DOCKET NO. **SA-516**

EXHIBIT NO. **20A**

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

FIRE AND EXPLOSION GROUP FACTUAL REPORT

NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Washington, DC 20594

OCTOBER 31, 1997

FIRE AND EXPLOSION GROUP FACTUAL REPORT

DCA-96-MA-070

A. ACCIDENT

Location	:	East Moriches, New York
Date	:	July 17, 1996
Time	:	2031 Eastern Daylight Time (EDT)
Aircraft	:	Boeing 747-131, N93119,

B. FIRE AND EXPLOSION GROUP

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C. SUMMARY

On July 17, 1996, at 2031 EDT, a Boeing 747-131, N93119, crashed into the Atlantic Ocean, about 8 miles south of East Moriches, New York, after taking off from John F. Kennedy International Airport (JFK). All 230 people aboard were killed. The airplane was being operated as a Code of Federal Regulations (CFR) Part 121 flight to Charles De Gaulle International Airport (CDG) at Paris, France, as Trans World Airlines (TWA) Flight 800. The last transponder altitude reported by air traffic control radar was 13,700 feet and the Captain's altimeter was found fixed at slightly more than 13,820 feet. Wreckage from the airplane was recovered from more than nine square miles of ocean. Reconstruction of portions of the wreckage found evidence of an explosion in the center wing fuel tank (CWT), and parts from the CWT were among the first found along the debris trail.

D. DETAILS OF THE INVESTIGATION

References to fuselage locations (STA, WL, RBL, LBL, etc.) in these notes are in some cases approximations. There may be minor differences between locations cited in these notes and those of the same wreckage pieces in notes from other groups. These differences are due to the nature of the fracture surface geometry, and the fact that these locations are approximations.

TABLE OF CONTENTS

1. DOCUMENT STATUS

These field notes represent the status of the inventory and assessment of the fire and explosion factual evidence as of September 11, 1997.

2. DOCUMENT ORGANIZATION

This document is organized into four primary sections. The bulk of the document is a text description of the wreckage recovered. There are three appendices, which are separate from the bulk of the document, and are not page numbered.

Appendix I contains sequentially-numbered photographs of specific parts of the wreckage which are referenced in the text.

Appendix II contains diagrams of sooting and fracture surfaces of the center wing tank and the right and left wings. The fracture surfaces are color-coded to show whether they are sooted or clean. This Appendix also contains copies of Structures Group diagrams that identify and locate each piece of wreckage.

Appendix III contains test results and laboratory documentation. These tests are referred to in the text of the document.

3. DETAILS OF THE INVESTIGATION

Extensive fire damage is limited to a few specific areas of the airplane. Fire damage was found on components in the center wing tank; floor beams and some of the seats above and just aft of the center wing tank; part of the fuselage over the right wing; parts of the right wing including the wing front spar; and parts of the left wing just outboard of the number 1 engine. Sooting of the fuselage aft of the front spar was generally limited to the external skin of the aircraft. However, there was heavy sooting on the aft (broken near the midspar) section of the keel beam. The forward section of the keel beam shows little sooting.

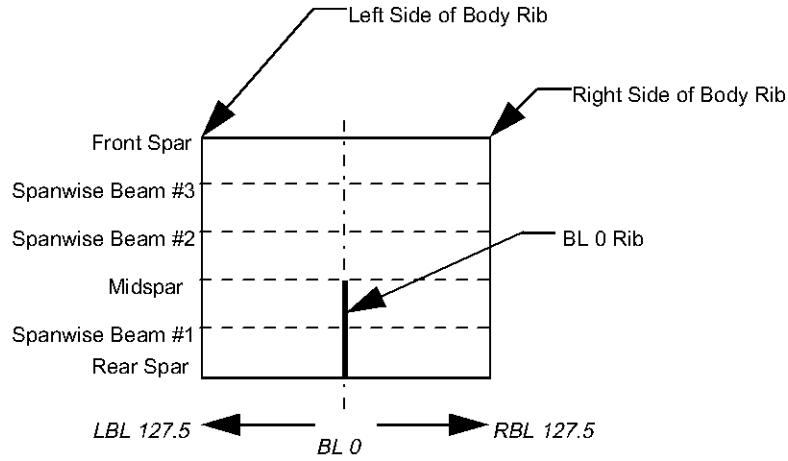
The wreckage showed evidence of an over-pressurization (explosion) in the center wing tank. Evidence of a center wing tank explosion occurring early in the accident sequence is supported by the combination of fire/sooting/structural deformation patterns along with location of parts found in the first debris field. These parts included center wing tank pieces, parts mounted underneath the center wing tank, and fuselage parts just forward of the front spar, all found along the first part of the debris path. Reconstruction of the recovered pieces of the center wing tank was initiated to provide a better picture of how the damage to the various pieces was interrelated. As additional pieces were recovered during the investigation, they were fitted into the reconstruction.

Various potential ignition sources have been considered for the center wing tank explosion. These include mechanical/electrical, a pre-existing fire below the CWT, a bomb, and a missile. Inspection of the lower surface of the CWT, the keel beam, and the air cycle machines has shown no evidence of a pre-existing fire below the CWT. No evidence of a bomb or a missile has been found on the hardware of the center wing tank or surrounding area. No ignition source has been confirmed by the Fire/Explosion

Group. Ignition sources that are being explored include the electrical fuel gauging system, electrical power to the fuel pumps, static electric charge/discharge, and other systems.

The center wing tank is comprised of an upper and lower skin; front, mid, and rear spars; three spanwise beams; right and left hand side of body ribs; and a rib located at the rear spar running forward to the midspar at BL 0[1]. Figure 1, Appendix I shows how the center tank support structure of spanwise beams, spars, and ribs is configured.

The following sketch shows the center tank support structure. The forward section of the WCS is a dry bay (no fuel)that is bounded by the front spar and spanwise beam 3.



Plan (Top) View of
the Center Wing
Section

A high percentage of the upper and lower skins; front, mid, and rear spars; and spanwise beams has been recovered. A lower percentage of the side-of-body ribs has been recovered than other parts of the tank. In addition, side-of-body ribs that separate the main wing tanks from the center tank are also more highly fragmented than the other parts. The combination of the fire/sooting/structural deformation patterns with debris location of the pieces from this tank provide strong evidence of an early explosive event in the center wing tank.

Pieces of the tank that were found in the first debris field below the flight path of TWA 800 show little if any fire or soot damage. These include the majority of the parts from the front spar and spanwise beam #3, and the manufacturing access panel from spanwise beam #2. No other pieces of spanwise beam #2 were found in the first debris field.

The majority of parts from the front spar and spanwise beam #3 are free of fire/sooting damage. Most pieces of spanwise beam #2 were extensively fire damaged,

[1] BL 0 is Buttock line "0" which represents the centerline of the airplane running fore and aft.

with small areas of melted aluminum at various locations. However, the manufacturing access panel (CW703, Tag 490) in spanwise beam #2 was found in the first debris filed and is almost free of any fire damage or sooting. One piece of spanwise beam #2 located to the right of center exhibits extensive compression (accordion) damage from right to left. This compressed section of the spanwise beam is uniformly discolored (heated/sooted) in the folds, and showed no marks or scrapes from impact with another metal object. It also does not show pitting or metal erosion. While this "accordion" piece has fractures in the folds, it is basically intact and is attached to a large piece of the upper skin. It was located in the last debris field. This piece is uniformly discolored (sooted and heated), is "accordioned" without extensive fragmentation, and shows no impact marks or scrapes. The deformation of the piece was most likely caused by water impact after being heated.

Large pieces of the fuselage immediately forward of the front spar are also free of fire/sooting and were found in the first debris field. Main cabin floor beams and flooring material (composite fiberglass) were also found in the first debris field and are free of fire/soot damage. The two air cycle machines (ACM) located under the forward part of the center wing tank to the right and left of the keel beam were recovered from the first debris field. These ACM's did not show any heat damage, and the turbine sections were intact.

The two most forward large pieces of upper skin of the center wing tank are free of fire damage (see diagram 1 and 2). The upper surface of these two pieces is clean of sooting. The lower surface is moderately sooted forward of spanwise beam #3 and outboard of RBL 75. These pieces are fractured at approximately spanwise beam #2. The large upper right skin piece is extensively bowed upward to the right of center. The left piece is also deformed. The upper skin pieces on the right side, immediately aft of the forward piece, are heavily sooted including the fracture surfaces. The sooting patterns on the upper and lower skin pieces of the center wing tank are shown in diagrams 1 through 4. A large piece of the right fuselage with attached upper tank skin and upper surface of the right wing is heavily sooted. The fuselage section of this piece exhibits evidence of melting aluminum and "broomstrawing"[2].

The lower skin of the center wing tank (tank bottom) has some evidence of fire/sooting. On the upper or inside surface, the fire damage and sooting are predominantly on the right side at about spanwise beam #2 and on the left side at about midspar. There is an imprint of a fiberglass-like design pattern on the forward left side of the lower surface of the tank. This pattern is consistent with a fiberglass air duct that leads to the cabin air conditioning system associated with the number 1 air pack on the left side.

The upper and lower skins of the center wing tank were examined for evidence of any penetration from a bomb or missile. This examination consisted of a visual inspection of all recovered pieces for hot particle erosion, pitting, sooting, petaling, and circular hole penetration from outside to inside. No evidence of this type of damage has been found on any of the recovered pieces. Small areas of the upper and lower

[2] A phenomenon that describes the appearance of metal (aluminum) that is partially melted and then subjected to shock loading that results in a broom-like group of fibers.

skins of the center wing tank are missing as noted in the detailed diagrams 1 through 4. There are also missing portions of the top skin on the left side. The fuselage skin in this area (STA 1000 to 1240) was also examined for evidence of high explosive effects. No evidence was found. All seats, except seats over the missing upper skin pieces of the center wing tank, have been recovered. None show damage consistent with high explosive effects.

A large center piece of the rear spar is heat damaged and sooted heavily. The sooting is on the outside and inside surfaces of this center piece. The pieces of the rear spar on both sides of this center piece are only lightly sooted. There is a distinct soot density discontinuity at the fracture lines of this center piece as compared to the surrounding pieces. The flange that attaches the scavenge pump to the heavily sooted center piece shows the outline of the scavenge pump attachment. There is also an outline of the pump on the inside of the tank. To date, the pump has not been found.

Vent stringers, used to vent the fuel tanks, in the right wing showed soot deposits. Fire damage was noted on the right outboard wing where the wing tip had broken off just outboard of the #4 engine. There is however, no fire damage on the mating wing tip piece, although there is sooting in the surge tank and in the vent stringer sections in the wing tip. The sooting pattern on the vent stringer to the center wing tank showed heavier sooting on the outboard surface than on the inboard surface. The soot flow pattern in the center wing tank vent stringer at the outboard wing fracture suggests flow from inboard to outboard. The sooting flow pattern in the vent stringer for the number 4 tank is outboard to inboard.

Trajectory analysis and the absence of fire damage on the right wing tip is consistent with the overpressure in the CWT occurring prior to the right wing tip breaking off, which in turn occurred prior to the fire on the outboard end of the wing. The fire at the inboard right wing tip fracture surface appears to have been the result of the wing tip failure. The upper surface of the right wing showed heavy sooting particularly inboard near the fuselage.

The lower surface of the lower left wing skin was sooted, with moderate to heavy sooting just inboard of the bottom fairing. There was also a break in the left wing just outboard of the number 1 engine. There was sooting on the inboard fracture. The outboard fracture surface was clean. A series of penetration holes was noted in the lower right wing surface near the fuselage. These holes were free of soot and were uniformly spaced about 20 inches apart. The hole separation is consistent with the distance between the center tank stringers.

The keel beam was broken between the midspar and spanwise beam number 1. The forward piece is relatively clean with some sooting just forward of the trim air tube that passes through the keel beam at approximately station 1125. The fracture surfaces on this section of the keel beam are free of soot. The aft section of the keel beam is heavily sooted including the fracture surfaces.

Passenger cabin seats above the center wing tank include rows 21 through 27. Seats 8, 9, and 10 in row 21; seats 8 and 9 in rows 22 and 23, seats 4, 5, and 6 in row 24; seats 1, 2, and 3 in row 25, seats 4, 5, 6, and 7 in rows 26, 27, and 28; seats 8, 9, and 10 in row 27; and seats 2 and 8 in row 28 were fire damaged. No seats forward of

the center wing tank (forward of front spar) showed fire damage. Some fire damage was noted on seats aft of the rear spar. No passengers showed inhalation fire damage or serious external burns. Minor thermal damage to hair was noted on several casualties.

The passenger cabin seats were examined for evidence of high explosive damage such as hot particle penetration, metal erosion, and high degree of fragmentation. None of this evidence was noted either above the center wing tank or in other areas of the cabin. Selected seat back panels in rows 17, 19, 24, and 27 were damaged, exposing a brown to reddish brown colored material. This material was analyzed by infrared spectroscopy. Analysis showed the material to be consistent with a polychloroprene 3M Scotch-Grip™ 1357 High Performance contact adhesive. The report is attached in Appendix III-Tests and Analysis.

No evidence of a bomb, missile, or high order explosive damage was found on any of the pieces of wreckage that have been examined. In areas of the bottom and top skins of the center wing where small pieces are missing there is no evidence on the surrounding hardware, including aircraft skin and cabin flooring, of a missile entry and damage or damage from a bomb. In addiion, there was no evidence observed of projectile penetration of the aircraft structure below the center wing tank. Evidence of a fuel vapor explosion (over-pressurization) in the center wing tank was noted on the front spar, spanwise beam number 3, parts from spanwise beam 2, the bottom and top tank pieces. Based on the fire damage and soot deposits, a fire occurred after the explosion in this tank. An ignition source for this explosion, has not as yet been identified. No evidence of electrical arcing or other mechanical failure signature has been noted on the hardware.

4. CENTER WING SECTION

4.1 Center Wing Tank Overview

The following overall photographs of the center wing tank show overviews of the structure as reconstructed in the first mock-up.

OVERALL PHOTOGRAPHS

Figure	Title
1	Right Hand Side Fuselage Located Below Center Wing Tank, Overview
2	Right Hand Side Fuselage Located Below Center Wing Tank, Overview, Close Up
3	Left Hand Side Fuselage Located Below Center Wing Tank, Overview, Close Up
4	Left Hand Side Fuselage Located Below Center Wing Tank, Overview
5	Forward Looking Aft Center Wing Tank Mock-Up at Elevation, Overview

4.2 Center Wing Tank Upper Skin CW1XX Series

OVERALL PHOTOGRAPHS

Figure #	Title
7	Wall and Top Center Wing Fuel Tank Junction
8	Center Wing Tank, Upper Skin , Forward BL 0
8.1	Aft End of the Upper Surface of the Upper Skin
8.2	Mid-Section of the Upper Surface of the Upper Skin
8.3	Forward End of the Upper Surface of the Upper Skin
8.4	Forward/Left Corner of the Upper Surface of the Upper Skin

SOOTING/FRACTURE DIAGRAMS

Diagram #	Title
1	Upper surface of upper skin
2	Lower surface of upper skin
2.1	Upper Wing Center Section Skin Panel

Log #	Tag #	Observations - Center Wing Tank Upper Skin
CW101	C-808	This piece extends laterally from the right side-of-body rib to LBL 33, and forward/aft from the front spar to ~ S-24. It mates with CW114 and CW129 at its left edge. It is bowed upward ~11 inches at the front spar, and less so at its aft edge. Except as described below, this surface is clean of sooting and fire damage. Upper Surface The upper surface contains multiple soot trails which initiate at missing fastener holes at the spanwise beam #3 shear tie

Log #	Tag #	Observations - Center Wing Tank Upper Skin
		attach points. The sooting is light in quantity and trails in the forward direction. Each trail is ~ the width of the fastener at the hole, and tapers to a point about 1 - 2 inches forward of the hole. When this piece and CW114 are considered together, the pattern of the missing fasteners is symmetric about BL 0. There are in total 34 of these holes on CW101 and CW114. Of these 34, sooting is clearly visible on 18, but only faintly visible on 14 and not at all on 2 because the color of the underlying CATALAC coating makes this observation difficult. There is some darkening of CATALAC coating close to edge of part. A similar sooting pattern is visible forward of a lateral crack at STA 1020 which extends between RBL 33 and RBL 57. This sooting extends from ~ RBL 45 to RBL 52. Lower Surface The lower surface is moderately sooted forward of spanwise beam #3, light to moderately sooted aft of spanwise beam #3 and inboard (left) of RBL 75 and moderately sooted outboard (right) of RBL 75. At the attach area of spanwise beam #3 on the upper chord, there is a “halo” effect around the fastener heads from RBL 127 inboard to RBL 57. The halo effect is most pronounced at the two forward rows. See Figure 9 Appendix I. S-22, S-23, and S-25 do not have primer on them except where they attach. This was also noted on CW129. Otherwise, the primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. Between RBL 75 and 98 at S-25 and S-26, the stringers are still attached but pulled away from the surface. There is sooting between the stringers and the surface. Fracture Surfaces: The RBL 127 fracture surface from upper S-30 to upper S-33 has slight evidence of sooting. Some sooting exists inside splice fittings. There is minimal to no evidence of sooting on the fracture surface of the double plus chord skin flange from upper S-24 to upper S-30. The front spar chord is fractured at the intersection of fillet radius and skin flange and is relatively clean. The forward fracture face appears to be clean but evidence of soot is indeterminate. The greatest amount of sooting is in region from SOB to RBL 76. The aft fracture surface appears to be clean. The LBL 33 fracture surface has no evidence of sooting.

Log #	Tag #	Observations - Center Wing Tank Upper Skin
CW102	C-224	This piece extends laterally from ~ LBL 45 to RBL 75, and forward/aft from S-22 to S-8. Upper Surface: The upper surface is blackened. The blackening is relatively uniform, but lightens beginning just left of BL 0 and outboard. The remaining floor beams are blackened. Lower Surface: The lower surface forward of the midspar is moderately sooted, with light sooting ~3 inches wide running forward and aft at RBL 75, 57 and 34. Where S-16, S-17, S-18 were attached, sooting is very light. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The sooting has an uneven wavy pattern from S-14 to S-15 between RBL 9 and RBL 57. At S-15 and RBL 34, the fastener heads have shadowing around them. See Figure 10 Appendix I The center tank vent stringer to the right wing is heavily sooted on the outer surface from ~ RBL 34 left to the end of the piece at ~ LBL 45. Just to the left of RBL 34 is a 2" by 1-1/2" hole and to the left of that, the sooting becomes heavy. The sealant in this area is brittle. See Figure 11 Appendix I. The area from S-9 aft between RBL 75 and LBL 45 is heavily sooted. At RBL 75 and 57, in the center tank vent stringer upper surface (lower surface of skin), there is shadowing around the fastener heads consistent with an outboard flow. There is moderate to heavy sooting inside the vent stringer when viewed from RBL 75. Sealant in this area appears flexible. See Figure 12 Appendix I. In the area between S-12 and S-13, and between RBL 24 and RBL 33, the upper skin has spalled into two horizontal layers of about equal thickness. Similar spalling has occurred in the area between S-12 and S-14, and between ~ RBL 34 and RBL 38. There is moderate sooting between the spalled layers. From RBL 11 to LBL 45 the piece is heavily sooted and/or fire damaged forward of S-9 and aft of midspar (S-14). Between RBL 11 and LBL 11, S-11 has separated from the skin and the skin is very lightly sooted where the stringer was attached to the web. Outboard from LBL 11, the skin is heavily sooted and/or burned. S-12 is also separated from the skin between RBL 11 and LBL 11 and the skin is lightly sooted left to LBL 11. The sooting then becomes moderate to ~ LBL 45 where there is a fracture

Log #	Tag #	Observations - Center Wing Tank Upper Skin
		in the part. From this fracture to the left, the sooting becomes heavy and/or fire damaged. The area where the midspar was attached, between ~ LBL 21 and the edge of the part, is heavily sooted and/or burned. Fracture Surfaces: The fracture surface on the inboard/outboard edge at the aft end of the piece is sooted and/or burned. The forward/aft fracture surface on the outboard side is sooted from S-8 to S-14, and is clean from S-14 to S-20, and is darkened from S-20 to the forward end of the piece at S-22. The fracture on the forward edge is sooted. The S-14 to S-8 fracture surface on the LBL 45 edge is sooted in some places and corroded in some places.
CW103	C-221	This piece extends from S-8 back to the rear spar, and extends laterally from ~ BL 0 outboard to RBL 98. Upper Surface The upper surface is uniformly blackened. The floor beam stubs are burned. The beam located at ~ RBL 33 is broomstrawed. Lower Surface: The forward right-hand side (S-8 to S-6) from RBL 98 to RBL 90 is not sooted. The aft right-hand side from RBL 75 to RBL 98 and S-6 to the rear spar is moderately sooted. The area from RBL 75 to ~ BL 0 is heavily sooted. There is heavy sooting outboard of RBL 98 between the rear spar and S-3. The sealant in this area remains pliable. Between S-3 and S-7 the sooting is light to moderate. Along RBL 98, between S-1 and S-2, there are heave soot deposits inboard of fastener heads, with the surrounding area relatively clean. Along RBL 98, between S-1 and the rear spar, there are light soot deposits inboard of fastener heads, with the surrounding area relatively clean. The area outboard of RBL 100 from the rear spar and S-3 is heavily sooted. See Figure 13 Appendix I. At RBL 75, there is a non-sooted, 2 - 3" wide ribbon-like area that is centered on the fastener line and that extends from the rear spar to S-8. At RBL 57, there is a non-sooted, 1 - 2" wide ribbon-like area that is centered on the fastener line and that extends from the rear spar to S-1, and continues from S-5 to S-8. AT RBL 33, there is a non-sooted, 1 -2" wide ribbon-like area that is centered on the fastener line and extends from S-4 to S-7.

Log #	Tag #	Observations - Center Wing Tank Upper Skin
		Fracture Surfaces: The fracture surface along the rear spar is sooted between BL 0 to ~ RBL 33, and is not sooted outboard of that. The forward fracture surface along S-8 is sooted. The forward/aft fracture surface at BL 0 is sooted. The forward/aft fracture surface at RBL 98 is sooted from the rear spar to ~ S-6 and is not sooted forward of that.
CW104	C-2151	This piece extends from S-19 to S-30 and from ~ RBL 67 to RBL 127 and includes part of the upper skin of the right wing. The left edge mates with CW101, CW127 and CW128. Upper Surface: The upper surface is heavily sooted. The floor beams that remain attached are heavily sooted, including one which has been pulled away from the lower longitudinal chord and is heavily sooted on surface that had been attached. The top of the double plus chord is sooted around the fastener heads forward of spanwise beam #3 with a shadow effect. The fuselage skin which is attached to the upper surface of this piece is heavily sooted on the exterior surface. There is non-uniform sooting around the fastener heads that run forward and aft and the primer is still visible. Lower Surface: The lower surface forward of S-24 is heavily sooted or fire damaged. This area extends inboard from RBL 127 only a few inches. S-21, S-22, S-23, and S-25 appear to have no primer on any surfaces except the upper surface of the stringer. The area aft of S-24 to spanwise beam #2 is moderately to heavily sooted about 10" from RBL 127 to RBL 99. See Figure 14 Appendix I. At RBL 98, forward of spanwise beam #2, there is about 4 inches that is lightly sooted and the primer is visible. The area where S-21 and 22 have separated is lightly sooted. The area where S-23 is separated is heavily sooted. The area aft of spanwise beam #2 is very lightly sooted. Fracture Surfaces: The fracture surfaces from the aft edge of the piece to the inboard peak at S-22 are clean with the exception of two areas of sooting of 2' to 3" each. One was located between S-20 and S-21, and the second was located at ~ RBL 110. The fracture surfaces forward of S-22 are heavily sooted over a majority of the surface.
CW105	C-188	This piece is connected to the right side-of-body rib and is a part

Log #	Tag #	Observations - Center Wing Tank Upper Skin
		of the fuselage piece RF17. It extends from the rear spar forward to S-18, and laterally inboard from the right side-of-body rib to ~ RBL 78. Upper Surface: The upper surface is heavily sooted. Webs of remaining floor beams are burned. Lower Surface The lower surface is lightly sooted aft of spanwise beam #1. The area forward of spanwise beam #1 to the midspar is lightly sooted. Forward of the midspar, there is some localized moderate sooting. There is ~ 20" of S-1 attached to this piece. The inboard 4" are heavily sooted. The primer is not blistered, burned, or discolored. The sealant in this area is pliant. The aft inboard vertical surface of S-3 is heavily sooted; the forward vertical surface is very lightly sooted. Fracture Surfaces: The fracture surfaces on the upper skin are sooted from the rear spar to S-5, are clean from S-5 to S-8, and are sooted from S-8 to the forward edge of the piece. The fracture surfaces on the stringers are clean.
CW106	C-114	This piece extends from S-8 to S-3 and from LBL 107 to LBL 127. The forward edge mates with CW107 and the aft edge mates with CW133. The upper surface is coated with CATALAC which has moderate sooting. The primer and coating are not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The lower surface is lightly sooted. The primer is not blistered, burned, or discolored. All fracture surfaces are clean.
CW107	C-2023	This piece extends from S-13 to S-8 and from LBL 122 to LBL 127. The forward edge mates with CW132 and the aft edge mates with CW106. The upper surface is coated with CATALAC, and is lightly sooted. The primer and coating are not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The lower surface is very lightly sooted. All fracture surfaces are clean.
CW108	C-2027	This piece extends a few inches either side of the mid spar and

Log #	Tag #	Observations - Center Wing Tank Upper Skin
		extends from LBL 98 to LBL 127. Part of the aft edge mates with CW132. The upper surface is coated with CATALAC and is lightly sooted except at the right edge which is moderately sooted. The location where the mid spar bulkhead fitting was is clean. The primer and coating are not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The lower surface is very lightly sooted. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. All fracture surfaces are clean.
CW109	C-2014	This piece is located at LBL 127 and runs from S-12 to S-20 (spanwise beam #2). It is about 3 to 4" wide and is part of the double plus chord. The upper surface is coated with CATALAC, which does not appear to be sooted. The lower surface is mostly sealant. Where there is no sealant, the surface is clean. All fracture surfaces are clean.
CW110	C-2227	This piece extends from S-2 to S-1 and from LBL 105 to LBL 114. The inboard edge mates with CW135 and the outboard edge mates with CW134. The upper surface is coated with CATALAC and is clean outboard of LBL 110. The floor beam attach area is also clean. Inboard (right) of LBL 110, the CATALAC coating is darkened. The lower surface is very lightly sooted. The primer is not blistered, burned, or discolored. The sealant in this area is brittle. All fracture surfaces are clean.
CW111	C-2228	This piece extends from S-4 to S-3 and from LBL 106 to LBL 115. The inboard edge mates with CW135 and part of the outboard edge mates with CW133. The upper surface is coated with CATALAC which shows evidence of elevated temperature. The primer and coating are not blistered, burned, or discolored. The lower surface is very lightly sooted. The primer is not blistered, burned, or discolored. The sealant in this area is brittle. All fracture surfaces are clean.
CW112	C-2229	This piece is located between LBL 93 and LBL 125 and between

Log #	Tag #	Observations - Center Wing Tank Upper Skin
		S-21 and S-22. The upper surface is coated with CATALAC which shows evidence of elevated temperature. The coating is not blistered, burned, or discolored. The lower surface does not appear to be sooted. The primer is not blistered, burned, or discolored. All fracture surfaces are clean.
CW113	C-2233	This piece extends from S-14, 5" aft and between LBL 75 and LBL 98. The forward and inboard edge mates with CW122, the aft edge mates with CW115 and the outboard edge mates with CW108. The upper surface is coated with CATALAC which shows evidence of elevated temperature at LBL 75. Where the floor beam was located is clean. The primer and coating are not blistered, burned, or discolored. The lower surface is very lightly sooted. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. All fracture surfaces are clean.
CW114	Z-3028	This piece mates with the front spar and extends aft to S-27. It extends from LBL 17 to LBL 117. It mates with CW129 on the aft edge and CW101 on the right edge. On the left edge, a portion mates with CW121. Upper Surface: The upper surface is coated with CATALAC from the aft edge to S-29. The entire surface is moderately sooted. The primer is not blistered, burned, or discolored. Refer to CW101 for the upper surface fastener hole sooting pattern discussion which includes CW114. See Figure 15 Appendix I. Also, the following items are of note: Outboard of LBL 75 there are brownish/black "splatter" marks that are oriented roughly longitudinally. See Figure 16 Appendix I. A similar appearing material is accumulated on the aft side of the raised fastener heads at the front spar outboard of LBL 75. At ~ LBL 96, the CATALAC coating is crazed, which is different from other areas. See Figure 17 Appendix I. Lower Surface: The lower surface is lightly sooted. Where the stringers have

Log #	Tag #	Observations - Center Wing Tank Upper Skin
		been separated from the surface is clean. Where spanwise beam #3 attaches is also clean. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. Fracture Surfaces: All fracture surfaces are clean.
CW115		This piece extends from ~ S-14 to S-8, and from LBL 98 to LBL 45. The forward edge mates with CW113 and CW122, the aft edge mates with CW135 and the right edge mates with CW102 Upper Surface: The upper surface is coated with CATALAC and is moderately sooted. What remains of the floor beams at LBL 76 and 57 are also moderately sooted. Where the primer is visible, it does not appear to be blistered, burned, or discolored. Lower Surface: The lower surface has some localized moderate sooting from the aft end at S-8 to a few inches forward of S-12, between LBL 75 and LBL 57. This includes the area where S-12 was. Where S-8 was between LBL 76 and LBL 5, it is heavily sooted. It is also heavily sooted forward of S-8 in a localized area. At the right edge, at ~ S-10, there is a cone shaped area of heavy sooting with the base of the cone at the right edge and tailing off at ~ LBL 57. See Figure 18 Appendix I. Between S-9 and S-10, including where S-10 was, there is heavy sooting. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. Fracture Surfaces: All fracture surfaces are darkened. The nature of the darkening was not determined.
CW116	C-2166	Stringer S-2 This piece is the upper surface S-2, between RBL 11 and RBL 105. The forward surface of the stringer is heavily sooted except to the right of RBL 75, where there is a 1" band of light sooting. The aft surface is heavily sooted to the right of RBL 57 and to the left of RBL 75 to RBL 97. Between RBL 57 and RBL 75, it is moderately sooted. The area outboard of RBL 97 is lightly sooted.

Log #	Tag #	Observations - Center Wing Tank Upper Skin
		The upper surface of the stringer (where it attaches to the upper tank skin) is heavily sooted for the entire length. The sealant is pliable and not burned or blistered. The lower surface of the stringer is heavily sooted except for the areas between RBL 74 and RBL 76 ,and between RBL 97 and RBL 99. The primer is not blistered, burned, or discolored anywhere on the stringer. The fracture surfaces on the right edge are clean. The fracture surfaces on the left edge are sooted on the upper edge and too corroded to tell on the lower edge.
CW117	Z-3035	Stringer S-3 This piece is the upper surface S-3, between LBL 104 and RBL 104. Forward Surface: Sooting on the forward surface is as follows: RBL 104 to RBL 75 -- light RBL 75 to RBL 57 -- light to moderate RBL 57 to RBL 31 -- moderate RBL 31 0 BL 0 -- light RBL 0 to LBL 45 -- moderate LBL 45 to LBL 57 -- clean LBL 57 to LBL 104 -- moderate to some localized light areas. Aft Surface: The aft surface has very light sooting with localized areas of moderate sooting between RBL 33 and RBL 57, BL 0 and LBL 11 and LBL 57 to the left (outboard) to the end of the piece. Upper Surface: The upper surface of the stringer (where it attaches to the lower surface of the upper skin) is lightly sooted from ~ RBL 45 to RBL 11 and lightly to moderately sooted from LBL 11 to LBL 31. The sooting is light from LBL 31 to LBL 64 and moderate from LBL 64 to LBL 102. From LBL 102 to LBL 104, the sooting is light. Lower Surface: Sooting on the lower surface is as follows:

Log #	Tag #	Observations - Center Wing Tank Upper Skin
		RBL 104 to RBL 75 -- light RBL 75 to RBL 57 -- moderate RBL 57 to BL 0 -- clean BL 0 to LBL 33 -- light LBL 33 to LBL 47 -- moderate LBL 47 to LBL 57 -- light LBL 57 to LBL 75 -- moderate LBL 75 to LBL 98 -- light The primer is not blistered, burned or discolored anywhere on the stringer. The sealant is pliable and not burned or blistered. The fracture surfaces are clean.
CW118	Z-3036	This piece is upper surface S-4, between LBL 101 and RBL 108. There is no primer on this piece except for the upper surface where the stringer attaches to the upper surface of the center wing tank. The forward surface of the stringer is moderately sooted from RBL 108 to RBL 33. From RBL 33 to LBL 57 it is lightly sooted, and from LBL 57 to LBL 75 it is moderately sooted. From LBL 75 to LBL 101 the piece is lightly sooted. The aft surface has moderate sooting from RBL 108 to RBL 33, light sooting from RBL 33 to LBL 33 and moderate sooting from LBL 33 to LBL 101. The upper surface of the stringer (where it attaches to the upper tank skin) is moderately sooted from RBL 108 to RBL 33, lightly sooted from RBL 33 to LBL 57, and moderately sooted from LBL 57 to LBL 101. The lower surface of the stringer is lightly sooted from RBL 108 to LBL 33, then moderately sooted from LBL 33 to LBL 101. Where there is primer on the stringer, it is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The fracture surfaces are darkened. The nature of the darkening was not determined.
CW119	C-2167	This piece is upper surface S-9 and extends from LBL 44 to RBL 50. The forward surface of the stringer is heavily sooted with possible fire damage from LBL 44 to LBL 11.

Log #	Tag #	Observations - Center Wing Tank Upper Skin
		The aft surface is heavily sooted along the entire surface. The upper surface of the stringer (where it attaches to the upper tank skin) is heavily sooted from LBL 44 to LBL 13, lightly sooted from LBL 13 to LBL 6, and moderately sooted from LBL 6 to RBL 50. The lower surface of the stringer is heavily sooted. The primer is not blistered, burned or discolored anywhere on the stringer. The sealant is pliable and not burned or blistered. The fracture surface at LBL 44 is sooted. At RBL 50, the horizontal upper fracture surface is sooted. The horizontal lower fracture surface and the vertical edge are darkened by either corrosion or sooting.
CW120	C-2327	This piece extends from the front spar to S-29 at the double plus chord and is about 3" wide. The right edge mates with CW121. The upper surface is clean. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The lower surface is lightly sooted and/or grimy. The primer is not blistered, burned, or discolored. The fracture surfaces are clean.
CW121	C-413	This piece extends a few inches forward and aft of S-30 and extends from LBL 98 to LBL 127. The aft edge mates with CW114. The upper surface is lightly sooted. The primer is not blistered, burned, or discolored. The lower surface is lightly sooted. Where S-30 is missing is clean. There is one fastener hole with a small amount of moderate sooting around it. See Figure 19 Appendix I. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The fracture surfaces are clean.
CW122	C-3347	This piece extends from S-21 to S-13 and from LBL 40 to LBL 97. Part of the forward edge mates with CW130 and CW129, the aft edge mates with CW115 and CW113 and the left edge mates with CW131. The upper surface is moderately sooted. The primer and CATALAC coating are not blistered, burned, or discolored. The floor beams that remain attached do not show any evidence of damage due to exposure to fire or heat. The lower surface is lightly sooted. The area where stringers are

Log #	Tag #	Observations - Center Wing Tank Upper Skin
		missing is also lightly sooted. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The fracture surfaces are slightly darkened. The nature of the darkening was not determined.
CW123	Z-2674	This piece is the LBL 57 floor beam. It extends from STA 1097 to STA 1142. It attaches to CW122. The inboard and outboard surfaces are lightly sooted. The primer is not blistered, burned, or discolored. The fracture surfaces appear clean.
CW124	Z-2675	This piece is upper S-16 and extends from LBL 30 to RBL 77. The forward surface of the stringer is heavily sooted from LBL 40 to RBL 11, moderately sooted from RBL 11 to BL 0, and lightly sooted from BL 0 to RBL 77. The aft surface is heavily sooted from LBL 44 to LBL 40, moderately sooted from LBL 40 to RBL 33, and clean from RBL 33 to RBL 35. From RBL 35 to RBL 52, the piece is moderately sooted. From RBL 52 to RBL 77, the piece is clean. The upper surface of the stringer where it attaches to the upper tank skin is heavily sooted from LBL 21 to LBL 38. A piece is missing from LBL 6 to LBL 21. There is heavy sooting from LBL 6 to RBL 23. From RBL 23 to RBL 77 the piece is clean. The lower surface of the stringer is moderately sooted except at the attach point at RBL 34. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The fracture surface at LBL 40 is too corroded to determine sooting. It is heavily burned and distorted. The fracture surface at RBL 77 is clean.
CW125	Z-2723	This piece extends from S-21 to S-16 and from ~ LBL 20 to ~ RBL 25. The upper surface is moderately burned. The lower chord of the floor beams at LBL 11 and RBL 11 remain attached. The webs and stiffeners are burned away. The lower surface is lightly to moderately sooted. From S-17 to S-16, there is moderate sooting. Where the stringers detached is also moderately sooted. There is some shadowing around the fasteners at RBL 11. See Figure 20 Appendix I. The fracture surfaces are darkened and show evidence of

Log #	Tag #	Observations - Center Wing Tank Upper Skin
		corrosion. The nature of the darkening was not determined.
CW126	Z-2722	This part extends from S-21 to S-16 and from BL 0 to LBL 33. The forward edge mates with CW101 and the right and aft edges mate with CW125. The upper surface is moderately burned. The lower chords of the floor beams at LBL 11 and LBL 33 remain attached. The webs and stiffeners of the floor beams are burned away. The lower surface is heavily sooted. At S-20 (spanwise beam #2), just outboard of LBL 11, there is a 4" by 2" patch of very light sooting. See Figure 21 Appendix I. There is some heavy sooting forward of the forward fastener heads and aft of the aft fastener heads. The second fastener to the left and aft has a 3/8" heavy sooting mark inboard (to the right) of it. There is a 2" by 1" patch of light sooting inboard of LBL 11. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The fracture surface at the forward edge is sooted. The aft fracture surface is darkened. The outboard fracture surface at ~ RBL 33 appears burned.
CW127	no tag	This piece extends from S-20 to S-18 and from RBL 80 to RBL 90. The forward and left edges mate with CW102, the right edge mates with CW104, and the aft edge mates with CW128. The upper surface is heavily sooted. The coating condition is not visible. The lower surface is lightly to moderately sooted. Where the stringers were is very lightly sooted. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The fracture surfaces are clean.
CW128		This piece extends a few inches aft of S-19 and extends from RBL 80 to RBL 90. The forward edge mates with CW127, the right edge mates with CW104. The left edge mates with CW102 and the aft edge mates with CW105. The upper surface is heavily sooted. The coating condition is not visible. The lower surface is very lightly sooted from RBL 90 to RBL 84 and lightly to moderately sooted from RBL 84 to RBL 80. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered.

Log #	Tag #	Observations - Center Wing Tank Upper Skin
		The fracture surfaces are clean.
CW129	Z-2747	This piece extends from LBL 24 to LBL 123 and from S-27 to S-21. The forward edge mates with CW114, the aft edge mates with CW122 and CW130. The inboard edge mates with CW101. From LBL 127 to LBL 98 there is no visible sooting on the surface. From LBL 98 to LBL 33 the upper surface is slightly sooted; in addition, between LBL 98 and LBL 75 there is a black splatter pattern which is similar in appearance to the pattern documented on CW114. On the lower surface, there are localized traces of very light sooting. S-25 and S-23 are darkened. The primer elsewhere is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The inboard fracture is clean. The lateral fracture at forward edge appears clean, but with heavy corrosion deposits, rendering it hard to determine whether there is sooting. The outboard fracture is corroded. The aft fracture surface appears clean with slight corrosion
CW130	Z-2507	This piece extends a few inches either side of S-21 and extends from LBL 75 to LBL 95. The aft edge mates with CW122 and the forward edge mates with CW129. The upper surface is coated with CATALAC, which is moderately sooted and exhibits crazing over ~30% of its surface. The lower surface is very lightly sooted. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. Where S-21 is missing is also lightly sooted. All fracture surfaces appear to be clean.
CW131		This piece extends from S-17 to S-15 and from LBL 98 to LBL 116. The inboard edge mates with CW122. The upper surface is lightly sooted, except at the right edge, which is moderately sooted. The location where the longitudinal floor beam was attached is clean to lightly sooted. The lower surface is very lightly sooted. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The fracture surfaces are clean.
CW132		This piece extends from S-13 to S-12 and LBL 115 to LBL 127. The forward edge mates with CW108 and part of the aft and outboard edges mate with CW107.

Log #	Tag #	Observations - Center Wing Tank Upper Skin
		The upper surface is coated with CATALAC, and is lightly sooted. The primer and coating are not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The lower surface is lightly sooted. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The fracture surfaces are clean.
CW133		This piece extends from the rear spar to S-3 and from LBL 112 to LBL 127. The forward edge mates with CW106, the inboard edge mates with CW110 and CW111, and the aft edge mates with CW134. The upper surface is coated with CATALAC which shows evidence of elevated temperature. The primer and coating are not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The lower surface is very lightly sooted. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. All fracture surfaces are corroded making it difficult to determine if the surfaces are sooted.
CW135	Z-3211	This piece extends from S-8 to the rear spar and from BL 0 to LBL 105. The forward edge mates with CW115 and CW102 and the right edge mates with CW103. The upper surface is heavily sooted from LBL 11 to LBL 33 and moderately sooted elsewhere. The part is clean at the forward end between LBL 33 and LBL 57. The coating is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The lower surface is lightly sooted. There is sooting where the upper stringers were. There is some localized moderate sooting at S-1 to S-4 at ~ LBL 57. There is also moderate sooting from LBL 21 to BL 0 aft of S-6 and forward of S-7. The longitudinal floor beam fasteners at ~ LBL 33 have shadowing soot patterns oriented laterally extending outboard. See Figure 22 Appendix I. The fracture surfaces are clean.
CW136		No part currently assigned this number
CW137		No part currently assigned this number
CW138		No part currently assigned this number
CW139	Z-2736	This is a 5 inch by 18 inch piece from an undetermined location.

Log #	Tag #	Observations - Center Wing Tank Upper Skin
		Upper and lower surfaces are moderately sooted. CATALAC coating on the upper surface is partly burned away. Sealant on the lower surface is black and pliable. Primer on the lower surface is not burned or discolored. Fracture surfaces are moderately burned.
CW140	Z-2771	This piece is located from S-24 to S-25 and from LBL 100 - 125. Primer on the lower surface is not burned or discolored. Sealant on the upper and lower surfaces is black and pliable. The CATALAC coating on the upper surface shows evidence of elevated temperature. The fracture surfaces are lightly corroded but appear unburned and free of soot.
CW141	Z-2769	This is a small piece, with a portion of spanwise beam #2 attached, near LBL 98. Primer on all surfaces is not burned or discolored. Upper and lower surfaces are free of soot. CATALAC coating on the upper surface shows evidence of elevated temperature near LBL 98. Sealant is black and pliable. The spanwise beam #2 web attached to the upper tank skin has a mottled brown-gray appearance. Fracture surfaces are clean.
CW142	Z-2668	This is a ten inch by ten inch piece from an undetermined location. The entire piece is lightly sooted. The CATALAC coating on the upper surface shows evidence of elevated temperature. Sealant on the lower surface is black and pliable. Primer on the lower surface is not burned or discolored. Fracture surfaces are moderately corroded.
CW143	Z-2770	This piece is located near S-2 from ~ LBL 100 to LBL 110. It mates with CW110, CW111, CW133, and CW135. The lower surface is lightly sooted. Primer on the lower surface is not discolored or burned. Sealant on the lower surface is black and pliable. The CATALAC coating on the upper surface shows evidence of elevated temperature. The primer on the upper surface is clean to lightly sooted. Burning on the upper surface is markedly heavier than all four of the surrounding pieces. Fracture surfaces are moderately corroded but do not appear burned or sooted.
CW144	Z-2784	This is a group of four small fragments of upper tank skin from undetermined locations. Each fragment has a masking tape label identifying it as 1 of 4, 2 of 4, etc. Part 1 of 4: The upper surface is lightly sooted and shows evidence of elevated temperature. The CATALAC coating is

Log #	Tag #	Observations - Center Wing Tank Upper Skin
		scraped away on approximately 25% of the upper surface. The lower surface has one small area of moderate soot. It is clean otherwise. Sealant on both surfaces is black and pliable. Primer on the bottom surface is not burned or discolored. Fracture surfaces are clean. Part 2 of 4: The upper and lower surfaces are lightly sooted. CATALAC coating and primer are not burned or discolored. Fracture surfaces are moderately corroded. Part 3 of 4: The upper and lower surfaces are lightly sooted except as noted. CATALAC coating on the upper surface shows evidence of elevated temperature. Primer visible on the upper surface is not sooted, discolored, or burned. Primer on the lower surface is not discolored or burned. Sealant on the lower surface is black and pliable. Fracture surfaces are moderately corroded. Part 4 of 4: The upper and lower surfaces are moderately sooted. CATALAC coating on the upper surface is shows evidence of elevated temperature at the wide end of the piece. Sealant is black and pliable. Fracture surfaces are predominantly moderately corroded with two small areas lightly burned.
CW145	Z-2785	This is a group of ten small fragments of tank upper skin from undetermined locations. Each fragment has a masking tape label identifying it as 1 of 10, 2 of 10, etc. Pieces are generally not sooted on the lower surfaces. Fragment “8 of 10” is lightly sooted on the lower surface. Primer on lower surfaces is not burned or discolored. Sealant is black and pliable. CATALAC coating on the upper surface shows evidence of elevated temperature. The CATALAC coating on fragment “1 of 10” is heavily burned. Visible primer on the upper surface of that same piece is clean. Fracture surfaces are moderately corroded.
CW146	Z-2782	This is a spanwise beam #1 attach fitting with a small piece of upper tank skin attached. Specific location on spanwise beam #1 is undetermined. The primer on the upper surfaces is clean. CATALAC coating on the upper surface shows evidence of elevated temperature. In the primed area of the upper surface near fastener holes, there are indistinct rings of light sooting (fastener shanks remain in the holes). Primer on the lower skin surface is clean. Primer on the fitting

Log #	Tag #	Observations - Center Wing Tank Upper Skin
		portion below the tank skin is lightly sooted, but not burned or discolored. Sealant is black and pliable. Fracture surfaces have moderate to heavy corrosion.
CW147	Z-2382	This is a piece of upper tank skin from an undetermined location. The CATALAC coating on the upper surface shows evidence of elevated temperature. Primer visible under the CATALAC coating is not burned or discolored. The lower surface is lightly sooted. Primer is not burned or discolored. Sealant is black and pliable. Fracture surfaces are lightly corroded but appear free of sooting or burns.
CW148	Z-2737	This is a piece of upper tank skin near S-27 from ~ LBL 67 - LBL 103. The upper surface is lightly to moderately sooted. There is an area of heavy black splatter marks at the center of the upper surface. Primer visible on the upper surface is generally clean. In the primed area of the upper surface near fastener holes, there are indistinct rings of light sooting (fastener shanks remain in the holes). The lower surface of the tank skin is generally clean to very lightly sooted. The lower surface of the stringer itself is lightly sooted (i.e. sooting is heavier on the stringer than on the surrounding skin). Fasteners on the stringer lower surface do not exhibit soot shadowing. Primer is not burned or discolored. Sealant is black and pliable. Fracture surfaces are moderately corroded but do not appear to be sooted.
CW149	Z-2788	This is a small piece of upper tank skin at S-15 on the left SOB rib. The entire piece is very lightly sooted. CATALAC coating on the upper surface appears unburned. Primer is not burned or discolored. Sealant is black and pliable. Fracture surfaces are lightly corroded but appear free of soot.
CW150-152, CW154, CW155A-B, CW156-157, CW158A-B, CW159-163,		These are small parts identified to have come from the upper skin of the center wing tank by virtue of their having a CATALAC coating, and being of the appropriate thickness. They have been given log (e.g., CW) numbers but not tag (e.g., A-, B-, C-, etc.) numbers. They are presumed to have come from those areas of the center tank wing upper skin that are “missing”. Refer to

Log #	Tag #	Observations - Center Wing Tank Upper Skin
CW165-169, CW171-179		Diagram 2.1 for these areas. Only a few of these parts have had their location in the tank upper skin identified, and of those some have been placed in the mockup. None of these parts show evidence of sooting, or physical damage consistent with a projectile penetration into or out of the tank.

4.3 Center Wing Tank Lower Skin CW2XX

OVERALL PHOTOGRAPHS

Figure	Title
24	Center Wing Tank, Lower Skin, Upper Surface, Overall
25	Center Wing Tank, Lower Skin, Upper Surface, Aft End Facing Forward
26	Center Wing Tank, Lower Skin, Upper Surface, Left Side Facing Forward
27	Center Wing Tank, Lower Skin, Upper Surface, Right Side Facing Forward

SOOTING/FRACTURE DIAGRAMS

Diagram #	Title
3	Upper surface of lower skin
4	Lower surface of lower skin
4.1	Stringer soot demarcation map

Log #	Tag #	Observations - Center Wing Tank Lower Skin
CW201	C-2147	This piece is attached to the right wing lower skin from just forward of the rear spar to S-22. The piece varies significantly in width from front to back. Upper Surface: The upper surface of the skin is lightly sooted on the inboard edge between S-2 and S-5. These patterns match and represent the termination of sooting on the matching edge of CW202. There is light sooting between S-7 and S-9. The forward/aft fracture is close to the side-of-body rib between S-9 and S-11. There is light to moderate sooting between S-10 and S-13 that extends outboard to the row of fasteners located at RBL 104. There is material remaining between S-13 to S-14 that is a little more than a foot wide (inboard/outboard). The skin surface is lightly to moderately sooted from S-14 to S-15. Between S-15 and S-20 there is moderate sooting. Two pieces of attached intercostals on S-16 and S-17 are burned. There is light sooting from S-20 to S-23. Lower Surface: On the lower surface of the skin, the paint is darkened with light sooting. In some places the paint has cracked and begun to peel off. On the forward outboard end, fastener heads that had capseals have ~ half the sealant remaining on each fastener head, with the remaining sealant lying roughly at a 45° angle aft toward the inboard. This characteristic continues aft on all capseals until the fastener heads were not installed with

Log #	Tag #	Observations - Center Wing Tank Lower Skin
		capseals. The angle (chord) at ~ RBL 103 attached to the lower surface of the aft edge of CW201 has heavy sooting on the upper surface (where it would not be visible if it were fastened in place). There is localized soot buildup on surrounding skin near fasteners at the skin splice forward of spanwise beam #3 and RBL 120. Sooting around these fasteners is slightly heavier on the skin aft of the fasteners. Fracture Surfaces: The wing skin fracture surfaces around the periphery of the piece are clean, except that the inboard/outboard fracture surface at the rear spar has three small (about 1 inch wide) areas of localized moderate sooting, and the forward/aft fracture at the forward end, between S-15 and S-20 and at about RBL 11 is sooted. On the tear near the inboard edge, between S-15 (spanwise beam #2) and S-20 (spanwise beam #3), the fracture surface on the forward edge is moderately sooted. The aft edge of the section between S-18 and S-19 is moderately sooted. On the tear between S-19 and S-20, which is raised above the rest of the surrounding surface, the forward edge has light sooting. The fracture between this piece and the right side-of-body rib is slightly darkened. It is not clear whether this is light sooting or corrosion.
CW202	C-186	This piece was fractured just forward of the rear spar, and runs forward to S-5, and right to left from RBL 98 to ~ LBL 69. Upper Surface: Beginning at about RBL 12, the sooting is moderate and decreases outboard until it stops at about the fracture with CW201. On the left side, the sooting is light at LBL 12, and increases outboard until the fracture with CW203. Lower Surface: The lower surface of the skin shows fire damage and heavy sooting from RBL 11 outboard to the right edge of the piece. The enamel has been blackened and is peeling off in places. Beginning at RBL 11 outboard to the left side of the piece, the surface is moderately sooted, and the white enamel does not appear to have been heat stressed. Part of the keel beam chord is missing at both RBL 11 and LBL 11. The green primer there appears undamaged.

Log #	Tag #	Observations - Center Wing Tank Lower Skin
		Fracture Surfaces: The fracture surfaces around the periphery are clean except for the left forward/aft fracture, which is lightly sooted. The mating fracture surfaces on CW204 and CW217 are also sooted.
CW203	C-193	This piece lies between CW202 and CW204, mates with them. It extends from the rear spar lower chord forward to S-2. On the upper surface, the rear spar chord section is heavily sooted with heat damage. This continues forward to S-1. There is moderate sooting between S-1 and S-2. The capseals on the forward surface of the rear spar chord are sooted but still intact and flexible. The aft surface of the rear spar chord is moderately to heavily sooted. The capseals are sooted but still intact and flexible. The lower surface is lightly to moderately sooted. The white enamel is intact and not discolored except for the sooting. The fracture surfaces on the right side and along S-2 (both fracture surfaces attach to CW202) are clean. The fracture surface on the left that attaches to CW204 is sooted, as is the mating fracture surface on CW204. The fracture surface of the rear spar is sooted.
CW204	C-159	This piece extends from the rear spar to just forward of S-3, and from about LBL 55 to about LBL 98. A small piece of the rear spar remains attached. The upper surface is clean to lightly sooted over the entire piece, including the small piece of rear spar. The lower surface is lightly to moderately sooted except at the forward right corner where it mates with CW217, where there is heavier sooting. The aft side of the rear spar is lightly to moderately sooted. Capseals are sooted but intact and flexible. There is some soot streaking in an upward direction near some of the capseals. The inboard forward/aft fracture surface is lightly to moderately sooted. The left/right forward fracture surface is lightly sooted. The outboard forward/aft fracture surface is clean. The fracture surface on the rear spar varies from lightly sooted on the left to more heavily sooted on the right.
CW205	C-218	This piece extends forward/aft from S-5 to S-10 (mid spar), and from the left side of body rib to ~ RBL 70. The forward/aft fracture on right aft side mates with the matching part of the

Log #	Tag #	Observations - Center Wing Tank Lower Skin
		fracture on CW201. The upper surface is clean to lightly sooted over the keel beam area from S-6 to the aft end of the piece. Over the keel beam area, there is light to moderate sooting from S-8 to S-10. The upper surface from the keel beam area outboard on the right side has moderate sooting. From the keel beam outboard on the left side, there is light sooting to about LBL 50, from which point the sooting increases until it is moderate to heavy at the left side-of-body rib. Stringer locations show both clean and sooted areas. S-9 shielded the wing skin from sooting from ~ LBL 45 to about RBL 20. S-8 shielded the skin from ~ LBL 45 to ~ RBL 35. S-7 shielded the skin over the entire left hand side, with less pronounced shielding to the right hand end of the piece. Although S-6 separated from the skin, the area under the unattached portion is clean. On the paddle fittings on the left side-of-body rib, the capseals are burned and sooted, but still pliable. The lower surface is heavily sooted from the far right-hand side to ~ BL 0, where the sooting becomes moderate to the left-hand side of the piece. The white enamel on the outboard side is burned and peeled in some areas right of BL 0, and is intact left of BL 0. Pieces of the support structure right of about RBL 18 are missing, and the green primer where these pieces would be located is clean and intact. Outboard fillet sealant remaining is burned right of BL 0. Capseals on the far left-hand side are heat damaged, and some are partially missing, with the portion missing facing at about a 45^{o} angle forward, toward the right. The fracture surface at the left outboard edge is sooted. Other fracture surfaces are slightly darkened.
CW206	C-2160	This piece extends forward/aft from S-10 to about 7 inches forward of S-13, and inboard/outboard from the left side-of-body rib to the mating fractured of CW207. There is moderate sooting on the upper surface and the green primer is still visible and intact under the sooting. Sealant that remained on piece is intact and not heat or fire damaged. The sooting on this side extends through the locations where the stringers should be located. The upper surface is markedly different from the mating upper surface on CW207, which is heavily sooted. The lower surface is heavily sooted. The primer and enamel are

Log #	Tag #	Observations - Center Wing Tank Lower Skin
		still intact. This sooting is markedly different from the mating lower surface on CW206, which is relatively clean. The outboard fracture surface is clean. The fracture surface along S-10 is slightly sooted; the skin edge is sooted under S-10. The inboard fracture surface between S-20 and the forward edge of CW214 is darkened to lightly sooted. All fracture surfaces between this piece and CW214 are clean. The aft fracture surface is clean (the mating piece is missing).
CW207	C-238	This piece extends forward/aft from S-10 to S-15, and inboard/outboard from ~ RBL 7 to ~ LBL 95. The lower surface is heavily sooted from ~ BL 0 to LBL 50. From LBL 50 outboard, the sooting diminishes and becomes relatively light at the outboard edge. Enamel is still visible under sooting on the outboard surface. The outboard lower surface is markedly different from the mating surfaces on CW206 and CW214, which are much more sooted. The upper surface is moderately sooted from BL 0 to ~ LBL 70. From LBL 70 outboard, the sooting increases until it is heavy at the outboard edge, especially at the forward corner. The outboard upper surface is markedly different from the mating surfaces on CW206 and CW214, which are much less sooted. The outboard fracture surface that mates with CW206, CW214, and CW218 is sooted. The sealant surface along the splice at S-15 is clean. The surface along the splice at S-10 has clean white enamel. The fracture surface along the tear at S-14 is clean. The forward/aft fracture surface at BL 0 is clean.
CW208	C-2234	This piece extends from ~ BL 0 to ~ RBL 40, and from the splice at S-15 to just aft of S-13. The inboard and outboard fracture surfaces mate with those on CW207 and CW209, respectively. The upper surface is moderately sooted from the outboard end to about RBL 12, where it is heavily sooted. The former locations of S-13 and S-14 are as sooted as the rest of the surface. Sealant is split, dirty, and sooted, but not charred or brittle. The lower surface has moderate sooting on the outboard side, increasing to moderate to heavy sooting on the inboard side. Some enamel is peeling off, and the primer is darkened. The fracture surfaces on the periphery are clean, except at the forward inboard edge of the S-15 chord. It is lightly sooted. The sealant on the splice is not damaged and remains pliable.
CW209	C-2169	This piece extends inboard to about RBL 45 at the outboard end of CW208, to which it mates, and outboard to about RBL 75 at

Log #	Tag #	Observations - Center Wing Tank Lower Skin
		the inboard end of CW235, to which it also mates. It extends forward/aft from S-14 to S-15. S-14 is missing from the piece. S-15 is present, is broken off on the outboard edge, but continues inboard past the end of the skin itself. The upper surface including the section of S-15 is moderately to heavily sooted. The green primer is intact. The lower surface is very heavily sooted over the entire surface. The white enamel is burned and the enamel is peeling along the aft edge of the piece. The fracture surfaces are clean, except the outboard fracture of S-15 is lightly sooted.
CW210	C-2149	This piece extends from the rear spar forward to just past S-1, and inboard from the left side-of-body rib to LBL 100. The upper surface is clean. The paint, primer, and sealant are not damaged. The lower surface is moderately sooted except at the locations of the rear spar chord and an attachment, where the green primer is still clean. The paint, primer, and sealant are not damaged. All fracture surfaces are clean.
CW211	C-1031	This piece is still attached to the keel beam, and is about as wide as the beam. It extends forward about 10 inches. The upper surface is lightly sooted. The paint, primer, and sealant are not damaged. The lower surface is moderately sooted. The paint, primer, and sealant are not damaged. The fracture surfaces are clean except for the fracture surface on the rear spar web which is slightly sooted.
CW212	C-2157	This piece is located between S-2 and S-5 and from ~ LBL 120 to LBL 100. The outboard fracture is just inboard of the end of the stringers, and the piece extends inboard about 20 inches. The upper surface is clean. The sealant and CATALAC coating are not damaged. The lower surface is heavily sooted, and the white enamel is burned. The sealant is not damaged. The fracture surfaces are clean except at the splice at S-5, which is sooted.
CW213	C-2168	This piece was renumbered as CW223.

Log #	Tag #	Observations - Center Wing Tank Lower Skin
CW214	C-2165	This piece was renumbered as CW229
CW215	C-251	This piece forms the corner between the right side-of-body rib and the front spar. It extends inboard about 10 inches, and aft past S-22. The upper surface is lightly sooted and/or grimy. The lower surface is moderately sooted. All fracture surfaces are clean.
CW216	C-2148	This piece extends aft from the front spar almost to S-20, and left/right from BL 0 to RBL 98. The upper surface is lightly sooted from the front spar to S-23; is lightly to moderately sooted between S-22 and S-23; moderately sooted between S-21 and S-22; and moderately to heavily sooted from S-21 to the aft end of the piece. The sooting is lighter where S-22 and S-23 would be located. Green primer is mostly intact, except for some scratches and gouges. The lower surface is heavily sooted. The enamel is lightly blistered in areas visible through the soot. Areas under missing pieces of fittings at RBL 42 and RBL 76 are relatively clean. The fracture surface at the front spar chord is moderately sooted. The forward/aft fracture surface at ~ RBL 2 is sooted. The forward/aft fracture surface at the outboard edge of the piece is slightly darkened. It is not clear whether this is light sooting or the result of exposure to sea water. The aft fracture is slightly darkened inboard to ~ RBL 40, where the darkening increases to the inboard end.
CW217	C-2093	This piece extends from LBL 68 to LBL 90, and from just aft of S-4 to S-5. The upper surface is lightly sooted. The lower surface is moderately to heavily sooted. All fracture surfaces around the periphery are sooted. The fracture surface along the tear between S-4 and S-5 is clean.
CW218	C-2161	This piece extends aft from the splice at S-15 to ~ half way between S-13 and S-14, and has mating surfaces on CW207 and CW206. The upper surface is lightly sooted. The CW218 area around the mating part of CW206 is similar to the CW206 area. However, the CW218 area around the mating part of CW207 is markedly different from the corresponding heavily sooted CW207 area.

Log #	Tag #	Observations - Center Wing Tank Lower Skin
		The lower surface is heavily sooted. The CW218 area around the mating part of CW207 is markedly different from the corresponding relatively clean CW207 area. The outboard fracture surface is clean. The forward surface along the splice is clean. The fracture surface mating with CW207 is sooted.
CW219	C-2159	This is a small part aft of the splice at S-15 from LBL 127 to LBL 115. It mates with CW218 inboard along a fracture under the stringer flange. The upper surface is lightly sooted. The sealant and primer are undamaged. The lower surface is heavily sooted. The sealant and primer are undamaged. The fracture surfaces are darkened and corroded. They do not appear to be sooted.
CW220	Z-2673	This piece is part of S-22 and extends from ~ RBL 82 to RBL 115. This part attaches to the upper surface of CW201. The forward surface has light to moderate sooting from RBL 100 to RBL 113. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The aft surface has non-uniform, moderate sooting at ~ RBL 106. The primer is not blistered, burned, or discolored. The top of the stringer has non-uniform moderate sooting and there is a splatter mark of an unidentified brown/black material at ~ RBL 106. There is light to moderate sooting on ~8" of the underside of the top of the stringer. The fracture surfaces do not appear to be sooted but it is difficult to tell because of corrosion.
CW221	Z-3492	This piece is located at the forward left corner, and runs from the front spar to S-15, and from the left side-of-body rib to RBL 36. The inboard fracture from the front spar to S-21 is at BL 0. There is a tear at S-21 outboard to ~ RBL 33. At the splice at S-20 the piece mates with CW216 from the front spar aft to S-20, and with CW201 from S-20 aft to S-15. The upper surface has moderate sooting from the aft edge to a diagonal line between ~ LBL 66 at S-15 and BL 0 at S-21. There is also moderate sooting from the outboard edge to about LBL 80 between S-19 and the front spar. The lower surface is lightly sooted at the side-of-body left rib.

Log #	Tag #	Observations - Center Wing Tank Lower Skin
		The sooting is moderate to heavy inboard beginning at ~ LBL 45, except that a band adjacent to the fracture between S-15 and S-20 at RBL 18 to RBL 26 is only lightly sooted; this is in contrast to the mating surface on CW201, which is heavily sooted. Also, the area between the front spar and ~ halfway between S-22 and S-23 is relatively clean, which is in contrast to the mating piece on CW216, which is moderately sooted. From the front edge of the piece at the keel beam mounting interface at LBL 11, right approximately 11 inches to the fracture and aft approximately 17 inches, there is an area that is free of soot. The forward 2 or 3“ of the keel beam mounting interface at LBL 11 are also generally free of soot. To the left of this area there is extensive sooting/grime. Between the keel beam mounting interfaces, the lower surface from the aft edge forward approximately 50” is heavily sooted. This sooting extends to the right, across the keel beam interface. The aft right edge inboard 3” to 4” from the edge is free of soot. The rivet holes for the stringers are free of soot. The fracture surface on the chord at the front spar is generally darkened, and whether this is due to sooting or exposure to salt water has not been determined. At ~ LBL 66, there is a darker area that may be sooting. All fracture surfaces are darkened. The nature of the darkening was not determined.
CW222	Z-2751	This piece extends from 5” forward to 7” aft of S-2 and from LBL 125 to LBL 107. The aft edge mates with CW210, the forward edge mates with CW212, the outboard edge mates with CW210 and CW224 and the inboard edge mates with CW204. The upper surface is lightly sooted evenly over the surface. It is clean where S-2 was located. The lower surface where the longitudinal angle was at LBL 104 is clean. The remaining lower surface is heavily sooted. The paint is not blistered, burned, or discolored. The fracture surfaces are darkened but the origin of the darkening is unknown.
CW223	C-2168	This piece is at the rear spar and includes 15” of the right wing. The forward edge mates with the aft edge of CW201. The upper surface is very lightly sooted. The primer is not blistered, burned, or discolored. The sealant is pliable and not

Log #	Tag #	Observations - Center Wing Tank Lower Skin
		burned or blistered. The lower surface has non-uniform heavy sooting throughout. Where the angle at RBL 103 was attached is also heavily sooted. Where the fastener heads were is clean. The fracture surfaces are clean.
CW224	Z-2750	This piece extends from S-5 to S-2 between LBL 118 and LBL 127. The inboard edge mates with CW212 and the left surface mates with CW210 and CW222. The upper surface is very lightly sooted. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The area where S-3 and S-4 were is clean. The lower surface has localized heavy sooting near the inboard and outboard edges. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The fracture surfaces are darkened but the origin is undetermined because of corrosion.
CW225	Z-2756	This piece extends from S-10 to S-9 and from RBL 112 to RBL 91. The forward, outboard, and aft edges mate with CW201. The inboard edge mates with CW226. The upper surface is very lightly sooted. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The lower surface is heavily sooted. The paint is not blistered, burned, or discolored. The fracture surfaces are too corroded to determine if sooting is present.
CW226	Z-2709	This piece extends from RBL 91 to RBL 71 and from S-10 to S-8. The outboard edge mates with CW225, the aft edge mates with CW201 and the inboard edge mates with CW205. The upper surface is lightly sooted. Where S-9 was is clean. The primer is not blistered, burned, or discolored. The lower surface is heavily sooted. The paint is not blistered, burned, or discolored. The fracture surfaces are too corroded to determine if sooting is present.
CW227	Z-2753	This piece extends from S-14 to S-13 and from RBL 106 to RBL 75. The outboard and aft edges mate with CW201 and the forward edge mates with part of CW201 and CW235. Part of the

Log #	Tag #	Observations - Center Wing Tank Lower Skin
		inboard edge mates with CW236. The upper surface is lightly sooted. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. Forward of the forward row of fastener holes of S-14 there is light to moderate sooting with isolated areas of heavy sooting. At five fastener holes, there are patterns of sooting with heavy sooting in the center fanning forward (to the right and left) to lighter sooting. The fracture surfaces are too corroded to determine if sooting is present.
CW228	Z-2710	This piece extends from S-6 to S-5 and RBL 80 to RBL 55. The forward and inboard edges mate with CW205. The aft edge mates with CW202 and the outboard edge mates with CW201. The upper surface is lightly sooted. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. Fastener holes at S-6 and ~ RBL 65 have soot trails extending forward and outboard from the holes. The lower surface is heavily sooted. The fracture surfaces are too corroded to determine if sooting is present.
CW229	C-2165	This piece extends from S-13 to S-12 and from LBL 98 to LBL 104. The inboard edge mates with CW207 and the aft and outboard edge mate with CW206. The upper surface is lightly sooted. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The lower surface has localized heavy sooting towards the forward and inboard edges. The paint is not blistered, burned, or discolored. The fracture surfaces are darkened but it is difficult to tell if they are sooted.
CW230	Z-2752	This piece extends from the midspar 3 inches forward and from RBL 2 to LBL 27. The forward and left edges mate with CW207 and the aft edge mates with CW205. The upper surface is lightly sooted. There is shadowing around the S-10 fastener heads. At LBL 11, there are fastener heads missing and where they were is clean. The lower surface is moderately sooted from RBL 2 to LBL 11. Outboard of LBL 11 is lightly sooted. The paint is not blistered,

Log #	Tag #	Observations - Center Wing Tank Lower Skin
		burned, or discolored. The fracture surfaces appear clean.
CW231	Z-2715	This piece extends from S-10 to half way to S-9 and from RBL 18 to RBL 42. The aft and left edges mate with CW205. The upper surface is moderately sooted. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The lower surface is uniformly moderately sooted. There are splatter marks in a fore/aft line at ~ RBL 28. The fracture surfaces are too corroded to determine if sooted.
CW232	Z-3376	This piece extends from S-13 to S-10 and extends from RBL 11 to RBL 62. The forward right edge mates with CW201, the aft edge mates with CW205, the left edge mates with CW207 and the forward left edge mates with CW208. The upper surface is moderately sooted including areas where the stringers detached. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The lower surface is heavily sooted including the area at RBL 11 where the "T" was. The paint is not blistered, burned, or discolored. The fracture surfaces are too corroded to determine if sooted.
CW233	Z-2703	This piece mates with the front spar, extends ~ 5 inches aft, and extends from RBL 94 to RBL 114. The lower flange of the lower chord overlaps CW234 by ~ 8 inches. The inboard and aft surfaces mate with CW216. The upper surface is lightly sooted with localized moderate sooting at RBL 106. The lower surface is clean outboard of RBL 116 where the lower chord mates with CW234. There is heavy sooting inboard of RBL 116. Where fastener heads are missing the area is clean. The fracture surfaces are clean.
CW234	Z-2757	This piece mates with the front spar, extends to S-23 and extends from RBL 106 to RBL 120. The inboard edge mates with CW233 and the aft edge mates with CW201. The upper surface had overall light sooting with localized moderate sooting at ~ RBL 106. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The joint with the front spar is clean.

Log #	Tag #	Observations - Center Wing Tank Lower Skin
		The lower surface has some moderate sooting with some localized heavy sooting towards the front spar and inboard of RBL 106. The area of the attach strap is clean and the areas where the fastener heads were are also clean. The primer is not blistered, burned, or discolored. The fracture surfaces are darkened but the origin of the darkening is unclear.
CW235	Z-2754	This piece extends from S-15 to S-14 and from RBL 75 to RBL 93. The forward and outboard edges mate with CW201, the aft edge mates with CW227, and the inboard edge mates with CW209. The upper surface is moderately sooted. The area where S-15 was is clean. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The lower surface is uniformly moderately sooted. The fracture surfaces are darkened, but it could not be determined whether sooting is present.
CW236	C-2755	This piece extends from S-14 to mid way between S-13 and S-12 and from RBL 75 to RBL 45. The forward edge mates with CW209, the left and aft edges mate with CW201 and the right edge mates with CW227. The upper surface is moderately sooted including areas where the stringers detached. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The lower surface is heavily sooted. Where the RBL 57 angle was is moderately sooted. The fracture surfaces are darkened, but it could not be determined whether sooting is present.

There are 23 stringers which are attached to the upper (tank internal) surface of the CWT lower skin. These stringers run transversely, and are numbered sequentially from aft to front, beginning just forward of the rear spar as S-1 and ending just aft of the front spar as S-23.

Some of these stringers display very sharp demarcation lines between sooted and unsooted areas, and these demarcation lines were mapped (see Diagram 4.1). These mappings were created in an attempt to indicate the amount of fuel that was present in the tank at the time of the overpressure. However, these demarcation lines are very inconsistent, and because similar lines are also seen on the upper CWT stringers, the ability to get useful information regarding the amount of fuel was considered unreliable.

4.4 Center Wing Tank Front Spar CW5XX

OVERALL PHOTOGRAPHS

Figure #	Title
27.1	Forward Surface of the Front Spar

SOOTING/FRACTURE DIAGRAMS

Diagram #	Title
5	Forward surface of front spar
6	Aft surface of front spar

Log #	Tag #	Observations - Center Wing Tank Front Spar
CW501	A-018	This piece runs the full height of the front spar, and extends at the bottom from RBL 67 to LBL 26, and at the top from RBL 42 to ~ LBL 18. This piece has several punctures and gashes. The forward face has white enamel, which shows no signs of burning, blistering, or discoloration. The forward surface shows a light coating of sooting or grime, which can be wiped off. The sooting or grime is most evident around two large gashes, which run vertically on the web on either side of BL 0. The gashes are 4" - 6" wide, ~3 to 3.5 feet long, and material is missing from them. The fracture surfaces around the periphery and in the punctures and gashes are darkened. It is not clear whether this is due to sooting/grime or to exposure to salt water. Appears to be light sooting on some fracture surfaces. Nylon wire clamps are present on the front face along RBL 41.77. Wire clamps are broken but not damaged by heat or fire exposure. A black sealant and a brown adhesive run along the top edge of the forward face, but do not appear to be damaged by fire. A wire bundle near RBL 40, including flexible, shrinkable plastic sleeve insulators, shows very light soot, no melting or burning; flexible plastic parts remain relatively pliable. On the aft face, a mating plastic sleeve for the wire bundle is relatively brittle and appears blackened. Wiring shows medium sooting. The lap joint splices are sooted.
CW502	A-021	This piece runs the full height of the front spar from ~ LBL 17 to LBL 73. There are punctures in this piece, one is ~3.5" by 2.5" with the edges curling both forward and aft at ~ LBL 38, one ~3 x 5 inches with the edges curling aft located at ~ LBL 46. Puncture has small amount of material missing. There are scattered areas of light sooting or grime on forward face. Wire bundle at ~ LBL 40

Log #	Tag #	Observations - Center Wing Tank Front Spar
		has shrinkable plastic insulating sleeve intact and relatively pliable; wire insulation shows no signs of melting or burning. Plastic "P" clamps running vertically along LBL 61.65 show mechanical damage but no melting or discoloration. Forward face is white enamel; paint shows no signs of bubbling or discoloration. Sealant and corrosion inhibiting compound (CIC) on forward face is blackened. Aft face is primed, shows no sooting or thermal effect. The lap joint flanges are sooted. Fracture surfaces appear clean.
CW503	C-251	This piece forms the forward right lower corner of the center wing tank, and comprises small pieces of the center wing tank front spar, right side-of-body rib, right wing front spar, center wing tank lower skin, and the right wing lower skin. The forward surface on the center wing tank front spar section has moderate sooting. The aft surface on the center wing tank front spar section has moderate sooting. The fracture surface on the area below the dry bay access hole on the forward face of the center wing tank front spar section is heavily sooted; the painted area surrounding this fracture is heavily sooted. On the wing front spar section of this piece, there is moderate sooting on the forward surface inboard of the remnants of the fiberglass composite barrier at WBL 150, and heavy sooting outboard of that barrier. On the aft surface, there very light to no sooting. The paint and primer show no peeling, blistering, or discoloration. The fiberglass panel perpendicular to the forward face at WBL 150 is burned away, leaving a charred remnant attached to the piece. The area of the lower chord at the lower inboard corner of the piece (normally covered by adjacent chord) has a charred area ~3 sq. in. on the upper corner of the exposed chord. The lower (external) surface of the lower center wing tank skin was primed and painted with enamel. The enamel is missing in about 20% of the area; the remaining enamel is blackened. The exposed primer is intact and not discolored. An area of the fracture surface on the aft face ~ 30" outboard from the right side-of-body rib has a very thin brown line (<1 mm wide) at its edge. The aft face of the part is very lightly sooted/grimy. There is no blistering, peeling, or discoloration of the primer.

Log #	Tag #	Observations - Center Wing Tank Front Spar
CW504	A-236	This piece mates with CW515. There is a small amount of insulation covering still stuck to the corrosion inhibiting compound on the forward surface of the web. Fracture surfaces appear clean. The forward face has very light soot/grime. At the upper outboard corner of the aft surface, there is an area of brownish, elastic material in a non-uniform splattered pattern. The area is roughly triangular, extends across the fracture between CW504 and CW515, and is bounded by the top of the piece, the left side of CW504 and a hypotenuse from ~30" down on the left edge to ~ LBL 83 at the top of CW515. The material exists on the web and all faces of stiffeners. The density of the splatter pattern decreases from the upper outboard corner moving down and inboard. There are small punctures with edges curled forward near the top at LBL 95 and near LBL 76, ~2 feet from the bottom of the piece.
CW504a	C-2108	This piece is a vertical stiffener. All faces have moderate sooting. Some charring of sealant is evident on the forward face. The fracture surfaces show some corrosion. The forward fracture surface of the upper surface shows moderate blackening. The primer shows no blistering, peeling, or discoloration.
CW505	C-2140	Pieces CW505, CW506, CW507, CW508, CW509, CW510, CW511, CW516, and CW402 have been riveted together with zinc "mend plates" in the mockup. Most fracture surfaces are hidden. Visible fracture surfaces appear clean. There is light grime/sooting on the forward face. Numerous bolts, used to attach C-2140 to C-2135 and C-2018 during manufacture, are pushed partly out of their holes (heads displaced toward the nose of the aircraft). The aft face is predominantly clean with some areas of very light sooting. There is no melting, blistering, peeling, or discoloration of paint, primer, or sealant.
CW506	C-2135	See descriptive information found under CW505.
CW507	C-2186	See descriptive information found under CW505.
CW508	C-2137	See descriptive information found under CW505.
CW509	C-2018	See descriptive information found under CW505.
CW510	C-2141	See descriptive information found under CW505.
CW511	C-2187	See descriptive information found under CW505.
CW512	A-238	There is very light sooting or grime on the forward face of the web and on stiffener sides. The forward face of the stiffener is clean. Very small pieces of insulating blanket remain stuck to the adhesive/sealant/CIC on the forward face of the web. Along ~ RBL 49 on forward face of skin section, ~8" from the top of the piece, there is an area ~1.5" in diameter containing numerous black, soot-like particles adhering to the painted surface. Sealant, paint, and primer show no blistering, peeling, or

Log #	Tag #	Observations - Center Wing Tank Front Spar
		discoloration.
CW513	A-500	Forward face is lightly sooted/grimy. Aft face is very lightly sooted except that portion which mates to the underlying stiffener (A-238), which is clean. Paint, primer, and sealant show no blistering, burning, or discoloration. Fracture surfaces are clean.
CW514	A-459	The forward face is very lightly sooted or grimy. Other faces and fracture surfaces are clean. Paint and primer show no blistering, burning or discoloration.
CW515	A-618	There is a small area of very light sooting on forward face. The aft face shows very light soot. The fracture surfaces are clean.
CW516	C-2226	See descriptive information found under CW505.
CW517	C-801	(Note: this is a large piece consisting primarily of right fuselage skin and structure. The area of center wing tank is that below ~ S-26 at STA 1000. Documentation here includes only the center wing tank portion.) Forward face is heavily sooted on the lower portion. With sooting decreasing upwards to very light at ~ S-26. Primer is visible through the white enamel on forward and inboard faces. Some white enamel is blistered on forward face. Some fracture surfaces on the lower portion of the front face are sooted. Sealant on inboard face is slightly blistered. Inboard face of stiffener web is burned with ~15% of original primer visible. Aft face has medium sooting out to fasteners, then very light at the fastener lines. Outboard face heavily sooted. Aft fracture faces clean.
CW518	C-851	(Note: this is a very large piece consisting primarily of left fuselage skin and structure. The area of center wing tank is that below ~ S-27 at STA 1000. Documentation here includes only the center wing tank portion.) Aft face is very lightly sooted/grimy. Primer shows no blistering, burning, or discoloration. There is a pliable foam cushion strip extending ~6" horizontally outboard from the plane of the aircraft outer skin. That cushion is still pliable and shows no melting or brittleness. Forward face is lightly sooted; paint and primer show no blistering, burning, or discoloration. Sealant on the inboard face of the STA 1000 former shows some bubbling and slight blackening. Outboard face has light to medium soot; paint shows no blistering, burning, or discoloration. Fracture surfaces appear free of sooting or fire effects.
CW519	Z-3029	The forward face is predominantly very lightly sooted/grimy. The area of the forward face outboard of the ring chord has light to medium soot. Plastic wire clamps on the forward face show no melting. Plastic wire insulation sleeves at terminal GD3360D, GD3358D, and adjacent to braided wire at ~ RBL 81 show no

Log #	Tag #	Observations - Center Wing Tank Front Spar
		melting and remain pliable. Wires, plastic sleeve, and plastic clamp at terminal GD3950D and GD3952D show no melting. The area around the dry bay access hole is lightly charred. There is medium sooting on forward and aft faces. The paint around the hole is scraped off in areas on the forward face. There is a 6" x 48" hole between RBL 58 and RBL 73 with edges curled forward and most material missing.
CW520	C-2026	See descriptive information found under CW505.
CW521		This is a small pieces of the front spar web. The forward surface is lightly sooted or grimy. The aft surface is lightly sooted to clean. All fracture surfaces are clean.
CW522		This is a small pieces of the front spar web. The forward surface is lightly sooted or grimy. The aft surface is lightly sooted to clean. All fracture surfaces are clean.
CW523		This is a piece of the upper chord which is primed. This piece is not sooted.
CW524		This is a piece of the lower chord. This piece exhibits similar characteristics to the other pieces of the front spar web.
CW525		This is a small pieces of the front spar web. The forward surface is lightly sooted or grimy. The aft surface is lightly sooted to clean. All fracture surfaces are clean.

4.5 Spanwise Beam #3 CW6XX

OVERALL PHOTOGRAPHS OF SPANWISE BEAM #3

Figure	Title
28	Spanwise beam #3 Aft Surface Facing Left

SOOTING/FRACTURE DIAGRAMS

Diagram #	Title
7	Forward surface of spanwise beam #3
8	Aft surface of spanwise beam #3

Log #	Tag #	Observations - Spanwise beam #3
CW601	C-868	This tag number is actually two physical pieces of wreckage: 1) a large area of spanwise beam #3 and 2) the spanwise beam - side-of-body stiffener. Piece 1) is described first. This piece shows evidence of elevated temperature. Forward face is heavily sooted. Areas at the upper inboard and bottom outboard corners appear to have been wiped during recovery. Primer in these wiped areas exhibits a greenish-tan (forward face) color. Sealant on front face fasteners is generally missing except in the lower outboard and upper inboard corners. Fracture surfaces inboard of RBL 78 (top) and at fastener line at ~ RBL 94 (top) exhibit a “spiketooth” appearance. Fractures at the fastener lines near RBL 94 and RBL 111 exhibit “broomstraw” appearance near the top. There is a group of fine parallel lines of brown material extending upwards from a burned area at ~ RBL 82, thinning out and terminating ~18” from the top of the piece. The line pattern is interrupted by a fracture ~21” from the top of the piece. The brown line pattern appears identical on both sides of the fracture. Most fracture surfaces curl forward. Holes and fractures between RBL 87 and RBL 95 have edges generally curled aft. The aft face is heavily sooted inboard and has medium sooting outboard. See Figures 28 and 29. The outboard portion has numerous dark splatters throughout. Stiffeners which are missing or separated from the aft face are outlined clearly in sooting at the bottom and more faintly outlined moving upward. Fracture surfaces at the bottom of stiffeners have a broomstrawed appearance. The stiffener at ~ RBL 94 is crushed inboard, nearly flat against the aft face, creating short-radius bends where the stiffener web joins the skin and aft stiffener face. Neither of these bends has fractures along the bend axis. Several other web areas are bent tightly near stiffeners. Sooting is uniform inside these tight bends (i.e. no soot shielding by the bending). A portion of skin near the top

Log #	Tag #	Observations - Spanwise beam #3
		outboard corner is folded down and aft 180^0. Sooting is present inside the folded area to the same degree as outside of it. Piece 2) The spanwise beam - side-of-body stiffener is separated from the rest of the piece. Aft face of this stiffener is heavily sooted. Outboard face is clean. Forward face is heavily sooted with fastener heads outlined in soot. This stiffener is not outlined on the forward web face of the main piece.
CW602	A-210	This piece is located from ~ RBL 23 to RBL 53. There are 3 foil-like placard labels still attached to the forward face near the bottom ~ at RBL 38. The forward face has a light to medium deposit of dark material. To determine whether this is soot and/ or grime would require analytical chemical work, which was not done. The fasteners on the forward face exhibit soot/grime tails oriented in the vertical direction across the entire surface of each piece. On the aft face, the top four fasteners common to the stiffener and web associated with the left edge of the stiffener at RBL 33.97 exhibit soot/grime tailing in the upward direction. The lower circumferences of these fasteners exhibit some buildup of soot/grime. The fracture at the top of this stiffener has broken material through the soot/grime tail above the adjacent head. The scabbed surface of this fracture, facing aft, appears free of soot/grime. The upper and forward portions of this fracture appear sooted/grimy. The fracture does not mate with the stub attached to the upper skin. However, it is only 1" to 2" below where the mating fracture must have been. The forward face of this fracture exhibits evidence of impact with another structure, possibly the front spar. Fracture face along fastener line at RBL 50 is sooted/grimy. Fracture face on the extreme outboard edge of the piece is lightly sooted/grime. Fracture face outboard of double fastener line at RBL 34 has medium soot/grime. Other fracture faces are clean. Sealant on all faces is black and pliable. Primer on all faces is not burned, blistered or discolored. A 1" x 3" hole ~36" from the bottom of the piece at ~ RBL 44 has material missing and edges curled aft. The aft face (including inboard and outboard stiffener webs) is very lightly sooted/grimy.
CW603	A-227	This piece is located at ~ LBL 17 to RBL 23 and extends up ~55" from the lower skin. The forward face has a light deposit of dark material. To determine whether this is soot and/ or grime would require

Log #	Tag #	Observations - Spanwise beam #3
		analytical chemical work, which was not done. The aft surface is very lightly sooted. The fracture surfaces are clean. The sealant throughout is black and pliable. The primer throughout is not burned, blistered, or discolored.
CW604	A-475	This piece is located at ~ LBL 17 to LBL 83 and extends nearly the entire height of the beam. The forward face has a light deposit of dark material. To determine whether this is soot and/or grime would require analytical chemical work, which was not done. The aft surface is very lightly sooted. The fracture faces are clean. Sealant throughout is black and pliable. Primer throughout is not burned, blistered, or discolored.
CW605	C-2172	This piece is located at LBL 127.5. The piece is very lightly sooted/grimy on all faces. The fracture faces are clean. Sealant throughout is black and pliable. Primer throughout is not burned, blistered, or discolored
CW606	Z-3045	This piece is located at LBL 127 to ~ LBL 100; WL 140 to WL 156. The forward face has a light deposit of dark material. To determine whether this is soot and/or grime would require analytical chemical work, which was not done. The aft surface is very lightly sooted. The fracture faces are clean. Sealant throughout is black and pliable. Primer throughout is not burned, blistered, or discolored.
CW607	Z-2506	This piece is located between ~ RBL 72 and RBL 79 and measures ~40" up from the bottom of the lower skin shear tie. It comprises mostly the stiffener at RBL 76 and the portion of the web attached to and immediately around it. The forward face has a light to medium deposit of dark material. To determine whether this is soot and/or grime would require analytical chemical work, which was not done. The fasteners common to the stiffener and web exhibit noticeable soot/grime tails in the upward direction. There is considerable buildup of soot/grime on the lower circumferences of these fasteners. These soot/grime tails appear along the length of this piece; however, they appear most noticeably along the lower right fastener row. The forward face is very lightly sooted/grimy. The primer is not

Log #	Tag #	Observations - Spanwise beam #3
		blistered, burned, or discolored. The aft face, including all faces of the stiffener, is very lightly sooted/grimy. The primer on the aft face is not blistered, burned or discolored; the sealant is pliable; a thin piece of cotton/phenolic laminated sheet shim is not burned or discolored. See Figure 29.1 Appendix I. The fracture surfaces of the web are clean. The fracture surfaces of the lower intercostals appear lightly sooted/grimy.
CW608	A-533	This piece is located from ~ LBL 80 to LBL 99 and extends down ~9" from the upper chord. The stiffener at ~ LBL 92 extends down ~16" from the upper chord. The right edge of this piece mates with the left edge of CW604. The forward face is lightly sooted/grimy. The primer on the forward face is not blistered, burned, or discolored. The aft face is clean. The primer is not blistered, burned or discolored; the sealant is pliable. The fracture surfaces are clean.
CW609	Z-2671	This piece is located between ~ RBL 96 and RBL 113 and extends 6-10" down from the upper chord. The entire forward face is heavily sooted and charred. The entire aft face is heavily sooted. What sealant remains is still pliable. All fracture surfaces are sooted.
CW610	Z-2764	This piece is located ~ between LBL 83 and LBL 112 and extends from WL 130 to WL 180. There are faint dark soot tails extending outboard and down from some of the fastener heads. The forward face has a light deposit of dark material. To determine whether this is soot and/ or grime would require analytical chemical work, which was not done. The primer on the forward face is not burned or discolored. Sealant on capseals is black and pliable. A 1" fracture at the upper edge of the piece at ~ LBL 88 has matching fracture surfaces curled aft with slight scuffing of primer. A large fracture area from the upper edge ~12" down between LBL 91 and LBL 98 has a rounded "Y" shape. Most fracture surfaces in this area are bent aft and slightly down. Fracture surfaces of the web areas are clean or lightly corroded. An area at the extreme outboard edge of the piece, ~30" from the bottom, is curled aft.

Log #	Tag #	Observations - Spanwise beam #3
		The outboard 2" of the forward face of this piece exhibits a large number of large-radius concentric arcs of alternating bare metal and primer. Arcs are very closely spaced (<1 mm). An additional horizontal fracture 1" long extends from the edge of the piece radially inward through the concentric arcs. The arcs are continuous across the fracture except for an area ~1 mm wide on each side. On the lower of these two areas, the primer is intact; on the upper, the primer is completely removed. There is a discontinuity in the amount of dark material on the forward surfaces of CW606 and CW611, which are adjoining pieces. The aft face of the piece is lightly corroded and very lightly sooted. The metal has a mottled brownish-gray appearance in the upper third of the piece. Fracture surfaces on stiffeners on the aft face are corroded. Primer on aft face stiffeners is not burned or discolored. One fracture area at the bottom of the piece, at ~ LBL 90 has the edge bent forward and has a brownish-gray color.
CW611	Z-2765	This piece extends from LBL 96 to LBL 127 and from ~ WL 120 to ~ WL 130. The forward face has a light deposit of dark material. To determine whether this is soot and/ or grime would require analytical chemical work, which was not done. On the forward face, there are light soot trails extending upward and slightly inboard from fasteners on the outboard half of the piece. Primer on the forward face is not burned or discolored. Sealant on capseals on the forward face is black and pliable. The aft face is lightly sooted. There is soot shadowing on both horizontal stiffeners on the piece. This shadowing stops and the sooting becomes uniform on the inboard 2-3" of these stiffeners. Primer on the aft face is not burned or discolored. Sealant on the aft face is black and pliable. Fracture surfaces are clean or lightly corroded.
CW612	Z-2763	This piece extends from ~ RBL 78 to RBL 85 and from WL 155 to WL 175. Forward face is lightly sooted. Primer is blackened toward the bottom and tanned further up. Sealant on capseals in the lower portion of the piece is black and cracked, but remains pliable. All above effects diminish rapidly at the middle of the piece (moving upward) such that above the area noted, surface is very lightly sooted, primer is not burned or discolored, sealant is intact, black, and pliable. On the lower forward face, there are several

Log #	Tag #	Observations - Spanwise beam #3
		parallel gouges of varying lengths. None penetrates the web, but all reveal bare metal under the primer. These areas of bare metal are not sooted or burned. On the outboard edge near the bottom there is a 2" long area of metal curled tightly forward with a spiketooth fracture at the top. The aft face is moderately corroded but appears heavily sooted. Many fracture surfaces are corroded and sand-encrusted. Visible fracture surfaces are clean.
CW613	D-2003	This is a piece of spanwise beam #3 web, with part of the stiffener at LBL 83. The piece mates with CW610 above. The forward face is lightly sooted, and primer is not burned, discolored, or blistered. Sealant is black and pliable. The aft face is slightly darkened, except for an area under a missing piece of stiffener at the top of the piece. Fracture surfaces are lightly corroded.
CW614	D-2011	This is a piece of stiffener and web at LBL 11. It mates with CW603 below and with CW604 outboard. The forward face is lightly sooted, and primer is not burned, discolored, or blistered. Sealant is black and pliable. Aft face is generally clean with light sooting on the forward stiffener flange and the forward one inch of the stiffener body. Fracture surfaces are lightly corroded.

4.6 Spanwise Beam #2 CW7XX

OVERALL PHOTOGRAPHS OF SPANWISE BEAM #2

Figure #	Title
30	Spanwise Beam #2, Forward Surface Facing Left
31	Spanwise Beam #2, Aft Surface Facing Left

SOOTING/FRACTURE DIAGRAMS OF SPANWISE BEAM #2

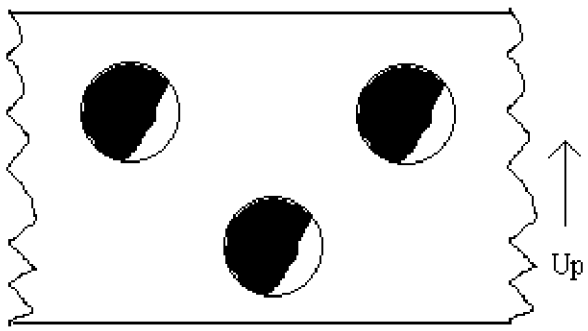
Diagram #	Title
9	Forward surface of spanwise beam #2
10	Aft surface of spanwise beam #2

Log #	Tag #	Observations - Spanwise Beam #2
CW701	C-874	This piece extends from RBL 127 to ~ RBL 98. Aft face is heavily sooted outboard, decreasing to medium then light moving inboard. Sooting is present inside "folds" to the same degree as flatter surfaces. Fracture surfaces are clean with the exception of the upper 6" of a fracture in the stiffener at RBL 106, which is very lightly sooted. Areas under missing fastener heads along outboard edge of aft face are clean. Primed areas generally have light to medium sooting, no burning or discoloration. One primed area, around fastener lines at the upper outboard corner of the aft face, is free of soot. The outboard 6" of two horizontal stiffeners nearest the upper outboard corner are burned. The area of aft face (near top) where stiffener at RBL 98.5 has pulled away, is clean. See Figure 33 Appendix I. The fuel vent tube contained in this piece is flattened. See Figure 32 Appendix I. The flattened tube lies parallel to the upper edge of spanwise beam #2 and extends inboard from the manufacturing hole. Most fractures on the vent tube are flattened, with a few remaining curled radially outward. The visible portion of the inside of the vent tube is clean. There is a regular, 3/8" diameter hole in the vent tube wall in a position ~10" forward of spanwise beam #2 forward face (in the intact aircraft). Metal is curled outward (relative to tube axis). Forward face has moderate to heavy sooting outboard, in the center of the piece, decreasing very slightly inboard and decreasing to light sooting at the top and bottom. Primed surfaces at the outboard edge are clean on the outboard face, lightly sooted at the top of the forward face, increasing to heavy sooting at the bottom of the forward face. Some soot shadowing is present at fasteners in the above primed area, with cleaner areas to the lower inboard of the fasteners. An area of the piece

Log #	Tag #	Observations - Spanwise Beam #2
		at the upper outboard corner forward face is a primed panel (behind a cutout). The primed area below the top stringer is heavily sooted (bare metal surrounding this area is nearly clean). A plastic/nylon "P" clip on the forward face near RBL 112.4 is melted.
CW702	C-224	This piece extends from ~ RBL 30 to RBL 91. Its upper surface adjoins the lower surface of the center wing tank upper skin pieces CW127 and CW102. Piece is crushed laterally. Crush damage is inboard-out to the stiffener at RBL 49 and outboard-in to the same stiffener. Forward Face: The front face is unpainted/unprimed and exhibits a nearly uniform blackish-brown color with medium sooting. See Figure 34 Appendix I. The sooting and coloration on the forward face is uniform inside the folds of the material. See Figures 35 and 36. Plastic/nylon wire clamps on the forward face are melted. Brackets holding those wire clamps are missing at RBL 75.9 and RBL 83.2. The metal under these missing brackets is markedly cleaner than the surrounding surface. See the Wiring Section for photo references and details on wire clamps. There is no "soot shadowing" along rivet lines for stiffeners. The area toward the upper outboard corner of the forward face is less sooted than the rest of the piece. Primer along the bottom edge of the piece (under stringer in the intact aircraft) and on the top stringer is very lightly sooted. The area of the lower side of the center wing tank upper skin immediately above spanwise beam #2 is heavily sooted except near rivet holes. Two remaining rivets on the same surface of upper tank skin near RBL 33 show soot shadowing with the clean area inboard of the rivet head. Sealant appears to have retained its original black color and its original pliability. The "folds" of the piece show no fractures along the fold axes. Aft Face The aft face has light-to-medium sooting and appears less darkened than the forward face. See Figures 37, 38, and 39. Areas which were originally under the stabilizing straps on aft faces of stiffeners are markedly less sooted than surrounding metal. Sooting decreases toward the bottom of the piece. The inboard, outboard, and aft faces of stiffeners are sooted the same as the surrounding web with the following exceptions: the outboard faces of stiffeners at RBL 83.2 and 75.9 are clean, as it the aft face of stiffener at RBL 83.2. Noticeable

Log #	Tag #	Observations - Spanwise Beam #2
		soot buildup exists on the surface immediately above many rivets along RBL 33, 41, and 49. This buildup is absent on visible rivet lines further outboard. Primer along the aft face bottom edge has some areas of light sooting. Torn skin around the perimeter of the piece is generally curled forward, with some areas curled aft. The aft face of stiffener at RBL 41.7 is curled up at the bottom ~6". The fracture faces are free of soot. Fracture of the web near the top stringer between RBL 70 and RBL 75 has black material resembling sealant on the fracture surface. Fracture surfaces visible from the aft face are clean.
CW703	A-490	This piece is a right hand access door located between ~ RBL 8 and RBL 30. Front face is lightly sooted at the top, clean below. Front face is primed with no burning, blistering, or discoloration. See Figure 40 Appendix I. Aft face is bare metal. On the aft side there is an area of light sooting near the outboard side of the piece, ~10" from the top. There are streaks of light sooting near the center, on an axis from lower outboard to upper inboard. The entire piece is curled slightly forward. There is a large "U" shaped tear ~12" long in the lower outboard section extending into sooted areas of aft face noted above. The metal is curled very slightly forward with no scrapes or scuffs noted on the aft face. See Figure 41 Appendix I. Fracture surfaces are uniformly corroded.
CW704	B-2003	This piece is located between LBL 3 and ~ RBL 32. The lower portion is attached to the lower chord and is ~20" high. It contains the complete stiffener at RBL 17 (~72" high and 5" wide). Forward face is heavily sooted and black at the top along RBL 25.2. Outlines of all missing fasteners (except the topmost) along RBL 09 and RBL 25.2 are clearly discernible and relatively free of soot. Sooting on the remaining front face is medium to light. Primer on the forward face of the bottom chord is heavily sooted in some areas, with no burning, blistering, or discoloration. An area ~1" x 16" along the bottom front face of the bottom chord is irregularly scraped free of primer. The primed surface of the front face web (under the chord in the intact aircraft) is clean. Two fasteners on the forward face of the bottom chord near RBL 33 are missing heads. The missing heads are outlined in soot and the remaining fastener shank has

Log #	Tag #	Observations - Spanwise Beam #2
		primer visible on the top (head) face. Sealant at the bottom edge of the bottom chord is black and pliable; shows no burning or melting. Fracture faces are clean. Most tears and punctures have metal deformed forward. A large tear or puncture at the top of the piece near RBL 25.2 has metal bent 180^0 forward with very short radius bends. A tear at the upper corner of the piece, near RBL 33, has metal curled tightly aft. The relatively horizontal portion of a tear near RBL 33 fastener line, ~6" above the bottom chord, has an area ~1/2" long that exhibits a very fine "spiketooth" appearance on both fracture surfaces. The "teeth" are ~1 mm long. There is an irregularly shaped hole ~3/4" in diameter at ~ RBL 21 ~10" from the bottom chord. The metal around the hole is curled tightly forward. See Figure 42 Appendix I. Several fasteners along the horizontal portion of the bottom chord are pushed part way out (moved upward). Several missing fastener heads on that surface at ~ RBL 22 are outlined in soot. Sealant on that face and on the bottom aft edge of the chord is black and pliable; it shows no melting or burning. The aft face has medium to heavy soot; areas under original stiffener positions are relatively clean. (Note: found in one piece, cut into two pieces per NTSB)
CW704	C-2003	The forward face is heavily sooted. Sooting decreases to medium in the area of the stiffener at RBL 09 at the lower end. The lower outboard portion of web skin is bent aft and has a brownish color. Fracture surfaces are free of soot. Tears in web have metal curling forward with very short radii. The forward face of the stiffener is visible at the lower 6". The primed surface at that point is lightly sooted. The area surrounding the fastener shank immediately below the fracture line of the web on the lower stiffener forward face is heavily sooted in a ring pattern slightly larger in diameter than the fastener hole above it. The outboard face of the stiffener at RBL 09 is heavily sooted; inboard face appears to have been heavily sooted at the top (piece appears to have been wiped to enable marking during recovery). Soot on the inboard stiffener face decreases to very light at the bottom. Aft face of stiffener at RBL 09 has medium sooting with numerous dark black splatters. A small amount of primer at the bottom of the aft stiffener face is blistered and has medium soot. Bottom face is lightly sooted.
CW705	C-2170	This piece is located between LBL 9 and LBL 34. It is ~54" in length down from the upper stringer and contains the frame of an access door. There is heavy sooting and charring on the piece. The access panel facesheets are missing and the aluminum honeycomb core is shredded with the majority of fragments of

Log #	Tag #	Observations - Spanwise Beam #2
		core remaining curled forward. See Figures 43 and 44. On the forward face, metal under the stabilizing strap at the bottom and at the tops of stiffeners at LBL 9 and LBL 17 where web skin is missing are clean to lightly sooted. The metal comprising the web, where visible through soot, exhibits a brownish color. Primer at the top forward faces of stiffeners at LBL 9 and LBL 17 shows no blistering, burning, or discoloration. Aft face, including inboard and outboard stiffener faces, has medium sooting and extensive areas of black splattering. Most web skin is missing between stiffeners with fracture edges predominantly curling forward. Two areas 2" long, immediately outboard of LBL 17 and LBL 34, are curled tightly aft. Primer on the extreme outboard bottom of the piece is burned. The entire piece exhibits a bulged appearance in the forward direction.
CW706	B-2002	This piece extends from LBL 24 to LBL 3, and extends ~20"up from the lower chord. The right side of this piece adjoins the left side of CW704. The left half of the bottom face of the lower chord is moderately sooted and the right half is lightly sooted. The forward face of the lower chord is heavily sooted. The primer is not blistered, charred or discolored. Sealant between lower chord and tank floor is black and pliable; no blistering or burning. Some fastener soot shadowing on front face of chord, with cleaner areas generally outboard and down. Several fastener heads near BL 0 are heavily sooted on the upper right (with respect to the aircraft) 2/3 with the surrounding chord area clean:  View looking aft Forward face of web above chord is heavily sooted and has a brownish color. Web skin is bent forward. Most fracture surfaces curl forward. Fracture surfaces are corroded but appear free of soot. Top face of chord has primer and sealant. Sealant is black and pliable; primer is very lightly sooted with no burning, blistering, or discoloration. Aft face is lightly sooted from bottom up to ~3", then heavily sooted above. A missing fastener head near LBL 09 on the forward face is outlined in soot. No

Log #	Tag #	Observations - Spanwise Beam #2
		noticeable soot shadowing elsewhere. Primer on aft face is not burned, blistered, or discolored.
CW707	C-2151	This piece is the upper paddle fitting and is located at ~ RBL 127. Forward face has light sooting on primed area, medium sooting on unprimed area. Primer not blistered, burned, or discolored. A bracket on the forward face is heavily sooted; nylon/plastic "P" clip melted. Aft face has an area of medium sooting inboard; heavy sooting outboard along flange edges. Soot shadowing evident at fasteners and in a machined groove, with cleaner areas to lower inboard. Primer on aft face is not blistered, burned, or discolored.
CW708	C-2275	This piece is outboard of and mates with CW702 (tag C-224). Primer on forward face at the bottom is clean. Forward face is heavily sooted, exhibits a brownish color, and has numerous dark splatter marks on the surface. A portion of the forward face of the stiffener at RBL 91.1 is visible above the web and is clean. Fracture surfaces are clean. The piece is crushed laterally, resulting in numerous folds of the web skin. Sooting and color are relatively uniform inside the folds and on flatter areas. There are several fracture lines along the fold axes. A series of vertical, parallel scrape marks exists inboard of RBL 91 near the bottom. The scrape marks are free of soot. The vertical, parallel orientation extends around a short-radius 180^0 bend in the skin and across a tear in the skin. The aft face has light to medium soot. A missing stiffener at ~ RBL 109 is outlined in soot. Primer on the aft face is not burned, blistered, or discolored. Most fracture surfaces curl forward.
CW709	C-2265	Bottom face of chord is clean. Forward face is lightly sooted. Primer has no burning, blistering, or discoloration. Sealant is black and pliable. Part of a fitting on the forward face is missing and outlined clearly in soot. The top face of the beam running fore-aft through spanwise beam #2 is clean forward of spanwise beam #2 and heavily sooted aft. Web skin does not appear discolored. Aft face is very lightly sooted from bottom up to ~3", then heavily sooted above. Missing fastener heads are indistinctly outlined in soot. Primer on aft face is not burned, blistered, or discolored. Sealant on aft face is black and pliable. Fracture surfaces are clean. Fracture surfaces are predominantly flat, with some curling slightly aft and some curling slightly forward.
CW710	Z-2540	The inboard and outboard stiffener web faces have medium sooting and black splatters. The aft stiffener face is very lightly sooted. No soot shadowing is evident. The lower 6" of the aft stiffener face is separated from the stiffener web and curled aft. The forward stiffener face and attached skin has medium soot.

Log #	Tag #	Observations - Spanwise Beam #2
		Fracture faces are clean. A nylon "P" clamp near the top of the piece is melted.
	Z-3103	All faces of the stiffener and attached skin are free of sooting except an area ~2" x 6" on the lower inboard stiffener web face, which is lightly sooted. The forward faces of the stabilization straps have medium soot; the aft faces of the straps have no soot. Skin inboard of the stiffener is curled forward. On the forward face of the curled skin, the skin area attached to the stiffener is a gray-brown color; the skin inboard of that area is a brighter, silver-gray color. The line of demarcation between the two colors is ~ vertical, with a noticeable curve inboard ~ 4 feet from the bottom. The aft face of the same skin area is similarly colored. The color demarcation line on the aft face is ~ vertical, 1/2" inboard of the demarcation line on the forward face, and does not exhibit the curve noted above. Primer at the bottom stringer area is clean with no burning, blistering, or discoloration.
CW711	Z-3259	This piece is located at ~ LBL 57 and is ~12" wide and 36" long. It is located above, but does not adjoin, CW709. The lower half of the forward face of the web is moderately sooted and the upper half is lightly sooted. The upper 2/3 of the aft face of the web is moderately to heavily sooted and the lower 1/3 is heavily sooted. The upper and lower surfaces of the intercostal are heavily sooted, as are the inboard and outboard surfaces of the adjoining stiffening angle. The inboard fracture surfaces show evidence of soot. The sootiness of the outboard and aft facing fracture surfaces is difficult to determine due to the gauge of the aluminum and the presence of corrosion products. The primer on the straps is heavily sooted but not blistered, charred or discolored.
CW712	Z-2815	This is a piece of spanwise beam #2 web approximately one foot square at LBL 93. It contains the manufactured 5" hole for the refuel snorkel to pass through. Front and rear faces are slightly darkened but appear free of soot. The front face has areas of bluish-copper color near the bottom and outboard edges. No sealant, primer, or paint is on the piece. Fracture surfaces are moderately corroded.

4.7 Center Wing Tank Mid Spar CW8XX

OVERALL PHOTOGRAPHS OF MID SPAR

Figure	Title
44.1	Right Hand Aft Surface of the Mid Spar and the Right Half of the BL 0 Rib

SOOTING/FRACTURE DIAGRAMS

Diagram #	Title
11	Forward Surface of Mid Spar
12	Aft Surface of Mid Spar

Log #	Tag #	Observations - Center Wing Tank Mid Spar
CW801	C-224	This is a very large piece which is located from ~ LBL 49 to RBL 85 and includes two access panels. The forward face: From LBL 45 to LBL 34 there is moderate to heavy sooting on the face of the web. The fracture surfaces on the left outboard edge (at ~ LBL 45) are heavily sooted and burned. From LBL 34 to LBL 17 the web face above the access panel is heavily sooted. The entire forward skin of the access panel is missing. There is blue/green structural adhesive remaining only around the periphery of the access panel. The fracture surface along the upper edge is heavily sooted. From ~ LBL 17 to RBL 17 there is a large horizontal fracture ~12”-16” down from the top which begins at LBL 17 and runs to RBL 9. See Figure 112 Appendix I. The lower portion of the fractured section protrudes forward. The web face is uniformly moderately sooted below the fracture and moderately to heavily sooted above the fracture. The fracture surfaces of the large horizontal fracture are moderately to heavily sooted. There is soot shadowing on the rivets at the upper chord. See Figure 47 Appendix I. From RBL 19 to RBL 44, there is a large fracture ~20” long from the lower chord up to the horizontal stiffener below the access panel. The web face is uniformly moderately sooted. The entire face of the access panel is missing. Blue structural adhesive is prevalent around the periphery although some is present in the center of the honeycomb core panel. The aluminum honeycomb core is horizontally fractured in five places with most pieces protruding in a forward direction. See Figure 48 Appendix I. All fracture surfaces, including the honeycomb core fractures, are clean. The primer around the

Log #	Tag #	Observations - Center Wing Tank Mid Spar
		access panel is darkened. The primer on the lower chord is not blistered, charred or discolored. The primer on the upper chord is intermittently sooted on the lower web face. The rivets on the upper chord are shadowed with soot. See Figures 49 and 50. From RBL 44 to RBL 67 the upper surface of the web is lightly to moderately sooted. The lower surface is clean except for a soot shadow at the stiffener at RBL 57. See Figures 51 and 52. The webs of the stiffeners at RBL 57 and RBL 76 are bent inboard. All fracture surfaces are clean. The primer on the upper and lower chords is not blistered, charred or discolored. The lower chord rivets are shadowed with soot. See Figures 53 and 54. Aft face: From LBL 45 to LBL 34 there is moderate sooting on the web face above and below the intercostal. There is heavy sooting on the aft and upper faces of the intercostal. There is heavy to very heavy sooting on the upper 24" of inboard and outboard faces of the stiffener at LBL 34. From LBL 34 to LBL 17 there is heavy sooting above the access panel. The center 50% of the facesheet of the access panel is missing and the remaining piece curls aft. The skin panel is golden at its periphery progressing to brown and dark brown towards the central hole. The core is split ~6" from the top of the access panel and the fractured pieces protrude aft. There are wrinkles in the skin panel at ~ LBL 30. Where the aluminum skin is missing, there is no structural adhesive present. The remainder of the exposed structural adhesive is burned black. See Figure 55 Appendix I. The fracture surfaces of the aluminum honeycomb core are clean. The fracture surfaces of the access panel skin are difficult to see and it cannot be determined if they are sooted or not. The primer on the tripler at the stiffener at LBL 17 is black at the top and darkened at the bottom. There is heavy sooting on the outboard face of the stiffener at LBL 17, moderate sooting on the inboard face, and heavy sooting on the aft face. From LBL 17 to BL 0 there is a large horizontal fracture ~14" from the top. There is moderate sooting above and ~36" below the fracture and light sooting on the lower portion. The intercostal between the stiffeners at LBL 17 and LBL 9 is

Log #	Tag #	Observations - Center Wing Tank Mid Spar
		severely distorted, heat damaged and heavily sooted. The fracture surfaces are sooted. The primer on the lower chord is not blistered, charred, or discolored. The aluminum angle at BL 0 is heavily sooted along the top 50% (~3") and moderately sooted along the bottom 50%. The primer is blackened at the top and darkened at the bottom. From BL 0 to RBL 9 the web face is moderately sooted from top to bottom. The inboard face of the stiffener at RBL 9 is heavily sooted and the outboard face is lightly sooted. From RBL 9 to RBL 17 the aft and upper faces of the intercostal is heavily sooted and the lower face is moderately sooted. The aft face of the midspar web is very lightly sooted above the intercostal and very light to light below the intercostal. All fracture surfaces are clean. The primer at the lower chord is not blistered, charred, or discolored. The inboard and aft faces of the stiffener at RBL 17 are heavily sooted and the outboard face is lightly sooted. From RBL 17 to RBL 34 the web face is uniformly lightly sooted except for the access panel. There is a fracture in the skin of the access panel from top to bottom with the lower inboard edge curling slightly aft. See Figure 46 Appendix I. There is moderate sooting in the skin face. The honeycomb core which is visible contains structural adhesive which is still bright blue. The fracture surfaces of the access panel skin are clean. See Figure 56 Appendix I. The primer on the lower chord is not blistered, charred, or discolored. The inboard and aft faces of the stiffener at RBL 34 are heavily sooted, the outboard face is moderately sooted, and the inboard tripler is moderately sooted. The fracture surfaces are clean. The primer is not blistered, charred, or discolored. From RBL 34 to RBL 45 the web face is lightly sooted. The intercostal is grossly distorted (bent upward) and heavily sooted on all surfaces. The fracture surfaces on both web and intercostal are clean. The inboard and aft faces of the stiffener at RBL 45 are moderately sooted and the outboard face is lightly to moderately sooted. From RBL 45 to RBL 67 the web face is lightly sooted. The intercostal between the stiffeners at RBL 45 and RBL 58 is grossly distorted (bent upward) and is moderately to heavily sooted on all surfaces. All fracture surfaces are clean. The primer at the lower chord is not blistered, charred, or discolored.

Log #	Tag #	Observations - Center Wing Tank Mid Spar
		All sealant is intact and unburned.
CW802	C-2164	This is a piece located from ~ LBL 65 to LBL 90 and extends from the bottom to ~ WL 150. There are 2 fractures on this piece located running from LBL 75 to inboard edge and spaced ~ 12" apart. The forward face of the web is lightly sooted/darkened between the two significant fractures. The aft face of the web is clean except the outboard surfaces of the vertical stiffeners at LBL 87, LBL 75 and LBL 66 are lightly sooted. The fracture surfaces are darkened. The primer along the lower chord is not discolored, blistered or burned on both the aft and forward faces of the web.
CW803	C-183	This piece is located from RBL 127 to the right side of body rib. It is ~ 12" high and contains the upper portion of a fuel vent cutout. Its lower end abuts the upper end of CW805. The forward face is lightly sooted except for moderate sooting around the fuel vent cutout. There is heavy sooting along a narrow strip, ~ 6" long, on the forward edge of the inboard side of the center web of the stiffener at RBL 111.5. The aft face is clean except for moderate sooting around the fuel vent cutout. All fracture surfaces are clean. All primer and sealant is intact with no blistering, charring, or discoloration.
CW804	C-2027	This is a piece of stiffener fitting located at the top of the mid spar web at LBL 111. It is 16" high and ~3" wide. Its upper end is still attached to the upper chord of the midspar and its lower end abuts the upper end of CW806. Both forward and aft faces are clean. The primer is intact with no blistering, charring, or discoloration. All fracture surfaces are clean.
CW805	B-2024	This piece is located between RBL 95 to RBL 116, is 36" high and contains the bottom portion of the fuel vent cutout. Its upper end meets the lower end of CW803. The lower end of the stiffener at RBL 111.5 is bent upward nearly 180 degrees. The forward face is clean except for moderate to heavy sooting around the fuel vent cutout. See Figure 57 Appendix I. All faces of the stiffener at RBL 111.5 are clean.

Log #	Tag #	Observations - Center Wing Tank Mid Spar
		The aft face is clean except for moderate sooting around the fuel vent cutout. See Figure 58 Appendix I. All faces of the stiffener at RBL 111.5 are clean. The fracture surfaces are clean. All primer is intact with no blistering, charring, or discoloration.
CW806	C-2344	This is a piece of stiffener that attaches to the forward face of the midspar web at LBL 111. It is 44" high and ~3" wide. Its upper end abuts the lower end of CW804. Both forward and aft faces are clean. The primer is intact with no blistering, charring, or discoloration. All fracture surfaces are clean.
CW807	Z-2740	This piece is located between RBL 67 and RBL 94, from the upper chord down ~34". The left edge of this piece mates with the right edge of CW801. The forward face of the web is lightly sooted with two moderately sooted ~5"x8" patches on the upper inboard corner and in the upper center portion. There exist the remnants of two brackets ~8" down from the upper chord, both with darkened and peeling primer. The primer on the upper chord is not blistered, burned, or discolored. The aft face is clean except for light to moderate sooting along the length of the stiffener at ~ RBL 75, and light sooting along the length of the stiffener at ~ RBL 85. The primer on the exposed upper chord is not blistered, burned, or discolored; the sealant on this chord is pliable. The fracture surfaces are clean.
CW808	Z-2719	This piece is located from ~ RBL 72 to RBL 104 from the lower chord up ~25". Its left edge mates with the lower right edge of CW801. The upper half of the forward face is lightly sooted with a patch of moderate sooting in the center. The lower half is clean. The primer is not blistered, burned, or discolored. The aft face is clean to very lightly sooted with a patch of light to moderate sooting in the area surrounding a large upper, central dent. The primer is not blistered, burned, or discolored. The fracture surfaces are clean.
CW809	Z-3550	This piece is located from ~ LBL 57 to LBL 98 and from ~ WL 143 to WL 180. The piece mates with CW810 inboard and CW802 inboard.

Log #	Tag #	Observations - Center Wing Tank Mid Spar
		The forward face is very lightly sooted except at the outboard lower portion, which is lightly sooted. Aft face is moderately sooted. Areas at the top of the piece under missing stiffeners at LBL 64 and LBL 56 are outlined in soot and are clean. Fracture surfaces are lightly corroded.
CW810	Z-2762	This piece is located from ~ LBL 52 to LBL 78 and from ~ WL 144 to WL 167. The piece mates with CW809 outboard and CW802 outboard and below. The forward face is very lightly sooted/darkened. The aft face is very lightly sooted/darkened. Fracture surfaces are lightly corroded.
CW811	Z-2782	This is a small piece of web which mates with the right side of CW805 when viewed from the aft side looking forward. It is located ~15" down from the upper chord. All surfaces and fracture surfaces are clean.
CW812	Z-2794	This is a small piece of web which mates with the left side of CW805 when viewed from the aft side looking forward. It is located ~15" down from the upper chord. All surfaces and fracture surfaces are clean.
CW813	Z-2712	This is a small piece of web located on the right side of CW808 when viewed from the aft side looking forward. The piece is located ~15" up from the lower chord. The forward surface is clean. The aft surface is darkened slightly, and may not be soot. The fracture surfaces are clean.
CW814	Z-2711	This is a small piece of web located on the left side of CW808 when viewed from the aft side looking forward. The piece is located ~15" up from the lower chord. The forward surface is clean. The aft surface is darkened slightly, may not be soot. The fracture surfaces are clean.
CW815	Z-2774	This piece is located between LBL 15 and LBL 30 and is ~6 inches high and is 10 inches up from the lower chord. The aft surface is moderately to lightly sooted. There is no sooting where the vertical stiffener, which is missing, would be

Log #	Tag #	Observations - Center Wing Tank Mid Spar
		attached. The forward surface is clean. The fracture surfaces are too corroded to determine if there was sooting on the edges.
CW816		This piece is located between LBL 45 and LBL 65 and is ~20 inches up from the lower chord. It is a piece of the web and the vertical stiffener at LBL 60. The forward surface is clean. The aft surface is lightly sooted/darkened on the right half and is clean on the left half.
CW817	C-2233	This piece is located between LBL 75 and LBL 95 and includes the upper chord, a piece of the web, and a small section of the upper skin coated with CATALAC coating. The forward surface is clean. The upper chord primer is clean and sealant is pliable and undamaged. The aft surface is very lightly darkened.
CW818		This piece is a section of the upper chord between ~ LBL 20 and LBL 45. The aft surface has some darkening. The lower fracture surface is corroded.
CW819	D-2008	This is a small piece of the web which is located ~10" below the upper chord between LBL 100 and LBL 110. There is no evidence of sooting on either surface or the fracture surfaces.
CW820	Z-2793	This is a small piece of the web which is located ~24" below the upper chord between LBL 100 and LBL 108. There is no evidence of sooting on either surface or the fracture surfaces.

4.8 Spanwise Beam #1 CW9XX

OVERALL PHOTOGRAPHS OF SPANWISE BEAM #1

Figure	Title
59.1	Left Half of the Forward Surface of Spanwise beam #1 and the Left Half of the BL 0 Rib.
59.2	Left Half of the Aft Surface of Spanwise beam #1 and the Left Half of the BL 0 Rib.
59.3	Right Half of the Forward Surface of Spanwise beam #1 and the Right Half of the BL 0 Rib.

SOOTING/FRACTURE DIAGRAMS

Diagram #	Title
13	Forward surface of spanwise beam #1
14	Aft surface of spanwise beam #1

Log #	Tag #	Observations Spanwise Beam #1
CW901	C-970	This piece is located from ~ LBL 60 to BL 0 with a small portion on the lower outboard edge extending to LBL 66. It is nearly the total height of the spanwise beam and contains the lower chord shear ties. It contains an aluminum honeycomb core access panel between ~ LBL 34 and LBL 17. It contains two fuel line cutouts at the lower end of ~ LBL 53. The right edge of this piece mates with the left edge of CW906 and the left edge mates with the right edge of CW902. The forward face of the web and all faces of the stiffeners are moderately sooted with a 14"x16" area of heavier sooting on all surfaces at the lower inboard portion. The skin of the access panel is still attached to the web. However it is separated from the web at its top and bottom edges. See Figure 60 Appendix I. It is fractured down the center with most of the fracture surfaces curling aft. The aft face of the forward skin has blue structural adhesive on it which has slightly darkened in shade. The primer which is left on the access door skin is charred and very slightly blistered. The primer on the web near the lower chord is not blistered, burned, or darkened. The aft face of the web is lightly sooted with an area of moderate sooting in the lower outboard portion between LBL 66 and LBL 60. The entire aft skin of the access panel is missing. There is a large vertical fracture running in the honeycomb core. The core is shredded inboard of this fracture with the shreds extending aft. See Figure 61 Appendix I. There is moderate sooting in the core inboard of the fracture. The structural adhesive in the core cells is dark blue at the bottom and burned at the top. See Figures 59 and 62. There are five half-moon shaped areas of sooting on each side of the access panel along the fastener lines for the adjacent stiffeners. There is heavy sooting on the upper surface of the horizontal stiffener directly below the access panel. All faces of the upper chord are moderately sooted with heavier sooting on the aft face and upper surface of the upper flange. See Figures 63, 64, and 65. The shear ties, including their upper faces, are also moderately to heavily sooted. Sooting along the upper chord outboard from ~ LBL 21 is locally heavy outboard of fastener heads. All primer on the aft face is not blistered, burned or discolored; the sealant is not brittle or burned.

Log #	Tag #	Observations Spanwise Beam #1
		All fracture surfaces are sooted. There are three wire brackets on the aft side of this piece. See the wiring section of the center wing tank for details.
CW902	C-897	This piece is located between ~ LBL 60 and ~ LBL 106 and is nearly the height of the spanwise beam. There is a piece ~3"x7" missing between ~ LBL 98 and LBL 90 about midway down the panel. There is a fractured piece of web (~4"x6") at ~ LBL 70 (~33" from the top) which is curled forward ~ 90 degrees. The forward face of the web between LBL 106 and LBL 66 is moderately sooted along the upper 8" of the web; the remainder is lightly sooted. There is moderate sooting around the 4"x6" fracture with heavy sooting on the inboard side of the curled pieces. Between LBL 66 and LBL 60, the web face is moderately sooted with the heaviest sooting at the bottom. The inboard side of the stiffener at LBL 66 is heavily sooted. The aft face of the web is moderately sooted on the portion above the diagonal described from the upper outboard edge to the lower inboard edge. Below that diagonal the web is lightly sooted. The upper chord is non-uniformly sooted. See Figures 66, 67, and 68. The fracture surfaces on the inboard edge of the piece, around the tear between LBL 75 and LBL 66, and on the forward stiffener at LBL 66 are heavily sooted. No primer is blistered, burned, or discolored. The sealant, located on the shear ties, is not brittle or burned.
CW903	C-2131	This piece is located between ~ RBL 53 and RBL 69 from the bottom of the lower chord up 27" with the top 7" folded forward nearly 180 degrees. It contains two fuel line cutouts at ~ RBL 61. Its left edge mates with the right edge of CW906 and its right edge mates with the left edge of CW910. The forward surface of the web is moderately sooted along a 4" band of the inboard edge, on the forward and aft surfaces on the top 7" folded portion and on all surfaces within the fold. The rest of the face and its accompanying stringers, including the area surrounding the fuel line cutouts, is lightly sooted. The primer in the forward surfaces is not blistered, burned, or discolored. The inboard edge and most of the top 4" of the aft face are moderately sooted. The remainder of the aft web face and its accompanying stiffener are lightly sooted. The primer on the aft side is not blistered, burned, or discolored. The fracture surfaces on inboard edge, the upper edge of the

Log #	Tag #	Observations Spanwise Beam #1
		folded portion, and the forward face are heavily sooted. All other fracture surfaces are clean.
CW904	C-2177	This piece is located between the left side of body rib and ~ LBL 108 and extends ~12" down. It consists of portions of the upper chord, the left side of body-upper chord splice plate and a small piece of the spanwise beam web. Its lower edge mates with the upper edge of CW907 and its right edge mates with the left edge of CW902. The forward side is heavily sooted. The primer on the chord and splice plate is not blistered, burned, or discolored. The aft side is moderately to heavily sooted with very heavy sooting on the upper surface of the splice fitting. There are light streaks extending up and inboard (~45 degrees from horizontal) in the heavy sooting on the top row of upper chord fasteners and a light horizontal band along the fasteners below. The primer on the aft side is not blistered, burned, or discolored. All fracture surfaces are heavily sooted. Two seal caps remain at the side of body-chord splice; the sealant is pliable and without evidence of blistering or charring.
CW905	C-2107	This piece is located between ~ LBL 106 and LBL 98 right above the lower chord. It consists of an 8"x8" piece of the spanwise beam web, a 16" section of the lower intercostal on the forward side, and a 10" section of the lower intercostal upper flange on the aft side. The forward face of the web is clean. The outboard face of the lower intercostal is moderately sooted while the inboard face, the lower surface of the upper flange and the upper surface of the lower flange are heavily sooted. The upper surface of the upper intercostal flange is lightly sooted. The lower surface of the lower intercostal flange is clean. All primer on the forward side is not blistered, burned, or discolored. The aft surface of the web and the upper surface of the flange are lightly sooted. The lower surface of the flange is clean. The primer on the aft side is not blistered, burned, or discolored. The fracture surfaces are clean except for heavy sooting on a ~2" section at the upper leftmost corner of the web.
CW906	Z-3272	This piece is located between BL 0 and ~ RBL 52 and is ~52" high. It contains an access panel between ~ RBL 17 and RBL 34. There is an 8" vertical fracture at the lower end of the web near BL 0 with the end of the fracture curling aft. The right edge of this piece mates with the left edge of CW903 and the left edge

Log #	Tag #	Observations Spanwise Beam #1
		of this piece mates with the right edge of CW901. The upper 2/3 of the forward faces of the web and stiffeners are moderately sooted while the lower 1/3 and the outboard faces of the stiffeners are moderately to heavily sooted. The forward skin of the access panel is attached but slightly separated from the web at its top and bottom edges. Primer on the access door is blistered, peeling, and darkened. Primer on the straps, brackets/angles and along the web face at the lower chord is not blistered, burned, or darkened. The aft face of the web is lightly sooted with some areas of light to moderate sooting along the top, bottom and inboard edges. The aft skin of the access panel is missing. The core has four widely spaced horizontal splits ~5" long. The structural adhesive remaining in the cells is bright blue as is the adhesive visible through the cells on the aft face of the forward skin. There are six faint half-moon sooted areas (three on each side) along the lower 2/3 of the access panel, similar to those on CW901 but much lighter. Primer around the access door is not darkened but is peeling. The peeling may be due to the underlying corrosion of the aluminum rather than heat or fire damage. Primer on the aft face of the web is not blistered, burned, or discolored; the sealant, including that on the one remaining lower shear tie, is not brittle or burned. Fracture surfaces are moderately sooted on the bottom edge near RBL 20 and clean or corroded elsewhere.
CW907	Z-2662	This piece extends from the left side of body rib to ~ LBL 108 and from near the upper chord down ~44". Its left edge mates with the right edge of CW902 and its upper edge mates with the lower edge of CW904. The lower half of the web aft face is moderately sooted at the bottom and heavily sooted at the top. The upper half of the web has heavily sooted patches in lightly sooted areas. These heavily sooted areas contain irregular areas of light soot. See Figure 70 Appendix I. The horizontal stiffeners on the aft face are moderately sooted on the top and bottom faces while the aft faces are very lightly sooted. The primer on the horizontal stiffeners and the doubler is not blistered, burned, or discolored. The sealant is pliable and is not blistered or burned. The forward face has heavy sooting at the top decreasing to light sooting at the bottom. There is heavy sooting on the inboard and outboard faces of the top 6" of the stiffener at ~ LBL 116. The sooting continues under the stiffener (which is disconnected from the web) and to the upper corner of the web. The primer on the

Log #	Tag #	Observations Spanwise Beam #1
		forward face is not blistered, burned, or discolored. The fracture surfaces on the upper 50% of the piece and the upper and forward portion of the stiffener at LBL 116 are sooted. All other fracture surfaces appear clean.
CW908	Z-2679	This piece is the forward flange of the stiffener at ~ LBL 108 on the forward side of spanwise beam #1. There is a small portion of stiffener web attached at the very top. Its aft fracture surface mates with the forward fracture surface of the stiffener web. There are the remnants of two straps in the middle of the flange. The forward face of the flange is uniformly lightly sooted except along the top 6" where it is lightly to moderately sooted. The aft face of the flange is clean except for heavy sooting at the top 8" corresponding to the heavy sooting at the top of CW907. All fracture surfaces are clean except for the fracture surfaces of the stiffener web at the top which are heavily sooted. The primer on the straps is not blistered, burned, or discolored.
CW909	Z-2741	This piece is located from ~ RBL 42 to RBL 76 and comprises the upper chord and ~5" of the web face. The forward face is moderately to heavily sooted. The one inch of the upper chord exposed on the inboard edge is clean and the primer on it is not blistered, burned, or discolored. The 2" of the upper chord exposed on the outboard edge is moderately sooted. The primer on it is burned (brown in color) at the top outboard corner. The aft faces of the web and attached stiffeners are moderately sooted. The top and bottom surfaces of both flanges of the upper chord are moderately sooted while the aft face is mostly lightly sooted. Sooting is heavier toward the inboard and outboard edges and shows some soot shadowing around fastener heads. The primer on the aft side is not blistered, burned, or discolored; the sealant is not blistered or burned. All fracture surfaces are sooted, however, heavy corrosion on the lower portion of the web face makes the lower fracture surfaces difficult to characterize.
CW910	Z-2724	This piece is located from ~ RBL 73 to RBL 107 and extends from the bottom of the lower chord up ~22". It contains a fuel line cutout at ~ RBL 96 about 8" up from the lower chord. Its left edge mates with the right edge of CW903. The forward face is clean except for light sooting along the top periphery and in a 3-inch wide vertical band ~10" long at ~ RBL

Log #	Tag #	Observations Spanwise Beam #1
		87. There are dark halos around the upper fastener holes at ~ RBL 79 and ~ RBL 85. See Figure 71 Appendix I. The primer on the forward face is not blistered, burned, or discolored. The aft face is lightly sooted from ~ RBL 68 to RBL 95. The web is clean outboard of RBL 95. The primed area around and inside the fuel line cutout has patches of moderate to heavy sooting. The primer on the aft face is not blistered, burned, or discolored. All fracture surfaces are clean.
CW911	A-2054	This piece is located between ~ RBL 66 and RBL 77 and is ~21" long. The lower outboard fracture surface mates with the upper inboard fracture surface of CW910. Two flaps on the inboard edge (~8" and 12" long) are curled aft nearly 180 degrees. The lower fracture surface of the upper flap is spiketoothed. The forward face of the web is lightly to moderately sooted inboard of the stiffener at ~ RBL 74. It is lightly sooted outboard of the stiffener. The area where the stiffener has separated from the panel is not sooted. The aft face of the web is lightly to moderately sooted inboard of the stiffener at ~ RBL 74 including those areas inside the curled flaps. The lower portion outboard of RBL 74 is clean while the upper portion is lightly to moderately sooted. Soot patterns on the aft face correlate with material thickness and underlying structure. Sooting is heavier in areas that are thin or that have underlying stiffeners. The inboard and upper fracture surfaces are sooted; the outboard fracture surfaces are clean. The primer on the aft face of the exposed stiffener is not blistered, burned, or discolored.
CW912	Z-2725	This piece is located at ~ RBL 71 to RBL 95 and from ~ WL 145 to WL 173. The piece mates with RF17 outboard and CW911 inboard and below. Forward face has light to moderate soot. The aft face has light to moderate sooting. Soot patterns on the aft face reflect material thickness and underlying structure. Sooting is heavier in areas that are thin or that have underlying stiffeners. Two non-metallic "P" clips on the aft face are melted away. Fracture surfaces are generally clean or lightly corroded. There is a fracture at RBL 93 and WL166 that has the fracture surface curled tightly forward.

Log #	Tag #	Observations Spanwise Beam #1
CW913	Z-3394	This is part of the stiffener at RBL 83 with a small area of spanwise beam #1 web attached. The piece mates with CW910 outboard and below and with CW911 inboard. The forward and aft faces are very slightly darkened. The forward face is very lightly sooted. Fracture surfaces are moderately corroded.
CW914	Z-2808	This is one of a group of small spanwise beam #1 pieces assembled together for purposes of reconstruction. Pieces included are CW914, CW915, CW916, CW917, CW918, and CW919. Together, they form part of the right side closure panel in the general area of RBL 107 - RBL 127.5. The assembly is adjacent to CW912 inboard and CW910 below. Primer on stiffeners on the rear faces is not discolored or burned. Forward and aft faces of all pieces are slightly darkened. The forward face of CW918 has a faint bronze color. The rear face of CW914 at the top edge is lightly burned. All fracture surfaces are lightly corroded.
CW915	Z-2809	See description at CW914.
CW916	Z-2810	See description at CW914.
CW917	Z-2811	See description at CW914.
CW918	Z-2812	See description at CW914.
CW919	Z-2813	See description at CW914.

4.9 Center Wing Tank Rear Spar CW10XX

OVERALL PHOTOGRAPHS - REAR SPAR

Figure #	Title
71.1	Left Half of the Forward Surface of the Rear Spar and the Left Half of the BL 0 Rib
71.2	Aft Surface of the Rear Spar

SOOTING/FRACTURE DIAGRAMS

Diagram #	Title
15	Forward surface of rear spar
16	Aft surface of rear spar

Log #	Tag #	Observations - Center Wing Tank Rear Spar
CW1001	C-2280	This piece extends from RBL 85 to the right hand side of the

Log #	Tag #	Observations - Center Wing Tank Rear Spar
(Part of RF17)		tank at RBL 127, and includes a large section of the right hand fuselage and also includes the pickle fork fitting. The following comments apply only to the rear spar section of this piece. On the forward surface, there is localized light sooting on the upper chord. The aft surface is lightly sooted/grimy but does not show fire damage. See Figure 72 Appendix I. All fracture surfaces are clean.
CW1002	C-2146	This piece is at the top of the rear spar from ~ RBL 21 to RBL 80 and includes the upper chord and a portion of the sloping pressure deck. The forward surface outboard of RBL 33 is clean everywhere below the sloping pressure deck. All areas of the sloping pressure deck are heavily sooted and greasy. The capseals on the upper chord and web are mostly intact and are not affected by exposure to fire or heat. The upper chord shows rivet soot shadowing from ~ RBL 33 to RBL 57. See Figure 73 Appendix I. The aft surface inboard of RBL 33 piece is heavily sooted. Between RBL 33 and RBL 46 there is moderate to heavy sooting on the sloping pressure deck. The surface is lightly sooted/grimy outboard of RBL 46. The vertical stiffeners at RBL 46 and RBL 63 are missing, and the green primer is relatively clean. The fracture surface along the inboard edge is darkened. The darkening of this fracture surface does not appear to be as a result of exposure to fire or heat. The fracture surfaces along the lower and right hand edges are not sooted.
CW1003	C-2143	This piece extends from ~ RBL 33 to RBL 87. The upper edge forms a matching fracture surface to the lower edge of CW1002. The forward face is mostly clean with the exception of a small lightly sooted patch at ~ RBL 80 to RBL 83. Light sooting continues onto CW1012. The purge air inlet door is darkened. The areas around the purge air inlet door and the pressure refuel shutoff valve are lighter in color. The aft surface has moderate to heavy sooting inboard of ~ RBL 57 and moderate sooting outboard of ~ RBL 57. At the location where the pressure refuel shutoff valve is located, there is light sooting. Left of RBL 46, about half the enamel has been burned off and the primer is slightly darker.

Log #	Tag #	Observations - Center Wing Tank Rear Spar
CW1004	C-2139	This piece attaches to the upper chord, where it extends from LBL 11 to RBL 33. At the bottom, it extends from LBL 21 to BL 0. Its mates on the right hand edge with CW1002 at RBL 33, and with CW1006 at LBL 21. It also mates with CW1009 (CW1009 is actually two separate pieces attached to the aft end of the keel beam in the mockup. One piece of CW1009 comes from the right side of this piece, and the other CW1009 piece comes from the left side.). The forward surface is heavily burned across the entire piece. The aft surface has heavy sooting on the stiffeners. The webs are heavily burned. The fracture surfaces are sooted and/or burned. The fracture surface at ~ RBL 2 and about three feet down from the upper chord is heavily broomstrawed.
CW1005	C-193	This piece is still connected to the CW203 (C-193) piece of the lower skin of the center wing tank. It extends outboard from ~ LBL 11 to LBL 54. At the inboard end, the web is ~8 inches high, and at the outboard end fractured just below the height of the chord flange. The forward surface (both web and chord) is heavily sooted, and the web at the inboard end is burned. The sooting is markedly discontinuous between CW1007 and CW1005 across the left fracture surface of the lower chord. The aft surface, including the capseals, is heavily sooted. The sooting is continuous between CW1007 and CW1005 across the fracture between the web and the chord. The top and left hand fracture surfaces are sooted. The right hand fracture surface is clean.
CW1006	C-2136	This piece extends from ~ LBL 57 to LBL 11. It extends almost the full height of the rear spar. The stiffeners at LBL 21, LBL 33, and LBL 45 are full length. At the top there is a section of the sloping pressure deck. It mates with the left hand piece of CW1009, and CW1004, but the fire damage to this piece compared to CW1009 and CW1004 is significantly different. The forward surface web and chord are lightly sooted. There are two large and two small nylon clamps that show varying levels of heat damage from very slight to moderate. The chord is relatively clean, but there are a few fasteners which show circular soot trails of ~ a quarter inch pointing down. The forward surface of the sloping pressure deck is heavily sooted and/or burned.

Log #	Tag #	Observations - Center Wing Tank Rear Spar
		The aft surface is blackish, which looks more like grime than soot. There is a different pattern on the inboard surface of the stiffener at LBL 21 extending onto the web, which looks like a dark liquid dried on the surface. The fracture surfaces on the web are clean to slightly darkened. The fracture surface on the upper chord is sooted.
CW1007	C-159	This piece is still connected to the CW204 (C-159) piece of the lower skin of the center wing tank. It extends outboard from ~ LBL 54 to LBL 104. It has the stiffener at LBL 75, where it is ~12 inches high, the highest point. The forward web surface shows slight sooting outboard of the stiffener at LBL 75, and light to moderate sooting inboard of LBL 75. The chord shows light sooting outboard of LBL 75, and heavier sooting on the sealant inboard. The aft surface from the inboard edge to ~ LBL 85 is moderately to heavily sooted. There are scratches and gouges in the area which are sooted. The capseals inboard of LBL 85 show signs of exposure to heat or fire. There is a clamp on the stiffener at LBL 75 up ~8 inches which has rubber that shows heat damage. The aft surface outboard of LBL 85 is not sooted. The fracture surfaces inboard of LBL 80 are sooted. The fracture surfaces outboard of ~ LBL 80 are clean.
CW1008	C-1051	This piece is located at the far left hand side and includes the left half of the pickle fork fitting. The forward surface shows no evidence of sooting or exposure to heat or fire. The aft surface shows no evidence of sooting or exposure to heat or fire. See Figure 74 Appendix I. The fracture surfaces are clean.
CW1009	C-1031	This piece consists of two parts, one connected to the stiffener attached to the keel beam at RBL 11, and the other attached to the stiffener attached to the keel beam at LBL 11. The RBL 11 part is larger than the LBL 11 part. The RBL part extends from ~ BL 0 outboard to ~ RBL 33. Both surfaces show heavy heat damage, and the fracture surfaces also show heavy heat damage including broomstrawing. The LBL part is located ~2 feet above the lower skin, and is about 1 foot high. It shows heavy heat damage to both surfaces, and the fracture surfaces also show heavy heat

Log #	Tag #	Observations - Center Wing Tank Rear Spar
		damage including broomstrawing.
CW1010	C-2138	This piece extends from ~ RBL 11 to RBL 83, and includes the lower chord. It varies in height from ~4 inches to 1 foot. There is a downward split in the piece at ~ RBL 50. Its upper surface mates with the lower surfaces of CW1011, CW1003, and CW1009. The forward surface is heavily sooted from the inboard end of the piece at ~ RBL 11 to the break at RBL 50, and lightly sooted outboard from RBL 50. The aft surface is moderately sooted inboard of RBL 21. It is heavily sooted and burned between ~ RBL 46 and RBL 21. From RBL 46 outboard, the surface is grimy. The fracture surface at the top of the piece between ~ RBL 46 and RBL 11 is sooted. All other fracture surfaces are clean. Capseals on the forward surface are sooted and are not damaged by heat or fire exposure.
CW1011	C-2145	This piece extends from ~ RBL 33 to RBL 68. It is ~ one foot high and attaches to the lower chord. The upper edge of this piece mates with the lower edge of CW1003. The forward surface is heavily sooted and darkened from the far left hand side to ~ RBL 57, where there is no sooting and only slight darkening of the aluminum from RBL 57 to the far right hand side. The capseals and fillet seal at the RBL 57 vertical stiffener are mostly intact and are not damaged by fire or heat exposure. The aft surface has moderate to heavy sooting inboard of ~ RBL 57 and moderate sooting outboard of ~ RBL 57. The fracture surfaces are clean with the exception of the far inboard fracture surface at RBL 33 which is sooted.
CW1012	C-2144	This piece is attached to the stiffener at RBL 85 at the top of the rear spar. It runs between ~ RBL 80 and RBL 90. The forward surface is sooted on the inboard lower corner located at ~ RBL 80 to RBL 83. This light sooting continues onto CW1003 but not to CW1002. The fillet seal is intact and is not sooted. The upper chord rivet line shows soot shadowing. See Figure 75 Appendix I. The aft surface is essentially clean. Fracture surfaces are not sooted.
CW1013	C-2284	This piece extends outboard of LBL 98 to ~ LBL 110, and mates

Log #	Tag #	Observations - Center Wing Tank Rear Spar
		with CW1014 on the inboard edge. The forward surface shows no evidence of sooting or exposure to heat or fire. The aft surface shows no evidence of sooting or exposure to heat or fire. The fracture surfaces are clean.
CW1014	Z-2656	This piece is just inboard of the pickle fork fitting on the left hand side, and has a piece of rear spar web at the top about 9 inches wide, and has the stiffener at LBL 98. Its bottom edge mates with the upper edge of CW1017. The forward surface shows no evidence of sooting or exposure to heat or fire. The aft surface shows no evidence of sooting or exposure to heat or fire. The fracture surfaces are clean.
CW1015	Z-2652	This piece is the outboard leg of the left pickle fork fitting. The forward surface shows no evidence of sooting or exposure to heat or fire. The aft surface shows no evidence of sooting or exposure to heat or fire. The fracture surfaces are clean.
CW1016	Z-3297	This piece is the inboard leg of the pickle fork fitting. The inboard piece at the bottom mates with CW1017. The forward surface shows no evidence of sooting or exposure to heat or fire. The aft surface shows no evidence of sooting or exposure to heat or fire. The fracture surfaces are clean.
CW1017	Z-2726	This piece extends from the lower chord to the lower edge of CW1014, and mates with it. It has the stiffener at LBL 98. The outboard piece of web at the bottom mates with CW1016. The forward surface shows no evidence of sooting or exposure to heat or fire. The aft surface shows no evidence of sooting or exposure to heat or fire. The fracture surfaces are clean.
CW1018	Z-2766	The forward face is very lightly sooted/darkened. Primer at

Log #	Tag #	Observations - Center Wing Tank Rear Spar
		upper chord area is not burned or discolored. Sealant on all faces is intact, black, and pliable. Aft face and upper surfaces (a portion of the sloping pressure deck) are white enamel and grimy. Enamel is not burned, blistered, or discolored. A wire attachment at the top of the aft face has a portion of plastic sleeve attached. The plastic is brittle but not burned or sooted. A remnant of what appears to be plastic or nylon is in a clip at LBL 75. The material is partially melted. There are black radial streaks across the aft face. These streaks are continuous across the area of a missing stiffener at LBL 63. Fracture surfaces are heavily corroded.
CW1019	Z-2767	A large area of the forward face appears to have been wiped during recovery. Remaining area outboard is very lightly sooted. Remaining area inboard is moderately sooted and has a brown/black color. Aft face is grimy white enamel. Paint is not burned, blistered, or discolored. Insulation on wires on the aft face is not burned or melted. Rubber insulating strips on wire clamps (aft face) is pliable, not burned or melted. Fracture surfaces are lightly corroded but otherwise clean.
CW1020	Z-2768	Forward face is very lightly sooted. One area appears to have been wiped during recovery. Aft face is grimy white enamel. Enamel is not burned, blistered or discolored. Fracture surfaces are lightly corroded but otherwise clean.
CW1021	Z-2772	Forward face has corrosion but no soot. The aft, inboard, and outboard faces are moderately sooted. The lower 18” of the outboard face is heavily sooted. Rubber insulating rings on wire clamps are pliable but heavily sooted. Insulation on wiring is lightly burned and brittle. A large diameter plastic sleeve around wiring near the bottom of the piece is heavily sooted and brittle. The piece is nearly intact. The only fracture surface is on a piece of 1” strap on the forward face. That fracture surface is clean.
CW1022	C-2372	This a stiffener at RBL 21. It mates with the rear surface of CW1004. Paint and primer on all surfaces are not discolored, peeled, or blistered.

Log #	Tag #	Observations - Center Wing Tank Rear Spar
		The forward face of the forward stiffener flange is lightly sooted on the lower 18 inches. There is an area of heavy sooting at the fourth fastener hole from the top of this face. The sooted area is fan-shaped and extends from the hole outboard. The area of this face around the sixth through the eighth holes from the top is heavily sooted. The aft face of the forward flange has moderate to heavy sooting from the fourth to eighth fastener holes from the top and near the horizontal support member located approximately halfway up the piece. Sooting in these areas generally covers the primer "rings" under missing fastener heads. The aft and outboard faces of the lower half of the piece are moderately sooted. Fastener heads remaining in this area have heavier soot deposits on their upper portion and slight soot shadowing below them. Primed areas under missing fastener heads on this part of the piece are generally very lightly sooted. The inboard surface of the piece is generally lightly to moderately sooted, with one exception: an area approximately 12 inches long on the bottom half where the aft flange meets the stiffener body. This area is heavily sooted. Fracture surfaces are clean or lightly corroded.
CW1023	Z-2814	This is a stiffener at RBL 46. It mates with the rear surface of CW1002 and CW1003. Paint and primer are not burned, blistered, or discolored. The entire piece is generally moderately sooted. Sooting is heavier on an area of the inboard face of the stiffener body from ~12 inches from the top to ~24 inches from the top. On the forward face of the front stiffener flange, there is heavy sooting at the eighth through tenth fastener holes from the top. This sooting has a fan shaped pattern extending outboard and slightly downward from the holes. The mating surface of CW1003 exhibits a similar fan shaped appearance at the ninth and tenth fastener holes; but the sooting on that surface extends both inboard and outboard. Fracture surfaces are clean or lightly corroded.
CW1024	C-2038	This is the outboard leg of the left rear spar terminal fitting. It mates with CW1015 and CW1008 inboard. The forward surface shows no evidence of sooting or exposure to heat or fire. The aft surface shows no evidence of sooting or exposure to

Log #	Tag #	Observations - Center Wing Tank Rear Spar
		heat or fire. The fracture surfaces are clean.
	Z-4016	This piece forms a portion of the rear spar along LBL 98. The lower fracture surface of this piece mates with the upper fracture surface of CW1017. The piece is approximately 6" in height and extends approximately 3" outboard of the LBL 98 centerline and approximately 10" inboard of the LBL 98 centerline. The forward surface is unsooted. The aft surface is lightly to moderately sooted approximately 2" inboard of the LBL 98 centerline. The remaining forward surface is unsooted. All fracture surfaces are corroded, but appear to be unsooted.

4.10 Center Wing Tank BL 0 Rib CW11XX

OVERALL PHOTOGRAPHS - CENTER WING TANK BL 0 RIB

Figure	Title
44.1	Right Hand Aft Surface of the Mid Spar and the Right Half of the BL 0 Rib
59.1	Left Hand of the Forward Surface of Spanwise Beam #1 and the Left Half of the BL 0 Rib
59.2	Left Half of the Aft Surface of Spanwise Beam #1 and the Left Half of the BL 0 Rib
59.3	Right Half of the Forward Surface of Spanwise Beam #1 and the Right Half of the BL 0 Rib
71.1	Left Half of the Forward Surface of the Rear Spar and the Left Half of the BL 0 Rib

SOOTING/FRACTURE DIAGRAMS OF CENTER WING TANK BL-0 RIB

Diagram #	Title
17	Left Surface of BL 0 Rib
18	Right Surface of BL 0 Rib

Log #	Tag #	Observations - Center Wing Tank BL 0 Rib
CW1101		There is moderate sooting on all surfaces of the part including the fracture surfaces.
CW1102	C-2077	Left side is lightly sooted except for the top half of the aft doubler which is moderately sooted. Right side is heavily sooted on the bottom half of the piece. The top half of the right side is moderately sooted. All fracture surfaces are sooted.
CW1103	Z-2749	Left surface: Piece extends from spanwise beam #1 to the rear spar at BBL 0, piece is moderately sooted on the left surface; upper chord, lower flange face is heavily sooted; outboard aft face of the upper chord is less sooted. Wiring/wiring p clip standoffs are melted and burned. See Wiring section for more details. Right surface: The surface is heavily sooted with standoffs and electrical clips exhibiting mechanical damage and/or heat damage All Fracture surfaces are sooted. The stiffeners are heavily sooted at the aft end of the piece and become moderately sooted towards the forward end of the piece.

Log #	Tag #	Observations - Center Wing Tank BL 0 Rib
CW1104	Z-2702	This piece is part of the BBL 0 rib and extends from ~ STA 1194 to STA 1220 and from ~ WL 127 to WL 136. The piece mates with CW1103 above. The left face is corroded with light to moderate sooting. In the vicinity of STA 1189, sooting is moderate. The right face is corroded with heavy sooting. On the front edge ~3" from the top of the piece there is a spiketooth fracture ½" long. Fracture surfaces are corroded or clean. At the forward upper corner there are two penetrating fractures with fracture surfaces deformed rightward.

4.11 Right Hand Side-of- Body Rib CW3XX

SOOTING/FRACTURE DIAGRAMS OF RIGHT HAND SIDE-OF-BODY RIB

Diagram #	Title
19	Outboard Surface of Right Hand Side-of-Body Rib
20	Inboard Surface of Right Hand Side-of-Body Rib

Note: All references to stringer location (e.g. S-xx) refers to the upper wing stringers.

Log #	Tag #	Observations - Right Hand Side-of-Body Rib
CW301		This piece is located on the upper Center Wing Tank (CWT) skin and extends from S-24 to S-33. It is ~1" to 3" in height and includes the upper edge of the right hand SOB web. The inboard surfaces are moderately to heavily sooted. The outboard surface shows light to no sooting. The fracture surfaces are unsooted.
CW302	C-2279	This piece is a upper double plus chord thin and portions of the top edge of the side-of-body web that extends from the rear spar to S-15. The inboard surface of the web itself is clean to lightly sooted. The inboard surface of the chord to which the web is attached is locally lightly sooted. On the surface facing the center wing tank interior, in the bay between the rear spar and spanwise beam #1, the sooting on the vertical surfaces between the stringers is light at the rear spar and progressively increases to moderate sooting at spanwise beam #1. In the bay between spanwise beam #1 and the mid spar, the sooting on the vertical surfaces between the stringers is light up to the vent stringer (S-10 and S-11). Forward of the vent stringer the sooting progressively increases to moderate at the

Log #	Tag #	Observations - Right Hand Side-of-Body Rib
		mid spar. From the mid spar (S-14) forward to S-18, which is the forward end of the part, the sooting decreases to light. The outboard surface is unsooted.
CW303	C-239	This piece is at the top of the upper side-of-body rib, extends from upper S-14, aft to upper S-20. At upper S-16, the piece extends down from the top of the rib ~40". At spanwise beam #2, the piece measures ~18"-24" from the top of the web. This piece forms part of the side of the tank between the mid spar and spanwise beam #2. The inboard surface show little to no sooting. The outboard surface of the web is clean, and the forward faces of the stiffeners show little to no sooting. All the fracture surfaces are unsooted.
CW304	B-2023	This piece begins at the top of the side-of-body rib, extends from just aft of upper S-10 to just forward of upper S-13, and down to WL 125. This piece forms a portion of the side of the tank between the spanwise beam #1 and the mid spar. The inboard surface is unsooted. The outboard surface is clean. There is a nylon clamp for a wire bundle which shows no damage. All the fracture surfaces are unsooted.
CW305	B-2022	This piece forms a portion of the top of the side-of-body rib, extends from upper S-3 to upper S-7, from WL 170 to WL 125 at upper S-6. Its aft fracture surface mates with the forward fracture surface of CW306. This piece forms part of the side of the CWT between the rear spar and spanwise beam #1. The inboard surface is unsooted. The outboard surface is unsooted. All the fracture surfaces are unsooted.
CW306	C-196	This piece is the upper aft corner of the side-of-body rib. It extends from the rear spar to just forward of upper S-3, and from WL 163 to WL 135. Its forward fracture surface mates with the corresponding fracture surface of CW305. This piece forms part of the side of the tank between the rear spar and spanwise beam #1. The inboard surface is unsooted. The outboard surface is unsooted.

Log #	Tag #	Observations - Right Hand Side-of-Body Rib
		All the fracture surfaces are unsooted.
CW307	C-868	This is a small piece about 9 inches high and 8 inches wide located between upper S-28 and upper S-29, along WL 140. Part of the aft fracture surface mates with a corresponding fracture surface on the forward side of CW308. The inboard surface is moderately to heavily sooted. The outboard surface is unsooted. The fracture surfaces do not show sooting.
CW308	Z-2728	This piece is at the top of the side-of-body rib, and extends from spanwise beam #3 aft to ~ upper S-24 and from WL 185 down to WL 125. This piece forms part of the side of the tank between the spanwise beam #2 and spanwise beam #3. The aft fracture surface mates with the forward fracture surface on CW309. The inner surface is moderately to heavily sooted over the lower 2/3 of the piece. The outer surface is unsooted. The fracture surfaces do not show sooting.
CW309	Z-2727	This piece extends from just aft of upper S-26 to just forward of upper S-22. Its upper end is about a foot and a half below the lower chord of the stringer tie-in, and extends down from WL 170 to WL 120. This piece forms part of the side of the tank between the spanwise beam #2 and spanwise beam #3. The forward fracture surface mates with the corresponding fracture surface on CW308. The inner surface is moderately to heavily sooted over the lower 2/3 of the piece. See Figure 75.1 Appendix I. Some soot tails are evident along rivet row located between S-24 and S-25. The direction of sooting appears to be from aft to forward. Missing fasteners show no sooting where the fastener heads were located. The outer surface is unsooted. The fracture surfaces do not show sooting.
CW310	Z-2729	This piece extends from the front spar aft to ~3" aft of upper S-32. It extends from WL 140 to WL 185. The outboard surface is clean. The sealant is pliable and not burned or blistered. The primer is not blistered, burned, or discolored.

Log #	Tag #	Observations - Right Hand Side-of-Body Rib
		The inboard surface is light to moderately sooted. The upper 16" are light to moderately sooted and the rest is moderately sooted. Most of the fasteners are missing and there is no sooting where the fastener heads were located. The sealant is pliable and not burned or blistered. The primer is not blistered, burned, or discolored. See Figure 75.2 Appendix I. The fracture surfaces are unsooted.
CW311	Z-2707	This piece extends from ~3" aft of lower S-1 to 2" aft of lower S-5 and from WL 125 to WL 145. The aft edge mates with the forward bottom edge of CW312 (~6"). The upper edge mates with CW306. The upper forward surface mates with CW305. The outboard surface is unsooted. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The inboard surface is unsooted. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The fracture surfaces are unsooted.
CW312	Z-2717	This piece extends from the rear spar forward 8". It also extends from WL 128 to WL 153. The lower forward corner (6") mates with the rear aft end of CW311. The remainder of the forward edge (17") mates with CW306. There is a cut out at the upper right surface that is the opening for the jettison line. The outboard surface is clean. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The inboard surface is unsooted. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The fracture surfaces are unsooted.
CW313	Z-2732	This part extends from upper S-31 forward to approximately upper S-33 and from WL 185 down to WL 170. It forms a portion of the right side of body web between the front spar and spanwise beam #3. The forward fracture of this piece mates with the aft upper 1' fracture of CW310. The interior surface is light to moderately sooted. Areas of missing rivet heads are unsooted. The exterior surface is unsooted. All fracture surfaces are unsooted.

Log #	Tag #	Observations - Right Hand Side-of-Body Rib
CW314	Z-2730	This part is located between upper S-29 and upper S-31 and between WL 125 and WL 142. The part measures approximately 19" by 10", and forms a portion of the right side of body web between the front spar and spanwise beam #3. The interior surface is lightly sooted over the bottom 1/3 of the part, while the upper 2/3 is moderately to heavily sooted. The exterior surface is unsooted. All fracture surfaces are unsooted.
CW315 CW316 CW319 CW320 CW322		These are small pieces of side-of-body stringers. All surfaces, including fracture surfaces, are clean.
CW317	Z-2795	This part extends from approximately 4" aft of upper S-32 forward to upper S-33 and extends from approximately WL 130 to WL 150. It forms a portion of the right side of body web between the front spar and spanwise beam #3. The fracture surface on the upper forward 6" of this part mates with the aft lower fracture of CW310. The interior surface is lightly to moderately sooted while the lower forward corner is heavily sooted. Areas of missing rivet heads are unsooted. Soot shadowing shows evidence of sooting direction from lower aft to upper forward. The exterior surface is unsooted. All fracture surfaces are unsooted.
CW318	Z-2798	This part is a portion of a external vertical stiffener extending from its upper attach point between upper S-22 and upper S-23 down to approximately WL 145. There is no right side of body web attached to the stiffener. All surfaces and fractures are unsooted.
CW321	Z-2714	This part is a portion of an external vertical stiffener extending from its upper attach point between upper S-21 and upper S-22 down to approximately WL 145. There is no right side of body web attached to the stiffener. All surfaces and fractures are unsooted.
CW323	Z-2796	This part extends from 3" aft of upper S-7 to 1" aft of upper S-10 and from WL 130 to WL 165. The part measures approximately 22" by 37" and includes a portion of the exterior vertical stiffener. This part forms a portion of the right side of body web approximately 10" aft of spanwise beam #1 and 12" forward of

Log #	Tag #	Observations - Right Hand Side-of-Body Rib
		spanwise beam #1. The forward fracture surface mates with the aft fracture of CW304. The aft fracture surface mates with the forward fracture surface of CW305. All surfaces and fractures are unsooted.
CW324	Z-2804	This part is located between 3" aft of upper S-15 and upper S-16 and extends from approximately WL 135 to WL 141. This part is approximately 6" by 10" and forms a portion of the right side of body web between the mid spar and spanwise beam #2. The upper fracture surface mates with a portion of the lower fracture of CW303. The interior surface is unsooted. The exterior surface is unsooted. All fracture surfaces are unsooted.
CW325	Z-2805	This part is a portion of the lower attach flange for the right side of body web between spanwise beam #1 aft to lower S-7. All surfaces and fractures are unsooted.
CW326	Z-2797	This part is the lower aft portion of the right side of body web and includes the attach flange. The part is located approximately 2" aft of lower S-1 and extends from WL 121 to WL 130. The part measures approximately 9" by 9". All surfaces and fractures are unsooted.
CW327 CW328	Z-2820 Z-2827	These are small pieces of the lower attach flange located between the lower skin lower S-7 through lower S-9. All surfaces and fractures are unsooted.
CW329	Z-2828	This is a small piece of the lower attach flange located between the lower skin lower S-16 through lower S-18. The inboard surface is moderately sooted. The outboard surfaces and fractures are not sooted.
CW330	Z-4001	This is a very small piece of the side-of-body web located at the forward end. The inboard surface is moderately sooted. Where fasteners are missing, there is no sooting. The outboard and fracture surfaces are clean.
CW331	Z-4002	This piece mates with CW305 on the forward edge and with CW311 on the aft edge.

Log #	Tag #	Observations - Right Hand Side-of-Body Rib
		All surfaces including fracture surfaces are not sooted.
CW332	Z-4003	This is a piece of web located at the top of the side-of-body rib just forward of spanwise beam #2. The exterior surface is clean. The interior surface is lightly sooted/grimy. All surfaces including fracture surfaces are not sooted.
CW333	Z-2829	This piece is located at the mid spar. All surfaces including fracture surfaces are not sooted.
CW334	Z-4011	This is a piece of the side-of-body web located at the intersection of spanwise beam #3. The inboard surface is moderately to heavily sooted except where the vertical stiffener was located, which is not sooted. The outboard surface and fracture surfaces are not sooted.
CW335	Z-4012	This is a piece of the side-of-body web located just forward of spanwise beam #3. The inboard surface is moderately sooted. The outboard surface and fracture surfaces are not sooted.
	C-2279	This part is located between upper S-1 and upper S-15 and is attached to the right fuselage / upper wing skin section. This part is the upper portion of the right side of body web which includes mainly the upper surface attach surface. At upper S-14 to upper S-12, the part extends down approximately 12” from the upper attach surface in a triangular shape. The interior surfaces are unsooted from upper S-1 to upper S-8. Beyond upper S-8 forward, the sooting increases to lightly sooted at upper S-15. The exterior surface is unsooted. The fracture surfaces are unsooted.

4.12 Left Hand Side-of-Body Rib CW4XX

SOOTING/FRACTURE DIAGRAMS OF LEFT HAND SIDE-OF-BODY RIB

Diagram #	Title
21	Outboard Surface of Left Hand Side-of-Body Rib
22	Inboard Surface of Left Hand Side-of-Body Rib

Log #	Tag #	Observations - Left Hand Side-of-Body of Rib
CW401	C-114	This piece forms the intersection of the upper wing skin and the left side-of-body rib. It extends from S-24 to the rear spar. It includes the Side-of-body double plus chord and a piece of the center tank vent stringer. It contains the fracture surface for the side-of-body rib with the upper skin of the center wing tank. The piece is lightly sooted between S-6 and S-7 where the center fuel tank vent stringer is located. The sooting continues for ~18 " aft of S-6. There are no other areas of sooting on this piece. The fracture surfaces are corroded.
CW402	C-2026	This piece forms the intersection of the right side-of-body rib and the front spar, at the bottom of the tank. The top edge is at WL 161, and mates with the fracture surface on CW410. The inboard surface is clean. The outboard surface is clean. The fracture surfaces are corroded.
CW403	C-2175	This piece forms the intersection of the upper wing skin and the left side-of-body rib. It extends from the front spar (S-33) aft to S-25. It contains the fracture surface for the side-of-body rib with the upper skin of the center wing tank. Both the inboard and outboard surfaces are clean. The fracture surfaces are corroded.
CW404	C-2269	This piece is the side-of-body rib at the upper front spar. The piece is clean.
CW405		This piece is a side-of-body stiffener that runs between S-31 at the upper and S-21 and S-22 at the lower chord. The piece is clean.
CW406		This piece is the lower stiffener attachment at the side-of-body rib, lower chord, at the first stiffener forward of the mid-spar. It is about 9 inches long and about 4 inches high. On the inboard surface (tank side), there are soot trails forward of the fastener heads.
CW407A CW407B	C-2268 C-2266	There are two pieces for log 3 CW407. These two pieces form the intersection of the center wing tank mid-spar and the left side-of-body rib. The inboard surfaces are clean.

Log #	Tag #	Observations - Left Hand Side-of-Body of Rib
		The outboard surfaces are lightly sooted in localized areas. See Figures 75.3 and 75.4. The fracture surfaces are corroded.
CW408	C-2282	This piece is a part of the stiffener attached to CW411. It is ~30 inches long. It has a plastic piece attached which is darkened. It looks ripped. The outboard surface is clean. The inboard surface is clean. The fracture surfaces are clean.
CW409	C-114	This piece is attached to CW401 between S-4 and S-7. The inboard surface is clean. The outboard surface is clean. The fracture surface is clean.
CW410	C-2270	This piece is at the forward upper edge. The bottom edge is at WL 161 and extends upward to ~ WL 185. The fracture surface of the bottom edge mates to CW402. The inboard surface is lightly sooted. The outboard surface is clean. The fracture surfaces are slightly darkened.
CW411	Z-2547	This piece is at the juncture of the side-of-body rib and the rear spar. Its forward end mates with CW401 and CW409. It is ~2 feet forward/aft, and ~30 inches in height. The inboard surface is clean. The outboard surface is clean. The fracture surface is clean.
CW412		This piece lies below CW412 and mates with it. The inboard surface is clean. The outboard surface is clean. The fracture surface is clean.
CW413	Z-2677	This piece mates with the rear spar. It is ~25" long. The rear upper part mates with CW411. The forward upper part mates with the lower part of CW412 and CW408 stiffener. It ranges in height from 3" to 12". The outboard surface is clean. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or

Log #	Tag #	Observations - Left Hand Side-of-Body of Rib
		blistered. The inboard surface is clean. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The fracture surfaces are clean.
CW414	Z-2676	This piece is 14" tall and 17" wide and is near the rear spar. The lower surface mates with CW412 and the upper surface mates with CW411 and stiffener CW408. The outboard surface is clean. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The inboard surface is clean. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The fracture surfaces are clean.
		There are many small pieces of the side-of-body web and attach fittings. All surfaces of all pieces are not sooted.

4.13 Keel Beam

OVERALL PHOTOGRAPHS OF KEEL BEAM

Figure #	Title
92.3	Right Hand Side of Keel Beam
92.4	Top View of Keel Beam
92.5	Left Hand Side of Keel Beam

Log #	Tag #	Observations - Keel Beam
LF14A	A2048	This piece is parts of the vertical web, lower surface, and internal cross bracing, and is located between the front spar & STA 1152. On the left vertical web: There is light soot/grime between the forward edge of the piece to STA 1100. Sooting/grime then increases moving aft to the end of the piece at the keel beam fracture. From the front of the keel beam aft for ~ 90 inches, the upper circumferences of the fastener heads exhibit a buildup of soot/grime; the lower circumferences do not. There are no soot/grime tails. Aft of this the fastener heads appear to be very lightly and uniformly sooted/grimy as is the keel beam web. There are heavier soot/grime deposits around the cutout for the trim air duct and in a localized area aft of the stiffener near the CWT midspar location. The primed surface on top of this area is clean. The fracture surfaces are clean. On the right vertical web: In the web bay containing the pneumatic penetration, the forward row of fastener heads exhibits some soot/grime tailing in a downward direction. The upper nine fasteners exhibit chipped paint below them in a tail-type pattern. Those that retain the paint exhibit soot tails extending downward and slightly aft or just downward. These particular fasteners have a very high profile nut attached; the remaining rows of fasteners are much lower profile and do not exhibit any sooting/grime. A 3 inch by 9 inch piece of lower body fairing access door remains attached, located approximately 9 inches forward of the lower chord fracture of the keel beam at FS 1141. The inside surface of the fairing, as well as its aluminum support bracket, is moderately sooted/grimy. There is no sooting/grime on the outside surface of the access door. The rubber grommets in this area which carry wiring are lightly sooted/grimy but free of any thermal damage. On the right exterior vertical portion, there is generally light soot

Log #	Tag #	Observations - Keel Beam
		or grime from the forward edge of the piece to STA 1110. There are areas of heavy soot/grime at the lower front corner and at the lower edge near the CWT spanwise beam #3 location. There is moderate soot/grime on the lower half of the web between STA 1082 and STA 1092. Sooting/grime increases slightly at STA 1102 and becomes heavy between STA 1112 and STA 1122. Stiffeners at STA 1102 and 1122 are sooted/grimy on their aft faces and clean on their front faces. A bracket at STA 1122 has moderate soot/grime on the aft face and is clean on the forward face. Sooting/grime on the stiffener in an area approximately 45^0 up from horizontal and forward of this bracket is markedly lighter than the surrounding areas. The trim air duct support bracket from STA 1122 to STA 1132 is sooted/grimy on the top but clean on the bottom. There are areas of heavier sooting/grime at the edges of the trim air duct cutout in the web. See Figures 92.1 and 92.2. There is an area of relatively heavier soot in the center of the web between STA 1132 and STA 1142. A bracket normally attached to the bottom edge of the keel beam at approximately STA 1142 is broken and bent under the keel beam. The area under the original location of the bracket is markedly cleaner than the surrounding web. The bracket itself is sooted/grimy only on the face that was originally the outboard side. The bottom surface is unsooted except for several small black patches of soot/grime between STA 1000 and STA 1050. The interior of the keel beam is unsooted. Fracture surfaces are clean. Enamel and primer are not burned, peeled, or discolored.
LF14B	C061	This is part of the RHS vertical web, portions of the bottom surface, and some internal bracing between STA 1152 and 1338. The exterior vertical surface is heavily sooted/grimy from the front of the piece to approximately STA 1255, then lightly sooted/grimy aft to the end. The line between soot/grime levels is indistinct. The upper surface primer is clean to the location of the rear spar. Aft of this point, the primed surface is sooted/grimy to the same degree as the vertical web. The interior vertical surface is heavily sooted/grimy from the front of the piece to approximately STA 1265. At that point, there is a marked change to light soot/grime with areas of gray splattered material. Fasteners at STA 1202 and 1212 are more heavily sooted/grimy on the aft side than on the forward side. The bottom surface is burned and grimy from the front to approximately STA 1265. Aft of this point, sooting/grime

Log #	Tag #	Observations - Keel Beam
		decreases. The fracture surface at the forward end of the piece which mates with the aft end of the right half of the web at LF14A is sooted/grimy. Other fracture surfaces are clean/darkened.
LF14C	C061	This is part of left hand side web between STA 1152 and STA 1255. The interior surface is heavily sooted/grimy. Insulation on wiring in this area is brittle and burned. Areas under cross-brace attach points at STA 1172 and STA 1232 are clean. The exterior surface has moderate soot/grime with heavier patches aft of the stiffeners at STA 1152 and STA 1172. The structure which extends upward from the keel beam to the CWT rear spar has patches of heavy soot/grime on all faces. Primer on the upper surface of the piece is clean. The fracture surface at the forward end of the piece which mates with the aft end of the left half of the web at LF14A is sooted/grimy. Other fracture surfaces are clean/darkened except for an area of light soot/grime at the fracture on the upper edge of the piece at approximately STA 1178.
	C-1031	This is a piece of left hand side web and landing gear door actuator from approximately STA 1265 to STA 1338. There is light to moderate soot on all faces of the piece. There is light soot or grime on the gear door actuator. Fracture surfaces are clean/darkened. Enamel is not burned, peeled, or blistered.
LF14D	C-061	This is part of right hand side vertical web between STA 1350 and STA 1480. The interior surface is lightly sooted. The exterior surface has light to moderate soot. Fracture surfaces are clean. Paint and primer are not burned, peeled, or blistered.
LF17	C-109	This is part of the BL 0 keel beam center web extending from STA 1241 (rear spar of the center wing tank) aft to ~ STA 1330, and from the pressure deck at WL 186.3 down to WL 116 (top of the keel beam box). The part is sooted at the following locations: 1) There is moderate sooting on the lower surface of the keel beam box forward of the STA 1265 cross-ship intercostal and fitting. Sooting is also present on the forward surface of the

Log #	Tag #	Observations - Keel Beam
		cross-ship intercostal and on the portion of the vertical LBL 9 web on the portion of the intercostal (inboard surface). 2) There is moderate sooting on the BL 0 web right surface from the rear spar of the wing box aft to ~ STA 1255 vertical stiffener, from the top of the keel beam box upper surface up to ~ WL 143. 3) There is moderate sooting on the lower portion and forward face of the lower parts of the lateral control system on the right side of the BL 0 web assembly. The lateral control system components on the left side are not sooted. 4) There is moderate sooting on ~ 4 feet of toilet drain tube which normally extends down the wing box rear spar to the lower drainage valve.

4.14 Spiketooth Fracture Sooting

The following Table summarizes the location and sooting pattern for spiketooth fractures located in the Center Wing Section. Unless otherwise specified, all references in this section to "the fracture" relate to the spike tooth fracture only, not any adjacent fractures.

Note: The "-x" number reference in the Location of Fracture column indicates the number of the fracture on that particular beam or web. These numbers correspond with the numbering scheme found in the Metallurgy Group notes. <Example: spanwise beam 3-1 indicates that this fracture is the first fracture document on spanwise beam #3.

Fracture Location	Figure #	Observations - Spiketooth Fracture Sooting
SWB3-1	103	Located on the 3rd "Z" stiffener from the bottom of Spanwise Beam #3 on the far right side. Fracture is ~3.75" from the outboard edge of the Z-stiffener and spans two of the three surfaces of the "Z". The spike toothed portion of the fracture extends over the mid "Z" portion of the stiffener and is ~1" in length and is curled in the up direction. All surfaces surrounding the spike tooth fracture are heavily sooted while the fracture surface remains clean and unsooted. Sooting on a portion of the surrounding areas appears to have been cleaned due to scraping or impact. The opposing fracture surface is slightly "spike toothed" in texture but shows signs of impact or rubbing.
SWB3-2	99	The fracture is located ~5" outboard of the RBL 106.2 rivet center line and 22" below the top of the spanwise beam #3 web. The fracture is ~1.5" in length and is curled in the aft

Fracture Location	Figure #	Observations - Spiketooth Fracture Sooting
		direction. The area surrounding the fracture is heavily sooted while the fracture surface itself remains clean and unsooted. The curled portion of the fracture is aluminum in color but contains some darkening (brown) which runs from top to bottom of the curled area and appears to have been rubbed clean of sooting. The opposing fracture surface is not present (evident) to document.
SWB3-3	101	The fracture is located ~18" up from the bottom of the web and 4" outboard of the RBL 91.1 rivet center line. The fracture is bent slightly aft and is ~1.25" long with the spike toothed portion being more pronounced at the base of the fracture and spanning ~0.5" of the total fracture. The fracture is bent in the aft direction. The surfaces of spanwise beam #3 (forward and aft) surrounding the fracture are heavily sooted while the fracture surface itself is clean and unsooted. The opposing fracture surface is not "spike toothed", but is smooth in texture.
SWB3-4	102	The fracture is located ~41" up from the bottom of the spanwise beam #3 web and between 3.5" to 5" inboard of the RBL 91.1 rivet center line. The fracture is ~2" in length and is curled in the aft direction. The aft surface of spanwise beam #3 surrounding the fracture is light to medium sooted. The forward surface of spanwise beam #3 surrounding the fracture shows light to no sooting. The fracture surface itself is clean and unsooted. The forward surface of spanwise beam #3 immediately surrounding the fracture appears to have been scraped clean (through green paint to the metal) ~0.25" from the fracture. The opposing fracture surface is not present (evident) to document.
SWB3-5	105	The fracture is located ~14" below the top of the spanwise beam #3 web and ~2" outboard of the RBL 106.2 rivet center line. The fracture is ~0.75" long and is curled in the forward direction. The forward and aft surfaces of spanwise beam #3 surrounding the fracture are heavily sooted while the fracture surface itself is clean and unsooted. Some rubbing of the sooted area (aft side) immediately surrounding the fracture has cleaned ~0.125" of the surface. The opposing fracture surface is not present (evident) to document.
SWB3-6	100	The fracture is located ~3" inboard of the far right edge of the spanwise beam #3 web and ~2" above the 2nd "Z" stiffener from the bottom right side of spanwise beam #3. The fracture is ~0.5" in length and is bent slightly forward. The forward surface of spanwise beam #3 which surrounds the

Fracture Location	Figure #	Observations - Spiketooth Fracture Sooting
		fracture is medium to heavily sooted. The aft surface of spanwise beam #3 which surrounds the fracture is heavily sooted. The fracture surface itself is clean and unsooted and shows evidence of rubbing or scraping along the length of the fracture. The opposing fracture surface is not "spike toothed" in texture, but is smooth and shows signs of rubbing along the length of the fracture.
SWB3-7	97	The fracture is located ~29" up from the bottom of the spanwise beam #3 web and ~5" outboard of the RBL 83.24 rivet center line. The fracture is ~1.1" in length and is curled in the forward direction. The forward surface of spanwise beam #3 which surrounds the fracture is light to moderately sooted. The aft surface of spanwise beam #3 which surrounds the fracture is moderately to heavily sooted. The fracture surface itself is clean and unsooted. The opposing fracture surface is not "spike toothed", but is smooth in texture and shows signs of rubbing or scraping.
SWB2-1	106	The fracture is located ~39" up from the bottom of the spanwise beam #2 web and ~3" inboard of the RBL 75.9 rivet center line. The forward surface of spanwise beam #2 which surrounds the fracture is lightly to moderately sooted. The aft surface of spanwise beam #2 which surrounds the fracture is lightly sooted. The fracture surface itself is clean and unsooted and is ~1" long. The fracture is actually bent in the aft direction, however the piece of metal it is part of is bent forward. The opposing fracture surface is not present (evident) to document. There is an additional spike tooth fracture located ~1" further down the spanwise beam #2 web. This fracture is ~1" in length and is curled in the aft direction. The same surface sooting and rubbing characteristics described above apply. There appears to be scraping along the length of the fracture in the direction of the fracture (longitudinally).
SWB2-2	98	The fracture is located ~8"-12" up from the bottom of the spanwise beam #2 web and ~5" outboard of the RBL 98.58 rivet center line. The aft surface of spanwise beam #2 which surrounds the fracture is moderately to heavily sooted. The forward surface of spanwise beam #2 which surrounds the fracture is lightly to moderately sooted. The fracture surface is clean and unsooted and is ~0.375" in length. The metal section which this fracture resides is bent in the aft direction. There is evidence of rubbing on the forward surface of the

Fracture Location	Figure #	Observations - Spiketooth Fracture Sooting
		fracture in the direction of the fracture. There is a secondary "spike tooth" fracture ~2" further outboard of the RBL 98.58 rivet center line. The fracture is ~0.5" in length and the same surface sooting and rubbing characteristics described above apply. The opposing fracture surfaces are not present (evident) to document.
SWB2-3	108	The fracture is located ~6" up from the bottom of the spanwise beam #2 web and ~6" outboard of the RBL 25.2 rivet center line. The forward surface of spanwise beam #2 which surrounds the fracture is lightly to moderately sooted. The aft surface of spanwise beam #2 which surrounds the fracture is moderately sooted. The fracture surface is clean and unsooted and is ~0.75" in length. Both opposing fracture surfaces are present and both exhibit spike tooth characteristics. The lower fracture surface is bent slightly aft.
SWB2-4		The fracture is located approximately 1" outboard of LBL 11.31 and approximately 27.5" below the upper edge of spanwise beam #2. The fracture is approximately 1.75" in length and is located at the 90° bend on the metal material found between the upper cross tie and the surface of spanwise beam #2. All fracture surfaces are unsooted and both opposing fracture surfaces are spike toothed in texture. All spanwise beam #2 surfaces are moderately to heavily sooted. The forward surface of the material which borders the fracture shows signs of rubbing along the length of the fracture.
SWB1-1	107	The fracture is located ~20" up from the bottom of spanwise beam #1 and ~8" inboard of the RBL 75.93 rivet center line. The forward surface of spanwise beam #1 which surrounds the fracture shows light to no sooting. The aft surface of spanwise beam #1 which surrounds the fracture also shows signs of light to no sooting. The fracture surface itself is clean and unsooted and is ~3.5" in length. The fracture is bent in the aft and up direction. There is evidence of rubbing on the forward surface of spanwise beam #1 immediately surrounding the fracture. The opposing fracture surface is not present (evident) to document.
BL0-1 (aft cell)	109	The fracture is located ~42" from the top of the BL 0 web and ~18" aft of the forward edge of the web. The left surface of the BL 0 web which surrounds the fracture shows light to no sooting. The right side of the BL 0 web which surrounds the fracture is moderately to heavily sooted. The fracture surface

Fracture Location	Figure #	Observations - Spiketooth Fracture Sooting
		itself appears to be clean and unsooted and is ~0.5" in length. The spike tooth portion of the fracture is bent to the left. The opposing fracture surface is not spike toothed, but is smooth in texture and shows evidence of rubbing or scraping along the length of the fracture.

4.15 Embedded Metal In Sealant

The following Table summarizes photos taken of areas at the Upper Chord of the Midspar on the forward surface and the Upper Chord of Spanwise Beam #2 where there are metal fragments embedded in the sealant.

Metal Debris Sample Reference Number	Figure #	Title
1	93	Metal Debris Embedded in Sealant - Forward of Midspar @ ~ RBL 34
2	94	Metal Debris Embedded in Sealant - Forward of Midspar @ ~ RBL 57, Close up
3	95	Metal Debris Embedded in Sealant - Aft of Spanwise Beam #2 @ ~ RBL 57, Overall View
4	96	Metal Debris Embedded in Sealant -Forward of Spanwise Beam #2 @ ~ RBL 41, Overall View
5	104	Metal Debris Embedded in Sealant -Aft of Spanwise Beam #3 @ ~ RBL 75, Overall View

Appendix III contains the findings of the analysis of the metal debris removed from the sealant in the center wing tank.

4.16 Wiring in the Fuel Quantity Indicating System

The purpose of this wiring section is to document the fuel quantity indicating system (FQIS) wiring attach points, and penetrations inside the center wing tank. This section does not include observations of the wiring attach points in the dry bay between spanwise beam #3 and the front spar, or on the aft surface of the rear spar.

Location	Observations - Wiring in FQIS
Span Wise Beam #3	There is wiring located on spanwise beam #3, however the pieces which have been recovered are not the sections of spanwise beam #3 which have wiring.
Span Wise Beam #2	On the right hand side, forward face, there are 6 wire tie down metal brackets and non-metal clamps. All brackets holding the tie down clamps are all darkened and are coated with a medium amount of sooting. The six wire tie downs are located ~ at RBL 91, RBL 83, RBL 75, RBL 66, RBL 57, and RBL 41. See Figures 76 - 79. The bracket at RBL 41 is missing the piece with is at a 90 degree angle and to which the tie down clamps are fastened. The brackets at RBL 57 and 66 are flattened to the left. The bracket at RBL 57 is missing a piece at the top of the bracket which is angled 90 degrees. The brackets and tie down clamps at RBL 83 and 75 are missing. The bracket at RBL 91 is intact. All brackets show darkening and a medium amount of sooting. The clamps from the brackets at RBL 91, RBL 83 and RBL 75 are only stubs where the clamps are held to the brackets with metal screws. The stubs have pulled fibers remaining which is evidence of heat damage. There is a hole for the wire to come into spanwise beam #2 at ~ RBL 88. The grommet is missing, however there are visible marks which indicate a grommet was in place when observed from the forward side of the beam. There is a medium amount of soot surrounding the penetration.
Mid Spar	On the forward face, right hand side of CW801, there are 6 wire tie down metal brackets (the 2 outboard most without non-metal clamps and the rest with non-metal clamps). They are located at ~ RBL 67, RBL 57, RBL 44, RBL 34, RBL 17, and RBL 9. See Figures 80 - 82. There are 6 metal brackets from top to bottom at ~ BL 0 (2 without non-metal clamps and 4 without non-metal clamps). 5 out of these six brackets are bent in the left outboard direction. All brackets and bracket pieces which are remaining are darkened and moderately sooted. The tie downs at RBL 67 and 57 are missing the 90 degree leg of the bracket which holds the clamp. The tie down brackets at RBL 44 and RBL 34 are bent towards the centerline ~10 degrees. The bracket at RBL 17 is bent towards the centerline ~45 degrees. The bracket at RBL 9 is essentially intact. The clamps from the brackets at RBL 44, RBL 34, RBL 17, and RBL 9 are only stubs where the clamps are held to the brackets with metal screws. The stubs have pulled fibers remaining which is evidence of heat damage.

Location	Observations - Wiring in FQIS
	There are two brackets attached to CW805 at RBL 99 and one attached to CW803 (two with remnants of the non-metallic clamps and one without). These clamps show the same sort of damage as seen on the clamps attached to CW801.
Spanwise Beam #1	Near the top of the spanwise beam on the left hand side, aft face, there are six wire tie down brackets and clamps and one wiring penetration. The plastic straps of the tie downs have all melted away. A small nub of the strap is still in place and these nubs are blistered. The six wire tie downs are located at ~ LBL 9, LBL 25, LBL 42, LBL 66, LBL 83, and LBL 91. See Figures 83 - 86. The sheet metal brackets are all intact. There is sooting evident on the skin of the aft face. The wiring hole is located at ~ LBL 85. At the penetration, there was no grommet found, however there is also nothing unusual about the vicinity of the penetration. On the forward face of spanwise beam #1, the penetration has definite signs of a grommet being in place. The wire run continues forward from the forward face of spanwise beam #1, however there are no parts available to inspect.
Rear Spar	The metal tube feed where wiring enters the center tank (P/N 60B40037-35) on the left hand side of the forward face is flattened. There is some moderate sooting on the part. See Figures 87 - 90. The wiring is sill there and is moderately sooted. Sleeving material around large white-coated wire is fire damaged and partially missing. A wire tie down at ~ LBL 33 is broken and sooted, but not melted. A wire tie down located at ~ LBL 21 is broken and is coated w/ grease but no sooting. There is no evidence of heat damage to this tie down. At the corner of the rear spar forward face there is a wire tie down bracket that is broken off but not sooted. The final tie down point is located just forward of the rear spar on the left hand side of the BL 0 rib. See Figures 91 and 92. This tie down clamp shows blistering and sooting. There is a fuel line thermoplastic clamp near this tie down which is slightly melted. There is no wiring on the right hand side of the rear spar.

5. RIGHT WING

5.1 Overview

SOOTING/FRACTURE DIAGRAMS

Diagram #	Title
23	External surfaces of the upper and lower skins
24	Internal surfaces of the upper and lower skins

5.2 Right Wing Upper Skin Surfaces

Log #	Tag #	Observations - Right Wing Upper Skin Surfaces
RW1	E-2013	RW1 and RW4 are both part of the intact right wing tip. RW1 is the upper wing skin and RW4 is the lower wing skin. This wing tip piece extends from WS 1239 to the wing tip on the forward edge, and from WS 1454 to the wing tip on the aft edge. There is no sooting on the right wing tip exterior surfaces. The paint is not blistered, burned, or discolored. All the fracture surfaces are free of soot. All visible surfaces (aft face of front spar, lower face of upper skin, all ribs, etc.) inside the dry bay (WS 1280 to WS 1485) exhibit a very light coating of either soot or grime. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. All the fracture surfaces are free of soot. The interior of the vent stringer for the outboard pickup of the inboard main tank vent has a light coating of soot or grime. The interior of the vent stringer for the inboard pickup of the inboard main tank vent also has a light coating of soot or grime. The interior of the vent stringer for the center wing tank vent has a slightly heavier coating of soot. Some fasteners which protrude into this stringer channel have soot shadows which are consistent with a flow direction from inboard to outboard. Some vent cover plate fasteners which protrude into this stringer channel have light halos around them. These halos are areas of lesser soot deposition. The vent stringer cutouts near WS 1280 and WS 1364 also exhibit soot shadowing consistent with an outboard flow direction. The interior surfaces of the outboard main tank vent stringer appear to be free of soot or grime. The surge tank extends from WS 1485 to WS 1548 and contains a rib at WS 1516. The sooting on the interior skin face between WS 1485 and WS 1548 is light to moderate. The sooting on the exterior surface of the center wing tank vent stringer is light near WS 1485 and WS 1516. From WS 1516 to WS 1548, the center

Log #	Tag #	Observations - Right Wing Upper Skin Surfaces
		wing tank vent stringer is open (without the lower surface) and is lightly to moderately sooted on the forward portion. There are numerous linear streaks of soot oriented fore and aft. At WS 1542, which is at the exit the outboard main tank vent stringer, the upper skin contains an ~1" by 1" puncture, with the fracture surfaces curled into the surge tank. There is a yellowish-orange material on the fracture surfaces which is being analyzed. The inboard face of the rib at WS 1548, both faces of the rib at WS 1516, and the outboard face of the rib at WS 1485 are lightly sooted.
RW7	C-2151	This is a piece of upper skin attached to a section of the center wing tank upper surface and extends outboard to WS 528. The upper surface was sooted. On the fuel tank surface, there were discontinuous blotches of sooting about 1 inch in diameter, with clean areas around the blotches. This was a little more pronounced forward of the midspar.
RW8	C-183	This piece originally extended from the right fuselage outboard to approximately WS 1220. This piece was subsequently cut into three sections. The first cut was made parallel to the fuselage about five feet outboard of the wing-body intersection. The other cut was outboard of and roughly parallel to this, and ran from WS 640 at the front spar to WS 570 at the rear spar. When necessary, these sections shall be referred to as the inboard, mid, and outboard sections. All three sections contain portions of the front, mid and rear spars. The forward and inboard edges mate with RW7 and the outboard edge mates with RW11, RW20, and RW21. The exterior surface is heavily sooted. The paint is peeling from WS 724 to WS 834. Except as noted below, the interior surface of the skin is lightly coated with soot or grime which has an appearance consistent with the contaminant having been suspended in a liquid which then dried, leaving the contaminant behind. Also unless noted, all visible primer shows no signs of blistering or burning. Observations from break at WS 1220 : The two inboard tank vent stringers at the break at WS 1220 are not sooted or fire damaged on their outer surfaces. The inner surfaces of both of these stringers are moderately sooted. The outer forward face of the center wing tank vent stringer is

Log #	Tag #	Observations - Right Wing Upper Skin Surfaces
		heavily sooted and burned from WS 1220 to the #4 engine pylon centerline. The inner forward face is also heavily sooted along this same length. The remainder of the inner faces of the center tank vent stringer visible from this break are lightly sooted. The inner and outer faces of the outboard tank vent stringer are heavily sooted and fire damaged from the break at WS 1220 to the #4 engine pylon centerline. Upper stringer S-14 (a modified 'Z' section) has heavy sooting on the aft flange but light sooting on the forward flange. The vertical stringer leg is very lightly sooted. There is soot shielding around several of the fasteners in the forward row on the aft flange, and for about two inches outboard of the #4 engine pylon centerline. There is less pronounced soot shielding around some of the forward flange fasteners. From the break to the #4 engine pylon centerline, between S-14 and S-15, the inner skin surface is heavily sooted. Forward of this, from S-15 to S-17, the skin is moderately sooted. The inner skin surface from S-17 to the front spar is moderately sooted from the break inboard to WS 1181. Stringers 15 to 17 extend outboard of the skin break, and are all burned outboard of this break. Vent Tube Soot Deposits: A heavy soot deposit on the inner skin surface extends between S-25 and the front spar for approximately 18" inboard and outboard of WS 724. A halo of lighter sooting is visible within this deposit. Another heavy soot deposit on the inner skin surface extends between S-24 and S-25 for approximately 10" inboard and outboard of WS 724. The locations of these soot deposits correspond to the two inlet/outlets of a fore and aft vent tube which routes to the outboard tank vent stringer in the intact aircraft. The halo dimensions correspond to the diameter of the vent tube inlet/outlet. A 2" by 2" heavy soot deposit is present on the inner skin surface between the outboard tank vent stringer (S-12 /S-13) and the mid spar (S-14) at WS 944. This sooting density fades inboard and outboard of WS 944, and ends approximately 12 inches on either side of WS 944. Heavy inner skin surface sooting is also present from WS 930 to WS 954 between the mid spar and S-15. This sooting density fades inboard and outboard of WS 944, and ends at approximately WS 889 and WS 964 respectively. The forward face of the mid spar and the aft face of S-15 display localized 12" patches of heavy

Log #	Tag #	Observations - Right Wing Upper Skin Surfaces
		sooting centered about WS 944. The locations of these soot deposits correspond to the two inlet/outlets of a fore and aft vent tube which routes to the outboard tank vent stringer in the intact aircraft. A portion of this tube which remains is heavily sooted on the inside. Additional Localized Soot Deposits There is light to moderate sooting of the inner wing skin from WS 944 to WS 985 between the rear spar and S-4. Some soot shielding by the fasteners is present forward of the fasteners. The adjacent fracture surfaces are clean. There is moderate sooting of the inner wing skin from WS 1000 to WS 1028 between the rear spar and S-4. Some soot shielding by the fasteners is present forward of the fasteners. The adjacent fracture surfaces are clean. There is moderate sooting of the inner wing skin from WS 1082 to WS 1098 between the rear spar and S-4. Some soot shielding by the fasteners is present forward of the fasteners. The adjacent fracture surfaces are clean. From WS 834 to WS 862, the lower surface of the upper skin aft of the rear spar is heavily sooted. This sooting extends down the aft face of the remaining portion of the vertical leg of the rear spar attach chord. The fracture surfaces are free of soot. Vent Stringers: The inner surfaces of the vent stringer for the outboard pickup for the inboard tank are visible from approximately WS 586 to WS 889. These surfaces are lightly to moderately sooted. The inner surfaces of the vent stringer for the inboard pickup for the inboard tank are visible from approximately WS 586 to WS 889. These stringer surfaces are lightly sooted along the entire visible length. The inner surface of the wing skin is lightly sooted from WS 586 to WS 642, and heavily sooted outboard of WS 642. The inner wing skin surface in the vent stringer for the center tank is moderately sooted from the center tank out to WS 944, where it becomes moderate to heavy. The remaining interior surfaces of this segment of this vent stringer are lightly sooted. Fastener heads which protrude into the center tank vent stringer between RBL 98 and RBL 127 have soot buildups on the inner wing skin just inboard of them, consistent with a flow direction inboard to outboard. This sooting is touching the fastener heads. Outboard of each of these fastener heads, a

Log #	Tag #	Observations - Right Wing Upper Skin Surfaces
		1/2" wide by 18" long soot tail is present, again consistent with inboard to outboard flow. The inner wing skin surface in the vent stringer for the outboard tank is heavily sooted from its origin at WS 740 to its outboard end. All other inner surfaces of this vent along this segment are lightly sooted. Inboard Section of RW8 The fuselage interior is heavily sooted and oily with areas of burned paint. The sooting extended below the cabin floor (missing) down to the top of the center wing tank. The sooted area of the interior skin is normally covered by insulation and sidewall panels (both missing). The areas of the door frame normally shielded by the R3 door are also sooted. Most fracture surfaces in the fuselage interior are sooted. The R3 door was recovered separately and is sooted and burned on both the inside and outside surface. The areas of the door normally shielded by the door frame are also sooted. The fuselage exterior skin and top surface of the wing skin is sooted with areas of burned paint. Aircraft structure exposed by missing skin in this area is also sooted as are most fracture surfaces. A section of internal wing structure from WS 1252 was recovered separately and is burned with broomstrawed aluminum at a fracture surface. The thin aluminum that forms the webs between structure in this piece is mostly missing. What remains of the web pieces are all bent and curled in an outboard direction. The fracture surfaces in the webs are heat damaged but soot had not attached to the very ends while the rest of the piece is heavily sooted. The areas near where this rib attaches are free of sooting except for a ~15' section of the aft inboard tank vent stringer and another stringer attached to part of the WS 1280 rib. This piece was recovered separately and is sooted and burned. All the mating pieces to this piece are free of sooting except for the rib discussed above.
RW9	C-040	This piece extends from WS 1294 to WS 1470 and from the rear spar to ~ S-12. The forward surface mates with RW4. The lower (inner) surface is not sooted except for no or at most very light sooting over the vent stringer locations. The primer is not blistered, burned, or discolored. The sealant is pliable and not burned or blistered. The outer surface is clean. The paint is not burned or blistered.
RW11	C-804	This is a piece of upper skin that extends from WS 1196 to WS 1272 from S-10 (mid spar) to front spar.

Log #	Tag #	Observations - Right Wing Upper Skin Surfaces
		Upper (exterior) surface is free of sooting. Lower (interior) surface is free of sooting aft of the front spar. Forward of the front spar, the surface is lightly to moderately sooted. There is an area of cracked, burned, peeled paint on the surface between ~ WS 1222 and WS 1235 forward of the front spar. Primer and paint (except as noted above) are not discolored or burned. Fracture surfaces are clean or lightly corroded. Burned stringers from RW8 mate with unburned areas of this piece.
RW19	Z-2807	This piece is located at ~ STA 1250. The upper (exterior) surface is free of sooting. The lower (interior) surface is free of sooting aft of the front spar. Portions of the front spar cap attached this skin have non-uniform areas of heavy sooting. Upper surface forward of the front spar has non-uniform areas of moderate sooting. Primer and paint are not discolored or burned. Sealant is covered by primer and pliable. The fracture surfaces are clean and unsooted.
RW20	Z-3274	This piece extends from WS 1196 to WS 1280 and from S-10 (midspar) to S-8. Upper and lower surfaces are free of sooting. Paint and primer are not burned or discolored. Sealant is black and pliable. Fracture surfaces are clean.
RW21	Z-2806	This piece is from ~ WS 1196 to WS 1224 and from S-10 (midspar) to ~ S-9. Forward mates with RW11, aft outboard with RW20, inboard with RW8. Upper and lower surfaces are free of sooting (lower surface evaluation is incomplete due to the placement of the piece). Paint and primer are not burned or discolored. Sealant is black and pliable. Fracture surfaces are clean.

5.3 Right Wing Lower Skin Surfaces

Log #	Tag #	Observations - Right Wing Lower Skin Surfaces
RW2	C-251	RW2 includes part of the wing root and the front spar. This piece mates with RW3. CW503 is also part of this piece. The inner surface is not sooted.

Log #	Tag #	Observations - Right Wing Lower Skin Surfaces
		The outer surface has paint that has peeled off in places, leaving green primer visible. Some of the paint that remains has turned black. The primer appears not to have been heat damaged. . The transition from primer to bare metal is black in appearance; however, its physical makeup has not been determined. Outboard of the leading edge seal rib tension fitting there is heavy sooting.
CW201	C-2147	This piece and the right wing piece RW3 were recovered as a single unit, but were cut apart outboard of and more or less parallel to the right side-of-body rib to allow the various parts of the piece to be placed in appropriate center wing tank and right wing reconstructions. Although fractures were already present in this area in the recovered pieces, the cuts had to be made to separate the pieces. A section of CW201 that is outboard of the side-of-body rib forms a part of the lower right wing skin. It has little or no sooting on the upper (interior) surface. On the lower (exterior) surface, there is yellow primer, over which there is gray paint. In some places the paint has begun to peel off, and in some of these areas, the paint has become blackened. The primer does not appear discolored anywhere, but in some places the primer is missing, exposing bare metal. This effect increases outboard and becomes more pronounced on the mating RW3 piece. The bare metal in these areas has become darkened and rough. On the lower (exterior) skin, there are three gouges about 1/4 inch wide and 1/4 inch deep in the skin along ~ RBL 137 from S-16 aft at ~4 inch intervals. Bare metal is visible in these areas. There are patches of green paint in this area around each gouge, about 1 to 2 inches in diameter. This is the only area where this green paint is found.
RW3	C-185	This piece and CW201 were recovered as one unit. The inboard edge of RW3 mates with the outboard edge of CW201. See the preceding writeup for a description of that part of CW201. RW3 extends from the mating edge of CW201 (about one to two feet from the wing root) to ~ WS 1210, and from the front spar to the rear spar. There is no sooting on the lower (external) surface. However, the appearance of the lower surface is similar to that on CW201. The plate that forms the inboard forward part of the wing skin has a few patches of green primer for about 4 feet, mostly at the forward inboard edge. Outboard of that, the primer disappears

Log #	Tag #	Observations - Right Wing Lower Skin Surfaces
		and the plate surface is bare metal that is darkened and rough-surfaced. The transition from primer to bare metal is black in appearance; however, its physical makeup has not been determined. The wing skin plate just aft of this forward plate has intact primer for about six feet outboard from the inboard edge. The surfaces of these two plates is discontinuous across the splice. The primer on the aft plate gradually disappears moving outboard, leaving bare metal similar to the plate forward of it. The upper (internal) surface is clean. The fracture surfaces are not sooted.
RW4 (RW1)	E-2013	This piece includes the bottom skin of the surge tank including the two access doors. It extends from WS 1252 to the wing tip. It is connected to RW1 and the inboard and aft edges mate with RW10 and inboard mates with RW5. There were no pressure relief devices in either door. The surge tank suppression devices had not been discharged. There was light sooting on the inside surface of the surge tank. The rest of the interior surface is not accessible. The outer surface is clean except at WS 1480 on the #26 variable camber flap inboard edge, where there is a patch of moderate sooting ~6" by 6". The fracture surfaces are clean.
RW5	C-232	This piece extends from ~ WS 1196 to WS 1364. The aft edge mates with RW10, the inboard edge mates with RW3 and the outboard edge mates with RW4. There is light sooting on the lower (external) surface of the piece in a localized area from ~ WS 1270 to ~ WS 1300. Some sooting is evident around the fastener holes near the intersection of WS 1280 and the S-9 attach line. Several holes show evidence of sooting within the hole itself. Between ~ WS 1200 and ~ WS 1210 and S-10 aft to the break in the piece between S-8 and S-9, the lower (external) surface is heavily sooted / burned. The upper (interior) surface is lightly sooted except as noted below. Of the portion of S-9 that is attached to this piece, the upper horizontal flange is moderately to heavily sooted from WS 1252 to WS 1280. S-10, which remains attached to this piece of wing skin is moderately to heavily sooted along both the vertical and upper

Log #	Tag #	Observations - Right Wing Lower Skin Surfaces
		horizontal flanges of the stringer from WS 1238 to WS 1280. From WS 1280 to ~ WS 1300, S-10 is lightly sooted. Over the remaining portion of S-10, from WS 1300 to ~ WS 1322, the vertical and upper horizontal flanges are heavily sooted. Soot shadowing indicates that the direction of sooting is from inboard to outboard, top to bottom. S-11 exhibits similar burn/soot characteristics inboard to WS 1280. However, from WS 1280 to ~ WS 1308, S-11 is lightly to moderately sooted and outboard of S-11 is heavily sooted over its entire structure (all flanges). The upper (interior) surface of the wing skin, where S-11 attaches shows only light to no sooting. S-12 exhibits similar burn / soot characteristics inboard to WS 1280. However, outboard of WS 1280, the remaining portion of S-12 to WS 1300 is moderately to heavily sooted over the vertical and upper horizontal flanges. Between WS 1252 and WS 1280, the lower flange of the chord connecting the front spar and the lower wing skin is heavily sooted. The fore/aft stiffener located at STA 1280 between S-9 and S-10 is heavily sooted on the outboard side. The upper (interior) surface is lightly sooted except as noted. The upper 1-2" of stringers from ~ WS 1252 to WS 1280 (all surfaces) are moderately burned. The burning extends non-uniformly but to the same degree to ~ WS 1308 on the forward stringer. The burning extends 12" inboard to a lesser degree on the center two stringers of the piece. The stringer along the skin splice is moderately burned between ~ WS 1300 and WS 1336. Visible fracture surfaces in these burned areas are predominantly clean with a few very small burned areas. The painted area forward of the front spar on the upper surface is non-uniformly moderately burned from ~ WS 1252 to WS 1310 and lightly burned from ~ WS 1252 to the inboard edged of the piece. Paint and primer are not burned or discolored other than where noted above. Sealant is black and pliable. Fracture surfaces are lightly corroded or clean except as noted above.
RW6	C-256	This piece extends from the wing root to almost WS 440 and ~ S-3 to the rear spar. Attached to this piece, there is a section of rear spar chord ~16" long that is lightly sooted and/or grimy on the inboard side. This wing surface itself is not sooted on any surface or edge.

Log #	Tag #	Observations - Right Wing Lower Skin Surfaces
RW10	C-869	This piece extends from WS 1224 to WS 1454 and from the rear spar to S-9. The lower (exterior) surface is very lightly sooted. The upper (interior) surface is lightly sooted from ~ WS 1400 outboard to the end of the piece. Paint and primer are not burned or discolored. Sealant is black and pliable. Non-metallic spacers and fittings are not melted. There is very light burning around fastener holes for S-5 (both surfaces) at ~ WS 1440 immediately forward of the rear spar. Fracture surfaces are generally corroded, but visible fracture surfaces are clean.
RW12	C-2232	This piece extends from WS 1210 to ~ WS 1240 and from S-7 to the rear spar. The inboard edge mates with RW3 and the outboard edge mates with RW10. The inner surface is lightly sooted. The primer is not blistered, burned, or discolored. At WS 1239, aft of the rear spar there is a plastic extrusion and a small rubber wire clamp that are not fire damaged. The sealant is pliable and not burned or blistered. The outer surface is lightly sooted. The paint is peeled but there is no evidence of burning. The sealant at WS 1214 is pliable and not burned or blistered. The fracture surfaces are clean.

5.4 Right Wing Front Spar

A limited number of pieces of the right wing front spar have been recovered and identified.

Proceeding outboard, portions of the front spar inboard of engine #3 from ~ FSSI 486 to ~ FSSI 625 are not sooted. The #3 engine attachment fitting (RW36) is heavily sooted on the lower part of the outboard prong. Outboard of the #3 engine at ~ FSSI 716, there is heavy sooting that diminishes and disappears at ~ FSSI 1150. The #4 engine attachment fitting is clean. No front spar pieces were identified outboard of the #4 engine.

5.5 Right Wing Rear Spar

A limited number of pieces of the right wing front spar have been recovered and identified.

Proceeding outboard, portions of the rear spar from ~ WS 440 to ~ WS 570 are sooted. This sooting continues outboard past the #3 engine, and disappears at ~ WS 630. Sooting begins again at ~ WS 838 and disappears at ~ WS 1130. There is no further sooting out to engine #4 at ~ WS 1214. No rear spar pieces were identified outboard of the #4 engine.

5.6 Right Wing Lower Skin Punctures

There are six punctures in the lower skin of the right wing (RW3 and CW201). These punctures are aligned ~24" from the right hand side-of-body rib parallel to the side-of-body rib, and are located just aft of S-17; between S-17 and S-18; between S-18 and S-19; between S-19 and S-20; at S-22; and at S-23. Burning, sooting, and mechanical damage on the lower surface of the lower wing skin are continuous across those punctures. The spacing of these holes is similar to that of the side-of-body rib stiffeners. There is no evidence of sooting in or around these holes. Several of these impact marks are located at stringer attach points, so the impact which caused these punctures/indentations appears to have occurred after the lower skin internal stringer assemblies separated from each other. See Diagram 30.

5.7 Right Wing Other items

Log #	Tag #	Observations - Right Wing Other Items
RW22	Z-3007	This piece is the right wing HF antenna and surrounding structure. The antenna itself is free of sooting. Paint on the fiberglass antenna fairing has very light sooting but is not burned or that is darkened except as noted below. There is an area ~24" to 28" from the front of the piece on the upper skin where four fastener heads and all the skin between them have a heavy deposit of rust-colored substance. This same deposit exists on

Log #	Tag #	Observations - Right Wing Other Items
		the portions of three of the four fasteners that are visible in the interior of the piece. The sealant is gray and pliable. The insulation on the antenna cable extending from the front of the piece is brittle but not burned or melted. The fracture surfaces are clean.
RW24		This is a portion of the rib at WS 1252, aft of S-14 (upper) with part of the stringer attached. The entire piece is heavily burned except as noted. The web is approximately 90% missing. Remaining web fragments are bent outboard and generally shredded into ½ to 1 inch wide sections. The remaining piece of S 14 upper is severely broomstrawed at both the inboard and outboard ends. There is a small area at the outboard, upper, rear corner that has visible primer. This primer is moderately sooted but not otherwise burned or discolored. Non-metallic "P" clips on the aft 2/3 of the piece are melted off. "P" clips on the forward 1/3 of the piece are partly melted and heavily sooted. A fragment of coaxial wire approximately 36 inches long remains attached to the front 1/3 of the piece. On the aft 18 inches of this wire, the outer insulation is melted away, the braided wire layer is partly missing, and the inner insulation is intact; the forward 18 inches of the wire is intact. The circular non-metallic vent tube clamp at S 14 upper is partly melted and burned. The circular non-metallic fuel jettison tube clamp at S 5 upper is partly melted and heavily sooted. Fracture surfaces throughout the piece are a mixture of burned, clean, and corroded in no discernible pattern.
RW25	Z-3129	This piece consists of the aft portion of the WS 1280 rib, ~12 feet of the aft inboard tank vent stringer, ~9 feet of the stringer aft of the vent (S-5 upper), and ~5 feet of fuel jettison tubing. The piece mates with RW1 (RW4), RW9, RW20, and RW8. The inboard and outboard faces of the rib are moderately sooted. The forward 4 inches of both inboard and outboard rib faces is burned. Primer on both rib surfaces is not burned or discolored except as noted. CATALAC coating on fasteners on the inboard rib face is not burned. Sealant on the rib and stringers is black and pliable. Fracture surfaces on the forward rib fracture are corroded but appear burned. Fracture surfaces elsewhere on the rib are corroded but appear unburned. The fuel jettison tube is not crushed. The exterior surface of the tube is covered with black splatters. The tube is fractured circumferentially at each end. The outboard fracture surface is heavily corroded. The inboard fracture surface is lightly corroded

Log #	Tag #	Observations - Right Wing Other Items
		and appears unburned aft of a vertical line through the tube diameter. Forward of that line the fracture surface appears burned. Non-metallic spacers between the stringers and ribs are blackened. Rib fragments at WS 1308 and WS 1336 are moderately burned. Fracture surfaces on these fragments are moderately corroded but appear burned. All faces of S 5 upper are moderately to heavily sooted. Sooting is heaviest at both ends of the stringer. Primer outboard of WS 1280 on S 5 upper is tanned. Primer elsewhere on the stringer is not discolored or burned. Fastener heads remaining on the stringer between ~ WS 1290 and WS 1316 have uneven soot deposits. Sooting on these fastener heads is markedly heavier on their inboard sides. No soot shadowing by the fastener heads is evident on the stringer flange. From ~ WS 1306 to WS 1324 there is a series of closely spaced, shallow gouges on S 5 upper. The gouges are 1-3 mm long, 1-2 mm wide, and spaced relatively evenly every 1-2 mm. Fracture surfaces on the inboard and outboard ends of S-5 upper are burned. The exterior surface of the inboard tank vent stringer box has light to moderate sooting near the WS 1280 rib. Sooting increases both inboard and outboard to become moderate to heavy at the ends. Visible primer is not burned or discolored. Between ~ WS 1280 and WS 1328, sooting is uneven on fastener heads on the forward vent stringer flange. Between ~ WS 1280 and WS 1308, the sooting is heavier on the outboard sides of the fastener heads; between WS 1308 and WS 1328, sooting is heavier on the inboard sides of fastener heads. Sooting on other fastener heads is uniform and consistent with the surrounding flange. The interior of the vent stringer box has light to moderate soot. Primer is not burned or discolored. At the access panel opening just outboard of WS 1364, sooting is slightly heavier on the outboard lip than elsewhere. The fracture surface on the vent from ~ WS 1326 to WS 1340 is lightly corroded but appears unburned. Fracture surfaces at both ends are moderately corroded and appear burned.
	Z-3770	This is a portion of the right wing inboard main tank forward vent stringer The piece extends from WS1252 outboard to approximately WS 1350. A portion of the vertical webbing structure at WS 1308 is attached. The vent stringer is moderately sooted over the entire length of the exterior surface. The outboard fracture mates with the

Log #	Tag #	Observations - Right Wing Other Items
		inboard fracture of the corresponding vent stringer attached to RW4. The outboard fracture surface is heavily sooted. The internal structure of the vent stringer shows light to no sooting over a majority of the surface. However, the outboard 12-14" of the internal structure is lightly to moderately sooted with the most heavy concentration near the fracture area. The inboard fracture surfaces are lightly to moderately sooted.

5.8 Right Wing Leading and Trailing Edge Devices

This section is a synopsis of the general condition of leading and trailing edge devices as of 02/13/97. Some wreckage pieces have not been recovered, identified, or accurately positioned.

Component	Observation - Right Wing Leading and Trailing Edge Devices
RW13	This is the inboard flap track for the inboard flap. The ball-screw assembly and a portion of the forward attachment fitting for the flap track remain attached to the flap track. There is a three foot length of light sooting centered on the middle of outboard sidewall of the flap track. There is sporadic light sooting on the upper and lower surfaces. The outboard sidewall surface was inaccessible. No fracture surfaces were identified. The ball-screw assembly shows sporadic light sooting. The exterior surfaces of the fractured attachment fitting are moderately sooted. The fracture surfaces are corroded.
RW14	This is the inboard flap track for the outboard flap. The ball-screw assembly, flap carriage, and a portion of outboard mid-flap remain attached to the flap track. There is sporadic light sooting on all surfaces of the flap track for the forward three feet. Moderate soot/grime exists on all surfaces from the flap carriage aft. The screw is sheared aft of the flap trunion. The flap carriage is sporadically covered with grime/soot throughout. Soot/grime shadowing can be found around two nuts on the outboard leg of the flap carriage yoke. The shadowing extends aft. The attached flap portion exhibits sporadic moderate sooting. The prominent locations being the upper, inboard, aft and lower, inboard exterior surfaces. The interior of the piece is exposed

Component	Observation - Right Wing Leading and Trailing Edge Devices
	and shows no sooting. The upper, aft, exterior surface exhibits thermal damage. All fracture surfaces are clean except the aft surfaces of the upper flap which are sooted or burned.
RW18	This is the outboard flap track for the outboard flap. The ball-screw assembly, flap carriage, and portions of the outboard mid- and aft flaps remain attached. The two flap pieces are attached together. There is light soot/grime on the inboard sidewall of the flap track except for the forward two feet. A demarcation line separates the clean and soot/grime zones. The line starts two feet from the forward end of the flap track and runs near horizontally aft until merging with the lower flange. The soot/grime is above the demarcation line. Light soot/grime exists along the entire upper surface. A spatter pattern is on the outboard sidewall near the forward attachment points of the ball-screw assembly. Light soot/grime is found aft of the spatter pattern for the entire sidewall length. Light soot/grime is on the lower surface forward of the flap carriage. Light soot/grime covers 95% of the visible surface of the flap carriage. The interiors of both flap portions are exposed and clean of soot. The external surfaces exhibit soot and thermal damage. The damage is prominent on aft, upper surfaces, heaviest on the aft portions of each attached flap piece. All lower surfaces are clean of soot.
RW23	This is the outboard flap track for the inboard flap. The ball-screw assembly remains attached. The upper surface is lightly sooted on the forward half and moderately sooted at the mid-section. The inboard sidewall and lower surfaces showed no sooting. The outboard sidewall surface was inaccessible. No fracture surfaces were identified. No sooting was noted on the ball-screw assembly.
RW26	This is a segment of the mid and aft right hand wing outboard flap. There is moderate fire damage and soot on the upper surface. The lower surface was not accessible. The fire damage was greatest on the aft upper surface. The exposed honeycomb was charred.
RW27	This is a right hand wing outboard foreflap. There is moderate fire damage and soot on the upper surface.

Component	Observation - Right Wing Leading and Trailing Edge Devices
	The lower surface was not accessible. The fire damage was greatest on the aft upper surface. The exposed honeycomb was charred.
RW28	This is a part of the right hand wing outboard midflap. There is moderate fire damage and soot on the upper surface. The lower surface was not accessible. The fire damage was greatest on the aft upper surface. The exposed honeycomb was charred.
RW29	This is a right hand wing outboard aft flap segment. There is moderate fire damage and soot on the upper surface. The lower surface was not accessible. The fire damage was greatest on the aft upper surface. The exposed honeycomb was charred
RW30	This is a piece of the right hand wing outboard mid and aft flap. There is moderate soot on the lower and upper surfaces. There is soot and fire damage on the aft edges.
RW31	This is a piece of the right hand wing outboard foreflap. There is moderate sooting on all surfaces.
RW32	This is a piece of the right hand wing outboard foreflap. There is sporadic light soot/grime on all surfaces, which has moderate sooting.
RW33	This is a piece of the right hand wing inboard foreflap. There is moderate sooting on upper and lower exterior surfaces. There is charring on the aft exposed honeycomb.
RW34	This is a piece of the right hand wing inboard foreflap. There is moderate fire damage evident on the upper exterior surface. The paint finish luster is gone, with sporadic blistering aft. Charring covers all exposed surface honeycomb. There is moderate sooting on the lower exterior surface.
RW35	This is the #7 spoiler located on the right hand wing inboard flap. There is heavy soot and fire damage on the lower surface and connecting rear spar piece. The upper metallic skin is gone, and the honeycomb is left behind. There is fire damage on the upper surface at all metal skin edges.
RW36	This is the #8 spoiler located on the right hand wing inboard flap. There is heavy sooting on the lower exterior surface. The paint is blistered and peeling at the interface of the metallic sheets.
Outboard Aileron	Free of sooting and burning
Outboard Flaps	The variable camber flaps #'s 23, 24, and 25 remained with the right wing tip and are not sooted or burnt.

Component	Observation - Right Wing Leading and Trailing Edge Devices
	The outboard support and outboard flap portion of the #22 variable camber flap, which is located on the leading edge just outboard of the #4 engine, remained with the main part of the wing. Both of the two support arms had broomstrawing, with more on the outboard arm (almost 5 inches, or full depth) than on the inboard (about 2 inches). This contrasted with the composite panels. The flat panel (which when stowed is the upper surface) had areas of dark sooting on the green side, but was not sooted on the painted side. Another panel that folds under shows no sooting.
Inboard Aileron	Not identified
Inboard Flap	Light to medium soot. Honeycomb portions are burned.
Outboard Spoilers	All outboard spoilers (#9 through #12) are heavily burned.
Inboard Spoilers	Spoiler #7 is moderately burned. Spoiler #8 is lightly sooted

6. LEFT WING

6.1 Overview

SOOTING/FRACTURE DIAGRAMS

Diagram #	Title
25	External surfaces of the upper and lower skins
26	Internal surfaces of the upper and lower skins

6.2 Left Wing Upper Skin Surfaces

Log #	Tag #	Observations - Left Wing Upper Skin Surfaces
LW6	A-2018	LW5 and LW6 are the same physical piece of wreckage and comprise part of the wing tip including part of the surge tank to its outboard end. LW 6 refers to the piece of upper wing skin, which extends over part of the dry bay and over part of the surge tank. The upper (exterior) surface is not sooted. The lower (interior) surface is clean from its aft fracture surface to the forward edge of the forward vent stringer (to the main outboard tank, #1), and moderately to lightly sooted from that point to the front spar. The inner surfaces of the forward vent stringer (to the main outboard tank, #1) are clean. The inner surfaces of the vent stringer behind it (to the main inboard tank #2), are clean. All the fracture surfaces are clean.
	Z-3346	This piece forms part of the upper surface of the surge tank, and

Log #	Tag #	Observations - Left Wing Upper Skin Surfaces
		the outboard end of the tank at WS 1548.2, and includes the surge tank vent through the outboard tank end. The upper (external) surface is not sooted. The lower (internal) surface is very lightly sooted from the rear spar to the aft vertical surface of the aft vent stringer to the inboard main tank #2. Forward of that, it is moderately sooted to the forward fracture surface. All the fracture surfaces are clean.
	C-311	This piece comprises part of the rib at WS 1454.0, and lower surfaces of all the vent stringers. The upper (exterior) surface is clean. The lower (interior) surface is clean. The center wing tank vent stringer surface is grimy. The fracture surfaces are clean.
	Z-3251	This piece comprises part of the rib at WS 1423.0, and lower surfaces of the inboard main tank #2 vent stringers. The upper (exterior) surface is clean. The lower (interior) surface is clean. The vent stringer surfaces are clean. The fracture surfaces are clean.
LW7	C-114	This piece comprises a piece of upper wing skin located at the side-of-body rib, and extends from the rear spar up to S-24. There is no soot on the upper (external) surface. The lower (internal) surface is not sooted except for a region between S-6 and S-7 (center wing tank vent stringer) where there is sooting on the skin surface and on the adjoining webs of both stringers. The fracture surfaces are not sooted.
LW10	C-859	No evidence of sooting or fire damage.
LW15	C-2175	No evidence of sooting or fire damage.
LW19	C-2010	No evidence of sooting or fire damage.
LW24	E-2005	This piece has heavy sooting on both surfaces and fractures.
LW26	C-2264	No evidence of sooting or fire damage.
LW27	C-881	No evidence of sooting or fire damage.
LW28	C-2261	No evidence of sooting or fire damage.
LW29	C-2329	No evidence of sooting or fire damage.
LW30	C-010	No evidence of sooting or fire damage.

Log #	Tag #	Observations - Left Wing Upper Skin Surfaces
LW31	C-2262	No evidence of sooting or fire damage.
LW39	Z-2661	This piece extends from just inboard of WS 1336 to ~ WS1423, and comprises parts of the ribs at WS 1364 and WS 1392, and the attachment flange of the rib at WS 1336; and all the vent stringers. A 2 foot section of the fuel jettison tube is attached at WS 1364 and has light sooting or grime inside. The inside surface of the vent stringer to the center wing tank is lightly to moderately sooted. The inside surfaces of the other three vent stringers appear clean. The upper (external) surface is clean. The lower (internal) surface is clean. All the fracture surfaces are clean.
	Z-3216	This piece comprises some of the forward part of the rib at WS 1280, the outboard end of the reserve tank. Part of the center tank vent stringer is attached, including a piece of the outboard forward vertical surface which extends to and mates with the vent stringer fracture at WS 1336. This piece was separated from the upper wing skin. Another part of the rib at WS 1280 is described below under Z-2510. The piece has light to moderate sooting on the outboard face of the remaining part of the rib, and very light or no sooting on the inboard face. The vent stringer outer surfaces outboard of WS 1280 are moderately sooted. The fracture surfaces of the vent stringer forward vertical surface are sooted. The mating fracture and vent stringer surfaces on WS 1336 are not sooted. Other than that described just above, the fracture surfaces are not sooted.
	Z-2510	This piece comprises most of the rib at WS 1280, which is the outboard end of the reserve tank, and parts of 2 stringers at the forward end of the rib. Another part of the rib is described above under Z-3216. There is a piece of rib connecting these two pieces that has not been located and placed in the reconstruction. All surfaces and fracture surfaces are clean.
LW42	Z-3126	This is a piece of upper wing skin that extends inboard/outboard from ~ WS 1200 to ~ WS 1336, and forward/aft from ~6" aft of the front spar for ~ 40".

Log #	Tag #	Observations - Left Wing Upper Skin Surfaces
		The upper (exterior) surface is clean. The lower (interior) surface is clean. The fracture surfaces are clean. The rib described under Z-3276 fits on this skin. The rib had sooting.
	Z-3257	This is a piece of upper skin that mates with LW42 described just above, and extends inboard/outboard from ~ WS 1186 to WS 1280, and forward/aft about 3 feet, within ~9" of the front spar at one point. The upper (external) surface has an area showing evidence of sooting/heating damage at ~ WS 1224. The rest of the surface is lightly sooted or grimy. The lower (internal) surface shows light sooting inboard of ~ WS 1196. The fracture surfaces are darkened. Mating fracture surfaces on LW42 are not as dark. Mating fracture surfaces on piece 9-21-96-1 are not as dark.
		This is a piece of upper skin that lies forward of the piece Z-3257 described just above. It extends inboard/outboard from ~ WS 1168 to ~ WS 1230. The upper (exterior) surface is clean. The lower (interior) surface is clean. The fracture surfaces are clean.
		These are two small pieces ~12" x 5", just inboard of Z-3275. The upper (external) surface is clean. The lower (internal) surface has light to moderate sooting.
LW45	C-2357	This is a piece of the left wing front spar. The forward surface is covered with light soot/grime. The aft surface appears clean. The fracture and faying surfaces appear clean of soot.
LW48		This ID number is a large collection (>100) of very small upper skin pieces. There is no sooting or fire damage on these pieces and the fracture surfaces are clean.
LW49	C-2356	No evidence of sooting or fire damage.

6.3 Left Wing Lower Skin Surfaces

Log #	Tag #	Observations - Left Wing Lower Skin Surfaces
LW1	C-006	The internal surface is clean.

Log #	Tag #	Observations - Left Wing Lower Skin Surfaces
		The external surface is lightly sooted inboard to the engine, which shadowed it, and sooted heavily to flap track 2, which shadowed it, and outboard almost to the end of the piece, where there is shadowing from flap track 1. The fracture surfaces are clean.
LW2	C-005	The internal surface is clean except for a ~3" wide band on the inboard edge between ~ WS 610 and WS 656. The external surface is heavily sooted inboard to flap track 3 and outboard to the engine fairing. It is lightly sooted outboard to flap track 2. Most of the fracture surfaces are clearly clean, but some are darkened which may be due to exposure to salt water.
LW3	C-108	This piece consists of the forward piece of the left wing lower skin, extending from the front spar aft to S-15, and from the wing root to ~ WS 680. Almost all of the chord which attaches the left side-of-body rib and the center wing tank lower skin to the wing skin forms a part of this piece. The external surface shows heavy sooting from WS 680 to ~ WS 490. Between ~ WS 490 and ~ WS 430 the gray paint and primer are mostly peeled off down to bare metal, with some primer/paint left in moderately sooted splotches that have their edges curled up in many places for about 1 mm. Between ~ WS 430 and ~ WS 90 there is mostly bare metal. Inboard of ~ WS 90 to the location of the bottom fairing edge, there are splotches of gray paint and primer that are not sooted, but with sooted edges curled up about 1 mm. There is moderate to heavy sooting inboard of the bottom fairing location, including the chord connecting to the left side-of-body rib and the center wing tank lower skin. Some areas of the chord where the center wing tank lower skin had been located are heavily sooted. All fracture surfaces are clean, except for minor sooting on the CWT skin fracture at S-18 and S-19.
LW4	C-2293	This piece consists of the inboard aft piece of the left wing lower skin, extending from S-15 aft to the rear spar. It mates with LW3. Most of the chord which attaches the left side-of-body rib and the CWT lower skin to the wing skin forms a part of this piece. The internal surface is clean except that just inboard of the outboard fracture along the rear spar, there is heavy sooting for a foot or so at the location of the lower rear spar chord. There was no sooting at the site of the rear spar chord anywhere else on the piece except at that location. There were sooting streamers seen

Log #	Tag #	Observations - Left Wing Lower Skin Surfaces
		from the aft row of fastener holes that pointed aft and inboard. The external surface similarly affected on the outer surface as LW3, including heavy sooting inboard of the bottom fairing edge. Flap track 3 provided shielding of the surface on the outboard edge of the piece. All the fracture surfaces are clean.
LW5	A-2018	LW5 and LW6 are the same physical piece of wreckage and comprise part of the wing tip including part of the surge tank to its outboard end. LW 5 refers to the piece of lower wing skin, which extends under a very small part of the dry bay and under all of the surge tank (WS 1485 to WS 1548.2). The lower (external) surface is clean. The upper (interior) surface and attached structure is lightly sooted.
LW8	C-862	The internal surface is clean. The external surface has no sooting to slight spotted sooting. The fracture surfaces are clean.
LW9	C-876	This piece extends from ~ WS 1030 outboard to ~ WS 1230, and from the front spar to the rear spar. Part of the front spar and pylon attach fittings remain with the piece. See the Structures notes for a full description and photographs. Most of the upper (internal) surface is not sooted. There is heavy sooting outboard of WS 1228 on the front spar inner surface; however, the mating surface on LW8 is not sooted. The lower (external) surface is heavily sooted between flap track 1 and the #1 engine, both of which shadowed it. The fracture surfaces on the wing skin are not sooted except for the forward/aft fracture at the outboard end of the piece, which is heavily sooted. The mating fracture surface on LW8 is not sooted. The pylon attach fittings on the front spar are not sooted. The fittings aft of the front spar are heavily sooted and burnt.
LW11	C-884	The internal surface is clean. The external surface is moderately sooted between WS 730 and WS 890 aft of S-17. The sooting is heavy from WS 890 outboard to ~ WS 940, and moderately sooted from that point to the end of the piece at WS 1208. The fracture surfaces are clean.
LW12	C-886	The internal surface is clean. The external surface is heavily sooted.

Log #	Tag #	Observations - Left Wing Lower Skin Surfaces
		The fracture surfaces are clean.
LW13	C-894	The internal surface is clean. The external surface has no or light sooting inboard of WS 586, except for ~10" on either side of WS 557 where there is light to moderate sooting. Outboard of WS 586, there is heavy sooting. The fracture surfaces are clean.
LW14	C-2017	The internal surface has light to no sooting. The external surface is moderately sooted. The fractures surfaces are clean.
LW16	C-909	No evidence of sooting or fire damage.
LW17	E-2004	This piece forms the lower surface of the surge tank. The lower (external) surface is clean. The upper (internal) surface is very lightly sooted near the vent stringers. The fracture surfaces are clean.
LW18	C-2032	This piece mates with LW11 on its outboard and forward fracture surfaces. On the lower (external) surface, there is heavy sooting outboard of the inboard edge of the piece up to the location of the #2 engine pylon at WBL 470, which shielded the surface from most sooting; however there is light sooting in the pylon location. Outboard of the pylon area, there is light sooting. The fracture surfaces are clean.
LW20	C-2232	This is a piece of wing skin extending from WS860 to WS902 at the rear spar. There is no sooting on the internal (upper) surface. There is light sooting on the external (lower) surface. The fracture surfaces are not sooted.
LW21	C-008	This is the #4 outboard flap assembly and trailing edge flap section. See the Structures notes for a description and photographs. There is a blackish deposit on the flap and most of the flap track that does not rub off easily. Whether this is soot or grime was not determined.
LW22	C-887	This is the #3 flap track with a piece of wing skin attached. The track has sooting and/or grime just aft of the attached wing skin. The wing skin piece is moderately sooted on both surfaces. The wing skin fracture surfaces are clean.

Log #	Tag #	Observations - Left Wing Lower Skin Surfaces
LW23	C-906	This is a flap track for the outboard flap. There is light to moderate sooting on the forward 4 feet all the way around the piece and on the trailing edge bottom side.
LW25A, B, C	E-2001 E-2002 E-2003	These are the 3 inboard flaps. There is moderate sooting on both the upper and lower surface of each flap.
LW32 LW33 LW34 LW47	C-428 C-888 C-1685 Z-3025	This pieces are part of the left outboard aileron and power pack actuator. There is light sooting on both sides of LW32, LW33, and LW34. There is no sooting on LW47.
LW35	C-222	This is the inboard aileron. It is heavily sooted and twisted. The lower section is heat damaged.
LW36		The upper surface is heavily fire damaged. The lower surface exhibits light soot/grime, and little to no fire damage. The actuators and aft surfaces of this piece are heavily sooted/grimy. The internal webbing is heavily sooted/grimy. All fracture surfaces are not sooted.
LW37	C-2291	This piece is the outboard flap track carriage for the inboard flap. There is no sooting or fire damage.
LW38	C-2029	This piece is the outboard flap track transmission for the outboard flap. There is no sooting or fire damage.
LW40	Z-2538	This piece mates with LW-9 at WS 1140, at the two access panels on either side of WS 1140. The upper (interior) surface in the forward outboard area is heavily sooted. The inboard area is generally clean except for a sooted area ~8” x 3” at WS 1140. The rear fasteners at S-5 show soot shadowing on the forward side. The external surface is heavily sooted all over. The forward fracture face is sooted. Other fracture faces are clean.
		This piece is ~18” x 18” and mates with the aft end of LW40. It has similar sooting patterns. Inboard fracture surfaces are clean. Outboard fracture surfaces are sooted.
LW41	Z-2517	This piece of skin is located at the rear spar from ~ WS 1135 to ~ WS 1210. The internal surface has heavy sooting on a narrow strip at the outboard edge, and light to moderate sooting in the center and the area near the inboard edge.

Log #	Tag #	Observations - Left Wing Lower Skin Surfaces
		The external surface is not sooted. The fracture surfaces are not sooted.
LW43	Z-3083	This piece is an inboard flap track for the outboard flap. There is moderate sooting on the bottom edge and on 3' of the rear upper edge. The sooting is light on both sidewalls.
LW44	Z-3364	This piece extends from ~ WS 1264 to ~ WS 1485, and from the rear spar to the mid spar. There is no sooting on either the upper (internal) or the lower (external) surface. The fracture surfaces are not sooted.
LW46	Z-3123	The internal surface is not sooted. The external surface is heavily sooted. The fracture surfaces are not sooted clean.
LW50	Z-2544	This is the spoiler #5 panel and actuator. It is not sooted. There is light sooting/grime on the attach fitting.

6.4 Left Wing Leading and Trailing Edge Devices

Component	Observations - Left Wing Leading and Trailing Edge Devices
Leading Edge Devices	Leading edge devices generally have little or no sooting and burning. One segment of a leading edge flap and bullnose (location unknown) is heavily burned, with the paint blistered and burned off and the underlying metal bluish-bronze colored. Approximately 50% of the metal web in the attaching assembly is missing with the remaining fragments being broomstrawed.
Outboard Aileron	Light burning and sooting.
Outboard Flap	The piece is moderately sooted on the upper edge and heavily sooted on the bottom edge. The forward edge of the flap surface is very lightly sooted.
Inboard Aileron	Moderate to heavy soot.
Inboard Flap	Light to moderate soot.
Outboard Spoilers	Spoilers #1 through #4 are not identified.
Inboard Spoilers	Spoiler #5 is free of sooting or burning. Spoiler #6 is heavily sooted.

7. RIGHT FUSELAGE

The following overall photographs of the forward fuselage show overviews of the structure as reconstructed in the second mock-up.

OVERALL PHOTOGRAPHS

Figure	Title
110	Right Hand Side Fuselage, Overview No. 1
111	Right Hand Side Fuselage, Overview No. 2

Log #	Tag #	Observations - Right Fuselage Internal Surface	Observations - Right Fuselage External Surface
RF1	A-004	Very light sooting and/or grime	Very light sooting and/or grime
RF2	C-004	No sooting	No sooting
RF3A-H		These pieces are part of the forward main cargo door. Some have grimy corrosion inhibiting compound (CIC), but there is no apparent sooting.	These pieces are part of the forward main cargo door. Some have grimy corrosion inhibiting compound (CIC), but there is no apparent sooting.
RF4	B-103	No sooting	No sooting
RF5	A-071	No sooting	No sooting
RF6A	B-2004	No sooting	No sooting
RF6B	B-240	No sooting	No sooting
RF6C	B-318	No sooting	No sooting
RF7	A-033	No sooting	No sooting
RF8A		No sooting	No sooting
RF8B	B-256	No sooting	No sooting
RF8C	B-263	No sooting	No sooting
RF8D	B-068	No sooting	No sooting
RF8E	B-268	No sooting	No sooting
RF8F	B-248	No sooting	No sooting
RF9A	C-117	No sooting	No sooting
RF9B	C-117	No sooting	No sooting
RF9C	C-259	No sooting	No sooting
RF10A	C-729	Light sooting in an area bounded at the forward end by ~STA 1480, S-5, and S-12 (bottom of the piece at that point), and at the aft end by ~ STA 1700, S-2 (top of the piece), and S-9.	Heavy sooting on the majority of the part from S-2 (top of the piece) down to S-14, medium sooting down to S-17 and light sooting at the bottom of the part.
RF10B	C-115	No sooting	No sooting
RF10C	C-2236	No sooting	No sooting at the bottom of the part with some light sooting at the top
RF10D	C-2235	No sooting	No sooting
RF11	C-2246	Very light sooting	Very light sooting
RF12		Light sooting	Light sooting
RF13		Light sooting	Light sooting
RF14	C-157	Medium to heavy sooting	Medium sooting
RF15	C-117	Very light sooting	

Log #	Tag #	Observations - Right Fuselage Internal Surface	Observations - Right Fuselage External Surface
RF16		No piece has this number.	
RW8 RF17		Heavy fire damage and sooting	Heavy fire damage and sooting
RF18A		No sooting	No sooting
RF18B	B-006	No sooting	No sooting
RF18C		No sooting	No sooting
RF18D	B-2021	No sooting	No sooting
RF18E	B-202	No sooting	No sooting
RF18F	B-2013	No sooting	No sooting
RF18G		No sooting	No sooting
RF19A	A-166	No sooting	No sooting
RF19B	A-268	No sooting	No sooting
RF20	A-212	No sooting	No sooting
RF21	A-2031	No sooting	No sooting
RF22	C-2334	No sooting	Light sooting
RF23	C-299	Medium sooting	No sooting on the majority of the panel except for a small amount of light sooting at ~ STA 1070 between S-14 and S-19
RF24	B-333	No sooting	No sooting
RF25	B-289	No sooting.	No sooting.
RF26A	C-274	No sooting	Light sooting
RF26B	C-110	No sooting	No to very light sooting
RF27	C-269	Light sooting and/or grimy CIC	No to very light sooting
RF28	C-217	Heavy sooting on the upper portion with burned area on the bottom.	Heavy sooting and heavy fire damage over the entire surface.
RF29	A-127	No sooting	No sooting
RF30A	C-2252	No sooting	No sooting
RF30B	C-2253	No sooting	No sooting
RF31	B-2014	No sooting	No sooting
RF32	A-605	Light sooting	Damage from heat and light sooting
RF33A	C-2237	Light sooting and/or grimy CIC	Light sooting
RF33B	C-2238	Light sooting and/or grimy CIC	Light sooting
RF33C	C-2239	Light sooting and/or grimy CIC	Medium sooting
RF33D	C-2240	Light sooting and/or grimy CIC	Light sooting
RF33E	C-2245	Light to medium sooting and/or grimy CIC	No sooting
RF33F	C-2241	Light sooting and/or grimy CIC	Very light sooting

Log #	Tag #	Observations - Right Fuselage Internal Surface	Observations - Right Fuselage External Surface
RF33G	C-2242	Light sooting and/or grimy CIC	Light to medium sooting
RF33H	C-2244	Light sooting and/or grimy CIC	Light sooting
RF33I	C-2243	Light sooting and/or grimy CIC	Very light to no sooting
RF33J	C-1207	No to light sooting and/or grimy CIC	Light sooting
RF33K	C-692	Light sooting and/or grimy	Medium sooting
RF34	C-067	There is localized light sooting between S-2R and S-2L at STA 1100, especially on the inside stringer flanges; between S-7R and S-8R at STA 1050 and STA 95, and on the forward face of the frame segment at S-2R at STA 1120.	No sooting
RF35	A-421	No sooting	No sooting
RF36	C-142	Light sooting	Medium sooting
RF37	C-801	Medium sooting with one area of heavy sooting at ~ STA 1000 between S-12 and S-15	Medium sooting
RF38	C-811	No sooting	No sooting
RF39A	C-123	No sooting	No sooting
RF39B		No sooting	No sooting
RF40	C-2330	No sooting	No sooting
RF41	C-848	No sooting	No sooting
RF42	C-845	Light sooting on the forward part of the part with a diagonal break starting at ~ STA 1400 at the top going down and aft to STA 1480 transitioning to medium sooting on the aft part of the part	Medium sooting on the top part of the part. Light sooting starting forward at S-15 and down to the bottom of the part and going aft and diagonally down to S-18. There was one window remaining at ~ STA 1360 that was heat damaged on the exterior.
RF43	C-810	No sooting	No sooting
RF44A	C-2254	Very light sooting and/or grimy CIC	Light sooting

Log #	Tag #	Observations - Right Fuselage Internal Surface	Observations - Right Fuselage External Surface
RF44B	C-268	No sooting	No sooting
RF44C	C-2277	No sooting	No sooting
RF44D	C-2348	No sooting	No sooting
RF44E	C-2349	No sooting	No sooting
RF45A	C-122	Light sooting	Light sooting
RF45B	C-2276	Light sooting	Light sooting
RF45C	C-277	No sooting	No sooting
RF45D	C-2335	No sooting	No sooting
RF45E	C-1080	Light sooting and/or grimy CIC	Light sooting
RF45F	C-644	Light sooting	Light sooting
RF45G	C-2133	No sooting	No to light sooting
RF45H		No sooting	Light sooting
RF46	A-476	No sooting	No sooting
RF47A	C-219	Light sooting and/or grimy CIC	Light to moderate sooting
RF47B	C-885	No sooting	Very light sooting
RF48		No part currently assigned	
RF49		No part currently assigned	
RF50	B-255	No sooting	Very light sooting forward of STA 340
RF51	C-2002	Medium sooting	Light sooting
RF52A	C-646	Medium to heavy sooting and/or grimy CIC	Very light sooting
RF52B	C-365	Medium sooting and/or grimy CIC	Medium sooting
RF52C	C-2120	Light sooting and/or grimy CIC	No sooting
RF52D		Light sooting and/or grimy CIC	No sooting
RF52E	C-2094	Medium sooting and/or grimy CIC	Very light sooting
RF52F		Light sooting and/or grimy CIC	Very light sooting
RF53A		Light sooting and/or grimy CIC	Light to moderate sooting
RF53B	C-686	Light sooting and/or grimy CIC	Light sooting

Log #	Tag #	Observations - Right Fuselage Internal Surface	Observations - Right Fuselage External Surface
RF53C	C-1025	Very light sooting and/or grimy CIC	No sooting
RF53D	C-2087	Very light sooting and/or grimy CIC	No sooting
RF53E	D-2058	Very light sooting and/or grimy CIC	Light sooting
RF54A	C-1026	Light sooting and/or grimy CIC	Light sooting
RF54B	C-1024	Light sooting and/or grimy CIC	Light to medium sooting
RF54C	C-968	Light sooting and/or grimy CIC	Light sooting
RF54D	C-2106	Light sooting and/or grimy CIC	Light sooting
RF54E	C-2336	Light sooting and/or grimy CIC	Medium sooting
RF55A	C-1067	No sooting	No sooting
RF55B	C-803	No sooting	No sooting
RF55C	C-2238	No sooting	No sooting
RF55D	C-127	No sooting	No sooting
RF56	C-996	Light sooting and/or grimy CIC	No sooting
RF57	A-710	No sooting	No sooting
RF58	C-1037	No sooting	No sooting
RF59	C-236	Heavy sooting and/or very grimy CIC	Heavy sooting and heat damage
RF60	C-1049	Light to moderate sooting	Light sooting
RF61	D-2001	Moderate sooting	Moderate sooting
RF62	C-2337	No sooting	No sooting
RF63	C-1081	No to very light sooting and/or grimy CIC	Very light sooting
RF64	C-2153	No sooting	No sooting
RF65	C-1661	No sooting	Light sooting
RF66	C-2156	Light to moderate sooting	Light sooting
RF67	C-1696	Light sooting	Light to moderate sooting over the entire surface area. There are wire bundles coming out of ~ STA 1000 and S-29 right. The first foot of wires

Log #	Tag #	Observations - Right Fuselage Internal Surface	Observations - Right Fuselage External Surface
			away from the body is free of soot; the rest of the wires in the bundles are burned. Along STA 1000 at the bottom of the piece, there are several wire bundles coming out of the surface. All these are moderately burned and sooted.
RF68	B-2060	No sooting	No sooting
RF69	B-2063	No sooting	No sooting
RF70	B-167	Light sooting or grimy CIC	No sooting
RF71	C-2215	No sooting	Light to medium sooting
RF72	B-2064	Light sooting and/or grimy CIC	No sooting
RF73	C-2339	No sooting	No sooting
RF74	C-1668	No sooting	No sooting
RF75	C-2082	No sooting	No sooting
RF76	Z-2526	Light to medium sooting	Light sooting
RF77	Z-2505	Light sooting	Light sooting
RF78	B-286	No sooting	No sooting
RF79	B-2059	No sooting	No sooting
RF80	B-299	No sooting	No sooting
RF81	B-288	No sooting	No sooting
RF82	B-210	No sooting	No sooting
RF83	B-2058	No sooting	No sooting
RF84	A-2030	No sooting	No sooting
RF85	B-203	No sooting	No sooting
RF86	D-2002	No sooting	No sooting
RF87	A-2032	No sooting	No sooting
RF88	A-2025	No sooting	No sooting
RF89	A-2020	Light sooting and/or grimy CIC	No sooting
RF90	B-191	Light sooting and/or grimy CIC	No sooting
RF91	A-2021	No sooting	No sooting

Log #	Tag #	Observations - Right Fuselage Internal Surface	Observations - Right Fuselage External Surface
RF92	B-294	No sooting	No sooting
RF93	C-2206	No sooting	Light sooting
RF94A	C-2222	No sooting	No sooting
RF94B	C-404	No sooting	No sooting
RF94C	2207	No sooting	No sooting
RF95	Z-3072	Light sooting and/or grimy CIC. There is moderate sooting on the forward piece between S-36R and S-37R.	Moderate to heavy sooting
RF96	C-384	No sooting	No sooting
RF97	C-273	No sooting	No sooting
RF98		No sooting	No sooting
RF99	C-2340	No to light sooting	No sooting
RF100	C-2341	No sooting	No sooting
RF101	C-2342	No sooting	No sooting
RF102	C-2124	No sooting	No sooting
RF103	C-2200	No sooting	No sooting
RF104	C-2218	No sooting	Very light sooting
RF105	C-2343	No sooting	
RF106	C-1664	No sooting	Light sooting
RF107	A-2022	No sooting	No sooting
RF108	A-2033	No sooting	No sooting
RF109A	C-2379	No sooting	No to very light sooting
RF109B			
RF109C	D-2022	No to very light sooting and/or grimy CIC	No sooting
RF109D	C-1069	No to very light sooting and/or grimy CIC	No sooting
RF109E	C-2381	No to very light sooting and/or grimy CIC	No sooting
RF110	Z-3298	No sooting	No sooting
RF111A		Moderate sooting and/or grimy	

Log #	Tag #	Observations - Right Fuselage Internal Surface	Observations - Right Fuselage External Surface
		CIC	
RF111B		Light sooting and/or grimy CIC	
RF111C		Moderate sooting and/or grimy CIC	No sooting
RF111D		Light sooting and/or grimy CIC	Light sooting
RF111E		Light sooting and/or grimy CIC	
RF111F		Light sooting and/or grimy CIC	Light sooting
RF111G		Light sooting and/or grimy CIC	Light sooting
RF111H		No sooting	No sooting
RF112A			
RF112B	B-2086	Moderate sooting and/or grimy CIC	No sooting
RF113A		No sooting	No sooting
RF113B		No sooting	No sooting
RF114A	Z-3568	Light sooting	Light sooting
RF114B	Z-2854	Light sooting and/or grimy CIC, and some black splatters	No to light sooting
RF114C	Z-3215	Light to moderate sooting	Light sooting. This piece mates with RF23.
RF115		No sooting	Light to medium sooting
RF116			
RF117	T-6019	No sooting	No sooting
RF118	X-4001	No sooting	No sooting
RF119			
RF120			
RF121			
RF122A -V		No sooting	No sooting

8. LEFT FUSELAGE

The following overall photographs of the forward fuselage show overviews of the structure as reconstructed in the second mock-up.

OVERALL PHOTOGRAPHS

Figure	Title
112	Left Hand Side Fuselage, Overview No. 1
113	Left Hand Side Fuselage, Overview No. 2

Log #	Tag #	Observations - Left Fuselage Internal Surface	Observations - Left Fuselage External Surface
LF1		No sooting except for light sooting at forward end of horizontal support inboard of S-28L	No Sooting
LF2	C-002	Little to no sooting. This mates with LF39A, which is sooted.	Moderate sooting and blistered paint from the top of the panel to ~ S-19 with light sooting on the bottom of the part.
LF3	C-003	No sooting.	Moderate sooting on the top to light sooting on the bottom of the part
LF4	B-103	No sooting; sooting on inside surface of flexible cabin air ducts	Not accessible
LF5	A-022	Blistered paint at STA 800 and S-36L	No sooting
LF6A		The upper surface shows mostly grimy CIC. At the attachment area for the antenna, the enamel and sealant are not bonded. In the valleys of S-47R and S-47L in that immediate area, the enamel has disbonded.	There is a moderate to heavy deposit of a black oily material along BL0 from ~ STA 840 to the aft end of the piece at STA 1000. At STA 840 the deposit is ~3 feet wide, and narrows to the width of the keel beam aft of STA 880. There is apparent heat damage to the aluminum attachments for the wing-to-body fairing, and the enamel is blistered and bubbled.
LF6B		No sooting and grimy CIC.	Light sooting
LF7A		No sooting.	No sooting.
LF7B		Very light sooting.	No sooting.
LF7C		No sooting. Appears to be grimy.	No sooting.
LF7D		No sooting	No sooting
LF8A		No sooting	No sooting
LF8B		No sooting	No sooting
LF8C		No sooting	No sooting
LF8D		No sooting	No sooting

Log #	Tag #	Observations - Left Fuselage Internal Surface	Observations - Left Fuselage External Surface
LF8E		No sooting	No sooting
LF8F		No sooting	No sooting
LF9		No sooting	No sooting
LF10A		No to very light sooting and/or grimy	Light sooting
LF10B		No to very light sooting and/or grimy	Light sooting
LF10C		No to very light sooting and/or grimy	Light sooting
LF10D		No to very light sooting and/or grimy	Light sooting
LF10E		No sooting and/or grimy	No to light sooting
LF10F		No sooting and/or grimy	No sooting
LF10G		No sooting.	No sooting.
LF11A-Q		This is nose wheel well structure. Some of it is dirty, but there does not appear to be sooting.	This is nose wheel well structure. Some of it is dirty, but there does not appear to be sooting.
LF12A		No sooting	Not accessible
LF12B		No sooting	Not accessible
LF12C		No sooting	No sooting
LF13A		No sooting	Very light sooting
LF13B		No sooting	Light to moderate sooting
LF14A	A2048	See Section 3.12 covering the keel beam.	See Section 3.12 covering the keel beam.
LF14B	C061	See Section 3.12 covering the keel beam.	See Section 3.12 covering the keel beam.
LF14C	C061	See Section 3.12 covering the keel beam.	See Section 3.12 covering the keel beam.
	C1031	See Section 3.12 covering the keel beam.	See Section 3.12 covering the keel beam.
LF14D	C109	See Section 3.12 covering the keel beam.	See Section 3.12 covering the keel beam.
LF15A		No sooting	No sooting
LF15B		No sooting	No sooting
LF16A	C-2146	See CW1002	
LF16B	C-2136	See CW1006	
LF16C	C-2139	See CW1004	
LF17		Light to moderate sooting	Light to moderate sooting
LF18		Mostly no sooting. One internal surface has a blackish deposit that can be rubbed off, but whether this is soot was not	

Log #	Tag #	Observations - Left Fuselage Internal Surface	Observations - Left Fuselage External Surface
		determined.	
LF19A		Mostly no sooting. There are dark spots at junctions of stringers and frames between STA 400-STA 500 from S-7 to the crown, but whether these are sooting was not determined.	Not accessible
LF19B		Mostly no sooting, but there is darkening in places. Whether this is sooting was not determined.	No sooting
LF20	B-180	There is a light deposit of blackish material that will rub off. Whether this is soot was not determined.	Light sooting.
LF21		There is a light deposit of blackish material that will rub off. Whether this is soot was not determined.	There is a light deposit of blackish material that will rub off. Whether this is soot was not determined.
LF22	(35 + pieces)	These pieces form part of the belly skin under the forward cargo compartment. They have non-uniform blackening that is consistent with grimy CIC, which could include some sooting.	No sooting.
LF23		Light sooting and/or grimy CIC	No sooting
LF24		Light sooting and/or grimy CIC	No sooting
LF25		No sooting	No sooting
LF26A		No sooting	No sooting
LF26B		No sooting	No sooting
LF27 A-C;E-G		No sooting	No sooting
LF27D		Mostly no sooting. There is some darkening between STA 1840 and STA 1920 around S-26L. Whether the darkening is soot was not determined.	Not visible
LF28 A-C		No sooting	No sooting
LF29		Light sooting and/or grimy CIC	Not visible
LF30 B,		No sooting	No sooting

Log #	Tag #	Observations - Left Fuselage Internal Surface	Observations - Left Fuselage External Surface
C, E, F, G, H, I			
LF31			
LF32			
LF33A		No sooting	No sooting except for a small burn mark at S-24L and STA 2215
LF34		There is a deposit of blackish material that does not rub off. Whether it is soot was not determined.	There is a deposit of blackish material that does not rub off. Whether it is soot was not determined.
LF35A, B, C, D		Moderate sooting and/or grimy CIC	Light sooting
LF36		Light sooting and/or grime.	No external surface on this part
LF37A, B		There is a localized blackish deposit that rubs off. Whether this is soot or grime was not determined.	No external surface on this part
LF38		There is some localized darkening on stringers. Whether this is soot or grime was not determined.	Not accessible
LF39A	C-860	Medium sooting. Two windows remained and had moderate sooting. This piece mates with LF2 at STA 1416. LF2 has little to no sooting.	Very light sooting. Two windows remained and were lightly sooted.
LF39B	C-112	Medium to heavy sooting	(No external surface)
LF40		The left surface has light to medium sooting and/or grimy CIC	The right surface has light to medium sooting and/or grimy CIC
LF41		Moderate sooting and/or grimy CIC	No to light sooting
LF42 A,B,C,E, G		Moderate sooting	None to light sooting
LF43		Light sooting and/or grime	Light sooting and/or grime
LF44		Light sooting and/or grime	Light sooting and/or grime
LF45A, B, C		No to light sooting and/or grimy CIC	No to light sooting
LF46	C-961	Light sooting and/or grime	Light sooting
LF47	C-926	Moderate sooting and/or grimy	Light sooting

Log #	Tag #	Observations - Left Fuselage Internal Surface	Observations - Left Fuselage External Surface
		CIC	
LF48	C-148	No to light sooting and/or grimy CIC	No to very light sooting.
LF49		No to light sooting and/or grimy CIC	No sooting.
LF50	A-131	Light sooting and or grimy CIC	Light sooting and/or grimy CIC
LF51	C-642	No sooting	No sooting
LF52 A-G		Moderate sooting and/or grimy CIC	Light sooting and/or grimy CIC
LF53		Light to moderate sooting and/or grimy CIC	No sooting.
LF54 A-D		Light sooting and/or grimy CIC	Light sooting
LF55A	A-744	This piece consists of a vertical web section at FS1000, to which is attached a portion of outer fuselage skin. This skin extends forward to approximately FS980, and from S-39L to approximately S-42L. The forward face of the vertical surface exhibits light sooting/grime. The upper surface of the horizontal piece (skin) exhibits light sooting/grime. All fracture surfaces are clean.	The aft face of the vertical web contains soot/grime deposits on the upper circumference of the fastener heads. The lower surface of the horizontal piece (skin) exhibits light sooting/grime.
LF55B	A-2049	This piece mates to the inboard edge of the vertical component of LF55A. The forward face exhibits light sooting/grime.	The aft face is lightly sooted, and there are soot/grime deposits on the upper circumferences of the fastener heads. A swab was taken from this area and is marked with the notation "#7 3/6/97 NTSB FM".
LF55C	D-2035	This piece mates to the inboard edge of the vertical component of LF55B. This part extends from LBL 26.03 to LBL 9, and from the outer circumference of the fuselage up to the base of	The aft face is lightly sooted. A swab was taken from this area and is marked with the notation "#8 NTSB FM". On the aft face, there are at least eight soot/grime tails

Log #	Tag #	Observations - Left Fuselage Internal Surface	Observations - Left Fuselage External Surface
		the front spar. The forward face exhibits light sooting/grime.	immediately below the lap joint interface common to the front spar, between the keel beam and the bulkhead stiffener at LBL 17, which are oriented in a downward direction, across the lap joint fasteners. The lap joint interface is free of soot. There are soot/grime deposits on the upper circumferences of the fastener heads on the aft face along LBL 26.03. The fastener heads on the aft face of the web, common to the stiffener at LBL 17, have soot buildup on the upper circumferences. The lower circumferences are free of soot. There are very light soot/grime tails pointing downward and very slightly inboard below these fasteners.
LF55D	B-061	Light sooting and/or grimy CIC on forward face	Light sooting and/or grimy CIC on aft face
LF55E	D-2036	Light sooting and/or grimy CIC on forward face	Light sooting and/or grimy CIC on aft face
LF56A, B		No sooting	Light sooting
LF57			
LF58 A,B		Light sooting and/or grimy CIC	Light sooting and/or grimy CIC
LF59		No sooting	No sooting
LF60	C-2321	No sooting and grimy CIC	No sooting
LF61	C-1083	Light sooting	Light sooting
LF62	C-1667	No sooting	No sooting
LF63	Z-2519	No sooting	Light sooting and/or grime
LF64	Z-2520	No sooting	No sooting
LF65	Z-2653	Light sooting and/or grime	Light sooting and/or grime
LF66	Z-2322	No sooting	No sooting
LF67A	Z-3304	No sooting.	No sooting.
LF67B	Z-2548	No sooting.	No sooting.

Log #	Tag #	Observations - Left Fuselage Internal Surface	Observations - Left Fuselage External Surface
LF67C	C-2345	No sooting	No to light sooting
LF68	Z-3100	Heavy sooting	Heavy sooting
LF69	Z-2586	No sooting. The frame at the crown at STA 1416 was recovered and is heavily fire damaged.	No sooting.
LF70 A,B	Z-2518 Z-3119	No sooting	Light sooting or grime
LF71A	Z-2537	Light to moderate sooting	Moderate sooting
LF71B	Z-3268	Moderate sooting and/or grimy CIC	Light to moderate sooting.
LF72	B-2065	Light sooting or grimy	No sooting
LF73A	C-1682	Light sooting CIC	Not visible
LF73 B-C	C-2183 C-2220	No sooting	No sooting
LF74		Small areas of sooting/grimy CIC at STA 860 and S-1L	No sooting
LF75	Z-3110	No sooting of grimy CIC	No sooting
LF76	C-2346	No sooting	No to very light sooting
LF77	C-2347	No sooting	No sooting
LF78	C-370	No sooting	No sooting
LF79	C-388	No sooting	No sooting
LF80		No sooting.	No sooting except for the acrylic window in the door, which is lightly crazed typical of exposure to heat.
LF82 A-Y		No sooting and grimy CIC	Light sooting on exterior parts
LF83		No sooting	No sooting
LF84		No sooting and grimy CIC.	No sooting.
LF86 A-M		Light sooting and/or grimy CIC	Light sooting
LF87 A-I		No sooting	No sooting
LF88 A-M		No to light sooting and grimy CIC	No to light sooting
LF89		Light sooting and/or grimy CIC	Light sooting and/or grimy

9. EMPENNAGE

9.1 Vertical Stabilizer

Log #	Tag #	Observations - Vertical Stabilizer
V-1	E-2006	This is the upper forward section of the front spar. There is no sooting or fire damage.
V-2	E-2007	This is the lower section forward of the front spar. There is no sooting or fire damage.
V-3A V-3B V-3C V-3D V-3E	E-2008 E-2009 E-2010 E-2011 E-2112	These are panels from the left side aft leading edge and the right side forward front spar. There is no sooting or fire damage.
V-4	C-020	Left side skin and stringers upper end. There is no sooting or fire damage.
V-5	D-2019	Left side vertical skin and lower stringers. There is no sooting or fire damage.
V-6	D-2020	Left side vertical skin and lower stringers. There is no sooting or fire damage.
V-7	D-2393	This is the nose fairing and the vertical fin. There is no sooting or fire damage.
V-8	C-656	This is the right side vertical skin and stringer, lower forward. There is no sooting or fire damage.
V-9	C-1658	This is the right side vertical skin and stringer, lower aft. There is light sooting on portions of the interior and exterior surfaces.
V-10	Z-2824	This is the leading edge fin skin of the vertical stabilizer. There is no sooting or fire damage.

9.2 Horizontal Stabilizer

Log #	Tag #	Observations - Horizontal Stabilizer
H-1	Z-2575	Center torque box has no sooting or fire damage. Left horizontal stabilizer upper skin (attached) from rear spar forward approximately 36" shows evidence of light to moderate sooting on lower (interior) surface. Soot shadowing over fasteners indicates direction of sooting at ~30 degrees angle from right front to left aft. Left horizontal stabilizer lower skin (attached) from rear spar forward ~20" and extending ~40" outboard from horizontal stabilizer root shows evidence of sooting in and around fastener holes on lower (exterior) surface. Soot shadowing in and around fastener holes indicates direction of sooting from fore to aft. Upper (interior) surface shows light sooting outboard of STA 210 in and around fastener holes. Soot direction appears to be from fore to aft.
H-2	C-1078	Left hand horizontal stabilizer section has no sooting or fire damage.
H-3	C-1028	Right hand horizontal stabilizer section has no sooting or fire damage.
H-4	C-674	Left hand horizontal stabilizer section has no sooting or fire damage.
H-5	Z-3338	Left hand horizontal stabilizer leading edge section has no sooting or fire damage.
H-6	Z-3002	Right hand side horizontal stabilizer leading edge section has no sooting or fire damage.
H-7	C-2394	Right hand side inboard nose section has no sooting or fire damage.
H-8	C-3125	Right hand side upper side between auxiliary spar and front spar has no sooting or fire damage.
H-9	C-226	The left horizontal stabilizer, lower skin, from the front spar to S-9 shows evidence of soot or black residue transfer from ~ S-15 to between S-13 and S-14 at an angle ~30 degrees from right forward to left aft. Residue marking is ~12-14" in length. Some spattering is evident at several locations along the residue path. There is some soot/arcing evidence around a fastener located at the forward spar attach flange ~12" outboard of STA 165. Another soot/arc mark is located ~36" outboard of STA 187 along the aft row of fasteners at the lap joint at S-10.

Log #	Tag #	Observations - Horizontal Stabilizer
	C-2559	Left hand horizontal stabilizer leading edge section has no sooting or fire damage.
	C-496	Left hand horizontal stabilizer upper skin section has no sooting or fire damage.
	3554	Left hand horizontal stabilizer lower skin section upper (interior) surface is lightly sooted over outer 24" section of piece. Light sooting of stringers vertical and upper horizontal flanges. Left hand horizontal stabilizer lower skin section, lower (exterior) surface is lightly to moderately sooted (sealant) over outer 24" of piece. Direction of soot/sealant is fore to aft.

9.3 Left Elevator

Log #	Tag #	Observations - Left Elevator
LE1A LE1B	C-674 D-2021	This is a left hand inboard elevator piece. It is very lightly sooted on the bottom edge.
LE2A LE2B LE2C LE2D	E-2020 C-1078 E-2023 E-2024	This is a left hand outboard elevator piece. There is no sooting or fire damage.

9.4 Right Elevator

Log #	Tag #	Observations - Right Elevator
RE1	E-2025	This is the right hand inboard elevator. It is lightly sooted and has some fire damage on the outboard edge.
RE2A RE2B RE2C RE2D RE2E RE2F	E-2026 E-2027 E-2028 E-2029 E-2030 E-2031	These are right hand outboard elevator pieces. Pieces RE2A, 2B, 2C and 2D have no sooting or fire damage. Pieces RE2E and RE2F are lightly sooted and RE2F has some fire damage.

9.5 Rudder

Log #	Tag #	Observations - Rudder
R1	E-2032	There is no sooting or fire damage.
R2	C-219	There is no sooting or fire damage.
R3	E-2033	The lower surface is heavily coated with soot and/or grime. The piece is moderately sooted and/or grimy on the sides.
R4	E-2034	There is light sooting and/or grime on all sides.
R5	E-3034	There is no sooting or fire damage.

10. LANDING GEAR

The landing gear has substantial mechanical damage, but there is no fire damage. Both the wing gear and the body gear have areas of light to moderate soot. All tires have been recovered, and show no evidence of burning. See the Systems Field Notes for details of the landing gear and landing gear doors.

11. FIRE SUPPRESSION SYSTEMS

11.1 Cargo Primary Halon Bottles

There are two cargo primary Halon bottles, which can allow the flight deck crew to discharge Halon into a cargo compartment if a fire is detected. Both bottles were recovered.

AFT LOWER CARGO BOTTLE

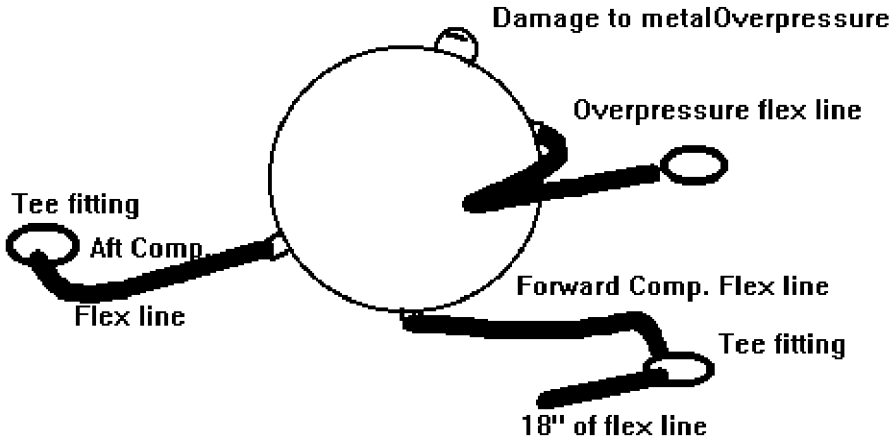
The aft lower bottle was manufactured by American Standard. The specifications were:

200 PSIG @ 70 degrees F
105 Lb. Halon 1301
American Standard # 35207900M
Boeing # 60860001-1
Gross Weight 122.30 Lb.

The bottle was found empty. The flex lines for the forward compartment, aft compartment, and overpressure discharge were attached. All lines were broken after the Tee fittings attached to the flex lines. The squib for the aft compartment had ~12" of the ground wire attached and ~1/2 inch of wire from the electrical plug. The squib for the forward compartment had no wire attached. There was a large (2 to 3 inch) tear in the metal dimple attached to the bottle. Other than a few dents, the bottle seemed to be free of any other damage.

The squibs were removed and inspected. They were intact and had not been fired. The frangible disks were intact and sealed to the discharge ports.

Cargo Primary Fire Bottle



FORWARD LOWER CARGO BOTTLE

The forward lower cargo bottle was fractured and about half the bottle was recovered. One of the two squib plugs remains intact and had not been fired.

11.2 Freon Bottles in Wing Surge Tanks

The wing surge tanks have a system to protect the tanks from flames entering them through the tank vents, which exhaust on the underside of the wings very near the wing tips. The system is designed so that a flame radiation detector will detect a flame that may enter the vent, in which case the system reacts by puncturing the retaining diaphragms and thereby discharging four containers (bottles) containing a flame-suppressing Freon. Three of these bottles (located at the inboard end of the surge tank at WS 1485) discharge directly into the tank itself, and the fourth (located at the outboard end of the tank at WS 1548) discharges directly into the vent leading from the tank to the outside.

On the left wing, the three bottles located at the inboard end of the surge tank at WS 1485 were recovered. The bottle located at WS 1548 was not recovered. The three recovered bottles had intact diaphragms, and no Freon had been discharged.

On the right wing, all four bottles were recovered. All four had intact diaphragms, and no Freon had been discharged.

12. OXYGEN BOTTLES

The oxygen supply system consists of

5 large permanently mounted passenger bottles

1 permanently mounted crew bottle

1 portable crew bottle

Of those listed above, all the permanently mounted bottles, the portable crew bottle, and 31 portable passenger bottles have been recovered. See the Systems Group Notes for the condition of these bottles.

13. AIR CONDITIONING EQUIPMENT

The air conditioning packs or air cycle machines (ACMs) provide conditioned air to the passenger and crew areas. The packs are located in the center wing section, below the center wing fuel tank. ACM #1 and ACM #3 and their associated heat exchangers are located under the center wing tank just behind the front spar (STA 1000), on either side of the keel beam. ACM #2 is located on the left side of the keel beam behind ACM #1.

There is considerable soot/grime on pieces of lower body fairing, including the access door. This sooting/grime appears to concentrate aft of the number 1 and 3 ACMs. The sooting/grime appears on the inside surface of the fairings, but not on the outside.

The #3 heat exchanger showed sooting/grime on the cooling fins on the ram air inlet side. The inside of the fiberglass ram air inlet ducting was sooted/grimy, while the outside of the duct was clean. The ram air exhaust side of the heat exchanger was slightly sooted/grimy. There was little to no sooting/grime. The ACM manufacturer's representative noted that soot buildup occurs during airline service, so it could not be determined whether this sooting had been a result of this accident.

The inboard lower surfaces of the number 2 ACM are sooted/grimy, including the lower circumferences of the primary and secondary air chambers.

The #1 heat exchanger also showed sooting on the cooling fins on the ram air inlet side and sooting on the inside of the ram air inlet duct. The sooting on the #1 heat exchanger was not as heavy as the #3 heat exchanger.

Visual inspection of electrical wiring for the heat exchanger section showed no evidence of arcing or melting of any wiring.

14. LOWER ACCESS DOORS AND FAIRINGS

ACM Access Door Left side - 191 NL STA 1239.25 to STA 1170	The interior surface of the access door is lightly to heavily sooted/grimy over the entire surface. The heaviest concentrations of soot/grime are over the aft 2' of the door and the outboard 18" near STA 1200. This door (as placed in the wreckage) consists of 3 pieces which have been located and duct taped together in their respective positions. A portion of this access door ~14" by 18" and located at ~ STA 1220 has not been recovered and/or placed at its relative position. The exterior surface of this access door appears to be clean and free of soot/grime except for in/around the aft inboard latching mechanism.
Fairing Panel Left side - 191 FL STA 1045 to STA 1121	The interior surface of the fairing panel exhibits light to heavy sooting/grime over the inboard 14" of the panel running the length of the panel. The heaviest

	concentration of soot/grime occurs at the inboard aft corner (14" by 8") of the panel. The exterior is clean and free of soot.
ACM Access Door Left Side - 191 HL STA 1121 to STA 1170	The interior surface of the access door is lightly to heavily sooted/grimy over a majority of the door. The heaviest concentration of soot/grime is located in/around the aft and outboard edge latching mechanisms/hinge assemblies. This door (as placed in the wreckage) consists of ~9 pieces which have been located and duct taped together in their relative positions. A portion of this access door (~ 12' by 20") located ~10" outboard of the inboard edge has not been recovered and/or placed in its relative position.
Fairing Panel Left Side - 191 ML	The interior surface of this fairing panel exhibits light sooting/grime over the entire surface. The heaviest concentrations of soot/grime occur along the forward edge (~8 " fore to aft) and along the inboard edge (~18" inboard to outboard). This fairing panel (as placed in the wreckage) consists of 5 pieces which have been located and duct taped together in their respective positions. The outboard forward corner (~14" by 8") and the access panel which make up the center of this whole panel have not been recovered and/or placed in their relative positions. The exterior surfaces of the pieces that make up this access panel show little to no sooting/grime.
ACM Access Door Right Side - 192 HR STA 1170 to STA 1112	The interior surfaces of this access door are moderately to heavily sooted/grimy. The largest concentrations of soot/grime occur over the inboard 24" of the door. This access door (as placed in the wreckage) consists of 4 pieces which have been duct taped together in their respective positions. The remaining piece remains attached to the forward portion of the keel beam. A quarter is embedded in the interior surface at 10" outboard of the inboard edge and ~18" forward of the aft edge of the access door. The exterior surfaces of the pieces that make up this access door show little to no sooting/grime.
Fairing Panel Right Side - 191 NR STA 1200 to STA 1239.25	The interior surface of this fairing panel piece shows evidence of light to moderate soot/grime over a majority of the piece. The heaviest concentration of soot/grime is located along the inboard 18" of the length of the piece and increasing at the forward edge. The

	outboard edge of the piece (~6" to 8") near the aft 18' shows little to no soot/grime. The forward 20" and a portion of the outboard front corner have not been recovered an/or placed in their relative positions. The exterior surface of this piece shows no evidence of soot/grime.
Fairing Panel Left Side - 191 JL STA 1112 to STA 1153	The interior surface of this panel shows evidence of light soot/grime over the entire surface. The heaviest concentrations are along the inboard 14" running the length of the panel. The exterior surface of this panel shows no evidence of soot/grime. There are heavy deposits of soot/grime in the aft support channel.

15. PASSENGER CABIN

15.1 Seats

The seats that have been recovered with fire and/or soot damage were located in seat rows 17 to 33. The seat fire damage diagram, Diagram 29, in Appendix II shows the fire and/or soot damaged seats in these rows.

Seat frames from row 28, (seats 4, 5, 6, and 7) was sooted with sooting in the fracture surfaces. The plastic (woven fabric with coating) seat pans were partially melted. A seat frame from row 26, (seats 4 and 5) was badly mechanically damaged and was sooted with partially melted plastic components. Seat frames from row 26, (seats 1, 2 and 3) and row 24, (seats 4, 5, 6, and 7) were lightly sooted and the coated fabric seat pans were fire damaged. Seat frames from row 21, (seats 8, 9 and 10) were sooted with partial melting of plastic components. Rows 22 and 23, (seats 9 and 10) were sooted and plastic components were partially melted. Row 27, (seats 1, 2 and 3) were sooted with some melting on the plastic components although not as severe as on row 26, (seats 4, 5 6 and 7). Row 27, (seats 4 through 7) were sooted and some plastic components were deformed due to heat. The front wall of Lavatory H was charred. The panel has foam in it and it is charred but not degraded due to fire.

15.2 Floor Panels

More than half of the floor panel structure have been recovered. Of the structure which has been recovered, it has been possible to determine where approximately one-half had been located in the airplane. These floor panels have been placed/located in a rudimentary reconstruction on the floor of the hangar.

Most of the floor panels over the center wing fuel tank are not included in this reconstruction. Of those that are present, very few show any evidence of fire damage or sooting.

Of the panels that have not had their airplane positions identified, approximately 25% show some evidence of heat/fire exposure. Notable effects vary from light sooting to heavy burning.

There is light sooting on a panel at STA 740 - STA 780 approximately 24" left of center. None of the surrounding panels or associated structure show evidence of soot or heat damage. There is burned sealant/paint on the sub-floor structure of panels between STA 860 and STA 960 approximately three feet each side of center. There is sooting about 2 feet long by 18 inches wide on a panel that starts at STA 980 and extends aft. There are two floor panels in the center of the airplane. One of the panels begins at STA 1140 and goes to STA 1260; this panel is sooted and fire damaged. The other panel begins at STA 1120 and extends to STA 1180; this panel is only sooted.

15.3 Ducts and Miscellaneous Interior Components

A fiberglass ventilation duct, identified as being forward of the #3 doors was sooted. A door assist handle was imbedded in the duct and was also sooted.

I. Many lightweight pieces of fiberglass ventilation ducts, ceiling and sidewall panels, partitions, stowage bins, interior cabin doors (lavatory and cabinet), seat cushions, cabin floor and unidentified composite panels had fire damage ranging from sooting to charring. The installed locations of these pieces could not be determined.