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MC DONNELL AIRCRAFT CORP., ST. LOUIS, MO. (REPORT 2343)

RAM JET HELICOPTER DEVELOPMENT - PROGRESS REPORT 61 -
MONTH OF SEPT 1951 - MODEL XH-20

WOOD, C.R., JR. 15 OCT 51 26PP PHOTOS, GRAPHS, DOWNS

USAF CONTR. NO. AF-33(038)-9845

HELICOPTER ROTORS, JET
ENGINES, RAM JET
HELICOPTERS, JET
H-20

ROTATING WING AIRCRAFT (34)
ROTOR DESIGN (4)

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REPORT NO. 2343

15 OCTOBER 1951

PROGRESS REPORT NO. 61

RAM JET HELICOPTER DEVELOPMENT

CONTRACT AF 33(038)-9845

SERIAL 3

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REPORT 2343
DATE 15 October 1951
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MCDONNELL *Aircraft Corporation*
ST. LOUIS 3, MISSOURI

PROGRESS REPORT 61

MONTH OF SEPTEMBER 1951

RAM JET HELICOPTER DEVELOPMENT

SUBMITTED UNDER Contract AF 33(038)-9845

PREPARED BY *C. R. Wood, Jr.*
C. R. Wood, Jr.

APPROVED BY *R. R. Osborn*
R. R. Osborn

APPROVED BY *A. C. Ballauer*
A. C. Ballauer

APPROVED BY *C. E. Barkamp*
C. E. Barkamp

DATE 15 October 1951

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PAGE 1REPORT 2343MODEL XH-20

C O N T E N T S

	<u>Page</u>
1. SUMMARY	2
2. ROTOR DEVELOPMENT	3
2.1 No. 1, 27-Foot Diameter Rotor Blade	3
2.1.1	3
2.1.2	3
2.1.3	4
2.2 No. 2, 27-Foot Diameter Rotor Blade	4
3. Ram Jets	5
3.1 MAC Ram Jet Development	5 & 6
3.2 8.71-Inch Diameter Ram Jets	6
3.2.1	6 & 7
3.2.2	7
3.3 Modified Radial Finger-Type Ram Jet	7
3.4 Modified Whirl Stand	8
4. XH-20, USAF Nos. 46-689 and 46-690	9
4.1 XH-20, No. 1, USAF 46-689	9
4.2 Modified XH-20, No. 2, USAF 46-690	9
5. DAILY FLIGHT SHEETS	10
6. WORK PROGRAM FOR MONTH OF OCTOBER	10
7. FIGURES (1) THROUGH (13)	11-23
8. DRAWINGS	

DATE 15 October 1951

REVISED _____

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PAGE 2REPORT 2343MODEL XH-201. SUMMARY

No. 1, 27-foot diameter rotor blades are being repaired in the small areas where the bonding of the metal cover had not been properly applied. MAC ram jet development under subject contract has approximately tripled blower ram jet thrust as in the table on Page 5. Improvement of MAC's ram jet test facilities now under construction will expedite development.

DATE 15 October 1951

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MCDONNELL *Aircraft Corporation*
ST. LOUIS 3, MISSOURI

PAGE 3REPORT 2343MODEL XH-20

2. ROTOR DEVELOPMENT

2.1 No. 1, 27-Foot Diameter Rotor Blade

2.1.1 The small cracks in the metalbond adhesive of the No. 1, 27-foot diameter rotor blade are under repair. A study indicated that the small areas where the bonding of the metal cover had not been properly applied could most easily be repaired by removal of No. 4 and No. 5 panels of the trailing edge assembly from the outboard tip of Blade No. 1; and panels No.s 3 and 4, from the outboard tip of Blade No. 2. In disassembly of blade for repair, the adhesive bond was strong and difficult to remove. Replacement panels have been manufactured, a portion of the channel located aft of the main spar cut out; the parts are to be reassembled with Epon VI. Figure (2) shows one new panel being tested for fit prior to installation. Figures (3) and (4) show one blade under repair and one blade completed. The enclosed blade assembly drawing J1-2162; deviation nos. 46237 and 44509; drawings J1-0156 and J1-2162DD-2 specify details of the blade repair.

2.1.2 While the blade is disassembled for repair, the ram jet connection to the fuel line at the blade tip is being modified to expedite installation and removal of the ram jets.

DATE 15 October 1951

REVISED _____

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MCDONNELL *Aircraft Corporation*
ST. LOUIS 3, MISSOURI

PAGE 4REPORT 2313MODEL XH-20

2.1.3 The rotor calibration tests results reported in Progress Reports Nos. 59 and 60, for July and August, have been further modified to include a small change in the value of the density ratio. The use of this revised density ratio in the reduction of test data to standard atmospheric conditions resulted in only a small change in test results; see Figures (1) and (5) of this report.

2.2 No. 2, 27-Foot Diameter Rotor

The No. 2, 27-foot diameter rotor will be of modified design; the design is now in preparation. It is proposed that the blades have CCA filler aft of the main spar; a one piece trailing edge; and continuous upper and lower surfaces, if possible. Tests for the accumulation of the data necessary to substantiate the design are next on the flight schedule.

DATE 15 October 1951

MCDONNELL *Aircraft Corporation*
ST. LOUIS 3, MISSOURI

PAGE 5

REVISED _____

REPORT 2343

REVISED _____

MODEL XH-20

3. RAM JETS

3.1 MAC Ram Jet Development

The following summary of development of ram jets for the 27-foot diameter rotor under subject contract is submitted to supplement the ram jet development data submitted with Progress Report for July 1951, No. 59.

MAC NO.	LENGTH (IN)	MAX. DIA. (IN)	EXIT DIA. (IN)	WEIGHT (LBS.)	TEST SPEED (FPS)	THRUST		COMMENTS
						BLOWER (LBS.)	WHIRL TESTS (LBS.)	
26	18	7.25	4.5	9.5	600	24	-	Originally tested on 27-foot rotor max tip speeds 800 fps
27	18	7.25	4.5	9.5	600	24	-	
28	18	7.25	5.0	9.5	600	32	-	
29	18	7.25	5.0	9.5	600	32	-	Ram jets had improved fuel spray characteristics tested on 20-foot and 27-foot rotors, tip speeds to 800 fps - destroyed by accident
30	18	7.25	4.5	12.6	800	50	-	
31	18	7.25	4.5	12.6	800	50	-	Very high noise level and resonance frequencies caused early structural failures
32	21.5	7.25	5.4	15	800	50	38(approx)	
33	21.5	7.25	5.4	15	800	50	38(approx)	Developed frequent cracks with no appreciably improved performance on 20-foot and 27-foot rotor to 800 fps
34	22.0	8.71	5.8	12.2	800	80	62(est)	
35	22.0	8.71	5.8	12.2	800	80	62(est)	Scaled-up version of Nos. 28 and 29 now under test showing higher thrust

DATE 15 October 1951

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PAGE 8REPORT 2343MODEL XH-20

3.4 Modified Whirl Stand

Figure (10) shows the P & W R-985 engine being prepared for the MAC sponsored installation on the whirl test stand. This assembly is replacing government furnished test equipment. Figure (11) shows a 27-foot diameter rotor assembly on the present whirl test stand. The new test stand will be more fully instrumented and will have 52 slip rings for measurement of temperatures, stresses, etc. Figure (12) shows the blower air supply which currently consists of Type "B" turbo supercharges driven by electric motors. Means of improving this air supply have been studied and a MAC sponsored installation is planned.

DATE 15 October 1951

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MCDONNELL *Aircraft Corporation*
ST. LOUIS 3, MISSOURI

PAGE 9REPORT 2343MODEL XH-20

4. XH-20, USAF 46-689 and 46-690

4.1 XH-20, No. 1, USAF 46-689

The XH-20, No. 1 was loaded into a WADC aircraft at MAC on 21 September for ferrying to WADC. It is to be displayed at the Ordnance Demonstration on 5 and 6 October.

4.2 Modified XH-20, No. 2, USAF 46-690

The helicopter was out of commission in September for repair of the No. 1, 27-foot diameter rotor blade. It is standing by for further evaluation tests of the rotor and of the rotor assembly changes, so that the design of the No. 2, 27-foot diameter rotor can be completed and submitted to WADC for approval. Figure (13) shows the helicopter with the rotor removed.

DATE 15 October 1951

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MCDONNELL *Aircraft Corporation*
ST. LOUIS 3, MISSOURI

PAGE 10REPORT 2343MODEL XH-20

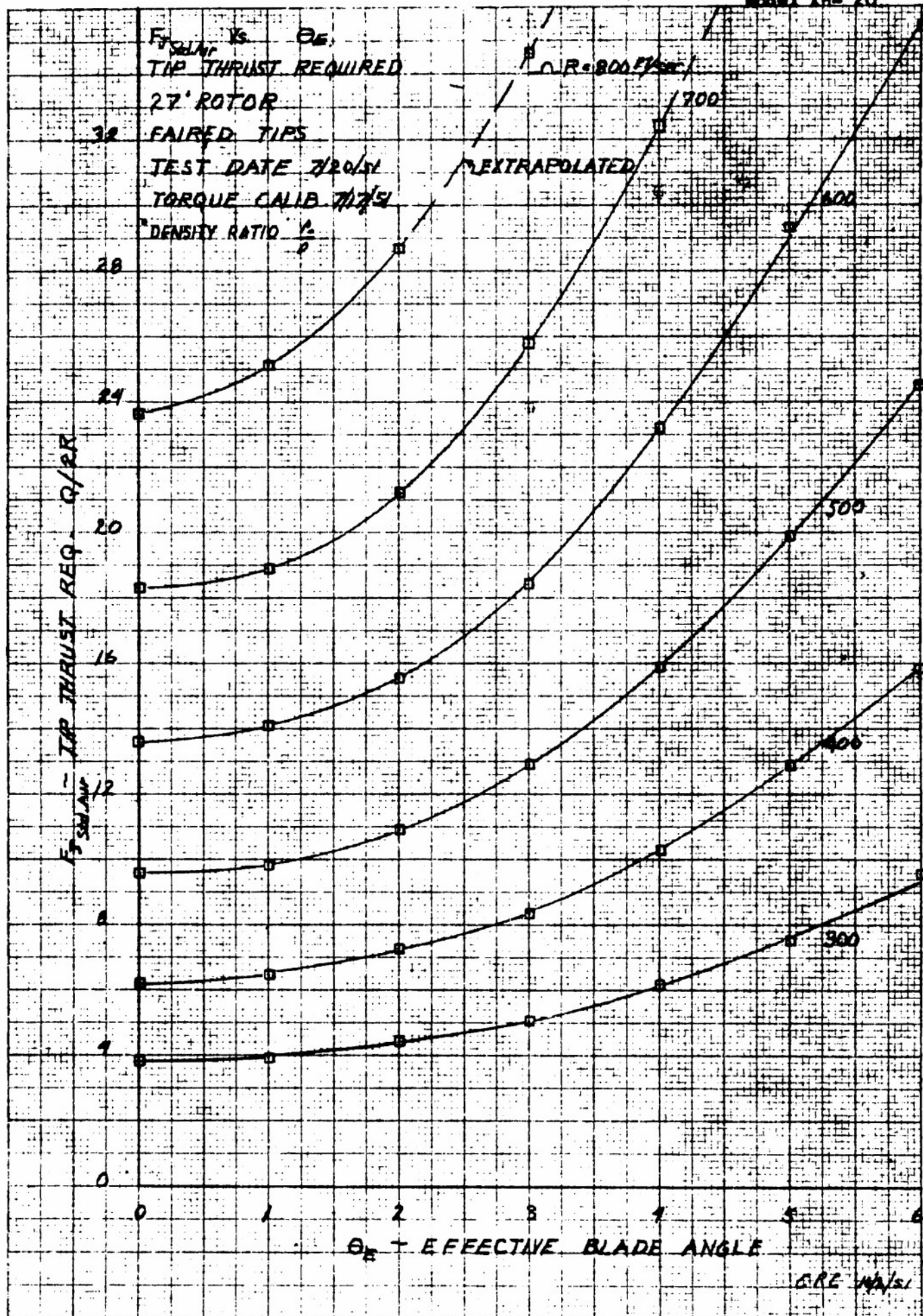
5. DAILY FLIGHT SHEETS, - XH-20 Helicopter Test Data

There were no operations scheduled for the
XH-20 during September.

6. WORK PLANNED FOR MONTH OF OCTOBER

Further evaluation of the rotor and rotor
assembly changes are scheduled upon completion of
repair to the rotor blade and assembly of suitable
ram jets.

FIGURE 1



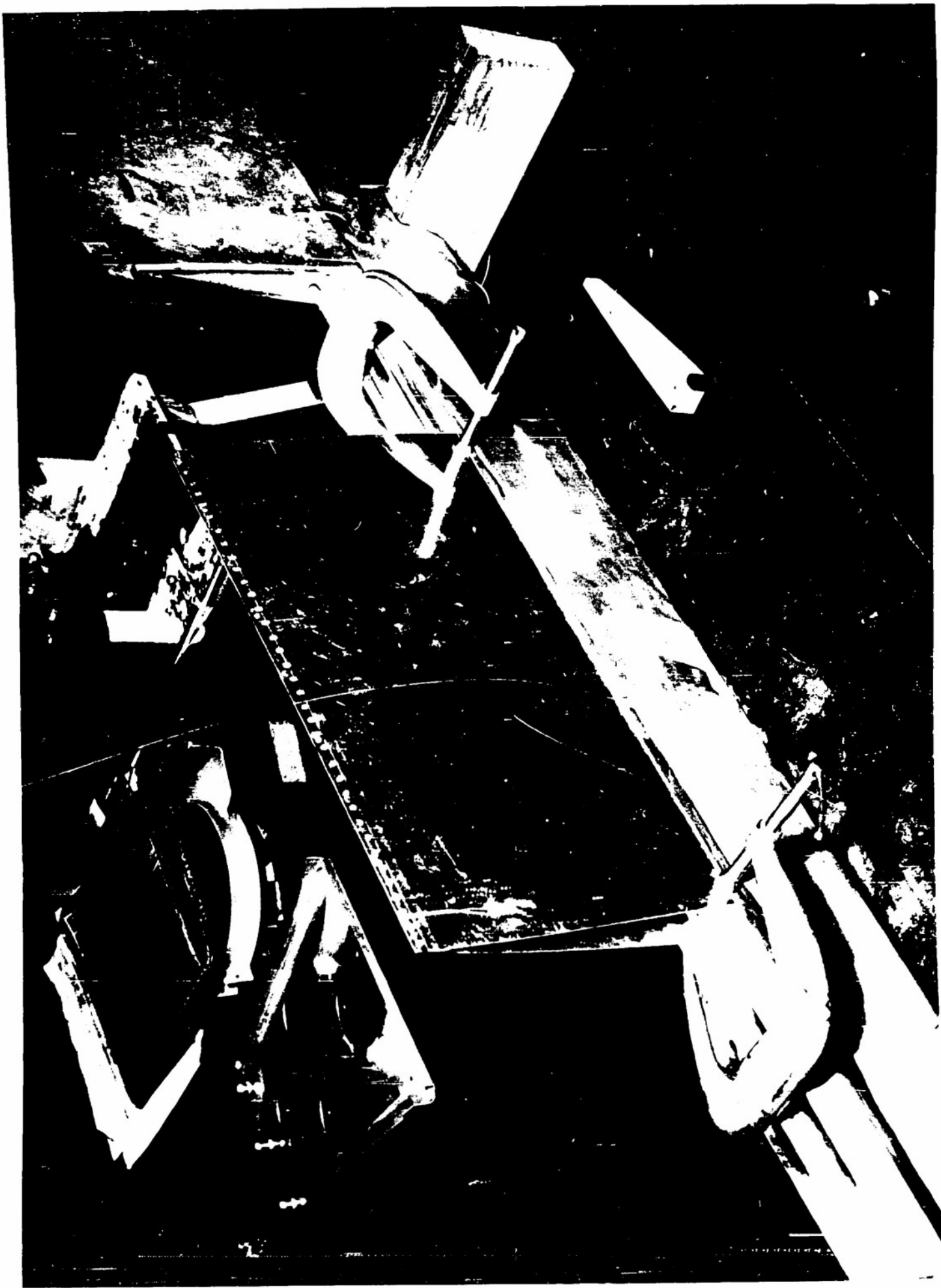


FIG (2) PAGE 12

FITTING REPLACEMENT PANEL TO NO. 1, 27-FOOT DIAMETER ROTOR
10/2/51

REPORT 2343
DUE 25727



REPORT 2343
D4E 25784

CEMENTING REPLACEMENT PANELS ON NO. 1, 27-FOOT ROTOR 10/11/51

FIGURE (3)

PAGE 13



REPORT 2343
D4E 25785

REPAIRED NO. 1, 27-FOOT DIAMETER BLADE 10/11/51

FIGURE (4)

PAGE 14

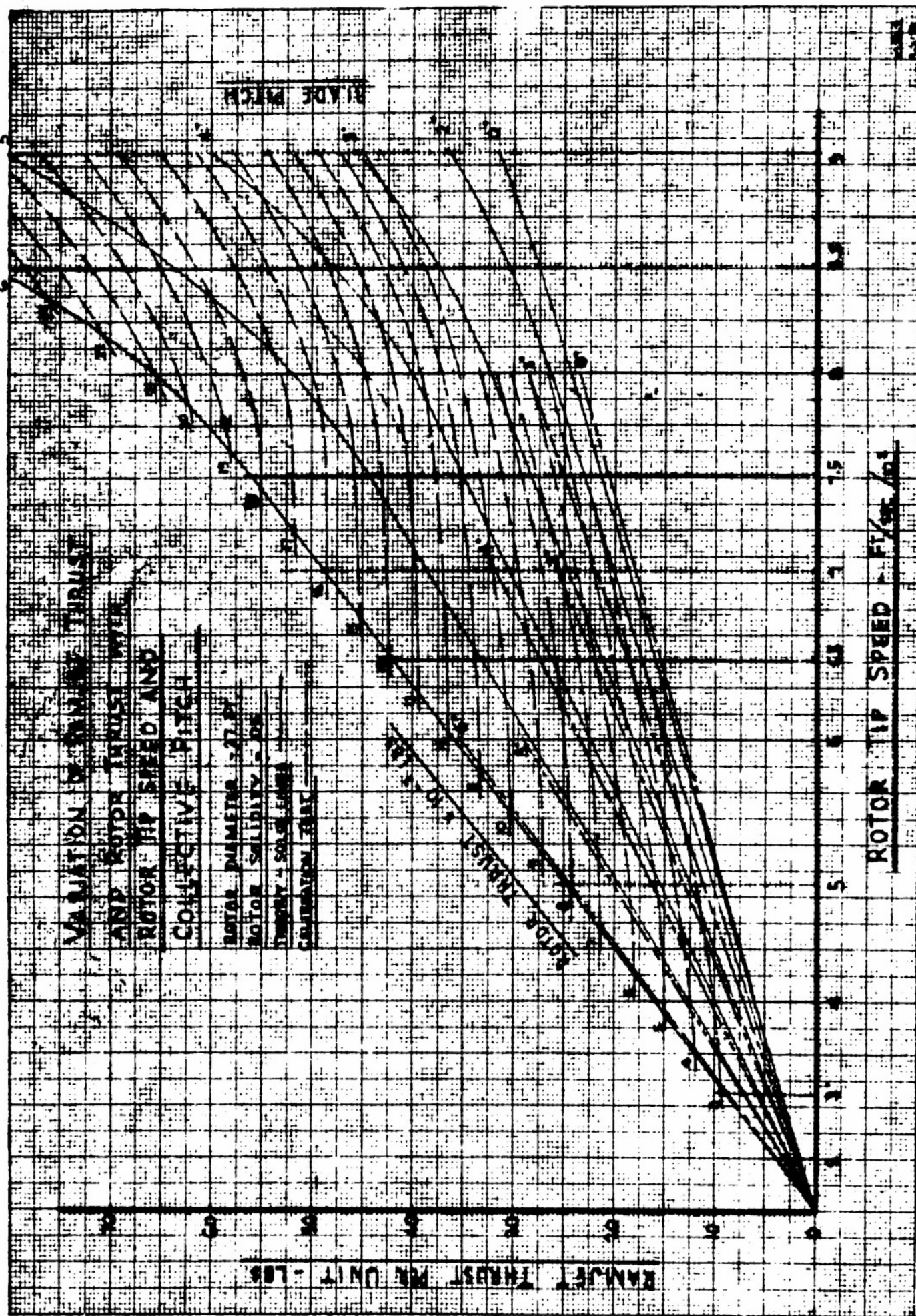
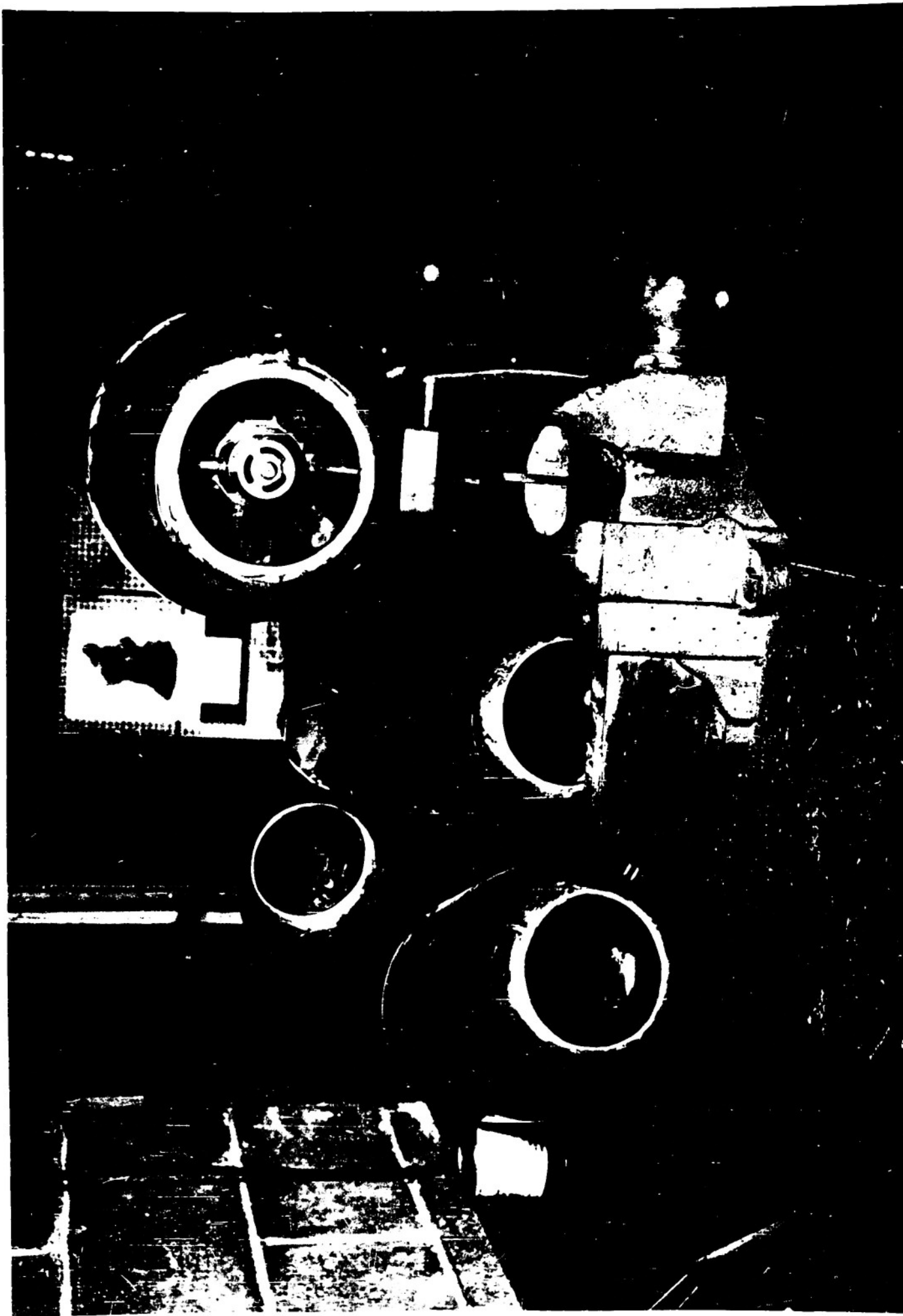


FIGURE 5



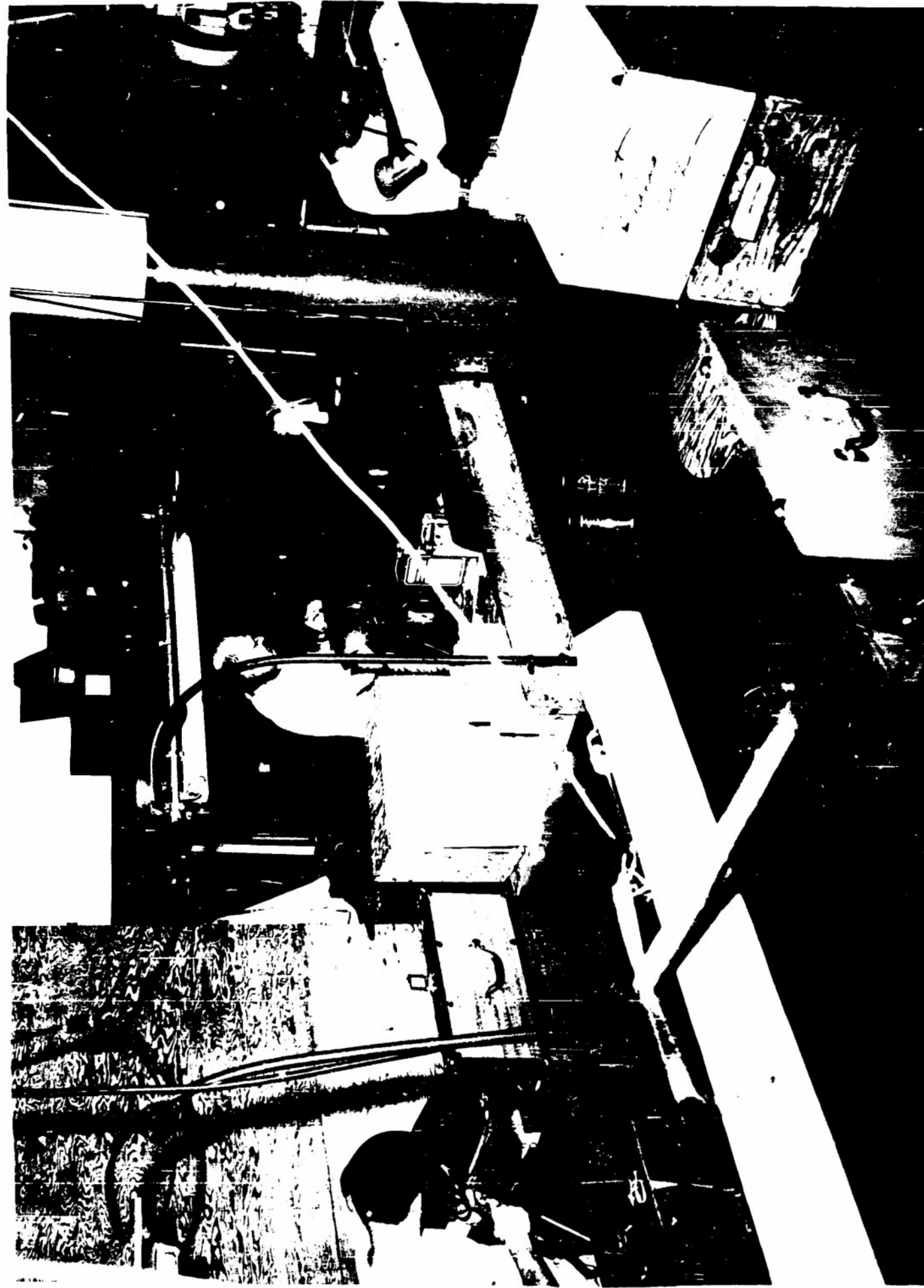




REPORT 2343
DJE 25722

7.25-IN DIAMETER RAM JET BEING REPAIRED - CRACKED SECTION REMOVED
AND REPLACED 10/2/51

FIGURE (8) PAGE 18



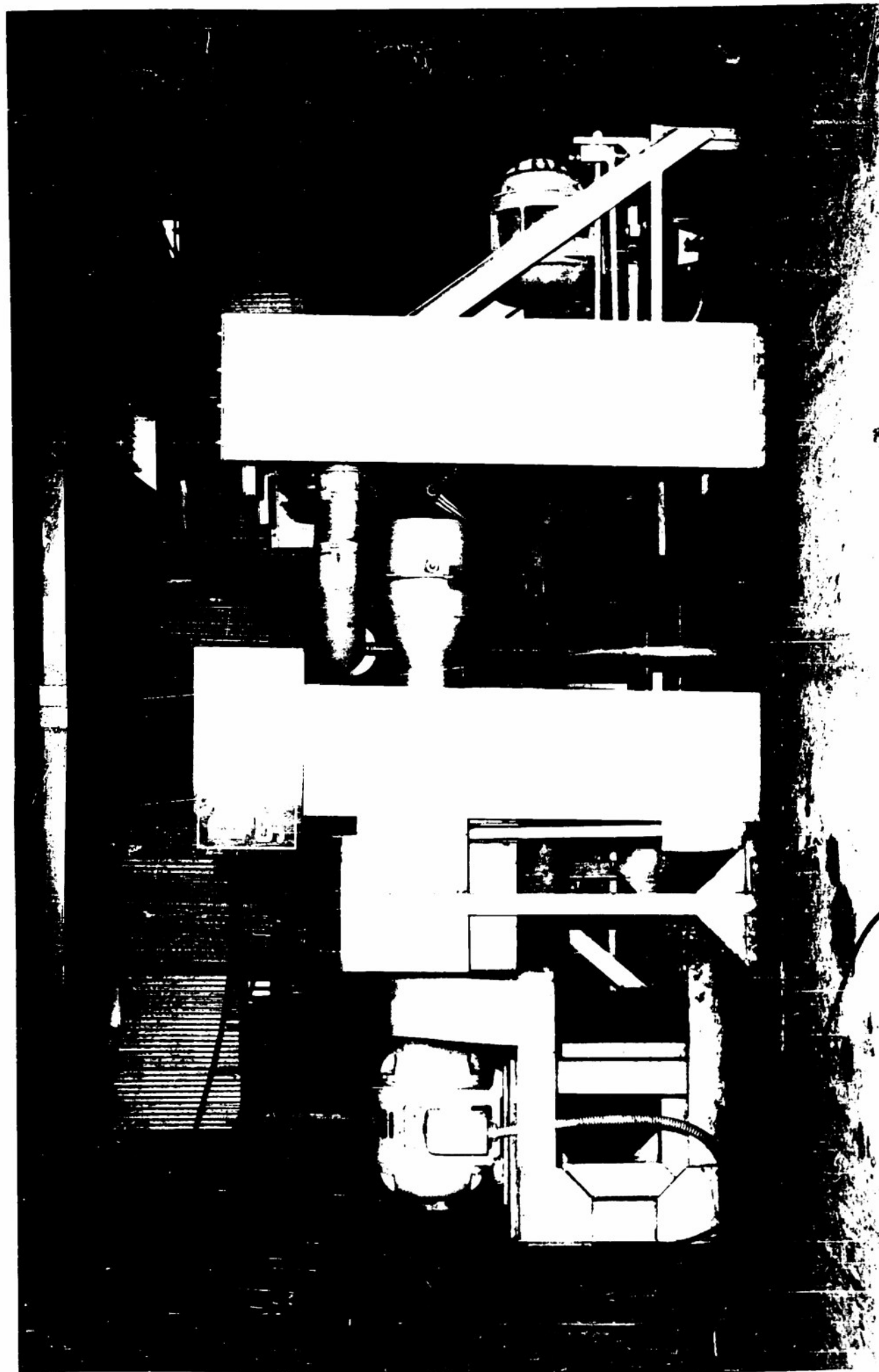


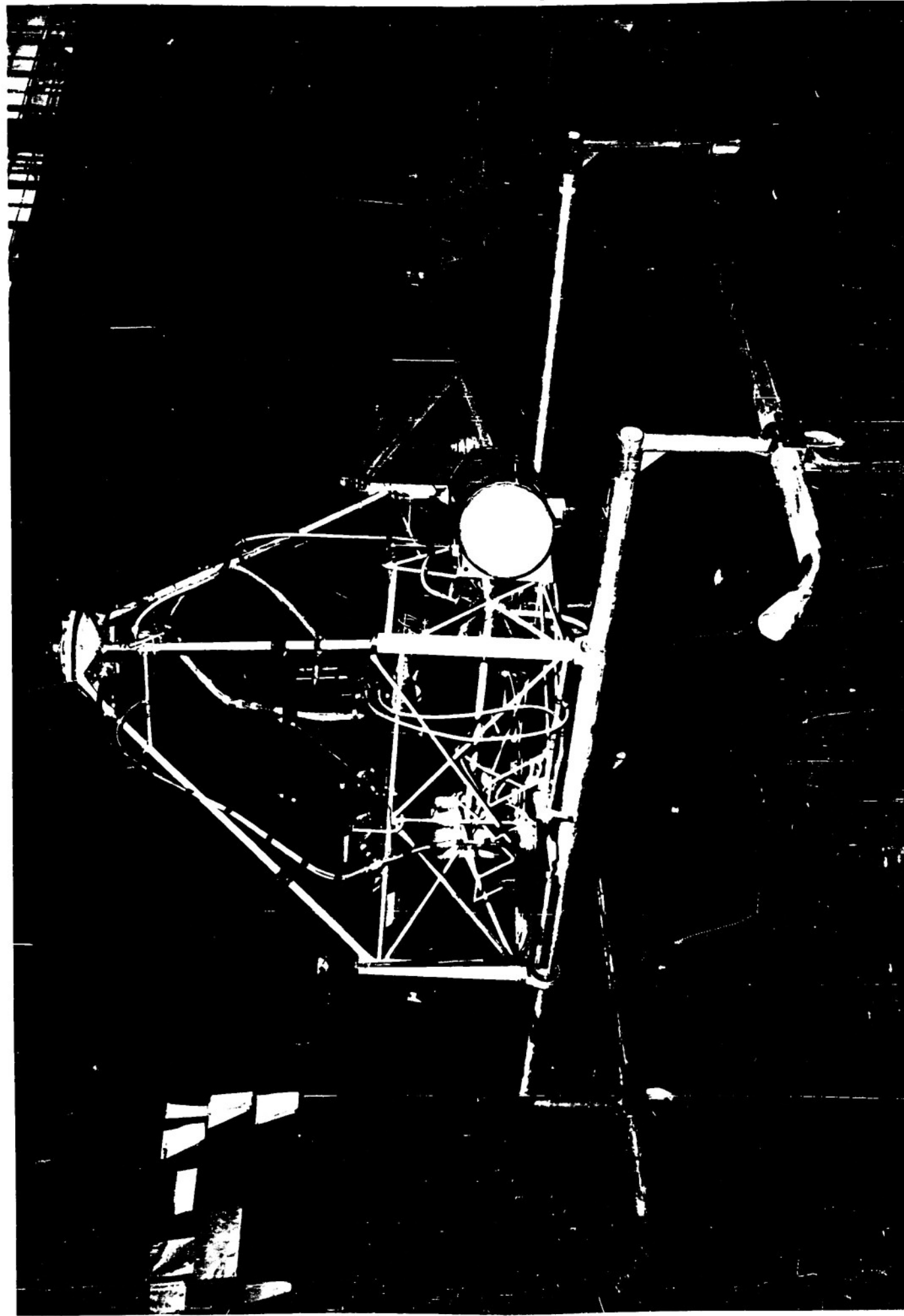
REPORT 2343
DUE 25731

450 HP ENGINE INSTALLATION FOR IMPROVED WHIRL TEST STAND 10/2/51

FIGURE (10) PAGE 20



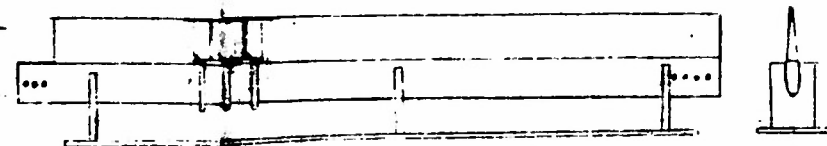




REPORT 2343
DUE 25726

XH-20 NO. 2, STANDING BY FOR 27-FOOT DIAMETER ROTOR 10/2/51

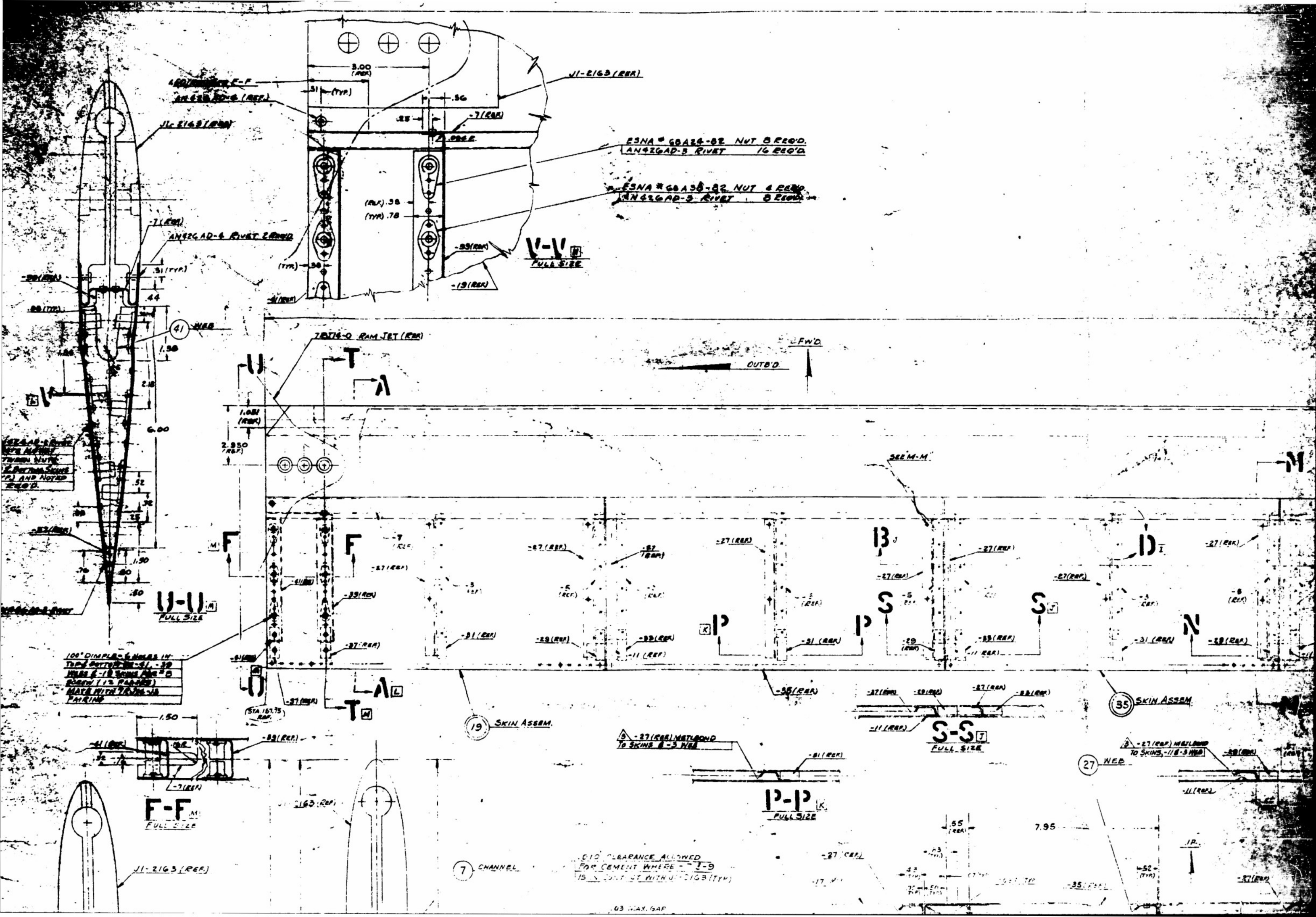
FIGURE (13) PAGE 23



5. SET-UP MAY BE MODIFIED AS NECESSARY FOR REPLACEMENT OF TWO OR MORE ADJOINING SECTIONS. A CLEAN NEW PANEL SECTIONS WITH A PORTION OF 10 PERCENT SULFURIC ACID, RATHER THAN CHLORINE PISOLPHATE AND 30 PARTS WATER AT 140°F. FOR THE MINUTE EXPOSE IN WARM WATER. 3. CLEAN 11. WASH IN WARM WATER AND DRY IMMEDIATELY. 4. GIVE BLENDED COLORED. 5. APPLY WITH BRUSH OR ROLLER WITH BRUSHES TO HOLD THEM IN POSITION.

NOTES:

The image shows a document page with a table on the left and a large, dark, irregular shape on the right. The table has several rows and columns, with some cells containing text. The right side of the page is heavily obscured by a large, dark, irregular shape, possibly a redaction or a large stain, making the text in that area illegible. The overall image quality is poor, with significant noise and artifacts.



SECTION 7-9
SEE 7-8 (FOR P)

AN 47040-2 RIVER 5 RPPD
FLUKE AND CHANNEL 7-9
TO 21 DURING DRAINAGE OPERATION

11.0

70.15

11-2163 SPAR 7 (REF)

-21 (REF)

-81 (REF)

-27 (REF)

13

N

N

-28 (REF)

-28 (REF)

-11 (REF)

-25 (REF)

-28 (REF)

-28 (REF)

-28 (REF)

-28 (REF)

-11 (REF)

-28 (REF)

-28 (REF)

-11 (REF)

ASSEMB

N

SPOTWELD 3 PLACES

11 PLATE
BOTTOM SKIN ONLY 15

-17 (REF)

(RPP) AN 47040-2 RIVER 5 RPPD

-28 (REF)

-27 (REF)

-28 (REF)

FORMED PLANE

-11 (REF)

-55 (REF)

N-N
FULL SIZE

UP

-27 (REF)

-5 (REF)

-7 (REF)

UP

11-2163 (REF)

UP

-21 (REF)

-7 (REF)

-17 (REF)

22.25
(FROM INBOARD END)

11-2163 (REF)

AN 47040-2 RIVER 5 RPPD
FLUKE AND CHANNEL 7-9
TO 21 DURING DRAINAGE OPERATION

2. CHURCH

- 70.19

11-2163 SPAR (REG'D)

STAMP PAGE NO. 1
DO NOT STEEL STAMP

-23 (4/24)

SECRET

-23 (REV)

-83 (444)

- 9 -
1984

-25 (RCA)

- 3 -

-3

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-17 (RFE)

-13/25-

(REP)

6 (A2B) =

-25 (cont)

... 50 (KAR)

15.04.1945

AN426 AD-2 RIVET
2 REED EA SKIN ASSEM.
FLUSH BOTH SIDES (TYR)

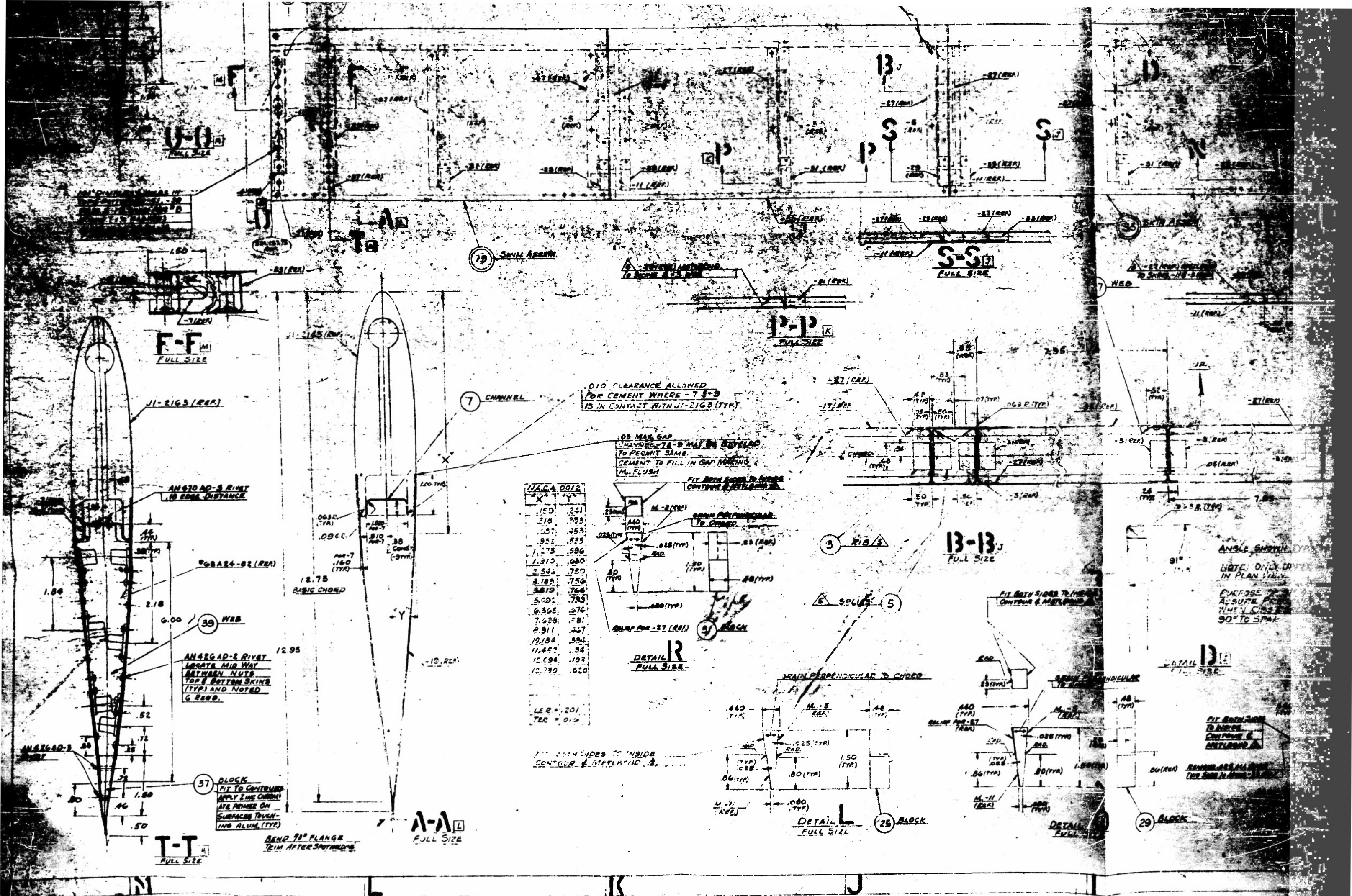
SKIN (13)

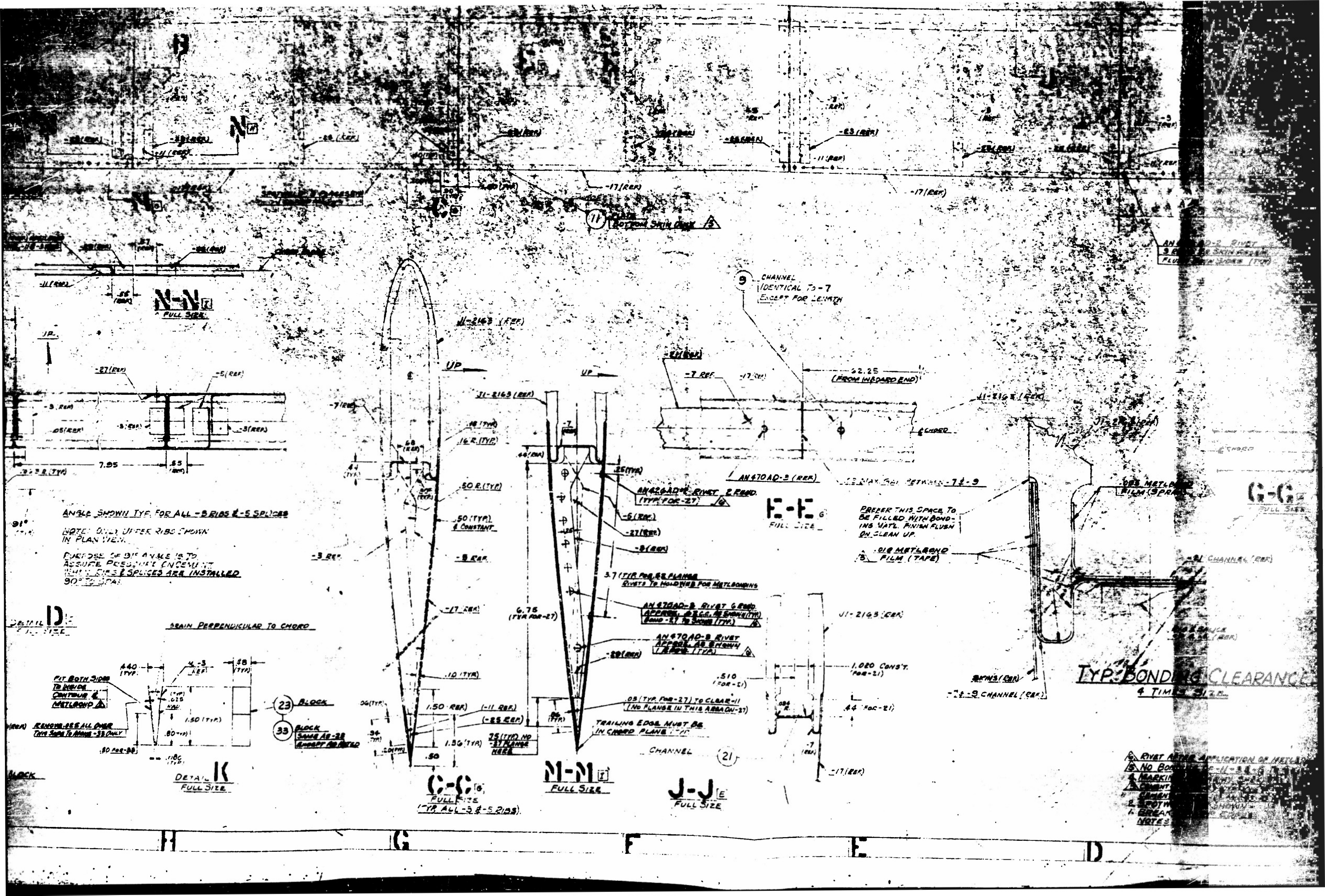
17. SKIN ASSEM

15 SKIN ABSOR

22.25
(FROM INBOARD END)

41-21,2 / CFE





N-N
FULL SIZE

ANGLE SHOWN TYP. FOR ALL -5 RIBS & -5 SPLICES
NOTE: ONLY UPPER RIBS SHOWN IN PLAN VIEW.
PURPOSE OF 91° ANGLE IS TO ASSURE PROPER ENGAGEMENT WHEN -5 SPLICES ARE INSTALLED 90° TO SPAN.

SPAIN PERPENDICULAR TO CHORD

DETAIL K
FULL SIZE

G-G
FULL SIZE

N-N
FULL SIZE

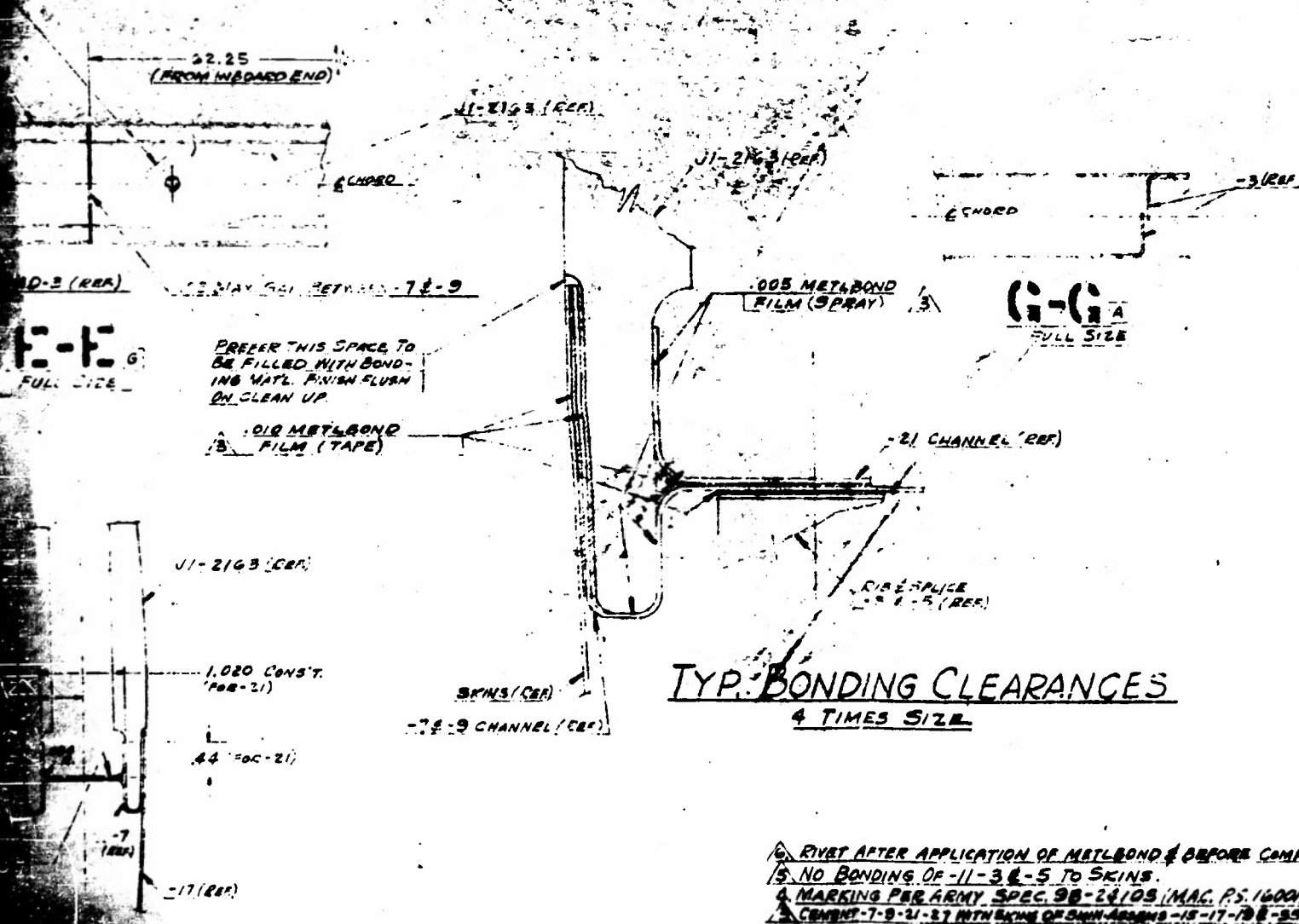
J-J
FULL SIZE

E-E
FULL SIZE

G-G
FULL SIZE

TYP. BONDING CLEARANCE
4 TIMES SIZE

1. RIVET AFTER APPLICATION OF METALBOND IS NO BONDING REQUIRED.
2. MARKING OF RIVETS IS REQUIRED.
3. RIVETS TO BE INSTALLED IN BOTH DIRECTIONS.
4. RIVETS TO BE INSTALLED IN BOTH DIRECTIONS.
5. RIVETS TO BE INSTALLED IN BOTH DIRECTIONS.



6. RIVET AFTER APPLICATION OF METLBOND & BEFORE COMPLETION OF BONDING (TYP)
 7. NO BONDING OF -11-36-5 TO SKINS.
 8. MARKING PER ARMY SPEC. 98-24109 (MAC. P.5.1600) CO NOT STEEL STAMP
 CEMENT-7-8-21-27 WITH RINGS OF BURN-ARMS-15-17-19-25-27-34-37-39-41-43-45-47-49-51-53-55-57-59-61-63-65-67-69-71-73-75-77-79-81-83-85-87-89-91-93-95-97-99-101-103-105-107-109-111-113-115-117-119-121-123-125-127-129-131-133-135-137-139-141-143-145-147-149-151-153-155-157-159-161-163-165-167-169-171-173-175-177-179-181-183-185-187-189-191-193-195-197-199-201-203-205-207-209-211-213-215-217-219-221-223-225-227-229-231-233-235-237-239-241-243-245-247-249-251-253-255-257-259-261-263-265-267-269-271-273-275-277-279-281-283-285-287-289-291-293-295-297-299-301-303-305-307-309-311-313-315-317-319-321-323-325-327-329-331-333-335-337-339-341-343-345-347-349-351-353-355-357-359-361-363-365-367-369-371-373-375-377-379-381-383-385-387-389-391-393-395-397-399-401-403-405-407-409-411-413-415-417-419-421-423-425-427-429-431-433-435-437-439-441-443-445-447-449-451-453-455-457-459-461-463-465-467-469-471-473-475-477-479-481-483-485-487-489-491-493-495-497-499-501-503-505-507-509-511-513-515-517-519-521-523-525-527-529-531-533-535-537-539-541-543-545-547-549-551-553-555-557-559-561-563-565-567-569-571-573-575-577-579-581-583-585-587-589-591-593-595-597-599-601-603-605-607-609-611-613-615-617-619-621-623-625-627-629-631-633-635-637-639-641-643-645-647-649-651-653-655-657-659-661-663-665-667-669-671-673-675-677-679-681-683-685-687-689-691-693-695-697-699-701-703-705-707-709-711-713-715-717-719-721-723-725-727-729-731-733-735-737-739-741-743-745-747-749-751-753-755-757-759-761-763-765-767-769-771-773-775-777-779-781-783-785-787-789-791-793-795-797-799-801-803-805-807-809-811-813-815-817-819-821-823-825-827-829-831-833-835-837-839-841-843-845-847-849-851-853-855-857-859-861-863-865-867-869-871-873-875-877-879-881-883-885-887-889-891-893-895-897-899-901-903-905-907-909-911-913-915-917-919-921-923-925-927-929-931-933-935-937-939-941-943-945-947-949-951-953-955-957-959-961-963-965-967-969-971-973-975-977-979-981-983-985-987-989-991-993-995-997-999-1001-1003-1005-1007-1009-1011-1013-1015-1017-1019-1021-1023-1025-1027-1029-1031-1033-1035-1037-1039-1041-1043-1045-1047-1049-1051-1053-1055-1057-1059-1061-1063-1065-1067-1069-1071-1073-1075-1077-1079-1081-1083-1085-1087-1089-1091-1093-1095-1097-1099-1101-1103-1105-1107-1109-1111-1113-1115-1117-1119-1121-1123-1125-1127-1129-1131-1133-1135-1137-1139-1141-1143-1145-1147-1149-1151-1153-1155-1157-1159-1161-1163-1165-1167-1169-1171-1173-1175-1177-1179-1181-1183-1185-1187-1189-1191-1193-1195-1197-1199-1201-1203-1205-1207-1209-1211-1213-1215-1217-1219-1221-1223-1225-1227-1229-1231-1233-1235-1237-1239-1241-1243-1245-1247-1249-1251-1253-1255-1257-1259-1261-1263-1265-1267-1269-1271-1273-1275-1277-1279-1281-1283-1285-1287-1289-1291-1293-1295-1297-1299-1301-1303-1305-1307-1309-1311-1313-1315-1317-1319-1321-1323-1325-1327-1329-1331-1333-1335-1337-1339-1341-1343-1345-1347-1349-1351-1353-1355-1357-1359-1361-1363-1365-1367-1369-1371-1373-1375-1377-1379-1381-1383-1385-1387-1389-1391-1393-1395-1397-1399-1401-1403-1405-1407-1409-1411-1413-1415-1417-1419-1421-1423-1425-1427-1429-1431-1433-1435-1437-1439-1441-1443-1445-1447-1449-1451-1453-1455-1457-1459-1461-1463-1465-1467-1469-1471-1473-1475-1477-1479-1481-1483-1485-1487-1489-1491-1493-1495-1497-1499-1501-1503-1505-1507-1509-1511-1513-1515-1517-1519-1521-1523-1525-1527-1529-1531-1533-1535-1537-1539-1541-1543-1545-1547-1549-1551-1553-1555-1557-1559-1561-1563-1565-1567-1569-1571-1573-1575-1577-1579-1581-1583-1585-1587-1589-1591-1593-1595-1597-1599-1601-1603-1605-1607-1609-1611-1613-1615-1617-1619-1621-1623-1625-1627-1629-1631-1633-1635-1637-1639-1641-1643-1645-1647-1649-1651-1653-1655-1657-1659-1661-1663-1665-1667-1669-1671-1673-1675-1677-1679-1681-1683-1685-1687-1689-1691-1693-1695-1697-1699-1701-1703-1705-1707-1709-1711-1713-1715-1717-1719-1721-1723-1725-1727-1729-1731-1733-1735-1737-1739-1741-1743-1745-1747-1749-1751-1753-1755-1757-1759-1761-1763-1765-1767-1769-1771-1773-1775-1777-1779-1781-1783-1785-1787-1789-1791-1793-1795-1797-1799-1801-1803-1805-1807-1809-1811-1813-1815-1817-1819-1821-1823-

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