ATTACHMENT 3

AIRWORTHINESS GROUP CHAIRMAN'S FACTUAL REPORT

LAX-02-GA-201

Scope: This document describes the Non Destructive Testing performed at Plane Parts, located in Pleasant Grove California, on the wreckage of a C- 130A as presented to Cedtech Testing Laboratories. Also stated are the results of said inspections, proposed additional testing, and inspection recommendations for in service aircraft.

Note: The words “Inspection” and “Testing” are used interchangeably in this document.

NON-DESTRUCTIVE INSPECTION OF WING SECTION AREAS OF EXTERNAL DOUBLER PANELS LOCATED TO EITHER SIDE OF CENTER WING STATION 61 LEFT

In preparation for radiographic inspection, a section of the center wing was cleaned with water and burnt paint chips were removed by scraping.

X-rays were taken on the four external doubler panels of the left side of the center wing section to either side of station 61. External doubler panels were not removed. A 14” x 17” film was placed over each external doubler panel and the surrounding area. The four external doubler panels are located as follows.

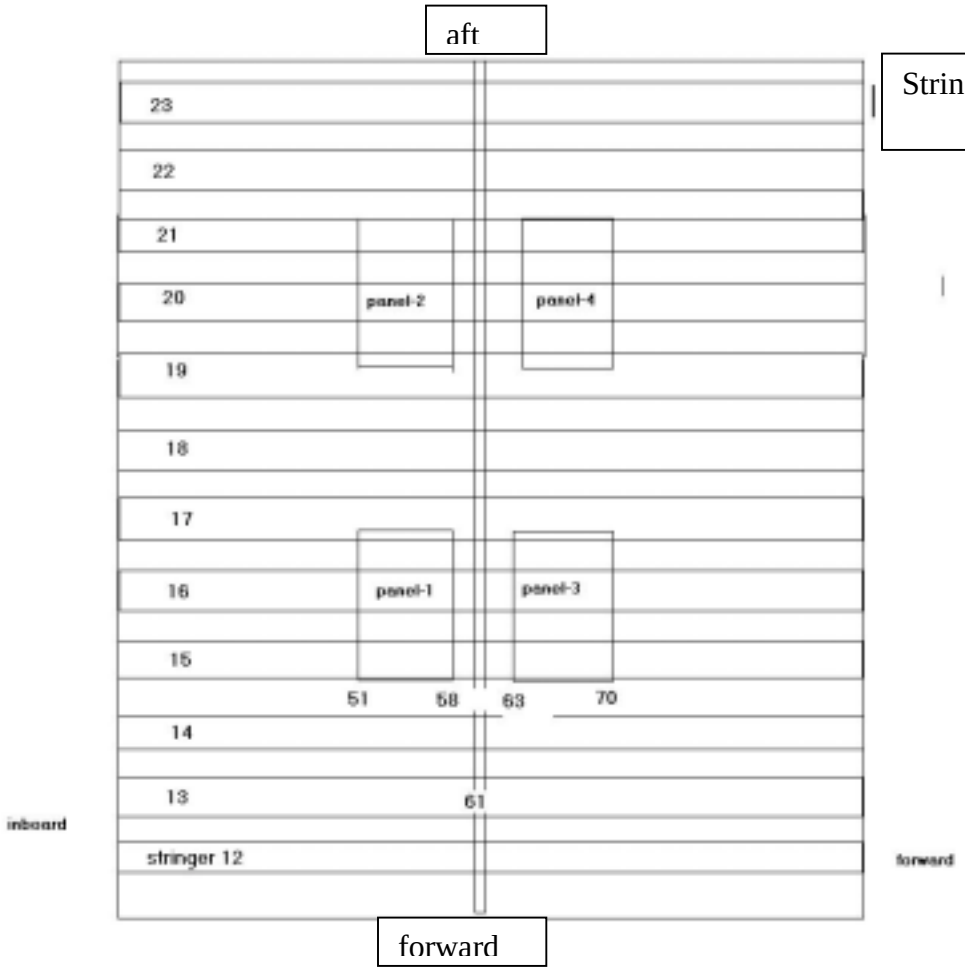
Inboard Aft External Doubler Panel - Inboard of wing station 61 toward the aft edge of wing. From station 51 thru station 58 and from stringer 21 thru stringer 19.

Inboard Forward External Doubler Panel - Inboard of wing station 61 toward the forward edge of wing. From station 51 thru station 58 and from stringer 21 thru stringer 19.

Outboard Aft External Doubler Panel – Outboard of wing station 61 toward the aft edge of wing. From station 63 thru station 70 and from stringer 21 thru stringer 19.

Outboard Forward External Doubler Panel - Outboard of wing station 61 toward the forward edge of wing. From station 63 thru station 70 and from stringer 21 thru stringer 19.

Approximate panel locations looking downward from side of stringers



Radiographs were taken with the film in contact with the lower wing skin panels on the under side of the wing. The X-ray tube was positioned on the stringers side. (See Figure-1 and photo-1) Focal film distance was from 48" – 52". All exposure values are as follows. (See Table-1)

Table-1

Time	MA	KV	Film
240 seconds	5 ma	95-115	Agfa D4 & D3

Figure 1

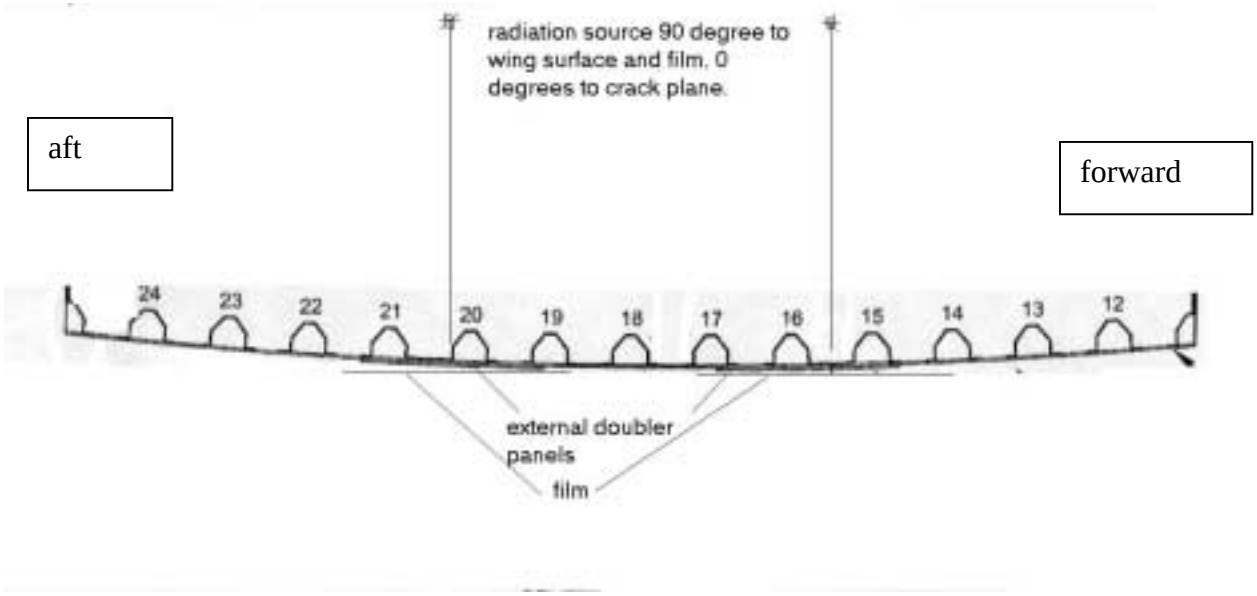


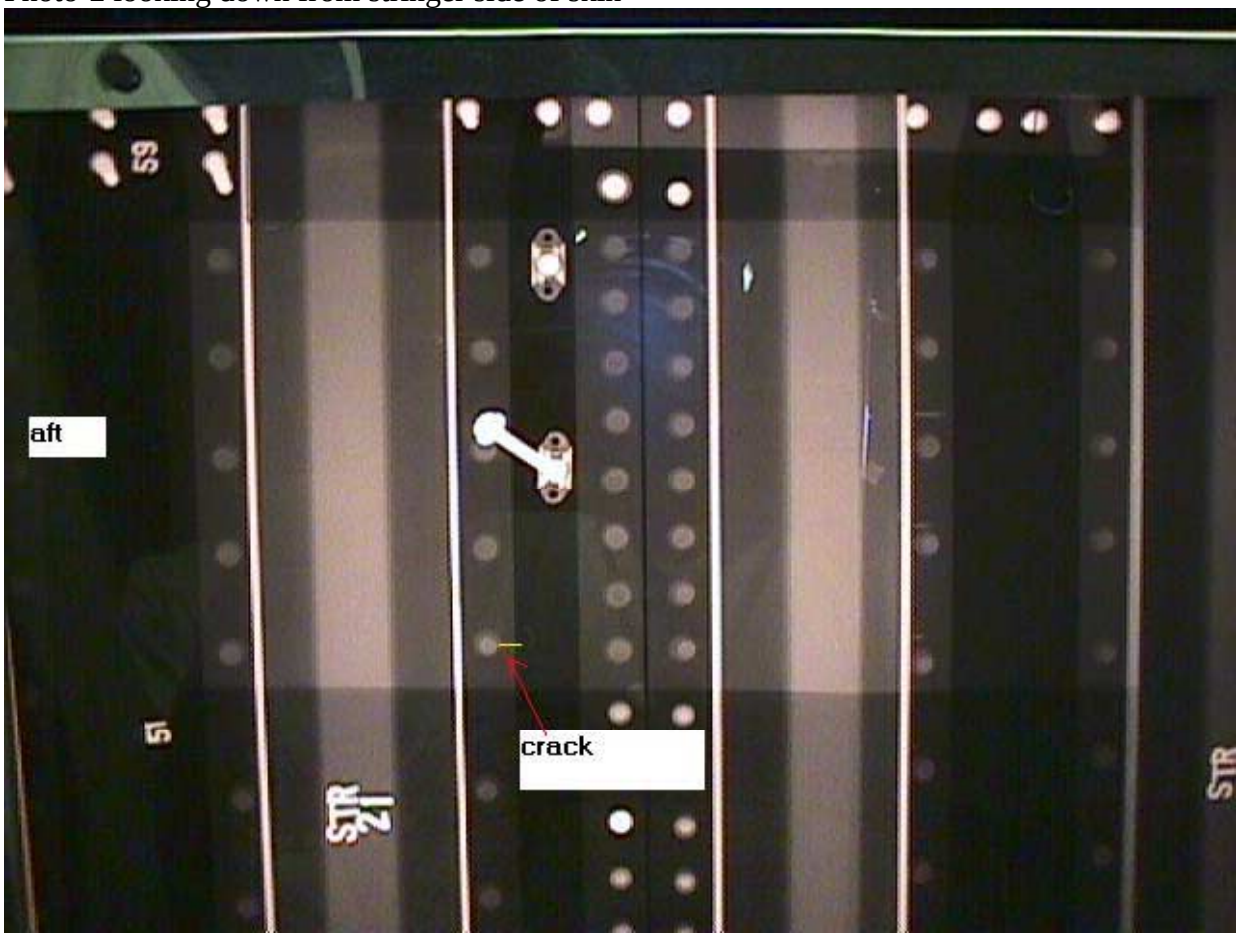
Photo-1 typical set up for x-ray of wing skins at external doubler panels

RESULTS OF NON-DESTRUCTIVE INSPECTION OF WING SECTION AREAS OF EXTERNAL DOUBLER PANELS LOCATED TO EITHER SIDE OF CENTER WING STATION 61 LEFT

X-ray inspection of the external doubler panel areas revealed three crack indications. All crack indications extend from fastener holes and are cord length. The cracks are labeled as X1, X2 & X3. The following is a description of each crack and its location. On the photos the crack locations are marked with yellow, with a red arrow pointing to them. (See photos 2 thru 3 and figure 2 thru 6)

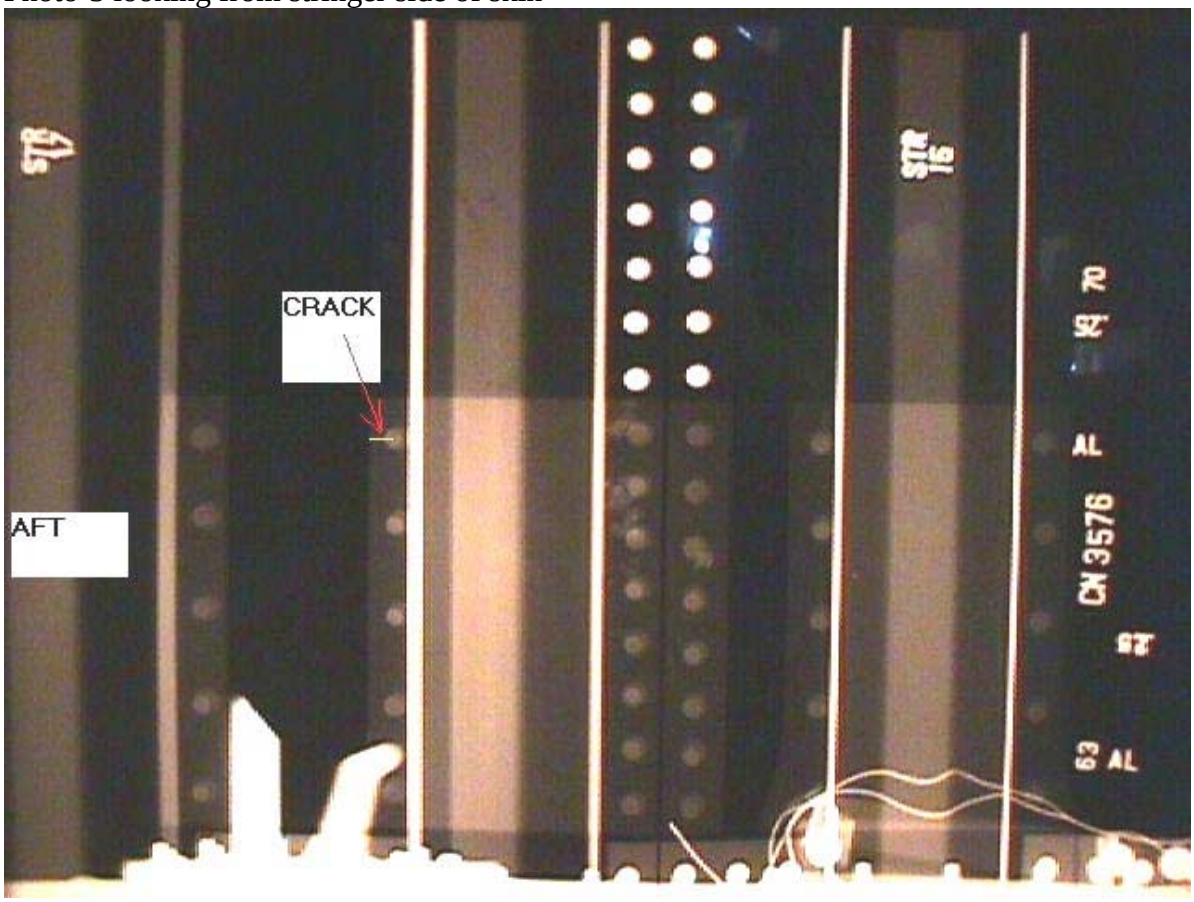
Crack X1 at inboard aft external doubler panel, extends aft from the 2nd fastener hole from the aft end of the external doubler panel and in the first row of fasteners along the inboard edge of the external doubler panel. Crack length is measured at .300". (Under forward flange of stringer 21 at wing station 51L) (See Photo-2)

Photo-2 looking down from stringer side of skin



Crack X2 at outboard forward external doubler panel, extends forward from the 2nd fastener hole from aft, in the first row of fasteners along the outboard edge of the external doubler panel. Crack length is measured at .450" (under aft flange of stringer 16 at wing station 70L) (See photo-3)

Photo-3 looking from stringer side of skin



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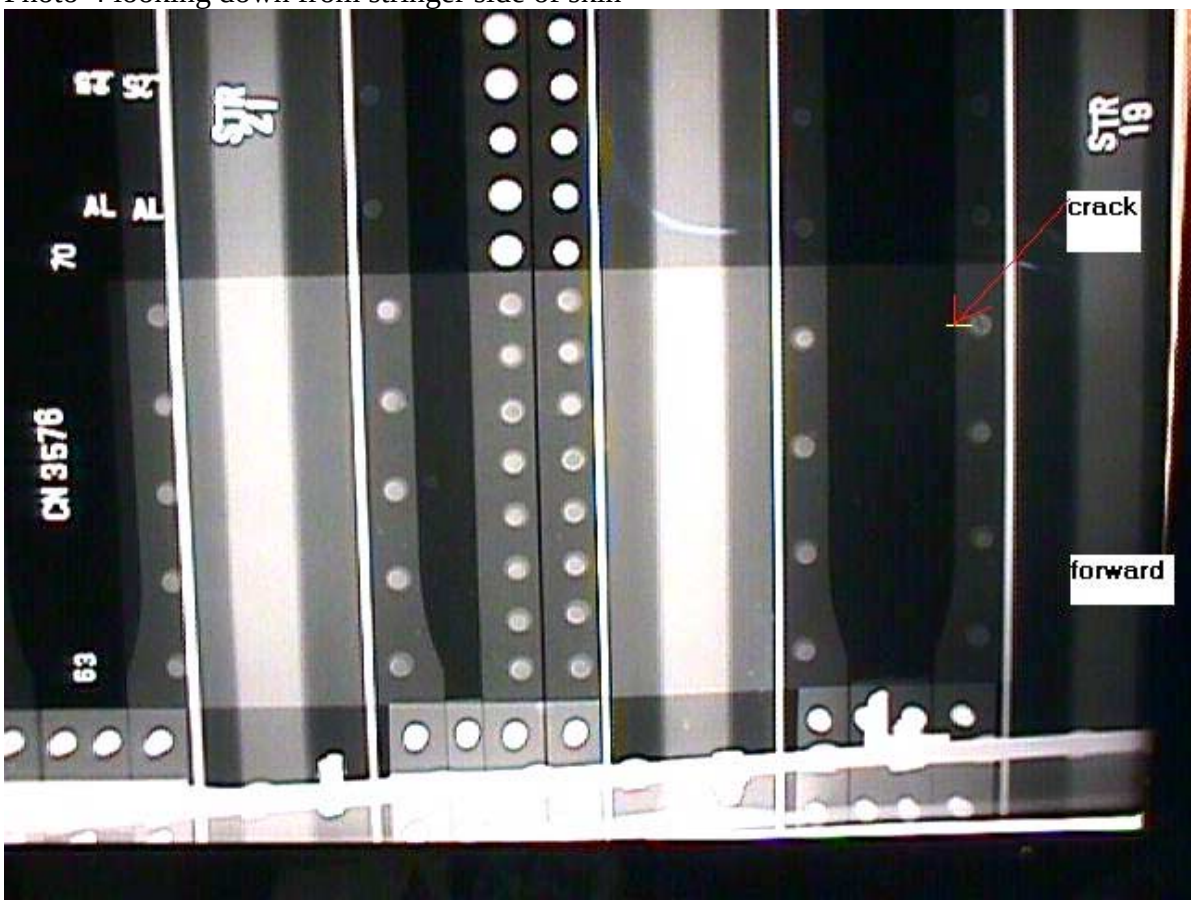
Crack X3 at the outboard aft external doubler panel, extends forward from the aft outboard corner fastener hole of external doubler panel 3 (Under aft flange of stringer 19 at wing station 70). Crack length is measured at .350" (see Photo-4)

Photo-4 looking down from stringer side of skin



Upon completion of the x-ray on the external doubler panel areas the fasteners were ground away and the external doubler panels removed. The lower wing skin was then cleaned in these areas and buffed with a scotch bright type abrasive material.

Fluorescent penetrant inspection was then performed using a water washable sensitivity level-III penetrant (Met-L-Chek FP99B). The minimum penetrant dwell time was 20 minutes. After washing the excessive penetrant material away with water, the skin was allowed to dry at ambient temperature (80 to 100 degrees F.)

The Fluorescent penetrant inspection revealed 5 cracks extending from fastener holes in the area of two external doubler panels. All cracks are in cord length. The cracks are labeled as P1, P2, P3, and P4 and P5. Crack P3 corresponds with crack X3 detected in X-ray inspection. The following photos show each crack. Note: although photography of

fluorescent penetrant inspection is much more difficult then visible dye inspection, it is a far more sensitive process. (See Photos 5 thru 9 and figure 2 thru 6)

Photo 5
Crack P1 under outboard aft external doubler panel. Crack is .120” in length.

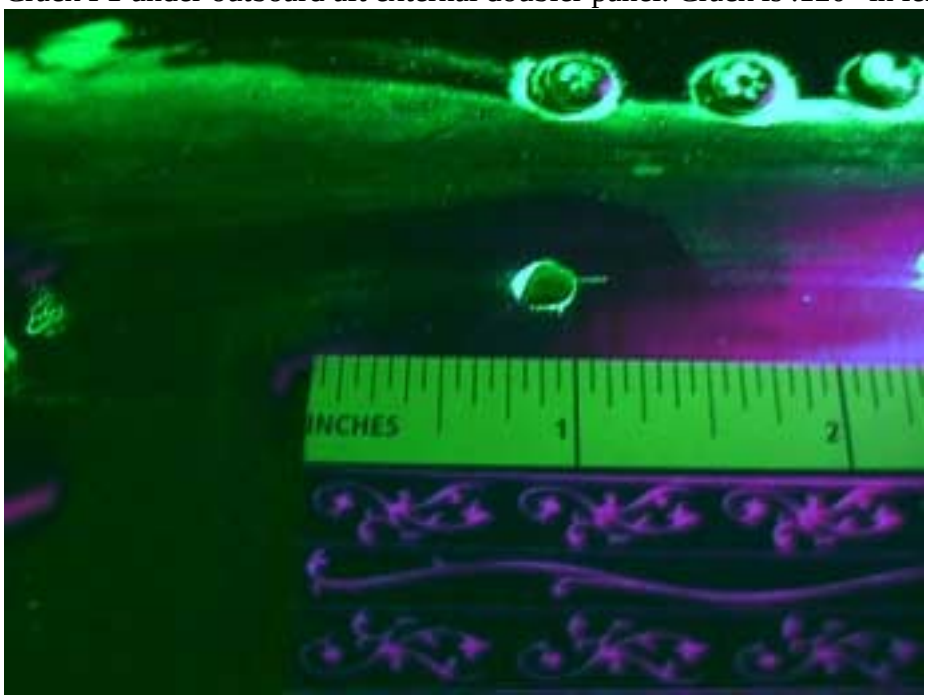


Photo 6 Crack-P2 under outboard aft external doubler panel. Crack is 100” in length.

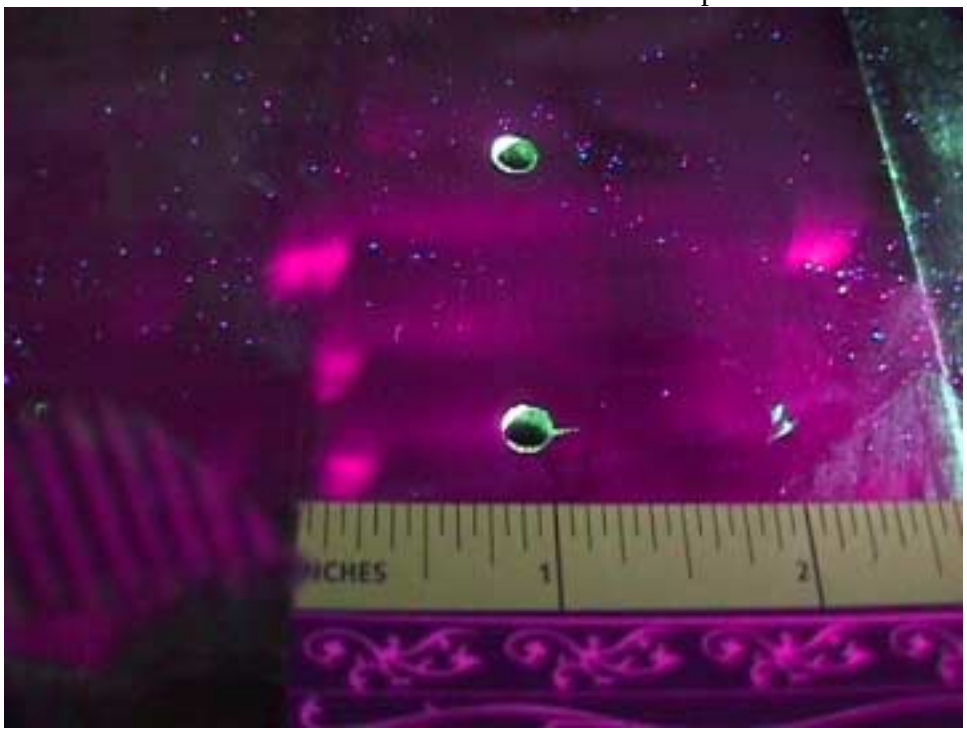


Photo 7 Crack P3 under outboard aft external doubler panel. Crack is 300” in length. and corresponds with crack X3

Photo 8 Crack P4 under inboard forward external doubler panel. Crack is .035” in length

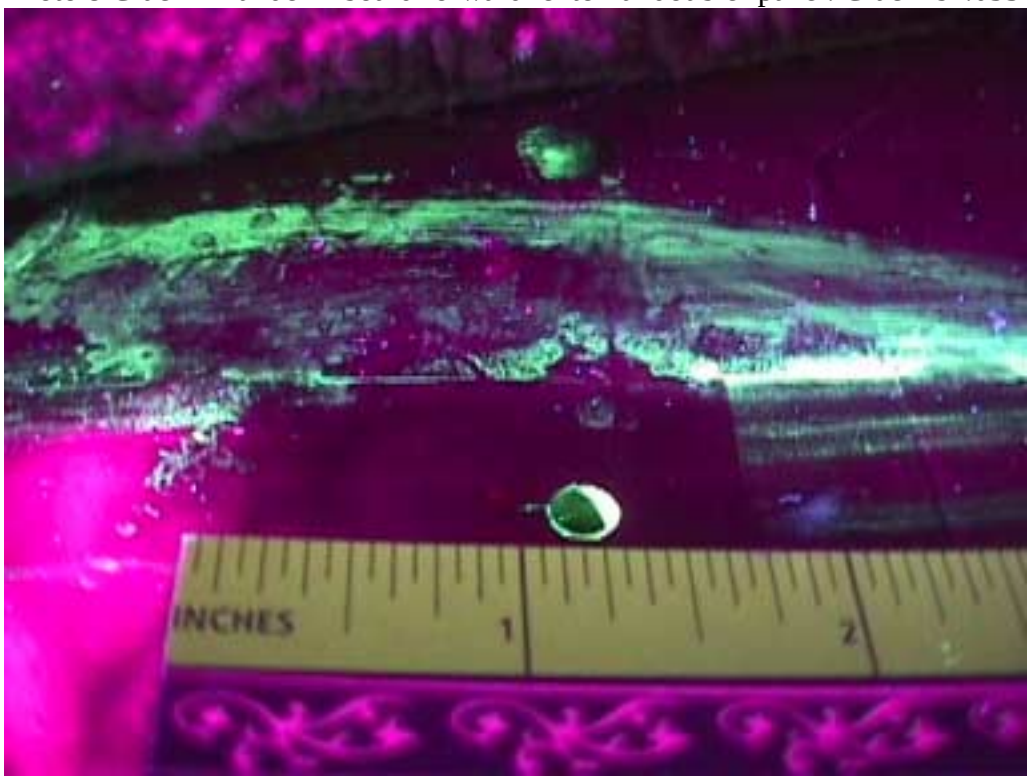


Photo 9 Crack-P5 under inboard forward external doubler panel. Crack is .050” in length

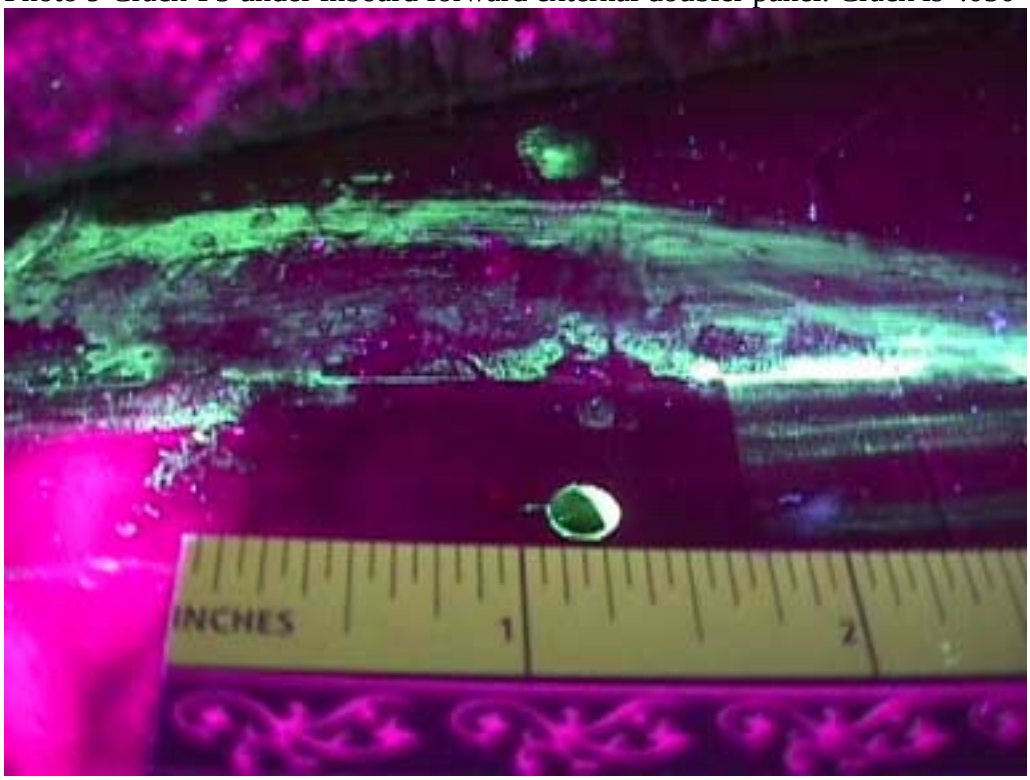


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Figure 2 thru figure 6 show all cracks under the external doubler panels and their locations, Figures 3 thru 6 are enlargements of figure 2

Figure 2

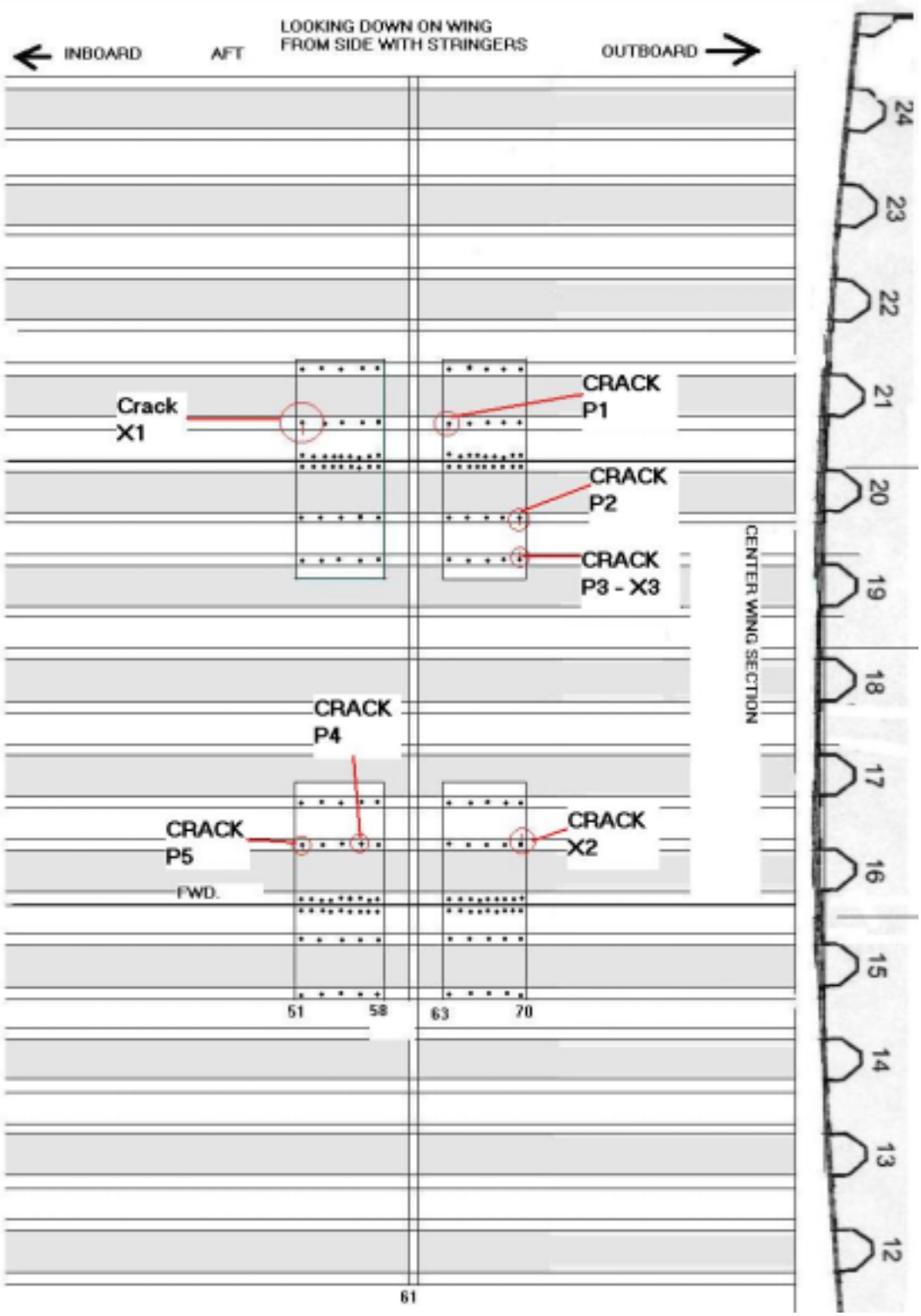

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Figure 3

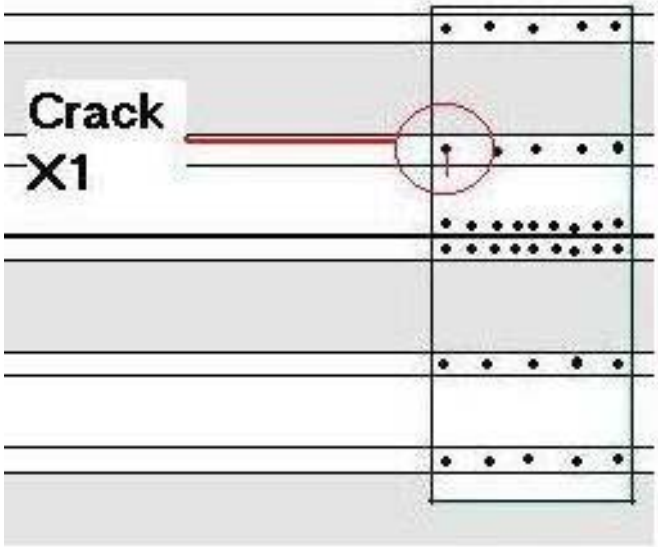

Figure 4

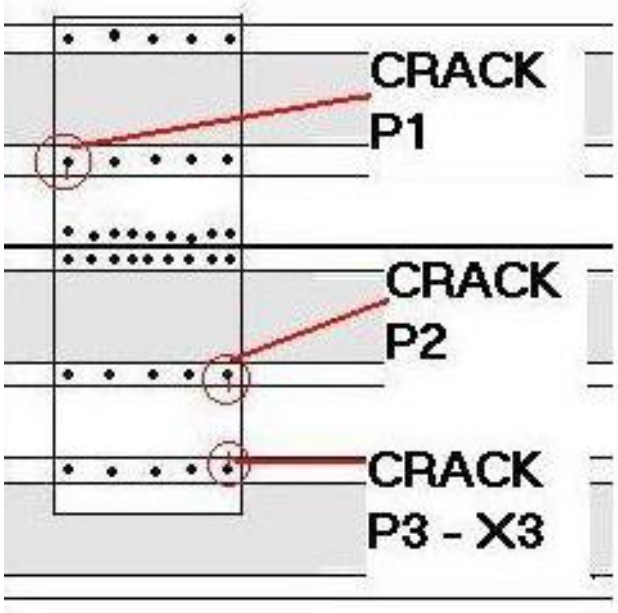

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Figure 5

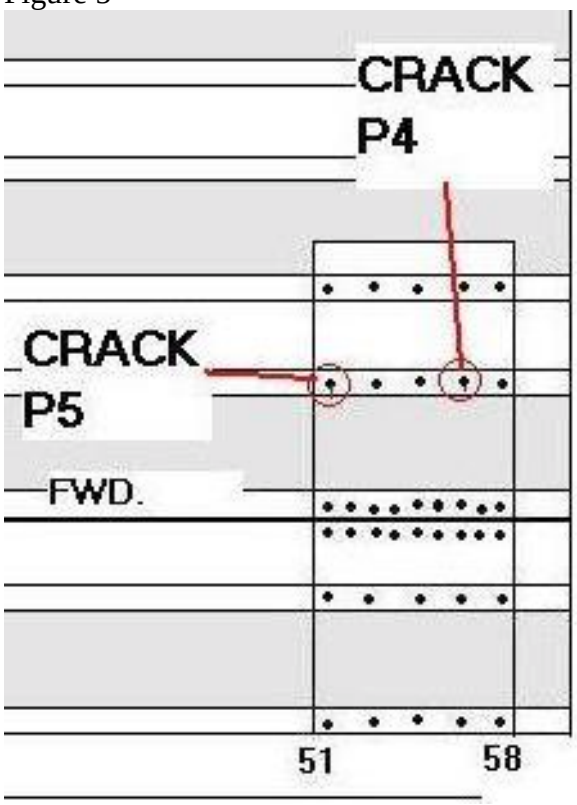
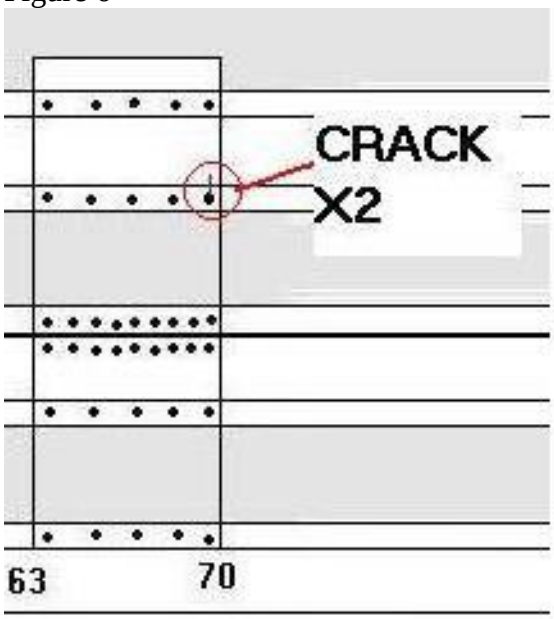


Figure 6



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FLUORESCENT PENETRANT INSPECTION OF WING SKIN PANELS IN THE LOCATION OF THE ATTACH ANGLE AT CENTER WING STATION 61L.

The remaining pieces of the attach angle at station 61 and the fasteners were removed. The area of the fastener holes, on the under side of the wing, was prepared in the same manner as that of the area of the external doubler panels.

Fluorescent penetrant was performed at all the fastener holes for the attach angle at station 61. These holes were in 3 rows along the cord of the wing skin.

No indications were found along the length of the attach angle on the wing skin panel fastener holes.

FLUORESCENT PENETRANT INSPECTION OF WING SKIN PANELS ALONG CENTER WING STATION 80

A 3" strip along station 80 was prepared at the area of the fastener holes, on the under side of the wing, in the same manner as the external doubler panels.

Fluorescent penetrant inspection was performed using the same materials and parameters as that of the external doubler panels.

No indications were detected at the fastener holes along station 81.

INSPECTION OF WING PANELS UNDER EXTERNAL DOUBLER AT ATTACH DRAG ANGLE LOCATION, AT WING STATION 213L

X-rays were taken to each side of the attach drag angle at wing station 213L from the forward edge back to the end of the external doubler at stringer 18. X-ray film was placed on the stringer side of the wing surface against the stringer flanges and the wing panel. The x-ray source was place below the wing surface at a source to film distance of 48" to 52" and at near perpendicular 90 degrees to the surface and the film along each side of the attach drag angle. X-ray exposure parameters were 105 – 125 KV for 4 minutes 5ma (20 milli ampere minutes) This procedure was repeated on each side of the attach drag angle and between every pair of stringers from the leading edge and stringer 12 to the forward flange of stringer 18. (See Photo 10 and Figure 7)

Photo 10

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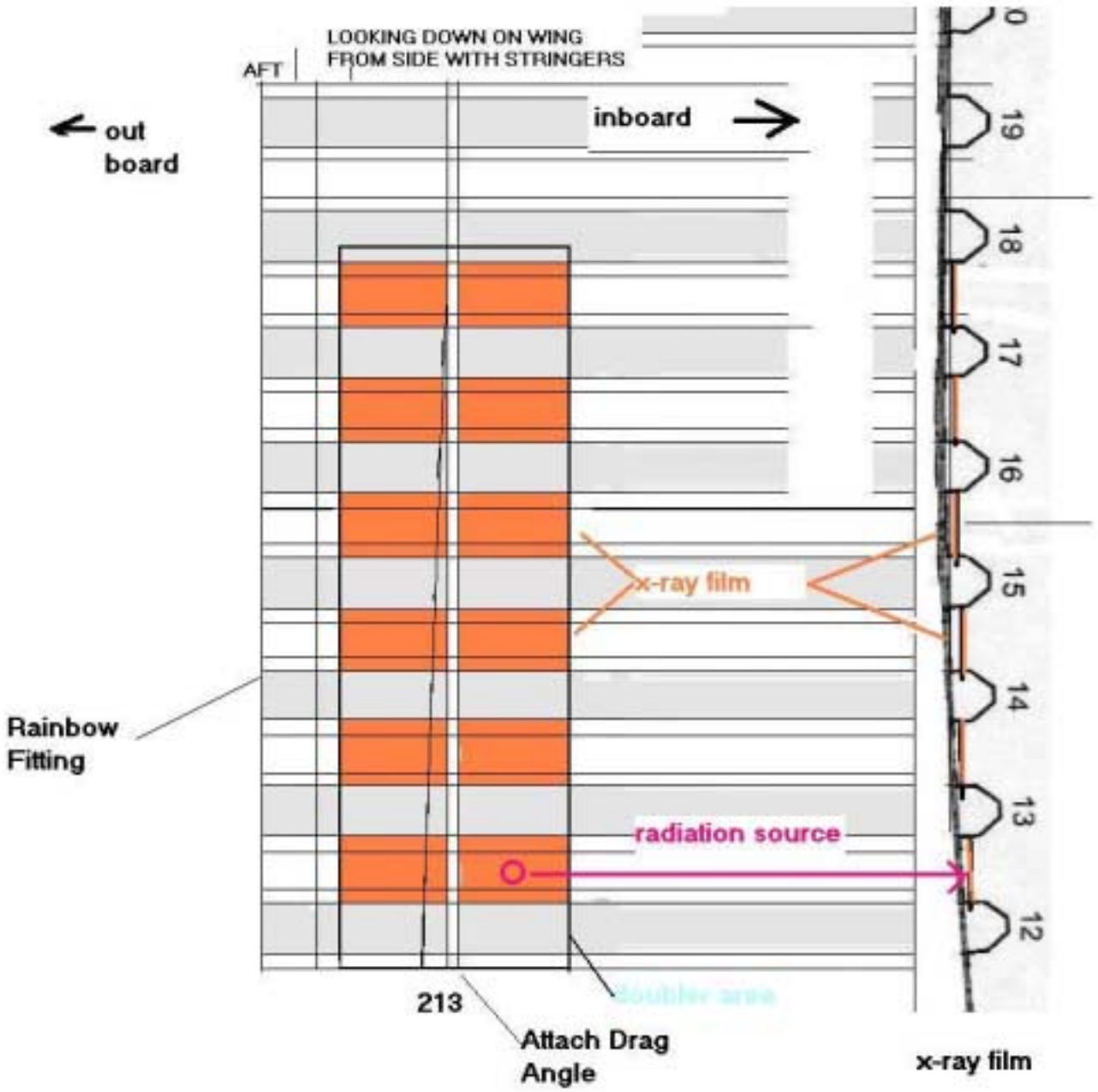
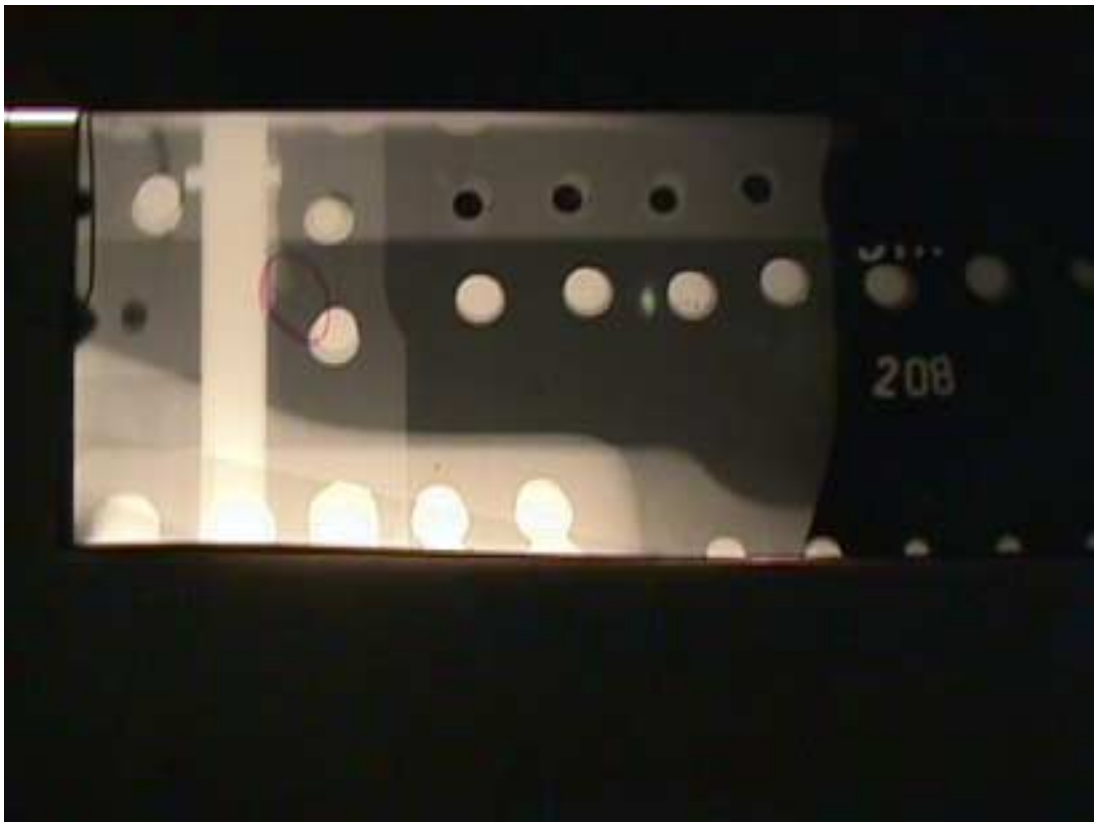
Figure 7



The x-ray inspection to the sides of wing station 213L along the length of the external doubler revealed 3 cracks. Photos 11-13 show the crack location on x-ray film. All extend from fastener holes. Figure 8 depicts crack locations in relation ship to the wing. It could not be determined from this inspection if cracks X5 and X6 are located in the wing panel or the doubler.

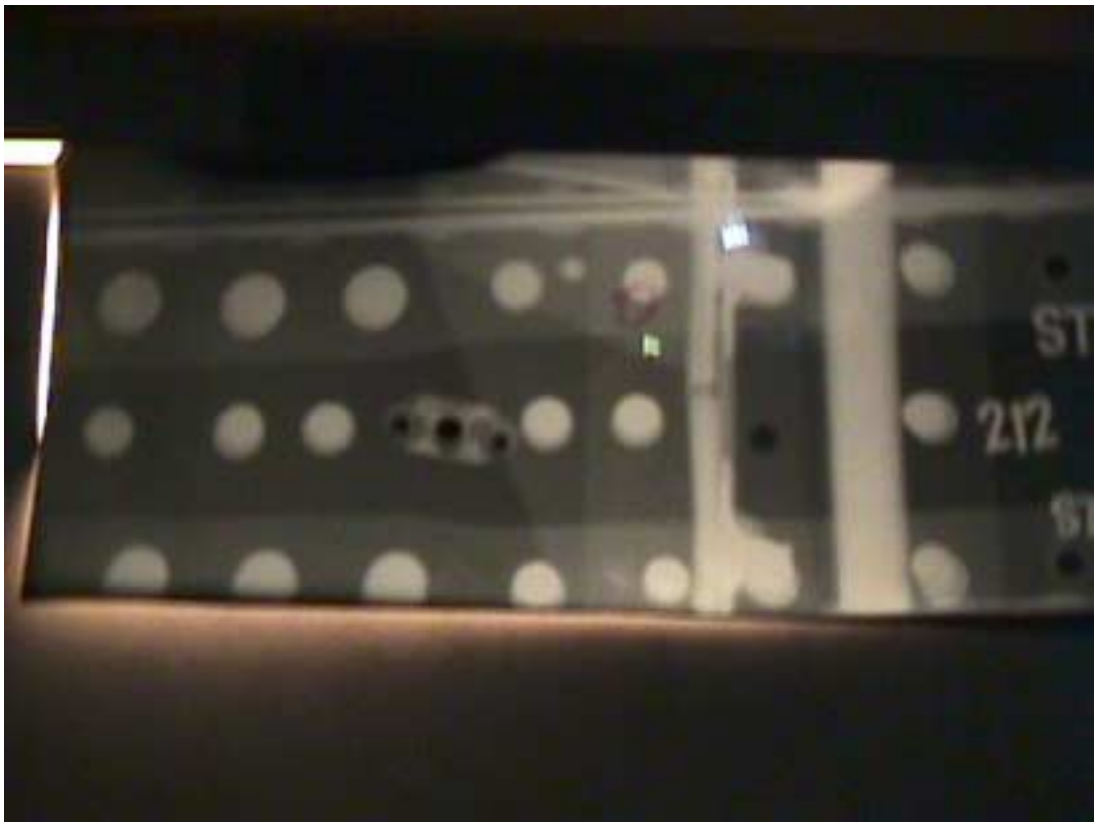
Crack X4 is located in the attach drag angle. The crack extends at a 45º angle and then turns cord length from the center of three fasteners located between stringer 12 and the forward beam. Crack length is .450". (See Photo 10 and figure 8 and 9)

Photo 10 Crack X4



Crack X5 extends from forward from the second fastener hole outboard of the attach angle under stringer 15 flange. Crack length is .120” (see Photo 11 and Figure 8 and 10)

Photo 11 Crack X5



Crack X6 extends from forward from the first fastener hole outboard of the attach angle under stringer 16 flange. Crack length is .220". (See Photo 12 and Figure 8 and 11)

PHOTO 3 CRACK X6

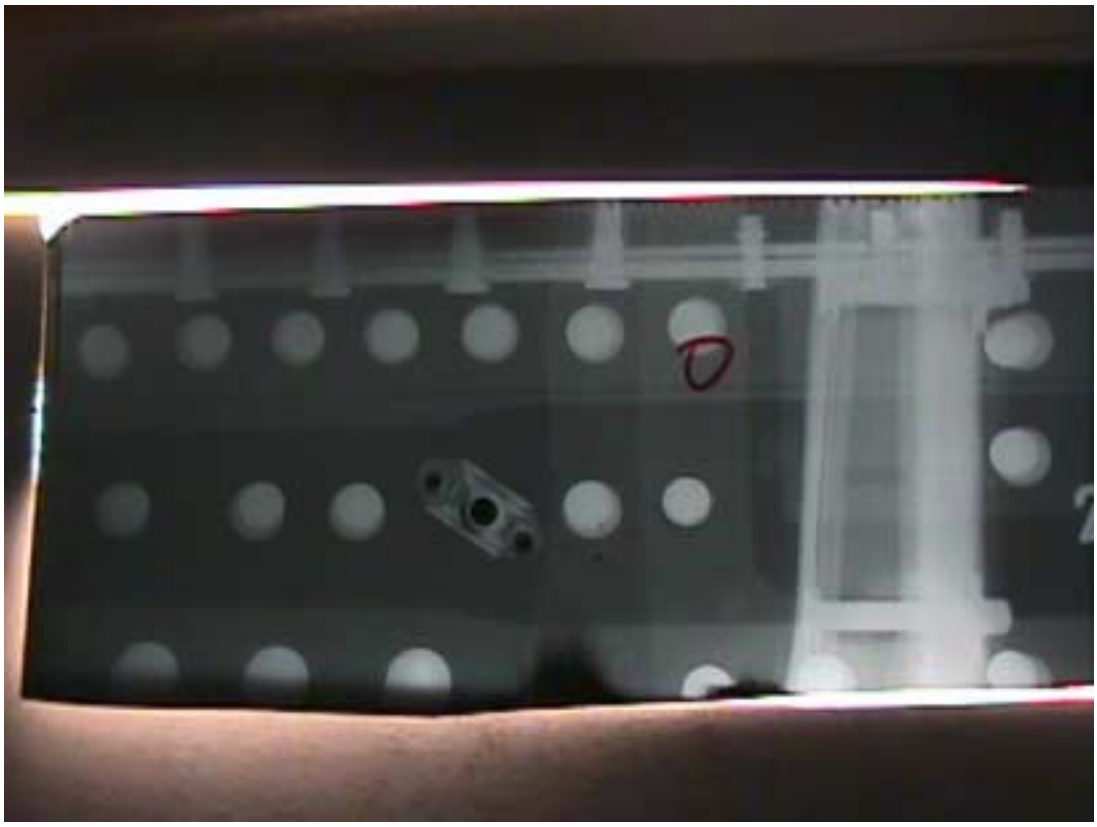


Figure 8

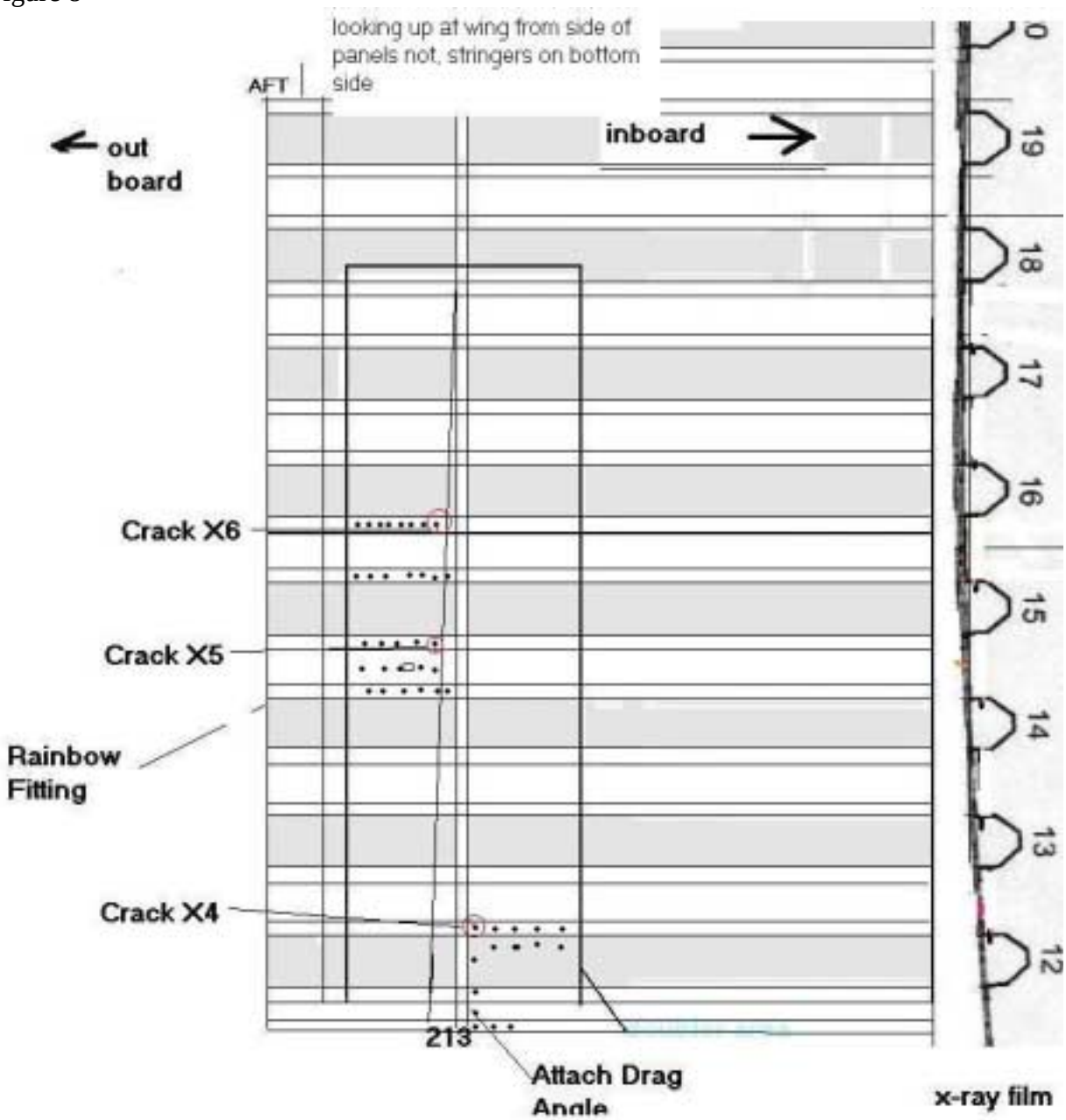

looking up at wing from side of panels not, stringers on bottom side
AFT
out board
inboard
Crack X6
Crack X5
Rainbow Fitting
Crack X4
213
Attach Drag Angle
x-ray film
0
19
18
17
16
15
14
13
12

Figure 9

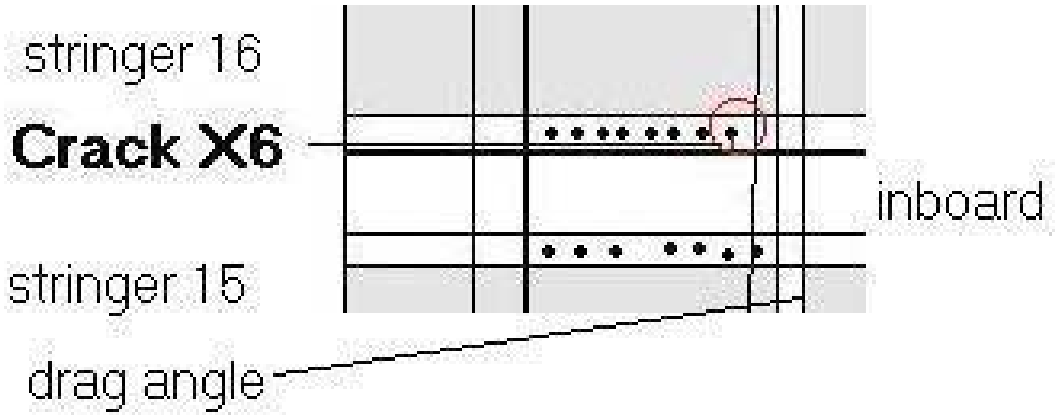


Figure 10

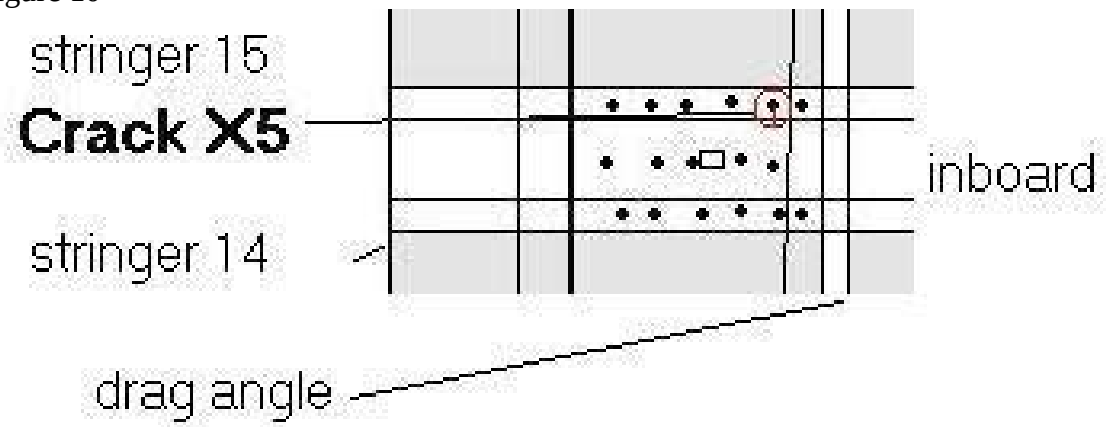
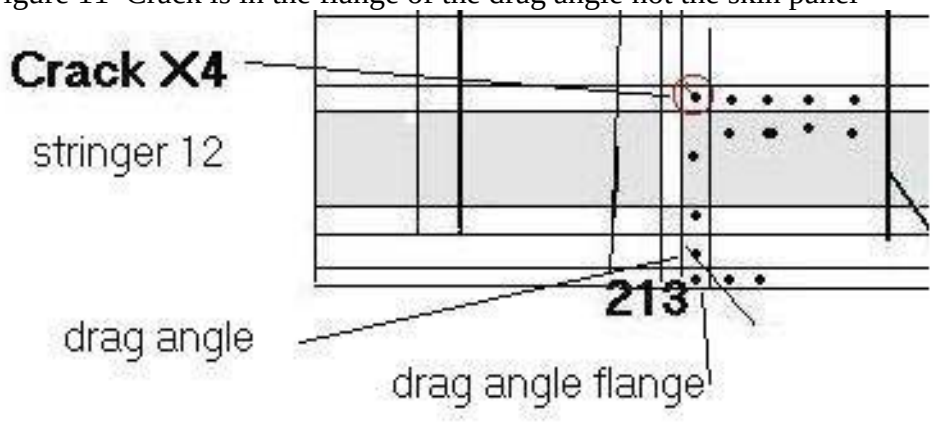


Figure 11 Crack is in the flange of the drag angle not the skin panel



PROPOSED ADDITIONAL WORK

Resources were minimal when performing the fluorescent penetrant inspection at the investigation site; in particular, the method for preparing the surface prior to penetrant inspection. The material used to remove the sealant and paint may have smeared the surface material. Smearing of the surface can mask true indications from the fluorescent penetrant inspection.

The area inspected will be removed from the existing section of the wreckage and shipped to us at Cedtech Testing Labs. Cedtech will then solvent clean all the areas to be re-inspected followed by a light etch to remove .0002" to .0004" of material. The areas will then be re-inspected. With proper cleaning the sensitivity of the inspection will be greatly increased.

A repair panel located at the forward edge between stations 61 and 80 that was not inspected at the investigation site will be x-rayed and penetrant inspected.

The x-ray will be performed prior to the removal of said panel. The repair panel will then be removed by grinding down the heads of the fasteners. The surface will then be cleaned with a solvent and then etched to remove .0002" to .0004" of material. Then a fluorescent penetrant inspection will be performed on the under side of the wing at said locations.

Additional x-ray will be performed at along the cord length of station 61 and at station 80.

Also some additional x-rays will be taken, using a maximum of 5 degree intersecting angle of the radiation source to perpendicular of the wing surface. Although x-ray has detected cracks on the wing, using the maximum 5º angle greatly increases the reliability of crack detections.

X-ray taken of the external doubler panel area at the investigation site were taken of a 14" x 17" area at approximately a 50.0" source to film distance creating an incident angle of greater then 10 degrees at the outer edges of the film. It is recommended that the incident angle of radiation be kept to a maximum incident angle of 5 degrees. A 5º incident angle will assure a much greater reliability of crack detection. Using the approximately the same source to film distance, the maximum area of coverage shall be kept to 10" in. length.

Additional work proposed for the area of the doubler around wing station 213L The drag angle should be removed and further inspection be performed to determine if the cracks are in the wing panel or the doubler.

Recommendations

X-ray Inspection, when properly performed can be a very reliable means of crack detection and requires no special preparation or disassembly of the aircraft. Fluorescent penetrant inspection and bolthole eddy current would require the removal of the fasteners and the external doubler panels. Fluorescent penetrant inspection would also require proper surface preparation.

X-rays taken of the external doubler panel area at the investigation site were taken of a 14" x 17 " area at approximately a 50.0" source to film distance. Creating an incident angle of greater then 10 degrees at the outer edges of the film. It is recommended that the incident angle of radiation be kept to a maximum incident angle of 5 degrees. A 5-degree incident angle will assure a much greater reliability of crack detection. Using approximately the same source to film distance, the maximum area of coverage shall be kept to 10 " in length.

We recommend that the inspection on a wing surface in the area of the external doubler panel areas be conducted by placing a strip film inside the wing, between the two stringers across the external doubler panel. The x-ray tube should be placed under the wing surface. This procedure shall be repeated between each set pair of stringers at the area of each external doubler panels.

To verify the capability of crack detection, this x-ray inspection will be performed at Cedtech Testing Labs, in areas that the fluorescent penetrant inspection detected cracks but the original x-ray did not, to verify the capability of crack detection.

We believe that X-ray inspection performed by adhering strictly to the 5º incident angle of radiation and good exposure factors will detect all cracks greater then .250" in length. Good exposure factors shall include a low kilovoltage setting and a minimum of 20 milliamp ere minutes. One key to the detection is that the cracks extending beyond the fastener heads. If the crack does not extend beyond the fastener head it either will not be detected or will require an additional x-ray exposure be taken at each location, using exposure parameter for specifically under the fastener heads. The film densities of these

exposures will not be sufficient for the area around the fasteners, and the reverse of this is also true.

The x-ray procedure, listed in the manual for the area adjacent to the attach angles at station 213 (57-30-17) are reasonable, but can be improved for greater crack detectability. The following is a list of recommendation. This list of recommendations should be applied for all x-ray crack detection.

1. Use the lowest KV setting possible
2. Use a minimum of 20 milliampere minutes
3. Insure that the near a near 90 degree angle is maintained. This is critical and should be stated as such.
4. Film densities from 2.0 thru 4.0 H&D shall be adequate.
5. KV settings shall be left to the individual performing the x-ray inspection as all X-ray equipment varies.

If any further clarification is needed pleas contact Paul Lopez NDT Level-III, Quality Assurance Manager At Cedtech Testing Labs

Paul Lopez NDT Level III 10/2/02
Test Examiner, Manager Quality Assurance