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DEPARTMENT OF THE AIR FORCE

HEADQUARTERS AERONAUTICAL SYSTEMS DIVISION (AFSC)

WRIGHT-PATTERSON AIR FORCE BASE OHIO 45433

REPLY TO ATTN OF ASNPD

5 JUNE 64

SUBJECT TN-WWLP-54-10C (TI-2628)

TO APC-4 / LT. SILVERMAN

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FINAL QUALIFICATION TESTS CONDUCTED ON THE B. F. GOODRICH TIRE & RUBBER COMPANY SELF-SEALING FORWARD FUSELAGE FUEL CELL CONSTRUCTION 3744-9 FOR THE F-84F AIRPLANE,

(6) and

(10) W. L. Norris
Power Plant Laboratory

(11) Jun 54
(12) 12 p.

SEO-524-871-F

Wright Air Development Center
Air Research and Development Command
United States Air Force
Wright-Patterson Air Force Base, Ohio

(400 358)

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(SEE WADCR 110-1)

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Wright Air Development Center
Air Research and Development Command
United States Air Force
Wright-Patterson Air Force Base, Ohio

Technical Note WCLP-54-100
June 1954

Power Plant Laboratory
Directorate of Laboratories
SEO-524-871F

FINAL QUALIFICATION TESTS CONDUCTED ON THE B. F. GOODRICH TIRE & RUBBER COMPANY SELF-SEALING FORWARD FUSELAGE FUEL CELL CONSTRUCTION 3744-9 FOR THE F-84F AIRPLANE

A. PURPOSE

1. To report results of final qualification tests conducted as required by Specification AN-T-49a on subject fuel cell.

B. FACTUAL DATA

2. A description of the cell is contained in Appendix I of this report.

3. The hot slosh test was conducted at Wright-Patterson Air Force Base in accordance with paragraph F-5b of Specification AN-T-49a and completed 7 February 1952. Subject cell satisfactorily passed the hot slosh test. Results of the test are contained in Appendix II of this report.

4. The gunfire test was conducted at Wright-Patterson Air Force Base on 25 November 1952 in accordance with paragraph F-5c of Specification AN-T-49a. Subject cell failed the gunfire test, the results of which are contained in Appendix III and Exhibits A and B of this report. The test was witnessed by:

J. Weil, Wright Air Development Center
C. Mohaupt, B. F. Goodrich
C. Henry, B. F. Goodrich

5. Failure of subject cell is attributed to the poor support afforded by a Type II backing material. A second gunfire test of the installation utilizing a Type I backing board on the left and right side, and forward end resulted in satisfactory performance. A Type II board , installed in the aft end for purposes of comparison, failed to provide the required support. The data are recorded in Republic Aviation Corporation Report, dated 1 December 1953, entitled: "Gunfire Tests, Forward and Main Fuselage Tanks, F-84F", and Appendix IV of this report.

6. The stand test was conducted at Wright-Patterson Air Force Base in accordance with paragraph 4.4.2.4 of Specification MIL-T-5578A and completed 16 May 1952. Subject cell passed the stand test. The results of this test are contained in Appendix V.

C. CONCLUSIONS

7. It is concluded that subject fuel cell, incorporated in an installation utilizing backing board Code No. 21G-048 Type II, is unsatisfactory for use in the F-84F airplane since it did not conform to the gunfire test requirements of Specification AN-T-49a.

8. It is concluded that the B. F. Goodrich self-sealing forward fuselage cell Construction 3744-9 incorporated in an installation utilizing backing board Code No. 31AG-029, Type I, is satisfactory for use in the F-84F airplane.

D. RECOMMENDATIONS

9. It is recommended that subject fuel cell utilized in an installation containing backing material Code No. 31AG-029 be approved for use in the F-84F airplane since it conformed to the final qualification test requirements of Specification AN-T-49a.

10. It is recommended that backing material Code No. 21G-048, Type II, not be approved for use with subject fuel cell in the F-84F airplane.

COORDINATION:

PREPARED BY:

W. L. Norris, WCLPI-4

PUBLICATION REVIEW
This report has been reviewed and is approved

distribution:
WCLPI-4
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WCPLXE
WCSF
WAGR-CD
WCAPO

NORMAN C. APPOLD, Colonel, USAF
Chief, Power Plant Laboratory

APPENDIX I

A. Description of Tank

1. Manufacturer - B. F. Goodrich Tire & Rubber Company
2. Construction Number - 3744-9
3. Serial Number - 101-14
4. Type of Cell - Self-sealing, flexible, fuel
5. Weight - 78.5 lbs
6. Breakdown of Tank Construction -

Ply	Top and Sides			Bottom		
	Ga.	In.	Wt. lbs/sq ft	Ga.	In.	Wt. lbs/sq ft
1. Liner 59450	.030		.194	.030		.194
Nylon Barrier	.001		.005	.001		.005
2. Sealant 83018	.055		.272	.075		.371
3. Fabric NS-2	.018		.082	.018		.082
4. Sealant 83018	.055		.272	.075		.371
5. Fabric NS-2	.018		.082	.018		.082
6. Fabric NS-10	.020		.090	.020		.090
Korolac	.001		.005	.001		.005
	.198"		1.002 lbs/sq ft	.238"		1.200 lbs/sq ft

B. Remarks

1. The basic construction 3744 received preliminary qualification test approval as indicated in Memorandum Report MCREXP-524-1960, dated 27 May 1949.

APPENDIX II

A. Conditions

1. Date - 3 November 1952

2. Test Fluid - MIL-H-5136, Type III

3. Test Fluid Temperature - 110±10°F

4. The tank contained in a structure providing support equivalent to that for which it was designed was mounted on the slosh machine filled two-thirds full of test fluid and rocked for 25 hours through a total angle of 30°, 15° either side of the horizontal, at a rate of 16 to 18 cycles per minute.

B. Remarks

1. The cell satisfactorily completed the slosh test.

APPENDIX III

Gunfire Test

A. Conditions

1. Date - 25 November 1952
2. Type of Fluid - MIL-H-3136, Type III
3. Fluid Temperature - Ambient
4. Location - Wright-Patterson Air Force Base
5. Range - 75 feet
6. Ammunition - 50 caliber AP
7. Backing Board - Swedlow 21G-048, Type II

Round No. 1 - In left side at 90° angle.
Entrance - Clean with damp seal occurring immediately. See Exhibit A.
Exit - Full tumble, 1/2 inch stream occurred immediately. A damp seal was apparent after a period of 6 1/2 minutes. See Exhibit B.

Round No. 2 - Entered left side at 90° angle.
Entrance - Full tumble with full stream resulting. See Exhibit A.
Exit - Full tumble with damp seal occurring immediately. See Exhibit B.

B. Remarks

1. The backing material did not afford the required support and the test was stopped in order to salvage the installation.

APPENDIX IV

A. Conditions

1. Date - 24 June 1953

2. Type of Fluid - MIL-H-3136, Type III

3. Fluid Temperature - Ambient

4. Location - Republic Aviation Corporation

5. Range - 75 feet

6. Ammunition - 50 caliber AP

7. Backing Board - Swedlow 31AG-029, Type I on sides and forward ends. Swedlow 210-048, Type II on aft end

Round No. 1 - In left side at 90° angle
Entrance - Clean with damp seal occurring immediately
Exit - 1/2 tumble with slow seep occurring immediately. A damp seal was apparent after a period of 1 minute

Round No. 2 - In left side at 90° angle
Entrance - Full tumble with damp seal resulting immediately
Exit - Full tumble with damp seal occurring immediately

Round No. 3 - Entered left side at 90° angle
Entrance - Full tumble with damp seal occurring immediately
Exit - Full tumble with damp seal occurring immediately

Round No. 4 - Entered left side at 90° angle
Entrance - Full tumble with slow seep occurring immediately
A damp seal was apparent after 2 minutes
Exit - Full tumble with damp seal occurring immediately

Round No. 5 - Entered left side at 90° angle
Entrance - Full tumble with medium seep occurring immediately
A damp seal was apparent after 1 1/2 minutes
Exit - Clean with damp seal resulting immediately

Round No. 6 - Entered left side above fuel level

Round No. 7 - Entered left side at 90° angle
Entrance - Clean, through stiffener, coring tank, plugged
Exit - Full tumble with damp seal occurring immediately

Round No. 8 - Entered left side at 90° angle
Entrance - Clean with damp seal occurring immediately
Exit - Full tumble with damp seal occurring immediately

Round No. 9 - Entered forward end at 90° angle
Entrance - Full tumble with 1/8 inch stream occurring immediately. A fast seep was apparent after 2 minutes. The wound was mis-aligned and sealed after being aligned by hand.
Exit - None

Round No. 10 - Entered forward end at 90° angle
Entrance - Full tumble with damp seal occurring in 30 seconds
Exit - None

Round No. 11 - Entered aft end at 90° angle
Entrance - Full tumble with 1/4 inch stream resulting immediately. A 1/8 inch stream was apparent after 1 minute, a fast seep after 2 minutes and the wound was still seeping slowly after 7 1/2 minutes
Exit - None

Round No. 12 - Entered aft end at 90° angle
Entrance - Clean with damp seal occurring immediately
Exit - None

Round No. 13 - Entered aft end at 90° angle
Entrance - Full tumble with 1/4" stream occurring immediately. A wet seal was apparent after 6 minutes
Exit - None

Round No. 14 - Entered aft end at 90° angle
Entrance - Full tumble with 1/8 inch stream occurring immediately. A slow seep was apparent after 2 minutes
Exit - None

B. Remarks

1. The walls of the cell which were backed with the Type I board performed satisfactorily when punctured.

2. The aft end of the cell did not seal satisfactorily because the Type II backing board provided inadequate support.

APPENDIX V

Stand Test

A. Conditions

1. Date - 28 January 1952 to 13 October 1952

2. The cell was filled with MIL-H-3136, Type III test fluid, maintained at ambient temperature for 80 days and then inspected.

3. Following the stand test the cell was refilled with Type III test fluid which was circulated 110±10°F for a period of 7 days, after which time it was drained and dried with hot air at approximately 160°F for 7 additional days.

4. The cell was then filled with MIL-H-3136, Type I, test fluid and maintained at a temperature of -65°F for 3 days.

B. Remarks

1. The cell satisfactorily completed the stand test with no indications of cell activation or fluid leakage.

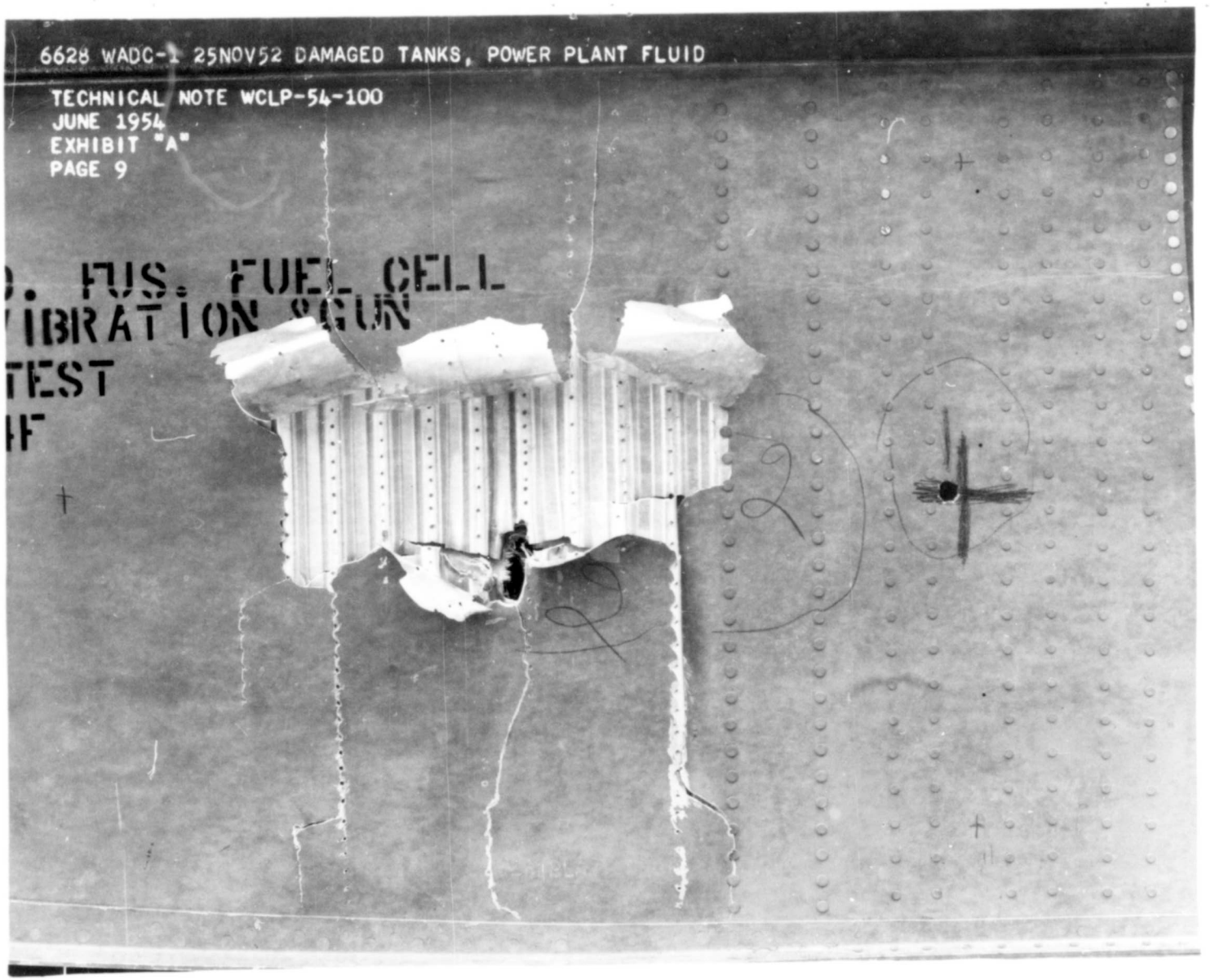
6628 WADC-1 25NOV52 DAMAGED TANKS, POWER PLANT FLUID
TECHNICAL NOTE WCLP-54-100
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EXHIBIT "A"
PAGE 9
FUS. FUEL CELL
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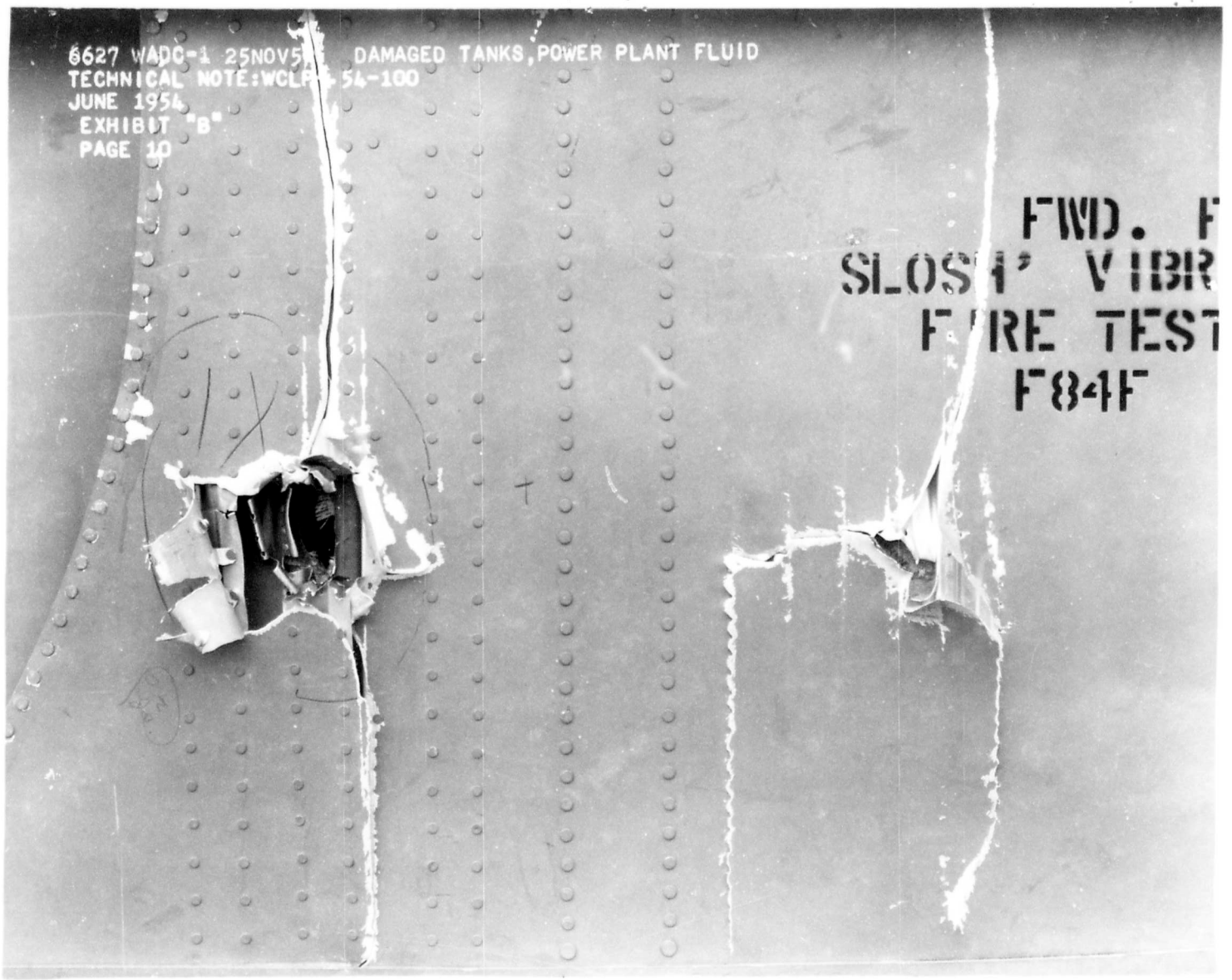
6627 WADC-1 25NOV5 DAMAGED TANKS, POWER PLANT FLUID
TECHNICAL NOTE: WCLR 54-100
JUNE 1954
EXHIBIT "B"
PAGE 10
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SLOSH' VIBR
F/RE TEST
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