | GOU23 | I:54.504,R:72.000,D:006 |
| 154 | 216.274 | 86.832 | -4.611 | GOU23 | I:54.504,R:72.000,D:006 |
| 155 | 205.992 | 81.905 | -4.613 | GOU23 | I:54.504,R:72.000,D:006 |
| 156 | 204.088 | 81.549 | -4.585 | GOU23 | I:54.504,R:72.000,D:006 |
| 157 | 205.311 | 83.653 | -4.495 | GOU23 | I:54.504,R:72.000,D:006 |
| 158 | 209.757 | 86.438 | -4.582 | GOU23 | I:54.504,R:72.000,D:006 |
| 159 | 212.664 | 88.735 | -4.575 | GOU23 | I:54.504,R:72.000,D:006 |
| 160 | 212.552 | 89.197 | -4.576 | GOU23 | I:54.504,R:72.000,D:006 |
| 161 | 211.034 | 88.921 | -4.600 | GOU23 | I:54.504,R:72.000,D:006 |
| 162 | 210.725 | 89.538 | -4.600 | GOU23 | I:54.504,R:72.000,D:006 |
| 163 | 209.288 | 88.993 | -4.601 | GOU23 | I:54.504,R:72.000,D:006 |
| 164 | 208.940 | 89.798 | -4.556 | GOU23 | I:54.504,R:72.000,D:006 |
| 165 | 218.979 | 94.357 | -4.707 | GOU23 | I:54.504,R:72.000,D:006 |
| 166 | 221.938 | 95.613 | -4.756 | GOU23 | I:54.504,R:72.000,D:006 |
| 167 | 218.978 | 95.366 | -4.666 | GOU23 | I:54.504,R:72.000,D:006 |
| 168 | 211.261 | 91.774 | -4.618 | GOU23 | I:54.504,R:72.000,D:006 |
| 169 | 415.021 | 167.141 | -3.833 | road_edge | I:54.504,R:72.000,D:006 |
| 170 | 245.367 | 175.405 | -3.096 | road_edge | I:54.504,R:72.000,D:006 |
| 171 | 52.834 | 184.710 | -2.413 | road_edge | I:54.504,R:72.000,D:006 |
| 172 | -168.479 | 194.898 | -1.608 | road_edge | I:54.504,R:72.000,D:006 |
| 173 | -216.580 | 197.620 | -1.209 | road_edge | I:54.504,R:72.000,D:006 |
| 174 | -254.155 | 199.761 | -0.392 | road_edge | I:54.504,R:72.000,D:006 |
| 175 | -248.785 | 109.519 | -0.891 | sign | I:54.504,R:72.000,D:006 |
| 176 | -239.593 | 108.824 | -0.948 | sign | I:54.504,R:72.000,D:006 |
| 177 | -307.760 | 130.830 | 0.601 | road_edge | I:54.504,R:72.000,D:006 |
| 178 | -309.601 | 88.777 | 0.697 | road_edge | I:54.504,R:72.000,D:006 |
| 179 | -348.872 | -42.956 | 2.121 | road_edge | I:54.504,R:72.000,D:006 |
| 180 | -324.986 | -44.196 | 1.977 | road_edge | I:54.504,R:72.000,D:006 |
| 181 | -319.885 | -45.970 | 2.005 | road_edge | I:54.504,R:72.000,D:006 |
| 182 | -316.221 | -48.922 | 1.885 | road_edge | I:54.504,R:72.000,D:006 |
| 183 | -313.149 | -53.160 | 1.660 | road_edge | I:54.504,R:72.000,D:006 |
| 184 | -312.168 | -57.395 | 1.543 | road_edge | I:54.504,R:72.000,D:006 |
| 185 | -312.347 | -65.474 | 1.056 | road_edge | I:54.504,R:72.000,D:006 |
| 186 | -313.051 | -78.133 | 0.505 | road_edge | I:54.504,R:72.000,D:006 |
| 187 | -313.607 | -94.227 | -0.029 | road_edge | I:54.504,R:72.000,D:006 |
| 188 | -290.027 | -96.237 | 0.023 | road_edge | I:54.504,R:72.000,D:006 |
| 189 | -288.125 | -76.851 | 0.508 | road_edge | I:54.504,R:72.000,D:006 |
| 190 | -287.189 | -60.375 | 1.345 | road_edge | I:54.504,R:72.000,D:006 |
| 191 | -286.394 | -56.087 | 1.549 | road_edge | I:54.504,R:72.000,D:006 |
| 192 | -283.829 | -52.356 | 1.683 | road_edge | I:54.504,R:72.000,D:006 |
| 193 | -280.142 | -48.837 | 1.782 | road_edge | I:54.504,R:72.000,D:006 |

| | | | | | |
|---|---|---|---|---|---|
| 194 | -273.237 | -46.678 | 1.868 | road_edge | I:54.504,R:72.000,D:006 |
| 195 | -205.970 | -49.909 | 1.753 | road_edge | I:54.504,R:72.000,D:006 |
| 196 | -47.906 | -57.478 | 1.286 | road_edge | I:54.504,R:72.000,D:006 |
| 197 | -16.691 | -58.988 | 1.156 | road_edge | I:54.504,R:72.000,D:006 |
| 198 | -14.853 | -62.214 | 1.144 | road_edge | I:54.504,R:72.000,D:006 |
| 199 | -13.209 | -64.571 | 1.031 | road_edge | I:54.504,R:72.000,D:006 |
| 200 | -12.941 | -66.834 | 1.013 | road_edge | I:54.504,R:72.000,D:006 |
| 201 | -13.201 | -71.065 | 0.780 | road_edge | I:54.504,R:72.000,D:006 |
| 202 | -13.806 | -87.525 | 0.022 | road_edge | I:54.504,R:72.000,D:006 |
| 203 | -15.366 | -119.309 | -0.262 | road_edge | I:54.504,R:72.000,D:006 |
| 204 | 9.627 | -120.130 | -0.342 | road_edge | I:54.504,R:72.000,D:006 |
| 205 | 10.875 | -89.682 | -0.076 | road_edge | I:54.504,R:72.000,D:006 |
| 206 | 11.682 | -70.146 | 0.867 | road_edge | I:54.504,R:72.000,D:006 |
| 207 | 11.716 | -67.292 | 1.028 | road_edge | I:54.504,R:72.000,D:006 |
| 208 | 13.314 | -64.974 | 1.006 | road_edge | I:54.504,R:72.000,D:006 |
| 209 | 15.220 | -62.256 | 1.088 | road_edge | I:54.504,R:72.000,D:006 |
| 210 | 15.941 | -61.472 | 1.066 | road_edge | I:54.504,R:72.000,D:006 |
| 211 | 15.930 | -60.517 | 1.093 | road_edge | I:54.504,R:72.000,D:006 |
| 212 | 62.734 | -62.795 | 0.963 | road_edge | I:54.504,R:72.000,D:006 |
| 213 | 196.960 | -69.253 | 0.496 | road_edge | I:54.504,R:72.000,D:006 |
| 214 | 242.230 | -54.126 | 0.317 | road_ctr | I:54.504,R:72.000,D:006 |
| 215 | -205.964 | -32.662 | 1.616 | road_ctr | I:54.504,R:72.000,D:006 |
| 216 | 24.970 | 0.081 | -0.247 | REF | I:54.504,R:0.000,D:006 |

WINNEBAGO COUNTY SHERIFF'S OFFICE
07-27-10 10-2829 WITTMAN FIELD
OSHKOSH, WI BEECHCRAFT PREMIER 1A
MEASURED BY: LUKER W45 & PUTZER W20
(TOPCON TOTAL STATION GPT3107W
TOPCON FC-120 DATA COLLECTOR)
DRAWN BY: D. PUTZER W20 (CRASHZONE 7.5.4)

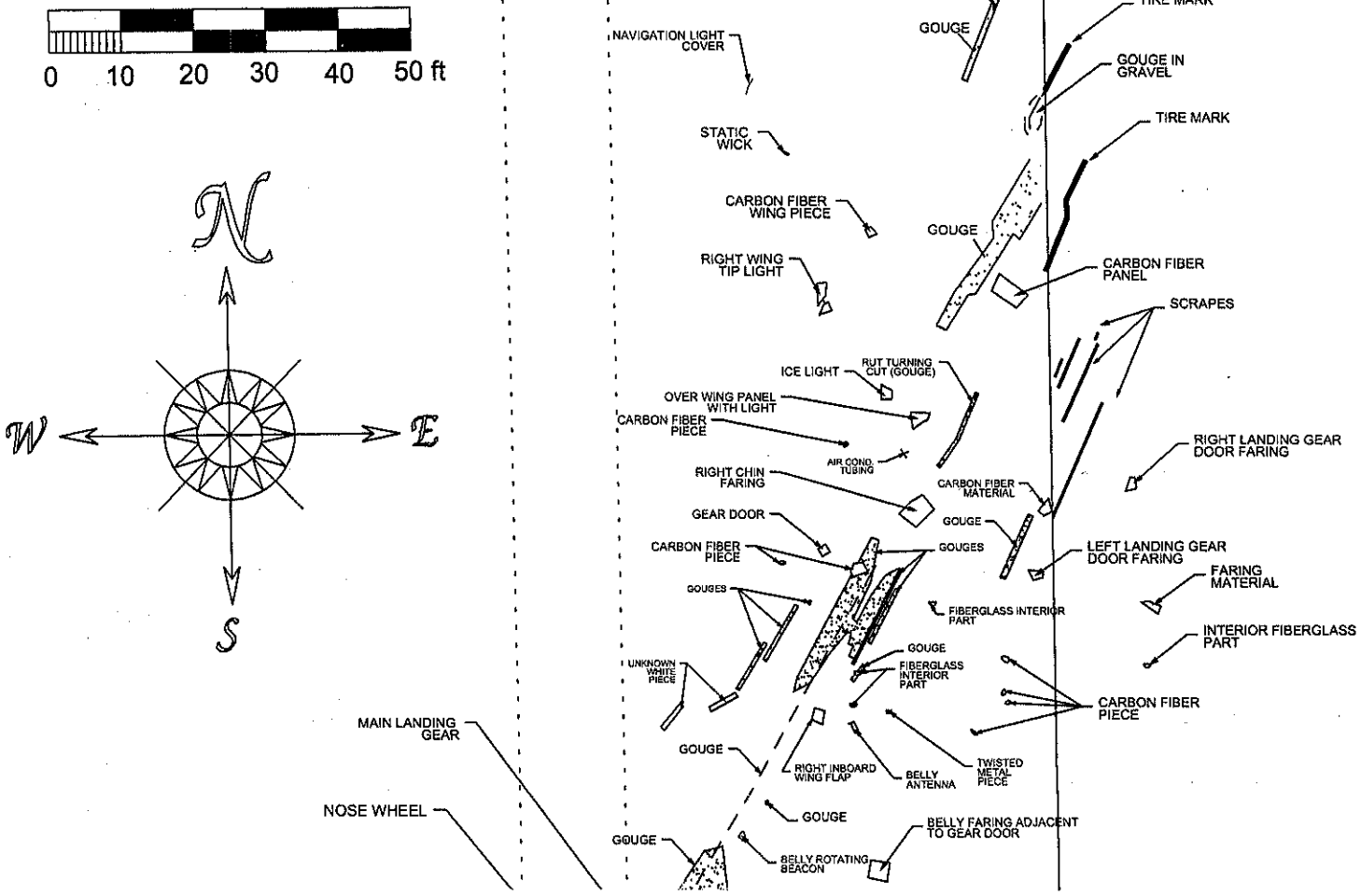






OLD RUNWAY 36

WINNEBAGO COUNTY SHERIFF'S OFFICE
07-27-10 10-2829 WITTMAN FIELD
OSHKOSH, WI BEECHCRAFT PREMIER 1A
MEASURED BY: LUKER W45 & PUTZER W20
(TOPCON TOTAL STATION GPT3107W
TOPCON FC-120 DATA COLLECTOR)
DRAWN BY: D. PUTZER W20 (CRASHZONE 7.5.4)



# APPENDIX E

## Enhanced Ground Proximity Warning System

**NATIONAL TRANSPORTATION SAFETY BOARD**
Office of Aviation Safety
505 South 336th Street, Suite 540
Federal Way, Washington 98003

September 21, 2010

EGPWS Examination Report

**A. ACCIDENT**

Place : Oshkosh, Wisconsin
Date : July 27, 2010
Vehicle : Hawker Beechcraft 390, N6JR
NTSB Accident Number: CEN10FA443
NTSB Investigator : Andrew Todd Fox

**B. ATTENDEES**

Joshua Cawthra, Aviation Accident Investigator
National Transportation Safety Board

Bill Pickins
Honeywell Aerospace

**C. DETAILS OF EXAMINATION**

Examination of the Enhanced Ground Warning Proximity System (EGPWS) was conducted at the facility of Honeywell Aerospace, Redmond, Washington, on September 21, 2010. The EGPWS was received in a secure unopened box. The EGPWS unit, a Honeywell Mark V, part number 965-0976-040-210-110, serial number 22054 was removed and examined. The EGPWS unit visually appeared to be undamaged. The unit was disassembled and all internal printed circuit boards (PCB) and memory chips appeared to be undamaged. The EGPWS unit was reassembled and subsequently installed on a test bench. Power was applied to the EGPWS unit, which allowed for any retained data to be extracted. A binary file was successfully downloaded from the flash memory chips within the unit.

The downloaded binary file data was decoded using a company software program. Examination of the downloaded data revealed that the most recent takeoff leg was recorded in flight leg 1001 at a unit operating time of 1847:40:43 from the Willow Run Airport, Detroit, Michigan. A landing record for flight leg 1001 was recorded at a unit operating time of 1848:28:15 at the Wittman Regional Airport, Oshkosh, Wisconsin.

Review of the EGPWS warning log revealed that a Terrain Clearance Alert was recorded at a unit operating time of 1848:28:00. Three bank angle warnings were recorded at unit operating times of 1848:28:11, 1848:28:20, and 1848:28:30 respectively. In

addition, a sink rate and pull up warning was recorded at a unit operating time of 1848:28:32. An additional sink rate warning was recorded at a unit operating time of 1848:28:33.


Photo 1: View of the EGPWS unit as received.

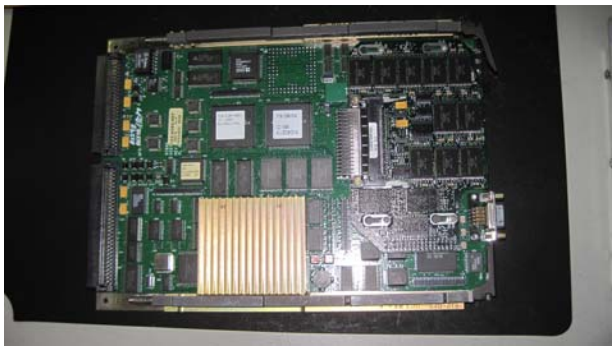


Photo 2: View of the internal PCB that contains the flash memory chips.

Summary

EGPWC CONFIGURATION:

| | |
|---|---|
| PART NUMBER: | 965-0976-040-210-210 |
| MOD STATUS: | 08 |
| SERIAL NUMBER: | 22054 |
| APPLICATION S/W VERSION: | 210.2 |
| CONFIGURATION S/W VERSION: | 210 |
| TERRAIN DATABASE VERSION: | 445 |
| ENVELOPE MOD DATABASE VERSION: | B06 |
| BOOT CODE VERSION: | B101.2 |

Takeoff Record:

FLIGHT LEG 1001: ( 1847:40:43)
Lat/Long: 42.23608 / -83.53626
Geometric Alt: 764.00 True Hdg: -136.41
GPS Alt: 756.00 VFOM: 80.00
Pos. Uncert: 0.0125 Pos. Source: GPS1
Airport: KYIP

Landing Record:

FLIGHT LEG 1001: ( 1848:28:15)
Lat/Long: 43.98256 / -88.55650
Geometric Alt: 884.00 True Hdg: -158.91
GPS Alt: 842.00 VFOM: 76.00
Pos. Uncert: 0.0107 Pos. Source: GPS1
Airport: KOSH

Counts

Part Number: 965-0976-040
Serial Number: 22054
Mod Status: 08
Boot Software: B101.2

WARNING COUNTERS:

| | |
|---|---|
| 66P | - Mode 1 Outer Curve Voice |
| 20P | - Mode 1 Inner Curve Voice |
| 28 | - Mode 2 Terrain Voice |
| 20 | - Mode 2 Pull-Up Voice |
| 13 | - Mode 3 Voice |
| 25 | - Mode 4 Too Low Terrain Voice |
| 16 | - Mode 4 Too Low Gear Voice |
| 19 | - Mode 4 Too Low Flap Voice |
| 5 | - Mode 4 C Too Low Terrain Voice |
| 254 | - Mode 5 Voice |
| 50P | - Mode 6 Bank Angle Alert |
| 19 | - Terrain Clearance Floor Voice |
| 16 | - Terrain Awareness Caution |
| 15 | - Terrain Awareness Pull-Up |
| 3 | - Obstacle Caution |
| 3 | - Obstacle Pull-Up |
| 4 | - Mode 7 Windshear Warning |
| 2 | - Mode 7 Windshear Caution |
| 0 | - Speed Brake Alert |
| 0 | - Improper Takeoff Flaps |

ACTIVITY COUNTERS:

| | |
|---|---|
| 32 | - Glideslope Cancel |
| 999 | - Number of Flights |
| 4:27:55 | - GPW INOP Time |
| 535:04:33 | - Windshear INOP Time |
| 13:02:22 | - TA&D INOP Time |
| 17:25:47 | - TA&D Not Available Time |
| 2:09:33 | - Terrain Inhibit Time |
| 1268:31:21 | - Flight Time |
| 1848:30:19 | - Operating Time |

PROGRAM PINS:

| | |
|---|---|
| 1 | - Program Pin 1 |
| 7 | - Program Pin 2 |
| 2 | - Program Pin 3 |
| 8 | - Program Pin 4 |
| 2 | - Program Pin 5 |
| 2 | - Program Pin 6 |
| 2 | - Program Pin 7 |
| 1 | - Program Pin 8 |
| 1 | - Program Pin 9 |
| 1 | - Program Pin 10 |
| 3 | - Program Pin 11 |
| 1 | - Program Pin 12 |
| 2 | - Program Pin 13 |
| 2 | - Program Pin 14 |
| 1 | - Program Pin 15 |
| 2 | - Program Pin 16 |
| 2 | - Program Pin 17 |
| 1 | - Program Pin 18 |
| 1 | - Program Pin 19 |
| 1 | - Program Pin 20 |
| 1 | - Program Pin 21 |
| 1 | - Program Pin 22 |
| 1 | - Program Pin 23 |
| 1 | - Program Pin 24 |

Decoded by FLT_HIST V2.7.3.2 on Tue Sep 21 10:48:47 2010

| Line No | Rec ID | Flt Leg | Oper Time | Lat | Long | Pos Uncert | CAS | TAS | Gspd | VFOM | GPS Alt | Uncorr Alt | TACAlt | Rad Alt | Terr Elv |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10079 | DATA | 1001 | 1848:27:40 | 43.97483 | -88.53418 | 0.0093 | 143.2 | 148.2 | 164.2 | 70 | 1318 | 1346 | 1344 | 585.5 | 800 |
| 10080 | DATA | 1001 | 1848:27:41 | 43.97483 | -88.53418 | 0.0093 | 142 | 147.5 | 164.2 | 70 | 1318 | 1336 | 1344 | 566.5 | 800 |
| 10081 | DATA | 1001 | 1848:27:42 | 43.97552 | -88.53452 | 0.0093 | 140.4 | 145.2 | 161.6 | 70 | 1304 | 1328 | 1334 | 550.8 | 800 |
| 10082 | DATA | 1001 | 1848:27:43 | 43.97621 | -88.53487 | 0.01 | 138.6 | 143.2 | 159.6 | 74 | 1294 | 1316 | 1322 | 543.8 | 800 |
| 10083 | DATA | 1001 | 1848:27:44 | 43.97689 | -88.53521 | 0.0093 | 136.4 | 140.8 | 157.5 | 70 | 1282 | 1306 | 1312 | 543 | 800 |
| 10084 | DATA | 1001 | 1848:27:45 | 43.97741 | -88.53572 | 0.01 | 134.2 | 139.2 | 154.8 | 74 | 1264 | 1294 | 1298 | 523 | 800 |
| 10085 | DATA | 1001 | 1848:27:46 | 43.97861 | -88.53675 | 0.01 | 133.2 | 139.6 | 152 | 72 | 1234 | 1280 | 1266 | 490.5 | 800 |
| 10086 | DATA | 1001 | 1848:27:47 | 43.97861 | -88.53675 | 0.01 | 133.3 | 140.1 | 152 | 72 | 1234 | 1266 | 1266 | 470.5 | 800 |
| 10087 | DATA | 1001 | 1848:27:48 | 43.97964 | -88.53812 | 0.0098 | 133.8 | 140.8 | 147 | 72 | 1194 | 1246 | 1228 | 434.8 | 800 |
| 10088 | DATA | 1001 | 1848:27:49 | 43.97964 | -88.53812 | 0.0098 | 133.9 | 140 | 147 | 72 | 1194 | 1230 | 1228 | 394.8 | 800 |
| 10089 | DATA | 1001 | 1848:27:50 | 43.98016 | -88.53881 | 0.0093 | 132.2 | 135.7 | 145 | 70 | 1168 | 1212 | 1204 | 403.5 | 800 |
| 10090 | DATA | 1001 | 1848:27:51 | 43.9805 | -88.5395 | 0.0093 | 130.9 | 136.9 | 142.8 | 70 | 1144 | 1196 | 1180 | 393.2 | 800 |
| 10091 | DATA | 1001 | 1848:27:52 | 43.98101 | -88.54018 | 0.0093 | 131 | 137.4 | 141.2 | 70 | 1128 | 1178 | 1162 | 349 | 800 |
| 10092 | DATA | 1001 | 1848:27:53 | 43.98136 | -88.54087 | 0.0093 | 131 | 136.9 | 139.9 | 70 | 1104 | 1164 | 1140 | 335.2 | 800 |
| 10093 | DATA | 1001 | 1848:27:54 | 43.98153 | -88.54173 | 0.0093 | 130.6 | 135.9 | 139.9 | 68 | 1084 | 1152 | 1122 | 316 | 800 |
| 10094 | DATA | 1001 | 1848:27:55 | 43.98187 | -88.54259 | 0.01 | 129.9 | 135.4 | 138.4 | 72 | 1072 | 1142 | 1108 | 300.8 | 800 |
| 10095 | DATA | 1001 | 1848:27:56 | 43.98239 | -88.54414 | 0.0098 | 129.6 | 135.6 | 135.1 | 72 | 1058 | 1126 | 1090 | 288.8 | 800 |
| 10096 | DATA | 1001 | 1848:27:57 | 43.98239 | -88.54414 | 0.0098 | 129.9 | 135.7 | 135.1 | 72 | 1058 | 1114 | 1090 | 275.8 | 800 |
| 10097 | DATA | 1001 | 1848:27:58 | 43.9829 | -88.54568 | 0.0093 | 128.5 | 132.9 | 131.5 | 70 | 1030 | 1100 | 1064 | 217.5 | 800 |
| 10098 | DATA | 1001 | 1848:27:59 | 43.9829 | -88.54568 | 0.0093 | 127.2 | 131.9 | 131.5 | 70 | 1030 | 1088 | 1064 | 215.8 | 800 |
| 10099 | TCF | 1001 | 1848:28:00 | | | | | | | 0x0002 | '57:208 | | | | |
| 10100 | DATA | 1001 | 1848:28:00 | 43.98307 | -88.54636 | 0.0093 | 126.1 | 131.5 | 129.5 | 70 | 1018 | 1078 | 1054 | 231.2 | 800 |
| 10101 | DATA | 1001 | 1848:28:01 | 43.98342 | -88.54723 | 0.0093 | 124.8 | 129.4 | 127.8 | 70 | 1008 | 1070 | 1044 | 215.5 | 800 |
| 10102 | DATA | 1001 | 1848:28:02 | 43.98359 | -88.54791 | 0.0093 | 123.8 | 129.8 | 125.9 | 70 | 1004 | 1060 | 1038 | 224.8 | 800 |
| 10103 | DATA | 1001 | 1848:28:03 | 43.98376 | -88.54877 | 0.0093 | 123.5 | 128.6 | 123.4 | 70 | 994 | 1052 | 1030 | 221.8 | 800 |
| 10104 | DATA | 1001 | 1848:28:04 | 43.98393 | -88.54945 | 0.0093 | 121.8 | 126.3 | 121.2 | 70 | 988 | 1038 | 1020 | 205.2 | 800 |
| 10105 | DATA | 1001 | 1848:28:05 | 43.98393 | -88.55032 | 0.0093 | 118.6 | 120.8 | 119.6 | 70 | 980 | 1026 | 1014 | 195.8 | 800 |
| 10106 | DATA | 1001 | 1848:28:06 | 43.9841 | -88.55169 | 0.0093 | 115.4 | 119.9 | 116.5 | 72 | 954 | 1010 | 990 | 185.2 | 800 |
| 10107 | DATA | 1001 | 1848:28:07 | 43.9841 | -88.55169 | 0.0093 | 113.7 | 118.4 | 116.5 | 72 | 954 | 996 | 990 | 182.8 | 800 |
| 10108 | DATA | 1001 | 1848:28:08 | 43.9841 | -88.55323 | 0.01 | 113.1 | 118.7 | 114.4 | 74 | 916 | 982 | 958 | 146 | 800 |
| 10128 | DATA | 1001 | 1848:28:09 | 43.9841 | -88.55323 | 0.01 | 113.4 | 119.8 | 114.4 | 74 | 916 | 970 | 958 | 131.2 | 800 |
| 10129 | DATA | 1001 | 1848:28:10 | 43.98393 | -88.55392 | 0.0103 | 113 | 118.1 | 112.1 | 74 | 896 | 960 | 940 | 104.2 | 800 |
| 10130 | M6BA | 1001 | 1848:28:11 | | | | | | | 0x0002 | '57:208 | | | | |
| 10131 | DATA | 1001 | 1848:28:11 | 43.98376 | -88.55444 | 0.0103 | 112 | 116.9 | 109.8 | 74 | 886 | 950 | 930 | 97 | 800 |
| 10132 | DATA | 1001 | 1848:28:12 | 43.98359 | -88.55512 | 0.0098 | 111.5 | 117 | 106.4 | 72 | 876 | 940 | 918 | 84 | 800 |
| 10133 | DATA | 1001 | 1848:28:13 | 43.98325 | -88.55563 | 0.01 | 110.7 | 114.1 | 109.4 | 74 | 864 | 928 | 906 | 68.8 | 800 |
| 10134 | DATA | 1001 | 1848:28:14 | 43.98256 | -88.5565 | 0.0107 | 108.5 | 113.4 | 105.9 | 76 | 842 | 914 | 884 | 47.2 | 800 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10135 | DATA | 1001 | 1848:28:15 | 43.98256 | -88.5565 | 0.0107 | 107.9 | 113 | 105.9 | 76 | 842 | 908 | 884 | 37.5 | 800 |
| 10136 | DATA | 1001 | 1848:28:16 | 43.9817 | -88.55684 | 0.0105 | 108.9 | 115.5 | 106 | 74 | 816 | 906 | 864 | 36.5 | 800 |
| 10137 | DATA | 1001 | 1848:28:17 | 43.98136 | -88.55701 | 0.011 | 109.8 | 115.7 | 99.5 | 78 | 834 | 914 | 878 | 48.8 | 800 |
| 10138 | DATA | 1001 | 1848:28:18 | 43.98136 | -88.55701 | 0.011 | 109.4 | 113.9 | 99.5 | 78 | 834 | 922 | 878 | 65.8 | 800 |
| 10139 | DATA | 1001 | 1848:28:19 | 43.98084 | -88.55735 | 0.0107 | 108.2 | 111.4 | 96.5 | 76 | 860 | 928 | 896 | 85 | 800 |
| 10140 | M6BA | 1001 | 1848:28:20 | | | | | | | 0x0002 | '57:208 | | | | |
| 10141 | DATA | 1001 | 1848:28:20 | 43.9805 | -88.55753 | 0.01 | 105.5 | 107.1 | 92.4 | 74 | 880 | 932 | 912 | 105.2 | 800 |
| 10142 | DATA | 1001 | 1848:28:21 | 43.98016 | -88.55769 | 0.0095 | 101.9 | 102.2 | 88.8 | 72 | 888 | 932 | 924 | 116.2 | 800 |
| 10143 | DATA | 1001 | 1848:28:22 | 43.97964 | -88.55769 | 0.01 | 98.2 | 101.1 | 87.1 | 74 | 898 | 928 | 932 | 117 | 800 |
| 10144 | DATA | 1001 | 1848:28:23 | 43.9793 | -88.55769 | 0.0105 | 97.8 | 101.3 | 86.2 | 76 | 894 | 924 | 932 | 105.8 | 800 |
| 10145 | DATA | 1001 | 1848:28:24 | 43.97844 | -88.55753 | 0.0103 | 97.1 | 102 | 83.8 | 74 | 882 | 920 | 924 | 96.8 | 800 |
| 10146 | DATA | 1001 | 1848:28:25 | 43.97844 | -88.55753 | 0.0103 | 97.7 | 103.1 | 83.8 | 74 | 882 | 918 | 924 | 95 | 800 |
| 10147 | DATA | 1001 | 1848:28:26 | 43.97775 | -88.55753 | 0.0105 | 97.8 | 101.6 | 81.8 | 76 | 872 | 914 | 912 | 86.8 | 800 |
| 10148 | DATA | 1001 | 1848:28:27 | 43.97775 | -88.55753 | 0.0105 | 96.4 | 98.6 | 81.8 | 76 | 872 | 910 | 912 | 78.8 | 800 |
| 10149 | DATA | 1001 | 1848:28:28 | 43.97741 | -88.55735 | 0.0103 | 94.2 | 97.6 | 80.6 | 74 | 864 | 904 | 906 | 68.8 | 800 |
| 10150 | DATA | 1001 | 1848:28:29 | 43.97707 | -88.55735 | 0.0098 | 94.7 | 100 | 79.5 | 74 | 848 | 898 | 894 | 63 | 800 |
| 10151 | M6BA | 1001 | 1848:28:30 | | | | | | | 0x0002 | '57:208 | | | | |
| 10152 | DATA | 1001 | 1848:28:30 | 43.97672 | -88.55735 | 0.0095 | 95.8 | 101.1 | 78.9 | 72 | 842 | 884 | 886 | 57.8 | 800 |
| 10153 | DATA | 1001 | 1848:28:31 | 43.97621 | -88.55735 | 0.0095 | 95.7 | 98.3 | 77.5 | 72 | 830 | 866 | 876 | 41 | 800 |
| 10154 | M1SK | 1001 | 1848:28:32 | | | | | | | 0x0002 | '57:208 | | | | |
| 10155 | M1PU | 1001 | 1848:28:32 | | | | | | | 0x0002 | '57:208 | | | | |
| 10156 | DATA | 1001 | 1848:28:32 | 43.97586 | -88.55735 | 0.0103 | 89.6 | 79 | 76.8 | 74 | 812 | 868 | 854 | *9.8 | 800 |
| 10157 | M1SK | 1001 | 1848:28:33 | | | | | | | 0x0002 | '57:208 | | | | |
| 10158 | DATA | 1001 | 1848:28:33 | 43.97569 | -88.55769 | 0.011 | *65.1 | *66.9 | 80 | 78 | 774 | *0.0 | 784 | *4.8 | 800 |
| 10159 | DATA | 1001 | 1848:28:34 | 43.97535 | -88.55787 | 0.0103 | *65.1 | *66.9 | 83.1 | 74 | 748 | *0.0 | 748 | *4.8 | 800 |
| 10160 | DATA | 1001 | 1848:28:35 | 43.97518 | -88.55804 | 0.0103 | *65.1 | *66.9 | 56.8 | 74 | 758 | *0.0 | 758 | *4.8 | 800 |
| 10161 | DATA | 1001 | 1848:28:36 | 43.97518 | -88.55821 | 0.0117 | *65.1 | *66.9 | 28.6 | 78 | 790 | *0.0 | 790 | *4.8 | 800 |
| 10162 | DATA | 1001 | 1848:28:37 | 43.97535 | -88.55821 | 0.0107 | *65.1 | *66.9 | 20.9 | 76 | 796 | *0.0 | 796 | *4.8 | 800 |
| 10163 | DATA | 1001 | 1848:28:38 | 43.97535 | -88.55804 | 0.0105 | *65.1 | *66.9 | 23.9 | 76 | 798 | *0.0 | 798 | *4.8 | 800 |
| 10164 | DATA | 1001 | 1848:28:39 | 43.97535 | -88.55804 | 0.0105 | *65.1 | *66.9 | 23.9 | 76 | 802 | *0.0 | 802 | *4.8 | 800 |
| 10165 | DATA | 1001 | 1848:28:40 | 43.97518 | -88.55804 | 0.0105 | *65.1 | *66.9 | 7.1 | 76 | 788 | *0.0 | 788 | *4.8 | 800 |
| 10166 | DATA | 1001 | 1848:28:41 | 43.97518 | -88.55804 | 0.0103 | *65.1 | *66.9 | 0.1 | 74 | 792 | *0.0 | 792 | *4.8 | 800 |
| 10167 | DATA | 1001 | 1848:28:42 | 43.97518 | -88.55804 | 0.0098 | *65.1 | *66.9 | 0.2 | 74 | 790 | *0.0 | 790 | *4.8 | 800 |

| Alt Rte | Mag Trk | Tru Trk | Tru Hd | Pitch | Roll | BAOA | L. Accl | N. Accl | Glides | Loc | Pos Src | SAT | TotShear | Gr Dn | Flp Sel | InAir | Apprc h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -683 | -18.2 | -13.2 | -20.8 | -2.1 | -23.9 | -0.70313 | -0.13477 | 1.15381 | *-3.750 | 0 | GPS1 | 29 | -0.02356 | 1 | 1 | 1 | 1 |
| -589 | -18.2 | -13.2 | -22.1 | -1.4 | -27.4 | 0 | -0.12134 | 1.17322 | *-3.750 | 0 | GPS1 | 29 | -0.01929 | 1 | 1 | 1 | 1 |
| -608 | -19.8 | -16.7 | -25.2 | -2.1 | -28.8 | -1.40625 | -0.14038 | 1.02734 | *-3.828 | 0 | GPS1 | 29 | -0.01355 | 1 | 1 | 1 | 1 |
| -695 | -24.6 | -21.3 | -31 | -2.1 | -31.6 | -0.70313 | -0.10425 | 1.18506 | *-3.906 | 0 | GPS1 | 29 | -0.01257 | 1 | 1 | 1 | 1 |
| -710 | -30.3 | -25.5 | -35.3 | -1.4 | -33.8 | 0 | -0.09241 | 1.15466 | *-3.906 | 0 | GPS1 | 29 | -0.01489 | 1 | 1 | 1 | 1 |
| -742 | -34 | -28.9 | -39.2 | -2.8 | -29.5 | 0 | -0.10474 | 1.0863 | *-3.984 | 0 | GPS1 | 29 | -0.01868 | 1 | 1 | 1 | 1 |
| -815 | -43.8 | -39.6 | -44.9 | -4.2 | -26.7 | -0.70313 | -0.11182 | 1.08923 | *-4.062 | -0.078 | GPS1 | 29 | -0.01074 | 1 | 1 | 1 | 1 |
| -897 | -43.8 | -39.6 | -48.7 | -4.2 | -28.8 | -0.70313 | -0.12781 | 1.00378 | *-4.141 | -0.078 | GPS1 | 29 | 0.00171 | 1 | 1 | 1 | 1 |
| -1105 | -51.3 | -45.5 | -52.9 | -2.8 | -26.7 | -1.40625 | -0.1134 | 1.09399 | *-4.219 | -0.078 | GPS1 | 29 | 0.01794 | 1 | 1 | 1 | 1 |
| -1050 | -51.3 | -45.5 | -57.3 | -3.5 | -23.9 | 0 | -0.08826 | 1.1731 | *-4.219 | -0.078 | GPS1 | 29 | 0.02441 | 1 | 1 | 1 | 1 |
| -1013 | -56.6 | -49.2 | -61.8 | -4.2 | -23.2 | 0 | -0.06885 | 1.12756 | *-4.297 | -0.078 | GPS1 | 29 | 0.01709 | 1 | 1 | 1 | 1 |
| -941 | -59.6 | -52.2 | -63.1 | -3.5 | -23.2 | 0 | -0.09119 | 1.10706 | *-4.453 | -0.078 | GPS1 | 29 | 0.00549 | 1 | 1 | 1 | 1 |
| -859 | -60 | -56.3 | -64.8 | -2.1 | -16.9 | 0 | -0.0697 | 1.20874 | *-4.531 | -0.078 | GPS1 | 29 | 0.01147 | 1 | 1 | 1 | 1 |
| -510 | -63.9 | -59.9 | -68.6 | -2.1 | -13.4 | 1.40625 | -0.06836 | 1.17249 | *-4.609 | -0.078 | GPS1 | 29 | 0.01599 | 1 | 1 | 1 | 1 |
| -307 | -66 | -63.5 | -69.4 | -1.4 | -11.3 | 0 | -0.08386 | 1.05371 | *-4.688 | -0.078 | GPS1 | 29 | 0.02234 | 1 | 1 | 1 | 1 |
| -384 | -65.5 | -64.4 | -68.8 | -2.1 | -8.4 | -1.40625 | -0.11865 | 0.89343 | *-4.766 | -0.078 | GPS1 | 29 | 0.02795 | 1 | 1 | 1 | 1 |
| -469 | -71.6 | -67.4 | -72.9 | -2.1 | -4.9 | -0.70313 | -0.1123 | 1.01208 | *-4.844 | -0.078 | GPS1 | 29 | 0.03711 | 1 | 1 | 1 | 1 |
| -430 | -71.6 | -67.4 | -76.6 | -2.1 | -7 | 0 | -0.10535 | 0.9823 | *-4.844 | -0.078 | GPS1 | 29 | 0.04761 | 1 | 1 | 1 | 1 |
| -442 | -73.1 | -67.5 | -76.5 | -0.7 | -9.1 | 0 | -0.08423 | 1.0719 | *-4.922 | -0.078 | GPS1 | 29 | 0.04578 | 1 | 1 | 1 | 0 |
| -375 | -73.1 | -67.5 | -77.4 | 0 | -7.7 | 0 | -0.0835 | 1.07532 | *-5.000 | 0 | GPS1 | 29 | 0.0376 | 1 | 1 | 1 | 0 |
| -281 | -75.5 | -69.8 | -80.4 | 0 | -6.3 | 0 | -0.10681 | 0.953 | *-5.000 | 0 | GPS1 | 29 | 0.03491 | 1 | 1 | 1 | 0 |
| -318 | -78.2 | -71 | -82.1 | 0 | -7.7 | 0 | -0.06555 | 1.08618 | *-5.078 | 0 | GPS1 | 29 | 0.03186 | 1 | 1 | 1 | 0 |
| -233 | -78.6 | -71.7 | -81.6 | -1.4 | -9.8 | 0.70313 | -0.10339 | 0.94543 | *-5.078 | 0 | GPS1 | 29 | 0.03076 | 1 | 1 | 1 | 0 |
| -498 | -78.5 | -73.2 | -83.6 | -1.4 | -14.8 | -1.40625 | -0.11047 | 0.86328 | *-5.156 | 0 | GPS1 | 29 | 0.03967 | 1 | 1 | 1 | 0 |
| -560 | -82.7 | -75.2 | -88.6 | 0 | -21.1 | 2.10938 | -0.01465 | 1.16492 | *-5.156 | 0 | GPS1 | 29 | 0.03174 | 1 | 1 | 1 | 0 |
| -626 | -86.7 | -76.9 | -90.3 | -1.4 | -26.7 | 2.10938 | -0.07153 | 0.92944 | *-5.234 | 0 | GPS1 | 29 | 0.00757 | 1 | 1 | 1 | 0 |
| -926 | -94.4 | -86.5 | -95.4 | 0 | -31.6 | 2.10938 | -0.03186 | 1.06433 | *-5.234 | 0 | GPS1 | 29 | -0.01599 | 1 | 1 | 1 | 0 |
| -990 | -94.4 | -86.5 | -101.8 | 0 | -32.3 | 4.21875 | 0.00952 | 1.2915 | *-5.312 | 0 | GPS1 | 29 | -0.02783 | 1 | 1 | 1 | 0 |
| -835 | -110.3 | -97.5 | -110.9 | 1.4 | -33 | 5.625 | 0.01953 | 1.27173 | *-5.312 | 0 | GPS1 | 29 | -0.02563 | 1 | 1 | 1 | 0 |
| -733 | -110.3 | -97.5 | -116.7 | 2.1 | -33.8 | 4.92188 | 0.04504 | 1.34741 | *-5.391 | 0 | GPS1 | 29 | -0.0144 | 1 | 1 | 1 | 0 |
| -636 | -117.4 | -104 | -124.2 | 2.8 | -39.4 | 6.32813 | 0.04565 | 1.32178 | *-5.469 | 0 | GPS1 | 29 | -0.0033 | 1 | 1 | 1 | 0 |
| -635 | -125.4 | -113 | -132.8 | 2.8 | -41.5 | 7.73438 | 0.07019 | 1.37134 | *-5.547 | 0 | GPS1 | 29 | 0.00122 | 1 | 1 | 1 | 0 |
| -648 | -134.6 | -121 | -142.6 | 2.1 | -43.6 | 7.03125 | 0.06775 | 1.34851 | *5.469 | 0 | GPS1 | 29 | 0.01025 | 1 | 1 | 1 | 0 |
| -718 | -144.4 | -129 | -151.8 | 2.8 | -42.9 | 7.73438 | 0.10437 | 1.30481 | *4.531 | 0 | GPS1 | 29 | 0.01367 | 1 | 1 | 1 | 0 |
| -564 | -158.7 | -151 | -159.9 | 6.3 | -31.6 | 9.14063 | 0.17859 | 1.2782 | *4.531 | 0 | GPS1 | 30 | 0.00293 | 1 | 1 | 1 | 0 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -207 | -158.7 | -151 | -163.2 | 9.8 | -12.7 | 9.84375 | 0.2738 | 1.24451 | *4.453 | 0 | GPS1 | 30 | 0 | 1 | 1 | 1 | 0 |
| 533 | -156.3 | -170 | -160.7 | 13.4 | 3.5 | 9.14063 | 0.23401 | 1.30054 | *-3.516 | 0 | GPS1 | 30 | 0.00391 | 1 | 1 | 1 | 0 |
| 976 | -155.4 | -166 | -159 | 12.7 | -5.6 | 8.4375 | 0.12512 | 1.15405 | *-5.625 | 0 | GPS1 | 30 | 0.01489 | 1 | 1 | 1 | 0 |
| 979 | -155.4 | -166 | -159.6 | 11.3 | -21.1 | 4.21875 | 0.03992 | 1.021 | *-5.781 | 0 | GPS1 | 30 | 0.02991 | 1 | 1 | 1 | 0 |
| 670 | -158.5 | -158 | -165.2 | 9.8 | -27.4 | 2.8125 | 0.01953 | 0.97717 | *-5.781 | 0 | GPS1 | 30 | 0.03748 | 1 | 1 | 1 | 0 |
| 341 | -166.1 | -161 | -173.2 | 7.7 | -30.2 | 4.92188 | 0.04211 | 0.99756 | *-5.703 | 0 | GPS1 | 30 | 0.02808 | 1 | 1 | 1 | 0 |
| -30 | -173.3 | -168 | -178.9 | 6.3 | -27.4 | 5.625 | 0.03699 | 0.8988 | *-5.703 | 0 | GPS1 | 30 | 0.00647 | 1 | 1 | 1 | 0 |
| -328 | -178.4 | -172 | 175.9 | 4.9 | -20.4 | 7.03125 | 0.0387 | 0.96631 | *-5.625 | 0 | GPS1 | 30 | -0.01794 | 1 | 1 | 1 | 0 |
| -472 | 177.2 | 176.7 | 173.2 | 4.9 | -15.5 | 6.32813 | 0.04956 | 0.96765 | *-5.625 | 0.078 | GPS1 | 30 | -0.01294 | 1 | 1 | 1 | 0 |
| -532 | 177.4 | 170.1 | 174.2 | 5.6 | -2.1 | 7.73438 | 0.0592 | 1.00342 | *-5.625 | 0.078 | GPS1 | 30 | -0.00696 | 1 | 1 | 1 | 0 |
| -526 | 177.4 | 170.1 | 173.2 | 4.9 | 0 | 7.03125 | 0.0376 | 0.9585 | *-5.625 | 0.078 | GPS1 | 30 | 0.00452 | 1 | 1 | 1 | 0 |
| -615 | 178.6 | 169.9 | 173.9 | 5.6 | -0.7 | 5.625 | 0.06189 | 0.96704 | *-5.625 | 0.078 | GPS1 | 30 | 0.01807 | 1 | 1 | 1 | 0 |
| -629 | 178.6 | 169.9 | 176.8 | 7 | 0.7 | 8.4375 | 0.1167 | 1.03333 | *-5.625 | 0.078 | GPS1 | 30 | 0.00732 | 1 | 1 | 1 | 0 |
| -646 | -177.9 | 171.6 | -180 | 6.3 | 12 | 11.25 | 0.08435 | 0.98218 | *-5.625 | 0.078 | GPS1 | 30 | -0.01147 | 1 | 1 | 1 | 0 |
| -922 | -174.5 | 171.3 | -175.8 | 6.3 | 33.8 | 9.14063 | 0.09888 | 1.02124 | *-5.703 | 0.078 | GPS1 | 30 | -0.00232 | 1 | 1 | 1 | 0 |
| -1342 | -168.1 | 173.8 | -166.2 | 6.3 | 44.3 | 11.25 | 0.08362 | 1.0238 | *-5.703 | 0.078 | GPS1 | 30 | 0.01208 | 1 | 1 | 1 | 0 |
| -1972 | -154.8 | -178 | -154.2 | 0 | 36.6 | *16.17188 | 0.05603 | 0.75842 | *-5.781 | 0.078 | GPS1 | 30 | 0 | 1 | 1 | 1 | 0 |
| -806 | -146.6 | -173 | *- | *24.6 | *0.0 | *4.92188 | *0.00000 | *0.35645 | *-5.859 | *0.078 | GPS1 | 30 | 0 | 1 | 1 | 1 | 0 |
| *0.0 | -137.3 | -154 | *- | *55.5 | *0.0 | *0.00000 | *0.00000 | *2.60840 | *-5.859 | *0.078 | GPS1 | 31 | 0 | 1 | 1 | 1 | 0 |
| *0.0 | -97.9 | -147 | *- | *71.0 | *0.0 | *- | *0.00000 | *-0.13086 | *-5.859 | *0.078 | GPS1 | | 0 | 0 | 1 | 1 | 0 |
| *0.0 | *102.4 | -132 | *- | *54.8 | *0.0 | *- | *0.00000 | *0.32422 | *-5.859 | *0.078 | GPS1 | | 0 | 0 | 1 | 1 | 0 |
| *0.0 | *74.5 | -96.6 | *- | *22.5 | *0.0 | *- | *0.00000 | *1.40332 | *-5.859 | *0.078 | GPS1 | | 0 | 0 | 1 | 1 | 0 |
| *0.0 | *58.9 | -38 | *- | *3.5 | *0.0 | *- | *0.00000 | *0.96875 | *-5.859 | *0.078 | GPS1 | | 0 | 0 | 1 | 1 | 0 |
| *0.0 | *52.5 | -1.2 | *- | *2.1 | *0.0 | *- | *0.00000 | *0.98926 | *-5.859 | *0.078 | GPS1 | | 0 | 0 | 1 | 1 | 0 |
| *0.0 | *52.2 | 33.6 | *- | *2.1 | *0.0 | *- | *0.00000 | *0.98535 | *-5.859 | *0.078 | GPS1 | | 0 | 0 | 1 | 1 | 0 |
| *0.0 | *52.2 | 67.6 | *- | *2.1 | *0.0 | *- | *0.00000 | *0.98535 | *-5.859 | *0.078 | GPS1 | | 0 | 0 | 1 | 1 | 0 |
| *0.0 | *52.2 | | *- | *2.1 | *0.0 | *- | *0.00000 | *0.98438 | *-5.859 | *0.078 | GPS1 | | 0 | 0 | 1 | 1 | 0 |
| *0.0 | *52.2 | | *- | *2.1 | *0.0 | *- | *0.00000 | *0.98242 | *-5.859 | *0.078 | GPS1 | | 0 | 0 | 1 | 1 | 0 |