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File: TX-53, 3-2
T-17102
Project No. 13.858.00

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
1st Review Date: 7/20/98
Authority: ☐ADC ☒ADD
Name: W. Layne
2nd Review Date: 7/23/98
Authority: ADD
Name: R.B. Craner
Determination (Circle Number):
1. Classification Retained
2. Classification Changed to: U
3. Contains No DOE Classified Information
4. Coordinate With:
5. Contains UCAI? NO
6. Comments: OK for Opennet

TO: DISTRIBUTION

Re: Static Tests on Fins (U)

Summary

A total of nine static tests were run on five fins (three different types) to evaluate the structural adequacy of the fins. Some of the fins were subjected to salt and humidity prior to testing. Two of the fins failed at simulated air loads of 3150 lbs, and 2990 lbs.

Object of Test

The object of this test was to evaluate by static tests simulating air loads, the bonding material used in the honeycomb sandwich of these fins and the structural adequacy of the fins as a whole. Some of the fins were subjected to a salt chamber test and a humidity test prior to static testing to determine if the structural adequacy of the fins was altered. Load-deflection data were taken on each fin.

Authorization for Test

This test was authorized in a Work Order from Division 7117 to Division 7321, dated June 20, 1960. The requesting organization's consultant was Mr. D. D. Baker, 7117-1.

Test Equipment and Instrumentation

The items tested were 5 fins; 2 with Dwg No. 160800, Issue 1, Phase 1; 2 with Dwg No. 160800, Issue 1, Phase 2; and 1 with Dwg No. 160800, Issue B, Phase 2.

Equipment

1 - Blackhawk Hydraulic Ram - 7½ ton capacity
1 - Baldwin SR-4 Strain Indicator, Serial No. J-92498
1 - Baldwin Load Cell, 5000-lb. capacity, Serial No. 2126

Instrumentation

4 - Starrett Dial Indicators, least graduation .001 inch

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
DOWNGRADING OR DECLASSIFICATION STAMP
CLASSIFICATION CHANGED TO: U
Emelda Selph 7/30/98
PERSON CHANGING MARKING & DATE
W C Layne 7/30/98
PERSON VERIFYING MARKING & DATE
AUTHORITY: R.B. Craner
RECORD ID: 98SN3055
DATED: 7/23/98

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RECORD FILE

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FILE No. TX-53 3-2

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Procedure

For the first three static tests that were run on the fins, the fins were attached to an aft case as shown in Fig. 1. This fin, as were all of the fins tested, was loaded through a contoured load pad at a point 14½ inches aft of the leading edge of the fin and 8 inches outboard from the rear case.

For the test on the first fin, dial indicators Nos. 1, 2 and 3 were mounted at the locations shown in Fig. 1. The dial indicators measured the deflection of the fin with respect to the static jig. For the test on the second fin and the first test on the third fin, an additional dial indicator (No. 4) was mounted to measure the deflection of the rear case with respect to the static jig at the location shown in Fig. 1. The fins were loaded in increments with dial indicator readings being taken at each increment of load.

The remaining six tests on the fins were run with the fins attached to the static jig by means of a machined adapter plate. The fins were loaded by the same method and at the same point as the first two tests. Four dial indicators were mounted to measure deflections of the fin with respect to the floor at the locations shown in Figs. 2 and 3.

Fin Nos. 1 and 2 were statically tested prior to any environmental tests.

Fin No. 3 was statically tested prior to any environmental tests. It then was subjected to a humidity environment in accordance with SC-4452(M) and the static test was performed again. It was then subjected to a salt environment in accordance with SC-4452(M) and the static test was performed again.

Fin No. 4 was statically tested prior to any environmental tests. It was then subjected to a salt environment in accordance with SC-4452(M) and was statically tested again.

Fin No. 5 was subjected to a salt environment in accordance with SC-4452(M) and then statically tested. The fin was then subjected to a humidity environment in accordance with SC-4452(M) and statically tested again.

Results

A description of the fins, a description of the tests, failure loads and an index of table locations are listed in Table I. Fig. 4 is a photograph of a typical failure during tests on fins Nos. 1 and 2.

L. J. Woolrich
L. J. WOOLRICH - 7322-1

Dale Buchanan
7321 Project Engineer: DALE BUCHANAN - 7321-5

APPROVED BY: R. S. HOOPER - 7321-5

LJW:7322-1:de

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Encs: Table I thru X
Figs. 1-4

Distribution:
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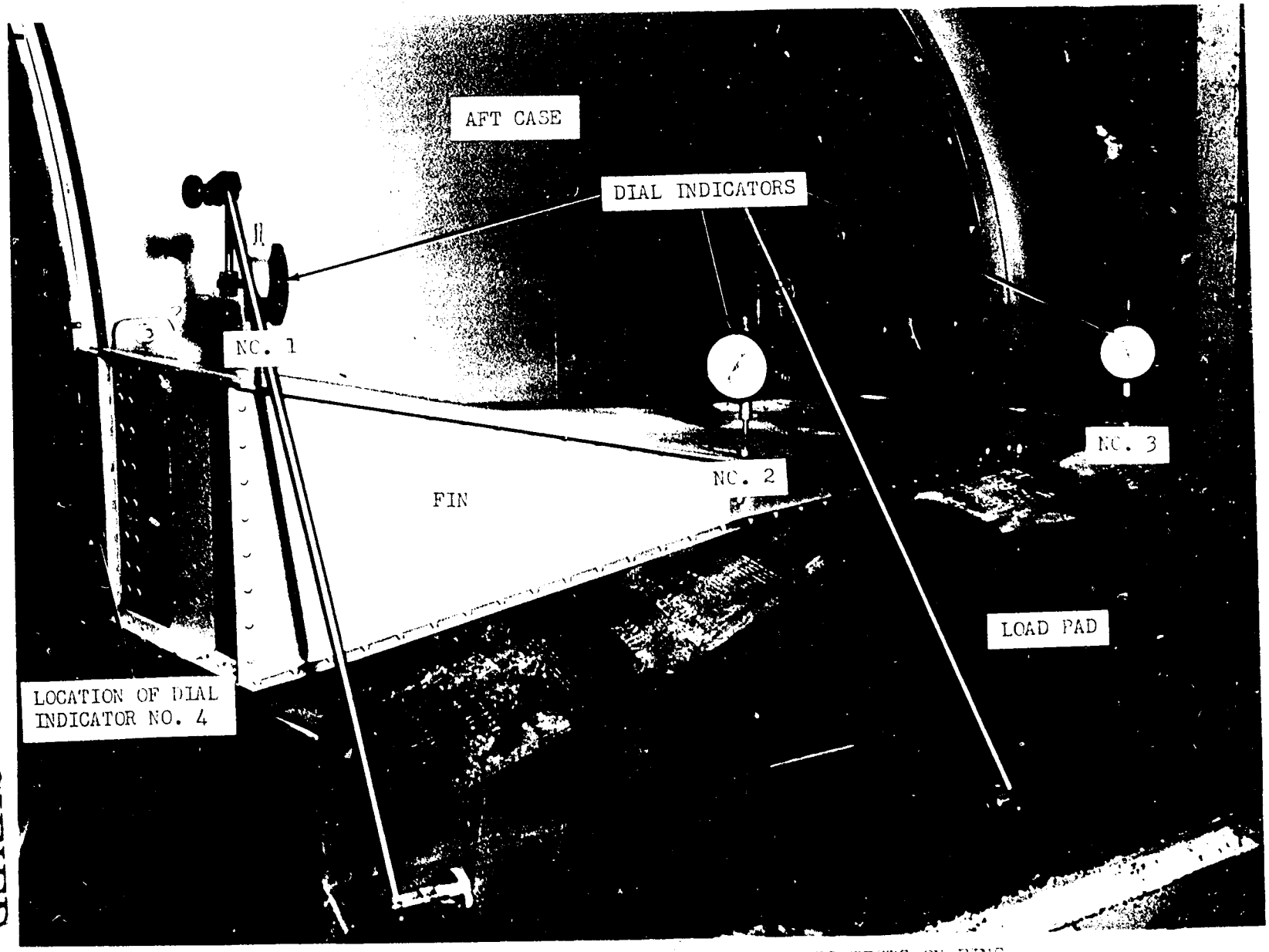

FIG. 1 - TEST SETUP USING AFT CASE IN STATIC TESTS ON FINS.

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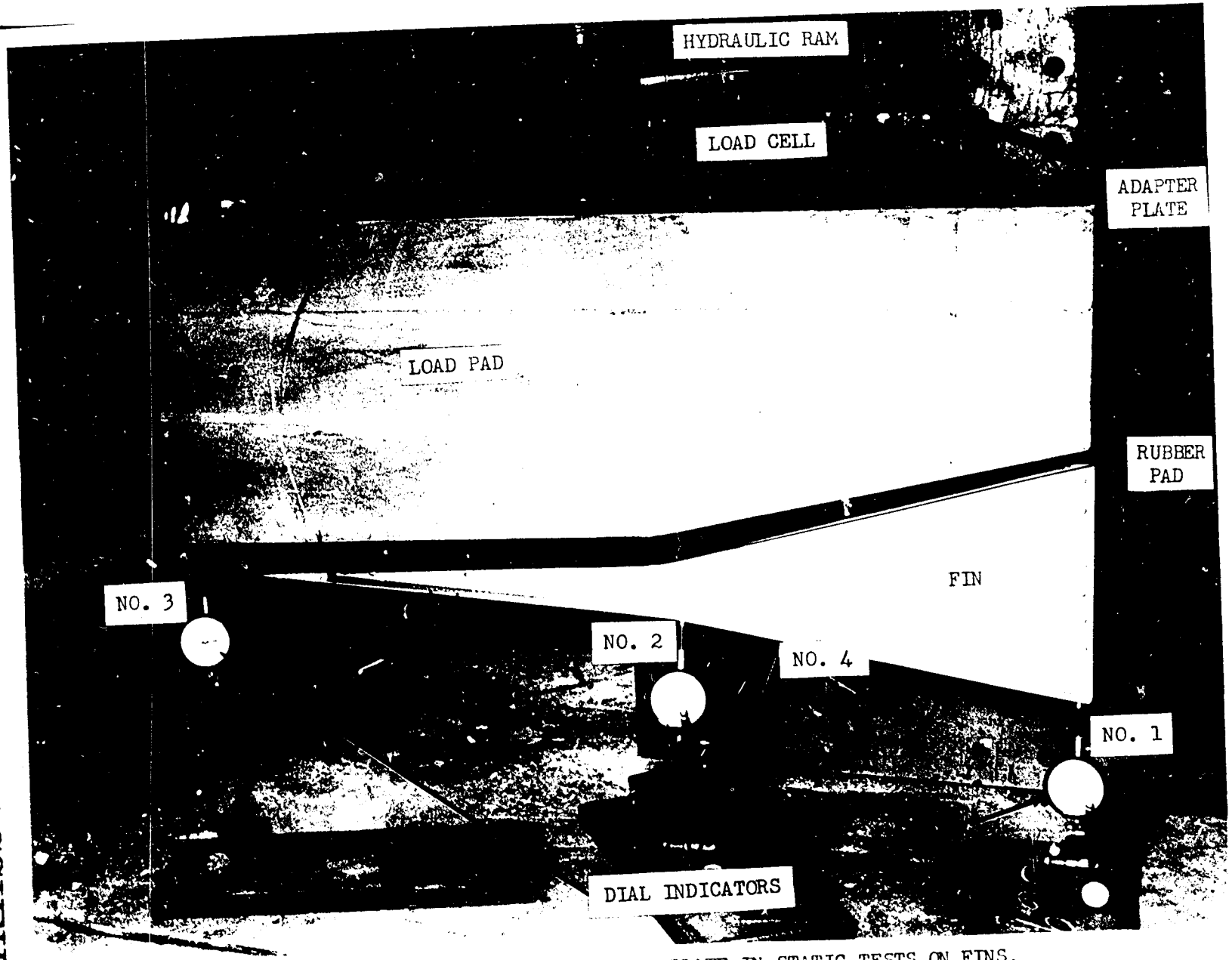

FIG. 2 - TEST SETUP USING ADAPTER PLATE IN STATIC TESTS ON FINS.

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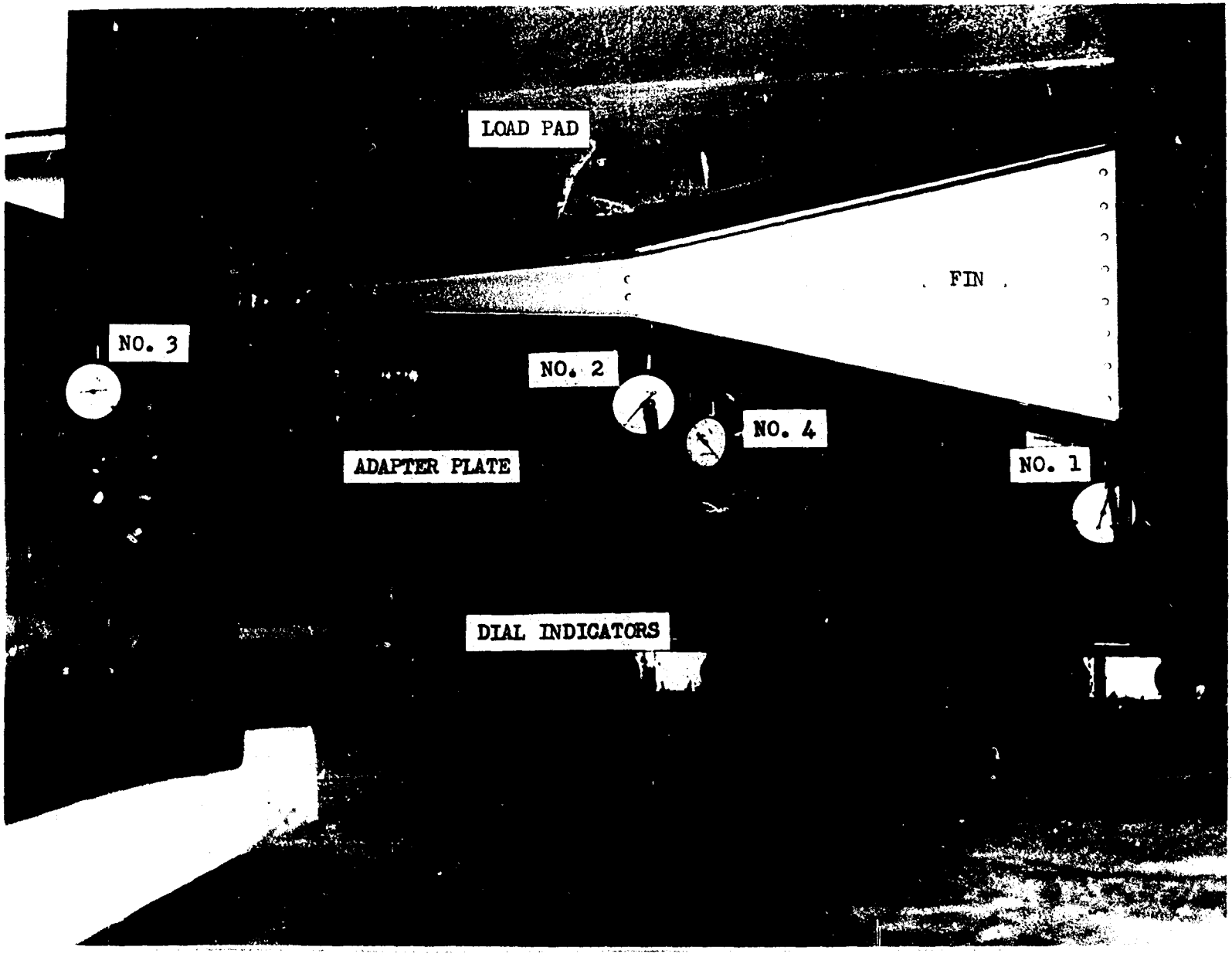

FIG. 3 - TEST SETUP USING ADAPTER PLATE IN STATIC TESTS ON FINS.

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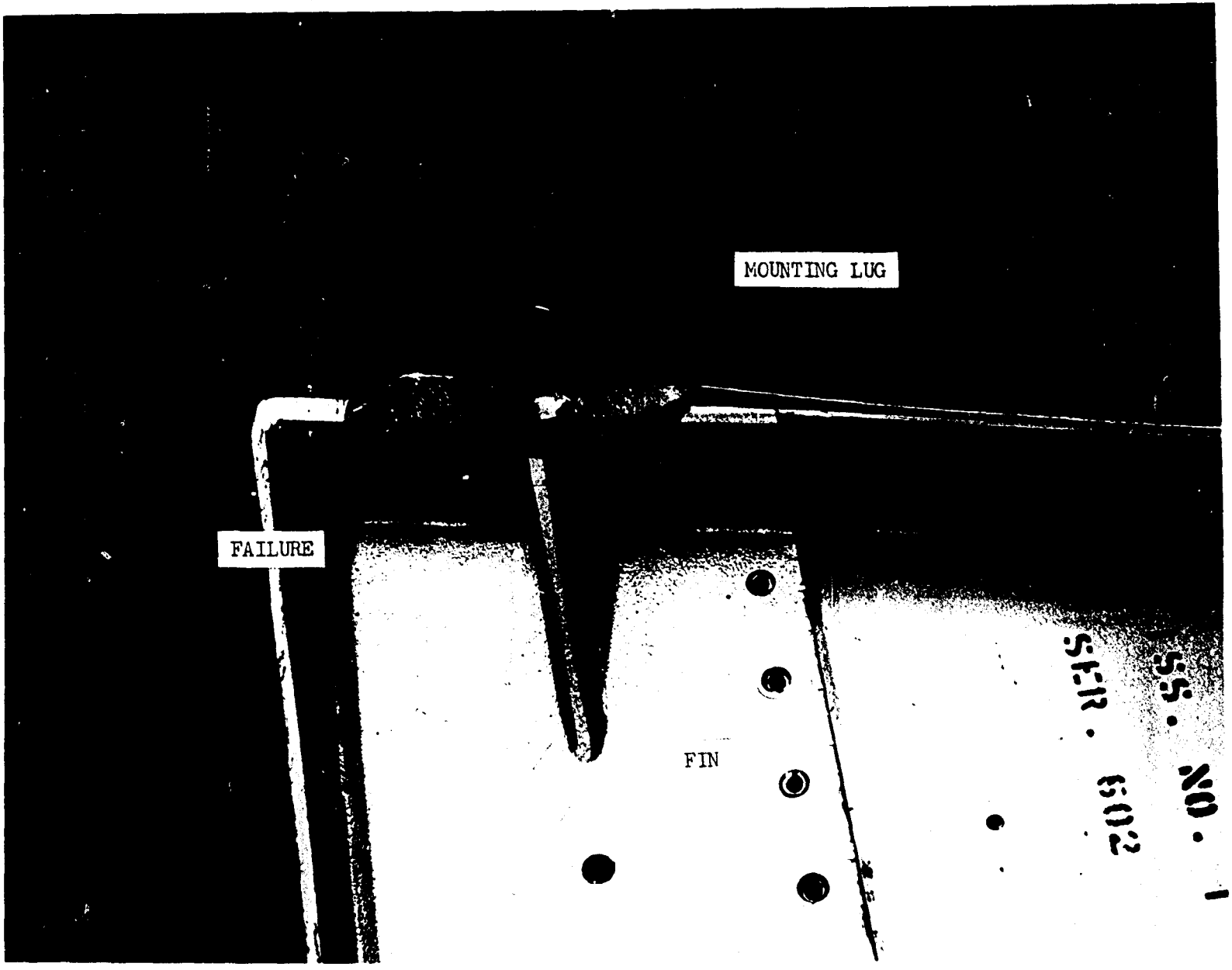

FIG. 4 - TYPICAL FAILURE IN STATIC TESTS ON FINS.

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TABLE I

Description of Fins, Description of Tests, Loads Applied, and Index of Tables for Static Test of Fins

Fin No.	Description of Fin	Test No.	Fixture to which Fin was Mounted	Photo of Test Setup	Maximum Load Applied (lbs)	Failure	Photo of Failure	Table of Load-Deflection Data
1	Completely riveted assembly with bonded honeycomb core. Honeycomb was 1.6 density, AL 3/8-3003, 0.001 P (wall thickness), Drawing No. 160800, Issue 1, Phase 1.	1	Aft case	Fig. 1	3150	Yes	Fig. 4	Table II
2	Same description as Fin No. 1.	2	Aft case	Fig. 1	2990	Yes	Fig. [illegible]	Table III
3	Completely bonded assembly, 1.6 density, AL 3/8-3003, 0.001 P (wall thickness), Drawing No. 160800, Issue 1, Phase 2, Serial No. 6019.	3	Aft case	Fig. 1	3550	No		Table IV
4	Completely bonded assembly, no center bulkhead, 4.5 density, aluminum 1/8-3003, 0.001 P (wall thickness), Drawing No. 160800, Issue B, Phase 2, Mod.	4	Adapter plate	Figs. 2 and 3	3550	No		Table V
5	Same description as Fin No. 3, Serial No. 6018. The fin was set in a salt chamber in accordance with SC-4452(M).	5	Adapter plate	Figs. 2 and 3	2850	No		Table VI
3	Same fin as used in Test No. 3, except fin was set in humidity chamber in accordance with SC-4452(M).	6	Adapter plate	Figs. 2 and 3	3550	No		Table VII
5	Same fin as used in Test No. 5, except fin was set in humidity chamber in accordance with SC-4452(M).	7	Adapter plate	Figs. 2 and 3	3550	No		Table VIII
4	Same fin as used in Test No. 4, except fin was set in salt chamber in accordance with SC-4452(M).	8	Adapter plate	Figs. 2 and 3	3550	No		Table IX
3	Same fin as used in Test No. 3, except fin was set in salt chamber in accordance with SC-4452(M).	9	Adapter plate	Figs. 2 and 3	3550	No		Table X

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TABLE II

Load-Deflection Data for Test No. 1
in Static Test of Fins

Load (lbs)	Deflection Gages 1	2	3
0	0.000	0.000	0.000
400	0.024	0.043	0.035
900	0.072	0.117	0.108
1400	0.131	0.210	0.215
1900	0.199	0.310	0.327
2400	0.259	0.397	0.425
2750	0.297	0.451	0.485
2900	0.313	0.474	0.506
3150	Failure		

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TABLE III

Load-Deflection Data for Test No. 2
in Static Test of Fins

Load (lbs)	Deflection Gages 1	2	3	4
0	0.000	0.000	0.000	0.000
400	0.020	0.035	0.043	0.053
900	0.061	0.108	0.142	0.092
1400	0.108	0.197	0.255	0.122
1900	0.169	0.285	0.370	0.124
2400	0.219	0.371	0.482	0.122
2750	0.250	0.423	0.552	0.122
2900	0.267	0.451	0.588	0.122
2990	Failure			

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TABLE IV

Load-Deflection Data for Test No. 3
in Static Test of Fins

Load (lbs)	Deflection Gages 1	2	3	4
0	0.000	0.000	0.000	0.000
400	0.025	0.042	0.042	0.005
900	0.072	0.119	0.136	0.042
1400	0.121	0.198	0.236	0.088
1900	0.167	0.270	0.331	0.109
2400	0.215	0.345	0.427	0.109
2750	0.248	0.396	0.488	0.107
2900	0.261	0.416	0.512	0.106
3400	0.306	0.489	0.600	0.103
3550	0.319	0.506	0.624	0.102
0	0.047	0.067	0.055	0.027

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TABLE V

Load-Deflection Data for Test No. 4
in Static Test of Fins

Load (lbs)	Deflection Gages 1	2	3	4
100	0.000	0.000	0.000	0.000
600	0.006	0.024	0.038	0.013
1100	0.017	0.052	0.079	0.027
1600	0.028	0.083	0.132	0.041
2100	0.038	0.114	0.187	0.055
100	0.008	0.014	0.013	0.010
2100	0.040	0.116	0.193	0.055
2600	0.051	0.149	0.255	0.070
2850	0.059	0.170	0.294	0.078
3100	0.066	0.188	0.328	0.086
3550	0.078	0.219	0.386	0.098
100	0.026	0.038	0.032	0.017

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TABLE VI

Load-Deflection Data for Test No. 5
in Static Test of Fins

Load (lbs)	Deflection Gages 1	2	3	4
100	0.000	0.000	0.000	0.000
600	0.005	0.023	0.031	0.015
1100	0.011	0.045	0.068	0.027
1600	0.020	0.087	0.113	0.041
2100	0.029	0.102	0.163	0.055
100	0.006	0.020	0.020	0.017
2100	0.032	0.105	0.158	0.056
2600	0.041	0.132	0.220	0.069
2850	0.046	0.148	0.253	0.076
100	0.010	0.026	0.026	0.021

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TABLE VII

Load-Deflection Data for Test No. 6
in Static Test of Fins

Load (lbs)	Deflection Gages 1	2	3	4
100	0.000	0.000	0.000	0.000
600	0.004	0.014	0.026	0.008
1100	0.010	0.036	0.068	0.020
1600	0.017	0.063	0.116	0.036
2100	0.024	0.088	0.167	0.048
100	0.002	0.013	0.016	0.015
2100	0.024	0.089	0.169	0.048
2600	0.031	0.111	0.221	0.059
2850	0.036	0.123	0.245	0.065
3100	0.040	0.137	0.274	0.072
3550	0.049	0.166	0.327	0.086
100	0.007	0.024	0.027	0.020

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TABLE VIII

Load-Deflection Data for Test No. 7
in Static Test of Fins

Load (lbs)	Deflection Gages 1	2	3	4
50	0.000	0.000	0.000	0.000
550	0.003	0.017	0.033	0.007
1050	0.008	0.042	0.086	0.020
1550	0.013	0.069	0.139	0.035
2050	0.019	0.098	0.198	0.052
50	0.006	0.016	0.017	0.016
2050	0.019	0.098	0.198	0.055
2550	0.026	0.129	0.264	0.073
2800	0.030	0.148	0.299	0.084
3050	0.034	0.165	0.334	0.095
3550	0.043	0.197	0.399	0.110
50	0.012	0.034	0.040	0.030

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TABLE IX

Load-Deflection Data for Test No. 8
in Static Test of Fins

Load (lbs)	Deflection Gages 1	2	3	4
50	0.000	0.000	0.000	0.000
550	0.002	0.019	0.035	0.009
1050	0.009	0.048	0.085	0.026
1550	0.013	0.073	0.138	0.040
2050	0.018	0.097	0.190	0.051
0	0.006	0.019	0.019	0.022
2050	0.018	0.098	0.195	0.055
2550	0.025	0.124	0.251	0.066
2800	0.028	0.138	0.282	0.071
3050	0.032	0.151	0.312	0.077
3550	0.038	0.178	0.367	0.088
0	0.007	0.025	0.025	0.027

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TABLE X

Load-Deflection Data for Test No. 9
in Static Test of Fins

Load (lbs)	Deflection Gages 1	2	3	4
50	0.000	0.000	0.000	0.000
550	0.003	0.017	0.036	0.004
1050	0.008	0.041	0.085	0.020
1550	0.013	0.068	0.140	0.035
2050	0.019	0.098	0.198	0.051
50	0.006	0.017	0.016	0.017
2050	0.011	0.101	0.204	0.054
2550	0.028	0.131	0.264	0.069
2800	0.032	0.148	0.297	0.076
3050	0.036	0.165	0.330	0.086
3550	0.044	0.196	0.392	0.102
0	0.015	0.034	0.032	0.025

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