NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Aviation Engineering Division
Washington, DC 20594

March 1, 2005

STRUCTURES GROUP CHAIRMAN'S FACTUAL REPORT

A. ACCIDENT DCA05MA004

Location: Kirksville Regional Airport (IRK), Kirksville, Missouri
Date: October 19, 2004
Time: 1945 Central Daylight Time (CDT)
Aircraft: American Connection 5966, BAe Systems Jetstream 3201, N875JX

B. STRUCTURES GROUP

Chairman: Clinton R. Crookshanks
National Transportation Safety Board
Washington, District of Columbia

Member: Sal Botta
FAA – Kansas City FSDO
Kansas City, Missouri

Member: Dwayne A. Coble
Corporate Airlines, Inc.
Smyrna, Tennessee

Member: W. Michael Reyer
FAA – Kansas City ACO
Kansas City, Missouri

C. SUMMARY

At approximately 1945 central daylight time (CDT), October 19, 2004, a Corporate Airlines, Inc., operating as American Connection flight 5966, BAe Systems Jetstream 3201, N875JX, operating in accordance with 14 CFR Part 121, crashed while the flight was on approach to the Kirksville Regional Airport, Kirksville, Missouri. The flight was conducting a non-precision LOC/DME Runway 36 approach. Eleven of the 13 passengers and the 2 flight crewmembers were fatally injured. The two surviving passengers received serious injuries. The airplane was destroyed by impact and post-impact fire. The reported weather was visibility 3 miles in mist and an overcast ceiling at 300 feet.

D. DETAILS OF THE INVESTIGATION

1.0 Airplane

The British Aerospace Jetstream 3201 is a low-wing, twin-turbopropeller, 19-seat passenger airplane with a tricycle landing gear configuration. It is 47 feet, 1.5 inches long, 17 feet, 5.5 inches high at the tip of the vertical stabilizer, and has a wingspan of 52 feet. See Appendix 1 for a three-view diagram of the airplane. The airplane is constructed primarily of aluminum alloy with a semi-monocoque fuselage design. The entrance door is located in the aft, left fuselage. The empennage has a plus arrangement with the horizontal stabilizers installed at the middle of the vertical stabilizer and utilizes a single elevator on each side and a full-length rudder. The wings are equipped with inboard and outboard flaps and an aileron on each side.

2.0 Overview

The main wreckage site was defined as an approximately circular area about 30 feet in diameter centered about a small 6-inch diameter tree and exhibited intense fire damage. The center was located at N 40° 03.844', W 92° 32.663' and, based on the USGS Millard Quadrangle topographic map, at an elevation of about 920 feet above mean sea level (MSL). The main wreckage site included a majority of the airplane and was located at the base of several trees in a wooded hollow between two adjacent bean fields about 1.4 miles from the runway 36 threshold that is at an elevation of 964 feet MSL. Remains of the right engine and propeller, the left propeller, the lower, forward fuselage, the left inboard wing, the right wing, the aft fuselage, and the empennage structure were all found here. A majority of the wreckage and the surrounding vegetation was consumed by fire. All of the measurements in this report will be referenced to the main wreckage site and/or the center point. See Appendix 2 for an overall wreckage diagram and a close up diagram of the main wreckage site.

The first evidence of impact was about 740 feet (0.14 mile) south of the main wreckage site. The heading from the initial impact to the main wreckage site was 360° magnetic. At the initial impact point, the airplane struck two trees near the top of a ridge. One tree was broken about 49.3 feet above the ground and the other was broken about 48.5 feet above the ground. The ground elevation at the base of the trees was measured to be 947 feet MSL. Beneath the trees were numerous pieces of tree debris, some with angled cuts and black transfer marks on the cut areas. There were also several vortex generators, pieces of the landing light lens, the left wingtip strobe light assembly, various small, white painted aluminum pieces, and small broken pieces of glass with a reflective coating on them beneath the trees. The aircraft then traveled about 400 feet further before striking another tree. From this point to the main wreckage site nearly all of the trees along the path showed evidence of being struck with tree debris littering the ground. About 530 feet from the

Figure 1

initial tree strike, a section of the outboard left wing was stuck about 15 feet up in a tree (Figure 1). About 45 feet prior to the wing and 90 feet to the right of the flight path was a 6-inch long tip section from one of the propeller blades. About 80 feet forward of the wing section a large oak tree was struck and one of the two large (18 inch diameter) branches that make up the upper portion of the tree was separated and found about 50 feet forward of the trunk in a pile of branches and tree debris. A section of the left wing and left outboard flap were found in this pile of branches with significant fire damage. A section of the left aileron was found about 15 feet prior to this pile and the left nose landing gear door was found about 5 feet forward of the pile. The left nose landing gear door hinges were pulled away from the actuator attachment fitting. The trees along the flight path from the wing section to the edge of the wooded area were cut at an angle of about 60° to horizontal as viewed looking back along the flight path from the main wreckage site (Figure 2). About 100 feet prior to the main

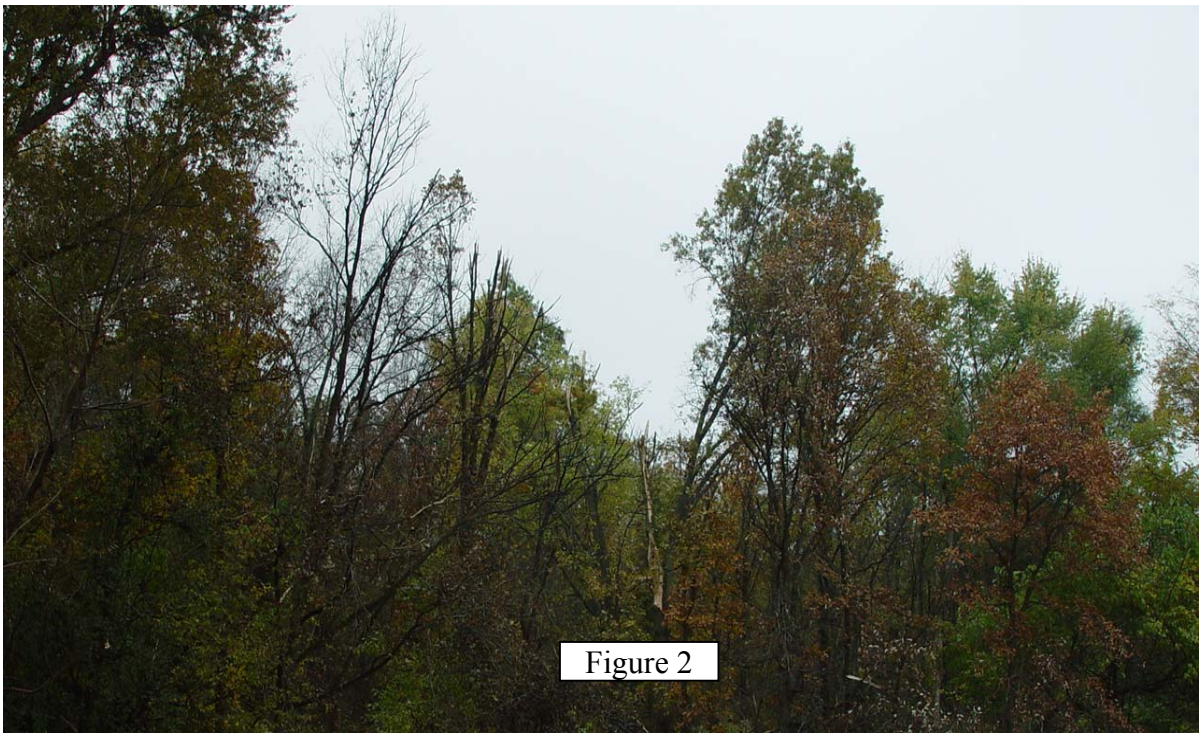


Figure 2

wreckage site, two of the trees exhibited moderate burning/charring to the upper branches about 20-25 feet above the ground. The airplane underfin was stuck in a tree branch in this area and the right nose landing gear door and weather radar were found on the ground beneath the charred trees. About 105 feet prior to the main wreckage site and 150 feet to the right of the flight path a second propeller blade tip was found. About 60 feet prior to the main wreckage site and about 30 feet to the right of the flight path, a propeller blade with a missing tip was found in the brush. About 40 feet prior to the main wreckage site there was an area of heavy ground scarring with pieces of a propeller bulkhead and slip ring, a piece of fuselage structure with attached windshield wiper, some radome material, and a propeller pitch change link scattered about.

Several pieces of wreckage were found beyond the main wreckage site. The left engine was found about 45 feet forward and to the right of the center of the main wreckage site while the upper and middle thirds of the rudder were found about 70 feet forward of the center.

3.0 Fuselage

The remnants of the forward fuselage included the instrument panels and the associated wiring bundles. Some small pieces of the lower, forward fuselage structure were mixed in with the wiring but most of it had been consumed by fire. The remnants were oriented on a 190° magnetic heading. Both the left and right forward equipment doors from the nose of the airplane were separated from the airplane and found just outside the area of intense fire with impact damage but very little fire damage. Several pieces of the fiberglass nose radome and weather radar housed within were found about 80-100 feet prior to the main wreckage site. The forward windshield structure was separated from the rest of the fuselage and found towards the forward side of the fire area along with numerous small shattered pieces of glass. The nose gear had separated from the airplane and was found adjacent to the right wing with the trunnion pins intact. The torque link attachment bolt was sheared and the inner cylinder was rotated about 180° from the outer cylinder. Both nose gear tires were burned away and the wheels were still attached to the gear.

The center fuselage structure from the cockpit to about fuselage station (STA) 315 was consumed by fire. The only discernable evidence of this structure was a section of the forward spar belt frame located at STA 199. See Appendix 3 for a fuselage diagram. No evidence of the emergency overwing exits was found.

The aft fuselage from STA 315 to the aft bulkhead at STA 463 and from stringer 7°-right on the top to stringer 170°-left on the bottom was relatively intact and laying on its left side (Figure 3). The remainder had been consumed by fire. The aft portion of the fuselage was oriented on a 240° magnetic heading. The passenger entry door located in the aft, left fuselage was mostly intact with fire damage to the interior and was found in the closed and latched position. About 50% of the aft pressure bulkhead (APB) remained in the aft fuselage with significant fire damage. The Flight Data Recorder mounting rack was still attached to the aft fuselage structure while the Cockpit Voice Recorder mounting rack was separated.

Figure 3

The Freon air conditioning system located aft of the APB was intact with the cover burned. The passenger oxygen bottle also located aft of the APB was intact with very little fire damage. The tailcone was separated from the aft fuselage and was found at the main wreckage site with moderate fire damage. The underfin was sheared off the tailcone and found in a tree as described earlier. The underfin had impact damage to the leading edge about 11 inches wide by 8 inches deep and the leading edge was bent 90° to the left.

4.0 Empennage

The lower half of the vertical stabilizer and lower third of the rudder remained attached to the aft fuselage. The lower, right side of the vertical stabilizer and rudder exhibited moderate fire damage and the middle portion had some light sooting on both sides. The right vertical stabilizer attach points were sheared off. The lower half of the rudder trim tab was still attached to the rudder. The top half of the vertical stabilizer was separated from the empennage and was found upright between two trees at the front of the main wreckage site. It exhibited moderate fire damage and there was impact damage about 12 inches long to the leading edge and the tip was deformed 30° to the left. Adjacent to this was the upper half of the rudder trim tab broken into 3 pieces. A small middle portion of the rudder and a larger portion of the upper rudder with the attached balance weight were found about 70 feet forward of the main wreckage site. The upper portion was separated at the upper hinge and both were relatively undamaged and exhibited no signs of fire or sooting.

The left horizontal stabilizer remained intact and attached to the empennage but was deformed down and underneath the aft fuselage section such that the lower surface was facing up. About 21 inches from the inboard end there was impact damage to the leading edge. The left elevator was still attached to its hinges on the stabilizer but the inboard edge and torque tube were detached. The inboard 52 inches of the lower surface of the horizontal stabilizer and elevator exhibited moderate sooting with light sooting on the remainder. The upper surface of the stabilizer and elevator were moderately sooted across the entire span even though they were recovered facing the ground (Figure 4). The sooting on both the upper and lower surfaces exhibited streaks where the soot had been rubbed away revealing the underlying white paint. Samples of the sooting on the upper and lower surfaces were retained for further analysis.

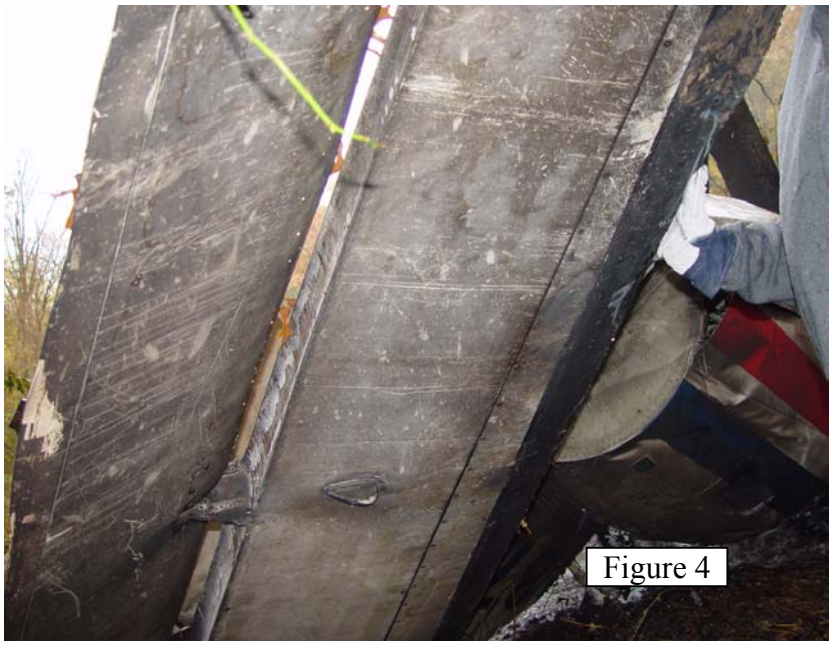


Figure 4

The right horizontal stabilizer and elevator were not attached to the empennage. A portion of the right elevator horn balance about 18 inches long by 8 inches wide, a stabilizer

leading edge rib, the conduit for the logo light wiring, a small portion of the forward spar with the elevator trim sprocket attached, and the elevator trim chain were found at the main wreckage site near the upper portion of the vertical stabilizer. The remainder was consumed by fire.

5.0 Wings

The left wing was broken into three major pieces; a section from the side of body at wing station (STN) 36 to the inboard edge of the landing light at about STN 155, a section from STN 155 to the outboard end of the outboard flap at STN 187, and a section from STN 187 to the tip. See Appendix 4 for a wing station diagram.

The inboard section of the left wing was found at the main wreckage site in an orientation consistent with the fuselage wreckage. The upper skin, leading edge and forward spar outboard of the nacelle were consumed by fire. The forward spar inboard of the nacelle, rear spar and the lower skin remained with heavy fire damage. The left, inboard flap assembly was intact and remained attached to the rear spar with heavy fire damage. The left wing, aft attach clevis remained attached to the rear spar with a fracture in the aft tang of the clevis. A portion of the fuselage lug remained in the clevis. The left main landing gear (LMLG) was attached to the bottom of the wing with the actuator in the extended position. Both LMLG tires were consumed by fire. The left exhaust remained attached to the upper portion of the wing although the left engine was separated. Outboard of the nacelle, there was a section of rear spar that extended to STN 155. Attached to the lower side of the spar were several pieces of deformed lower skin. These all exhibited moderate fire damage. A section of the upper wing skin was found unburned just forward of the main wreckage site. The left leading edge access panel normally located outboard of the nacelle was also found at the main wreckage site. The middle portion of the left wing extended from STN 155 to STN 187 at the trailing edge and to STN 210 at the leading edge. This section was found in the pile of branches and tree debris as described earlier with extensive fire damage. The forward spar was deformed rearward about 90° at STN 155. The upper skin was totally consumed by fire leaving the spars and lower skin with extensive fire damage. The outboard flap remained attached also with extensive fire damage. The inboard aileron hinge fitting was still attached to the rear spar with the aileron attach bolts still installed. The outboard wing section extended from STN 187 at the trailing edge and STN 210 at the leading edge to the wing tip. This section was found stuck in a tree as described earlier with no evidence of fire. The leading edge exhibited 4 distinct impact marks (Figure 5). At STN 215 there was a semi-circular impression about 12 inches wide and 18 inches deep that fractured the forward spar. At STN 232 there was a semi-circular impression about 13 inches wide and 10 inches deep. At STN 277 there were two semi-circular impressions adjacent to each other with a leading edge rib between them. The damage area was about 18 inches wide and 8 inches deep. At STN 300 there was a semi-circular impression about 17 inches wide and 8 inches deep. The wingtip fairing had damage to the tip with some of the skin and the strobe light missing. The upper skin was fractured diagonally from STN 210 at the leading edge to STN 187 at the trailing edge. Part of the left aileron from STN 241 to STN 307 remained attached to the outboard wing. The outboard section of the aileron leading edge had impact damage at STN 272 about 11 inches wide by 2 inches deep and at STN 297 about 11 inches wide and 3 inches deep. There was a crease at STN 272 and the aileron was bent down. The aileron horn balance was separated and found in the wooded area. A section of the lower wing skin that

Figure 5

included fuel tank access panel 6 was on the ground beneath the tree the wing was found in. The inboard section of aileron from STN 187 to STN 241, including the attached trim tab, was separated and found forward of the outboard wing section as described earlier. The outboard fourth of the trim tab piano hinge was separated and there was a large impact impression in the leading edge of the aileron at STN 223 about 12 inches wide and 4 inches deep. The aileron was bent about 45°. The balance weight remained attached to the inboard aileron section.

The right wing was found in two major pieces, both of which were found at the main wreckage site. The inboard section extended from STN 36 to STN 157. Most of this section was consumed by fire. Small, unmelted portions of forward and rear spar, center carry through structure, and flaps were found to confirm the location of the inboard right wing. The right engine and exhaust were found among the remnants of the inboard right wing.

The outboard section of the right wing extended from STN 157 to the tip and was located in the main wreckage site at the edge of the intense fire area. Thus, most of it incurred only light to moderate fire damage. The inboard end and trailing edge exhibited heavy fire damage, however. The aileron and trim tab were still attached. The leading edge had two areas of impact damage. There were semi-circular impressions at STN 259 about 10 inches wide and 8 inches deep and at STN 300 about 9 inches wide and 8 inches deep. The wingtip fairing and strobe light were intact. The right main landing gear (RMLG) was found attached to the remaining wing structure beneath the engine with the actuator in the extended position. The RMLG radius rod was sheared about 17.5 inches from the attachment point to the strut and both tires were consumed by fire.

6.0 Engines and Propellers

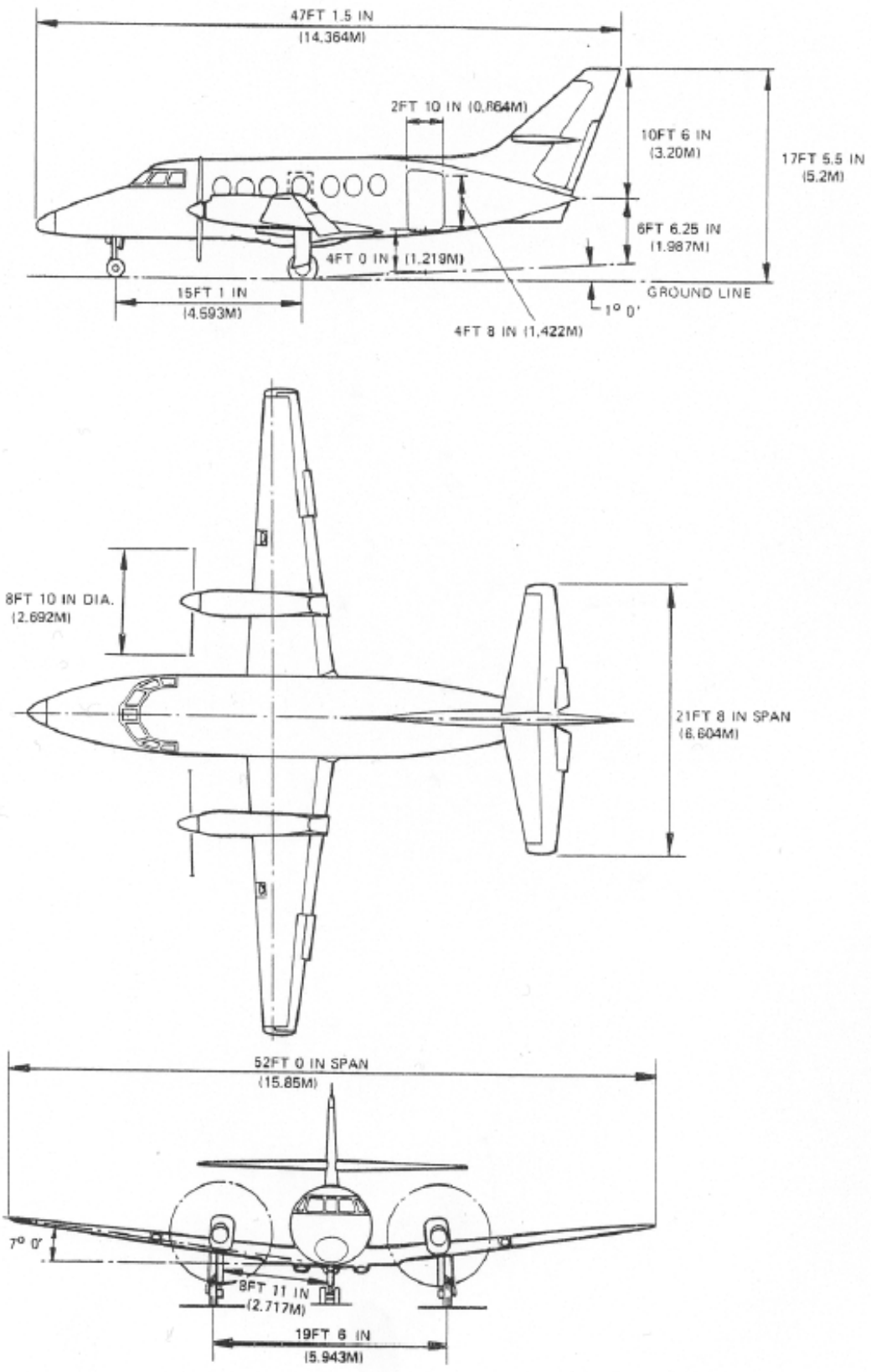
The left engine was located about 30 feet forward of the main wreckage site and aft of the wing it was attached to. This engine was essentially intact with no fire damage. The propeller had separated from the engine at the flange. The right engine was located among the right wing wreckage at the main wreckage site with extensive fire damage. About half of the engine case was consumed by fire with the enclosed gears scattered beneath. The propeller had separated from this engine as well but was found adjacent to the engine. Several sections of engine cowling were found scattered forward of the main wreckage site.

Both propeller assemblies were located at the main wreckage site. One of the propellers was found with the hub, bulkhead, spinner and three of the four blades intact. The fourth

blade was found in three adjacent pieces with extensive fire damage. The other propeller was found with the hub, spinner and two of the blades intact. One of the blades was missing and the other was melted to about a third its original length. About 3 inches of the tip of one of the intact blades was imbedded in a tree. The bulkhead was separated and the spinner was melted into a large chunk of slag.

Clinton R. Crookshanks
Aerospace Engineer

APPENDIX 1
Jetstream 3201 3-View Diagram


47FT 1.5 IN
(14.364M)
2FT 10 IN (0.864M)
10FT 6 IN
(3.20M)
17FT 5.5 IN
(5.2M)
6FT 6.25 IN
(1.987M)
4FT 0 IN (1.219M)
GROUND LINE
1° 0'
15FT 1 IN
(4.593M)
4FT 8 IN (1.422M)
8FT 10 IN DIA.
(2.692M)
21FT 8 IN SPAN
(6.604M)
52FT 0 IN SPAN
(15.85M)
7° 0'
8FT 11 IN
(2.717M)
19FT 6 IN
(5.943M)

APPENDIX 2
Wreckage Diagrams

Corporate Air,
American Airlines Flight 5966
Kirksville, Missouri
October 19, 2004

0 10 20 30 40 50
SCALE IN FEET

FEDERAL BUREAU OF INVESTIGATION EVIDENCE RESPONSE TEAM

FIELD

Propeller Tip

Propeller Tip

RH NLG Door

Weather Radar

Weather Radar Servo Motor

LH Wing Debris/OB Flap

LH Aileron

LH OB Wing

Reflector

Landing Light Lens

Vortex Generator

LH Wingtip Strobe Light

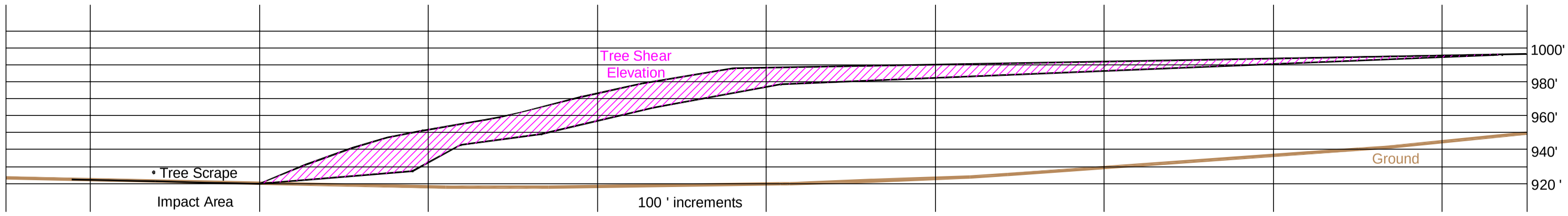
Landing Light Lens

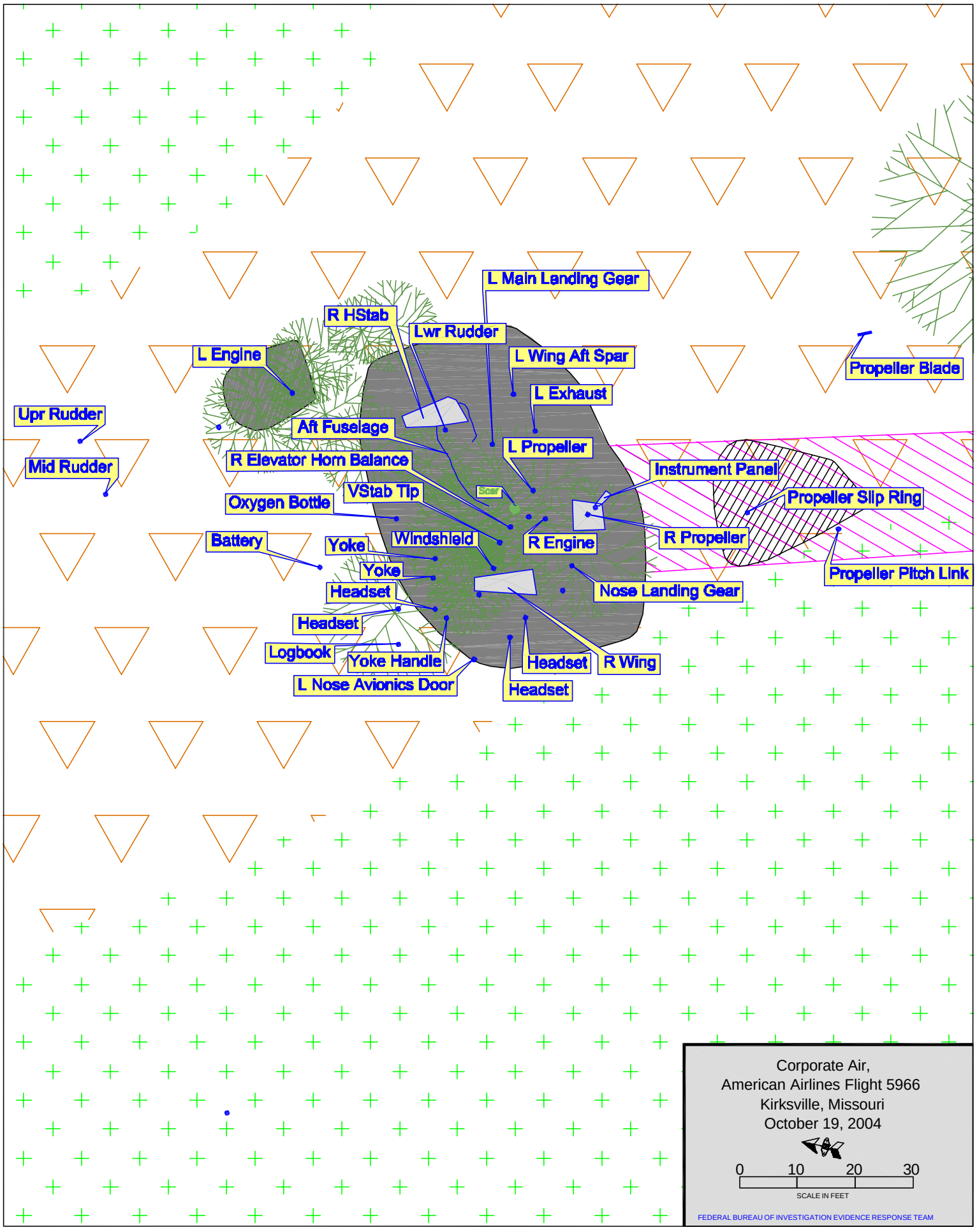
WOODED AREA

FIELD

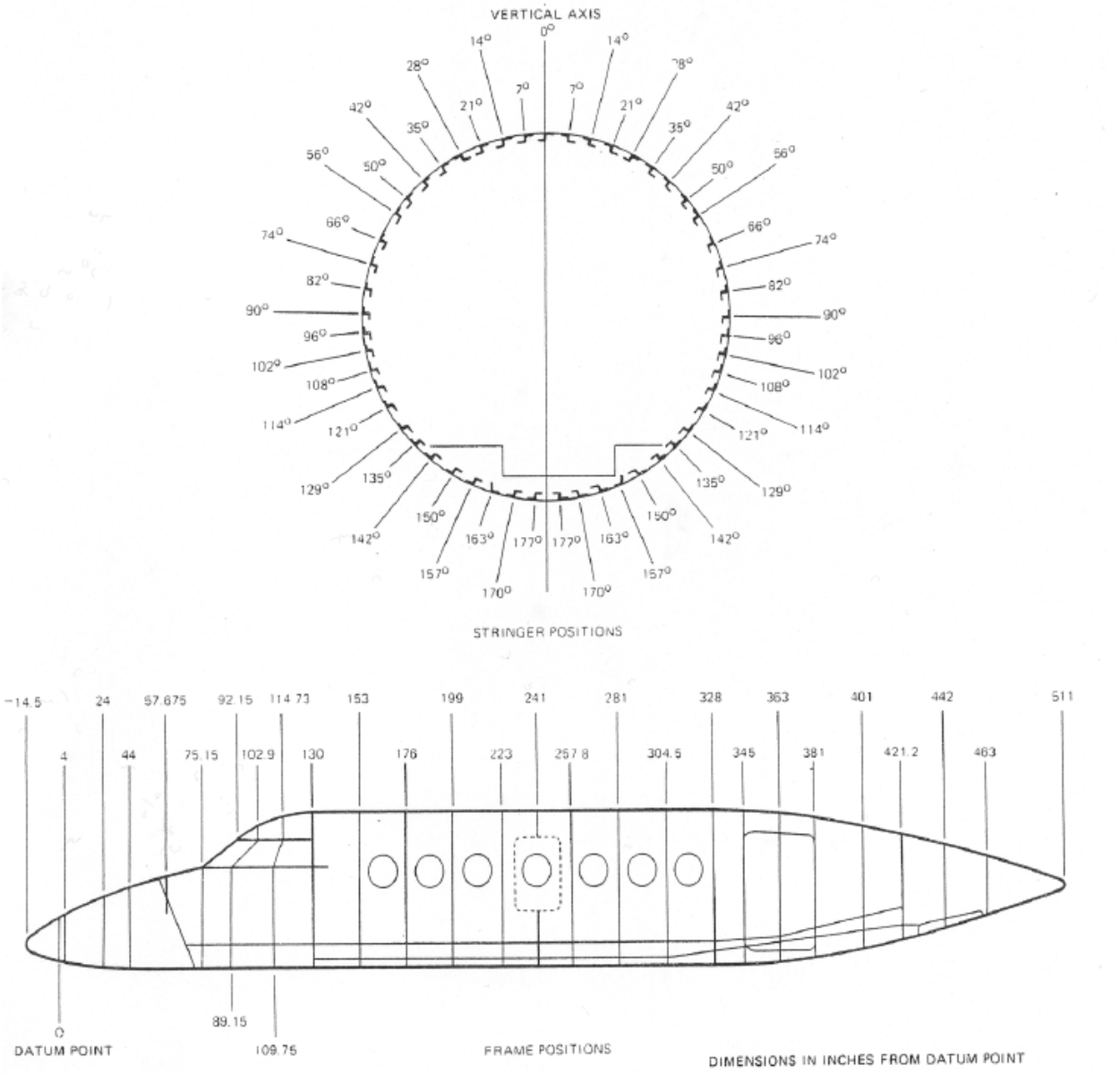
LEGEND

- Plane Debris
- Tree Shears
- Station Setup
- Human Remains/ Victims

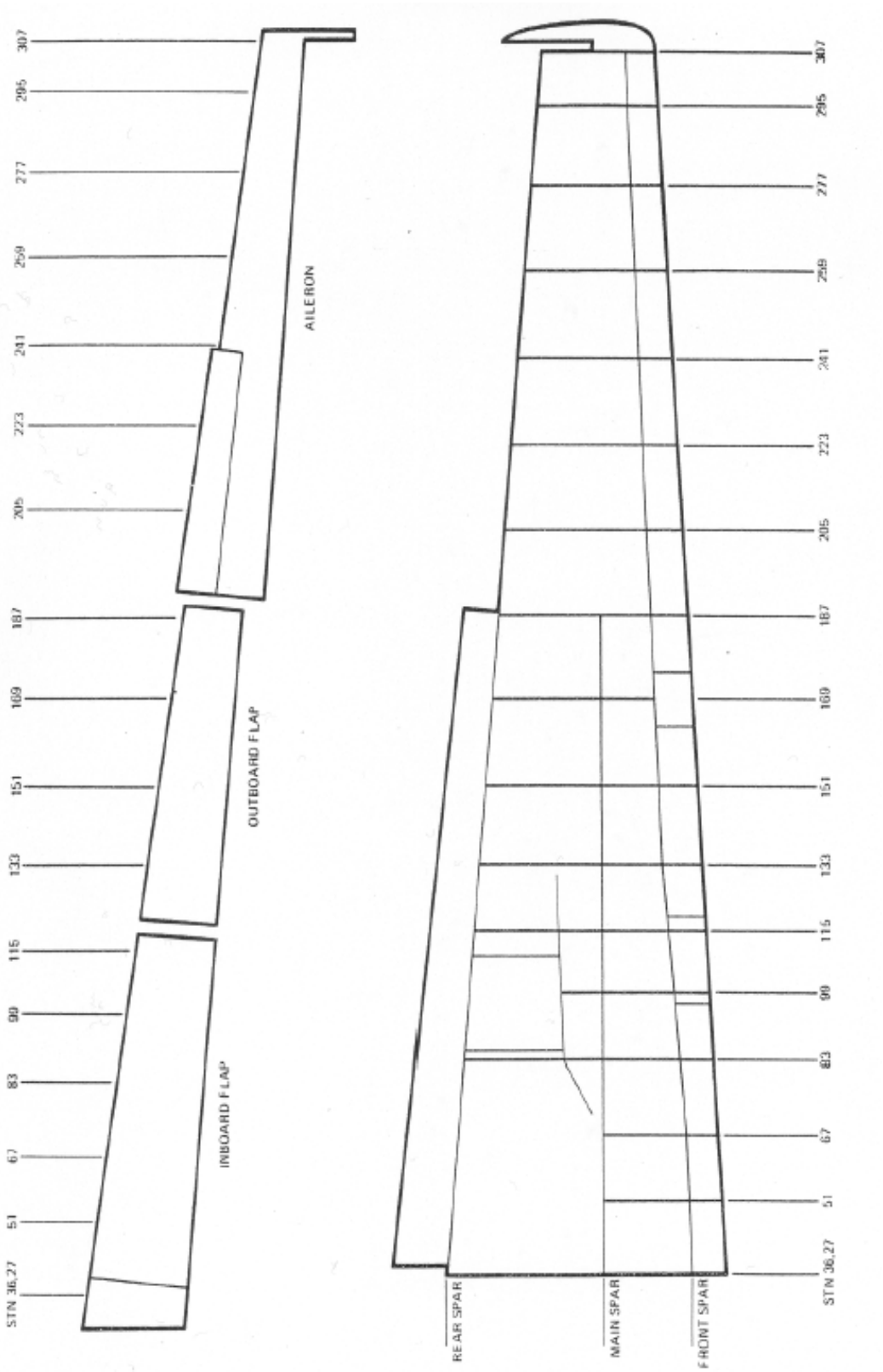



L Main Landing Gear
R HStab
Lwr Rudder
L Engine
L Wing Aft Spar
Propeller Blade
L Exhaust
Upr Rudder
Aft Fuselage
L Propeller
Mid Rudder
R Elevator Horn Balance
Instrument Panel
VStab Tip
Spar
Propeller Slip Ring
Oxygen Bottle
Windshield
R Engine
R Propeller
Battery
Yoke
Yoke
Propeller Pitch Link
Headset
Nose Landing Gear
Headset
Logbook
Yoke Handle
Headset
R Wing
L Nose Avionics Door
Headset
Corporate Air,
American Airlines Flight 5966
Kirksville, Missouri
October 19, 2004
0
10
20
30
SCALE IN FEET
FEDERAL BUREAU OF INVESTIGATION EVIDENCE RESPONSE TEAM

APPENDIX 3
Jetstream 3201 Fuselage Diagram


VERTICAL AXIS
0°
7°
7°
14°
14°
21°
21°
28°
35°
35°
42°
42°
50°
50°
56°
56°
66°
66°
74°
74°
82°
82°
90°
90°
96°
96°
102°
102°
108°
108°
114°
114°
121°
121°
129°
129°
135°
135°
142°
142°
150°
150°
157°
157°
163°
163°
170°
170°
177°
177°
STRINGER POSITIONS
-14.5
4
24
44
57.675
75.15
92.15
102.9
114.73
130
153
176
199
223
241
257.8
281
304.5
328
345
363
381
401
421.2
442
463
511
0
DATUM POINT
89.15
109.75
FRAME POSITIONS
DIMENSIONS IN INCHES FROM DATUM POINT

APPENDIX 4
Jetstream 3201 Wing Station Diagram


307
295
277
259
241
223
205
187
169
151
133
115
99
83
67
51
STN 36.27
AILERON
OUTBOARD FLAP
INBOARD FLAP
REAR SPAR
MAIN SPAR
FRONT SPAR