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W-31, 3-2
Project No. T-16670
Case No. 661.00

TO: DISTRIBUTION

Re: Static Test of W-31 Cover Assemblies

Summary of Test

To determine if the spot welds securing the AK mounting flange to the cover were adequate, ten W-31 cover assemblies were tested.

Cover Number one (AA-4382-H9) was loaded to failure in the lateral direction, failure occurred at 16,650 pounds.

Cover Number two (AA-1698-G9) was loaded to 20,000 pounds in the lateral direction. A small gap was noted between the AK mounting flange and the cover can at this load.

Cover Number three (AA-4322-H9) was loaded to 8000 pounds in the longitudinal direction with deflection measurements taken at two places on the AK mounting flange.

Cover Number four (AA-3940-[illegible]), Number five (AA-1979-G9), Number six (AA-3007-G9), Number seven (AA-4001-H9), Number eight (AA-4122-G9), Number nine (AA-3993-G9), and Number ten (AA-4103-G9) were loaded to 4000 pounds in the longitudinal direction, with deflection measurements taken the same as Number three.

Reason for Test

This test was conducted to determine if the spot welds securing the AK mounting flange to the cover were adequate and to determine a simple testing procedure that could be used in stockpile sampling to test the spotwelds. This test was requested in a Work Order Authorization from R. C. Walter, 2532-1, to A. W. Reger, 1613, dated December 10, 1959.

Summary of Past Tests

A previous static test of XW-31 cover can was performed and the results published in a report entitled, "Static Test of XW-31 Cover Can", Project No. TM-928, Ref. Sym: 1612(885), from H. A. Warrick, 1612-1 to A. T. Aldrich, 1247, dated January 28, 1959. A summary of the results of that test is as follows:

To determine the structural adequacy of the XW-31 cover can, a statically simulated inertia load in a forward longitudinal direction of 110 percent limit load (4,356 lbs. or 49.5 g) was applied to the cartridge mounting surface combined with an internal pressure of 37.4 psi. Strain gage data gave no indication of yielding or failure. The maximum stress was a tensile stress of 25,450 psi, which occurred in the fillet of the cartridge mounting flange.

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The cover can was tested to destruction by simulating lateral inertia loads of 310 percent limit load (139.5 g) combined with an internal pressure of 69.7 psi. Two separate lateral loads were applied, P1 simulating the inertia load of the cover can applied nine inches from the cover can mounting surface (9,750 lbs. at 310 percent limit load) and P2 simulating the inertia load of the cartridge and cables applied 24 1/2 inches from the cover can mounting surface (7,510 lbs. at 310 percent limit load). Failure occurred when the cartridge mounting flange pulled the spot welds out of the cover can.

At 160 percent limit load a small gap was noted under the cartridge mounting flange, and at 185 percent limit load a pressure leak developed at the electrical connector.

Test equipment and instrumentation:

The following equipment was used during this test:

1 - Baldwin SR-4 strain indicator, Serial No. J-59101
1 - Baldwin load cell (20,000 pound capacity) Serial No. 2245
1 - Baldwin load cell (5,000 pound capacity) Serial No. 2126
1 - Simplex hydraulic ram (30 ton capacity)
1 - Blackhawk hydraulic pump

The following instrumentation was used during the test:

2 - Starett dial indicators, least graduation 0.001 inch

Procedure

With the setup as shown in Fig. 1, load was applied to the Number 1 assembly until failure occurred, and to the Number 2 assembly up to 20,000 pounds.

With the setup as shown in Fig. 2 and dial indicators located as shown in Fig. 3, loads were applied to the Number 3 assembly in increments as listed in Table I, and to the remaining seven assemblies as listed in Tables II thru VIII.

Loads were applied by means of a hydraulic ram and measured with a load cell in conjunction with a Baldwin SR-4 strain indicator.

Results

The spot welds on the Number 1 assembly (AA-4332-E9) pulled loose at a lateral load of 16,650 pounds. For a photo of this failure, see Figure 4.

The Number 2 assembly (AA-1698-G9) was loaded the same as Number 1. At 20,000 pounds a small gap was noted between the AR mounting flange and the cover can.

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The Number 3 assembly (AA-4322-H9) was loaded in the longitudinal direction. Deflection gages were read and recorded in increments as listed in Table I.

The number 4 thru number 10 assemblies (AA-3940-H9), (AA-1977-G9), (AA-3007-G9), (AA-4001-H9), (AA-4122-G9), (AA-3993-G9), and (AA-4103-G9), were loaded the same as number 3, with deflection gages read and recorded at each increment of load as listed in Tables II thru VIII.

H. A. WARRICK - 1612-1

1613 Project Engineer: D. W. BAUER - 1613-3

Approved by: R. S. COOPER - 1613-3

HAW:1612-1:cc

Enc: Figures 1 thru 4
Tables I thru VIII

Copy to:

A. L. Thornton, 2532
Attn: R. C. Walter
W. A. Gardner, 1610
D. M. Bruce, 1282
J. M. Wiesen, 1442
J. R. Harrison, 5523
R. K. Smeltzer, 3421-3

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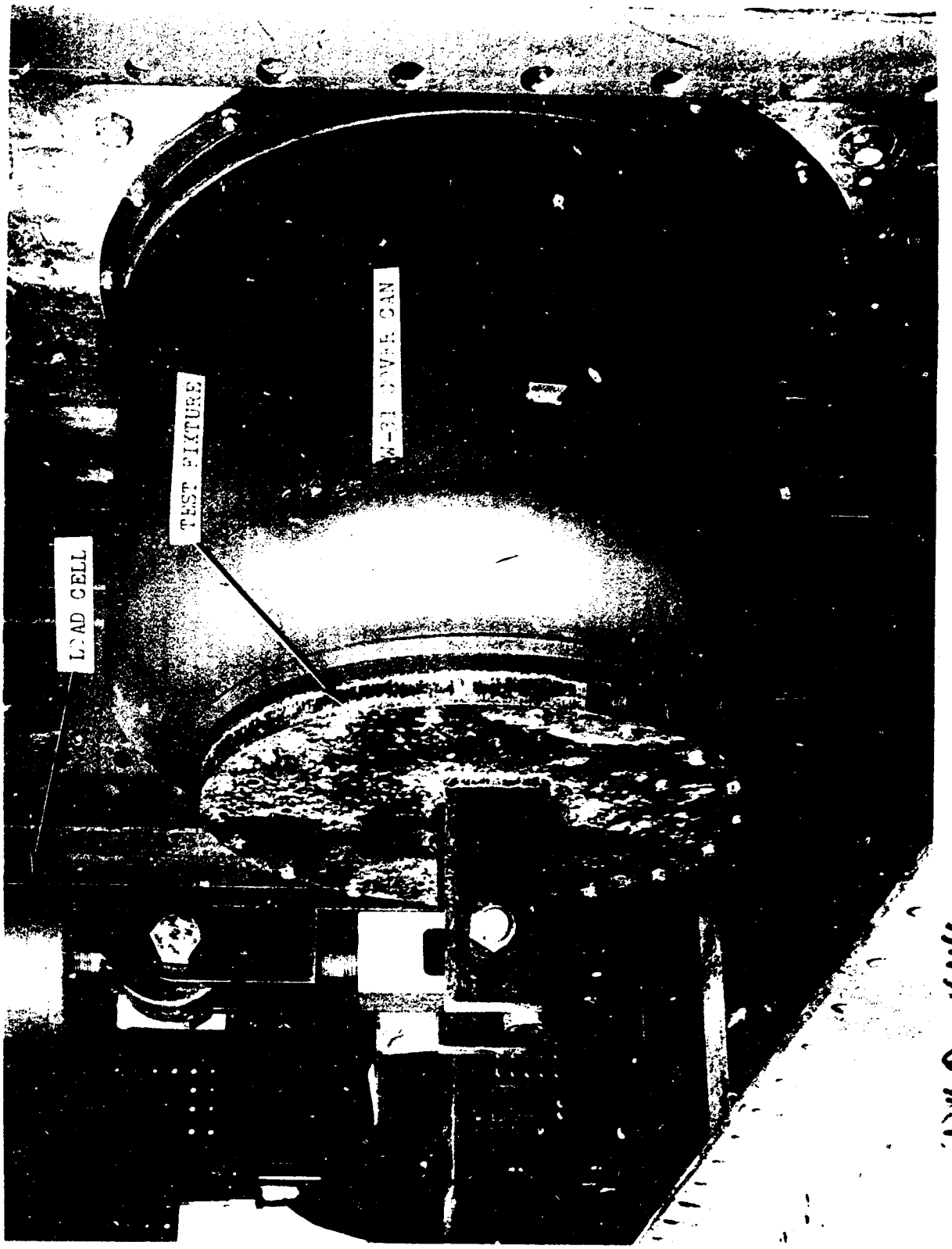

FIGURE 1 - TEST SETUP FOR LATERAL LOADING BEHAVIOR

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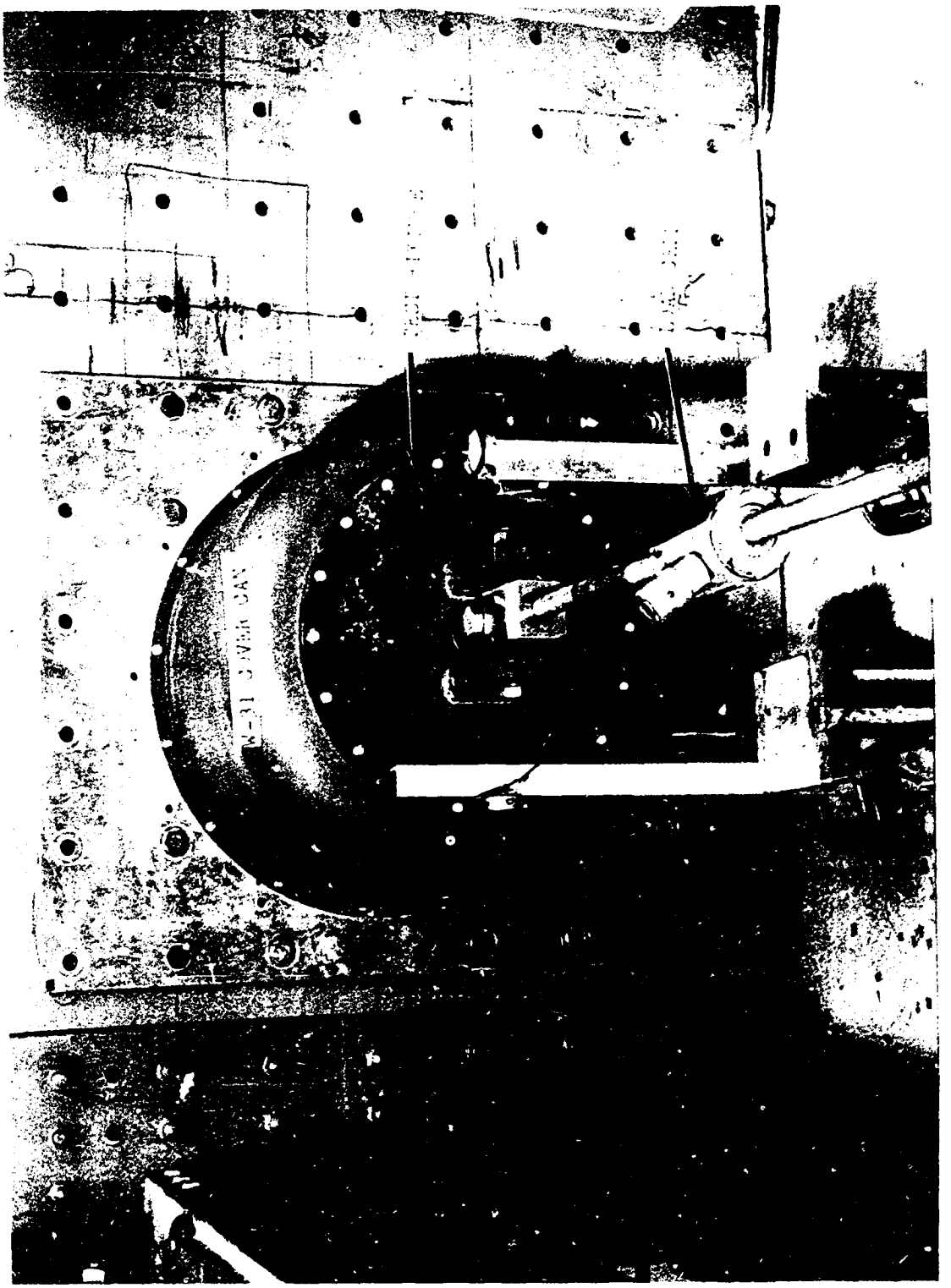

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FIGURE 3 - DIAL INDICATOR LOCATIONS FOR LONGITUDINAL LOADING

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D#0-845

FIGURE 4 - FAILURE WHICH OCCURRED TO NUMBER ONE ASSEMBLY DURING STATIC TEST OF [illegible]-31 COVER ASSEMBLIES
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TABLE I - LOAD-DEFLECTION DATA FOR COVER NUMBER 3 (AA-4322-H9) DURING STATIC TEST OF W-31 COVER ASSEMBLIES

LOAD (KIPS)	DEFLECTION (INCHES) NO. 1	NO. 2
0	0	0
1	.002	.004
2	.006	.009
0	.000	.000
3	.010	.016
0	.001	.002
4	.016	.023
0	.001	.002
5	.023	.031
0	.002	.002
6	.027	.036
0	.002	.003
7	.032	.042
0	.002	.003
8	.040	.050
0	.002	.003

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TABLE II - LOAD-DEFLECTION DATA FOR COVER NUMBER 4 (AA-3940-H9) DURING STATIC TEST OF W-31 COVER ASSEMBLIES

LOAD (KIPS)	DEFLECTION (INCHES) NO. 1	NO. 2
0	0	0
1	.002	.005
0	.000	.000
2	.008	.011
0	.000	.000
3	.013	.016
0	.000	.000
4	.018	.023
0	.001	.000

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TABLE III - LOAD-DEFLECTION DATA FOR COVER NUMBER 5 (AA-1979-G9) DURING STATIC TEST OF W-31 COVER ASSEMBLIES

LOAD (KIPS)	DEFLECTION (INCHES) NO. 1	NO. 2
0	0	0
1	.003	.004
0	.000	.000
2	.010	.010
0	.000	.000
3	.016	.017
0	.000	.000
4	.023	.024
0	.000	.000

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TABLE IV - LOAD-DEFLECTION DATA FOR COVER NUMBER 6 (AA-3007-G9) DURING STATIC TEST OF W-31 COVER ASSEMBLIES

LOAD (KIPS)	DEFLECTION (INCHES) NO. 1	NO. 2
0	0	0
1	.006	.005
0	.000	.000
2	.012	.011
0	.002	.000
3	.020	.018
0	.003	.000
4	.027	.025
0	.004	.000

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TABLE V - LOAD-DEFLECTION DATA FOR COVER NUMBER 7 (AA-4001(H9) DURING STATIC TEST OF W-31 COVER ASSEMBLIES

LOAD (KIPS)	DEFLECTION (INCHES) NO. 1	NO. 2
0	0	0
1	.004	.006
0	.000	.000
2	.010	.011
0	.001	.000
3	.015	.017
0	.001	.000
4	.020	.024
0	.001	.000

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TABLE VI - LOAD-DEFLECTION DATA FOR COVER NUMBER 8 (AA-4122-C9) DURING STATIC TEST OF W-31 COVER ASSEMBLIES

LOAD (KIPS)	DEFLECTION (INCHES) NO. 1	NO. 2
0	0	0
1	.004	.005
0	.000	.000
2	.010	.011
0	.000	.000
3	.013	.017
0	.001	.001
4	.019	.024
0	.001	.002

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TABLE VII - LOAD-DEFLECTION DATA FOR COVER NUMBER 9 (AA-3993-G9) DURING STATIC TEST OF W-31 COVER ASSEMBLIES

LOAD (KIPS)	DEFLECTION (INCHES) NO. 1	NO. 2
0	0	0
1	.005	.005
0	.000	.000
2	.010	.011
0	.001	.000
3	.013	.017
0	.001	.000
4	.018	.024
0	.001	.001

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TABLE VIII - LOAD-DEFLECTION DATA FOR COVER NUMBER 10 (AA-4103-G9) DURING STATIC TEST OF W-31 COVER ASSEMBLIES

LOAD (KIPS)	DEFLECTION (INCHES) NO. 1	NO. 2
0	0	0
1	.003	.005
0	.000	.000
2	.009	.012
0	.000	.001
3	.014	.018
0	.001	.001
4	.019	.025
0	.002	.002