Enclosure
3-1130-39-348

Vol. IV

BOEING

(NASA-CR-150836) LOAD AND DYNAMIC ASSESSMENT OF B-52B-008 CARRIER AIRCRAFT FOR FINNED CONFIGURATION 1 SPACE SHUTTLE SOLID ROCKET BOOSTER DECELERATION SUBSYSTEM DROP TEST VEHICLE. VOLUME (Boeing Co., Wichita, G3/05

N79-10051

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DOCUMENT NO. D3-11220-2 MODEL B-52B-008

TITLE LOAD AND DYNAMIC ASSESSMENT OF B-52B-008 CARRIER AIRCRAFT FOR FINNED CONFIGURATION 1 SPACE SHUTTLE SOLID ROCKET BOOSTER DECELERATION SUBSYSTEM DROP TEST VEHICLE - VOLUME IV, PYLON LOAD DATA METHOD 2.

ORIGINAL RELEASE DATE

ISSUE NO. TO

ADDITIONAL LIMITATIONS IMPOSED ON THIS DOCUMENT WILL BE FOUND ON A SEPARATE LIMITATIONS PAGE

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ABSTRACT

This volume presents the pylon loading at the drop test vehicle (DTV) and wing interface attack points. The loads shown are determined using Stiffness Method 2, which assumes the side stiffness of the forward hook guide and the fore and aft stiffness of each drag pin to be equal. The net effect of this assumption is that the forward hook guide reacts approximately 96 percent of the drop test vehicle yawing moment. For a comparison of these loads to previous X-15 analysis design loadings see Volume I of this document.

The other three volumes of this document contain the following information:

- Volume I - Summary of airplane flutter and load-strength evaluation analysis results and a comparison study of pylon loads resulting from the DTV.
- Volume II - Detailed B-52B-008/DTV flutter and load analysis results.
- Volume III - Pylon loading at the DTV and wing interface attach points using Stiffness Method 1.

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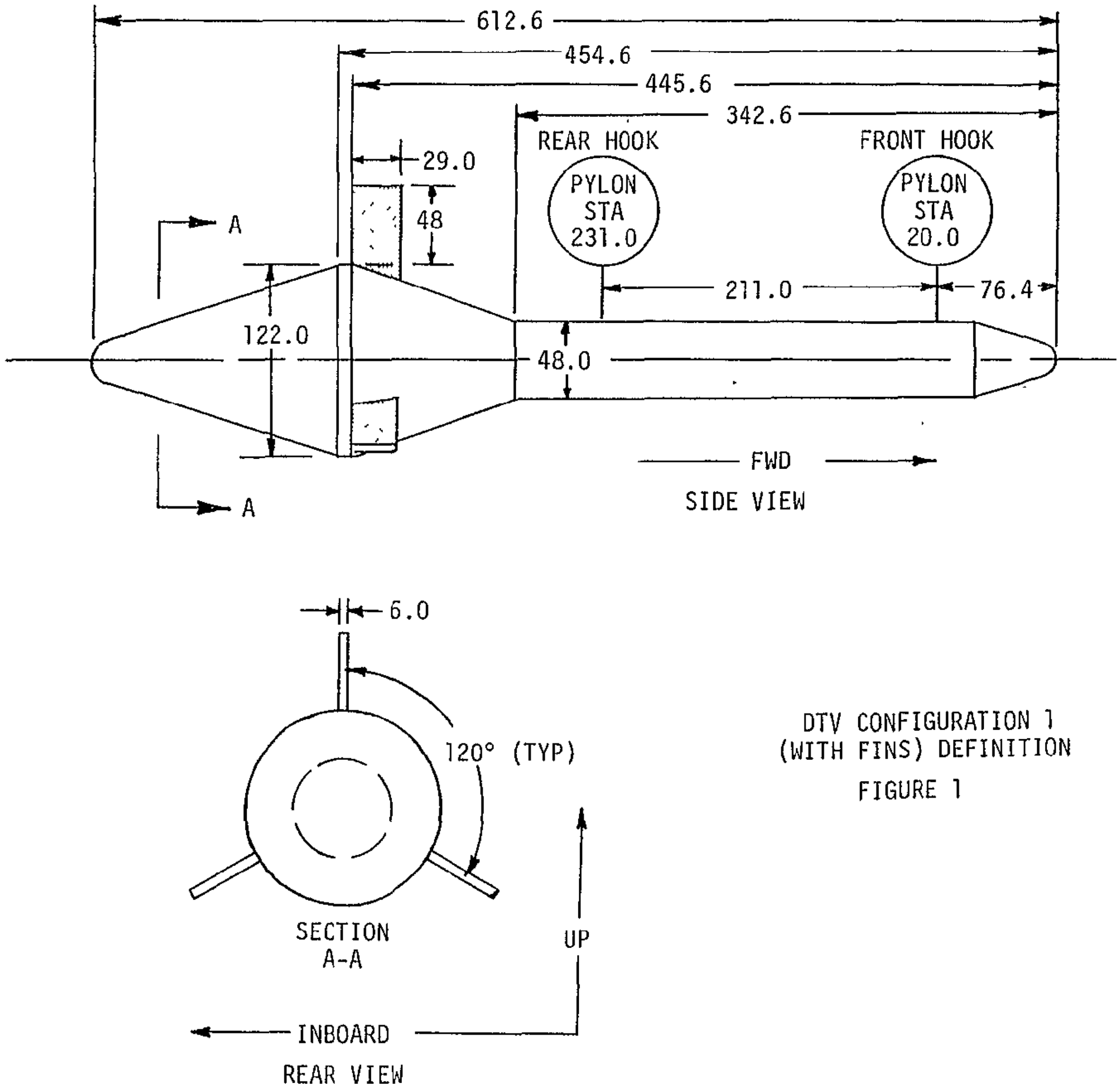
1.0 SUMMARY

The ultimate loading at the drop test vehicle (DTV)-pylon and pylon-wing interface attach points as obtained using Stiffness Method 2 is given for DTV Configuration 1 (with fins). A sketch of the finned DTV Configuration 1 is shown in Figure 1. Pylon geometry used in this analysis is defined in Figure 2. The analysis design conditions defined in Table I were developed using the inertia load factor criteria defined in Reference 1 for the X-15A-2 installation, B-52B angle of attack data per Reference 2, B-52B lateral gust criteria (55 foot per second limit gust velocity) and DTV aerodynamics as provided by George C. Marshall Space Flight Center (MSFC). An explanation of the condition numbering system is given in Figure 3. A summary of DTV Configuration 1 (with fins) critical pylon loadings is shown in Table II. For a comparison of these loadings to X-15A-2 design ultimates (1.5 * limit) see Volume I of this document.

Stiffness Method 2 assumes the side stiffness of the forward hook guide and the fore and aft stiffness of each drag pin to be equal. Therefore, the resultant stiffness of the drag pins is twice the side stiffness of the front hook guide. The net effect of this assumption is that the drag pins react approximately 4 percent of the DTV yawing moment as a drag force couple while the remaining 96 percent of the DTV yawing moment is reacted as a side force by the forward hook guide. For a complete mathematical description of this approach see Paragraph 2.4 of Reference 3.

Mathematical equations for defining DTV-pylon and pylon-wing interface loadings for DTV Configuration 1 (with fins) using Stiffness Method 2 are defined in Section 2.0, Paragraphs 2.1 and 2.2 of Reference 3. Aerodynamic loading is defined in Section 2.0 of this volume. DTV-pylon and pylon-wing interface loadings for all design conditions including the effect of DTV center of gravity variations are shown in Section 3.0 of this volume. See Table I for the conditions analyzed and Figure 3 for the center of gravity variations evaluated.



DTV CONFIGURATION 1
(WITH FINS) DEFINITION

FIGURE 1

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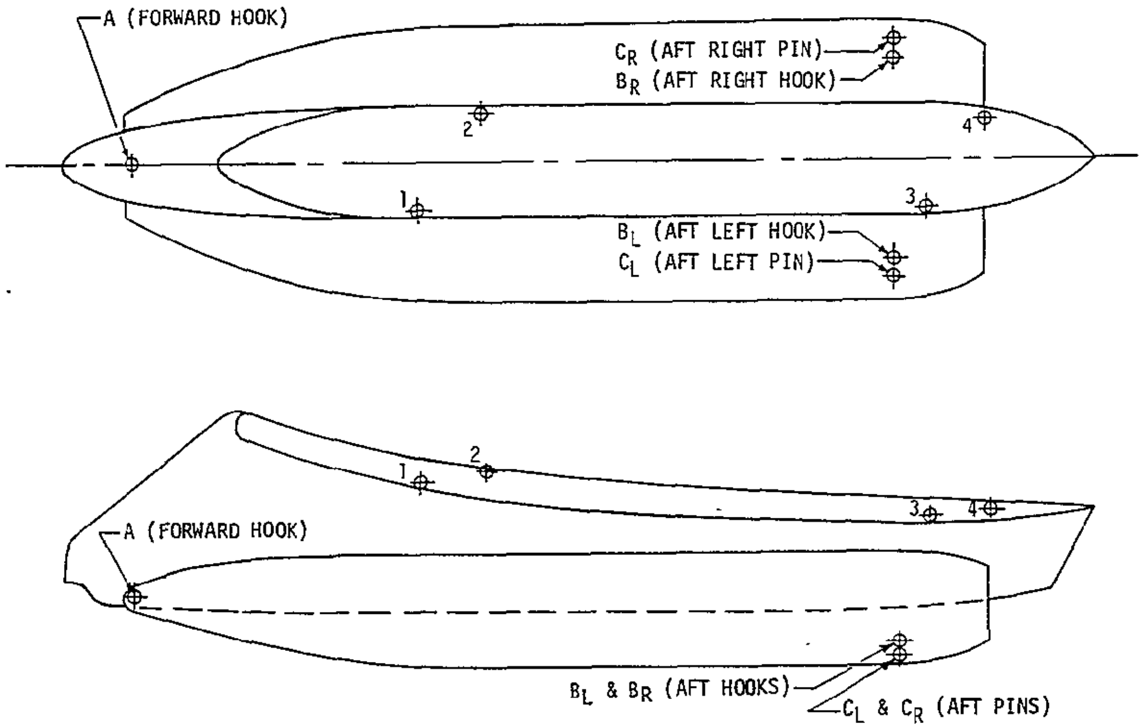

PYLON LOCATION	PYLON STATION	PYLON BUTTOCK LINE	PYLON WATER LINE
A	20.000	0.000	-1.1875
B_L	231.000	-26.437	-15.1870
B_R	231.000	26.437	-15.1870
C_L	231.000	-31.312	-17.5000
C_R	231.000	31.312	-17.5000
1	98.500	-13.500	28.7930
2	115.625	13.500	29.5210
3	236.342	-13.093	18.9440
4	251.813	11.750	19.2910

PYLON GEOMETRY

FIGURE 2

TABLE I
DESIGN CONDITIONS - PYLON LOADS

CONDITION NUMBER	n_x +FWD	n_y +LEFT	n_z +DOWN	VELOCITY (KEAS)	ALTITUDE (FEET)	$\alpha_{FUS.}$ (DEGREES)	BETA [1] (DEGREES)	BETA [1] (DEGREES)	BETA [1] (DEGREES)
101	1.50	0	3.32	203.328	0	14.0	-9.18	0	9.18
102	1.50	0	3.32	260.000	0	4.6	-7.18	0	7.18
103	1.50	0	3.32	247.260	33900.	4.7	-7.55	0	7.55
104	-1.50	0	3.32	203.328	0	14.0	-9.18	0	9.18
105	-1.50	0	3.32	260.000	0	4.6	-7.18	0	7.18
106	-1.50	0	3.32	247.260	33900.	4.7	-7.55	0	7.55
107	0	.56	1.50	143.775	0	14.0	-12.98	0	12.98
108	0	.56	1.50	260.000	0	-.5	-7.18	0	7.18
109	0	.56	1.50	247.260	33900.	-.9	-7.55	0	7.55
110	0	-.56	1.50	143.775	0	14.0	-12.98	0	12.98
111	0	-.56	1.50	260.000	0	-.5	-7.18	0	7.18
112	0	-.56	1.50	247.260	33900.	-.9	-7.55	0	7.55
113	1.50	0	-1.53	154.085	0	-15.1	-12.11	0	12.11
114	1.50	0	-1.53	260.000	0	-8.7	-7.18	0	7.18
115	1.50	0	-1.53	247.260	33900.	-10.4	-7.55	0	7.55
116	-1.50	0	-1.53	154.085	0	-15.1	-12.11	0	12.11
117	-1.50	0	-1.53	260.000	0	-8.7	-7.18	0	7.18
118	-1.50	0	-1.53	247.260	33900.	-10.4	-7.55	0	7.55
119	.75	0	3.32	---	---	---	---	---	---
120	-.75	0	3.32	---	---	---	---	---	---
121	0	.42	3.32	---	---	---	---	---	---
122	0	-.42	3.32	---	---	---	---	---	---

[1] BETA = $(55/(6080.20/3600.))(57.3)/V_{KEAS} = (32.565/V_{KEAS}) * 57.3$

TABLE II

PYLON LOADS SUMMARY (ULTIMATE)
METHOD 2 CONFIGURATION 1 (WITH FINS)

PYLON HOOK LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON DTV)

CONFIGURATION 1.0 WITH FINS

COND. NO.	VA POUNDS	VBL POUNDS	VBR POUNDS	VCL POUNDS	VCR POUNDS	DCL POUNDS	DCR POUNDS	SA POUNDS	SCL POUNDS
104.33	-57122.6	-47638.7	-52097.3	0.0	0.0	40092.8	40800.6	-2385.0	8389.3
105.11	-55345.6	-54118.4	-49363.6	0.0	0.0	43188.3	42400.8	2653.2	-10093.5
105.33	-55345.6	-49437.0	-54045.0	0.0	0.0	42344.8	43244.3	-3030.8	10738.9
105.93	-51259.4	-51480.1	-56088.2	0.0	0.0	42344.8	43244.3	-3030.8	10738.9
108.93	-20644.0	-17418.3	-34659.7	0.0	0.0	6701.7	5387.5	4428.0	30720.0
111.13	-22490.3	-33198.2	-17033.5	0.0	0.0	4454.3	7634.8	-10716.1	-9015.8
116.73	19714.2	0.0	0.0	27246.6	25191.4	38664.5	39081.4	-1404.5	5938.2
116.91	19714.2	0.0	0.0	25169.5	27268.5	39061.7	38684.2	1271.9	-5711.6
117.71	21033.1	0.0	0.0	25345.3	24426.6	43188.3	42400.8	2653.2	-10093.5
117.93	21033.1	0.0	0.0	24364.5	25407.4	42344.8	43244.3	-3030.8	10738.9
121.90	-44825.6	-51417.6	-66436.6	0.0	0.0	806.0	-806.0	5431.5	15148.5
122.70	-44825.6	-66436.6	-51417.7	0.0	0.0	-806.0	806.0	-5431.5	-15148.5

TABLE II (CONTINUED)
PYLON LOADS SUMMARY (ULTIMATE)
METHOD 2 CONFIGURATION 1 (WITH FINS)

PYLON LOADS ~ ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON B-52B)

CONFIGURATION 1.0 WITH FINS

COND. NO.	CASE 1				CASE 2			
	V1 POUNDS	V2 POUNDS	V3 POUNDS	V4 POUNDS	V1 POUNDS	V2 POUNDS	V3 POUNDS	V4 POUNDS
104.33	60099.7	68780.3	6108.3	25754.7	61353.8	67523.3	4745.1	27120.7
105.11	67417.7	56758.9	28938.9	9596.5	65941.7	58238.3	30543.3	7988.7
105.33	58725.1	69180.6	5733.9	29072.3	60242.5	67659.8	4084.5	30725.2
105.93	55588.3	66043.9	8701.1	32378.7	57105.7	64523.0	7051.7	34031.6
108.93	791.5	50582.2	-33758.6	56861.9	6504.3	44856.5	-39968.3	63084.5
111.13	37338.5	3376.1	44797.3	-11034.8	34008.6	6713.5	48416.9	-14661.9
116.73	-11365.9	-5373.8	-33099.1	-24103.6	-10514.9	-6226.7	-34024.1	-23176.7
116.91	-6315.7	-12557.2	-19911.0	-35158.4	-7152.1	-11718.8	-19001.8	-36069.6
117.71	-5958.6	-12803.3	-18893.9	-34939.2	-6958.5	-11801.3	-17807.1	-36028.3
117.93	-11541.4	-4900.0	-33142.1	-23011.7	-10500.2	-5943.6	-34273.9	-21877.6
121.90	29896.0	62881.6	5535.4	68251.4	33502.5	59266.9	1615.1	72179.8
122.70	57520.9	24535.4	69333.3	15174.7	53914.4	28150.1	73253.5	11246.3

TABLE II (CONTINUED)
PYLON LOADS SUMMARY (ULTIMATE)
METHOD 2 CONFIGURATION 1 (WITH FINS)

PYLON LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON B-52B)

CONFIGURATION 1.0 WITH FINS

COND. NO.	S1 POUNDS	S2 POUNDS	CASE 1 AND 2 S3 POUNDS	S4 POUNDS	D3 POUNDS	D4 POUNDS
104.33	1833.3	1833.3	-4835.5	-4835.5	-41324.2	-41324.2
105.11	-1563.8	-1563.8	5283.9	5283.9	-43672.1	-43672.1
105.33	2282.7	2282.7	-6136.7	-6136.7	-43672.1	-43672.1
105.93	2282.7	2282.7	-6136.7	-6136.7	-43672.1	-43672.1
108.93	-5428.2	-5428.2	-12473.4	-12473.4	-6044.6	-6044.6
111.13	9806.8	9806.8	386.8	386.8	-6044.6	-6044.6
116.73	1107.5	1107.5	-3374.4	-3374.4	-39750.4	-39750.4
116.91	-615.8	-615.8	2835.6	2835.6	-39750.4	-39750.4
117.71	-1563.8	-1563.8	5283.9	5283.9	-43672.1	-43672.1
117.93	2282.7	2282.7	-6136.7	-6136.7	-43672.1	-43672.1
121.90	-5514.1	-5514.1	-5021.6	-5021.6	0.0	0.0
122.70	5514.1	5514.1	5021.6	5021.6	0.0	0.0

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TABLE II (CONTINUED)
PYLON LOADS SUMMARY (ULTIMATE)
METHOD 2 CONFIGURATION 1 (WITH FINS)

INERTIA AND AIRLOADS - ULTIMATE

INERTIA LOADS - PLUS FWD, LEFT AND DOWN
AIRLOAD FORCES - PLUS AFT, RIGHT AND UP
AIRLOAD MOMENTS - PLUS NOSE UP AND NOSE RIGHT

CONFIGURATION 1.0 WITH FINS

COND. NO.	PNX FWD. POUNDS	PNY LEFT POUNDS	PNZ DOWN POUNDS	PX AFT POUNDS	PY RIGHT POUNDS	PZ UP POUNDS	MY NOSE UP INCH-LBS.	MZ NOSE RIGHT INCH-LBS.
104.33	-73500.0	0.0	162679.9	7393.4	-6004.3	5821.3	-1.299506E 06	8.426320E 05
105.11	-73500.0	0.0	162679.9	12089.2	7440.3	3852.2	-7.649614E 05	-9.889950E 05
105.33	-73500.0	0.0	162679.9	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06
105.93	-73500.0	0.0	162679.9	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06
108.93	0.0	27440.0	73500.0	12089.2	-7708.0	778.0	-2.714220E 04	1.088472E 06
111.13	0.0	-27440.0	73500.0	12089.2	-7708.0	778.0	-2.714220E 04	1.088472E 06
116.73	-73500.0	0.0	-74969.9	4245.9	-4533.7	-2817.7	7.323012E 05	6.327848E 05
116.91	-73500.0	0.0	-74969.9	4245.9	4439.7	-2817.7	7.323012E 05	-5.978466E 05
117.71	-73500.0	0.0	-74969.9	12089.2	7440.3	-4164.9	1.159155E 06	-9.889950E 05
117.93	-73500.0	0.0	-74969.9	12089.2	-7708.0	-4164.9	1.159155E 06	1.088472E 06
121.90	0.0	20580.0	162679.9	0.0	0.0	0.0	0.000000E-01	0.000000E-01
122.70	0.0	-20580.0	162679.9	0.0	0.0	0.0	0.000000E-01	0.000000E-01

TABLE II (CONTINUED)
PYLON LOADS SUMMARY (ULTIMATE)
METHOD 2 CONFIGURATION 1 (WITH FINS)

PYLON HOOK LOADS - AERODYNAMIC CONSIDERATIONS

CONFIGURATION 1.0 WITH FINS

COND. NO.	RHO SLUGS/FT**3	VELOCITY KEAS	XCP INCHES	YCP INCHES	ZCP INCHES	ALPHA DEGREES	BETA DEGREES
104.33	0.0023769	203.328	170.210	0.000	-26.000	14.000	9.180
105.11	0.0023769	260.000	170.210	0.000	-26.000	4.600	-7.180
105.33	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180
105.93	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180
108.93	0.0023769	260.000	170.210	0.000	-26.000	-0.500	7.180
111.13	0.0023769	260.000	170.210	0.000	-26.000	-0.500	7.180
116.73	0.0023769	154.085	170.210	0.000	-26.000	-15.100	12.110
116.91	0.0023769	154.085	170.210	0.000	-26.000	-15.100	-12.110
117.71	0.0023769	260.000	170.210	0.000	-26.000	-8.700	-7.180
117.93	0.0023769	260.000	170.210	0.000	-26.000	-8.700	7.180
121.90	0.0023769	0.000	170.210	0.000	-26.000	0.000	0.000
122.70	0.0023769	0.000	170.210	0.000	-26.000	0.000	0.000

TABLE II (CONTINUED)
PYLON LOADS SUMMARY (ULTIMATE)
METHOD 2 CONFIGURATION 1 (WITH FINS)

PYLON HOOK LOADS - INERTIA CONSIDERATIONS

CONFIGURATION 1.0 WITH FINS

COND. NO.	DTV WT. POUNDS	ULTIMATE LOAD FACTOR NX	NY	NZ	XCG INCHES	YCG INCHES	ZCG INCHES
104.33	49000.0	-1.50	0.00	3.32	167.560	0.650	-27.350
105.11	49000.0	-1.50	0.00	3.32	167.560	-0.650	-27.350
105.33	49000.0	-1.50	0.00	3.32	167.560	0.650	-27.350
105.93	49000.0	-1.50	0.00	3.32	172.860	0.650	-27.350
108.93	49000.0	0.00	0.56	1.50	172.860	0.650	-27.350
111.13	49000.0	0.00	-0.56	1.50	167.560	-0.650	-27.350
116.73	49000.0	-1.50	0.00	-1.53	172.860	-0.650	-27.350
116.91	49000.0	-1.50	0.00	-1.53	172.860	0.650	-27.350
117.71	49000.0	-1.50	0.00	-1.53	172.860	-0.650	-27.350
117.93	49000.0	-1.50	0.00	-1.53	172.860	0.650	-27.350
121.90	49000.0	0.00	0.42	3.32	172.860	0.650	-27.350
122.70	49000.0	0.00	-0.42	3.32	172.860	-0.650	-27.350

2.0 ANALYSIS METHOD DESCRIPTION

The method used for determining pylon loading at the drop test vehicle (DTV) and wing attachment interfaces is shown in Section 2.0, Paragraphs 2.1 and 2.2 of Reference 3.0. The stiffnesses assumed for solution are shown in Paragraph 2.4 of Reference 3.0. The expressions for ultimate aerodynamic lift, drag, side force and yawing moment are defined as follows:

$$P_x \text{ (Drag)} = 1.5 * (q * S * .008792)$$

$$P_y \text{ (Side Force)} = 1.5 * (q * S * (-.00009734 - .00076719 * \beta))$$

$$P_z \text{ (Lift)} = 1.5 * (q * S * (.00078500 + .00043839 * \alpha_{FUS}))$$

$$M_y \text{ (Pitching Moment)} = 1.5 * (q * S * \bar{c} * (-.0002626 - .0003819 * \alpha_{FUS}))$$

$$M_z \text{ (Yawing Moment)} = 1.5 * (q * S * \bar{c} * (.00013130 + .00038190 * \beta))$$

where

q = Dynamic pressure, PSF

S = 4000 sq. ft.

$\bar{c}$ = 275.5 inches

$\alpha_{FUS.}$ = Fuselage angle of attack, degrees

β = Airplane yaw angle, degrees

3.0 RESULTS

The ultimate pylon loadings at the drop test vehicle (DTV)-pylon and pylon-wing interface attach points are given for 22 DTV Configuration 1 (with fins) flight and ground handling load conditions. These loadings, tabulated in Figures III through XXI, were determined using the Stiffness Method 2 solution technique. For a summary of critical finned DTV Configuration 1 loadings see Table II in this volume. In addition, see Table I and Figure 3 of this volume to determine specifics about the condition numbering system used in these analysis results.

TABLE III
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FLAPS) CONDITION 101

PYLON HOOK LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON DTV)

CONFIGURATION 1.0 WITH FINS

COND. NO.	VA POUNDS	VBL POUNDS	VBR POUNDS	VCL POUNDS	VCR POUNDS	DCL POUNDS	DCR POUNDS	SA POUNDS	SCL POUNDS
101.11	-50260.3	-55707.3	-50891.1	0.0	0.0	-32798.0	-33308.6	1720.3	-7560.9
101.21	-50260.3	-53640.5	-52957.9	0.0	0.0	-32765.8	-33340.8	1937.2	-7777.8
101.31	-50260.3	-51573.7	-55024.7	0.0	0.0	-32733.6	-33372.9	2154.0	-7994.6
101.41	-48217.1	-56728.8	-51912.7	0.0	0.0	-32798.0	-33308.6	1720.3	-7560.9
101.51	-48217.1	-54662.1	-53979.4	0.0	0.0	-32765.8	-33340.8	1937.2	-7777.8
101.61	-48217.1	-52595.3	-56046.3	0.0	0.0	-32733.6	-33372.9	2154.0	-7994.6
101.71	-46174.0	-57750.4	-52934.2	0.0	0.0	-32798.0	-33308.6	1720.3	-7560.9
101.81	-46174.0	-55683.6	-55001.0	0.0	0.0	-32765.8	-33340.8	1937.2	-7777.8
101.91	-46174.0	-53616.8	-57067.8	0.0	0.0	-32733.6	-33372.9	2154.0	-7994.6
101.12	-50260.3	-55388.5	-51209.9	0.0	0.0	-33102.6	-33004.0	-332.4	414.2
101.22	-50260.3	-53321.7	-53276.7	0.0	0.0	-33070.4	-33036.1	-115.5	197.4
101.32	-50260.3	-51254.9	-55343.5	0.0	0.0	-33038.2	-33068.3	101.4	-19.5
101.42	-48217.1	-56410.0	-52231.5	0.0	0.0	-33102.6	-33004.0	-332.4	414.2
101.52	-48217.1	-54343.3	-54298.2	0.0	0.0	-33070.4	-33036.1	-115.5	197.4
101.62	-48217.1	-52276.4	-56365.1	0.0	0.0	-33038.2	-33068.3	101.4	-19.5
101.72	-46174.0	-57431.6	-53253.0	0.0	0.0	-33102.6	-33004.0	-332.4	414.2
101.82	-46174.0	-55364.8	-55319.8	0.0	0.0	-33070.4	-33036.1	-115.5	197.4
101.92	-46174.0	-53298.0	-57386.6	0.0	0.0	-33038.2	-33068.3	101.4	-19.5
101.13	-50260.3	-55069.7	-51528.7	0.0	0.0	-33407.2	-32699.4	-2385.0	8389.3
101.23	-50260.3	-53002.9	-53595.5	0.0	0.0	-33375.0	-32731.5	-2168.2	8172.5
101.33	-50260.3	-50936.1	-55662.3	0.0	0.0	-33342.8	-32763.7	-1951.3	7955.6
101.43	-48217.1	-56091.2	-52550.3	0.0	0.0	-33407.2	-32699.4	-2385.0	8389.3
101.53	-48217.1	-54024.5	-54617.0	0.0	0.0	-33375.0	-32731.5	-2168.2	8172.5
101.63	-48217.1	-51957.6	-56683.9	0.0	0.0	-33342.8	-32763.7	-1951.3	7955.6
101.73	-46174.0	-57112.8	-53571.8	0.0	0.0	-33407.2	-32699.4	-2385.0	8389.3
101.83	-46174.0	-55046.0	-55638.6	0.0	0.0	-33375.0	-32731.5	-2168.2	8172.5
101.93	-46174.0	-52979.2	-57705.4	0.0	0.0	-33342.8	-32763.7	-1951.3	7955.6

TABLE III (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 101

PYLON LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON B-52B)

CONFIGURATION 1.0 WITH FINS

COND. NO.	CASE 1 V1 POUNDS	CASE 1 V2 POUNDS	CASE 1 V3 POUNDS	CASE 1 V4 POUNDS	CASE 2 V1 POUNDS	CASE 2 V2 POUNDS	CASE 2 V3 POUNDS	CASE 2 V4 POUNDS
101.11	42425.9	33529.5	49104.3	35683.4	41197.2	34761.0	50439.9	34345.0
101.21	41304.7	35148.8	45960.7	38328.9	40402.0	36053.6	46942.0	37345.5
101.31	40183.5	36768.1	42817.0	40974.5	39606.7	37346.2	43443.9	40346.2
101.41	40857.5	31961.1	50587.9	37336.6	39628.8	33192.6	51923.5	35998.2
101.51	39736.3	33580.4	47444.3	39982.1	38833.6	34485.2	48425.6	38998.7
101.61	38615.1	35199.8	44300.6	42627.7	38038.3	35777.9	44927.5	41999.4
101.71	39289.2	30392.7	52071.5	38989.8	38060.4	31624.2	53407.2	37651.3
101.81	38167.9	32012.0	48927.9	41635.3	37265.2	32916.8	49909.2	40651.9
101.91	37046.7	33631.3	45784.2	44280.8	36469.9	34209.4	46411.2	43652.6
101.12	39815.3	37233.6	42368.1	41326.1	39502.0	37547.7	42708.7	40984.8
101.22	38694.1	38852.9	39224.5	43971.6	38706.8	38840.2	39210.7	43985.4
101.32	37572.9	40472.3	36080.8	46617.2	37911.5	40132.9	35712.7	46986.0
101.42	38246.9	35665.2	43851.7	42979.3	37933.6	35979.3	44192.3	42638.0
101.52	37125.7	37284.5	40708.1	45624.8	37138.3	37271.8	40694.3	45638.6
101.62	36004.5	38903.9	37564.4	48270.3	36343.1	38564.5	37196.3	48639.2
101.72	36678.5	34096.8	45335.3	44632.4	36365.2	34410.9	45675.9	44291.1
101.82	35557.3	35716.1	42191.7	47277.9	35570.0	35703.4	42178.0	47291.7
101.92	34436.1	37335.5	39048.0	49923.5	34774.7	36996.1	38679.9	50292.4
101.13	37204.7	40937.8	35631.9	46968.8	37806.8	40334.3	34977.4	47624.6
101.23	36083.5	42557.0	32488.3	49614.3	37011.6	41626.9	31479.5	50625.2
101.33	34962.2	44176.4	29344.6	52259.8	36216.3	42919.5	27981.4	53625.8
101.43	35636.3	39369.3	37115.5	48621.9	36238.4	38765.9	36461.0	49277.8
101.53	34515.1	40988.6	33971.9	51267.4	35443.2	40058.5	32963.1	52278.3
101.63	33393.8	42608.0	30828.2	53913.0	34647.9	41351.1	29465.0	55279.0
101.73	34067.9	37800.9	38599.1	50275.1	34670.0	37197.5	37944.7	50930.9
101.83	32946.7	39420.2	35455.5	52920.6	33874.8	38490.1	34446.7	53931.5
101.93	31825.4	41039.6	32311.8	55566.2	33079.5	39782.7	30948.7	56932.2

TABLE III (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 101

PYLON LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON B-52B)

CONFIGURATION 1.0 WITH FINS

		CASE 1 AND 2				
COND. NO.	S1 POUNDS	S2 POUNDS	S3 POUNDS	S4 POUNDS	D3 POUNDS	D4 POUNDS
101.11	-1270.5	-1270.5	4190.8	4190.8	33930.8	33930.8
101.21	-1444.9	-1444.9	4365.1	4365.1	33930.8	33930.8
101.31	-1619.2	-1619.2	4539.5	4539.5	33930.8	33930.8
101.41	-1270.5	-1270.5	4190.8	4190.8	33930.8	33930.8
101.51	-1444.9	-1444.9	4365.1	4365.1	33930.8	33930.8
101.61	-1619.2	-1619.2	4539.5	4539.5	33930.8	33930.8
101.71	-1270.5	-1270.5	4190.8	4190.8	33930.8	33930.8
101.81	-1444.9	-1444.9	4365.1	4365.1	33930.8	33930.8
101.91	-1619.2	-1619.2	4539.5	4539.5	33930.8	33930.8
101.12	97.0	97.0	-137.9	-137.9	33930.8	33930.8
101.22	-77.4	-77.4	36.4	36.4	33930.8	33930.8
101.32	-251.7	-251.7	210.8	210.8	33930.8	33930.8
101.42	97.0	97.0	-137.9	-137.9	33930.8	33930.8
101.52	-77.4	-77.4	36.4	36.4	33930.8	33930.8
101.62	-251.7	-251.7	210.8	210.8	33930.8	33930.8
101.72	97.0	97.0	-137.9	-137.9	33930.8	33930.8
101.82	-77.4	-77.4	36.4	36.4	33930.8	33930.8
101.92	-251.7	-251.7	210.8	210.8	33930.8	33930.8
101.13	1464.5	1464.5	-4466.6	-4466.6	33930.8	33930.8
101.23	1290.1	1290.1	-4292.3	-4292.3	33930.8	33930.8
101.33	1115.8	1115.8	-4118.0	-4118.0	33930.8	33930.8
101.43	1464.5	1464.5	-4466.6	-4466.6	33930.8	33930.8
101.53	1290.1	1290.1	-4292.3	-4292.3	33930.8	33930.8
101.63	1115.8	1115.8	-4118.0	-4118.0	33930.8	33930.8
101.73	1464.5	1464.5	-4466.6	-4466.6	33930.8	33930.8
101.83	1290.1	1290.1	-4292.3	-4292.3	33930.8	33930.8
101.93	1115.8	1115.8	-4118.0	-4118.0	33930.8	33930.8

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TABLE III (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 101

INERTIA AND AIRLOADS - ULTIMATE

INERTIA LOADS - PLUS FWD, LEFT AND DOWN
AIRLOAD FORCES - PLUS AFT, RIGHT AND UP
AIRLOAD MOMENTS - PLUS NOSE UP AND NOSE RIGHT

CONFIGURATION 1.0 WITH FINS

COND. NO.	-PNX FWD. POUNDS	PNY LEFT POUNDS	PNZ DOWN POUNDS	PX AFT POUNDS	PY RIGHT POUNDS	PZ UP POUNDS	MY NOSE UP INCH-LBS.	MZ NOSE RIGHT INCH-LBS.
101.11	73500.0	0.0	162680.0	7393.4	5840.6	5821.3	-1.299506E 06	-7.817944E 05
101.21	73500.0	0.0	162680.0	7393.4	5840.6	5821.3	-1.299506E 06	-7.817944E 05
101.31	73500.0	0.0	162680.0	7393.4	5840.6	5821.3	-1.299506E 06	-7.817944E 05
101.41	73500.0	0.0	162680.0	7393.4	5840.6	5821.3	-1.299506E 06	-7.817944E 05
101.51	73500.0	0.0	162680.0	7393.4	5840.6	5821.3	-1.299506E 06	-7.817944E 05
101.61	73500.0	0.0	162680.0	7393.4	5840.6	5821.3	-1.299506E 06	-7.817944E 05
101.71	73500.0	0.0	162680.0	7393.4	5840.6	5821.3	-1.299506E 06	-7.817944E 05
101.81	73500.0	0.0	162680.0	7393.4	5840.6	5821.3	-1.299506E 06	-7.817944E 05
101.91	73500.0	0.0	162680.0	7393.4	5840.6	5821.3	-1.299506E 06	-7.817944E 05
101.12	73500.0	0.0	162680.0	7393.4	-81.9	5821.3	-1.299506E 06	3.041884E 04
101.22	73500.0	0.0	162680.0	7393.4	-81.9	5821.3	-1.299506E 06	3.041884E 04
101.32	73500.0	0.0	162680.0	7393.4	-81.9	5821.3	-1.299506E 06	3.041884E 04
101.42	73500.0	0.0	162680.0	7393.4	-81.9	5821.3	-1.299506E 06	3.041884E 04
101.52	73500.0	0.0	162680.0	7393.4	-81.9	5821.3	-1.299506E 06	3.041884E 04
101.62	73500.0	0.0	162680.0	7393.4	-81.9	5821.3	-1.299506E 06	3.041884E 04
101.72	73500.0	0.0	162680.0	7393.4	-81.9	5821.3	-1.299506E 06	3.041884E 04
101.82	73500.0	0.0	162680.0	7393.4	-81.9	5821.3	-1.299506E 06	3.041884E 04
101.92	73500.0	0.0	162680.0	7393.4	-81.9	5821.3	-1.299506E 06	3.041884E 04
101.13	73500.0	0.0	162680.0	7393.4	-6004.3	5821.3	-1.299506E 06	8.426320E 05
101.23	73500.0	0.0	162680.0	7393.4	-6004.3	5821.3	-1.299506E 06	8.426320E 05
101.33	73500.0	0.0	162680.0	7393.4	-6004.3	5821.3	-1.299506E 06	8.426320E 05
101.43	73500.0	0.0	162680.0	7393.4	-6004.3	5821.3	-1.299506E 06	8.426320E 05
101.53	73500.0	0.0	162680.0	7393.4	-6004.3	5821.3	-1.299506E 06	8.426320E 05
101.63	73500.0	0.0	162680.0	7393.4	-6004.3	5821.3	-1.299506E 06	8.426320E 05
101.73	73500.0	0.0	162680.0	7393.4	-6004.3	5821.3	-1.299506E 06	8.426320E 05
101.83	73500.0	0.0	162680.0	7393.4	-6004.3	5821.3	-1.299506E 06	8.426320E 05
101.93	73500.0	0.0	162680.0	7393.4	-6004.3	5821.3	-1.299506E 06	8.426320E 05

TABLE III (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 101

PYLON HOOK LOADS - AERODYNAMIC CONSIDERATIONS

CONFIGURATION 1.0 WITH FINS

COND. NO.	RHO SLUGS/FT**3	VELOCITY KEAS	XCP INCHES	YCP INCHES	ZCP INCHES	ALPHA DEGREES	BETA DEGREES
101.11	0.0023769	203.328	170.210	0.000	-26.000	14.000	-9.180
101.21	0.0023769	203.328	170.210	0.000	-26.000	14.000	-9.180
101.31	0.0023769	203.328	170.210	0.000	-26.000	14.000	-9.180
101.41	0.0023769	203.328	170.210	0.000	-26.000	14.000	-9.180
101.51	0.0023769	203.328	170.210	0.000	-26.000	14.000	-9.180
101.61	0.0023769	203.328	170.210	0.000	-26.000	14.000	-9.180
101.71	0.0023769	203.328	170.210	0.000	-26.000	14.000	-9.180
101.81	0.0023769	203.328	170.210	0.000	-26.000	14.000	-9.180
101.91	0.0023769	203.328	170.210	0.000	-26.000	14.000	-9.180
101.12	0.0023769	203.328	170.210	0.000	-26.000	14.000	0.000
101.22	0.0023769	203.328	170.210	0.000	-26.000	14.000	0.000
101.32	0.0023769	203.328	170.210	0.000	-26.000	14.000	0.000
101.42	0.0023769	203.328	170.210	0.000	-26.000	14.000	0.000
101.52	0.0023769	203.328	170.210	0.000	-26.000	14.000	0.000
101.62	0.0023769	203.328	170.210	0.000	-26.000	14.000	0.000
101.72	0.0023769	203.328	170.210	0.000	-26.000	14.000	0.000
101.82	0.0023769	203.328	170.210	0.000	-26.000	14.000	0.000
101.92	0.0023769	203.328	170.210	0.000	-26.000	14.000	0.000
101.13	0.0023769	203.328	170.210	0.000	-26.000	14.000	9.180
101.23	0.0023769	203.328	170.210	0.000	-26.000	14.000	9.180
101.33	0.0023769	203.328	170.210	0.000	-26.000	14.000	9.180
101.43	0.0023769	203.328	170.210	0.000	-26.000	14.000	9.180
101.53	0.0023769	203.328	170.210	0.000	-26.000	14.000	9.180
101.63	0.0023769	203.328	170.210	0.000	-26.000	14.000	9.180
101.73	0.0023769	203.328	170.210	0.000	-26.000	14.000	9.180
101.83	0.0023769	203.328	170.210	0.000	-26.000	14.000	9.180
101.93	0.0023769	203.328	170.210	0.000	-26.000	14.000	9.180

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TABLE III (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 101

PYLON HOOK LOADS - INERTIA CONSIDERATIONS

CONFIGURATION 1.0 WITH FINS

COND. NO.	DTV WT. POUNDS	ULTIMATE LOAD FACTOR NX	NY	NZ	XCG INCHES	YCG INCHES	ZCG INCHES
101.11	49000.0	1.50	0.00	3.32	167.560	-0.650	-27.350
101.21	49000.0	1.50	0.00	3.32	167.560	0.000	-27.350
101.31	49000.0	1.50	0.00	3.32	167.560	0.650	-27.350
101.41	49000.0	1.50	0.00	3.32	170.210	-0.650	-27.350
101.51	49000.0	1.50	0.00	3.32	170.210	0.000	-27.350
101.61	49000.0	1.50	0.00	3.32	170.210	0.650	-27.350
101.71	49000.0	1.50	0.00	3.32	172.860	-0.650	-27.350
101.81	49000.0	1.50	0.00	3.32	172.860	0.000	-27.350
101.91	49000.0	1.50	0.00	3.32	172.860	0.650	-27.350
101.12	49000.0	1.50	0.00	3.32	167.560	-0.650	-27.350
101.22	49000.0	1.50	0.00	3.32	167.560	0.000	-27.350
101.32	49000.0	1.50	0.00	3.32	167.560	0.650	-27.350
101.42	49000.0	1.50	0.00	3.32	170.210	-0.650	-27.350
101.52	49000.0	1.50	0.00	3.32	170.210	0.000	-27.350
101.62	49000.0	1.50	0.00	3.32	170.210	0.650	-27.350
101.72	49000.0	1.50	0.00	3.32	172.860	-0.650	-27.350
101.82	49000.0	1.50	0.00	3.32	172.860	0.000	-27.350
101.92	49000.0	1.50	0.00	3.32	172.860	0.650	-27.350
101.13	49000.0	1.50	0.00	3.32	167.560	-0.650	-27.350
101.23	49000.0	1.50	0.00	3.32	167.560	0.000	-27.350
101.33	49000.0	1.50	0.00	3.32	167.560	0.650	-27.350
101.43	49000.0	1.50	0.00	3.32	170.210	-0.650	-27.350
101.53	49000.0	1.50	0.00	3.32	170.210	0.000	-27.350
101.63	49000.0	1.50	0.00	3.32	170.210	0.650	-27.350
101.73	49000.0	1.50	0.00	3.32	172.860	-0.650	-27.350
101.83	49000.0	1.50	0.00	3.32	172.860	0.000	-27.350
101.93	49000.0	1.50	0.00	3.32	172.860	0.650	-27.350

TABLE IV
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FLAPS) CONDITION 102

PYLON HOOK LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON DTV)

CONFIGURATION 1.0 WITH FINS

COND. NO.	VA POUNDS	VBL POUNDS	VBR POUNDS	VCL POUNDS	VCR POUNDS	DCL POUNDS	DCR POUNDS	SA POUNDS	SCL POUNDS
102.11	-48483.3	-57683.4	-52660.9	0.0	0.0	-30376.1	-31034.8	2219.4	-9659.8
102.21	-48483.3	-55616.7	-54727.7	0.0	0.0	-30343.9	-31067.0	2436.3	-9876.6
102.31	-48483.3	-53549.9	-56794.5	0.0	0.0	-30311.7	-31099.1	2653.2	-10093.5
102.41	-46440.2	-58705.0	-53682.5	0.0	0.0	-30376.1	-31034.8	2219.4	-9659.8
102.51	-46440.2	-56638.2	-55749.3	0.0	0.0	-30343.9	-31067.0	2436.3	-9876.6
102.61	-46440.2	-54571.4	-57816.1	0.0	0.0	-30311.7	-31099.1	2653.2	-10093.5
102.71	-44397.1	-59726.6	-54704.1	0.0	0.0	-30376.1	-31034.8	2219.4	-9659.8
102.81	-44397.1	-57659.8	-56770.9	0.0	0.0	-30343.9	-31067.0	2436.3	-9876.6
102.91	-44397.1	-55593.0	-58837.7	0.0	0.0	-30311.7	-31099.1	2653.2	-10093.5
102.12	-48483.3	-57275.7	-53068.7	0.0	0.0	-30765.6	-30645.2	-405.7	539.6
102.22	-48483.3	-55208.9	-55135.4	0.0	0.0	-30733.4	-30677.4	-188.8	322.7
102.32	-48483.3	-53142.1	-57202.3	0.0	0.0	-30701.3	-30709.6	28.0	105.8
102.42	-46440.2	-58297.3	-54090.2	0.0	0.0	-30765.6	-30645.2	-405.7	539.6
102.52	-46440.2	-56230.5	-56157.0	0.0	0.0	-30733.4	-30677.4	-188.8	322.7
102.62	-46440.2	-54163.7	-58223.8	0.0	0.0	-30701.3	-30709.6	28.0	105.8
102.72	-44397.1	-59318.9	-55111.8	0.0	0.0	-30765.6	-30645.2	-405.7	539.6
102.82	-44397.1	-57252.1	-57178.6	0.0	0.0	-30733.4	-30677.4	-188.8	322.7
102.92	-44397.1	-55185.3	-59245.4	0.0	0.0	-30701.3	-30709.6	28.0	105.8
102.13	-48483.3	-56868.0	-53476.4	0.0	0.0	-31155.2	-30255.6	-3030.8	10738.9
102.23	-48483.3	-54801.2	-55543.2	0.0	0.0	-31123.0	-30287.8	-2814.0	10522.0
102.33	-48483.3	-52734.4	-57610.0	0.0	0.0	-31090.8	-30320.0	-2597.1	10305.1
102.43	-46440.2	-57889.5	-54498.0	0.0	0.0	-31155.2	-30255.6	-3030.8	10738.9
102.53	-46440.2	-55822.8	-56564.7	0.0	0.0	-31123.0	-30287.8	-2814.0	10522.0
102.63	-46440.2	-53756.0	-58631.5	0.0	0.0	-31090.8	-30320.0	-2597.1	10305.1
102.73	-44397.1	-58911.1	-55519.6	0.0	0.0	-31155.2	-30255.6	-3030.8	10738.9
102.83	-44397.1	-56844.4	-57586.3	0.0	0.0	-31123.0	-30287.8	-2814.0	10522.0
102.93	-44397.1	-54777.5	-59653.2	0.0	0.0	-31090.8	-30320.0	-2597.1	10305.1

TABLE IV (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 102

PYLON LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON B-52B)

CONFIGURATION 1.0 WITH FINS

COND. NO.	CASE 1 V1 POUNDS	CASE 1 V2 POUNDS	CASE 1 V3 POUNDS	CASE 1 V4 POUNDS	CASE 2 V1 POUNDS	CASE 2 V2 POUNDS	CASE 2 V3 POUNDS	CASE 2 V4 POUNDS
102.11	42507.5	31863.7	52487.3	35853.6	41031.5	33343.1	54091.7	34245.8
102.21	41386.4	33483.1	49343.7	38499.1	40236.3	34635.7	50593.8	37246.4
102.31	40265.1	35102.4	46200.0	41144.7	39441.1	35928.4	47095.7	40247.1
102.41	40939.1	30295.3	53970.9	37506.8	39463.1	31774.7	55575.3	35899.0
102.51	39817.9	31914.7	50827.3	40152.3	38667.9	33067.3	52077.4	38899.6
102.61	38696.7	33534.0	47683.6	42797.9	37872.6	34359.9	48579.3	41900.3
102.71	39370.7	28726.9	55454.5	39160.0	37894.7	30206.3	57058.9	37552.2
102.81	38249.5	30346.3	52310.9	41805.5	37099.5	31498.9	53561.0	40552.8
102.91	37128.3	31965.7	49167.2	44451.1	36304.3	32791.6	50063.0	43553.5
102.12	39168.8	36600.9	43872.4	43070.0	38863.5	36906.9	44204.3	42737.4
102.22	38047.6	38220.3	40728.8	45715.5	38068.3	38199.6	40706.3	45738.0
102.32	36926.4	39839.6	37585.1	48361.1	37273.1	39492.2	37208.2	48738.7
102.42	37600.4	35032.5	45356.0	44723.2	37295.1	35338.5	45687.9	44390.6
102.52	36479.2	36651.9	42212.4	47368.7	36499.9	36631.2	42189.9	47391.2
102.62	35358.0	38271.2	39068.7	50014.3	35704.6	37923.7	38691.9	50391.9
102.72	36032.0	33464.1	46839.6	46376.4	35726.7	33770.1	47171.5	46043.9
102.82	34910.8	35083.5	43696.0	49021.9	34931.5	35062.7	43673.5	49044.5
102.92	33789.6	36702.8	40552.3	51667.5	34136.2	36355.3	40175.5	52045.1
102.13	35830.1	41338.2	35257.5	50286.4	36695.6	40470.8	34316.8	51229.1
102.23	34708.9	42957.4	32113.9	52931.9	35900.3	41763.3	30818.8	54229.7
102.33	33587.6	44576.8	28970.2	55577.5	35105.1	43055.9	27320.8	57230.3
102.43	34261.7	39769.7	36741.1	51939.6	35127.1	38902.3	35800.4	52882.3
102.53	33140.5	41389.0	33597.5	54585.1	34331.9	40194.9	32302.4	55882.9
102.63	32019.2	43008.4	30453.8	57230.7	33536.7	41487.5	28804.4	58883.5
102.73	32693.3	38201.4	38224.7	53592.8	33558.7	37334.0	37284.0	54535.5
102.83	31572.1	39820.7	35081.1	56238.3	32763.5	38626.5	33786.1	57536.1
102.93	30450.8	41440.0	31937.4	58883.9	31968.3	39919.2	30288.0	60536.8

TABLE IV (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 102

PYLON LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON B-52B)

CONFIGURATION 1.0 WITH FINS

COND. NO.	S1 POUNDS	S2 POUNDS	CASE 1 AND 2 S3 POUNDS	S4 POUNDS	D3 POUNDS	D4 POUNDS
102.11	-1583.9	-1583.9	5304.1	5304.1	31582.9	31582.9
102.21	-1758.3	-1758.3	5478.4	5478.4	31582.9	31582.9
102.31	-1932.6	-1932.6	5652.8	5652.8	31582.9	31582.9
102.41	-1583.9	-1583.9	5304.1	5304.1	31582.9	31582.9
102.51	-1758.3	-1758.3	5478.4	5478.4	31582.9	31582.9
102.61	-1932.6	-1932.6	5652.8	5652.8	31582.9	31582.9
102.71	-1583.9	-1583.9	5304.1	5304.1	31582.9	31582.9
102.81	-1758.3	-1758.3	5478.4	5478.4	31582.9	31582.9
102.91	-1932.6	-1932.6	5652.8	5652.8	31582.9	31582.9
102.12	165.0	165.0	-231.9	-231.9	31582.9	31582.9
102.22	-9.4	-9.4	-57.6	-57.6	31582.9	31582.9
102.32	-183.7	-183.7	116.8	116.8	31582.9	31582.9
102.42	165.0	165.0	-231.9	-231.9	31582.9	31582.9
102.52	-9.4	-9.4	-57.6	-57.6	31582.9	31582.9
102.62	-183.7	-183.7	116.8	116.8	31582.9	31582.9
102.72	165.0	165.0	-231.9	-231.9	31582.9	31582.9
102.82	-9.4	-9.4	-57.6	-57.6	31582.9	31582.9
102.92	-183.7	-183.7	116.8	116.8	31582.9	31582.9
102.13	1913.9	1913.9	-5767.9	-5767.9	31582.9	31582.9
102.23	1739.5	1739.5	-5593.5	-5593.5	31582.9	31582.9
102.33	1565.2	1565.2	-5419.2	-5419.2	31582.9	31582.9
102.43	1913.9	1913.9	-5767.9	-5767.9	31582.9	31582.9
102.53	1739.5	1739.5	-5593.5	-5593.5	31582.9	31582.9
102.63	1565.2	1565.2	-5419.2	-5419.2	31582.9	31582.9
102.73	1913.9	1913.9	-5767.9	-5767.9	31582.9	31582.9
102.83	1739.5	1739.5	-5593.5	-5593.5	31582.9	31582.9
102.93	1565.2	1565.2	-5419.2	-5419.2	31582.9	31582.9

TABLE IV (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 102

INERTIA AND AIRLOADS - ULTIMATE

INERTIA LOADS - PLUS FWD, LEFT AND DOWN
AIRLOAD FORCES - PLUS AFT, RIGHT AND UP
AIRLOAD MOMENTS - PLUS NOSE UP AND NOSE RIGHT

CONFIGURATION 1.0 WITH FINS

COND. NO.	PNX FWD. POUNDS	PNY LEFT POUNDS	PNZ DOWN POUNDS	PX AFT POUNDS	PY RIGHT POUNDS	PZ UP POUNDS	MY NOSE UP INCH-LBS.	MZ NOSE RIGHT INCH-LBS.
102.11	73500.0	0.0	162680.0	12089.2	7440.3	3852.2	-7.649614E 05	-9.889950E 05
102.21	73500.0	0.0	162680.0	12089.2	7440.3	3852.2	-7.649614E 05	-9.889950E 05
102.31	73500.0	0.0	162680.0	12089.2	7440.3	3852.2	-7.649614E 05	-9.889950E 05
102.41	73500.0	0.0	162680.0	12089.2	7440.3	3852.2	-7.649614E 05	-9.889950E 05
102.51	73500.0	0.0	162680.0	12089.2	7440.3	3852.2	-7.649614E 05	-9.889950E 05
102.61	73500.0	0.0	162680.0	12089.2	7440.3	3852.2	-7.649614E 05	-9.889950E 05
102.71	73500.0	0.0	162680.0	12089.2	7440.3	3852.2	-7.649614E 05	-9.889950E 05
102.81	73500.0	0.0	162680.0	12089.2	7440.3	3852.2	-7.649614E 05	-9.889950E 05
102.91	73500.0	0.0	162680.0	12089.2	7440.3	3852.2	-7.649614E 05	-9.889950E 05
102.12	73500.0	0.0	162680.0	12089.2	-133.8	3852.2	-7.649614E 05	4.973878E 04
102.22	73500.0	0.0	162680.0	12089.2	-133.8	3852.2	-7.649614E 05	4.973878E 04
102.32	73500.0	0.0	162680.0	12089.2	-133.8	3852.2	-7.649614E 05	4.973878E 04
102.42	73500.0	0.0	162680.0	12089.2	-133.8	3852.2	-7.649614E 05	4.973878E 04
102.52	73500.0	0.0	162680.0	12089.2	-133.8	3852.2	-7.649614E 05	4.973878E 04
102.62	73500.0	0.0	162680.0	12089.2	-133.8	3852.2	-7.649614E 05	4.973878E 04
102.72	73500.0	0.0	162680.0	12089.2	-133.8	3852.2	-7.649614E 05	4.973878E 04
102.82	73500.0	0.0	162680.0	12089.2	-133.8	3852.2	-7.649614E 05	4.973878E 04
102.92	73500.0	0.0	162680.0	12089.2	-133.8	3852.2	-7.649614E 05	4.973878E 04
102.13	73500.0	0.0	162680.0	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06
102.23	73500.0	0.0	162680.0	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06
102.33	73500.0	0.0	162680.0	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06
102.43	73500.0	0.0	162680.0	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06
102.53	73500.0	0.0	162680.0	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06
102.63	73500.0	0.0	162680.0	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06
102.73	73500.0	0.0	162680.0	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06
102.83	73500.0	0.0	162680.0	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06
102.93	73500.0	0.0	162680.0	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06

TABLE IV (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 102

PYLON HOOK LOADS - AERODYNAMIC CONSIDERATIONS

CONFIGURATION 1.0 WITH FINS

COND. NO.	RHO SLUGS/FT**3	VELOCITY KEAS	XCP INCHES	YCP INCHES	ZCP INCHES	ALPHA DEGREES	BETA DEGREES
102.11	0.0023769	260.000	170.210	0.000	-26.000	4.600	-7.180
102.21	0.0023769	260.000	170.210	0.000	-26.000	4.600	-7.180
102.31	0.0023769	260.000	170.210	0.000	-26.000	4.600	-7.180
102.41	0.0023769	260.000	170.210	0.000	-26.000	4.600	-7.180
102.51	0.0023769	260.000	170.210	0.000	-26.000	4.600	-7.180
102.61	0.0023769	260.000	170.210	0.000	-26.000	4.600	-7.180
102.71	0.0023769	260.000	170.210	0.000	-26.000	4.600	-7.180
102.81	0.0023769	260.000	170.210	0.000	-26.000	4.600	-7.180
102.91	0.0023769	260.000	170.210	0.000	-26.000	4.600	-7.180
102.12	0.0023769	260.000	170.210	0.000	-26.000	4.600	0.000
102.22	0.0023769	260.000	170.210	0.000	-26.000	4.600	0.000
102.32	0.0023769	260.000	170.210	0.000	-26.000	4.600	0.000
102.42	0.0023769	260.000	170.210	0.000	-26.000	4.600	0.000
102.52	0.0023769	260.000	170.210	0.000	-26.000	4.600	0.000
102.62	0.0023769	260.000	170.210	0.000	-26.000	4.600	0.000
102.72	0.0023769	260.000	170.210	0.000	-26.000	4.600	0.000
102.82	0.0023769	260.000	170.210	0.000	-26.000	4.600	0.000
102.92	0.0023769	260.000	170.210	0.000	-26.000	4.600	0.000
102.13	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180
102.23	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180
102.33	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180
102.43	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180
102.53	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180
102.63	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180
102.73	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180
102.83	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180
102.93	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180

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TABLE IV (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 102

PYLON HOOK LOADS - INERTIA CONSIDERATIONS

CONFIGURATION 1.0 WITH FINS

COND. NO.	DTV WT. POUNDS	ULTIMATE LOAD FACTOR NX	NY	NZ	XCG INCHES	YCG INCHES	ZCG INCHES
102.11	49000.0	1.50	0.00	3.32	167.560	-0.650	-27.350
102.21	49000.0	1.50	0.00	3.32	167.560	0.000	-27.350
102.31	49000.0	1.50	0.00	3.32	167.560	0.650	-27.350
102.41	49000.0	1.50	0.00	3.32	170.210	-0.650	-27.350
102.51	49000.0	1.50	0.00	3.32	170.210	0.000	-27.350
102.61	49000.0	1.50	0.00	3.32	170.210	0.650	-27.350
102.71	49000.0	1.50	0.00	3.32	172.860	-0.650	-27.350
102.81	49000.0	1.50	0.00	3.32	172.860	0.000	-27.350
102.91	49000.0	1.50	0.00	3.32	172.860	0.650	-27.350
102.12	49000.0	1.50	0.00	3.32	167.560	-0.650	-27.350
102.22	49000.0	1.50	0.00	3.32	167.560	0.000	-27.350
102.32	49000.0	1.50	0.00	3.32	167.560	0.650	-27.350
102.42	49000.0	1.50	0.00	3.32	170.210	-0.650	-27.350
102.52	49000.0	1.50	0.00	3.32	170.210	0.000	-27.350
102.62	49000.0	1.50	0.00	3.32	170.210	0.650	-27.350
102.72	49000.0	1.50	0.00	3.32	172.860	-0.650	-27.350
102.82	49000.0	1.50	0.00	3.32	172.860	0.000	-27.350
102.92	49000.0	1.50	0.00	3.32	172.860	0.650	-27.350
102.13	49000.0	1.50	0.00	3.32	167.560	-0.650	-27.350
102.23	49000.0	1.50	0.00	3.32	167.560	0.000	-27.350
102.33	49000.0	1.50	0.00	3.32	167.560	0.650	-27.350
102.43	49000.0	1.50	0.00	3.32	170.210	-0.650	-27.350
102.53	49000.0	1.50	0.00	3.32	170.210	0.000	-27.350
102.63	49000.0	1.50	0.00	3.32	170.210	0.650	-27.350
102.73	49000.0	1.50	0.00	3.32	172.860	-0.650	-27.350
102.83	49000.0	1.50	0.00	3.32	172.860	0.000	-27.350
102.93	49000.0	1.50	0.00	3.32	172.860	0.650	-27.350

TABLE V
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FLAPS) CONDITION 103

PYLON HOOK LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON DTV)

CONFIGURATION 1.0 WITH FINS

COND. NO.	VA POUNDS	VBL POUNDS	VBR POUNDS	VCL POUNDS	VCR POUNDS	DCL POUNDS	DCR POUNDS	SA POUNDS	SCL POUNDS
103.11	-48242.6	-57937.2	-52961.7	0.0	0.0	-30970.3	-31596.2	2108.9	-9190.9
103.21	-48242.6	-55870.4	-55028.5	0.0	0.0	-30938.1	-31628.4	2325.7	-9407.8
103.31	-48242.6	-53803.6	-57095.3	0.0	0.0	-30906.0	-31660.6	2542.6	-9624.6
103.41	-46199.5	-58958.8	-53983.2	0.0	0.0	-30970.3	-31596.2	2108.9	-9190.9
103.51	-46199.5	-56892.0	-56050.0	0.0	0.0	-30938.1	-31628.4	2325.7	-9407.8
103.61	-46199.5	-54825.2	-58116.8	0.0	0.0	-30906.0	-31660.6	2542.6	-9624.6
103.71	-44156.3	-59980.3	-55004.8	0.0	0.0	-30970.3	-31596.2	2108.9	-9190.9
103.81	-44156.3	-57913.6	-57071.6	0.0	0.0	-30938.1	-31628.4	2325.7	-9407.8
103.91	-44156.3	-55846.7	-59138.4	0.0	0.0	-30906.0	-31660.6	2542.6	-9624.6
103.12	-48242.6	-57549.4	-53349.4	0.0	0.0	-31340.8	-31225.7	-387.7	508.7
103.22	-48242.6	-55482.7	-55416.2	0.0	0.0	-31308.6	-31257.9	-170.8	291.8
103.32	-48242.6	-53415.9	-57483.0	0.0	0.0	-31276.4	-31290.1	46.1	75.0
103.42	-46199.5	-58571.0	-54371.0	0.0	0.0	-31340.8	-31225.7	-387.7	508.7
103.52	-46199.5	-56504.3	-56437.7	0.0	0.0	-31308.6	-31257.9	-170.8	291.8
103.62	-46199.5	-54437.4	-58504.6	0.0	0.0	-31276.4	-31290.1	46.1	75.0
103.72	-44156.3	-59592.6	-55392.5	0.0	0.0	-31340.8	-31225.7	-387.7	508.7
103.82	-44156.3	-57525.8	-57459.3	0.0	0.0	-31308.6	-31257.9	-170.8	291.8
103.92	-44156.3	-55459.0	-59526.1	0.0	0.0	-31276.4	-31290.1	46.1	75.0
103.13	-48242.6	-57161.7	-53737.2	0.0	0.0	-31711.3	-30855.3	-2884.2	10208.3
103.23	-48242.6	-55094.9	-55804.0	0.0	0.0	-31679.1	-30887.4	-2667.3	9991.5
103.33	-48242.6	-53028.1	-57870.8	0.0	0.0	-31646.9	-30919.6	-2450.4	9774.6
103.43	-46199.5	-58183.3	-54758.7	0.0	0.0	-31711.3	-30855.3	-2884.2	10208.3
103.53	-46199.5	-56116.5	-56825.5	0.0	0.0	-31679.1	-30887.4	-2667.3	9991.5
103.63	-46199.5	-54049.7	-58892.3	0.0	0.0	-31646.9	-30919.6	-2450.4	9774.6
103.73	-44156.3	-59204.8	-55780.3	0.0	0.0	-31711.3	-30855.3	-2884.2	10208.3
103.83	-44156.3	-57138.1	-57847.1	0.0	0.0	-31679.1	-30887.4	-2667.3	9991.5
103.93	-44156.3	-55071.2	-59913.9	0.0	0.0	-31646.9	-30919.6	-2450.4	9774.6

TABLE V (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 103

PYLON LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON B-52B)

CONFIGURATION 1.0 WITH FINS

COND. NO.	CASE 1 V1 POUNDS	CASE 1 V2 POUNDS	CASE 1 V3 POUNDS	CASE 1 V4 POUNDS	CASE 2 V1 POUNDS	CASE 2 V2 POUNDS	CASE 2 V3 POUNDS	CASE 2 V4 POUNDS
103.11	42021.8	31770.2	52527.9	36706.1	40601.1	33194.1	54072.1	35158.6
103.21	40900.6	33389.6	49384.2	39351.6	39805.9	34486.7	50574.1	38159.2
103.31	39779.3	35008.9	46240.5	41997.2	39010.7	35779.4	47076.1	41159.9
103.41	40453.4	30201.8	54011.5	38359.2	39032.7	31625.7	55555.8	36811.8
103.51	39332.2	31821.2	50867.9	41004.8	38237.5	32918.3	52057.8	39812.4
103.61	38210.9	33440.5	47724.2	43650.3	37442.3	34210.9	48559.7	42813.1
103.71	38885.0	28633.4	55495.1	40012.4	37464.3	30057.3	57039.4	38465.0
103.81	37763.8	30252.8	52351.5	42657.9	36669.1	31349.9	53541.4	41465.6
103.91	36642.5	31872.1	49207.8	45303.5	35873.8	32642.5	50043.3	44466.3
103.12	38846.6	36275.3	44335.0	43568.9	38539.3	36583.3	44669.1	43234.2
103.22	37725.4	37894.7	41191.4	46214.4	37744.1	37875.9	41171.1	46234.8
103.32	36604.2	39514.0	38047.8	48860.0	36948.9	39168.5	37673.1	49235.5
103.42	37278.2	34706.9	45818.7	45222.1	36970.9	35014.9	46152.7	44887.4
103.52	36157.0	36326.2	42675.1	47867.6	36175.7	36307.5	42654.8	47888.0
103.62	35035.8	37945.6	39531.4	50513.2	35380.5	37600.1	39156.7	50888.6
103.72	35709.8	33138.5	47302.3	46875.3	35402.5	33446.5	47636.3	46540.6
103.82	34588.6	34757.8	44158.7	49520.8	34607.3	34739.1	44138.4	49541.2
103.92	33467.4	36377.2	41015.0	52166.3	33812.1	36031.7	40640.3	52541.8
103.13	35671.4	40780.4	36142.2	50431.8	36477.6	39972.5	35266.0	51309.8
103.23	34550.3	42399.8	32998.6	53077.3	35682.4	41265.1	31768.0	54310.4
103.33	33429.0	44019.2	29854.9	55722.9	34887.1	42557.8	28270.0	57311.1
103.43	34103.1	39212.0	37625.9	52084.9	34909.2	38404.1	36749.7	52963.0
103.53	32981.9	40831.4	34482.2	54730.5	34114.0	39696.7	33251.7	55963.6
103.63	31860.6	42450.7	31338.6	57376.0	33318.7	40989.3	29753.6	58964.3
103.73	32534.7	37643.6	39109.5	53738.1	33340.8	36835.7	38233.3	54616.2
103.83	31413.5	39263.0	35965.9	56383.6	32545.6	38128.3	34735.3	57616.8
103.93	30292.2	40882.3	32822.2	59029.2	31750.3	39420.9	31237.2	60617.4

TABLE V (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 103

PYLON LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON B-52B)

CONFIGURATION 1.0 WITH FINS

	CASE 1 AND 2					
COND. NO.	S1 POUNDS	S2 POUNDS	S3 POUNDS	S4 POUNDS	D3 POUNDS	D4 POUNDS
103.11	-1515.0	-1515.0	5056.0	5056.0	32160.8	32160.8
103.21	-1689.3	-1689.3	5230.3	5230.3	32160.8	32160.8
103.31	-1863.6	-1863.6	5404.7	5404.7	32160.8	32160.8
103.41	-1515.0	-1515.0	5056.0	5056.0	32160.8	32160.8
103.51	-1689.3	-1689.3	5230.3	5230.3	32160.8	32160.8
103.61	-1863.6	-1863.6	5404.7	5404.7	32160.8	32160.8
103.71	-1515.0	-1515.0	5056.0	5056.0	32160.8	32160.8
103.81	-1689.3	-1689.3	5230.3	5230.3	32160.8	32160.8
103.91	-1863.6	-1863.6	5404.7	5404.7	32160.8	32160.8
103.12	148.2	148.2	-208.8	-208.8	32160.8	32160.8
103.22	-26.1	-26.1	-34.4	-34.4	32160.8	32160.8
103.32	-200.4	-200.4	139.9	139.9	32160.8	32160.8
103.42	148.2	148.2	-208.8	-208.8	32160.8	32160.8
103.52	-26.1	-26.1	-34.4	-34.4	32160.8	32160.8
103.62	-200.4	-200.4	139.9	139.9	32160.8	32160.8
103.72	148.2	148.2	-208.8	-208.8	32160.8	32160.8
103.82	-26.1	-26.1	-34.4	-34.4	32160.8	32160.8
103.92	-200.4	-200.4	139.9	139.9	32160.8	32160.8
103.13	1811.5	1811.5	-5473.5	-5473.5	32160.8	32160.8
103.23	1637.1	1637.1	-5299.2	-5299.2	32160.8	32160.8
103.33	1462.8	1462.8	-5124.8	-5124.8	32160.8	32160.8
103.43	1811.5	1811.5	-5473.5	-5473.5	32160.8	32160.8
103.53	1637.1	1637.1	-5299.2	-5299.2	32160.8	32160.8
103.63	1462.8	1462.8	-5124.8	-5124.8	32160.8	32160.8
103.73	1811.5	1811.5	-5473.5	-5473.5	32160.8	32160.8
103.83	1637.1	1637.1	-5299.2	-5299.2	32160.8	32160.8
103.93	1462.8	1462.8	-5124.8	-5124.8	32160.8	32160.8

E4227

TABLE V (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 103

INERTIA AND AIRLOADS - ULTIMATE

INERTIA LOADS - PLUS FWD, LEFT AND DOWN
AIRLOAD FORCES - PLUS AFT, RIGHT AND UP
AIRLOAD MOMENTS - PLUS NOSE UP AND NOSE RIGHT

CONFIGURATION 1.0 WITH FINS

COND. NO.	PNX FWD. POUNDS	PNY LEFT POUNDS	PNZ DOWN POUNDS	PX AFT POUNDS	PY RIGHT POUNDS	PZ UP POUNDS	MY NOSE UP INCH-LBS.	MZ NOSE RIGHT INCH-LBS.
103.11	73500.0	0.0	162680.0	10933.5	7082.1	3538.5	-7.049161E 05	-9.428593E 05
103.21	73500.0	0.0	162680.0	10933.5	7082.1	3538.5	-7.049161E 05	-9.428593E 05
103.31	73500.0	0.0	162680.0	10933.5	7082.1	3538.5	-7.049161E 05	-9.428593E 05
103.41	73500.0	0.0	162680.0	10933.5	7082.1	3538.5	-7.049161E 05	-9.428593E 05
103.51	73500.0	0.0	162680.0	10933.5	7082.1	3538.5	-7.049161E 05	-9.428593E 05
103.61	73500.0	0.0	162680.0	10933.5	7082.1	3538.5	-7.049161E 05	-9.428593E 05
103.71	73500.0	0.0	162680.0	10933.5	7082.1	3538.5	-7.049161E 05	-9.428593E 05
103.81	73500.0	0.0	162680.0	10933.5	7082.1	3538.5	-7.049161E 05	-9.428593E 05
103.91	73500.0	0.0	162680.0	10933.5	7082.1	3538.5	-7.049161E 05	-9.428593E 05
103.12	73500.0	0.0	162680.0	10933.5	-121.0	3538.5	-7.049161E 05	4.498382E 04
103.22	73500.0	0.0	162680.0	10933.5	-121.0	3538.5	-7.049161E 05	4.498382E 04
103.32	73500.0	0.0	162680.0	10933.5	-121.0	3538.5	-7.049161E 05	4.498382E 04
103.42	73500.0	0.0	162680.0	10933.5	-121.0	3538.5	-7.049161E 05	4.498382E 04
103.52	73500.0	0.0	162680.0	10933.5	-121.0	3538.5	-7.049161E 05	4.498382E 04
103.62	73500.0	0.0	162680.0	10933.5	-121.0	3538.5	-7.049161E 05	4.498382E 04
103.72	73500.0	0.0	162680.0	10933.5	-121.0	3538.5	-7.049161E 05	4.498382E 04
103.82	73500.0	0.0	162680.0	10933.5	-121.0	3538.5	-7.049161E 05	4.498382E 04
103.92	73500.0	0.0	162680.0	10933.5	-121.0	3538.5	-7.049161E 05	4.498382E 04
103.13	73500.0	0.0	162680.0	10933.5	-7324.2	3538.5	-7.049161E 05	1.032827E 06
103.23	73500.0	0.0	162680.0	10933.5	-7324.2	3538.5	-7.049161E 05	1.032827E 06
103.33	73500.0	0.0	162680.0	10933.5	-7324.2	3538.5	-7.049161E 05	1.032827E 06
103.43	73500.0	0.0	162680.0	10933.5	-7324.2	3538.5	-7.049161E 05	1.032827E 06
103.53	73500.0	0.0	162680.0	10933.5	-7324.2	3538.5	-7.049161E 05	1.032827E 06
103.63	73500.0	0.0	162680.0	10933.5	-7324.2	3538.5	-7.049161E 05	1.032827E 06
103.73	73500.0	0.0	162680.0	10933.5	-7324.2	3538.5	-7.049161E 05	1.032827E 06
103.83	73500.0	0.0	162680.0	10933.5	-7324.2	3538.5	-7.049161E 05	1.032827E 06
103.93	73500.0	0.0	162680.0	10933.5	-7324.2	3538.5	-7.049161E 05	1.032827E 06

TABLE V (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 103

PYLON HOOK LOADS - AERODYNAMIC CONSIDERATIONS

CONFIGURATION 1.0 WITH FINS

COND. NO.	RHO SLUGS/FT**3	VELOCITY KEAS	XCP INCHES	YCP INCHES	ZCP INCHES	ALPHA DEGREES	BETA DEGREES
103.11	0.0007699	247.260	170.210	0.000	-26.000	4.700	-7.550
103.21	0.0007699	247.260	170.210	0.000	-26.000	4.700	-7.550
103.31	0.0007699	247.260	170.210	0.000	-26.000	4.700	-7.550
103.41	0.0007699	247.260	170.210	0.000	-26.000	4.700	-7.550
103.51	0.0007699	247.260	170.210	0.000	-26.000	4.700	-7.550
103.61	0.0007699	247.260	170.210	0.000	-26.000	4.700	-7.550
103.71	0.0007699	247.260	170.210	0.000	-26.000	4.700	-7.550
103.81	0.0007699	247.260	170.210	0.000	-26.000	4.700	-7.550
103.91	0.0007699	247.260	170.210	0.000	-26.000	4.700	-7.550
103.12	0.0007699	247.260	170.210	0.000	-26.000	4.700	0.000
103.22	0.0007699	247.260	170.210	0.000	-26.000	4.700	0.000
103.32	0.0007699	247.260	170.210	0.000	-26.000	4.700	0.000
103.42	0.0007699	247.260	170.210	0.000	-26.000	4.700	0.000
103.52	0.0007699	247.260	170.210	0.000	-26.000	4.700	0.000
103.62	0.0007699	247.260	170.210	0.000	-26.000	4.700	0.000
103.72	0.0007699	247.260	170.210	0.000	-26.000	4.700	0.000
103.82	0.0007699	247.260	170.210	0.000	-26.000	4.700	0.000
103.92	0.0007699	247.260	170.210	0.000	-26.000	4.700	0.000
103.13	0.0007699	247.260	170.210	0.000	-26.000	4.700	7.550
103.23	0.0007699	247.260	170.210	0.000	-26.000	4.700	7.550
103.33	0.0007699	247.260	170.210	0.000	-26.000	4.700	7.550
103.43	0.0007699	247.260	170.210	0.000	-26.000	4.700	7.550
103.53	0.0007699	247.260	170.210	0.000	-26.000	4.700	7.550
103.63	0.0007699	247.260	170.210	0.000	-26.000	4.700	7.550
103.73	0.0007699	247.260	170.210	0.000	-26.000	4.700	7.550
103.83	0.0007699	247.260	170.210	0.000	-26.000	4.700	7.550
103.93	0.0007699	247.260	170.210	0.000	-26.000	4.700	7.550

TABLE V (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 103

PYLON HOOK LOADS - INERTIA CONSIDERATIONS

CONFIGURATION 1.0 WITH FINS

COND. NO.	DTV WT. POUNDS	ULTIMATE LOAD FACTOR NX	NY	NZ	XCG INCHES	YCG INCHES	ZCG INCHES
103.11	49000.0	1.50	0.00	3.32	167.560	-0.650	-27.350
103.21	49000.0	1.50	0.00	3.32	167.560	0.000	-27.350
103.31	49000.0	1.50	0.00	3.32	167.560	0.650	-27.350
103.41	49000.0	1.50	0.00	3.32	170.210	-0.650	-27.350
103.51	49000.0	1.50	0.00	3.32	170.210	0.000	-27.350
103.61	49000.0	1.50	0.00	3.32	170.210	0.650	-27.350
103.71	49000.0	1.50	0.00	3.32	172.860	-0.650	-27.350
103.81	49000.0	1.50	0.00	3.32	172.860	0.000	-27.350
103.91	49000.0	1.50	0.00	3.32	172.860	0.650	-27.350
103.12	49000.0	1.50	0.00	3.32	167.560	-0.650	-27.350
103.22	49000.0	1.50	0.00	3.32	167.560	0.000	-27.350
103.32	49000.0	1.50	0.00	3.32	167.560	0.650	-27.350
103.42	49000.0	1.50	0.00	3.32	170.210	-0.650	-27.350
103.52	49000.0	1.50	0.00	3.32	170.210	0.000	-27.350
103.62	49000.0	1.50	0.00	3.32	170.210	0.650	-27.350
103.72	49000.0	1.50	0.00	3.32	172.860	-0.650	-27.350
103.82	49000.0	1.50	0.00	3.32	172.860	0.000	-27.350
103.92	49000.0	1.50	0.00	3.32	172.860	0.650	-27.350
103.13	49000.0	1.50	0.00	3.32	167.560	-0.650	-27.350
103.23	49000.0	1.50	0.00	3.32	167.560	0.000	-27.350
103.33	49000.0	1.50	0.00	3.32	167.560	0.650	-27.350
103.43	49000.0	1.50	0.00	3.32	170.210	-0.650	-27.350
103.53	49000.0	1.50	0.00	3.32	170.210	0.000	-27.350
103.63	49000.0	1.50	0.00	3.32	170.210	0.650	-27.350
103.73	49000.0	1.50	0.00	3.32	172.860	-0.650	-27.350
103.83	49000.0	1.50	0.00	3.32	172.860	0.000	-27.350
103.93	49000.0	1.50	0.00	3.32	172.860	0.650	-27.350

TABLE VI
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FLAPS) CONDITION 104

PYLON HOOK LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON DTV)

CONFIGURATION 1.0 WITH FINS

COND. NO.	VA POUNDS	VBL POUNDS	VBR POUNDS	VCL POUNDS	VCR POUNDS	DCL POUNDS	DCR POUNDS	SA POUNDS	SCL POUNDS
104.11	-57122.6	-52142.3	-47593.8	0.0	0.0	40766.3	40127.0	2154.0	-7994.6
104.21	-57122.6	-50209.4	-49526.7	0.0	0.0	40734.2	40159.2	1937.2	-7777.8
104.31	-57122.6	-48276.3	-51459.7	0.0	0.0	40702.0	40191.4	1720.3	-7560.9
104.41	-55079.5	-53163.9	-48615.3	0.0	0.0	40766.3	40127.0	2154.0	-7994.6
104.51	-55079.5	-51230.9	-50548.3	0.0	0.0	40734.2	40159.2	1937.2	-7777.8
104.61	-55079.5	-49297.9	-52481.3	0.0	0.0	40702.0	40191.4	1720.3	-7560.9
104.71	-53036.3	-54185.4	-49636.9	0.0	0.0	40766.3	40127.0	2154.0	-7994.6
104.81	-53036.3	-52252.5	-51569.8	0.0	0.0	40734.2	40159.2	1937.2	-7777.8
104.91	-53036.3	-50319.5	-53502.9	0.0	0.0	40702.0	40191.4	1720.3	-7560.9
104.12	-57122.6	-51823.5	-47912.6	0.0	0.0	40461.7	40431.6	101.4	-19.5
104.22	-57122.6	-49890.5	-49845.5	0.0	0.0	40429.5	40463.8	-115.5	197.4
104.32	-57122.6	-47957.5	-51778.5	0.0	0.0	40397.4	40496.0	-332.4	414.2
104.42	-55079.5	-52845.1	-48934.1	0.0	0.0	40461.7	40431.6	101.4	-19.5
104.52	-55079.5	-50912.1	-50867.1	0.0	0.0	40429.5	40463.8	-115.5	197.4
104.62	-55079.5	-48979.1	-52800.1	0.0	0.0	40397.4	40496.0	-332.4	414.2
104.72	-53036.3	-53866.6	-49955.7	0.0	0.0	40461.7	40431.6	101.4	-19.5
104.82	-53036.3	-51933.7	-51888.7	0.0	0.0	40429.5	40463.8	-115.5	197.4
104.92	-53036.3	-50000.6	-53821.7	0.0	0.0	40397.4	40496.0	-332.4	414.2
104.13	-57122.6	-51504.7	-48231.4	0.0	0.0	40157.1	40736.3	-1951.3	7955.6
104.23	-57122.6	-49571.7	-50164.3	0.0	0.0	40124.9	40768.4	-2168.2	8172.5
104.33	-57122.6	-47638.7	-52097.3	0.0	0.0	40092.8	40800.6	-2385.0	8389.3
104.43	-55079.5	-52526.3	-49252.9	0.0	0.0	40157.1	40736.3	-1951.3	7955.6
104.53	-55079.5	-50593.3	-51185.9	0.0	0.0	40124.9	40768.4	-2168.2	8172.5
104.63	-55079.5	-48660.3	-53118.9	0.0	0.0	40092.8	40800.6	-2385.0	8389.3
104.73	-53036.3	-53547.8	-50274.5	0.0	0.0	40157.1	40736.3	-1951.3	7955.6
104.83	-53036.3	-51614.9	-52207.4	0.0	0.0	40124.9	40768.4	-2168.2	8172.5
104.93	-53036.3	-49681.9	-54140.5	0.0	0.0	40092.8	40800.6	-2385.0	8389.3

TABLE VI (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 104

PYLON LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON B-52B)

CONFIGURATION 1.0 WITH FINS

COND.	CASE 1				CASE 2			
NO.	V1 POUNDS	V2 POUNDS	V3 POUNDS	V4 POUNDS	V1 POUNDS	V2 POUNDS	V3 POUNDS	V4 POUNDS
104.11	67336.1	58424.7	25555.9	9426.3	66107.4	59656.2	26891.6	8087.9
104.21	66328.6	59898.3	22568.3	11947.8	65425.8	60803.2	23549.7	10964.4
104.31	65320.9	61372.0	19580.7	14469.3	64744.2	61950.1	20207.7	13841.1
104.41	65767.8	56856.3	27039.5	11079.5	64539.0	58087.8	28375.2	9741.0
104.51	64760.1	58329.9	24052.0	13601.0	63857.4	59234.7	25033.3	12617.6
104.61	63752.5	59803.6	21064.3	16122.5	63175.8	60381.7	21691.3	15494.3
104.71	64199.3	55287.9	28523.1	12732.7	62970.5	56519.4	29858.8	11394.2
104.81	63191.8	56761.5	25535.6	15254.2	62289.0	57666.3	26516.9	14270.8
104.91	62184.1	58235.2	22547.9	17775.7	61607.4	58813.3	23174.9	17147.4
104.12	64725.5	62128.8	18819.7	15069.0	64412.2	62442.9	19160.3	14727.7
104.22	63717.9	63602.5	15832.1	17590.5	63730.6	63589.8	15818.4	17604.2
104.32	62710.3	65076.1	12844.5	20112.0	63049.0	64736.7	12476.4	20480.9
104.42	63157.1	60560.4	20303.3	16722.2	62843.8	60874.5	20643.9	16380.9
104.52	62149.5	62034.0	17315.8	19243.7	62162.2	62021.4	17302.0	19257.4
104.62	61141.9	63507.8	14328.1	21765.2	61480.6	63168.3	13960.0	22134.1
104.72	61588.7	58992.0	21786.9	18375.4	61275.3	59306.0	22127.5	18034.1
104.82	60581.1	60465.7	18799.4	20896.8	60593.8	60453.0	18785.6	20910.6
104.92	59573.5	61939.4	15811.7	23418.4	59912.2	61599.9	15443.6	23787.3
104.13	62114.9	65832.9	12083.5	20711.7	62716.9	65229.5	11429.1	21367.5
104.23	61107.3	67306.6	9096.0	23233.1	62035.4	66376.4	8087.2	24244.0
104.33	60099.7	68780.3	6108.3	25754.7	61353.8	67523.4	4745.2	27120.7
104.43	60546.5	64264.5	13567.1	22364.8	61148.5	63661.1	12912.7	23020.7
104.53	59538.9	65738.2	10579.6	24886.3	60467.0	64808.0	9570.8	25897.2
104.63	58531.3	67211.8	7591.9	27407.9	59785.4	65954.9	6228.8	28773.9
104.73	58978.1	62696.1	15050.8	24018.0	59580.1	62092.7	14396.3	24673.9
104.83	57970.5	64169.8	12063.2	26539.5	58898.6	63239.6	11054.4	27550.4
104.93	56962.9	65643.4	9075.5	29061.1	58217.0	64386.6	7712.4	30427.1

TABLE VI (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 104

PYLON LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON B-52B)

CONFIGURATION 1.0 WITH FINS

COND. NO.	CASE 1 AND 2 S1 POUNDS	S2 POUNDS	S3 POUNDS	S4 POUNDS	D3 POUNDS	D4 POUNDS
104.11	-1250.4	-1250.4	4170.7	4170.7	-41324.2	-41324.2
104.21	-1076.0	-1076.0	3996.3	3996.3	-41324.2	-41324.2
104.31	-901.7	-901.7	3822.0	3822.0	-41324.2	-41324.2
104.41	-1250.4	-1250.4	4170.7	4170.7	-41324.2	-41324.2
104.51	-1076.0	-1076.0	3996.3	3996.3	-41324.2	-41324.2
104.61	-901.7	-901.7	3822.0	3822.0	-41324.2	-41324.2
104.71	-1250.4	-1250.4	4170.7	4170.7	-41324.2	-41324.2
104.81	-1076.0	-1076.0	3996.3	3996.3	-41324.2	-41324.2
104.91	-901.7	-901.7	3822.0	3822.0	-41324.2	-41324.2
104.12	117.1	117.1	-158.1	-158.1	-41324.2	-41324.2
104.22	291.5	291.5	-332.4	-332.4	-41324.2	-41324.2
104.32	465.8	465.8	-506.7	-506.7	-41324.2	-41324.2
104.42	117.1	117.1	-158.1	-158.1	-41324.2	-41324.2
104.52	291.5	291.5	-332.4	-332.4	-41324.2	-41324.2
104.62	465.8	465.8	-506.7	-506.7	-41324.2	-41324.2
104.72	117.1	117.1	-158.1	-158.1	-41324.2	-41324.2
104.82	291.5	291.5	-332.4	-332.4	-41324.2	-41324.2
104.92	465.8	465.8	-506.7	-506.7	-41324.2	-41324.2
104.13	1484.6	1484.6	-4486.8	-4486.8	-41324.2	-41324.2
104.23	1659.0	1659.0	-4661.1	-4661.1	-41324.2	-41324.2
104.33	1833.3	1833.3	-4835.5	-4835.5	-41324.2	-41324.2
104.43	1484.6	1484.6	-4486.8	-4486.8	-41324.2	-41324.2
104.53	1659.0	1659.0	-4661.1	-4661.1	-41324.2	-41324.2
104.63	1833.3	1833.3	-4835.5	-4835.5	-41324.2	-41324.2
104.73	1484.6	1484.6	-4486.8	-4486.8	-41324.2	-41324.2
104.83	1659.0	1659.0	-4661.1	-4661.1	-41324.2	-41324.2
104.93	1833.3	1833.3	-4835.5	-4835.5	-41324.2	-41324.2

TABLE VI (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 104

INERTIA AND AIRLOADS - ULTIMATE

INERTIA LOADS - PLUS FWD, LEFT AND DOWN
AIRLOAD FORCES - PLUS AFT, RIGHT AND UP
AIRLOAD MOMENTS - PLUS NOSE UP AND NOSE RIGHT

CONFIGURATION 1.0 WITH FINS

COND. NO.	PNX FWD. POUNDS	PNY LEFT POUNDS	PNZ DOWN POUNDS	PX AFT POUNDS	PY RIGHT POUNDS	PZ UP POUNDS	MY NOSE UP INCH-LBS.	MZ NOSE RIGHT INCH-LBS.
104.11	-73500.0	0.0	162680.0	7393.4	5840.6	5821.3	-1.299506E 06	-7.817944E 05
104.21	-73500.0	0.0	162680.0	7393.4	5840.6	5821.3	-1.299506E 06	-7.817944E 05
104.31	-73500.0	0.0	162680.0	7393.4	5840.6	5821.3	-1.299506E 06	-7.817944E 05
104.41	-73500.0	0.0	162680.0	7393.4	5840.6	5821.3	-1.299506E 06	-7.817944E 05
104.51	-73500.0	0.0	162680.0	7393.4	5840.6	5821.3	-1.299506E 06	-7.817944E 05
104.61	-73500.0	0.0	162680.0	7393.4	5840.6	5821.3	-1.299506E 06	-7.817944E 05
104.71	-73500.0	0.0	162680.0	7393.4	5840.6	5821.3	-1.299506E 06	-7.817944E 05
104.81	-73500.0	0.0	162680.0	7393.4	5840.6	5821.3	-1.299506E 06	-7.817944E 05
104.91	-73500.0	0.0	162680.0	7393.4	5840.6	5821.3	-1.299506E 06	-7.817944E 05
104.12	-73500.0	0.0	162680.0	7393.4	-81.9	5821.3	-1.299506E 06	3.041884E 04
104.22	-73500.0	0.0	162680.0	7393.4	-81.9	5821.3	-1.299506E 06	3.041884E 04
104.32	-73500.0	0.0	162680.0	7393.4	-81.9	5821.3	-1.299506E 06	3.041884E 04
104.42	-73500.0	0.0	162680.0	7393.4	-81.9	5821.3	-1.299506E 06	3.041884E 04
104.52	-73500.0	0.0	162680.0	7393.4	-81.9	5821.3	-1.299506E 06	3.041884E 04
104.62	-73500.0	0.0	162680.0	7393.4	-81.9	5821.3	-1.299506E 06	3.041884E 04
104.72	-73500.0	0.0	162680.0	7393.4	-81.9	5821.3	-1.299506E 06	3.041884E 04
104.82	-73500.0	0.0	162680.0	7393.4	-81.9	5821.3	-1.299506E 06	3.041884E 04
104.92	-73500.0	0.0	162680.0	7393.4	-81.9	5821.3	-1.299506E 06	3.041884E 04
104.13	-73500.0	0.0	162680.0	7393.4	-6004.3	5821.3	-1.299506E 06	8.426320E 05
104.23	-73500.0	0.0	162680.0	7393.4	-6004.3	5821.3	-1.299506E 06	8.426320E 05
104.33	-73500.0	0.0	162680.0	7393.4	-6004.3	5821.3	-1.299506E 06	8.426320E 05
104.43	-73500.0	0.0	162680.0	7393.4	-6004.3	5821.3	-1.299506E 06	8.426320E 05
104.53	-73500.0	0.0	162680.0	7393.4	-6004.3	5821.3	-1.299506E 06	8.426320E 05
104.63	-73500.0	0.0	162680.0	7393.4	-6004.3	5821.3	-1.299506E 06	8.426320E 05
104.73	-73500.0	0.0	162680.0	7393.4	-6004.3	5821.3	-1.299506E 06	8.426320E 05
104.83	-73500.0	0.0	162680.0	7393.4	-6004.3	5821.3	-1.299506E 06	8.426320E 05
104.93	-73500.0	0.0	162680.0	7393.4	-6004.3	5821.3	-1.299506E 06	8.426320E 05

TABLE VI (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 104

PYLON HOOK LOADS - AERODYNAMIC CONSIDERATIONS

CONFIGURATION 1.0 WITH FINS

COND. NO.	RHO SLUGS/FT**3	VELOCITY KEAS	XCP INCHES	YCP INCHES	ZCP INCHES	ALPHA DEGREES	BETA DEGREES
104.11	0.0023769	203.328	170.210	0.000	-26.000	14.000	-9.180
104.21	0.0023769	203.328	170.210	0.000	-26.000	14.000	-9.180
104.31	0.0023769	203.328	170.210	0.000	-26.000	14.000	-9.180
104.41	0.0023769	203.328	170.210	0.000	-26.000	14.000	-9.180
104.51	0.0023769	203.328	170.210	0.000	-26.000	14.000	-9.180
104.61	0.0023769	203.328	170.210	0.000	-26.000	14.000	-9.180
104.71	0.0023769	203.328	170.210	0.000	-26.000	14.000	-9.180
104.81	0.0023769	203.328	170.210	0.000	-26.000	14.000	-9.180
104.91	0.0023769	203.328	170.210	0.000	-26.000	14.000	-9.180
104.12	0.0023769	203.328	170.210	0.000	-26.000	14.000	0.000
104.22	0.0023769	203.328	170.210	0.000	-26.000	14.000	0.000
104.32	0.0023769	203.328	170.210	0.000	-26.000	14.000	0.000
104.42	0.0023769	203.328	170.210	0.000	-26.000	14.000	0.000
104.52	0.0023769	203.328	170.210	0.000	-26.000	14.000	0.000
104.62	0.0023769	203.328	170.210	0.000	-26.000	14.000	0.000
104.72	0.0023769	203.328	170.210	0.000	-26.000	14.000	0.000
104.82	0.0023769	203.328	170.210	0.000	-26.000	14.000	0.000
104.92	0.0023769	203.328	170.210	0.000	-26.000	14.000	0.000
104.13	0.0023769	203.328	170.210	0.000	-26.000	14.000	9.180
104.23	0.0023769	203.328	170.210	0.000	-26.000	14.000	9.180
104.33	0.0023769	203.328	170.210	0.000	-26.000	14.000	9.180
104.43	0.0023769	203.328	170.210	0.000	-26.000	14.000	9.180
104.53	0.0023769	203.328	170.210	0.000	-26.000	14.000	9.180
104.63	0.0023769	203.328	170.210	0.000	-26.000	14.000	9.180
104.73	0.0023769	203.328	170.210	0.000	-26.000	14.000	9.180
104.83	0.0023769	203.328	170.210	0.000	-26.000	14.000	9.180
104.93	0.0023769	203.328	170.210	0.000	-26.000	14.000	9.180

TABLE VI (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 104

PYLON HOOK LOADS - INERTIA CONSIDERATIONS

CONFIGURATION 1.0 WITH FINS

COND. NO.	DTV WT. POUNDS	ULTIMATE LOAD FACTOR NX	NY	NZ	XCG INCHES	YCG INCHES	ZCG INCHES
104.11	49000.0	-1.50	0.00	3.32	167.560	-0.650	-27.350
104.21	49000.0	-1.50	0.00	3.32	167.560	0.000	-27.350
104.31	49000.0	-1.50	0.00	3.32	167.560	0.650	-27.350
104.41	49000.0	-1.50	0.00	3.32	170.210	-0.650	-27.350
104.51	49000.0	-1.50	0.00	3.32	170.210	0.000	-27.350
104.61	49000.0	-1.50	0.00	3.32	170.210	0.650	-27.350
104.71	49000.0	-1.50	0.00	3.32	172.860	-0.650	-27.350
104.81	49000.0	-1.50	0.00	3.32	172.860	0.000	-27.350
104.91	49000.0	-1.50	0.00	3.32	172.860	0.650	-27.350
104.12	49000.0	-1.50	0.00	3.32	167.560	-0.650	-27.350
104.22	49000.0	-1.50	0.00	3.32	167.560	0.000	-27.350
104.32	49000.0	-1.50	0.00	3.32	167.560	0.650	-27.350
104.42	49000.0	-1.50	0.00	3.32	170.210	-0.650	-27.350
104.52	49000.0	-1.50	0.00	3.32	170.210	0.000	-27.350
104.62	49000.0	-1.50	0.00	3.32	170.210	0.650	-27.350
104.72	49000.0	-1.50	0.00	3.32	172.860	-0.650	-27.350
104.82	49000.0	-1.50	0.00	3.32	172.860	0.000	-27.350
104.92	49000.0	-1.50	0.00	3.32	172.860	0.650	-27.350
104.13	49000.0	-1.50	0.00	3.32	167.560	-0.650	-27.350
104.23	49000.0	-1.50	0.00	3.32	167.560	0.000	-27.350
104.33	49000.0	-1.50	0.00	3.32	167.560	0.650	-27.350
104.43	49000.0	-1.50	0.00	3.32	170.210	-0.650	-27.350
104.53	49000.0	-1.50	0.00	3.32	170.210	0.000	-27.350
104.63	49000.0	-1.50	0.00	3.32	170.210	0.650	-27.350
104.73	49000.0	-1.50	0.00	3.32	172.860	-0.650	-27.350
104.83	49000.0	-1.50	0.00	3.32	172.860	0.000	-27.350
104.93	49000.0	-1.50	0.00	3.32	172.860	0.650	-27.350

TABLE VII
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FLAPS) CONDITION 105

PYLON HOOK LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON DTV)

CONFIGURATION 1.0 WITH FINS

COND. NO.	VA POUNDS	VBL POUNDS	VBR POUNDS	VCL POUNDS	VCR POUNDS	DCL POUNDS	DCR POUNDS	SA POUNDS	SCL POUNDS
105.11	-55345.7	-54118.5	-49363.6	0.0	0.0	43188.3	42400.8	2653.2	-10093.5
105.21	-55345.7	-52185.5	-51296.5	0.0	0.0	43156.1	42433.0	2436.3	-9876.6
105.31	-55345.7	-50252.5	-53229.6	0.0	0.0	43123.9	42465.2	2219.4	-9659.8
105.41	-53302.5	-55140.0	-50385.2	0.0	0.0	43188.3	42400.8	2653.2	-10093.5
105.51	-53302.5	-53207.1	-52318.1	0.0	0.0	43156.1	42433.0	2436.3	-9876.6
105.61	-53302.5	-51274.1	-54251.1	0.0	0.0	43123.9	42465.2	2219.4	-9659.8
105.71	-51259.4	-56161.6	-51406.7	0.0	0.0	43188.3	42400.8	2653.2	-10093.5
105.81	-51259.4	-54228.6	-53339.7	0.0	0.0	43156.1	42433.0	2436.3	-9876.6
105.91	-51259.4	-52295.6	-55272.7	0.0	0.0	43123.9	42465.2	2219.4	-9659.8
105.12	-55345.7	-53710.7	-49771.3	0.0	0.0	42798.7	42790.4	28.0	105.8
105.22	-55345.7	-51777.8	-51704.3	0.0	0.0	42766.5	42822.6	-188.8	322.7
105.32	-55345.7	-49844.8	-53637.3	0.0	0.0	42734.4	42854.8	-405.7	539.6
105.42	-53302.5	-54732.3	-50792.9	0.0	0.0	42798.7	42790.4	28.0	105.8
105.52	-53302.5	-52799.3	-52725.8	0.0	0.0	42766.5	42822.6	-188.8	322.7
105.62	-53302.5	-50866.3	-54658.8	0.0	0.0	42734.4	42854.8	-405.7	539.6
105.72	-51259.4	-55753.9	-51814.5	0.0	0.0	42798.7	42790.4	28.0	105.8
105.82	-51259.4	-53820.9	-53747.4	0.0	0.0	42766.5	42822.6	-188.8	322.7
105.92	-51259.4	-51887.9	-55680.4	0.0	0.0	42734.4	42854.8	-405.7	539.6
105.13	-55345.7	-53303.0	-50179.1	0.0	0.0	42409.2	43180.0	-2597.1	10305.1
105.23	-55345.7	-51370.1	-52112.0	0.0	0.0	42377.0	43212.2	-2814.0	10522.0
105.33	-55345.7	-49437.0	-54045.0	0.0	0.0	42344.8	43244.3	-3030.8	10738.9
105.43	-53302.5	-54324.6	-51200.6	0.0	0.0	42409.2	43180.0	-2597.1	10305.1
105.53	-53302.5	-52391.6	-53133.6	0.0	0.0	42377.0	43212.2	-2814.0	10522.0
105.63	-53302.5	-50458.6	-55066.6	0.0	0.0	42344.8	43244.3	-3030.8	10738.9
105.73	-51259.4	-55346.1	-52222.2	0.0	0.0	42409.2	43180.0	-2597.1	10305.1
105.83	-51259.4	-53413.2	-54155.1	0.0	0.0	42377.0	43212.2	-2814.0	10522.0
105.93	-51259.4	-51480.2	-56088.1	0.0	0.0	42344.8	43244.3	-3030.8	10738.9

TABLE VII (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 105

PYLON LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON B-52B)

CONFIGURATION 1.0 WITH FINS

COND. NO.	CASE 1 V1 POUNDS	CASE 1 V2 POUNDS	CASE 1 V3 POUNDS	CASE 1 V4 POUNDS	CASE 2 V1 POUNDS	CASE 2 V2 POUNDS	CASE 2 V3 POUNDS	CASE 2 V4 POUNDS
105.11	67417.8	56759.0	28938.9	9596.5	65941.7	58238.3	30543.4	7988.7
105.21	66410.1	58232.6	25951.4	12118.0	65260.1	59385.2	27201.4	10865.3
105.31	65402.6	59706.3	22963.7	14639.5	64578.5	60532.2	23859.4	13741.9
105.41	65849.3	55190.5	30422.5	11249.7	64373.3	56669.9	32027.0	9641.9
105.51	64841.7	56664.2	27435.0	13771.2	63691.7	57816.8	28685.1	12518.5
105.61	63834.1	58137.9	24447.3	16292.7	63010.1	58963.8	25343.1	15395.1
105.71	64280.9	53622.1	31906.1	12902.9	62804.9	55101.5	33510.6	11295.1
105.81	63273.3	55095.8	28918.6	15424.3	62123.3	56248.4	30168.7	14171.7
105.91	62265.8	56569.5	25930.9	17945.9	61441.7	57395.4	26826.7	17048.3
105.12	64079.0	61496.2	20324.0	16812.9	63773.7	61802.2	20655.9	16480.4
105.22	63071.4	62969.8	17336.4	19334.4	63092.1	62949.1	17314.0	19356.9
105.32	62063.9	64443.5	14348.8	21855.9	62410.5	64096.0	13972.0	22233.5
105.42	62510.6	59927.7	21807.6	18466.1	62205.3	60233.7	22139.5	18133.6
105.52	61503.0	61401.4	18820.1	20987.6	61523.7	61380.6	18797.6	21010.1
105.62	60495.4	62875.1	15832.4	23509.1	60842.1	62527.6	15455.6	23886.7
105.72	60942.2	58359.3	23291.2	20119.3	60636.9	58665.3	23623.1	19786.7
105.82	59934.6	59833.0	20303.7	22640.8	59955.3	59812.3	20281.2	22663.3
105.92	58927.0	61306.7	17316.1	25162.3	59273.7	60959.2	16939.2	25539.9
105.13	60740.3	66233.3	11709.1	24029.3	61605.7	65365.9	10768.4	24972.0
105.23	59732.7	67707.0	8721.6	26550.8	60924.2	66512.9	7426.5	27848.5
105.33	58725.1	69180.7	5733.9	29072.3	60242.6	67659.8	4084.5	30725.2
105.43	59171.9	64664.9	13192.7	25682.5	60037.3	63797.5	12252.0	26625.2
105.53	58164.3	66138.6	10205.2	28204.0	59355.8	64944.5	8910.1	29501.7
105.63	57156.7	67612.3	7217.5	30725.5	58674.1	66091.4	5568.1	32378.4
105.73	57603.5	63096.5	14676.4	27335.7	58468.9	62229.1	13735.6	28278.4
105.83	56595.9	64570.2	11688.8	29857.2	57787.3	63376.1	10393.7	31154.9
105.93	55588.3	66043.9	8701.1	32378.7	57105.7	64523.0	7051.7	34031.6

TABLE VII (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 105

PYLON LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON B-52B)

CONFIGURATION 1.0 WITH FINS

COND. NO.	CASE 1 AND 2 S1 POUNDS	S2 POUNDS	S3 POUNDS	S4 POUNDS	D3 POUNDS	D4 POUNDS
105.11	-1563.8	-1563.8	5283.9	5283.9	-43672.1	-43672.1
105.21	-1389.4	-1389.4	5109.6	5109.6	-43672.1	-43672.1
105.31	-1215.1	-1215.1	4935.2	4935.2	-43672.1	-43672.1
105.41	-1563.8	-1563.8	5283.9	5283.9	-43672.1	-43672.1
105.51	-1389.4	-1389.4	5109.6	5109.6	-43672.1	-43672.1
105.61	-1215.1	-1215.1	4935.2	4935.2	-43672.1	-43672.1
105.71	-1563.8	-1563.8	5283.9	5283.9	-43672.1	-43672.1
105.81	-1389.4	-1389.4	5109.6	5109.6	-43672.1	-43672.1
105.91	-1215.1	-1215.1	4935.2	4935.2	-43672.1	-43672.1
105.12	185.1	185.1	-252.0	-252.0	-43672.1	-43672.1
105.22	359.5	359.5	-426.4	-426.4	-43672.1	-43672.1
105.32	533.8	533.8	-600.7	-600.7	-43672.1	-43672.1
105.42	185.1	185.1	-252.0	-252.0	-43672.1	-43672.1
105.52	359.5	359.5	-426.4	-426.4	-43672.1	-43672.1
105.62	533.8	533.8	-600.7	-600.7	-43672.1	-43672.1
105.72	185.1	185.1	-252.0	-252.0	-43672.1	-43672.1
105.82	359.5	359.5	-426.4	-426.4	-43672.1	-43672.1
105.92	533.8	533.8	-600.7	-600.7	-43672.1	-43672.1
105.13	1934.0	1934.0	-5788.0	-5788.0	-43672.1	-43672.1
105.23	2108.4	2108.4	-5962.4	-5962.4	-43672.1	-43672.1
105.33	2282.7	2282.7	-6136.7	-6136.7	-43672.1	-43672.1
105.43	1934.0	1934.0	-5788.0	-5788.0	-43672.1	-43672.1
105.53	2108.4	2108.4	-5962.4	-5962.4	-43672.1	-43672.1
105.63	2282.7	2282.7	-6136.7	-6136.7	-43672.1	-43672.1
105.73	1934.0	1934.0	-5788.0	-5788.0	-43672.1	-43672.1
105.83	2108.4	2108.4	-5962.4	-5962.4	-43672.1	-43672.1
105.93	2282.7	2282.7	-6136.7	-6136.7	-43672.1	-43672.1

TABLE VII (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 105

INERTIA AND AIRLOADS - ULTIMATE

INERTIA LOADS - PLUS FWD, LEFT AND DOWN
AIRLOAD FORCES - PLUS AFT, RIGHT AND UP
AIRLOAD MOMENTS - PLUS NOSE UP AND NOSE RIGHT

CONFIGURATION 1.0 WITH FINS

COND. NO.	PNX FWD. POUNDS	PNY LEFT POUNDS	PNZ DOWN POUNDS	PX AFT POUNDS	PY RIGHT POUNDS	PZ UP POUNDS	MY NOSE UP INCH-LBS.	MZ NOSE RIGHT INCH-LBS.
105.11	-73500.0	0.0	162680.0	12089.2	7440.3	3852.2	-7.649614E 05	-9.889950E 05
105.21	-73500.0	0.0	162680.0	12089.2	7440.3	3852.2	-7.649614E 05	-9.889950E 05
105.31	-73500.0	0.0	162680.0	12089.2	7440.3	3852.2	-7.649614E 05	-9.889950E 05
105.41	-73500.0	0.0	162680.0	12089.2	7440.3	3852.2	-7.649614E 05	-9.889950E 05
105.51	-73500.0	0.0	162680.0	12089.2	7440.3	3852.2	-7.649614E 05	-9.889950E 05
105.61	-73500.0	0.0	162680.0	12089.2	7440.3	3852.2	-7.649614E 05	-9.889950E 05
105.71	-73500.0	0.0	162680.0	12089.2	7440.3	3852.2	-7.649614E 05	-9.889950E 05
105.81	-73500.0	0.0	162680.0	12089.2	7440.3	3852.2	-7.649614E 05	-9.889950E 05
105.91	-73500.0	0.0	162680.0	12089.2	7440.3	3852.2	-7.649614E 05	-9.889950E 05
105.12	-73500.0	0.0	162680.0	12089.2	-133.8	3852.2	-7.649614E 05	4.973878E 04
105.22	-73500.0	0.0	162680.0	12089.2	-133.8	3852.2	-7.649614E 05	4.973878E 04
105.32	-73500.0	0.0	162680.0	12089.2	-133.8	3852.2	-7.649614E 05	4.973878E 04
105.42	-73500.0	0.0	162680.0	12089.2	-133.8	3852.2	-7.649614E 05	4.973878E 04
105.52	-73500.0	0.0	162680.0	12089.2	-133.8	3852.2	-7.649614E 05	4.973878E 04
105.62	-73500.0	0.0	162680.0	12089.2	-133.8	3852.2	-7.649614E 05	4.973878E 04
105.72	-73500.0	0.0	162680.0	12089.2	-133.8	3852.2	-7.649614E 05	4.973878E 04
105.82	-73500.0	0.0	162680.0	12089.2	-133.8	3852.2	-7.649614E 05	4.973878E 04
105.92	-73500.0	0.0	162680.0	12089.2	-133.8	3852.2	-7.649614E 05	4.973878E 04
105.13	-73500.0	0.0	162680.0	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06
105.23	-73500.0	0.0	162680.0	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06
105.33	-73500.0	0.0	162680.0	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06
105.43	-73500.0	0.0	162680.0	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06
105.53	-73500.0	0.0	162680.0	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06
105.63	-73500.0	0.0	162680.0	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06
105.73	-73500.0	0.0	162680.0	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06
105.83	-73500.0	0.0	162680.0	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06
105.93	-73500.0	0.0	162680.0	12089.2	-7708.0	3852.2	-7.649614E 05	1.088472E 06

TABLE VII (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 105

PYLON HOOK LOADS - AERODYNAMIC CONSIDERATIONS

CONFIGURATION 1.0 WITH FINS

COND. NO.	RHO SLUGS/FT**3	VELOCITY KEAS	XCP INCHES	YCP INCHES	ZCP INCHES	ALPHA DEGREES	BETA DEGREES
105.11	0.0023769	260.000	170.210	0.000	-26.000	4.600	-7.180
105.21	0.0023769	260.000	170.210	0.000	-26.000	4.600	-7.180
105.31	0.0023769	260.000	170.210	0.000	-26.000	4.600	-7.180
105.41	0.0023769	260.000	170.210	0.000	-26.000	4.600	-7.180
105.51	0.0023769	260.000	170.210	0.000	-26.000	4.600	-7.180
105.61	0.0023769	260.000	170.210	0.000	-26.000	4.600	-7.180
105.71	0.0023769	260.000	170.210	0.000	-26.000	4.600	-7.180
105.81	0.0023769	260.000	170.210	0.000	-26.000	4.600	-7.180
105.91	0.0023769	260.000	170.210	0.000	-26.000	4.600	-7.180
105.12	0.0023769	260.000	170.210	0.000	-26.000	4.600	0.000
105.22	0.0023769	260.000	170.210	0.000	-26.000	4.600	0.000
105.32	0.0023769	260.000	170.210	0.000	-26.000	4.600	0.000
105.42	0.0023769	260.000	170.210	0.000	-26.000	4.600	0.000
105.52	0.0023769	260.000	170.210	0.000	-26.000	4.600	0.000
105.62	0.0023769	260.000	170.210	0.000	-26.000	4.600	0.000
105.72	0.0023769	260.000	170.210	0.000	-26.000	4.600	0.000
105.82	0.0023769	260.000	170.210	0.000	-26.000	4.600	0.000
105.92	0.0023769	260.000	170.210	0.000	-26.000	4.600	0.000
105.13	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180
105.23	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180
105.33	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180
105.43	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180
105.53	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180
105.63	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180
105.73	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180
105.83	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180
105.93	0.0023769	260.000	170.210	0.000	-26.000	4.600	7.180

TABLE VII (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 105

PYLON HOOK LOADS - INERTIA CONSIDERATIONS

CONFIGURATION 1.0 WITH FINS

COND. NO.	DTV WT. POUNDS	ULTIMATE LOAD FACTOR NX	NY	NZ	XCG INCHES	YCG INCHES	ZCG INCHES
105.11	49000.0	-1.50	0.00	3.32	167.560	-0.650	-27.350
105.21	49000.0	-1.50	0.00	3.32	167.560	0.000	-27.350
105.31	49000.0	-1.50	0.00	3.32	167.560	0.650	-27.350
105.41	49000.0	-1.50	0.00	3.32	170.210	-0.650	-27.350
105.51	49000.0	-1.50	0.00	3.32	170.210	0.000	-27.350
105.61	49000.0	-1.50	0.00	3.32	170.210	0.650	-27.350
105.71	49000.0	-1.50	0.00	3.32	172.860	-0.650	-27.350
105.81	49000.0	-1.50	0.00	3.32	172.860	0.000	-27.350
105.91	49000.0	-1.50	0.00	3.32	172.860	0.650	-27.350
105.12	49000.0	-1.50	0.00	3.32	167.560	-0.650	-27.350
105.22	49000.0	-1.50	0.00	3.32	167.560	0.000	-27.350
105.32	49000.0	-1.50	0.00	3.32	167.560	0.650	-27.350
105.42	49000.0	-1.50	0.00	3.32	170.210	-0.650	-27.350
105.52	49000.0	-1.50	0.00	3.32	170.210	0.000	-27.350
105.62	49000.0	-1.50	0.00	3.32	170.210	0.650	-27.350
105.72	49000.0	-1.50	0.00	3.32	172.860	-0.650	-27.350
105.82	49000.0	-1.50	0.00	3.32	172.860	0.000	-27.350
105.92	49000.0	-1.50	0.00	3.32	172.860	0.650	-27.350
105.13	49000.0	-1.50	0.00	3.32	167.560	-0.650	-27.350
105.23	49000.0	-1.50	0.00	3.32	167.560	0.000	-27.350
105.33	49000.0	-1.50	0.00	3.32	167.560	0.650	-27.350
105.43	49000.0	-1.50	0.00	3.32	170.210	-0.650	-27.350
105.53	49000.0	-1.50	0.00	3.32	170.210	0.000	-27.350
105.63	49000.0	-1.50	0.00	3.32	170.210	0.650	-27.350
105.73	49000.0	-1.50	0.00	3.32	172.860	-0.650	-27.350
105.83	49000.0	-1.50	0.00	3.32	172.860	0.000	-27.350
105.93	49000.0	-1.50	0.00	3.32	172.860	0.650	-27.350

TABLE VIII
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FLAPS)   CONDITION 106

PYLON HOOK LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON DTV)

CONFIGURATION 1.0 WITH FINS

COND. NO.	VA POUNDS	VBL POUNDS	VBR POUNDS	VCL POUNDS	VCR POUNDS	DCL POUNDS	DCR POUNDS	SA POUNDS	SCL POUNDS
106.11	-55104.9	-54372.2	-49664.4	0.0	0.0	42594.0	41839.4	2542.6	-9624.6
106.21	-55104.9	-52439.3	-51597.3	0.0	0.0	42561.9	41871.6	2325.7	-9407.8
106.31	-55104.9	-50506.3	-53530.3	0.0	0.0	42529.7	41903.8	2108.9	-9190.9
106.41	-53061.8	-55393.8	-50685.9	0.0	0.0	42594.0	41839.4	2542.6	-9624.6
106.51	-53061.8	-53460.8	-52618.9	0.0	0.0	42561.9	41871.6	2325.7	-9407.8
106.61	-53061.8	-51527.8	-54551.8	0.0	0.0	42529.7	41903.8	2108.9	-9190.9
106.71	-51018.6	-56415.4	-51707.5	0.0	0.0	42594.0	41839.4	2542.6	-9624.6
106.81	-51018.6	-54482.4	-53640.4	0.0	0.0	42561.9	41871.6	2325.7	-9407.8
106.91	-51018.6	-52549.4	-55573.4	0.0	0.0	42529.7	41903.8	2108.9	-9190.9
106.12	-55104.9	-53984.5	-50052.1	0.0	0.0	42223.6	42209.9	46.1	75.0
106.22	-55104.9	-52051.5	-51985.0	0.0	0.0	42191.4	42242.1	-170.8	291.8
106.32	-55104.9	-50118.5	-53918.1	0.0	0.0	42159.2	42274.3	-387.7	508.7
106.42	-53061.8	-55006.1	-51073.6	0.0	0.0	42223.6	42209.9	46.1	75.0
106.52	-53061.8	-53073.1	-53006.6	0.0	0.0	42191.4	42242.1	-170.8	291.8
106.62	-53061.8	-51140.1	-54939.6	0.0	0.0	42159.2	42274.3	-387.7	508.7
106.72	-51018.6	-56027.6	-52095.2	0.0	0.0	42223.6	42209.9	46.1	75.0
106.82	-51018.6	-54094.7	-54028.1	0.0	0.0	42191.4	42242.1	-170.8	291.8
106.92	-51018.6	-52161.7	-55961.2	0.0	0.0	42159.2	42274.3	-387.7	508.7
106.13	-55104.9	-53596.7	-50439.9	0.0	0.0	41853.1	42580.4	-2450.4	9774.6
106.23	-55104.9	-51663.8	-52372.8	0.0	0.0	41820.9	42612.5	-2667.3	9991.5
106.33	-55104.9	-49730.8	-54305.8	0.0	0.0	41788.7	42644.7	-2884.2	10208.3
106.43	-53061.8	-54618.3	-51461.4	0.0	0.0	41853.1	42580.4	-2450.4	9774.6
106.53	-53061.8	-52685.3	-53394.4	0.0	0.0	41820.9	42612.5	-2667.3	9991.5
106.63	-53061.8	-50752.3	-55327.3	0.0	0.0	41788.7	42644.7	-2884.2	10208.3
106.73	-51018.6	-55639.8	-52483.0	0.0	0.0	41853.1	42580.4	-2450.4	9774.6
106.83	-51018.6	-53706.9	-54415.9	0.0	0.0	41820.9	42612.5	-2667.3	9991.5
106.93	-51018.6	-51773.9	-56348.9	0.0	0.0	41788.7	42644.7	-2884.2	10208.3

TABLE VIII (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 106

PYLON LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON B-52B)

CONFIGURATION 1.0 WITH FINS

COND. NO.	CASE 1 V1 POUNDS	CASE 1 V2 POUNDS	CASE 1 V3 POUNDS	CASE 1 V4 POUNDS	CASE 2 V1 POUNDS	CASE 2 V2 POUNDS	CASE 2 V3 POUNDS	CASE 2 V4 POUNDS
106.11	66931.9	56665.5	28979.5	10449.0	65511.3	58089.3	30523.7	8901.5
106.21	65924.3	58139.1	25991.9	12970.5	64829.7	59236.2	27181.8	11778.1
106.31	64916.8	59612.8	23004.3	15492.0	64148.1	60383.2	23839.8	14654.7
106.41	65363.6	55097.0	30463.1	12102.2	63942.9	56520.9	32007.3	10554.7
106.51	64356.0	56570.7	27475.5	14623.6	63261.3	57667.8	28665.4	13431.3
106.61	63348.4	58044.4	24487.9	17145.2	62579.7	58814.8	25323.5	16307.9
106.71	63795.1	53528.6	31946.7	13755.3	62374.5	54952.5	33491.0	12207.9
106.81	62787.6	55002.3	28959.2	16276.8	61692.9	56099.4	30149.1	15084.4
106.91	61780.0	56476.0	25971.5	18798.3	61011.3	57246.4	26807.1	17961.1
106.12	63756.8	61170.6	20786.7	17311.8	63449.5	61478.5	21120.7	16977.1
106.22	62749.2	62644.2	17799.1	19833.3	62768.0	62625.5	17778.8	19853.7
106.32	61741.6	64117.9	14811.5	22354.8	62086.3	63772.4	14436.8	22730.3
106.42	62188.4	59602.1	22270.3	18965.0	61881.1	59910.1	22604.3	18630.3
106.52	61180.8	61075.8	19282.8	21486.4	61199.6	61057.0	19262.4	21506.8
106.62	60173.2	62549.5	16295.1	24008.0	60517.9	62204.0	15920.4	24383.5
106.72	60620.0	58033.7	23753.9	20618.2	60312.7	58341.7	24087.9	20283.5
106.82	59612.4	59507.4	20766.4	23139.6	59631.1	59488.6	20746.0	23160.0
106.92	58604.8	60981.1	17778.7	25661.2	58949.5	60635.6	17404.0	26036.7
106.13	60581.7	65675.6	12593.8	24174.7	61387.8	64867.7	11717.6	25052.7
106.23	59574.1	67149.3	9606.3	26696.2	60706.1	66014.6	8375.7	27929.3
106.33	58566.5	68622.9	6618.7	29217.7	60024.5	67161.6	5033.7	30805.9
106.43	59013.2	64107.2	14077.5	25827.9	59819.3	63299.3	13201.3	26705.9
106.53	58005.7	65580.9	11089.9	28349.3	59137.7	64446.2	9859.4	29582.4
106.63	56998.1	67054.6	8102.3	30870.9	58456.1	65593.1	6517.4	32459.1
106.73	57444.8	62538.8	15561.1	27481.0	58250.9	61730.9	14684.9	28359.1
106.83	56437.3	64012.5	12573.5	30002.5	57569.3	62877.8	11343.0	31235.6
106.93	55429.7	65486.2	9585.9	32524.0	56887.8	64024.8	8001.0	34112.3

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TABLE VIII (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 106

PYLON LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON B-52B)

CONFIGURATION 1.0 WITH FINS

COND. NO.	CASE 1 AND 2					
	S1 POUNDS	S2 POUNDS	S3 POUNDS	S4 POUNDS	D3 POUNDS	D4 POUNDS
106.11	-1494.8	-1494.8	5035.8	5035.8	-43094.2	-43094.2
106.21	-1320.5	-1320.5	4861.5	4861.5	-43094.2	-43094.2
106.31	-1146.1	-1146.1	4687.2	4687.2	-43094.2	-43094.2
106.41	-1494.8	-1494.8	5035.8	5035.8	-43094.2	-43094.2
106.51	-1320.5	-1320.5	4861.5	4861.5	-43094.2	-43094.2
106.61	-1146.1	-1146.1	4687.2	4687.2	-43094.2	-43094.2
106.71	-1494.8	-1494.8	5035.8	5035.8	-43094.2	-43094.2
106.81	-1320.5	-1320.5	4861.5	4861.5	-43094.2	-43094.2
106.91	-1146.1	-1146.1	4687.2	4687.2	-43094.2	-43094.2
106.12	168.4	168.4	-228.9	-228.9	-43094.2	-43094.2
106.22	342.7	342.7	-403.3	-403.3	-43094.2	-43094.2
106.32	517.1	517.1	-577.6	-577.6	-43094.2	-43094.2
106.42	168.4	168.4	-228.9	-228.9	-43094.2	-43094.2
106.52	342.7	342.7	-403.3	-403.3	-43094.2	-43094.2
106.62	517.1	517.1	-577.6	-577.6	-43094.2	-43094.2
106.72	168.4	168.4	-228.9	-228.9	-43094.2	-43094.2
106.82	342.7	342.7	-403.3	-403.3	-43094.2	-43094.2
106.92	517.1	517.1	-577.6	-577.6	-43094.2	-43094.2
106.13	1831.6	1831.6	-5493.7	-5493.7	-43094.2	-43094.2
106.23	2005.9	2005.9	-5668.0	-5668.0	-43094.2	-43094.2
106.33	2180.3	2180.3	-5842.3	-5842.3	-43094.2	-43094.2
106.43	1831.6	1831.6	-5493.7	-5493.7	-43094.2	-43094.2
106.53	2005.9	2005.9	-5668.0	-5668.0	-43094.2	-43094.2
106.63	2180.3	2180.3	-5842.3	-5842.3	-43094.2	-43094.2
106.73	1831.6	1831.6	-5493.7	-5493.7	-43094.2	-43094.2
106.83	2005.9	2005.9	-5668.0	-5668.0	-43094.2	-43094.2
106.93	2180.3	2180.3	-5842.3	-5842.3	-43094.2	-43094.2

TABLE VIII (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 106

INERTIA AND AIRLOADS - ULTIMATE

INERTIA LOADS - PLUS FWD, LEFT AND DOWN
AIRLOAD FORCES - PLUS AFT, RIGHT AND UP
AIRLOAD MOMENTS - PLUS NOSE UP AND NOSE RIGHT

CONFIGURATION 1.0 WITH FINS

COND. NO.	PNX FWD. POUNDS	PNY LEFT POUNDS	PNZ DOWN POUNDS	PX AFT POUNDS	PY RIGHT POUNDS	PZ UP POUNDS	MY NOSE UP INCH-LBS.	MZ NOSE RIGHT INCH-LBS.
106.11	-73500.0	0.0	162680.0	10933.5	7082.1	3538.5	-7.049161E 05	-9.428593E 05
106.21	-73500.0	0.0	162680.0	10933.5	7082.1	3538.5	-7.049161E 05	-9.428593E 05
106.31	-73500.0	0.0	162680.0	10933.5	7082.1	3538.5	-7.049161E 05	-9.428593E 05
106.41	-73500.0	0.0	162680.0	10933.5	7082.1	3538.5	-7.049161E 05	-9.428593E 05
106.51	-73500.0	0.0	162680.0	10933.5	7082.1	3538.5	-7.049161E 05	-9.428593E 05
106.61	-73500.0	0.0	162680.0	10933.5	7082.1	3538.5	-7.049161E 05	-9.428593E 05
106.71	-73500.0	0.0	162680.0	10933.5	7082.1	3538.5	-7.049161E 05	-9.428593E 05
106.81	-73500.0	0.0	162680.0	10933.5	7082.1	3538.5	-7.049161E 05	-9.428593E 05
106.91	-73500.0	0.0	162680.0	10933.5	7082.1	3538.5	-7.049161E 05	-9.428593E 05
106.12	-73500.0	0.0	162680.0	10933.5	-121.0	3538.5	-7.049161E 05	4.498382E 04
106.22	-73500.0	0.0	162680.0	10933.5	-121.0	3538.5	-7.049161E 05	4.498382E 04
106.32	-73500.0	0.0	162680.0	10933.5	-121.0	3538.5	-7.049161E 05	4.498382E 04
106.42	-73500.0	0.0	162680.0	10933.5	-121.0	3538.5	-7.049161E 05	4.498382E 04
106.52	-73500.0	0.0	162680.0	10933.5	-121.0	3538.5	-7.049161E 05	4.498382E 04
106.62	-73500.0	0.0	162680.0	10933.5	-121.0	3538.5	-7.049161E 05	4.498382E 04
106.72	-73500.0	0.0	162680.0	10933.5	-121.0	3538.5	-7.049161E 05	4.498382E 04
106.82	-73500.0	0.0	162680.0	10933.5	-121.0	3538.5	-7.049161E 05	4.498382E 04
106.92	-73500.0	0.0	162680.0	10933.5	-121.0	3538.5	-7.049161E 05	4.498382E 04
106.13	-73500.0	0.0	162680.0	10933.5	-7324.2	3538.5	-7.049161E 05	1.032827E 06
106.23	-73500.0	0.0	162680.0	10933.5	-7324.2	3538.5	-7.049161E 05	1.032827E 06
106.33	-73500.0	0.0	162680.0	10933.5	-7324.2	3538.5	-7.049161E 05	1.032827E 06
106.43	-73500.0	0.0	162680.0	10933.5	-7324.2	3538.5	-7.049161E 05	1.032827E 06
106.53	-73500.0	0.0	162680.0	10933.5	-7324.2	3538.5	-7.049161E 05	1.032827E 06
106.63	-73500.0	0.0	162680.0	10933.5	-7324.2	3538.5	-7.049161E 05	1.032827E 06
106.73	-73500.0	0.0	162680.0	10933.5	-7324.2	3538.5	-7.049161E 05	1.032827E 06
106.83	-73500.0	0.0	162680.0	10933.5	-7324.2	3538.5	-7.049161E 05	1.032827E 06
106.93	-73500.0	0.0	162680.0	10933.5	-7324.2	3538.5	-7.049161E 05	1.032827E 06

TABLE VIII (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 106

PYLON HOOK LOADS - AERODYNAMIC CONSIDERATIONS

CONFIGURATION 1.0 WITH FINS

COND. NO.	RHO SLUGS/FT**3	VELOCITY KEAS	XCP INCHES	YCP INCHES	ZCP INCHES	ALPHA DEGREES	BETA DEGREES
106.11	0.0007699	247.260	170.210	0.000	-26.000	4.700	-7.550
106.21	0.0007699	247.260	170.210	0.000	-26.000	4.700	-7.550
106.31	0.0007699	247.260	170.210	0.000	-26.000	4.700	-7.550
106.41	0.0007699	247.260	170.210	0.000	-26.000	4.700	-7.550
106.51	0.0007699	247.260	170.210	0.000	-26.000	4.700	-7.550
106.61	0.0007699	247.260	170.210	0.000	-26.000	4.700	-7.550
106.71	0.0007699	247.260	170.210	0.000	-26.000	4.700	-7.550
106.81	0.0007699	247.260	170.210	0.000	-26.000	4.700	-7.550
106.91	0.0007699	247.260	170.210	0.000	-26.000	4.700	-7.550
106.12	0.0007699	247.260	170.210	0.000	-26.000	4.700	0.000
106.22	0.0007699	247.260	170.210	0.000	-26.000	4.700	0.000
106.32	0.0007699	247.260	170.210	0.000	-26.000	4.700	0.000
106.42	0.0007699	247.260	170.210	0.000	-26.000	4.700	0.000
106.52	0.0007699	247.260	170.210	0.000	-26.000	4.700	0.000
106.62	0.0007699	247.260	170.210	0.000	-26.000	4.700	0.000
106.72	0.0007699	247.260	170.210	0.000	-26.000	4.700	0.000
106.82	0.0007699	247.260	170.210	0.000	-26.000	4.700	0.000
106.92	0.0007699	247.260	170.210	0.000	-26.000	4.700	0.000
106.13	0.0007699	247.260	170.210	0.000	-26.000	4.700	7.550
106.23	0.0007699	247.260	170.210	0.000	-26.000	4.700	7.550
106.33	0.0007699	247.260	170.210	0.000	-26.000	4.700	7.550
106.43	0.0007699	247.260	170.210	0.000	-26.000	4.700	7.550
106.53	0.0007699	247.260	170.210	0.000	-26.000	4.700	7.550
106.63	0.0007699	247.260	170.210	0.000	-26.000	4.700	7.550
106.73	0.0007699	247.260	170.210	0.000	-26.000	4.700	7.550
106.83	0.0007699	247.260	170.210	0.000	-26.000	4.700	7.550
106.93	0.0007699	247.260	170.210	0.000	-26.000	4.700	7.550

TABLE VIII (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 106

PYLON HOOK LOADS - INERTIA CONSIDERATIONS

CONFIGURATION 1.0 WITH FINS

COND. NO.	DTV WT. POUNDS	ULTIMATE LOAD FACTOR NX	NY	NZ	XCG INCHES	YCG INCHES	ZCG INCHES
106.11	49000.0	-1.50	0.00	3.32	167.560	-0.650	-27.350
106.21	49000.0	-1.50	0.00	3.32	167.560	0.000	-27.350
106.31	49000.0	-1.50	0.00	3.32	167.560	0.650	-27.350
106.41	49000.0	-1.50	0.00	3.32	170.210	-0.650	-27.350
106.51	49000.0	-1.50	0.00	3.32	170.210	0.000	-27.350
106.61	49000.0	-1.50	0.00	3.32	170.210	0.650	-27.350
106.71	49000.0	-1.50	0.00	3.32	172.860	-0.650	-27.350
106.81	49000.0	-1.50	0.00	3.32	172.860	0.000	-27.350
106.91	49000.0	-1.50	0.00	3.32	172.860	0.650	-27.350
106.12	49000.0	-1.50	0.00	3.32	167.560	-0.650	-27.350
106.22	49000.0	-1.50	0.00	3.32	167.560	0.000	-27.350
106.32	49000.0	-1.50	0.00	3.32	167.560	0.650	-27.350
106.42	49000.0	-1.50	0.00	3.32	170.210	-0.650	-27.350
106.52	49000.0	-1.50	0.00	3.32	170.210	0.000	-27.350
106.62	49000.0	-1.50	0.00	3.32	170.210	0.650	-27.350
106.72	49000.0	-1.50	0.00	3.32	172.860	-0.650	-27.350
106.82	49000.0	-1.50	0.00	3.32	172.860	0.000	-27.350
106.92	49000.0	-1.50	0.00	3.32	172.860	0.650	-27.350
106.13	49000.0	-1.50	0.00	3.32	167.560	-0.650	-27.350
106.23	49000.0	-1.50	0.00	3.32	167.560	0.000	-27.350
106.33	49000.0	-1.50	0.00	3.32	167.560	0.650	-27.350
106.43	49000.0	-1.50	0.00	3.32	170.210	-0.650	-27.350
106.53	49000.0	-1.50	0.00	3.32	170.210	0.000	-27.350
106.63	49000.0	-1.50	0.00	3.32	170.210	0.650	-27.350
106.73	49000.0	-1.50	0.00	3.32	172.860	-0.650	-27.350
106.83	49000.0	-1.50	0.00	3.32	172.860	0.000	-27.350
106.93	49000.0	-1.50	0.00	3.32	172.860	0.650	-27.350

TABLE IX
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FLAPS) CONDITION 107

PYLON HOOK LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON DTV)

CONFIGURATION 1.0 WITH FINS

COND. NO.	VA POUNDS	VBL POUNDS	VBR POUNDS	VCL POUNDS	VCR POUNDS	DCL POUNDS	DCR POUNDS	SA POUNDS	SCL POUNDS
107.11	-24488.5	-16640.8	-29460.0	0.0	0.0	3227.8	468.9	9295.6	13998.3
107.21	-24488.5	-15737.2	-30363.5	0.0	0.0	3227.8	468.9	9295.6	13998.3
107.31	-24488.5	-14833.7	-31267.1	0.0	0.0	3227.8	468.9	9295.6	13998.3
107.41	-23565.4	-17204.2	-29819.7	0.0	0.0	3178.8	517.9	8965.5	14328.4
107.51	-23565.4	-16300.6	-30723.3	0.0	0.0	3178.8	517.9	8965.5	14328.4
107.61	-23565.4	-15397.0	-31626.8	0.0	0.0	3178.8	517.9	8965.5	14328.4
107.71	-22642.3	-17767.6	-30179.4	0.0	0.0	3129.8	566.9	8635.4	14658.5
107.81	-22642.3	-16864.0	-31083.0	0.0	0.0	3129.8	566.9	8635.4	14658.5
107.91	-22642.3	-15960.4	-31986.6	0.0	0.0	3129.8	566.9	8635.4	14658.5
107.12	-24488.5	-16415.4	-29685.4	0.0	0.0	3012.5	684.3	7844.4	19636.5
107.22	-24488.5	-15511.8	-30588.9	0.0	0.0	3012.5	684.3	7844.4	19636.5
107.32	-24488.5	-14608.3	-31492.5	0.0	0.0	3012.5	684.3	7844.4	19636.5
107.42	-23565.4	-16978.8	-30045.1	0.0	0.0	2963.5	733.3	7514.3	19966.6
107.52	-23565.4	-16075.2	-30948.7	0.0	0.0	2963.5	733.3	7514.3	19966.6
107.62	-23565.4	-15171.6	-31852.2	0.0	0.0	2963.5	733.3	7514.3	19966.6
107.72	-22642.3	-17542.2	-30404.8	0.0	0.0	2914.5	782.2	7184.2	20296.7
107.82	-22642.3	-16638.6	-31308.4	0.0	0.0	2914.5	782.2	7184.2	20296.7
107.92	-22642.3	-15735.0	-32212.0	0.0	0.0	2914.5	782.2	7184.2	20296.7
107.13	-24488.5	-16190.0	-29910.8	0.0	0.0	2797.1	899.6	6393.2	25274.7
107.23	-24488.5	-15286.4	-30814.3	0.0	0.0	2797.1	899.6	6393.2	25274.7
107.33	-24488.5	-14382.9	-31717.9	0.0	0.0	2797.1	899.6	6393.2	25274.7
107.43	-23565.4	-16753.4	-30270.5	0.0	0.0	2748.1	948.6	6063.1	25604.8
107.53	-23565.4	-15849.8	-31174.1	0.0	0.0	2748.1	948.6	6063.1	25604.8
107.63	-23565.4	-14946.3	-32077.6	0.0	0.0	2748.1	948.6	6063.1	25604.8
107.73	-22642.3	-17316.8	-30630.2	0.0	0.0	2699.1	997.6	5733.1	25934.9
107.83	-22642.3	-16413.2	-31533.8	0.0	0.0	2699.1	997.6	5733.1	25934.9
107.93	-22642.3	-15509.6	-32437.4	0.0	0.0	2699.1	997.6	5733.1	25934.9

TABLE IX (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 107

PYLON LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON B-52B)

CONFIGURATION 1.0 WITH FINS

COND. NO.	CASE 1 V1 POUNDS	CASE 1 V2 POUNDS	CASE 1 V3 POUNDS	CASE 1 V4 POUNDS	CASE 2 V1 POUNDS	CASE 2 V2 POUNDS	CASE 2 V3 POUNDS	CASE 2 V4 POUNDS
107.11	8501.6	43762.6	-20431.5	40511.6	12087.5	40168.6	-24329.3	44417.6
107.21	8020.7	44461.3	-21816.5	41678.9	11753.9	40719.7	-25874.5	45745.2
107.31	7539.8	45160.1	-23201.6	42846.1	11420.2	41270.8	-27419.7	47072.9
107.41	7879.4	42943.2	-19642.5	41164.2	11465.3	39349.2	-23540.3	45070.1
107.51	7398.5	43641.9	-21027.5	42331.4	11131.7	39900.2	-25085.4	46397.8
107.61	6917.6	44340.6	-22412.6	43498.7	10798.1	40451.4	-26630.6	47725.5
107.71	7257.3	42123.7	-18853.4	41816.7	10843.2	38529.7	-22751.2	45722.7
107.81	6776.4	42822.4	-20238.4	42983.9	10509.6	39080.8	-24296.3	47050.3
107.91	6295.5	43521.1	-21623.5	44151.2	10176.0	39631.9	-25841.5	48378.0
107.12	6655.9	46381.4	-25193.9	44500.9	10889.0	42138.7	-29795.2	49111.8
107.22	6175.0	47080.1	-26578.9	45668.1	10555.4	42689.8	-31340.3	50439.4
107.32	5694.1	47778.8	-27964.0	46835.4	10221.8	43240.9	-32885.5	51767.1
107.42	6033.8	45561.9	-24404.8	45153.4	10266.9	41319.2	-29006.1	49764.3
107.52	5552.9	46260.6	-25789.8	46320.7	9933.3	41870.3	-30551.2	51092.0
107.62	5072.0	46959.4	-27174.9	47487.9	9599.6	42421.4	-32096.4	52419.7
107.72	5411.6	44742.4	-23615.7	45806.0	9644.7	40499.8	-28217.0	50416.8
107.82	4930.8	45441.1	-25000.7	46973.2	9311.1	41050.9	-29762.2	51744.5
107.92	4449.8	46139.9	-26385.8	48140.5	8977.5	41602.0	-31307.4	53072.2
107.13	4810.3	49000.1	-29956.2	48490.1	9690.5	44108.8	-35261.0	53806.0
107.23	4329.4	49698.8	-31341.2	49657.4	9356.9	44659.9	-36806.1	55133.6
107.33	3848.5	50397.6	-32726.3	50824.6	9023.3	45211.0	-38351.3	56461.3
107.43	4188.1	48180.6	-29167.1	49142.7	9068.4	43289.3	-34471.9	54458.5
107.53	3707.2	48879.3	-30552.1	50309.9	8734.8	43840.4	-36017.0	55786.2
107.63	3226.3	49578.1	-31937.2	51477.2	8401.2	44391.5	-37562.2	57113.9
107.73	3566.0	47361.2	-28378.0	49795.2	8446.3	42469.8	-33682.8	55111.0
107.83	3085.1	48059.9	-29763.1	50962.4	8112.7	43020.9	-35228.0	56438.7
107.93	2604.2	48758.6	-31148.2	52129.7	7779.0	43572.0	-36773.2	57766.4

TABLE IX (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 107

PYLON LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON B-52B)

CONFIGURATION 1.0 WITH FINS

COND. NO.			CASE 1 AND 2			
	S1 POUNDS	S2 POUNDS	S3 POUNDS	S4 POUNDS	D3 POUNDS	D4 POUNDS
107.11	-8796.1	-8796.1	-3178.4	-3178.4	-1848.4	-1848.4
107.21	-8796.1	-8796.1	-3178.4	-3178.4	-1848.4	-1848.4
107.31	-8796.1	-8796.1	-3178.4	-3178.4	-1848.4	-1848.4
107.41	-8530.8	-8530.8	-3443.8	-3443.8	-1848.4	-1848.4
107.51	-8530.8	-8530.8	-3443.8	-3443.8	-1848.4	-1848.4
107.61	-8530.8	-8530.8	-3443.8	-3443.8	-1848.4	-1848.4
107.71	-8265.4	-8265.4	-3709.2	-3709.2	-1848.4	-1848.4
107.81	-8265.4	-8265.4	-3709.2	-3709.2	-1848.4	-1848.4
107.91	-8265.4	-8265.4	-3709.2	-3709.2	-1848.4	-1848.4
107.12	-7829.3	-7829.3	-6238.7	-6238.7	-1848.4	-1848.4
107.22	-7829.3	-7829.3	-6238.7	-6238.7	-1848.4	-1848.4
107.32	-7829.3	-7829.3	-6238.7	-6238.7	-1848.4	-1848.4
107.42	-7564.0	-7564.0	-6504.1	-6504.1	-1848.4	-1848.4
107.52	-7564.0	-7564.0	-6504.1	-6504.1	-1848.4	-1848.4
107.62	-7564.0	-7564.0	-6504.1	-6504.1	-1848.4	-1848.4
107.72	-7298.6	-7298.6	-6769.5	-6769.5	-1848.4	-1848.4
107.82	-7298.6	-7298.6	-6769.5	-6769.5	-1848.4	-1848.4
107.92	-7298.6	-7298.6	-6769.5	-6769.5	-1848.4	-1848.4
107.13	-6862.5	-6862.5	-9299.1	-9299.1	-1848.4	-1848.4
107.23	-6862.5	-6862.5	-9299.1	-9299.1	-1848.4	-1848.4
107.33	-6862.5	-6862.5	-9299.1	-9299.1	-1848.4	-1848.4
107.43	-6597.2	-6597.2	-9564.4	-9564.4	-1848.4	-1848.4
107.53	-6597.2	-6597.2	-9564.4	-9564.4	-1848.4	-1848.4
107.63	-6597.2	-6597.2	-9564.4	-9564.4	-1848.4	-1848.4
107.73	-6331.8	-6331.8	-9829.8	-9829.8	-1848.4	-1848.4
107.83	-6331.8	-6331.8	-9829.8	-9829.8	-1848.4	-1848.4
107.93	-6331.8	-6331.8	-9829.8	-9829.8	-1848.4	-1848.4

TABLE IX (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 107

INERTIA AND AIRLOADS - ULTIMATE

INERTIA LOADS - PLUS FWD, LEFT AND DOWN
AIRLOAD FORCES - PLUS AFT, RIGHT AND UP
AIRLOAD MOMENTS - PLUS NOSE UP AND NOSE RIGHT

CONFIGURATION 1.0 WITH FINS

COND. NO.	PNX FWD. POUNDS	PNY LEFT POUNDS	PNZ DOWN POUNDS	PX AFT POUNDS	PY RIGHT POUNDS	PZ UP POUNDS	MY NOSE UP INCH-LBS.	MZ NOSE RIGHT INCH-LBS.
107.11	0.0	27440.0	73500.0	3696.7	4146.1	2910.6	-6.497577E 05	-5.590054E 05
107.21	0.0	27440.0	73500.0	3696.7	4146.1	2910.6	-6.497577E 05	-5.590054E 05
107.31	0.0	27440.0	73500.0	3696.7	4146.1	2910.6	-6.497577E 05	-5.590054E 05
107.41	0.0	27440.0	73500.0	3696.7	4146.1	2910.6	-6.497577E 05	-5.590054E 05
107.51	0.0	27440.0	73500.0	3696.7	4146.1	2910.6	-6.497577E 05	-5.590054E 05
107.61	0.0	27440.0	73500.0	3696.7	4146.1	2910.6	-6.497577E 05	-5.590054E 05
107.71	0.0	27440.0	73500.0	3696.7	4146.1	2910.6	-6.497577E 05	-5.590054E 05
107.81	0.0	27440.0	73500.0	3696.7	4146.1	2910.6	-6.497577E 05	-5.590054E 05
107.91	0.0	27440.0	73500.0	3696.7	4146.1	2910.6	-6.497577E 05	-5.590054E 05
107.12	0.0	27440.0	73500.0	3696.7	-40.9	2910.6	-6.497577E 05	1.520952E 04
107.22	0.0	27440.0	73500.0	3696.7	-40.9	2910.6	-6.497577E 05	1.520952E 04
107.32	0.0	27440.0	73500.0	3696.7	-40.9	2910.6	-6.497577E 05	1.520952E 04
107.42	0.0	27440.0	73500.0	3696.7	-40.9	2910.6	-6.497577E 05	1.520952E 04
107.52	0.0	27440.0	73500.0	3696.7	-40.9	2910.6	-6.497577E 05	1.520952E 04
107.62	0.0	27440.0	73500.0	3696.7	-40.9	2910.6	-6.497577E 05	1.520952E 04
107.72	0.0	27440.0	73500.0	3696.7	-40.9	2910.6	-6.497577E 05	1.520952E 04
107.82	0.0	27440.0	73500.0	3696.7	-40.9	2910.6	-6.497577E 05	1.520952E 04
107.92	0.0	27440.0	73500.0	3696.7	-40.9	2910.6	-6.497577E 05	1.520952E 04
107.13	0.0	27440.0	73500.0	3696.7	-4228.0	2910.6	-6.497577E 05	5.894247E 05
107.23	0.0	27440.0	73500.0	3696.7	-4228.0	2910.6	-6.497577E 05	5.894247E 05
107.33	0.0	27440.0	73500.0	3696.7	-4228.0	2910.6	-6.497577E 05	5.894247E 05
107.43	0.0	27440.0	73500.0	3696.7	-4228.0	2910.6	-6.497577E 05	5.894247E 05
107.53	0.0	27440.0	73500.0	3696.7	-4228.0	2910.6	-6.497577E 05	5.894247E 05
107.63	0.0	27440.0	73500.0	3696.7	-4228.0	2910.6	-6.497577E 05	5.894247E 05
107.73	0.0	27440.0	73500.0	3696.7	-4228.0	2910.6	-6.497577E 05	5.894247E 05
107.83	0.0	27440.0	73500.0	3696.7	-4228.0	2910.6	-6.497577E 05	5.894247E 05
107.93	0.0	27440.0	73500.0	3696.7	-4228.0	2910.6	-6.497577E 05	5.894247E 05

TABLE IX (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 107

PYLON HOOK LOADS - AERODYNAMIC CONSIDERATIONS

CONFIGURATION 1.0 WITH FINS

COND. NO.	RHO SLUGS/FT**3	VELOCITY KEAS	XCP INCHES	YCP INCHES	ZCP INCHES	ALPHA DEGREES	BETA DEGREES
107.11	0.0023769	143.775	170.210	0.000	-26.000	14.000	-12.980
107.21	0.0023769	143.775	170.210	0.000	-26.000	14.000	-12.980
107.31	0.0023769	143.775	170.210	0.000	-26.000	14.000	-12.980
107.41	0.0023769	143.775	170.210	0.000	-26.000	14.000	-12.980
107.51	0.0023769	143.775	170.210	0.000	-26.000	14.000	-12.980
107.61	0.0023769	143.775	170.210	0.000	-26.000	14.000	-12.980
107.71	0.0023769	143.775	170.210	0.000	-26.000	14.000	-12.980
107.81	0.0023769	143.775	170.210	0.000	-26.000	14.000	-12.980
107.91	0.0023769	143.775	170.210	0.000	-26.000	14.000	-12.980
107.12	0.0023769	143.775	170.210	0.000	-26.000	14.000	0.000
107.22	0.0023769	143.775	170.210	0.000	-26.000	14.000	0.000
107.32	0.0023769	143.775	170.210	0.000	-26.000	14.000	0.000
107.42	0.0023769	143.775	170.210	0.000	-26.000	14.000	0.000
107.52	0.0023769	143.775	170.210	0.000	-26.000	14.000	0.000
107.62	0.0023769	143.775	170.210	0.000	-26.000	14.000	0.000
107.72	0.0023769	143.775	170.210	0.000	-26.000	14.000	0.000
107.82	0.0023769	143.775	170.210	0.000	-26.000	14.000	0.000
107.92	0.0023769	143.775	170.210	0.000	-26.000	14.000	0.000
107.13	0.0023769	143.775	170.210	0.000	-26.000	14.000	12.980
107.23	0.0023769	143.775	170.210	0.000	-26.000	14.000	12.980
107.33	0.0023769	143.775	170.210	0.000	-26.000	14.000	12.980
107.43	0.0023769	143.775	170.210	0.000	-26.000	14.000	12.980
107.53	0.0023769	143.775	170.210	0.000	-26.000	14.000	12.980
107.63	0.0023769	143.775	170.210	0.000	-26.000	14.000	12.980
107.73	0.0023769	143.775	170.210	0.000	-26.000	14.000	12.980
107.83	0.0023769	143.775	170.210	0.000	-26.000	14.000	12.980
107.93	0.0023769	143.775	170.210	0.000	-26.000	14.000	12.980

TABLE IX (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 107

PYLON HOOK LOADS - INERTIA CONSIDERATIONS

CONFIGURATION 1.0 WITH FINS

COND. NO.	DTV WT. POUNDS	ULTIMATE LOAD FACTOR NX	NY	NZ	XCG INCHES	YCG INCHES	ZCG INCHES
107.11	49000.0	0.00	0.56	1.50	167.560	-0.650	-27.350
107.21	49000.0	0.00	0.56	1.50	167.560	0.000	-27.350
107.31	49000.0	0.00	0.56	1.50	167.560	0.650	-27.350
107.41	49000.0	0.00	0.56	1.50	170.210	-0.650	-27.350
107.51	49000.0	0.00	0.56	1.50	170.210	0.000	-27.350
107.61	49000.0	0.00	0.56	1.50	170.210	0.650	-27.350
107.71	49000.0	0.00	0.56	1.50	172.860	-0.650	-27.350
107.81	49000.0	0.00	0.56	1.50	172.860	0.000	-27.350
107.91	49000.0	0.00	0.56	1.50	172.860	0.650	-27.350
107.12	49000.0	0.00	0.56	1.50	167.560	-0.650	-27.350
107.22	49000.0	0.00	0.56	1.50	167.560	0.000	-27.350
107.32	49000.0	0.00	0.56	1.50	167.560	0.650	-27.350
107.42	49000.0	0.00	0.56	1.50	170.210	-0.650	-27.350
107.52	49000.0	0.00	0.56	1.50	170.210	0.000	-27.350
107.62	49000.0	0.00	0.56	1.50	170.210	0.650	-27.350
107.72	49000.0	0.00	0.56	1.50	172.860	-0.650	-27.350
107.82	49000.0	0.00	0.56	1.50	172.860	0.000	-27.350
107.92	49000.0	0.00	0.56	1.50	172.860	0.650	-27.350
107.13	49000.0	0.00	0.56	1.50	167.560	-0.650	-27.350
107.23	49000.0	0.00	0.56	1.50	167.560	0.000	-27.350
107.33	49000.0	0.00	0.56	1.50	167.560	0.650	-27.350
107.43	49000.0	0.00	0.56	1.50	170.210	-0.650	-27.350
107.53	49000.0	0.00	0.56	1.50	170.210	0.000	-27.350
107.63	49000.0	0.00	0.56	1.50	170.210	0.650	-27.350
107.73	49000.0	0.00	0.56	1.50	172.860	-0.650	-27.350
107.83	49000.0	0.00	0.56	1.50	172.860	0.000	-27.350
107.93	49000.0	0.00	0.56	1.50	172.860	0.650	-27.350

TABLE X
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FLAPS) CONDITION 108

PYLON HOOK LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON DTV)

CONFIGURATION 1.0 WITH FINS

COND. NO.	VA POUNDS	VBL POUNDS	VBR POUNDS	VCL POUNDS	VCR POUNDS	DCL POUNDS	DCR POUNDS	SA POUNDS	SCL POUNDS
108.11	-22490.3	-18914.1	-31317.7	0.0	0.0	7578.8	4510.4	10338.4	9661.2
108.21	-22490.3	-18010.5	-32221.2	0.0	0.0	7578.8	4510.4	10338.4	9661.2
108.31	-22490.3	-17107.0	-33124.8	0.0	0.0	7578.8	4510.4	10338.4	9661.2
108.41	-21567.1	-19477.5	-31677.4	0.0	0.0	7529.8	4559.4	10008.4	9991.3
108.51	-21567.1	-18573.9	-32580.9	0.0	0.0	7529.8	4559.4	10008.4	9991.3
108.61	-21567.1	-17670.3	-33484.5	0.0	0.0	7529.8	4559.4	10008.4	9991.3
108.71	-20644.0	-20040.9	-32037.1	0.0	0.0	7480.8	4608.4	9678.3	10321.4
108.81	-20644.0	-19137.3	-32940.6	0.0	0.0	7480.8	4608.4	9678.3	10321.4
108.91	-20644.0	-18233.7	-33844.2	0.0	0.0	7480.8	4608.4	9678.3	10321.4
108.12	-22490.3	-18506.4	-31725.4	0.0	0.0	7189.2	4899.9	7713.3	19860.5
108.22	-22490.3	-17602.8	-32628.9	0.0	0.0	7189.2	4899.9	7713.3	19860.5
108.32	-22490.3	-16699.2	-33532.5	0.0	0.0	7189.2	4899.9	7713.3	19860.5
108.42	-21567.1	-19069.7	-32085.1	0.0	0.0	7140.2	4948.9	7383.2	20190.6
108.52	-21567.1	-18166.2	-32988.7	0.0	0.0	7140.2	4948.9	7383.2	20190.6
108.62	-21567.1	-17262.6	-33892.2	0.0	0.0	7140.2	4948.9	7383.2	20190.6
108.72	-20644.0	-19633.1	-32444.8	0.0	0.0	7091.3	4997.9	7053.1	20520.7
108.82	-20644.0	-18729.6	-33348.4	0.0	0.0	7091.3	4997.9	7053.1	20520.7
108.92	-20644.0	-17826.0	-34252.0	0.0	0.0	7091.3	4997.9	7053.1	20520.7
108.13	-22490.3	-18098.6	-32133.1	0.0	0.0	6799.7	5289.5	5088.2	30059.9
108.23	-22490.3	-17195.1	-33036.6	0.0	0.0	6799.7	5289.5	5088.2	30059.9
108.33	-22490.3	-16291.5	-33940.2	0.0	0.0	6799.7	5289.5	5088.2	30059.9
108.43	-21567.1	-18662.0	-32492.8	0.0	0.0	6750.7	5338.5	4758.1	30389.9
108.53	-21567.1	-17758.5	-33396.4	0.0	0.0	6750.7	5338.5	4758.1	30389.9
108.63	-21567.1	-16854.9	-34299.9	0.0	0.0	6750.7	5338.5	4758.1	30389.9
108.73	-20644.0	-19225.4	-32852.5	0.0	0.0	6701.7	5387.5	4428.0	30720.0
108.83	-20644.0	-18321.9	-33756.1	0.0	0.0	6701.7	5387.5	4428.0	30720.0
108.93	-20644.0	-17418.3	-34659.7	0.0	0.0	6701.7	5387.5	4428.0	30720.0

TABLE X (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 108

PYLON LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON B-52B)

CONFIGURATION 1.0 WITH FINS

COND.	CASE 1				CASE 2			
NO.	V1 POUNDS	V2 POUNDS	V3 POUNDS	V4 POUNDS	V1 POUNDS	V2 POUNDS	V3 POUNDS	V4 POUNDS
108.11	9675.1	41349.3	-15336.8	38789.5	12751.8	38265.6	-18681.2	42140.8
108.21	9194.2	42048.0	-16721.9	39956.7	12418.2	38816.7	-20226.3	43468.5
108.31	8713.3	42746.7	-18106.9	41124.0	12084.5	39367.8	-21771.5	44796.2
108.41	9052.9	40529.8	-14547.7	39442.0	12129.6	37446.1	-17892.1	42793.3
108.51	8572.0	41228.5	-15932.8	40609.3	11796.0	37997.2	-19437.2	44121.0
108.61	8091.1	41927.3	-17317.9	41776.5	11462.4	38548.3	-20982.4	45448.7
108.71	8430.8	39710.4	-13758.7	40094.6	11507.5	36626.7	-17103.0	43445.9
108.81	7949.9	40409.1	-15143.7	41261.8	11173.9	37177.8	-18648.2	44773.5
108.91	7469.0	41107.8	-16528.8	42429.1	10840.3	37728.9	-20193.3	46101.2
108.12	6336.3	46086.5	-23951.7	46005.9	10583.8	41829.4	-28568.6	50632.4
108.22	5855.4	46785.2	-25336.7	47173.1	10250.2	42380.5	-30113.8	51960.1
108.32	5374.5	47483.9	-26721.8	48340.4	9916.6	42931.6	-31659.0	53287.8
108.42	5714.2	45267.0	-23162.6	46658.4	9961.7	41009.9	-27779.5	51285.0
108.52	5233.3	45965.7	-24547.7	47825.7	9628.0	41561.0	-29324.7	52612.6
108.62	4752.4	46664.5	-25932.8	48992.9	9294.4	42112.1	-30869.9	53940.3
108.72	5092.1	44447.5	-22373.6	47311.0	9339.5	40190.5	-26990.5	51937.5
108.82	4611.2	45146.3	-23758.6	48478.2	9005.9	40741.6	-28535.6	53265.2
108.92	4130.3	45845.0	-25143.7	49645.5	8672.3	41292.7	-30080.8	54592.9
108.13	2997.6	50823.7	-32566.5	53222.3	8415.8	45393.2	-38456.0	59124.0
108.23	2516.7	51522.4	-33951.6	54389.5	8082.2	45944.3	-40001.2	60451.7
108.33	2035.8	52221.1	-35336.7	55556.8	7748.6	46495.4	-41546.4	61779.4
108.43	2375.5	50004.2	-31777.5	53874.8	7793.7	44573.7	-37667.0	59776.6
108.53	1894.6	50702.9	-33162.5	55042.0	7460.1	45124.8	-39212.1	61104.2
108.63	1413.7	51401.6	-34547.6	56209.3	7126.4	45675.9	-40757.3	62431.9
108.73	1753.4	49184.7	-30988.4	54527.3	7171.5	43754.3	-36877.9	60429.1
108.83	1272.5	49883.4	-32373.4	55694.6	6837.9	44305.3	-38423.0	61756.7
108.93	791.6	50582.2	-33758.5	56861.8	6504.3	44856.5	-39968.2	63084.4

TABLE X (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 108

PYLON LOADS - ULTIMATE

PLUS LOADS - UP, AFT, LEFT (REVERSE SIGN FOR LOADS ON B-52B)

CONFIGURATION 1.0 WITH FINS

COND. NO.	CASE 1 AND 2					
	S1 POUNDS	S2 POUNDS	S3 POUNDS	S4 POUNDS	D3 POUNDS	D4 POUNDS
108.11	-9456.7	-9456.7	-870.7	-870.7	-6044.6	-6044.6
108.21	-9456.7	-9456.7	-870.7	-870.7	-6044.6	-6044.6
108.31	-9456.7	-9456.7	-870.7	-870.7	-6044.6	-6044.6
108.41	-9191.3	-9191.3	-1136.1	-1136.1	-6044.6	-6044.6
108.51	-9191.3	-9191.3	-1136.1	-1136.1	-6044.6	-6044.6
108.61	-9191.3	-9191.3	-1136.1	-1136.1	-6044.6	-6044.6
108.71	-8926.0	-8926.0	-1401.5	-1401.5	-6044.6	-6044.6
108.81	-8926.0	-8926.0	-1401.5	-1401.5	-6044.6	-6044.6
108.91	-8926.0	-8926.0	-1401.5	-1401.5	-6044.6	-6044.6
108.12	-7707.8	-7707.8	-6406.7	-6406.7	-6044.6	-6044.6
108.22	-7707.8	-7707.8	-6406.7	-6406.7	-6044.6	-6044.6
108.32	-7707.8	-7707.8	-6406.7	-6406.7	-6044.6	-6044.6
108.42	-7442.4	-7442.4	-6672.1	-6672.1	-6044.6	-6044.6
108.52	-7442.4	-7442.4	-6672.1	-6672.1	-6044.6	-6044.6
108.62	-7442.4	-7442.4	-6672.1	-6672.1	-6044.6	-6044.6
108.72	-7177.1	-7177.1	-6937.4	-6937.4	-6044.6	-6044.6
108.82	-7177.1	-7177.1	-6937.4	-6937.4	-6044.6	-6044.6
108.92	-7177.1	-7177.1	-6937.4	-6937.4	-6044.6	-6044.6
108.13	-5958.9	-5958.9	-11942.7	-11942.7	-6044.6	-6044.6
108.23	-5958.9	-5958.9	-11942.7	-11942.7	-6044.6	-6044.6
108.33	-5958.9	-5958.9	-11942.7	-11942.7	-6044.6	-6044.6
108.43	-5693.5	-5693.5	-12208.1	-12208.1	-6044.6	-6044.6
108.53	-5693.5	-5693.5	-12208.1	-12208.1	-6044.6	-6044.6
108.63	-5693.5	-5693.5	-12208.1	-12208.1	-6044.6	-6044.6
108.73	-5428.2	-5428.2	-12473.4	-12473.4	-6044.6	-6044.6
108.83	-5428.2	-5428.2	-12473.4	-12473.4	-6044.6	-6044.6
108.93	-5428.2	-5428.2	-12473.4	-12473.4	-6044.6	-6044.6

TABLE X (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 108

INERTIA AND AIRLOADS - ULTIMATE

INERTIA LOADS - PLUS FWD, LEFT AND DOWN
AIRLOAD FORCES - PLUS AFT, RIGHT AND UP
AIRLOAD MOMENTS - PLUS NOSE UP AND NOSE RIGHT

CONFIGURATION 1.0 WITH FINS

COND. NO.	PNX FWD. POUNDS	PNY LEFT POUNDS	PNZ DOWN POUNDS	PX AFT POUNDS	PY RIGHT POUNDS	PZ UP POUNDS	MY NOSE UP INCH-LBS.	MZ NOSE RIGHT INCH-LBS.
108.11	0.0	27440.0	73500.0	12089.2	7440.3	778.0	-2.714220E 04	-9.889950E 05
108.21	0.0	27440.0	73500.0	12089.2	7440.3	778.0	-2.714220E 04	-9.889950E 05
108.31	0.0	27440.0	73500.0	12089.2	7440.3	778.0	-2.714220E 04	-9.889950E 05
108.41	0.0	27440.0	73500.0	12089.2	7440.3	778.0	-2.714220E 04	-9.889950E 05
108.51	0.0	27440.0	73500.0	12089.2	7440.3	778.0	-2.714220E 04	-9.889950E 05
108.61	0.0	27440.0	73500.0	12089.2	7440.3	778.0	-2.714220E 04	-9.889950E 05
108.71	0.0	27440.0	73500.0	12089.2	7440.3	778.0	-2.714220E 04	-9.889950E 05
108.81	0.0	27440.0	73500.0	12089.2	7440.3	778.0	-2.714220E 04	-9.889950E 05
108.91	0.0	27440.0	73500.0	12089.2	7440.3	778.0	-2.714220E 04	-9.889950E 05
108.12	0.0	27440.0	73500.0	12089.2	-133.8	778.0	-2.714220E 04	4.973878E 04
108.22	0.0	27440.0	73500.0	12089.2	-133.8	778.0	-2.714220E 04	4.973878E 04
108.32	0.0	27440.0	73500.0	12089.2	-133.8	778.0	-2.714220E 04	4.973878E 04
108.42	0.0	27440.0	73500.0	12089.2	-133.8	778.0	-2.714220E 04	4.973878E 04
108.52	0.0	27440.0	73500.0	12089.2	-133.8	778.0	-2.714220E 04	4.973878E 04
108.62	0.0	27440.0	73500.0	12089.2	-133.8	778.0	-2.714220E 04	4.973878E 04
108.72	0.0	27440.0	73500.0	12089.2	-133.8	778.0	-2.714220E 04	4.973878E 04
108.82	0.0	27440.0	73500.0	12089.2	-133.8	778.0	-2.714220E 04	4.973878E 04
108.92	0.0	27440.0	73500.0	12089.2	-133.8	778.0	-2.714220E 04	4.973878E 04
108.13	0.0	27440.0	73500.0	12089.2	-7708.0	778.0	-2.714220E 04	1.088472E 06
108.23	0.0	27440.0	73500.0	12089.2	-7708.0	778.0	-2.714220E 04	1.088472E 06
108.33	0.0	27440.0	73500.0	12089.2	-7708.0	778.0	-2.714220E 04	1.088472E 06
108.43	0.0	27440.0	73500.0	12089.2	-7708.0	778.0	-2.714220E 04	1.088472E 06
108.53	0.0	27440.0	73500.0	12089.2	-7708.0	778.0	-2.714220E 04	1.088472E 06
108.63	0.0	27440.0	73500.0	12089.2	-7708.0	778.0	-2.714220E 04	1.088472E 06
108.73	0.0	27440.0	73500.0	12089.2	-7708.0	778.0	-2.714220E 04	1.088472E 06
108.83	0.0	27440.0	73500.0	12089.2	-7708.0	778.0	-2.714220E 04	1.088472E 06
108.93	0.0	27440.0	73500.0	12089.2	-7708.0	778.0	-2.714220E 04	1.088472E 06

TABLE X (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 108

PYLON HOOK LOADS - AERODYNAMIC CONSIDERATIONS

CONFIGURATION 1.0 WITH FINS

COND. NO.	RHO SLUGS/FT**3	VELOCITY KEAS	XCP INCHES	YCP INCHES	ZCP INCHES	ALPHA DEGREES	BETA DEGREES
108.11	0.0023769	260.000	170.210	0.000	-26.000	-0.500	-7.180
108.21	0.0023769	260.000	170.210	0.000	-26.000	-0.500	-7.180
108.31	0.0023769	260.000	170.210	0.000	-26.000	-0.500	-7.180
108.41	0.0023769	260.000	170.210	0.000	-26.000	-0.500	-7.180
108.51	0.0023769	260.000	170.210	0.000	-26.000	-0.500	-7.180
108.61	0.0023769	260.000	170.210	0.000	-26.000	-0.500	-7.180
108.71	0.0023769	260.000	170.210	0.000	-26.000	-0.500	-7.180
108.81	0.0023769	260.000	170.210	0.000	-26.000	-0.500	-7.180
108.91	0.0023769	260.000	170.210	0.000	-26.000	-0.500	-7.180
108.12	0.0023769	260.000	170.210	0.000	-26.000	-0.500	0.000
108.22	0.0023769	260.000	170.210	0.000	-26.000	-0.500	0.000
108.32	0.0023769	260.000	170.210	0.000	-26.000	-0.500	0.000
108.42	0.0023769	260.000	170.210	0.000	-26.000	-0.500	0.000
108.52	0.0023769	260.000	170.210	0.000	-26.000	-0.500	0.000
108.62	0.0023769	260.000	170.210	0.000	-26.000	-0.500	0.000
108.72	0.0023769	260.000	170.210	0.000	-26.000	-0.500	0.000
108.82	0.0023769	260.000	170.210	0.000	-26.000	-0.500	0.000
108.92	0.0023769	260.000	170.210	0.000	-26.000	-0.500	0.000
108.13	0.0023769	260.000	170.210	0.000	-26.000	-0.500	7.180
108.23	0.0023769	260.000	170.210	0.000	-26.000	-0.500	7.180
108.33	0.0023769	260.000	170.210	0.000	-26.000	-0.500	7.180
108.43	0.0023769	260.000	170.210	0.000	-26.000	-0.500	7.180
108.53	0.0023769	260.000	170.210	0.000	-26.000	-0.500	7.180
108.63	0.0023769	260.000	170.210	0.000	-26.000	-0.500	7.180
108.73	0.0023769	260.000	170.210	0.000	-26.000	-0.500	7.180
108.83	0.0023769	260.000	170.210	0.000	-26.000	-0.500	7.180
108.93	0.0023769	260.000	170.210	0.000	-26.000	-0.500	7.180

TABLE X (CONTINUED)
PYLON LOADS (ULTIMATE) - METHOD 2
CONFIGURATION 1 (WITH FINS) CONDITION 108

PYLON HOOK LOADS - INERTIA CONSIDERATIONS

CONFIGURATION 1.0 WITH FINS

COND. NO.	DTV WT. POUNDS	ULTIMATE LOAD FACTOR NX	NY	NZ	XCG INCHES	YCG INCHES	ZCG INCHES
108.11	49000.0	0.00	0.56	1.50	167.560	-0.650	-27.350
108.21	49000.0	0.00	0.56	1.50	167.560	0.000	-27.350
108.31	49000.0	0.00	0.56	1.50	167.560	0.650	-27.350
108.41	49000.0	0.00	0.56	1.50	170.210	-0.650	-27.350
108.51	49000.0	0.00	0.56	1.50	170.210	0.000	-27.350
108.61	49000.0	0.00	0.56	1.50	170.210	0.650	-27.350
108.71	49000.0	0.00	0.56	1.50	172.860	-0.650	-27.350
108.81	49000.0	0.00	0.56	1.50	172.860	0.000	-27.350
108.91	49000.0	0.00	0.56	1.50	172.860	0.650	-27.350
108.12	49000.0	0.00	0.56	1.50	167.560	-0.650	-27.350
108.22	49000.0	0.00	0.56	1.50	167.560	0.000	-27.350
108.32	49000.0	0.00	0.56	1.50	167.560	0.650	-27.350
108.42	49000.0	0.00	0.56	1.50	170.210	-0.650	-27.350
108.52	49000.0	0.00	0.56	1.50	170.210	0.000	-27.350
108.62	49000.0	0.00	0.56	1.50	170.210	0.650	-27.350
108.72	49000.0	0.00	0.56	1.50	172.860	-0.650	-27.350
108.82	49000.0	0.00	0.56	1.50	172.860	0.000	-27.350
108.92	49000.0	0.00	0.56	1.50	172.860	0.650	-27.350
108.13	49000.0	0.00	0.56	1.50	167.560	-0.650	-27.350
108.23	49000.0	0.00	0.56	1.50	167.560	0.000	-27.350
108.33	49000.0	0.00	0.56	1.50	167.560	0.650	-27.350
108.43	49000.0	0.00	0.56	1.50	170.210	-0.650	-27.350
108.53	49000.0	0.00	0.56	1.50	170.210	0.000	-27.350
108.63	49000.0	0.00	0.56	1.50	170.210	0.650	-27.350
108.73	49000.0	0.00	0.56	1.50	172.860	-0.650	-27.350
108.83	49000.0	0.00	0.56	1.50	172.860	0.000	-27.350
108.93	49000.0	0.00	0.56	1.50	172.860	0.650	-27.350

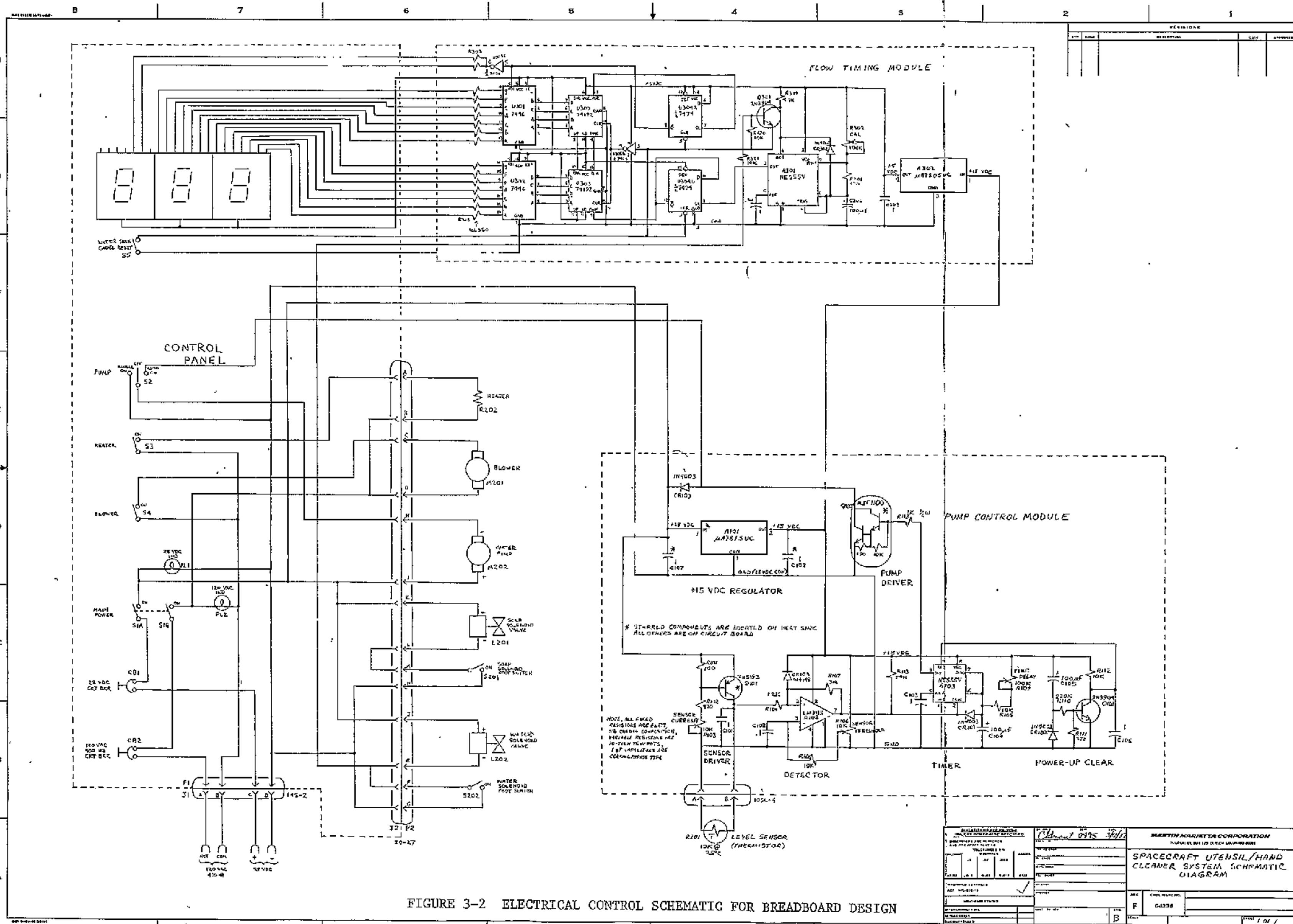

FIGURE 3-2 ELECTRICAL CONTROL SCHEMATIC FOR BREADBOARD DESIGN

FOLDOUT FRAME 1

FOLDOUT FRAME 2

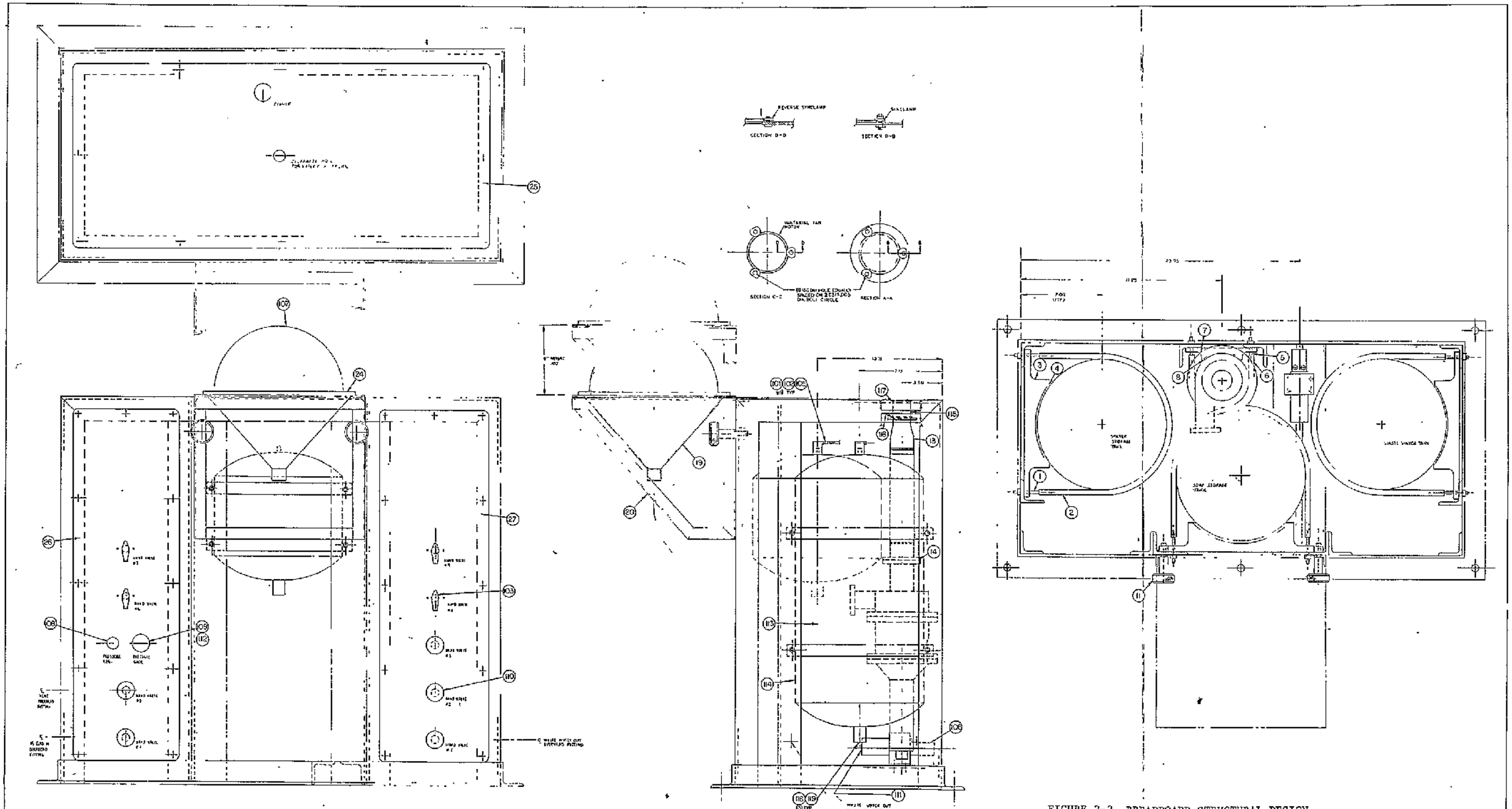

FIGURE 3-3 BREADBOARD STRUCTURAL DESIGN

RES3157010

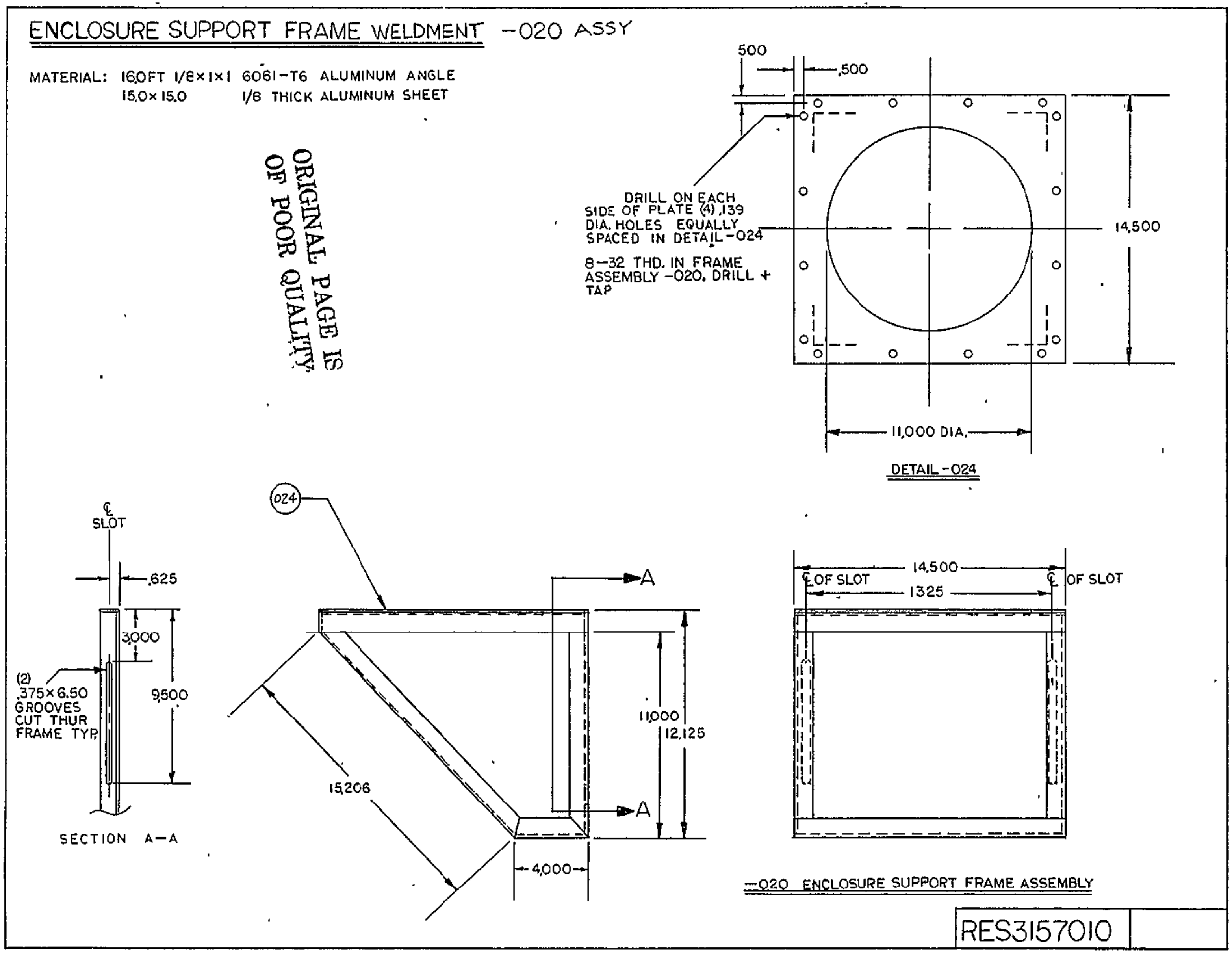

FIGURE 3-4 ENCLOSURE SUPPORT FRAME

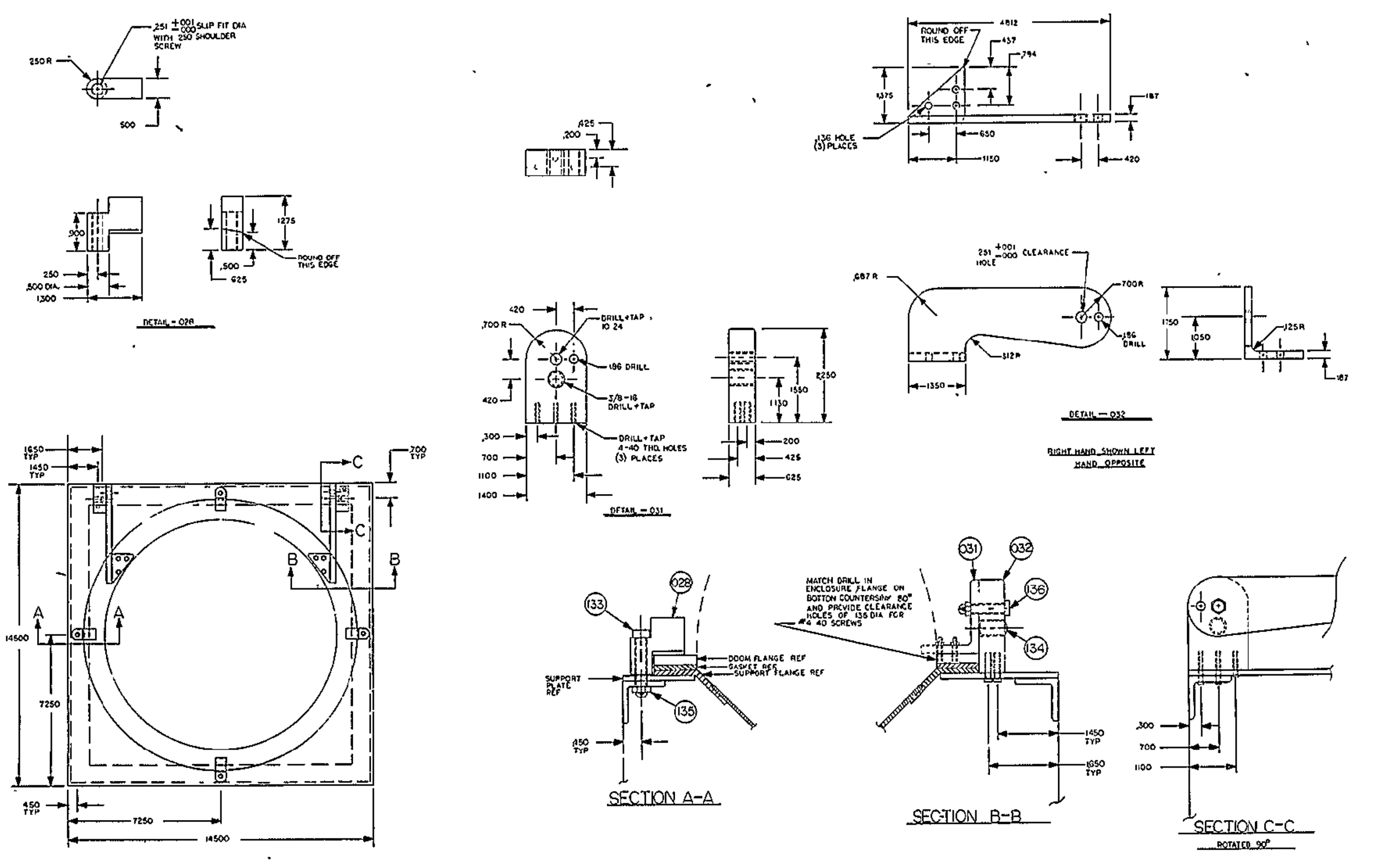

FIGURE 3-5 HINGE AND LATCHING MECHANISMS DETAILS

RES3157010

FOLDOUT FRAME 1

FOLDOUT FRAME 2

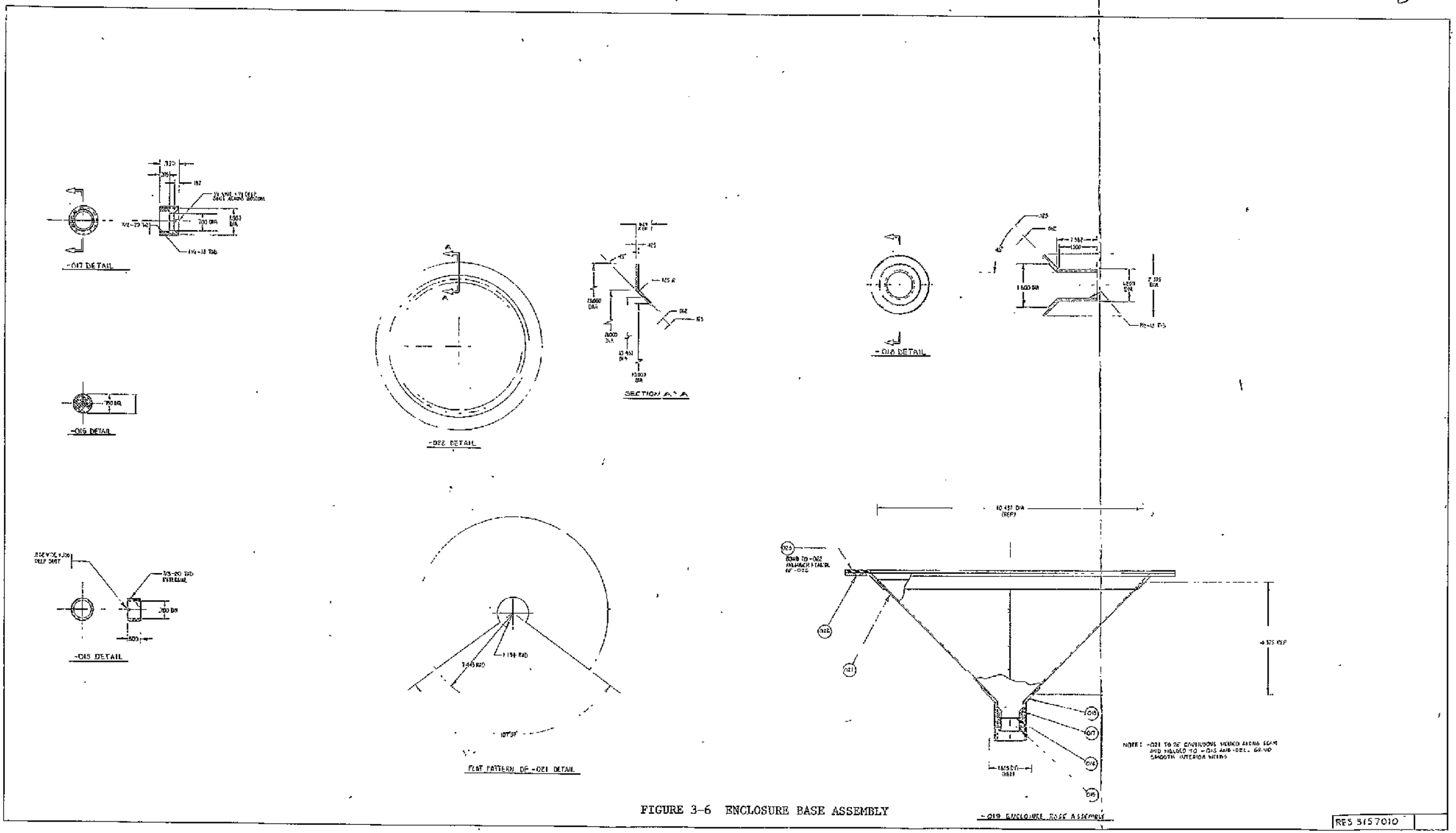

FIGURE 3-6 ENCLOSURE BASE ASSEMBLY

3.1.3 Waste Collection and Processing

The purpose of the waste collection and processing system was to transfer water from the Liquid-Gas Separator (LGS) to the system interface or to the waste water tank where it could be stored. The system consisted of a 6.35 mm (1/4 inch) line system with fluid components. The waste water gear pump had a flow rate of 1.58×10^{-5} m^3/sec (.25 gpm). A check valve and isolation valves were incorporated to allow a pressurize transfer of waste water from the .011 m^3 (2.5 gallon) storage bladder tank to the system interface.

3.1.4 Air Processing

The purpose of this subsystem was to provide a means of moving water by an air purge from the cleansing enclosure to the vortex type liquid-gas separator (LGS). The air purge was provided by an axial vane blower flowing $7.08 \times 10^{-3} m^3$/sec (15 CFM) of air. This allowed a velocity of greater than 1.22 m/sec (40 fps) of air flow in the drain line in order to move water in a zero-gravity environment. The LGS had no moving parts and separated the liquid from the air purge by means of a vortex action within the LGS body. The liquid was collected in the LGS sump and an electronic probe sensed when the sump was full. The sensor activated the water pump which would remain on for a definite period of time (10 sec) to empty the sump.

3.1.5 Soap Distribution

The soap distribution system provided liquid soap to the cleansing enclosure. It consisted of a pressurized soap storage tank and a distribution system. The tank was a bladder type and contained $4.54 \times 10^{-3} m^3$ (1.0 gallons) of betadyne soap. The tank was pressurized to 1.38×10^5 N/m^2 (20 psig) and a solenoid valve allowed soap to flow to the enclosure. The solenoid valve was activated by a foot switch. A fill/drain valve was provided to allow tank servicing.

3.1.6 Pressurization

The pressurization subsystem allowed the potable water, liquid soap, and the waste water tanks to be pressurized or vented as system needs dictated. A pressure regulator and vent valves were provided. The pressure regulator could be adjusted to the operating pressure of 1.38×10^5 N/m^2 (20 psig).

3.1.7 Electrical

The electrical subsystem provided electrical power and control for the various subsystems. Both 120 VAC, 400 Hz and 28 VDC power were utilized. Figure 3-2 showed the schematic and Figure 3-7 shows the electrical control panel layout.

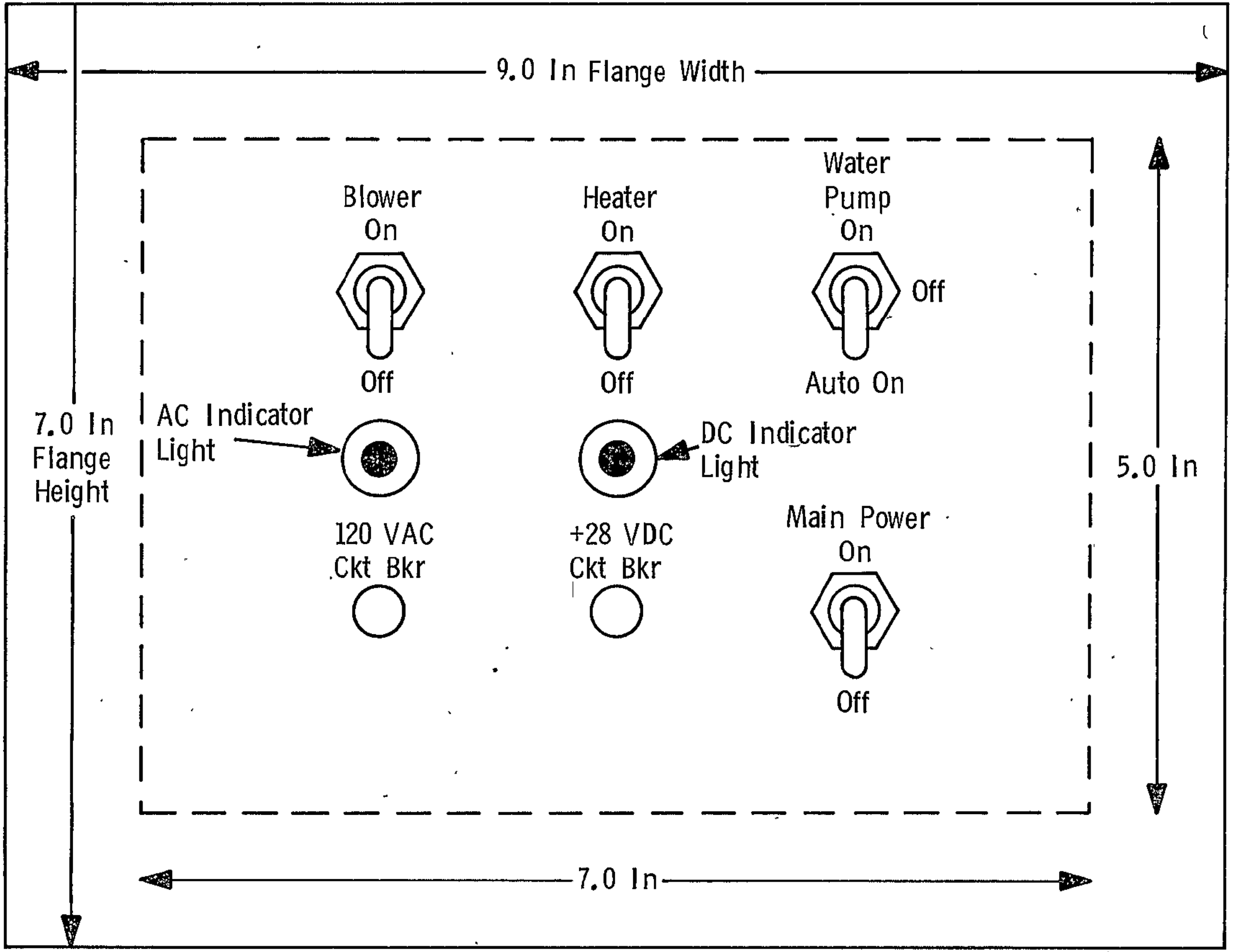

FIGURE 3-7 ELECTRICAL CONTROL PANEL

3.1.8 Structural Support

The structural system supported the cleansing enclosure and the electrical and fluid hardware. It was a 6061-T6 aluminum angle type structure with brackets and panels. The design loading was designed to 3 g's maximum for 1800 sec (30 min) to satisfy KC-135 requirements and 12 g's maximum for crash loading. The unit was designed to be compatible with KC-135 aircraft tie-down interfaces. The structure weldment assembly is shown in Figure 3-8. A foot restraint was provided and incorporated the solenoid activation switches for the water and soap valves. This assembly is shown in Figure 3-9. Two panels were provided (refer to Figure 3-3) for mounting the valves and gages as referenced in the mechanical schematic.

3.2 Breadboard Fabrication

The objective of this portion of the task was to fabricate a breadboard design of the spacecraft utensil/hand cleansig fixture. The assembly was fabricated in Martin Marietta's Engineering Model Shop.

3.2.1 Components and Materials

Table 3-1 lists the parts and material utilized for the fabrication. The item find numbers correspond to the parts and materials identified in the RES3157010 design drawings shown in Section 3-1. Figure 3-10 and 3-11 show the completed breadboard design of the cleansing fixture.

Table 3-1 Parts List for the SUHCF Breadboard Design

Assy No.	Vendor Part Number	Description	Vendor
119	3/4 x 1/8 Galv. Pipe Red.	Ell. (ST) Pipe	M. L. Foss
118	3/4 90° Galv. Pipe ST Ell.	Reducer (Pipe)	M. L. Foss
117	271166	Reverse Servo Clamps	Cramer Den Elec. Inc. (Aximax (1)
116	271167	Servo Clamps	Cramer Den. Elec. Inc. (Aximax (1)
114	WX-103	H_2O Tank	Weldon F. Kite Co. (Well-X-Trol)
113	040031500LT	Flex. Drum Heater	Watlow
112	6532 Lay	Adj. Relief Valve	Ross Equipment Co.
111	6133M2S	Ball Shock Valve	Ross Equipment Co.
110	P3232F2S	Mini. Needle Valve	Ross Equipment Co.
109	J2252	Pressure Gage	Curzon Fluid Power Co. (Wilkerson)
108	R00-01-P00	Pressure Regulator	Curson Fluid Power (Wilkerson)
107	B2LX174	Solenoid Valve	Haskel Eng + Supply Co.
106	12-31-316	Gear Pump w/28 VDC motor	Micro Pump
105	MS B560 B225	(Tygon) Clear Flex Hose	Martin Inv.
104	4953K13	PVC Ball Valve	McMaster-Carr Supply Co.

Figure 3-1 Parts List for the SUHCF Breadboard Design (cont'd)

Assy No.	Vendor Part Number	Description	Vendor
103	42XF2-316	3-Way Ball Valve	Den. Valve & Ftg (Whitey)
102	A-4L8	Hose Connector Sleeve	Den. Valve & Ftg (Cajon)
101	4HC - 1 - 2	Hose Connectors	Den. Valve & Ftg (Cajon)
Part No.	**Size**	**Description**	**Material**
-027	Right Front Panel	1/8 x 10.00"	6061-T6 AL
-026	Left Front Panel	1/8 x 10.00" x 31.00"	6061-T6 AL
-025	Top Framework Panel	1/8 x 17.00" x 37.00"	6061-T AL
-024	Enclosure Support Plate	1/8 x 15.0 x 15.0 Sht	6061-T6 AL
-023	Gasket	1/8THk x 13 1/2 x 13 1/2	Flex Rubber Sheet
-022	Cone Flange	3/4 x 13 1/2 x 13 1/3	S-Steel 300 Series
-021	Cone	.06 x 16 x 16	S-Steel 300 Series
-018	Cone End Piece	2 1/2 Dia RD x 2" Long	S-Steel 300 Series
-017	Screen Housing	1 1/4 RD x 1.00 Long	S-Steel 300 Series
-016	Screen	1.00 x 1.00 x Stk Thk	S-Steel 300 Series
-015	Screen Retainer	1.00 Dia RD x 3/4"L	S-Steel 300 Series
-014	Separator Connection	3.50" Dia. Rod x 2.25	6061-T6 AL
-013	Blower Connection	2.75" Dia. Rod x 3.50	S-Steel 300 Series
-012	Pipe Fitting	.750" x 1.50"	S-Steel 300 Series
-011	Adjustment Screw	1.75" Dia. x 3.50"	S-Steel 300 Series
-008	Rubber Sheet	1/8 x 1.00" x 4.00"	Flex Rubber Sheet
-007	Sep. Support Plate	1.00" x 1.25" x 6.25"	6061-T6 AL
-006	Flixible Tubing	1/2 OD, 1/4 ID x 8.50"	(Tygon) Clear & Flex
-005	U-Clamp	1/4-20 Thd Rod x 11.5"L	Mild Steel
-004	Rubber Sheet	1/8 x 1.00" x 10.00"	Flex. Rubber Sheet
-003	Tank Support Plate	1" x 2.75" x 12.75"	6061-T6 AL
-002	Flexible Tubing	1/2 OD, 1/4 ID x 20.00"	(Tygon) Clear Flex.
-001	U-Clamp	1/4-20Thd Rod x 24"L	Mild Steel

FOLDOUT FRAME

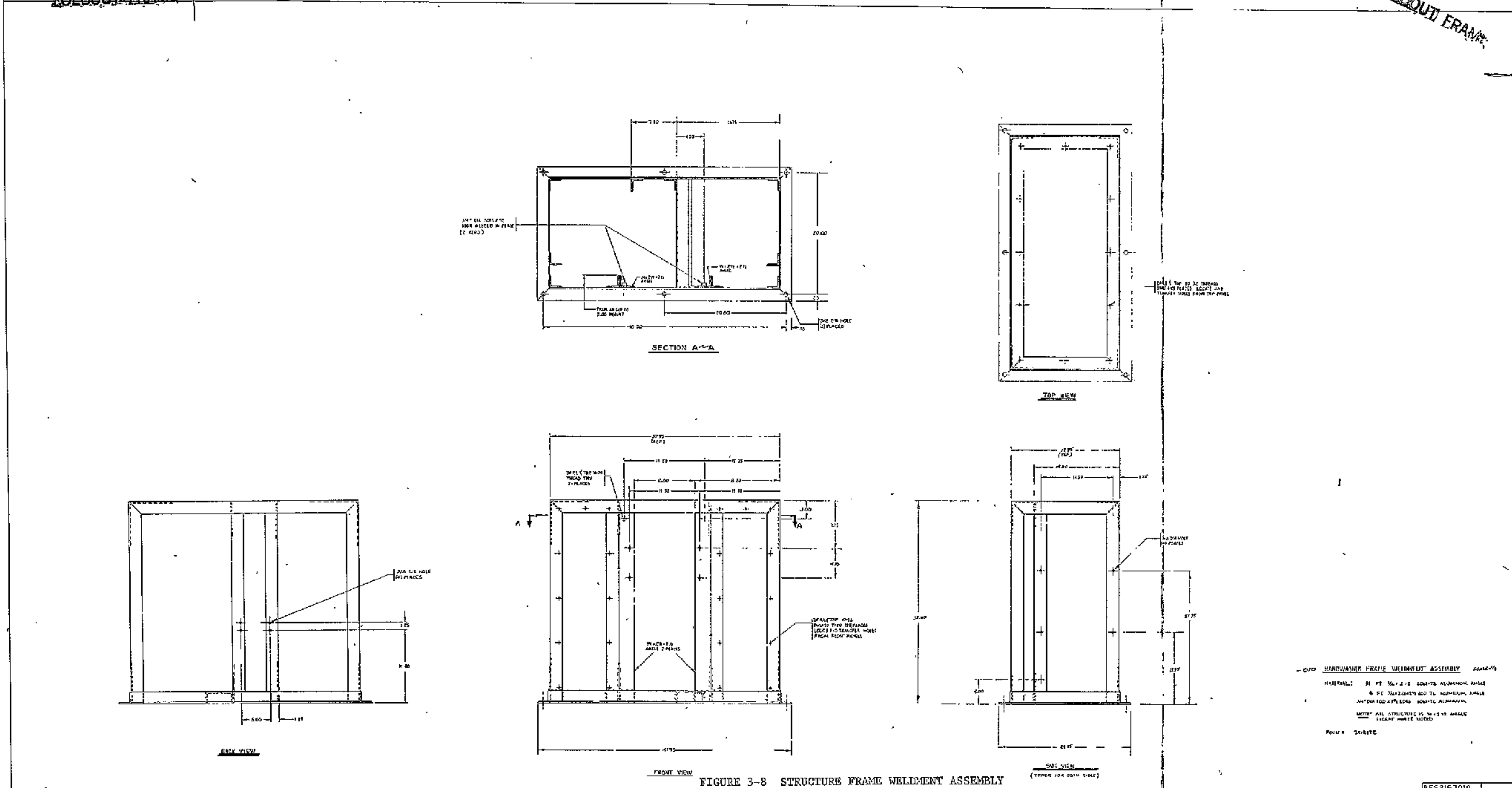

FIGURE 3-8 STRUCTURE FRAME WELDMENT ASSEMBLY

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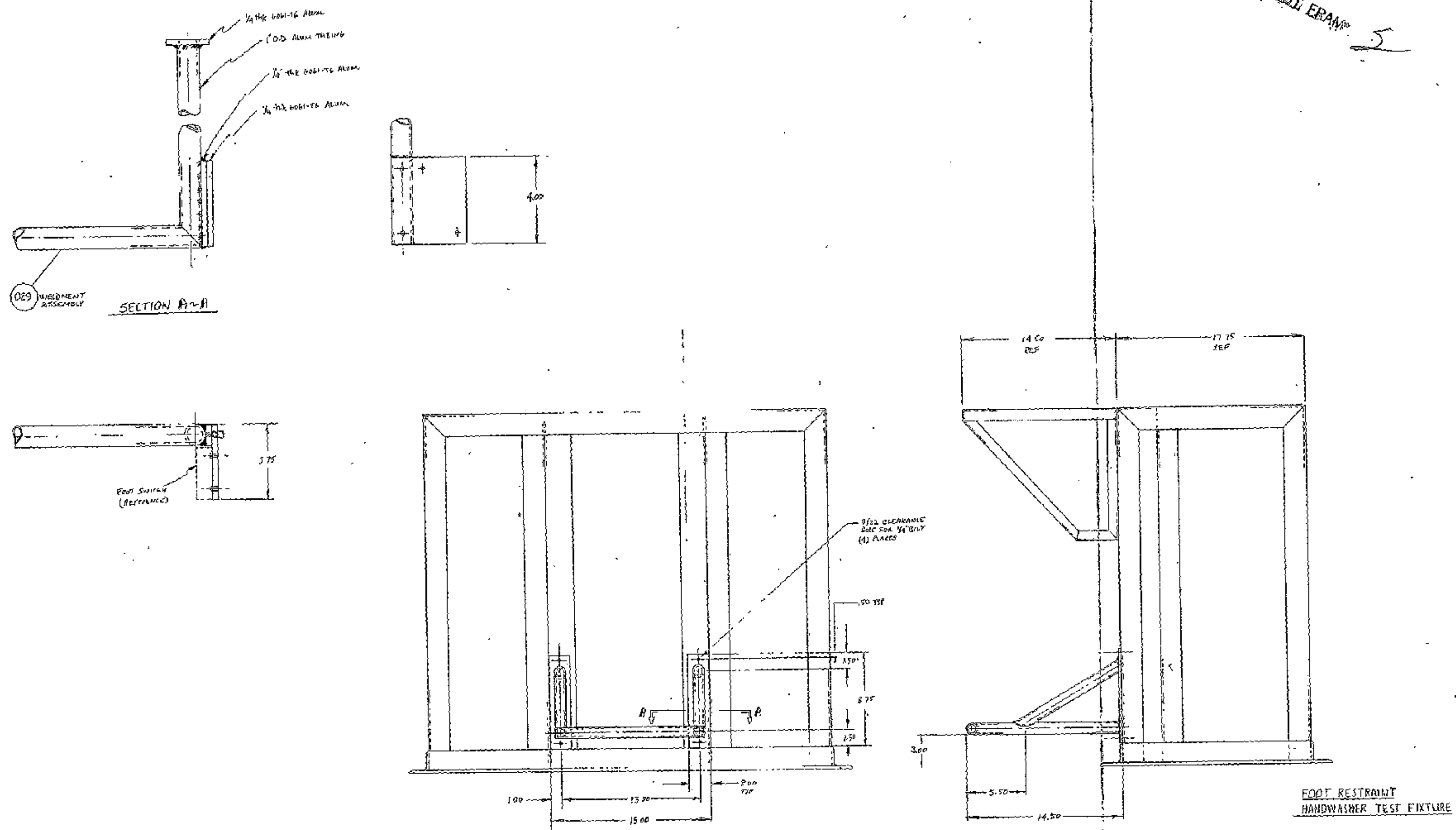
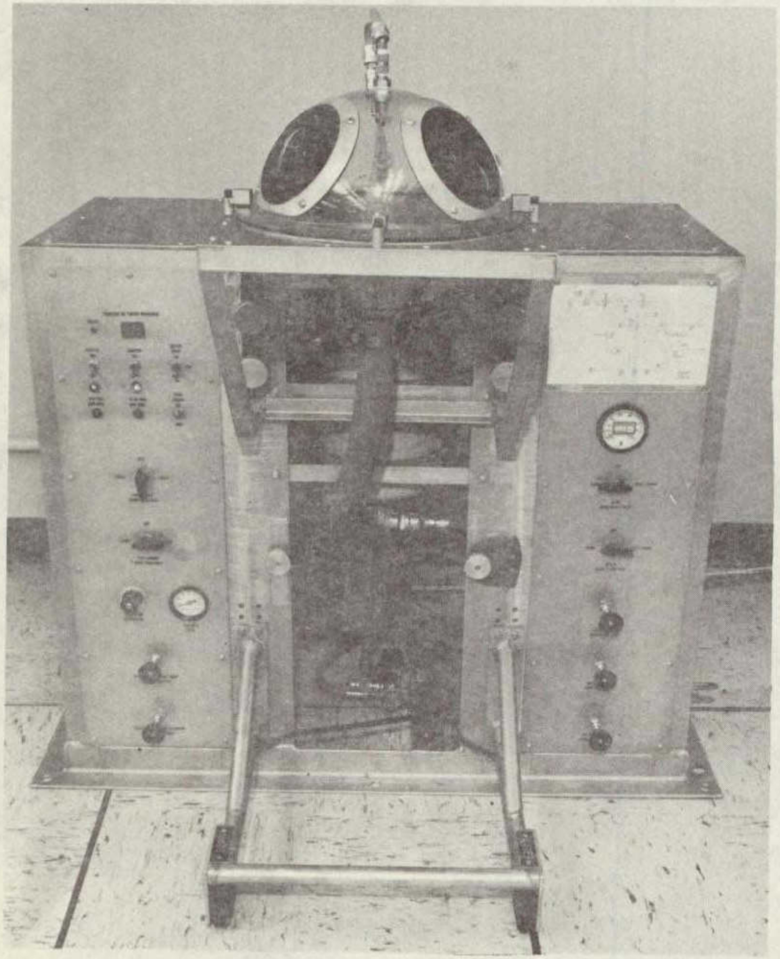
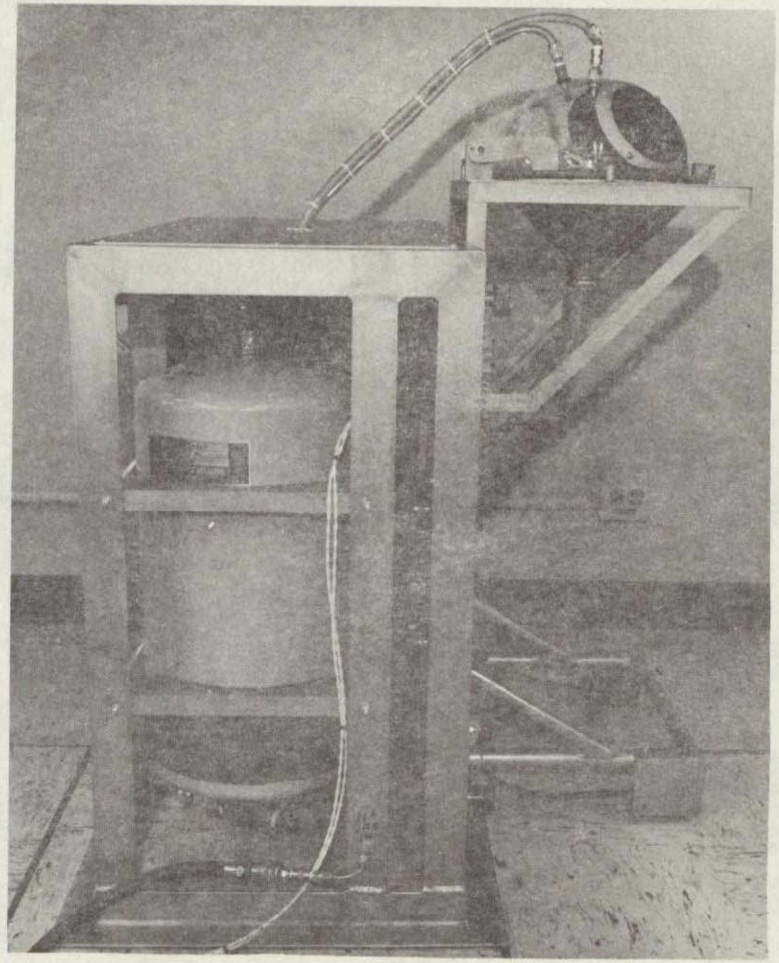


FIGURE 3-9 HANDWASHER FOOT RESTRAINT



Front View



Side View

FIGURE 3-10 SPACECRAFT UTENSIL/HAND CLEANSING FIXTURE

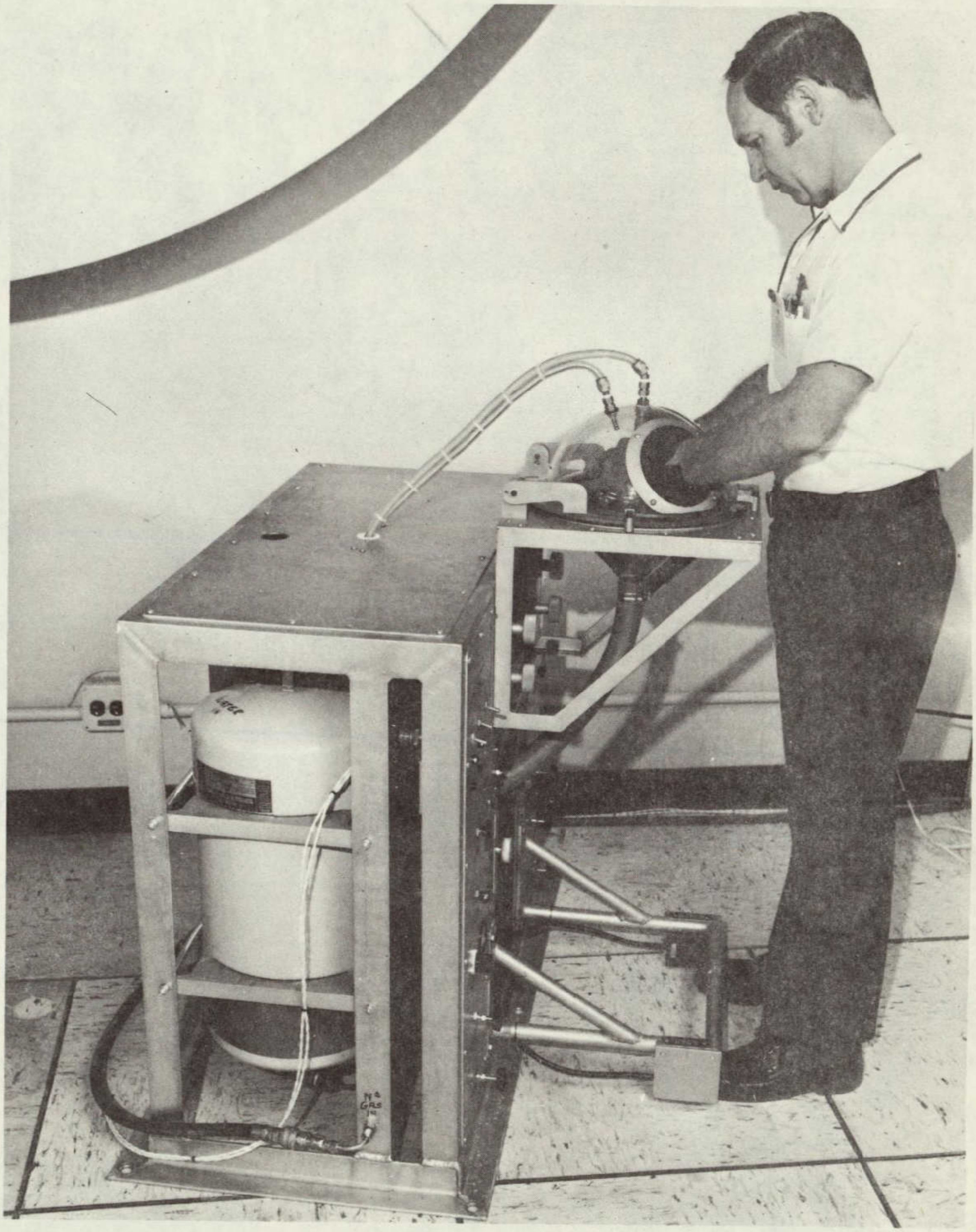


FIGURE 3-11 BREADBOARD DESIGN MAN/MACHINE INTERFACE

3.2.2 System Description

The cleansing fixture was comprised of a water, soap and air distibution system, a waste water collection and disposal system and a washing enclosure (refer to Section 3.1). Solenoid valves with foot switches provided soap and water upon demand and a vortex separator separated air from the waste water. The water pump activation was controlled by a water level sensor/timer with a manual override capability. The pump control module (PCM) (refer to Figure 3-2) turns on the drain pump when the PUMP switch on the control panel was placed to the AUTO-ON position. The pump continued to run until -- 1) a level sensor indicated the fluid level had dropped below the top of the sump, then -- 2) a set time interval had elapsed since the occurrence of the sensor indication to ensure complete evacuation of the sump. The PCM was made up of the following individual circuits:

- A sensor driver to provide a constant current to the thermistor level sensor;
- A detector to determine whether the thermistor output voltage is above or below the wet/dry threshold;
- A timer to hold the pump motor on for an interval following transition of the sensor output from wet to dry;
- A power-up clear circuit to ensure the pump does not run every time the power is turned on;
- A pump driver to switch the pump on and off; and
- A +15V DC regulator to supply a regulated voltage to the other module circuits.

Several provisions had to be added or altered from the original design of the cleansing fixture (breadboard design) in order to meet the Spacelab Mission Development (SMD) III crew requirements. These included:

- Addition of Betadine soap in plastic squeeze bottles. Since the Betadine soap is a highly foaming cleanser, substitution of it for the Palmetto hand soap in the cleansing fixture's dispensing system was not feasible due to the foam interferring with liquid level sensors on the separator.
- Addition of a timing device to allow the SMD III ground support crew to know when to refill the water tanks. The flow timing module (FTM) (refer to Figure 3-3) provided a digital display corresponding to the amount of water remaining in the supply tank. This amount was expressed as percentage of water remaining. The readout was a 2 1/2 digit red light-emitting diode (LED) display showing a range of 0 (empty) to 100 (full) percent in one percent increments. The indication was set to "full" by a front panel pushbutton. Thereafter, whenever the water solenoid was operated the display showed a decreasing count proportional to the amount of time the solenoid was operated.

- A multi-flow pattern spray nozzle so the crew could select a flow pattern to suit their needs (especially cleaning of blood from their hands).

- Addition of extra amounts of electrical wiring and plumbing to accommodate the difference in placing the fixture's components outside the SMD III mockup.

4.0 TASK 3 BREADBOARD TESTING

4.1 One-G Laboratory Tests

All testing was accomplished at the Martin Marietta Corporation, Denver Division, Chemical and Life Sciences Laboratory. The laboratory consists of 283.35 square meters (3.050 square feet) and contains test equipment for performance of microbiological, biochemical, biophysics, chemical, physiological and medical research in the fields of sterilization and life detection, quantitative microbial analyses and areas of crew support equipment.

4.1.1 Waste Chemical Fluid Disposal and Control of Evolved Gases

4.1.1.1 Test Objective

Since no guidelines exist for what type and quantity of various waste chemicals will be generated in Spacelab, we cannot assume any particular type would not be generated. Therefore, we must anticipate chemical waste of several broad classes:

- Volatile or inflammable solvents;
- Complex organics;
- Toxic or carcinogenic compounds;
- Acids;
- Bases;
- Any of the above containing radioactive material;
- Mixturs of the above;
- Material containing compounds suitable as microbial growth substrates.

The objective of this test was to evaluate the feasibility of using a charcoal canister to trap vapor from liquid chemicals disposed into the cleansing fixture. In previous work (refer to MCR-75-486), the major emphasis was on technical feasibility, estimating the amount of activated charcoal needed to absorb vaporized material and preventing it from contaminating the cabin air supply. Preliminary testing has indicated that roughly between 40 and 50 percent of a 20 ml dump of a solvent could be vaporized. How efficiently that vapor could be removed by a charcoal canister was the subject of this particular test.

4.1.1.2 Test Set-Up

A schematic of the test fixture is shown in Figure 4-1. A .007 CMS (15.00 CFM) air flow was provided by a blower to aid movement of the liquids from within the enclosure down to the Liquid-Gas Separator. At that point, the air portion of the fluid-air mixture was passed through the charcoal filter to collect the chemical vapors and then the air was returned to the Laboratory ambient. The fluid portion was collected in a calibrated beaker.

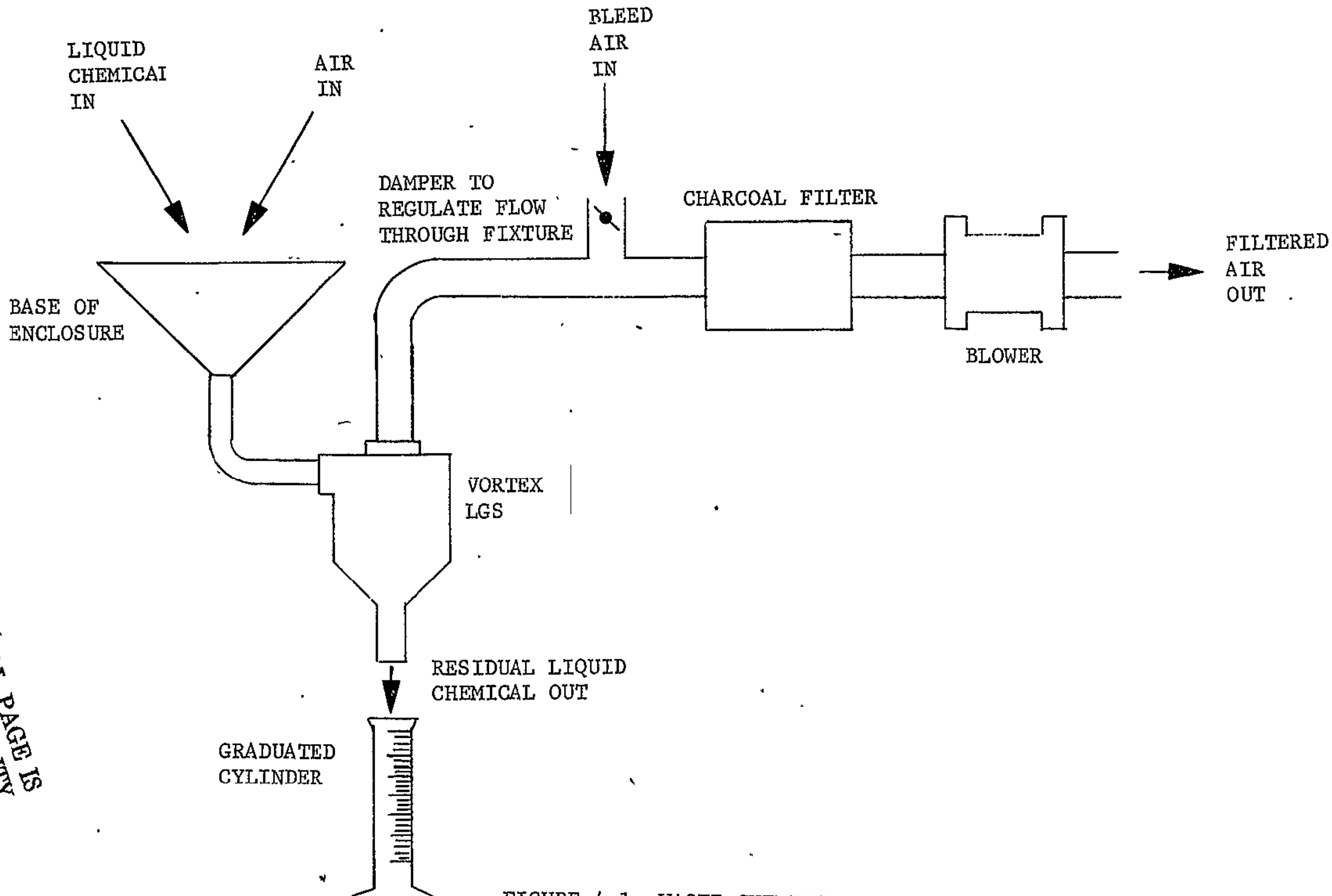


FIGURE 4-1 WASTE CHEMICAL DISPOSAL TEST SCHEMATIC

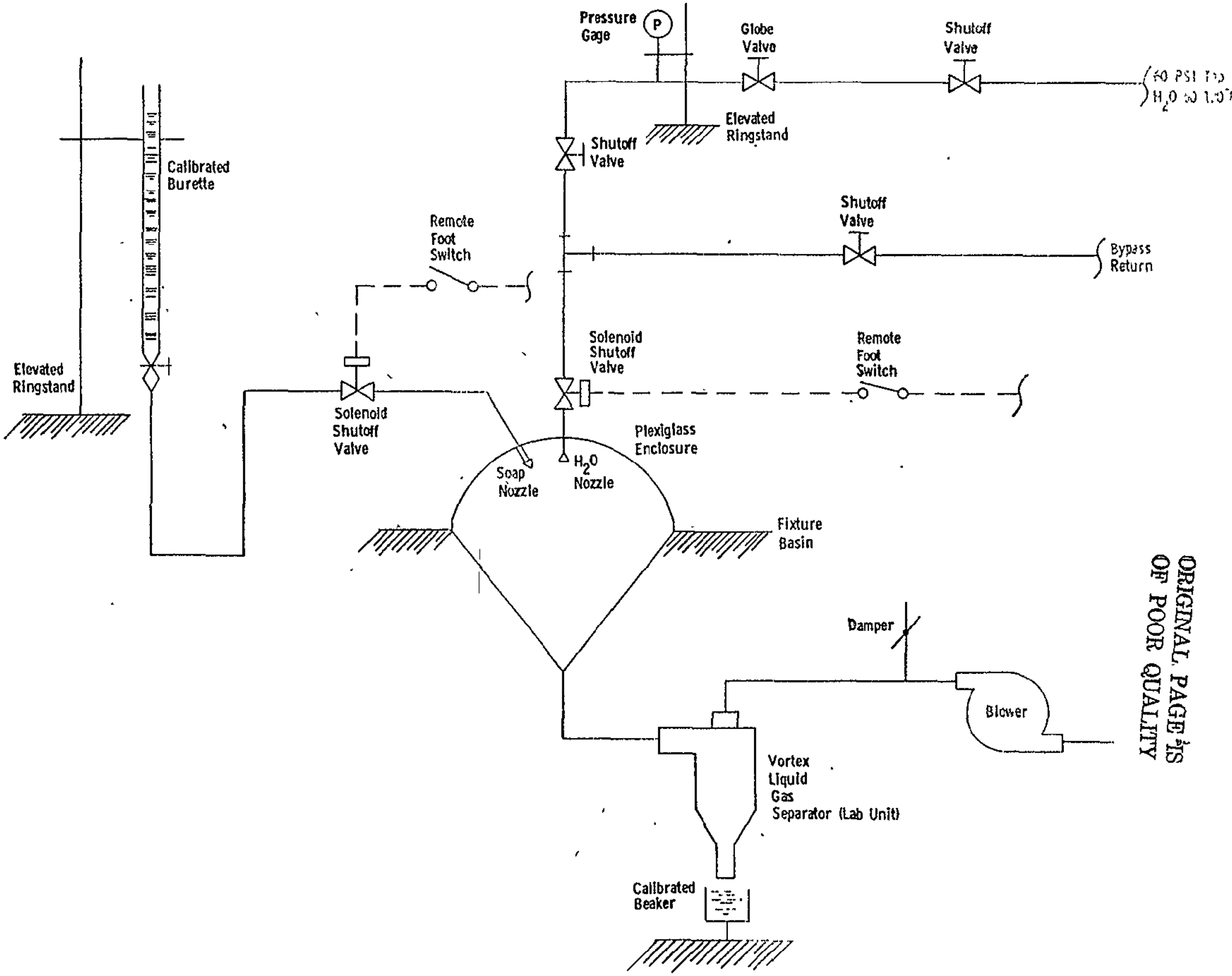


FIGURE 4-2 FEASIBILITY TEST MODEL SCHEMATIC

4.1.1.3 Test Procedures

To initiate the test, a preweighed beaker was placed under the sump of the LGS and the weighed charcoal canister was installed into the unit (see Figure 4-1). A preweighed 20 ml sample of ethyl alcohol and trichloroethylene was dumped into the bottom of the fixture with the blower on at .007 CMS (15 CFM). The charcoal canister contained 136.3 grams of Fisher Coconut Charcoal and 6-14 mesh screen. Each time a chemical was dumped the time was noted. The blower was left on for 60 seconds after dumping and was then turned off. The beaker under the sump and the charcoal canister was then reweighed. Based on an anticipated maximum average absorption capacity of 33% of the charcoal weight, the canister was loaded beyond its capacity to absorb.

After the canister was loaded the blower was cycled 1800 sec (30 minutes) on and 1800 sec (30 minutes) off for roughly five hours after the last dump. The charcoal canister was removed and reweighed each time the unit was turned off. Ethyl alcohol was dumped first with intermittent blower operation afterwards, then trichloroethylene was dumped, again with intermittent blower operation afterwards. The results of these tests give an indication of the absorption/desorption phenomena occurring in the dynamic environment of the hand cleansing fixture and roughly what efficiency you might expect from a charcoal canister for removing vapors from cleansing unit exhaust air.

4.1.1.4 Test Results

The test results are described in detail in Breadboard Test Report MCR-77-433 and summarized in section 1.2.1.1. Basicly this technique is unreliable and possibly dangerous to crew safety.

4.1.1.5 Conclusion

See discussion in section 1.4.

4.1.2 Microbial Burden and Disinfection Studies

4.1.2.1 Test Objective

The objective of test was to obtain an estimate of the normally anticipated microbial burden to be expected on the interior surface of the cleansing fixture before, during and after seventy handwashings per day. This was accomplished by assaying a portion of the interior surface of the cleansing fixture for a total microbial count.

4.1.2.2 Test Set-Up

4.1.2.2.1 Test Fixture

A schematic of the test fixture is shown in Figure 4-2. Two hand holes with coverings are provided at the front of the enclosure. Testing results from a mockup indicated that the natural angle formed between a man's arms (from his elbow to the fingers) when simulating handwashing is 1.92 radians (110°). The hand holes are placed so that this angle is obtained. Figure 4-3 shows the test fixture set-up. Water was obtained from the laboratory faucet.

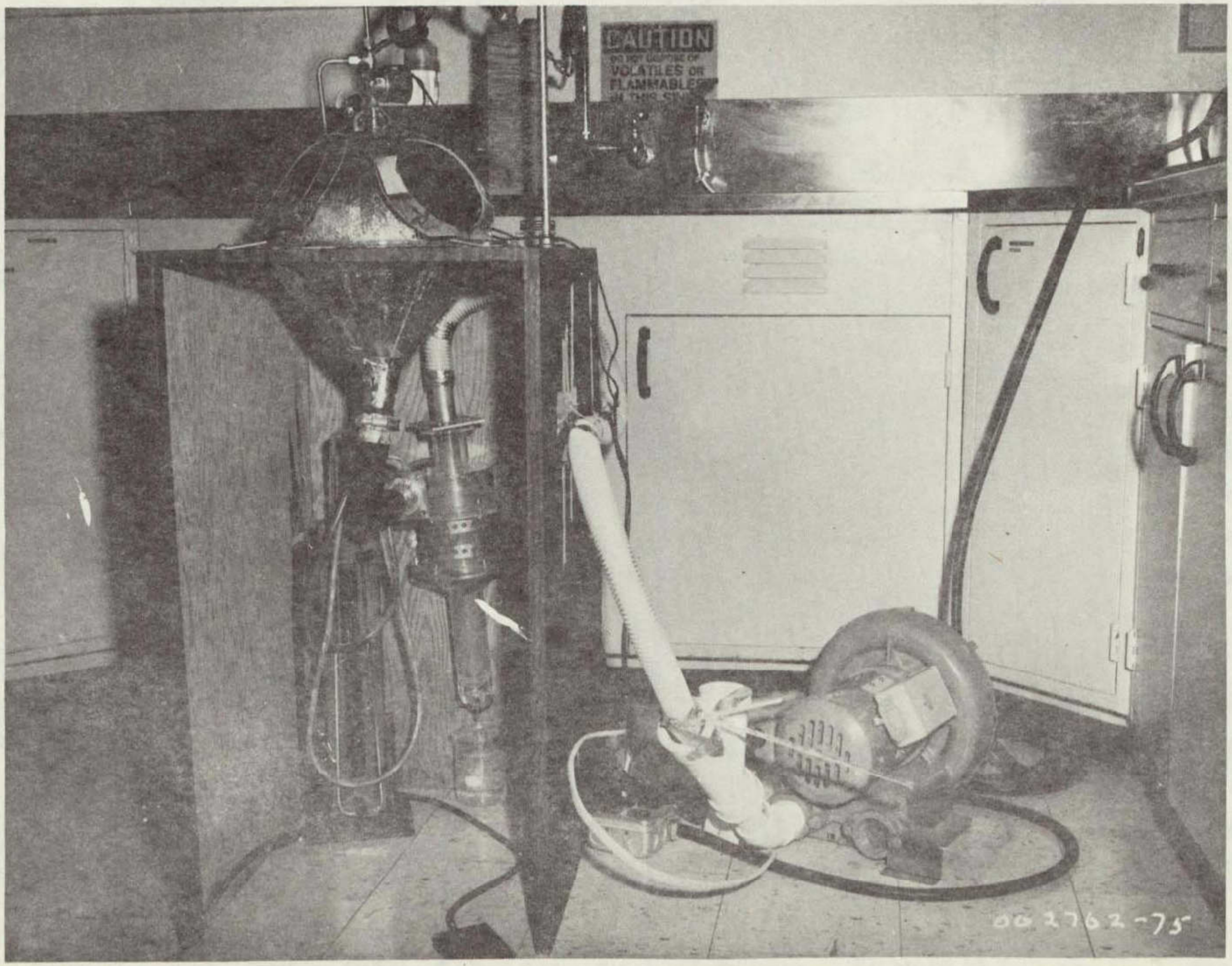


FIGURE 4-3 FRONT VIEW OF UTENSIL/HAND CLEANSING TEST FIXTURE

A globe valve set the pressure of the water delivered to the fixture and a pressure gage monitored this value. When the water foot switch was activated, the water solenoid valve would open thus allowing water flow. Soap was stored in a calibrated burette and was delivered by gravity pressure to the soap nozzle when the soap solenoid valve would open by activation of the soap foot switch. A .007 CMS (15 CFM) air flow was provided by a blower to aid movement of water from within the enclosure down to the Liquid-Gas Separator. At this point, the air portion of the fluid-air mixture is returned to the lab ambient and the fluid was collected in a calibrated beaker.

4.1.2.2.2 Material Preparation

a) Cotton Swabs - Score cotton swabs 2-3 cm above the swab and place in test tubes with caps. Autoclave at 121°C for 1200 sec (20 minutes) to sterilize.

b) Sample and Dilution Tubes - Contain 10 ml and 9 ml of phosphate buffered saline (PBS) respectively. Autoclave at 121°C for 600 sec (10 minutes) to sterilize.

c) Solidified Nutrient Medium for Microorganisms - After sterilization, place the flasks in a hot air oven at 45°C to temper (i.e., cool to a point just above solidification). When tempered, using asceptic technique in a clean area, manually pour about 25 ml of molten TSA into each Petri plate. Allow to solidify and cool before storage.

d) Pretest Disinfection Solution - Based on a normal use solution of .85 kg (30 oz) of Wescodyne .019 m^3 (4 gallons) of water, the solution used for pretest cleaning should have 4.7 ml Wescodyne/liter of water.

4.1.2.3 Test Procedures

See Section II.B.4 in Breadboard Test Report MCR-77-433.

4.1.2.4 Test Results

See Section II.B.5 in Breadboard Test Report MCR-77-433. This information is also summarized in section 1.2.1.2 in this final report.

4.1.2.5 Conclusion

Biocidal wipes similar to those used on Skylab seemed to be a quick, efficient means of performing the disinfection of the enclosure with least impact on the cleansing fixtures system and overall spacecraft systems.

4.2 Neutral Buoyancy Test

4.2.1 Test Objective

Neutral buoyancy testing was performed to evaluate zero-gravity man/machine interfaces with the enclosure design. This testing was performed to provide data for the man/machine interface refinement of the cleansing fixture and was provided as an addition to any contractual obligations. The cleansing fixture's overall height, ease of access, and the hand entrance angles into the enclosure were evaluated with respect to the neutral zero-gravity body position. The obective of this testing was to experimentally evaluate the theoretical cleansing fixture dimensions obtained by analyzing the upper extreme neutral zero-g body dimensions of a 5th percentile female and the lower extreme neutral zero-g body dimensions of a 95th percentile male. As a result of this testing, the theoretical sizing would be confirmed or adjustments would be made in the cleansing fixture's sizing accordingly.

4.2.2 Test Location

All testing was performed at Martin Marietta's Neutral Buoyancy Facility (NBF) located in the Vertical Test Facility (VTF). NBF pool is 6.75 meters (22.5 feet) in diameter by a 4.8 meters (16 feet) deep. The tank is above ground and is constructed of steel. Two large rectangular viewports are located on the ground level for observation and photographic data gathering.

4.2.3 Test Set-up

The cleansing fixture's enclosure was clamped to the top of a portion of another piece of mockup structure -- also being tested at that time -- which would enable the enclosure to be at the desired theoretical distance of 91.4 centimeters (36 inches) from the floor line. The enclosure was placed in the mockup structure to simulate the foot restraint's position with regard to the cleansing fixture. A HOOKAH device was used to provide the breathing air to the test subject. This required that the test subject have a 1.9 centimeter (3/4 inch) hose attached from his mouthpiece to the surface. All safety, operational, and medical procedures were followed as outlined in the Martin Marietta document "Neutral Buoyancy Procedures, NB 200."

4.2.4 Test Procedures

The cleansing fixture's dome was secured to the mockup structure utilizing three large C-clamps. The distance from the floorline to the centerline of the hand holes was measured and recorded. A rail-type foot restraint was secured to the floor approximately 5.08 centimeters (4 inches) in front of the mockup struc ture. The test subject entered the NBF pool from the top, donned the HOOKAH apparatus, and maneuvered to the test location where he placed his feet in the foot restraint and his hands into the enclosure. In this position the test subject simulated washing his hands while another diver took pictures of the procedure. Comments were obtained from the test subject in relation to accessibility and ease of use. The pictures were analyzed to determine the body alignment away from the accepted neutral body position obtained during zero gravity. From this data adjustments would be made to the design to accommodate more readily and comfortably a crew member.

4.2.5 Test Results

Figured 4-4 shows the side view of the man/machine interface. The body angles were analyzed and are shown in the form of a "stick figure" in Figure 4-5. The test subject, who was 5'-6" in height (5th percentile male), commented that the height of the enclosure (36 inches) was quite comfortable and didn't notice any fatigue associated with using the device. These body angles differed from those obtained in actual zero gravity flight conditions demonstrated in Figure 4-6. One reason for the differences is due to the tendency of the test subject to unconsciously force his body posture into an anticipated correct, upright position. It has been demonstrated in the past that this is due mainly to visual cues. When these visual cues were taken away, i.e., the test subject blinded, the body would naturally obtain a body position similar to that in Figure 4-6. An example of this is shown in Figure 4-7. Compare the body positions shown in that Figure with Figure 4-6. Figure 4-8 shows a front view of the test sequence. The hand entrance angles (110°) to the enclosure were comfortable to the test subject.

4.2.6 Conclusions

Based on the neutral buoyancy tests, the theoretical enclosure interface dimensions were found to be suitable. From this, no changes were incorporated into the breadboard design prior to the KC-135 zero-gravity tests.

4.3 Spacelab Mission Development (SMD) Test III Support

4.3.1 Test Objective

The forthcoming manned space missions with their increased crew size, mission duration and vehicle volume are placing increased emphasis on overall crew comfort. Both crew comfort and motivation can significantly be enhanced by personal hygiene provisions.

Space missions planned for the future, in particular Shuttle/Spacelab, have an extensive experimentation plan. To evaluate in-orbit Spacelab experiment operations, seven-day simulated life sciences missions were developed. The third Spacelab Mission Development Test (SMD III) was a continuation of this effort. The SMD III test, conducted in May 1977, greatly emphasized biological experiments involving extensive use of animals such as rats, mice, frogs, and monkeys. Like similar ground laboratory based experimentation, it was observed that the SMD III experiments would greatly benefit with the support of personal hygiene and laboratory utensil/tool cleansing provisions.

The breadboard design of the cleansing fixture was provided to the SMD III test so that its functional effectiveness could be evaluated in a "real-life" laboratory situation. During the conduct of the SMD III test, the Spacecraft Utensil/Hand Cleansing Fixture's design characteristics were monitored in respect to performance adequacy, crew interface, water and soap flow rates, hardware performance, etc. The data obtained during the testing will be utilized toward the design of the prototype fixture.

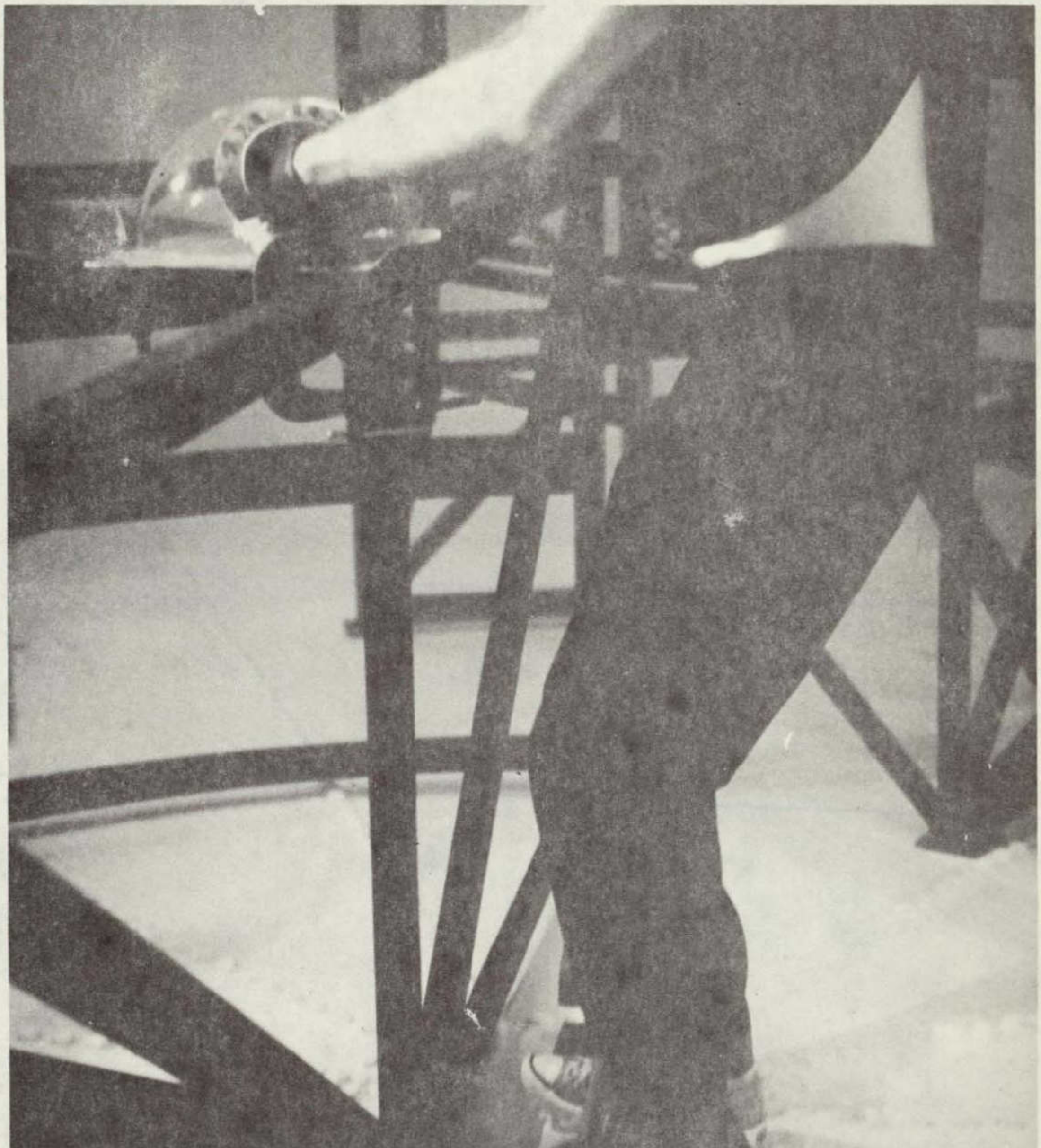


FIGURE 4-4 CLEANSING FIXTURE MAN/MACHINE INTERFACE - SIDE VIEW

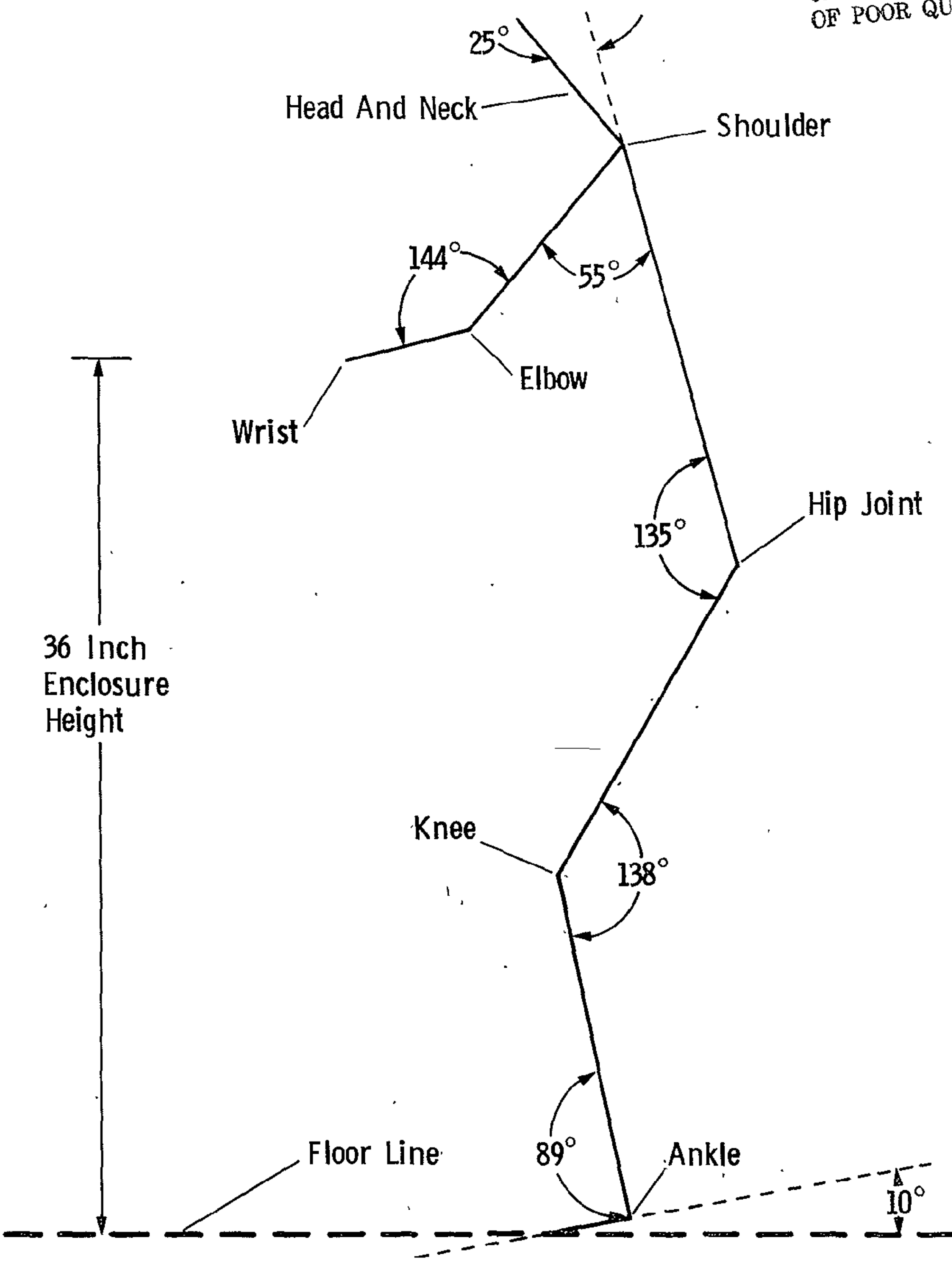


FIGURE 4-5 BODY ANGLES OBTAINED DURING NEUTRAL BUOYANCY MAN/MACHINE INTERFACE TEST

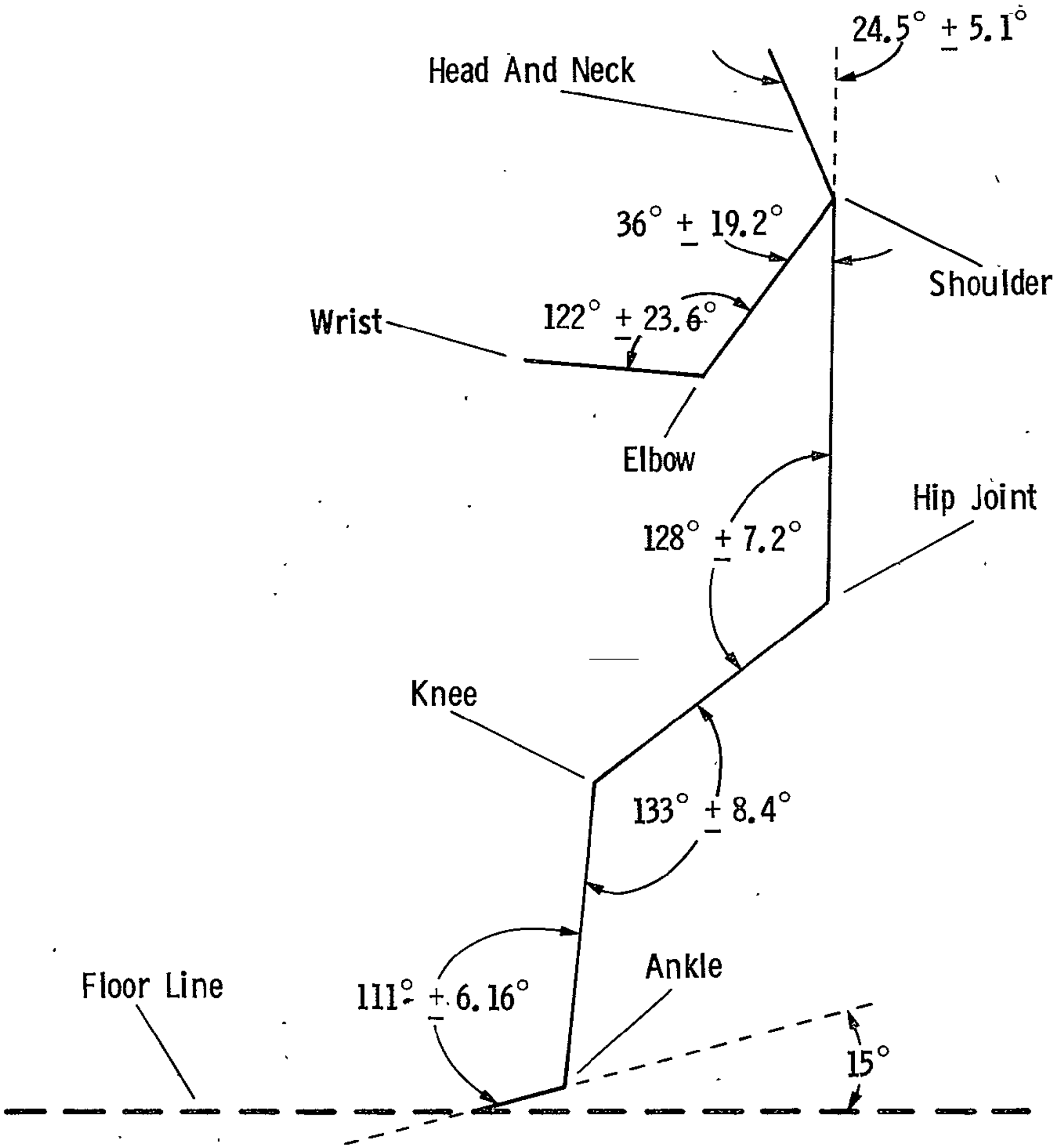


FIGURE 4-6 ZERO GRAVITY NEUTRAL BODY POSITION

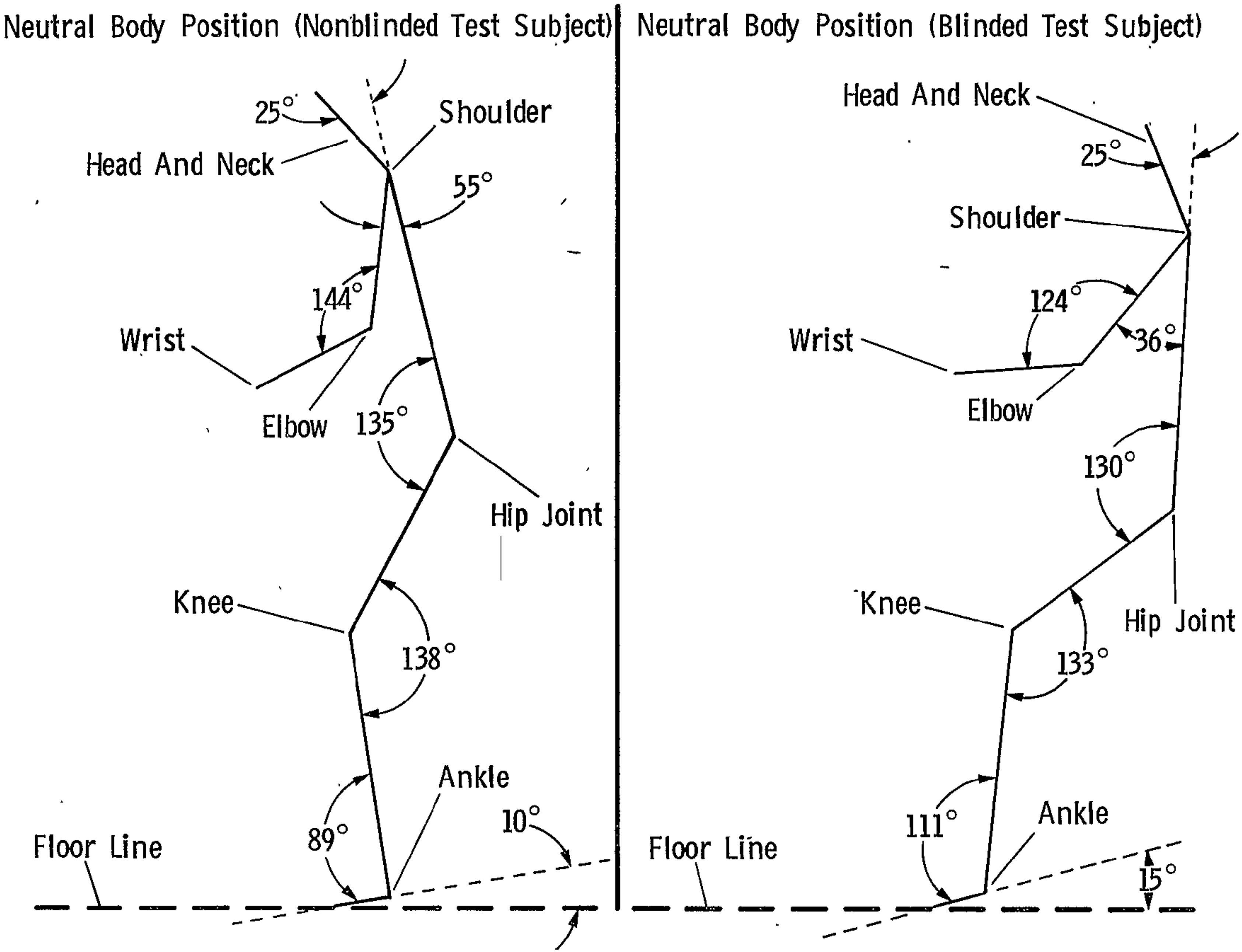


FIGURE 4-7 BLINDED VS NONBLINDED TEST SUBJECT'S NEUTRAL BODY POSITION

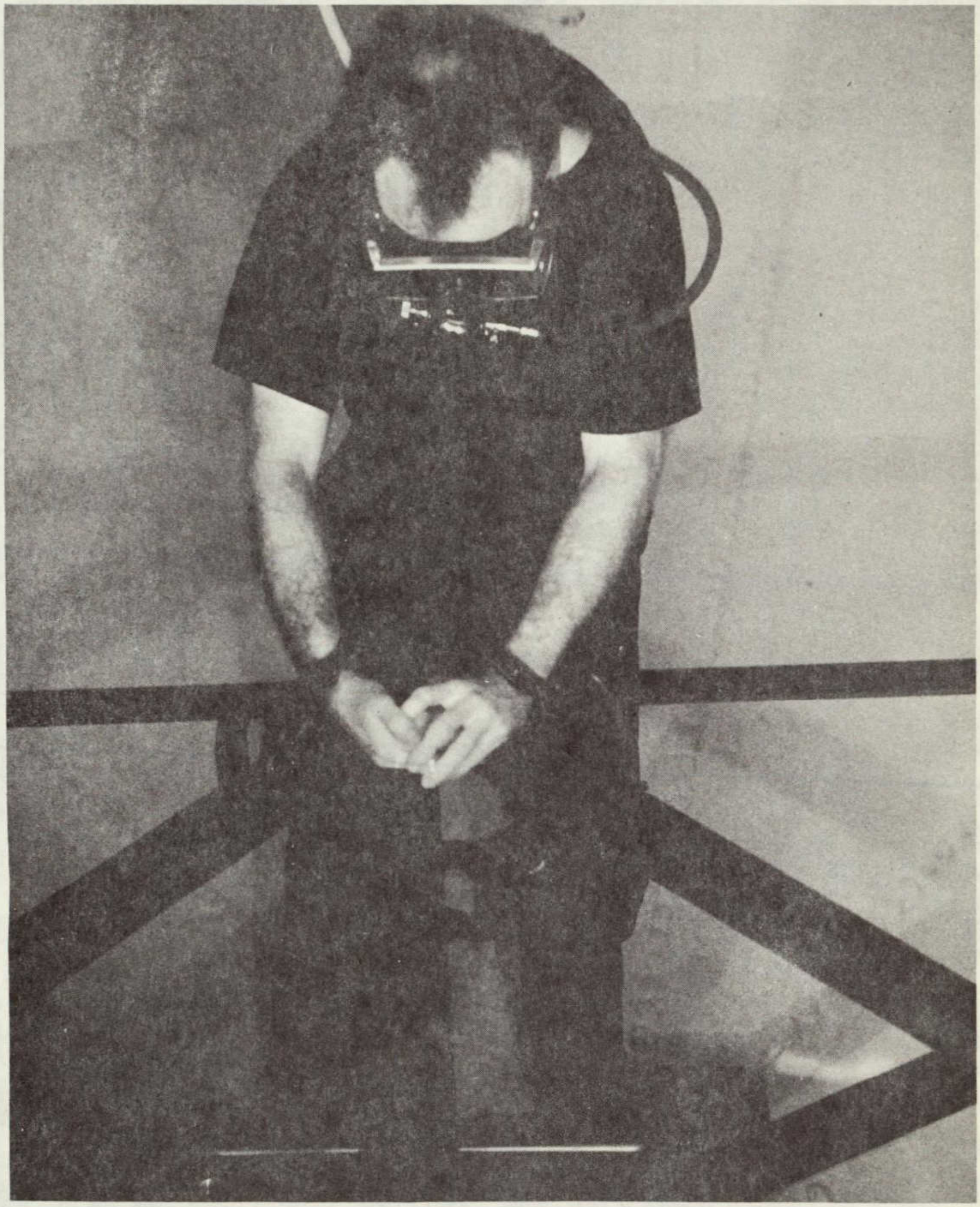


FIGURE 4-8 CLEANSING FIXTURE MAN/MACHINE INTERFACE - FRONT VIEW

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4.3.2 Test Location

The Spacelab Mission Development (SMD) Test III was held during May 1977 at the NASA/JSC life sciences laboratory. A full-scale mockup of the Spacelab and the Shuttle Orbiter Mid-deck housed the numerous biological/biomedical experiments and crew living quarters, respectively. The breadboard design was located at the forward end of the Spacelab mockup next to the surgical workbench.

4.3.3 Test Set-Up

The breadboard design of the cleansing fixture, which was designed to meet the KC-135 aircraft flight requirements was utilized for this test. The cleansing fixture was comprised of a water, soap and air distribution system, a waste water collection and disposal system and a washing enclosure. Solenoid valves with foot switches provided soap and water upon demand and a vortex separator separated air from the waste water. The water pump activation was controlled by a water level sensor/timer with a manual override capability. All the components were housed in an angle weldment structure. Figure 3-10 shows the breadboard cleansing fixture. The washing enclosure and its supporting the Palmetto hand soap in the cleansing fixture's dispensing system was not feasible due to the foam interfering with the liquid level sensors on the separator.

- o Addition of a timing device to allow the SMD III ground support crew to know when to refill the water tanks.

- o A multi-flow pattern spray nozzle so the crew could select a flow pattern to suit their needs (especially cleaning of blood from their hands).

- o Addition of extra amounts of electrical wiring and plumbing to accommodate the difference in placing the fixture's components outside the SMD III mockup.

4.3.4 Test Procedures

Prior to the first usage of the cleansing fixture, the main power switch had to be switched to the ON position and the water pump switch verified to be in the AUTO ON position. After these two maneuvers, the system was completely activated and ready for operation. Operation of the cleansing fixture during structure were detached from the remaining structure, which contained the bladder storage tanks, water, pump, liquid-gas separator, blower and electrical components, and was placed directly outside the mockup.

Several provisions had to be added or altered from the original design of the cleansing fixture (breadboard design) in order to meet SMD III crew requirements. These included:

- o Addition of Betadine Soap in plastic squeeze bottles. Since the Betadine soap is a highly foaming cleanser, substitution of it for the seven-day SMD III test was left to the user's discretion. For each operation, the following procedures had to be followed

- o Turn the blower switch on the ON position.
- o Activate the soap and water solenoid valves as desired by pressing on the appropriate foot switches.
- o To deactivate between uses, turn the blower switch to the OFF position. This left the system in an active mode for the next operation.

4.3.5 Test Results

Prior to the conduct of the SMD III test, several problem areas were identified concerning the cleansing fixture. These included:

- o A small crack in the enclosure from the right-hand hole to the water nozzle. (This occurred during shipment of the cleansing fixture to NASA/JSC, and was not deemed to have any effect on the cleansing fixture's overall performance.)
- o Sharp corners on the supporting structure harmful to crew. (These were never padded prior to the SMD III test due to the lack of time between assembly and test usage of the cleansing fixture. The unit was checked by KC-135 flight personnel and the unpadded corners were not viewed as being hazardous for KC-135 flights for which this unit was intended.)
- o Present design of hand hold flaps inadequate since they could recontaminate the crew's hands upon withdrawal from the cleansing fixture. (These were removed prior to the testing.)
- o The timer monitor on the Liquid-Gas Separator (LGS) sensors failed, which caused the water pump to be inoperable. (The cleansing fixture's water pump system was disconnected and NASA/JSC technicians provided a pump whose inlet was connected directly to the sump of the LGS and operated on a continuous basis.)
- o The water thermostat operated at too high of a temperature. (This unit was adjustable and was readjusted to the desired setting of $305.4^{o}K$ ($90^{o}F$) by NASA technicians prior to testing.)

Comments concerning the cleansing fixture were taken from the crew members after the conduct of the SMD III test. The general performance of the cleansing fixture in regards to removing blood and other fluids from the nails and crevices of the crews hands was acceptable. However, several design features were noted as being unacceptable by the crew members. These included:

- o The hand hole covers on the enclosure become wet and dirty and as one crewmember commented, "Defeat any attempt to decontaminate the hands. Arms which have been cleaned will then become dirty on withdrawal from the hand holes." The hand hole covers were removed for the purpose of the SMD III test to eliminate the contamination problem; however, in a weightless environment, some type of apparatus must be provided at the hand hole to prevent water and soap from splashing into the cabin environment. Because the coverings were removed, water was noticed by the crew to be splattering from the enclosure while in use. If the flaps had been left in place, no water would have escaped from the enclosure.

- The spray or simple stream was unsatisfactory in that an insufficient amount of water was delivered to the enclosure at any one time. The water flow rate utilized was optimally selected so as to minimize water usage and thus reduce the weight impact on the spacecraft. Any increase in the flow rate would add to system weight in hardware and water amount. However, a tradeoff should be considered in either utilizing the present water flow rate and employing mechanical devices such as a scrub brush in the cleansing activity or providing an increased water flow at the expense of system weight. The crew also noted that cold water and not the heated water worked better in removing the blood from hands.

- The soap poured from the dispenser when the soap foot switch was activated.

- The foot switches were difficult to operate. Lateral motion of the foot/leg to operate a foot activation switch was unsatisfactory. A yoke-type knee activation switch would be preferred, provided that it would not stick out too far so as to pose a safety problem to the crew. The knee activation device should be enclosed around the cleansing fixture so that it does not accidently get activated. With the knee activation system, on, off and pressure could be controlled by one switch.

- Insufficient space to manipulate scrub brushes in the cleansing process in the enclosure. Enlargement of the present hemispherical enclosure or incorporation of a different configuration would eliminate this problem in the prototype design.

- The drain filter clogged with debris from the crewman's hands. Due to the contamination problem, the crewman did not desire to remove the filter manually from the drain. Future design efforts will have to provide a means of removing the filter without possible crew/contaminated debris interface.

- On the sixth day of the SMD III test, reddish colored water was observed coming from the cleansing fixture when in operation. A sample of this water was taken at that time and an anlysis performed on it. The probable identity of the red floculant precipitate in the water sample is hydrated ferric oxide. To determine this fact the sample was filtered and ashed. The residue was then analyzed by emission spectroscopy. The major constituent was judged to be iron along with minor quantities of copper and silicon. The iron could have been present in the laboratory plumbing and during use could have flaked loose into the outgoing water. It could possibly have also been present in the water before processing since, if the iron was present as a ferrous salt, it could escape treatment. Later, after exposure to chlorine and air, it would precipitate as a ferric oxide hydrate. The water bladder tanks of the cleansing fixture were filled directly with water from a laboratory sink outside the mockup. The water did not pass through a filter system prior to usage in the cleansing fixture.

4.3.6 Conclusion

Prior to the SMD III test, the cleansing fixture was primarily tested as a personal hygiene station in which simple handwashings, utensil cleansings and shaving functions were performed. These tests, however, were laboratory controlled in that a limited number of activities were performed and not under extreme conditions. The SMD III test provided the first "real-life" test of the cleansing fixture under extreme laboratory conditions. The cleansing fixture performed adequately in removing blood from the crew's hands and nails which was the main objective of providing this unit for this test.

One crewman noted: "For Spacelab operations involving animals it is imperative that a means of personal hygiene and clean up are available to the crew. The Orbiter system has extremely limited capability for this, and should not be considered adequate for such operations. The mid-deck area has abundant means for contamination of the crew without the added burden of animal parts and waste products. As a means of clean up from the operations in Spacelab, the unit provided a definite service to the flight. Other than insignificant problems related entirely to accelerated delivery schedule, the unit functioned acceptably throughout the flight."

Several design problem areas concerning contamination and general laboratory work area policies were noticed which, prior to the test, were not noted.

The same care, if not more so, must be taken in the development of any unit to be used in a shuttle laboratory as in a ground-based laboratory, when contamination is of prime concern. If the cleansing fixture is to be used extensively in Spacelab, then modifications to the cleansing fixture must be considered to eliminate the numerous contamination areas (hand holes, crevices, dome/basin sealing area), minimize crew effort in system activation, maximize crew comfort in the cleansing activity and provide enough water and soap to adequately perform the cleansing activity.

4.4 Zero-Gravity KC-135 Tests

4.4.1 Test Objective

The purpose of this testing was to verify the man/machine interface and functional performance feasibility during the KC-135 zero-gravity simulation. The data obtained during this testing was evaluated and recommendations were made for the cleansing fixture design improvement.

Procedures for the KC-135 testing set forth in the NASA/JSC document, "Zero G Program-Requirements for Using Organizations", were strictly followed during the conduct of all phases of the zero-gravity test program.

The period of reduced g ranged from 25 sec for o-g up to 45 sec for higher g values. From previous contract efforts (NAS9-14671), it was determined that the standard time needed for a complete hand washing sequence consisting of prewet, soap, wash/rinse and enclosure cleaning cycles.as approximately 47 sec which necessitates the need to interrupt cleansing activities between each parabola. For this reason, water and soap usage and the time required for a complete hand washing or other personal hygiene activity were not abled to be accurately determined.

4.4.2 Test Location

The zero-gravity testing of the breadboard design of the cleansing fixture was performed on the KC-135 aircraft located and operated at Ellington Air Force Base in Texas.

4.4.3 Test Set-up and Procedures

This detailed information is available in the Breadboard Test Report MCR-77-433.

4.4.4 Test Results

Two days of KC-135 zero-gravity testing was accomplished during September 1977. A male test subject (95 percentile) performed hand cleansing, oral hygiene, utensil cleansing and shaving activities. Two female test subjects (95th and 50th percentile) performed hand cleansing and utensil cleansing activities. Still photographs and movies were taken of the various activities. From the photographs and film and comments by the test subjects and test coordinator, the following observations were made concerning the functional performance of the cleansing fixture in zero-gravity:

- The vortex liquid-gas separator worked properly. Water reached the LGS very slowly in zero-g. The water pump in the "Auto On" position was actuated by the liquid level sensors. Water remained only in the separator below the lower sensor. Up to 3.81 cm (1 1/2") of soap suds were noticed in the LGS sump at any one time time (above water line). It was not observed if this caused the LGS sensors to activate the water pump on due to the fact that the aircraft went from 0 to 2g very quickly and, in 2g, the water would rush rapidly to the LGS sump causing the water pump to turn on. However, no problems were observed and no backup of water into the enclosure from the LGS was noticed.

- Water did not leak out of the enclosure with the hand hole covers removed when the water system was activiated as long as no cleansing activity was involved. However, there was a problem with the water splattering to the cabin when hands were removed from enclosure. The friction (force) from the flaps overcame surface tension causing the water to splatter to the cabin environment.

- While the blower was on, the cleansing area did not fog and no problems were encountered in viewing the cleansing action. However, the air velocity was not great enough in itself to pull the water from the interior surface of the enclosure. The water remained on the walls until it was scrapped down into the drain. Many times the test subject or test coordinator would forget to turn the blower switch to the "on" position prior to the cleansing activity and the enclosure interior would fog up, thus making viewing of the cleansing activity nearly impossible.

- Shaving cream, toothpaste and food particles from the utensils were wiped onto the handhole covers when either the razor, toothbrush or utensil was placed into the enclosure to be cleaned. These substances would then rub onto the wrist area of the test subject performing the cleansing task and create a mess. Figure 4-11 shows shaving cream that has been wiped onto the flaps and surrounding outside area by the insertion and removal of the razor.

- The spray cone was preferred during the handwashing and facewetting activities, while the straight stream was preferred for the oral hygiene and shaving activities. The concentrated flow of water delivered by the straight stream quickly and efficiently cleaned the tooth brush and razor used respectively in these activities. Both were easily cleaned.

- The water heater was not utilized during the testing. The temperature of the ambient water was comfortable and did not present any problems.

- The soap and water nozzles should not protrude so far into the enclosure. Difficulty was encountered during the enclosure cleansing process and the test subjects would bump their hands on them.

- The test subjects enjoyed the freedom of their knees. They felt that they did not ever have to worry about bumping them into anything, i.e., they did not feel "cramped".

- The test subjects preferred the foot activation technique, at least for the water, even though the present foot switches (breadboard design) were difficult and awkward to operate. They commented that they almost had to remove their feet from the restraint to operate the activation switches. They felt that the hinge of the switch should be forward and not in back as in the design and this would have made the activation of the switches easier.

- The foot restraint was felt by all to be too high off the floorline.

- An accessory stowage area was needed.

- The shaving activity was messy. There was no problem in applying the shaving cream to the hand and face and also no problems were encountered in the actual shaving process itself. (See Figure 4-9) Cleanup of the razor was done quickly and easily. There were problems encountered, however, with applying water to the face during and after shaving. (See Figure 4-10) As the hands would pass out through the handhold covers, the friction caused by the flaps would overcome the surface tension of the water on the hands and would splatter the water into the cabin environment. The test subject commented that he would prefer to have used a terry cloth towel to moisten and wipe clean his face.

- The male test subject preferred the enclosure height (floor-line to centerline of handholes) to be at the minimum level of 91.4 cm (36 inches). He felt that at this level, his arm entrance angle into the enclosure was more comfortable. Both female test subjects preferred the enclosure to be at its maximum height of 106.7 cm (42 inches).

- In the oral hygiene activity, the toothpaste was swallowed by the test subject instead of being expectorated into the enclosure as previously outlined.

- Water remained in the basin as long as no interference force was applied when the enclosure's dome was lifted off. This was due to the surface tension of the water on the interior surface of the enclosure.

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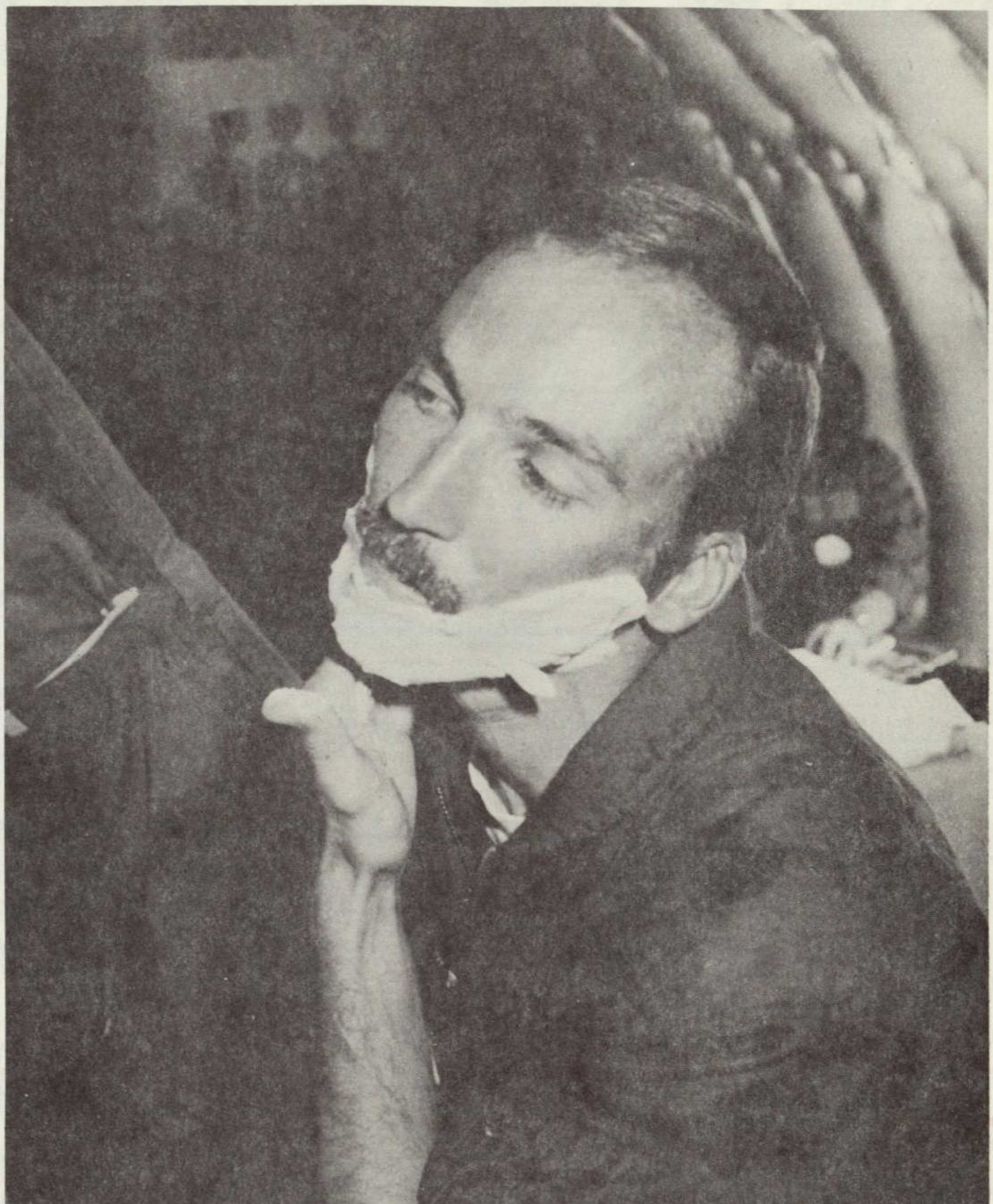

FIGURE 4-9 APPLICATION OF SHAVING CREAM DURING ZERO-G

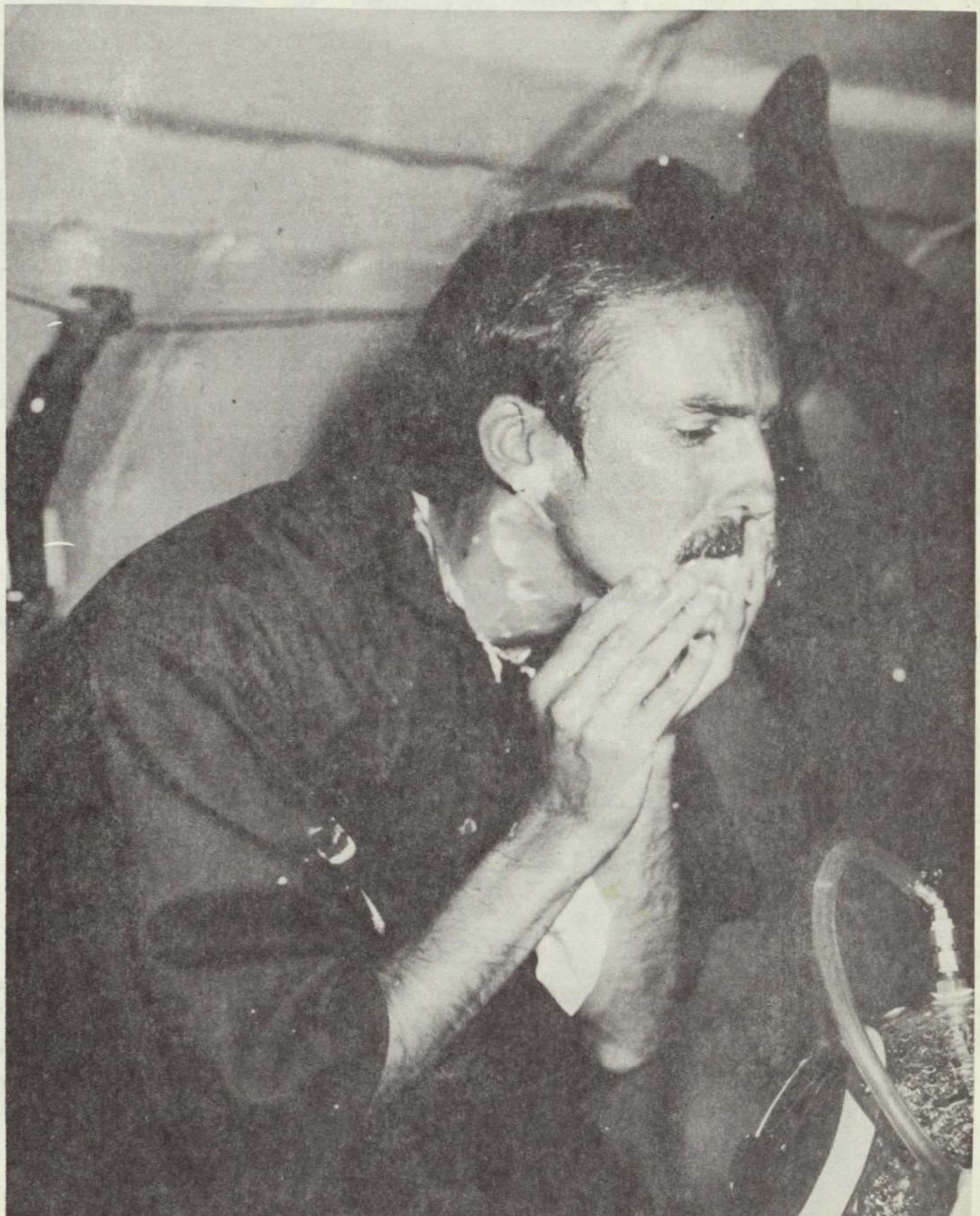

FIGURE 4-10 APPLICATION OF WATER TO THE TEST SUBJECT'S FACE AFTER SHAVING ACTIVITY

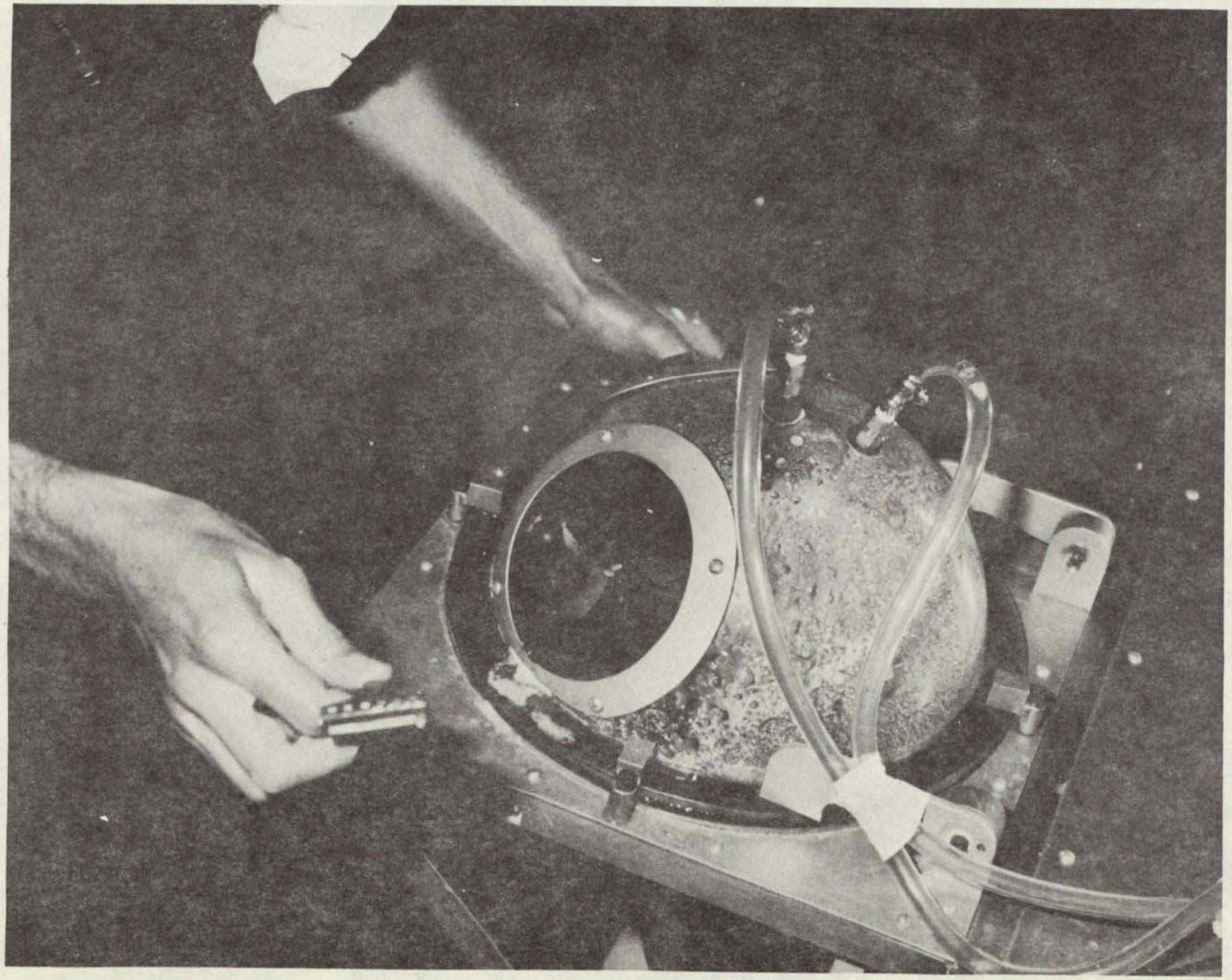

FIGURE 4-11 CONDITION OF ENCLOSURE AFTER A SHAVING ACTIVITY

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4.4.5 Conclusions

In general, the basic concepts of the cleansing fixture performed well in the zero-gravity test. The subjective data obtained from the test subjects concerning the performance feasibility test phase showed that the personal hygiene function of handwashing and oral hygiene and utensil cleansing were three very feasible functions of the cleansing fixture. If the procedural outline was changed to wetting the face with a towel instead of the hands, then the shaving activity also would be a feasible function.

All subsystem and components worked properly in zero-gravity. Different activation techniques should be examined so as to minimize crew effort, movement and time. If the present hand-hole covers are to be used in future designs, then a procedure must be developed that would outline the process of removing as much water and the like from the hands as possible prior to withdrawal from the enclosure. However, it is not recommended that these be used in further designs due to the potential contamination problems encountered during this test and SMD III and also due to the mess they create on the outside of the enclosure. The foot restraint incorporated into the design was satisfactory, however, for future design, it needs to be lower to the floorline. Both test subjects preferred a foot activated system since (1) they enjoyed the freedom of their knees and (2) felt that since their feet had to be in a restraining device, why not incorporate an activation system into this device. However, both felt that the design needed a switch that was easily activated from any foot angle or position.

5.0 TASK 4 - PRELIMINARY SYSTEM SPECIFICATION

This task was accomplished prior to the analyzes of all breadboard test data and as a result does not accurately describe the final developed prototype unit. The information in Preliminary System Specification document MCR-77-257 does provide a basic framework for developing a flight article system specification.

5.1 Requirements

The requirements listed in MCR-77-257 includes functional requirements such as washing, rinsing, purging system, liquid-gas separation, water control and storage, maintainability/Operability, and microbiological control. System design requirements established were in areas of structural loading, material selection, stowage provisions, power consumption, weight, equivalent weight and equipment layout. System operational requirements include the personal hygiene tasks (washing hands and face, sponge bathing, shaving, brushing teeth, washing hair and utensil cleaning), usage criteria, environments, anthropometric accommodations, restraints and modes of operation.

The subsystem design requirements and component specs include the water supply and distribution, soap supply and distribution, pressurant subsystem, air processing, and waste water collection/distribution subsystem. Also, the interface requirements are listed for the electrical power supply, water supply, waste water, air, pressurant, structural, and cabin environmental.

Overall design requirements are stated for areas of configuration and packaging, maintenance, materials-parts-processes, identification and marking, reliability, interchangeability and replaceability, commonality and spares, contamination control and transportability. Other items covered are safety and fabrication (wiring practices, welding, bolting, riveting and cleansing).

5.2 Quality Assurance

Guidelines are listed in MCR-77-257 for testing of components for compliance with specified requirements. Also system testing is categorized and methods of data recording and reporting are established.

5.3 Preparation For Delivery

Document MCR-77-257 lists the tasks that must be successfully completed prior to delivery of hardware.

6.0 TASK 5 - PROTOTYPE DESIGN

This task involved determining the final configuration of the washing enclosure and component arrangement within a standard narrow width spacelab rack. Results from breadboard testing were analized and corrective measures were incorpoated into the prototype design. The detail and assembly drawings (RES 3158000) and component specifications are provided in the addendum to this final report.

6.1 Description of Prototype Unit

The cleansing unit as shown in Figure 6-1, is the development prototype washing fixture that utilizes a spherical washing enclosure. Splash guard tubes, 0.13m (5-inch) inside diameter, are provided for hand/arm insertion and are positioned at an angle that allows ease of operational use and comfort by a crewman. The tubes extend out from the enclosure approximately 0.09m (3.5 inches). This arrangement can be seen in Figure 6-2 where the crewman in a zero-gravity natural position is using the washing fixture. Water and liquid soap are provided by pressurized bladder tanks that can be serviced in place or removed from the unit by quick release pins and a fluid coupling. These tanks and all subsystem components are mounted in the standard narrow spacelab rack. Figures 6-3 and 6-4 show the side and front views of the spacelab rack with the prototype hardware installed. The mechanical schematic, Figure 6-5, shows the interrelationship of all the fluid and air components within the washing fixture. The pressurized supply water passes from the bladder tank through a flex line and disconnect, then through some valving for flow control and then branches out into two lines. One goes directly to the enclosure for ambient temperature water supply. The other passes through a heater tank to provide hot water to the enclosure. Water selection is controlled by solenoid valves. The soap flow is similar in that it is also stored under pressure and dispensed through a control valve. The air system draws air into the hand access tubes and pulls the water through the drain line. A vortex liquid gas separator forces water droplets to the sump of the LGS as a result of internal differential pressures and air is drawn out the top of the unit. Here the air passes through the blower into the charcoal filter and returned to the cabin. The waste water in the LGS sump is pumped into a bladder tank for storage. A liquid level sensor in the sump controls the pump operation.

Figure 6-6 is an electrical schematic of the control system and Figure 6-7 describes the control panel which is located directly above the washing enclosure. From this panel, the operational mode (automatic or manual) of the water pump and blower can be set. Adjacent to these switches is the heater switch. The heater is thermostatically controlled in the "on" position. Below these switches is the main power switch and circuit breakers. In the center of the panel is the water temperature selector button and the corresponding indicator lamps. A water temperature gage is provided for the hot water. Equipment installation is shown in Figure 6-8. The supply water bladder tank is positioned at the upper rear location, the waste water bladder tank is directly below. The LGS and soap bladder tank are located in the lower front region in front of the waste water tank. The washing enclosure is centered in front and behind it is the charcoal filter and water heater tank. The electrical cable routing is illustrated in Figure 6-9.

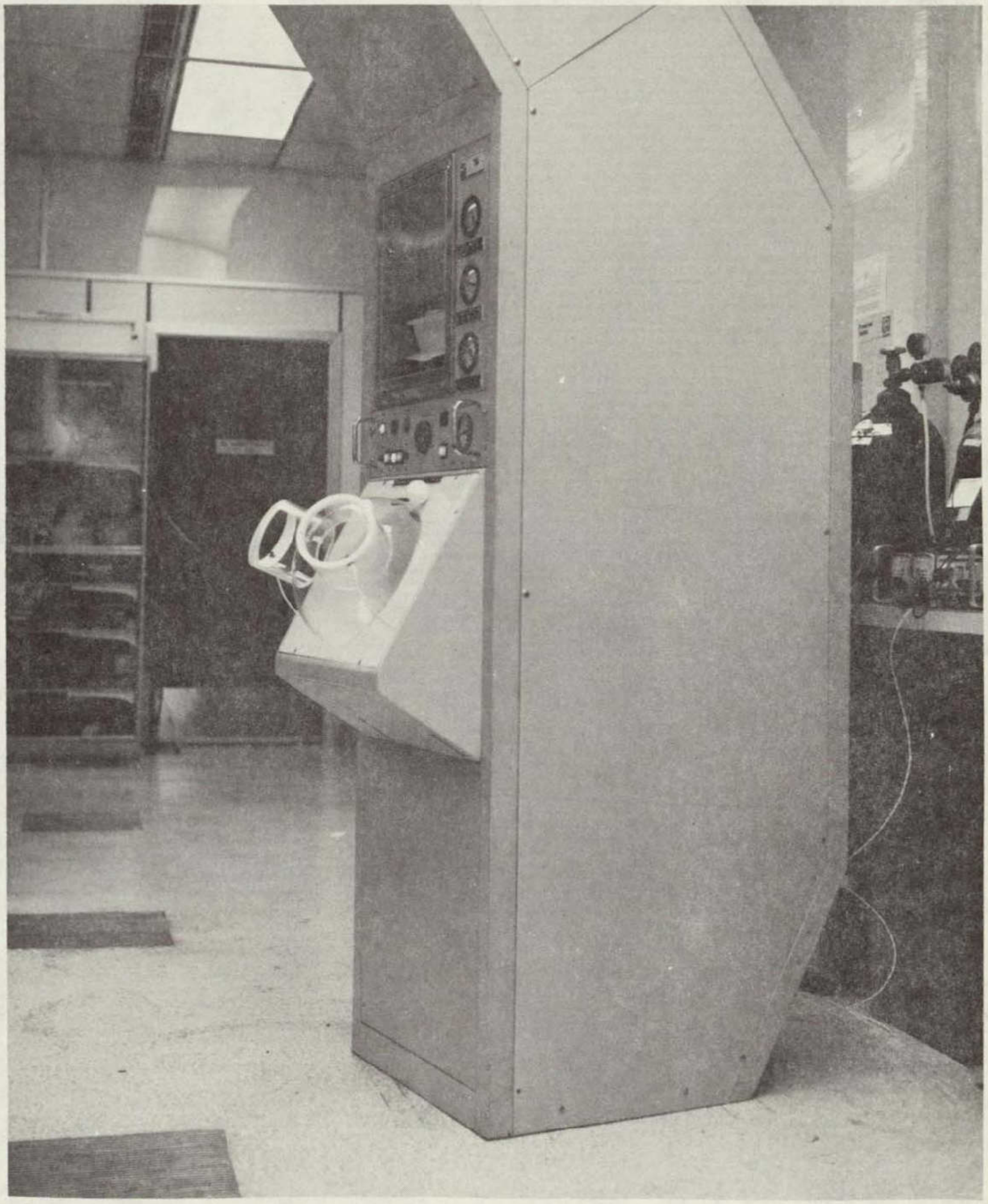
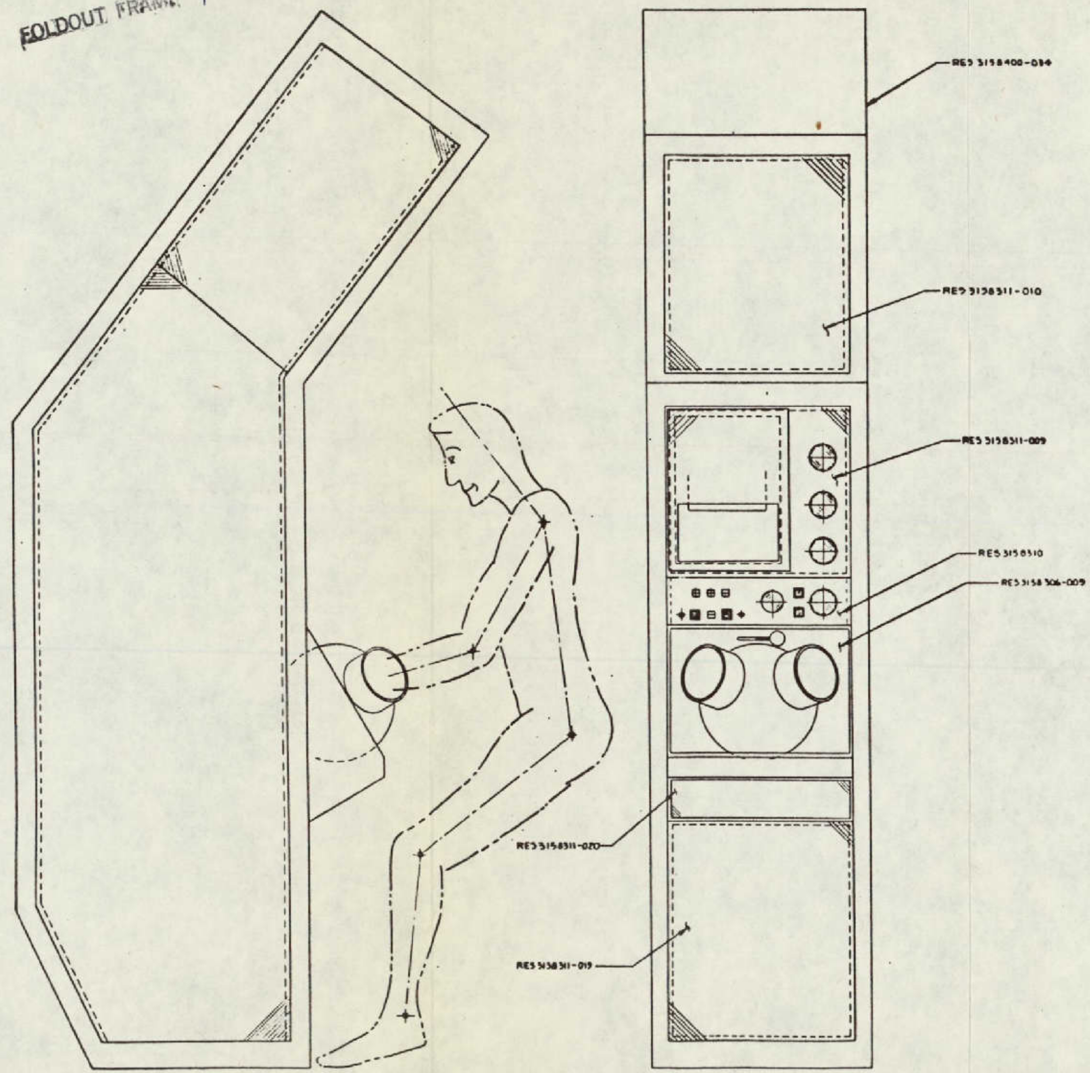


FIGURE 6-1 PROTOTYPE WASHING FIXTURE



-009 HANDWASHER COMPONENT INSTALLATION

FIGURE 6-2 CREWMAN INTERFACING WITH WASHING FIXTURE

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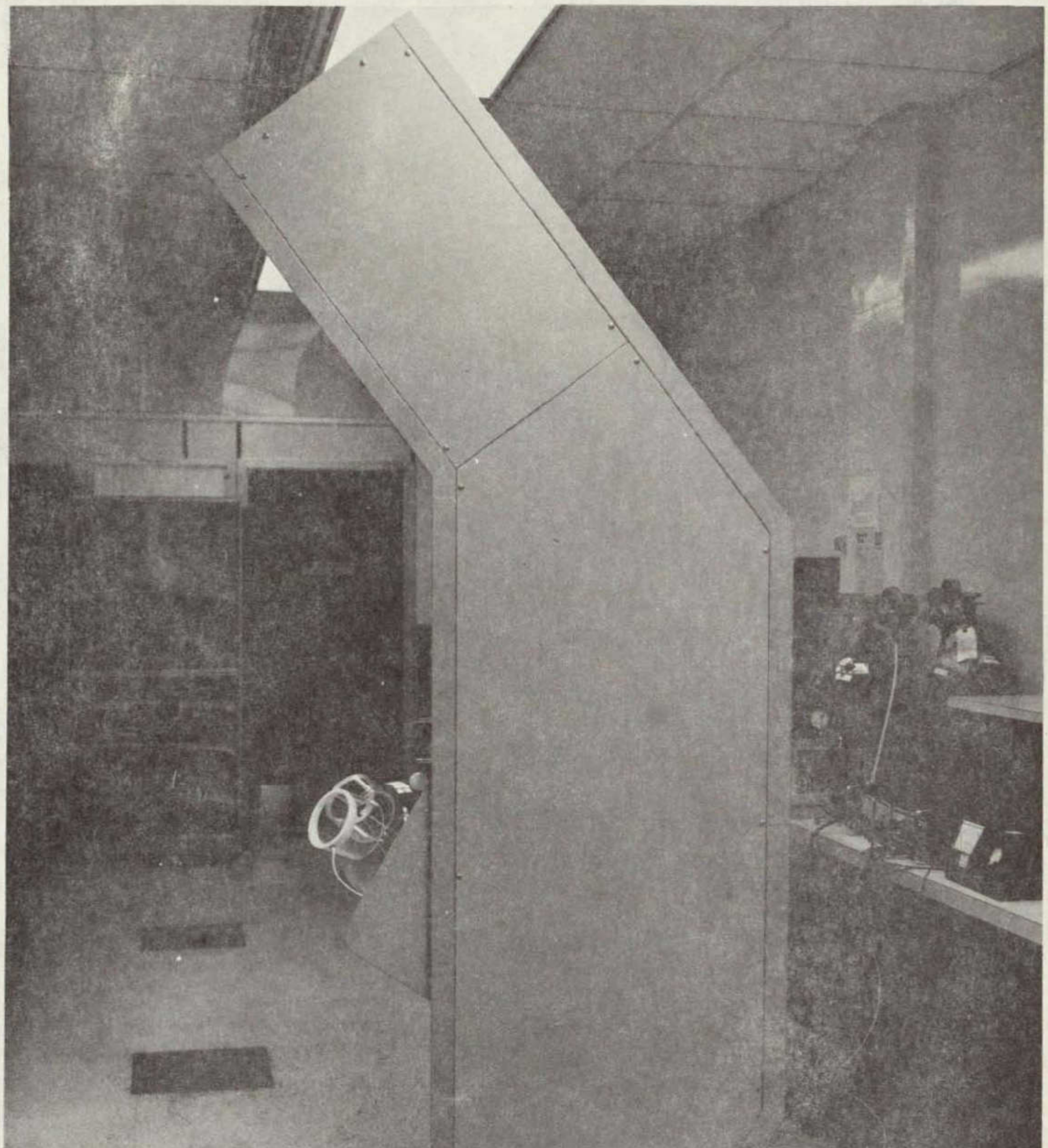

FIGURE 6-3 SIDE VIEW OF WASHING FIXTURE

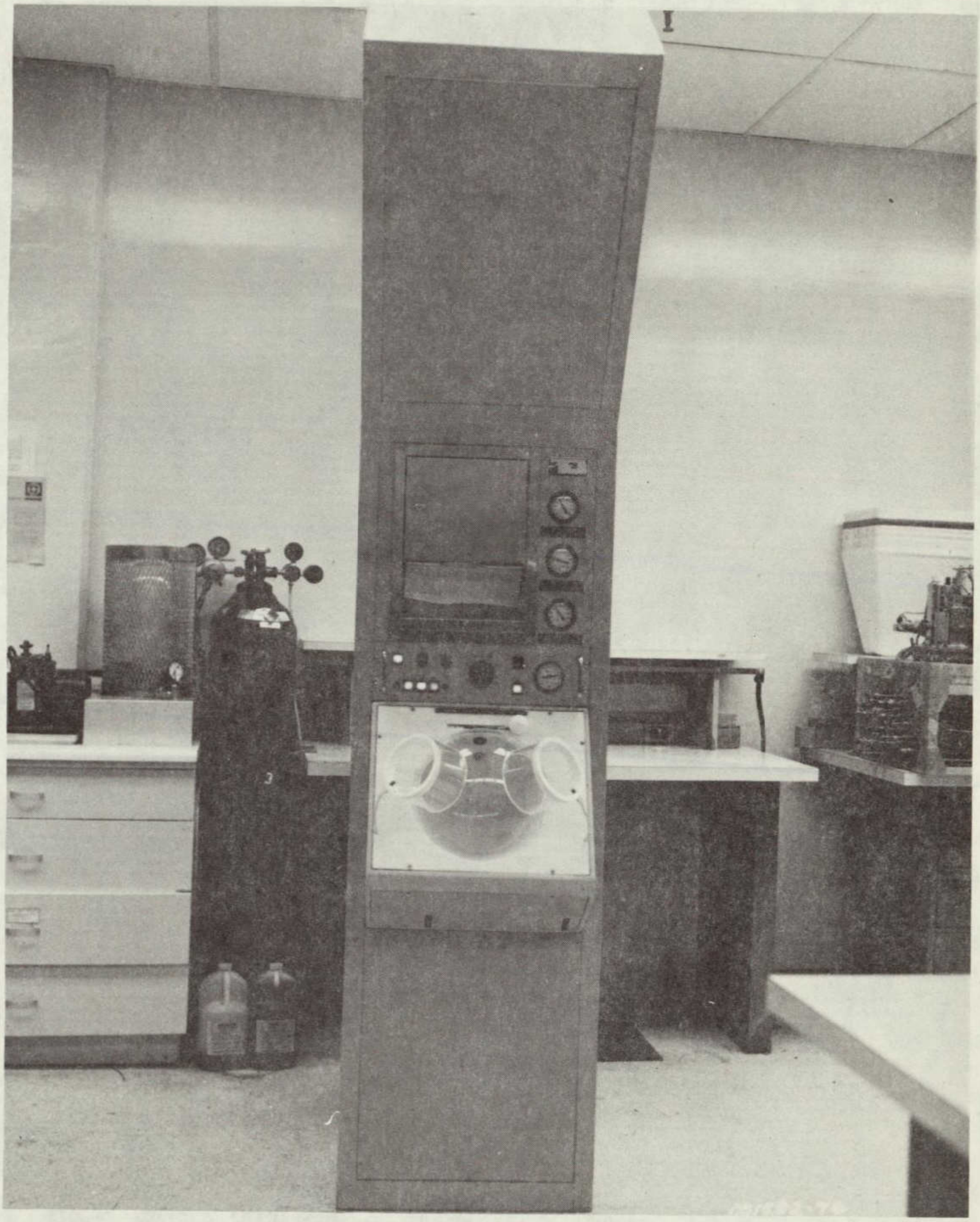

FIGURE 6-4 FRONT VIEW OF WASHING FIXTURE

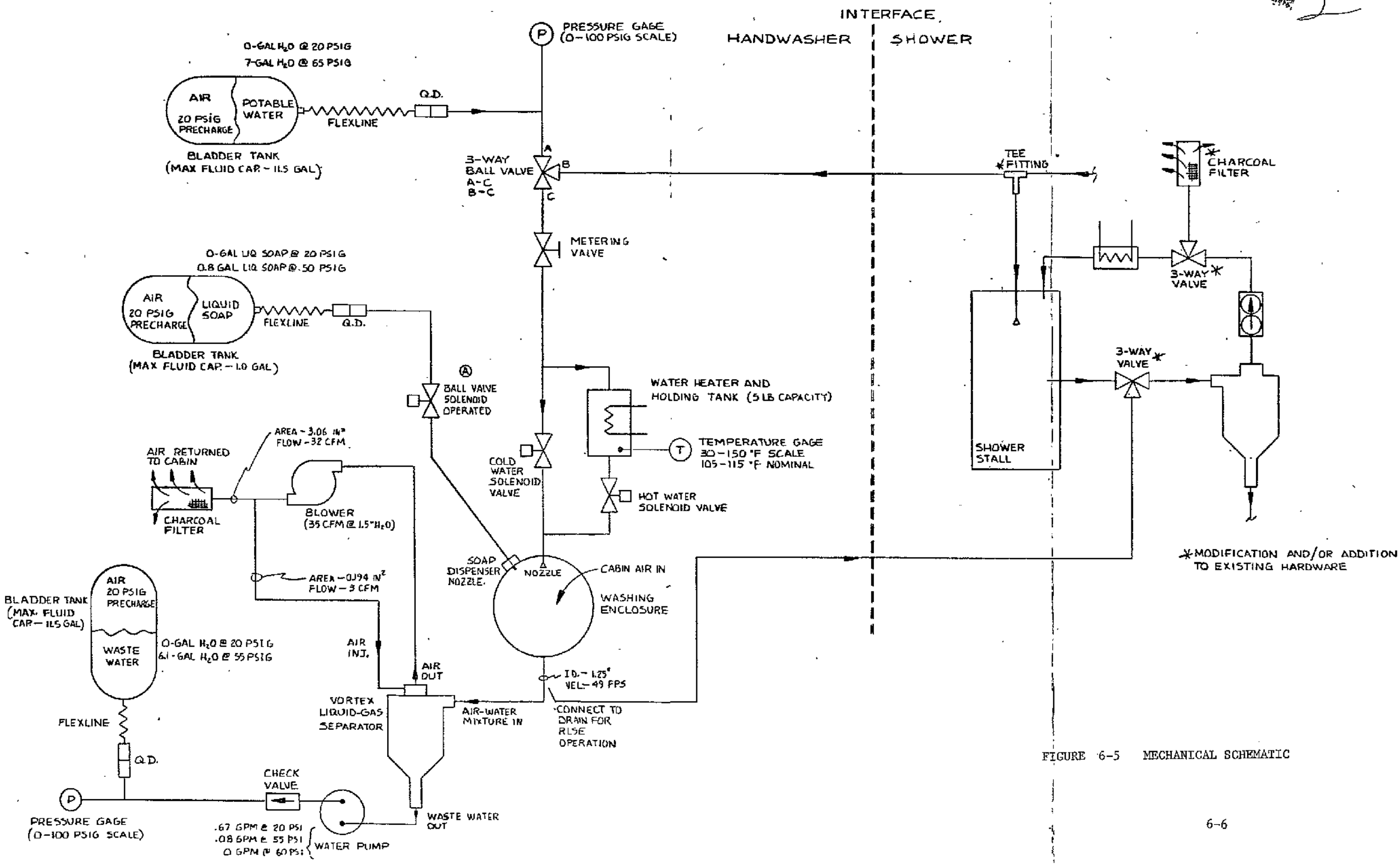

FIGURE 6-5 MECHANICAL SCHEMATIC

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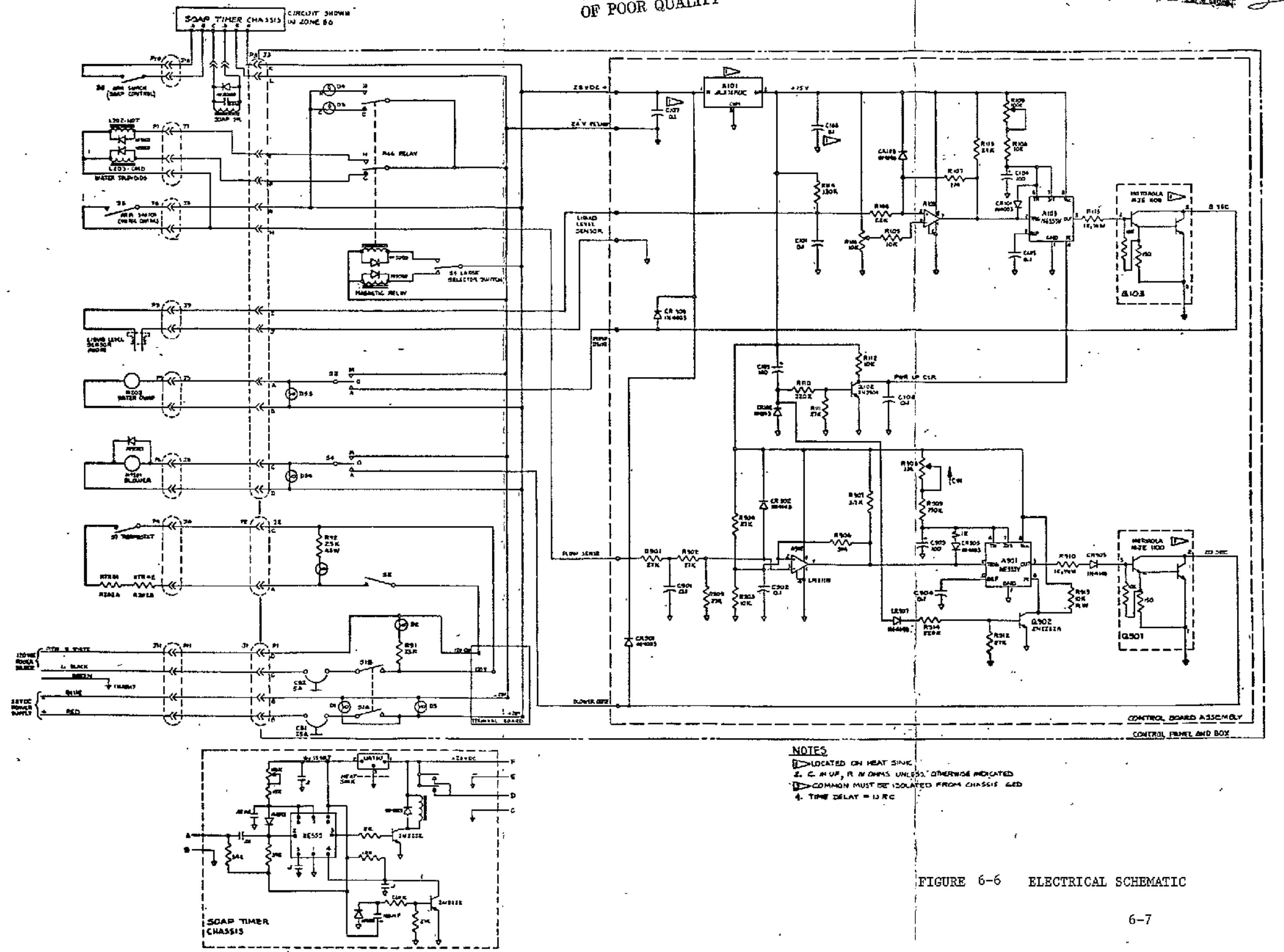

NOTES
1. ▷ LOCATED ON HEAT SINK
2. C IN UF, R IN OHMS UNLESS OTHERWISE INDICATED
3. ▷ COMMON MUST BE ISOLATED FROM CHASSIS GND
4. TIME DELAY = 1.1 RC

FIGURE 6-6 ELECTRICAL SCHEMATIC

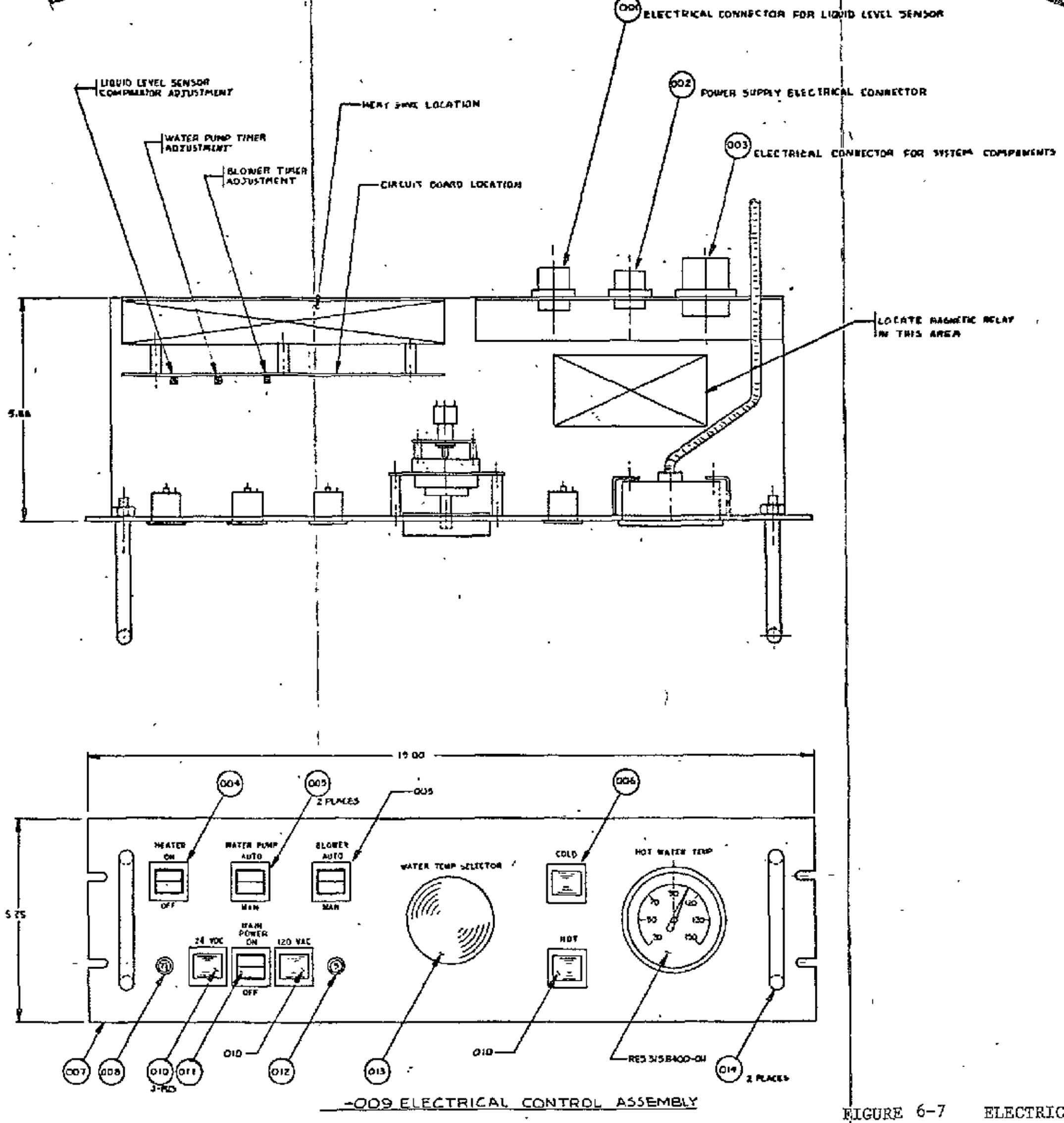

FIGURE 6-7 ELECTRICAL CONTROL PANEL

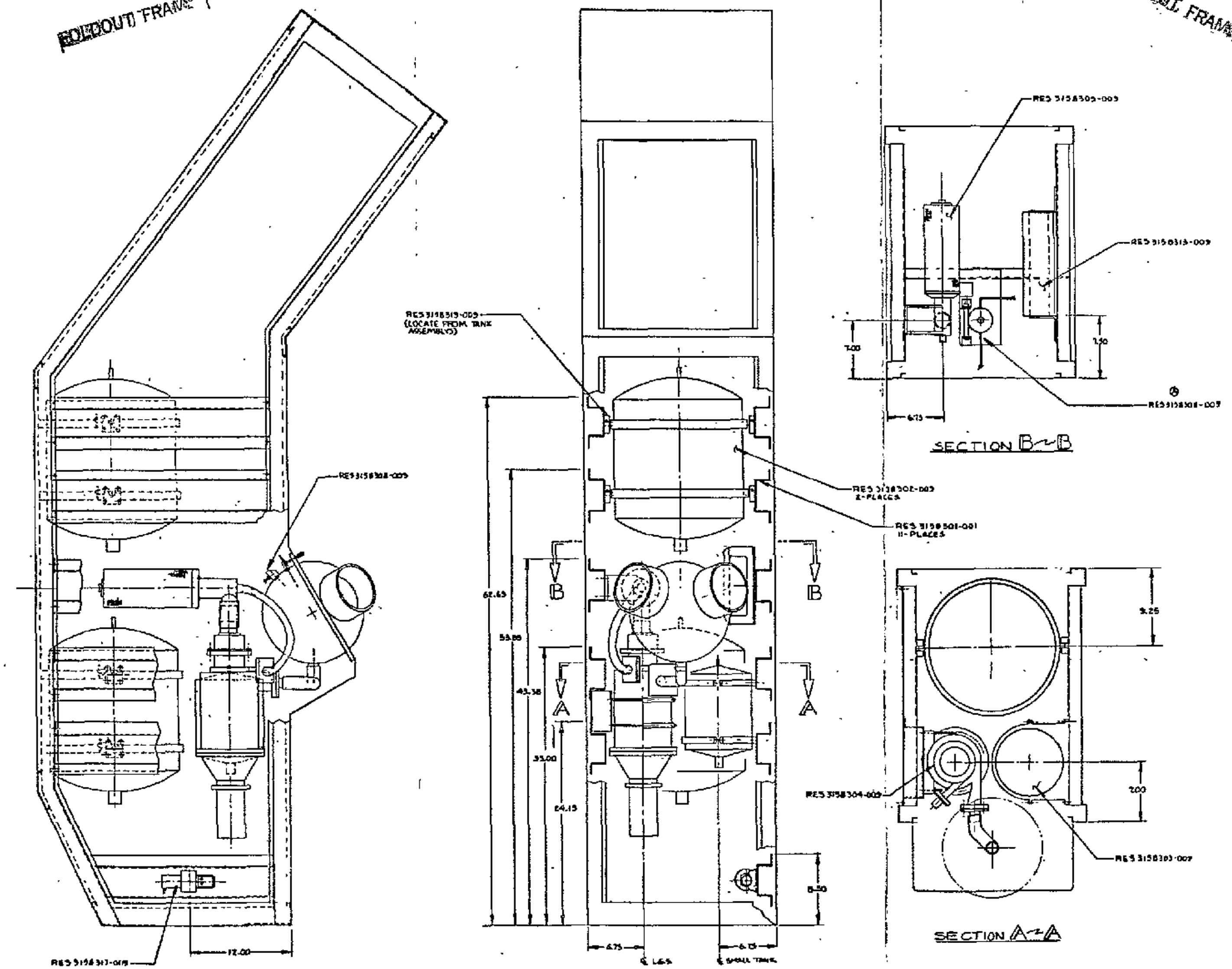

FIGURE 6-8 EQUIPMENT INSTALLATION

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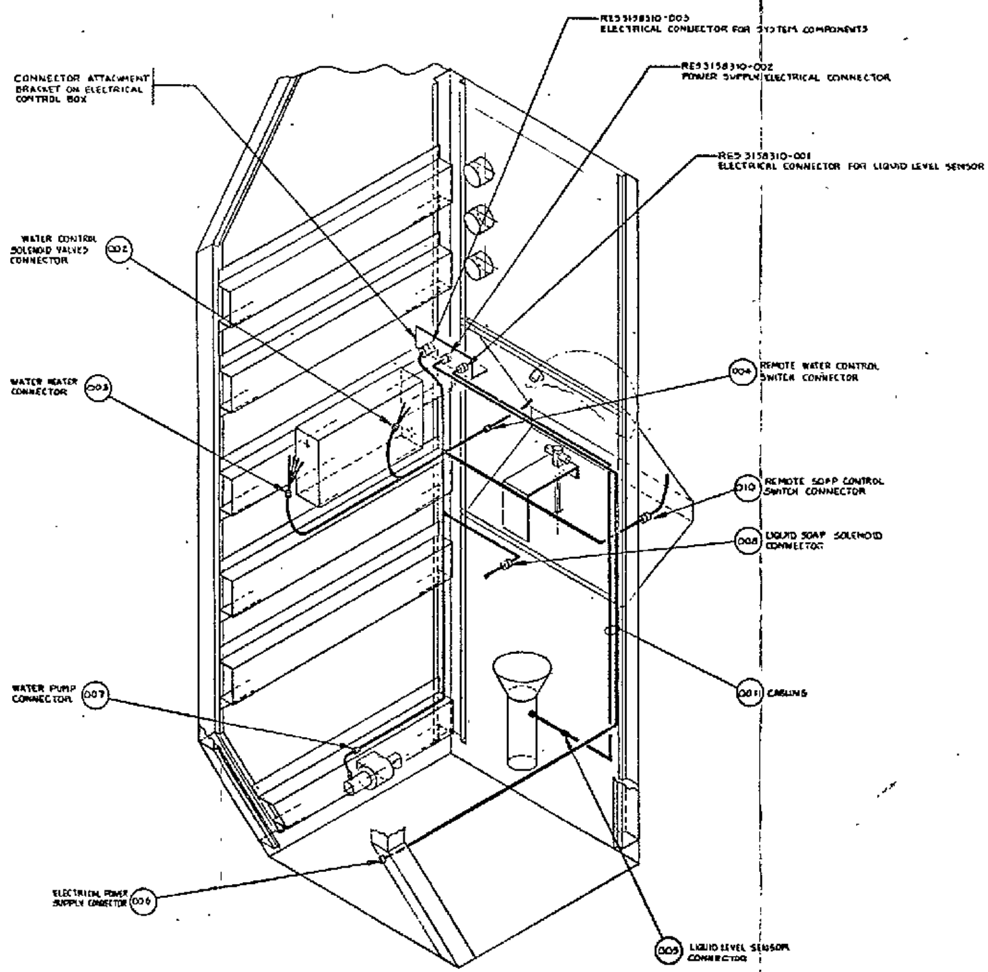


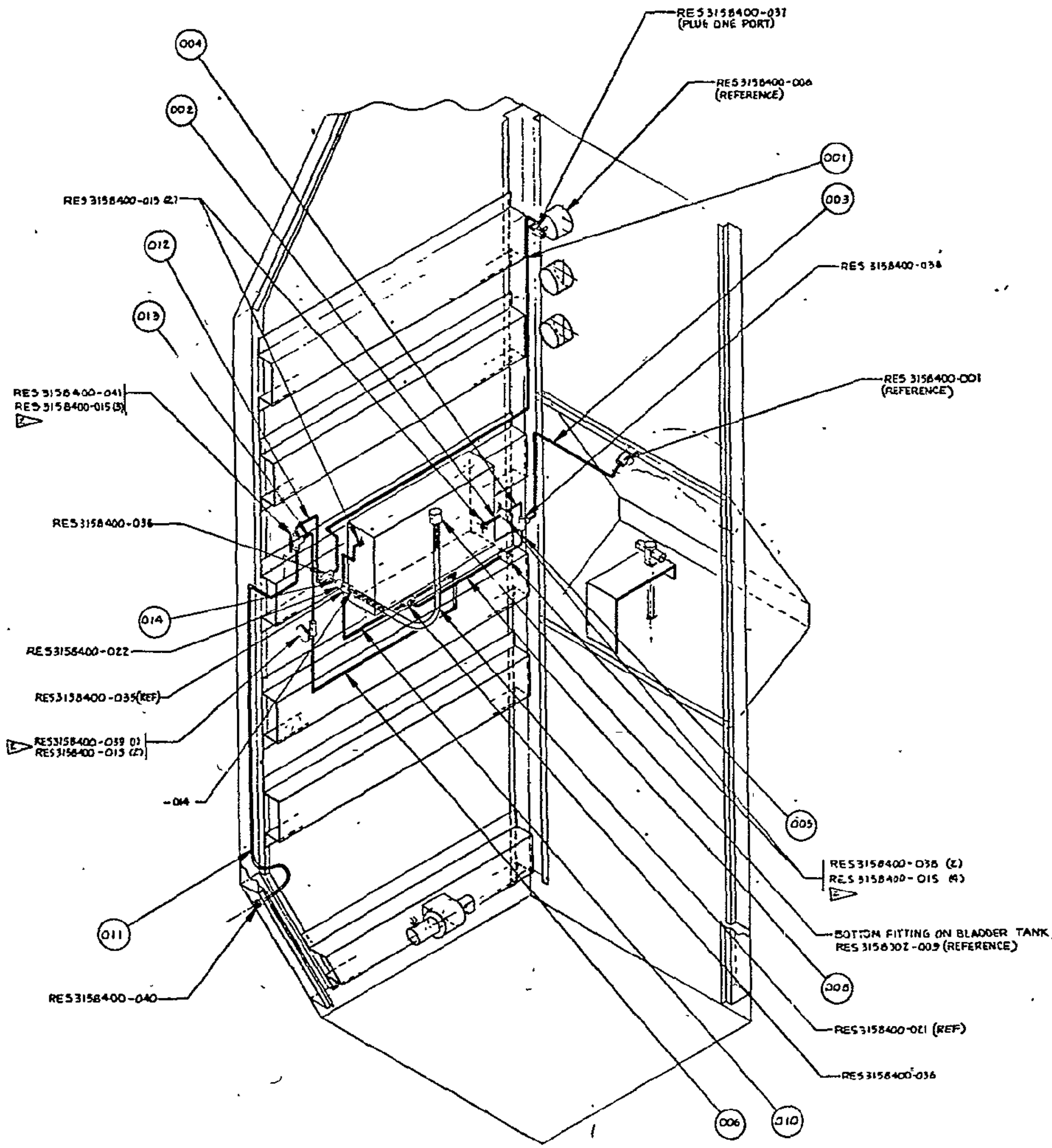
-009 ELECTRICAL CABLE ROUTING

FIGURE 6-9 ELECTRICAL CABLE ROUTING

The plumbing installation for the potable water line routing, liquid soap line routing, and the waste water line routing are shown in Figures 6-10 through 6-12 respectively. Table 6-1 is a calculated weight breakdown of the major components that make up the prototype unit.

Table 6-1 Calculated Weight Breakdown of Prototype Unit

Item	Weight kg	(lbs)
Electrical Control Box Assembly	2.3	(5)
Support-Lock Block Assembly and Pins	1.8	(4)
Water Pump Assembly	1.8	(4)
Hot Water Holding Tank	8.2	(18)
Panel Assemblies	3.2	(7)
Soap Activation System	2.3	(5)
Washing Enclosure	0.9	(2)
Air System	1.4	(3)
Liquid-Gas Separator	2.3	(5)
Small Bladder Tank With Attach Rings	3.6	(8)
Large Bladder Tanks With Attach Rings	27.3	(60)
Structural Attachment Beams	11.4	(25)
Charcoal Filter	1.4	(3)
Enclosure Support Bracket	1.8	(4)
Supply Water Line	2.3	(5)
Waste Water Line	1.8	(4)
Soap Line	1.8	(4)
	Total 74.7	(166)



-009 POTABLE WATER LINE PLUMBING INSTL

FIGURE 6-10 POTABLE WATER LINE ROUTING

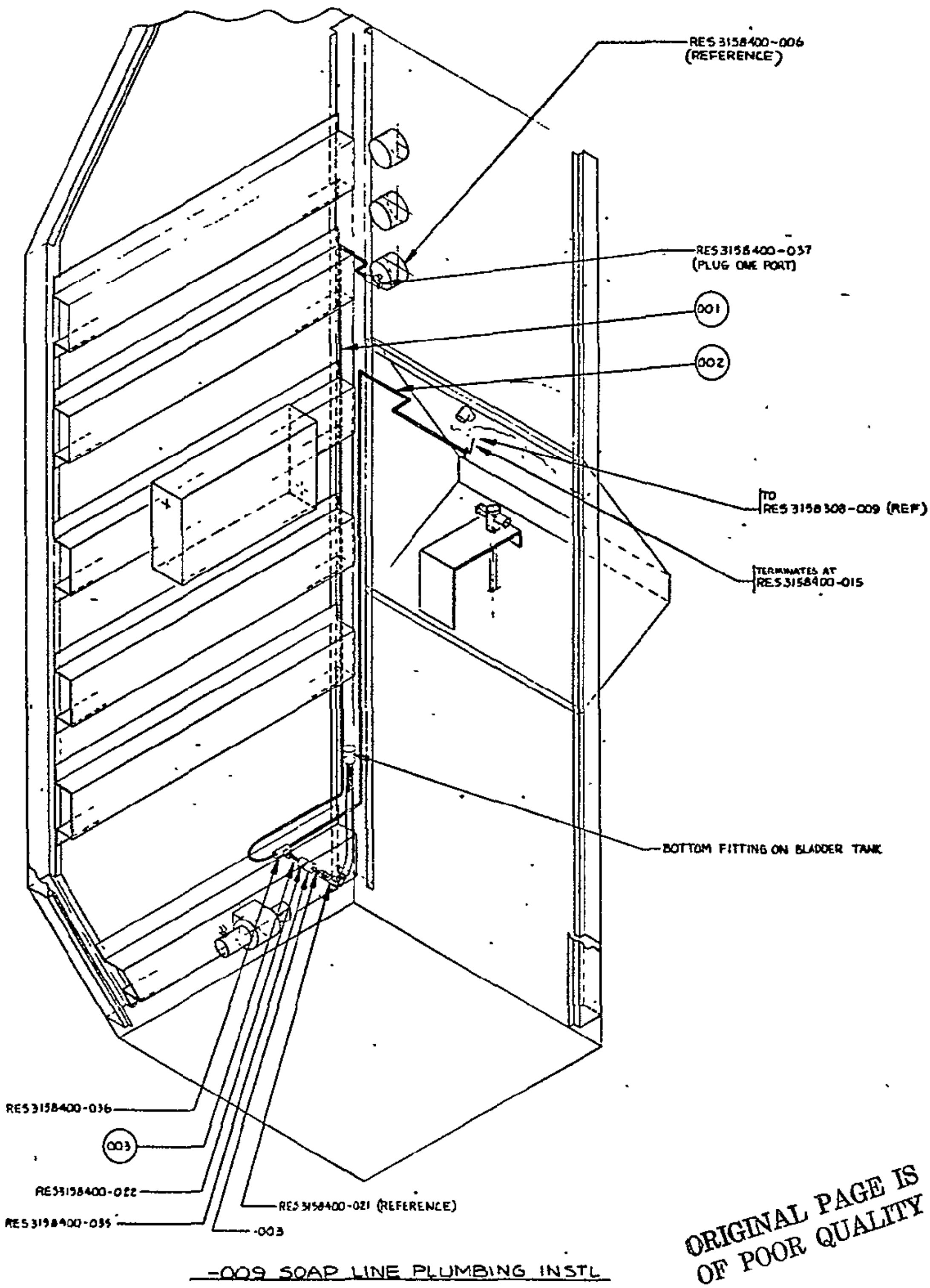
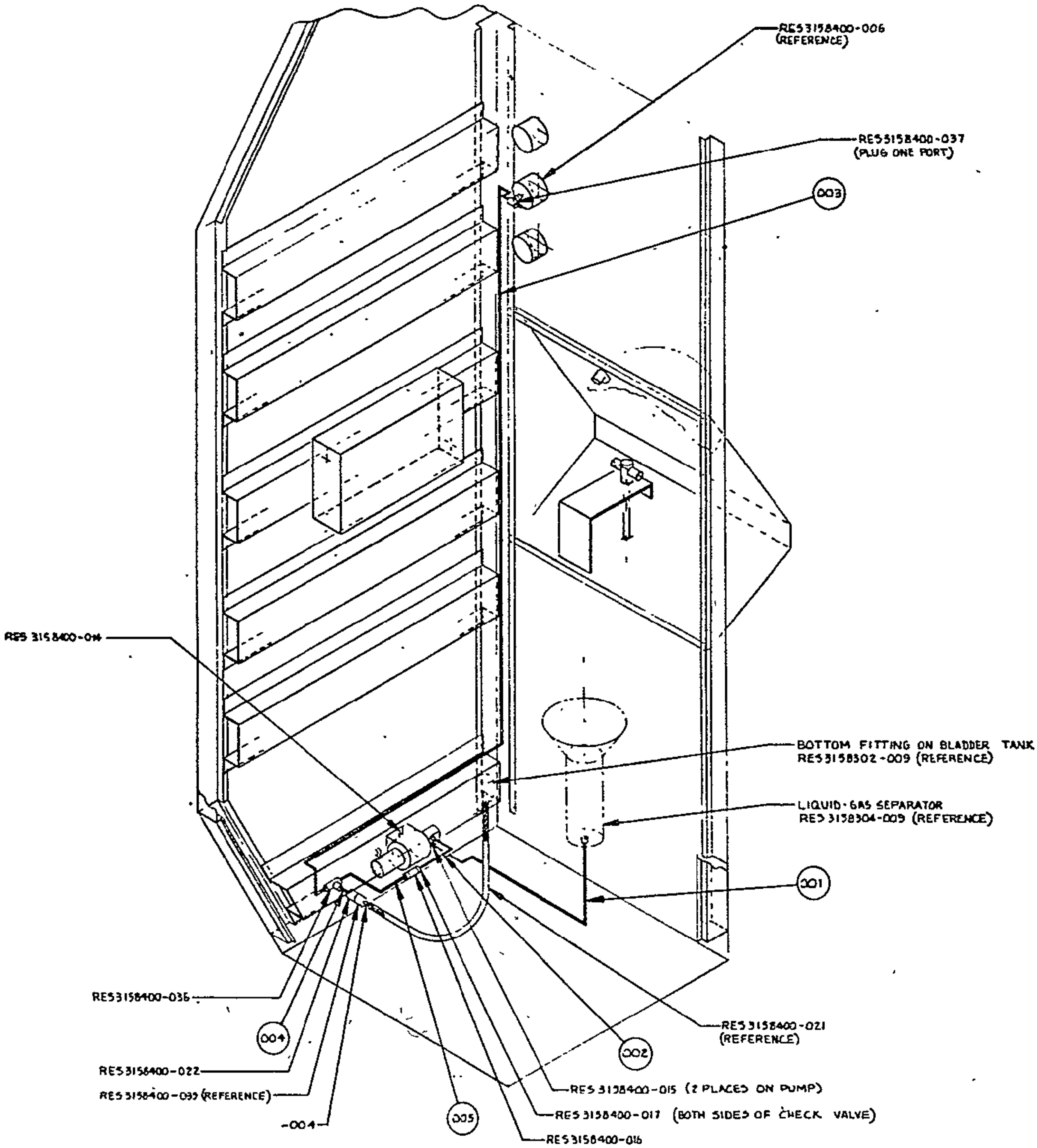


FIGURE 6-11 SOAP LINE ROUTING



-009 WASTE WATER LINE PLUMBING INSTL

FIGURE 6-12 WASTE WATER LINE ROUTING

6.2 Compliance With Requirements

The following paragraphs illustrate how the prototype design satisfies the contract S.O.W. requirements.

6.2.1 Technical Requirements

6.2.1.1 Washing

The prototype washing enclosure consists of a 0.3m (12-inch) diameter flanged sphere mounted on a 30-degree wedge shaped base that mates with the spacelab rack. Two 0.13m (5-inch) access tubes intersect the surface of the sphere with a horizontal separation of 90-degrees. The portion of the sphere protruding out from the base and the hand access tubes are fabricated out of clear acrylic plastic. The recessed portion of the sphere is white in color. This combination provides excellent visual inspection using surrounding lighting. Towards the top of the sphere is the water and soap nozzles (recessed). Activation is controlled by buttons mounted on the access tubes (water on right side and soap on the left). The access tubes are 0.09m (3.5-inches) in length and function as splash guard tubes thereby preventing loss of the water into the habitability area.

6.2.1.2 Rinsing

Water is controlled as discussed in paragraph 6.2.1.1. The water nozzle is adjustable with the use of an extended rod and knob located directly above the enclosure. The rod end consists of a collar that attaches to the movable sleeve of the nozzle. As the rod is rotated the spray pattern changes from a direct stream to a full cone. The knob is large enough and positioned to allow adjustment with users elbow (assuming hands are soiled and prevention of cross-contamination is desired).

6.2.1.3 Air Purge

A blower downstream of the washing enclosure drain has a minimum output of $1.16X10^{-2}m^3$/sec (24.7 CFM) which corresponds to a velocity of 14.5m/sec (47.8 fps) in a .03m (1.25-inch) I.D. drain line. This velocity is greater than the 9.9m/sec (33 fps) established as a minimum for moving water droplets in a zero gravity environment. After the hand washing operation is completed, the user pushes the remaining water droplets to the drain opening where the air velocity is effective in moving the droplets to the liquid gas separator. The used air passes through a filter with 3.3 Kg (1.5 lbs) of charcoal to remove contaminants and objectionable odors before it is returned to the habitability area.

6.2.1.4 Liquid-Gas Separator

The prototype fixture uses a vortex type LGS. This unit has no moving parts and proven performance in zero-G tests. Internally a pressure gradient is established when air passes through it with a higher pressure towards the top and lower pressure towards the sump. This plus the directional configuration of the inlet pushes the water into the sump of the separator where a level sensor controls a pump that pumps the waste water into a bladder tank. The bladder tank is connected to the structure at (4) pinned supports and to the system with a quick-disconnect. This allows for tank removal for inflight servicing.

6.2.1.5 Water Limiting Device

Water is controlled by an electrically operated solenoid valve that is normally closed. The user contacts a switch on the splash guard tube with his arm to activate the system. The switch is the type that has to be depressed to turn on the water and then depressed again to stop the water flow. This plus the adjustable nozzle controls the flow rate of water.

6.2.1.6 Water Stowage

The prototype system uses a precharged bladder tank for potable water storage. The tank capacity is sufficiant for 1-week of handwashings by (4) crewmen. The tank is modified by the addition of two rings and two locating pins per ring. The stationary structure contains clevis fittings that mate with the locating pins on the tank and support the tank when it is in place. Ball-lock-pins are inserted through the clevis fittings and lock the tank in place. The fluid interface is a quick-disconnect mounted on a flexline.

6.2.1.7 Design Life

The unit is designed for a 30-day mission with inflight servicing of water tanks. Between mission servicing will include liquid soap supply, towels, and air filter replacement.

6.2.1.8 Maintainability/Operability

The only inflight maintenance anticipated is that of bladder tank servicing. All other scheduled maintenance will be during scheduled down times. Items requiring maintenance are positioned for accessibility.

6.2.1.9 Microbiological Control

It is anticipated that a germicidal soap will be used for normal cleansing operations. Once a day the unit should be wiped down with a towel and soap from within the fixture. A separate and independent disinfectant system was deemed not necessary.

6.2.1.10 Configuration Requirement

The prototype unit component volume utilizes the bottom 2/3 of a narrow spacelab rack. External interfaces amount to only the electrical power connection.

6.2.2 Design Requirements

6.2.2.1 Environment

The prototype is designed to be used in either a zero-gravity or one-gravity environment. Height of the enclosure and configuration is a compromise between the two conditions.

6.2.2.2 Crew Physical Size

The prototype enclosure and controls are positioned to be comfortably used by crew sizes that range from the 5th percentile female to the 95th percentile male.

6.2.2.3 Human Engineering

All aspects of operation and maintenance design have been verified acceptable to within the limits set forth by MIL-STD-1472B.

6.2.2.4 Restraints

For zero-gravity use, the crewman will be using suction-cup restraint shoes. The control panel handles can be used by the crewman's hands for stabilization.

6.2.2.5 Structual Loading

Critical items such as the bladder tank attachments were analyzed and sized to withstand the 3-G launch and re-entry loading and the 12-G crash loading. The structural members are fabricated out of aluminum.

6.2.2.6 Stowage Provisions

The prototype unit has a recessed compartment for the stowage of towels. Additional support items can be restrained with the use of velcro strips located on the shelf area of the towel dispenser.

6.2.3 Performance Requirements

6.2.3.1 Crew Sizing

The system was designed for weekly water tank servicing based on test data. The tests utilized (4) men for (7) days. Changes in the number of crewman or usage rate will affect service intervals directly. Extended missions of up to 10.368×10^6 seconds (120 days) will increase the need of inflight scheduled maintenance for items such as liquid soap, towels and filters, that normally could be replenished between 2.592×10^6 seconds (30-day) missions.

6.2.3.2 System Tasks

The prototype fixture is capable of performing tasks like washing hands, face (with washcloth), sponge bathing, shaving and cleaning razor, brushing teeth and cleaning tooth brush, washing hair (with washcloth), oral hygiene and cleaning utensils. Waste fluid disposal is not recommended as discussed in section 1.4.

6.2.4 Interface Requirements

6.2.4.1 Cabin Atmosphere

The unit is designed to operate under standard atmosphere conditions of 1.013×10^5 N/m^2 (760 mm Hg).

6.2.4.2 Cabin Humidity

A 25 to 70 percent humidity is compatible with the prototype cleansing fixture. It is estimated that 90 grains of moisture will be lost to the cabin atmosphere per handwashing cycle.

6.2.4.3 Cabin Temperature

Cabin temperatures of 291-301°K (64-81°F) have no affect on materials or operation of the prototype fixture.

6.2.4.4 Heat Rejection

All of the electrical components in the prototype fixture combined, consume electrical power at a rate of 324 watts. This value is far below the 1,000 watt nominal or 3000 watt peak allowable heat rejection assuming all the electrical power consumed is converted into heat energy.

6.2.4.5 Power Interfaces

The electrical power source required to operate is 28 VDC and 115 VAC (60 Hz or 400 Hz).

6.2.4.6 Water Interface

The prototype fixture has the capability of being self contained in the areas of potable water supply and waste water storage, or the unit can accept external water and discharge waste water externally. A bulkhead fluid fitting located at the lower rear area of the unit is to be used for the connection of an external water supply source. A three-way valve incorporated in the unit selects the source (internal or external). A quick-disconnect is mounted on the flex-line leading to the internal waste water bladder tank. For external routing, a mating disconnect half and plumbing can replace the internal tank and flex-line/disconnect-half.

6.2.4.7 Air Interfaces

Cabin air is taken in to the fixture and discharged back into the cabin after passing through a charcoal filter to remove contaminants and/or objectionable odors.

6.2.4.8 Structure Interface

The prototype cleansing fixture utilizes a standard narrow spacelab rack as its base support structure.

6.2.4.9 Equivalent Weight Penalties

The weight penalty for handwashings amount to 0.72 Kg (1.58 lbs) for heat added directly into the cabin area. For continuous DC power the penalty is 46.7 Kg (102.8 lbs) and for AC power the penalty is 48.4 Kg (106.5 lbs).

6.2.4.10 Pressurant Interface

No pressurant interface is required on the prototype cleansing fixture.

7.0 TASK 6 - PROTOTYPE FABRICATION

This task involved the physical fabrication and assembly of the prototype cleansing fixture. The unit was fabricated in Martin Marietta's Engineering Model Shop per the engineering drawings as shown in the addendum to this final report.

The basic support structure is the spacelab rack. To this structure, hat-section beams were attached to provide a base structure from which component brackets could be located. At this point subassemblies can be installed. This would include items like bladder tanks, liquid gas separator, blower and related air ducting, water pump, electrical control box, and washing enclosure. After the major components are located, fluid and electrical lines can be routed. The installation of the rack exterior panels completes the fabrication and assembly task.

8.0 TASK 7 - PROTOTYPE TESTS

This task involved testing the prototype fixture described in section 6.0. Document MCR-78-600, PROTOTYPE TEST REPORT, was prepared and the following paragraphs are excerpts from that report.

The Spacecraft Utensil/Hand Cleansing Fixture provides a means for a crewman to perform, in zero-gravity, laboratory utensil/tool cleansing and personal hygiene functions such as handwashing, shaving, body wash and teeth brushing. A prototype unit was developed incorporating design improvements resulting from breadboard tests in a one-gravity and zero-gravity environment. This section presents the results of one-gravity laboratory tests for the Spacecraft Utensil/Hand Cleansing fixture prototype design developed under Contract NAS9-15012. The objective of these tests was to evaluate the performance and functional characteristics of the design and compare results with the design goals and system specifications. Quantitative criteria was developed to assess the cleansing fixture's impact on spacecrft related systems. The tests were performed at Martin Marietta's Power Systems Laboratory.

8.1 Prototype Subsystem Checkout Test

8.1.1 Test Objective

Prior to performing task performance tests all subsystems will be tested for designed performance individually and as a total system. The subsystems are the water distribution, liquid soap distribution, air processing, waste water collection, and the electrical control system.

8.1.2 Test Location

All one-gravity tests performed on the prototype hardware is conducted at the Power Systems Laboratory in the Space Systems Building at Martin Marietta.

8.1.3 Test Setup

See Test Report MCR-78-600 for a detailed description of the test setup.

8.1.4 Test Procedure

See Test Report MCR-78-600 for a detailed description of the test procedure

8.1.5 Test Results

8.1.5.1 Water Distribution Subsystem

a. Leakage - Table 8-1 lists the pressures reached during the test, the observations and the corrective measures taken to fix any discrepancies that occurred.

TABLE 8-1 POTABLE WATER LEAKAGE RESULTS

PRESSURE $N/m^2 \times 10^5$ (psig)	OBSERVATION	CORRECTIVE ACTION
1.38 (20)	Water droplets appear at fittings	Fitting tightened.
1.72 (25)	No leakage.	
2.07 (30)	No leakage.	
2.41 (35)	Water droplet at nozzle connection.	Seal added.
2.76 (40)	No leakage.	
3.10 (45)	No leakage.	
3.45 (50)	No leakage.	
3.79 (55)	No leakage.	
4.14 (60)	No leakage.	
4.48 (65)	No leakage.	

b. Spray Pattern - The adjustable nozzle was positioned to provide satisfactory cone and straight stream patterns within the limits of the adjusting lever.

c. Water Droplet Entrapement - With arms inserted into the enclosure with blower running and water sprayed onto the hands, no water droplet escapement from the splash guard tubes was observed.

d. Hot Water Temperature Control - The thermostat mounted on the hot water holding tank has been adjusted so that the water temperature stabilizes at 314.2°K (106°F) after approximately 1.8×10^3 seconds (30 minutes) of heat input from ambient temperature. Consecutive hand washings have a tendency to raise temperature readings up to maximum of 319.8°K (116°F). This indicates that the center portion of the heater is slightly hotter than the outer sides where the temperature probe is located. It was noticed that numerous consecutive handwashings did not deplete the availability of hot water, which always stayed within the desired range of 313.7 - 320.9°K (105 - 118°F).

e. Supply Water Lever - Figure 8-1 plots the bladder tank liquid volume as it relates to the compressed sealed air volume pressure.

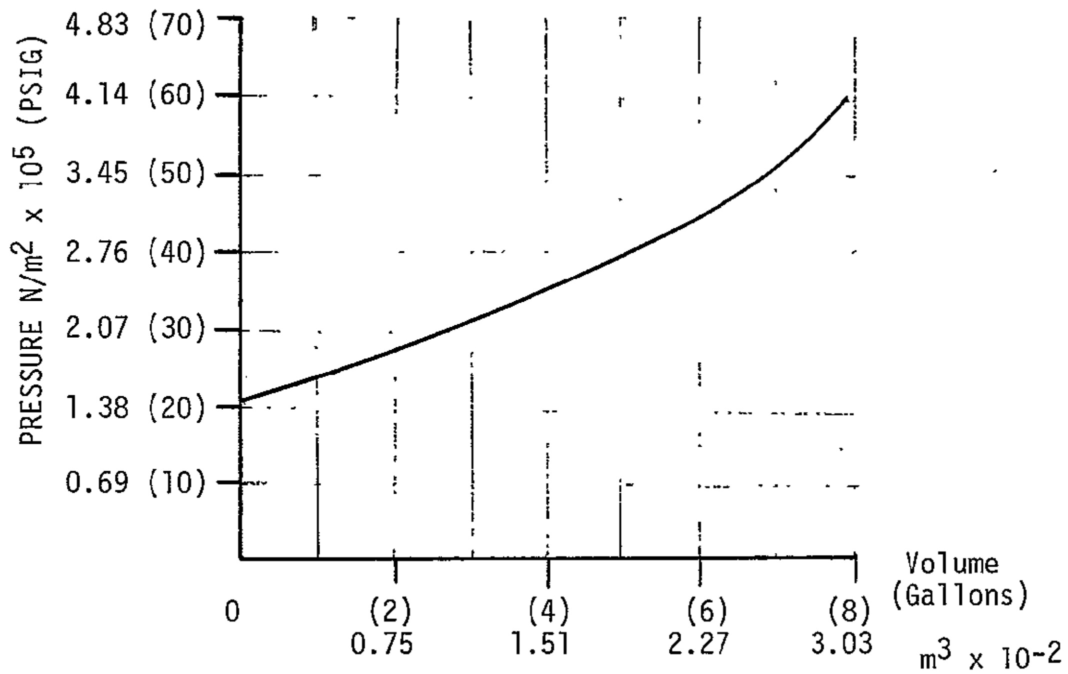


FIGURE 8-1 VOLUME OF WATER REMAINING VS. INDICATED PRESSURE

8.1.5.2 Soap Distribution Subsystem

a. Leakage - Table 8-2 lists the pressures reached during the test, the observations and corrective measures taken to fix any discrepancies that occurred.

TABLE 8-2 SOAP LEAKAGE RESULTS

PRESSURE N/m^3 x 105 (psig)	OBSERVATION	CORRECTIVE ACTION
1.38 (20)	Liquid soap droplets appear at fittings. Soap dispenser leaks and does not operate properly.	Fittings tightened. Piston type soap dispenser replaced with ball valve type.
1.72 (25)	No leakage.	
2.07 (30)	No leakage.	
2.41 (35)	No leakage.	
2.76 (40)	No leakage.	ORIGINAL PAGE IS OF POOR QUALITY
3.10 (45)	No leakage.	
3.45 (50)	No leakage.	

b. Dispensing Control - The revised soap dispenser incorporates a solenoid actuated ball-valve which includes an electrically controlled "on" time for the solenoid. The result is an adjustable unit which can meet the proposed 1 cc (.061 in^3) per activation requirement.

c. Liquid Soap Level - Figure 8-2 plots the bladder tank liquid volume as it relates to the compressed sealed air volume pressure.

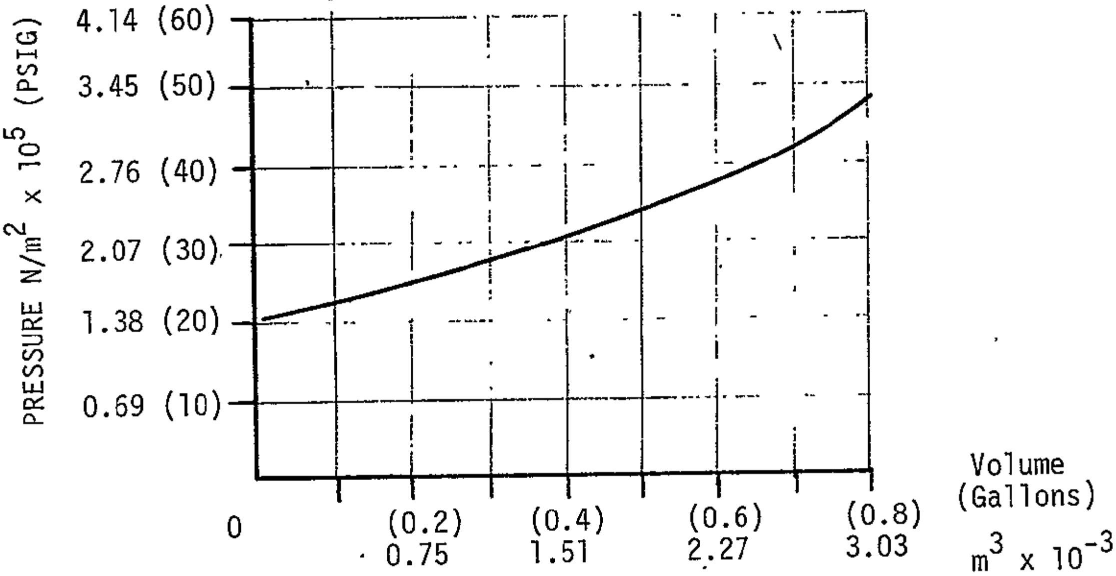


FIGURE 8-2 VOLUME OF LIQUID SOAP REMAINING VS. INDICATED PRESSURE

8.1.5.3 Air Processing Subsystem

a. Main Air Flow - The blower was drawing 0.7 amps at a voltage of 27 VDC at the blower. At the test altitude of 1585 m (5200 feet). the flow was $1.16 \times 10^{-2} m^3/sec$ (24.7 CFM). At sea level where the density

is higher, the flow rate will be 1.41×10^{-2} m^3/sec (30 CFM).

b. Air Injection Flow - The flow passing through the air injection line of the liquid gas separator is determined from cross-sectional areas in the air duct tee. With an area ratio of 5 percent the air flow in the injection line is 7.08×10^{-4} m^3/sec (1.5 CFM).

8.1.5.4 Waste Water Collection Subsystem

a. Leakage - Table 8-3 lists the pressures reached during the test, the observations and the corrective measures taken to fix any discrepancies that occurred.

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TABLE 8-3 WASTE WATER LEAKAGE RESULTS

PRESSURE $N/m^2 x 10^5$ (psig)	OBSERVATION	CORRECTIVE ACTION
1.38 (20)	Leaks at Fittings and at Base of Enclosure	Fittings Tightened and Seal Installed on Drain Line
1.72 (25)	No Leakage	
2.07 (30)	No Leakage	
2.41 (35)	No Leakage	
2.76 (40)	No Leakage	
3.10 (45)	Check Valve Backflows	Unit Dismantled, Cleaned and Reinstalled
3.45 (50	No Leakage	
3.78 (55)	No Leakage	

b. Pump Performance - The pump was capable of filling the waste water bladder tank to the 3.79 x 10^5 N/m^2 (55 psig) level. To reach this level of performance it was necessary to adjust the by-pass screw fully inward. The output pressure of the pump was 4.14 x 10^5 N/m^2 (60 psig).

c. Pump Timing - The pump timing (the running time from activation to shut off) is adjustable. A setting of 5-seconds appears to be the optimum point. At this setting, the water in the sump of the LGS is nearly emptied at the low initial back pressure. Care must be taken not to set the pump running time to long whereas air is pumped into the bladder tank. The pump is not designed to run dry (possible damage) and the bladder tank would require earlier than normal servicing. At higher back pressures, the pump will cycle more often since less water is transferred compared to the low back pressure condition.

d. Waste Water Level - Figure 8-1 plot applies to both supply and waste water tanks, since both are the same size and type.

e. Waste Tank Servicing - Tank servicing is scheduled at 3.79 x 10^5 N/m^2 (55 psig). This is an ideal point since maximum pump pressure is 4.14 x 10^5 N/m^2 (60 psig) and this point also corresponds to .028 m^3 (7.4 gallons) of fluid. A higher set point would result in very slow or negligible flow which would also result in a higher power consumption to transfer the same quantity of fluid.

8.1.5.5 Electrical Control Subsystem

a. Electrical Continuity - All components were checked for electrical continuity from control box to component.

b. Liquid Level Sensor - The liquid level sensor sensitivity adjustment was positioned so that when the water would reach the sensor it would trigger the pump start circuit.

c. Electronic Timers - The timer for the water pump was set at 5 seconds, which is sufficient to empty the sump of the LGS under low back pressure conditions. The timer for the blower is set at 20 seconds. This means that after the water is shut off, the blower will continue to run for 20 seconds before coming to a stop. This provides sufficient time to pull the water droplets from the drain line into the LGS. It should be noted that while the water is turned on, the blower is running and the timer shutoff does not become activated until the water flow is stopped.

d. Amperage Check - The current draw for all components was measured and listed in Table 8-4. Figure 8-3 is a typical power/time chart for a washing cycle.

TABLE 8-4 OPERATING COMPONENT AMPERAGE

COMPONENT	AMPERAGE	POWER SOURCE
Indicator Lights	0.2	DC
Blower	0.07	DC
Water Pump	2.1	DC
Water Solenoid	0.3	DC
Soap Solenoid	2.9	DC
(2) Heaters	1.3	AC

8.1.6 Conclusion

All subsystems are working to the designed performance level. The system (combination of all subsystems) is working properly and is ready for the cyclic task performance tests.

8.2 Prototype Task Performance Capability Test

8.2.1 Test Objective

The objective of this test is to demonstrate the capability of the prototype cleansing fixture in performing different cleansing functions and in simulating a 30-day mission involving four crewman each washing their hands five times daily. The functional tasks are washing hands, washing utensils, shaving, brushing teeth, whole body sponge bath, oral hygiene and washing of hair.

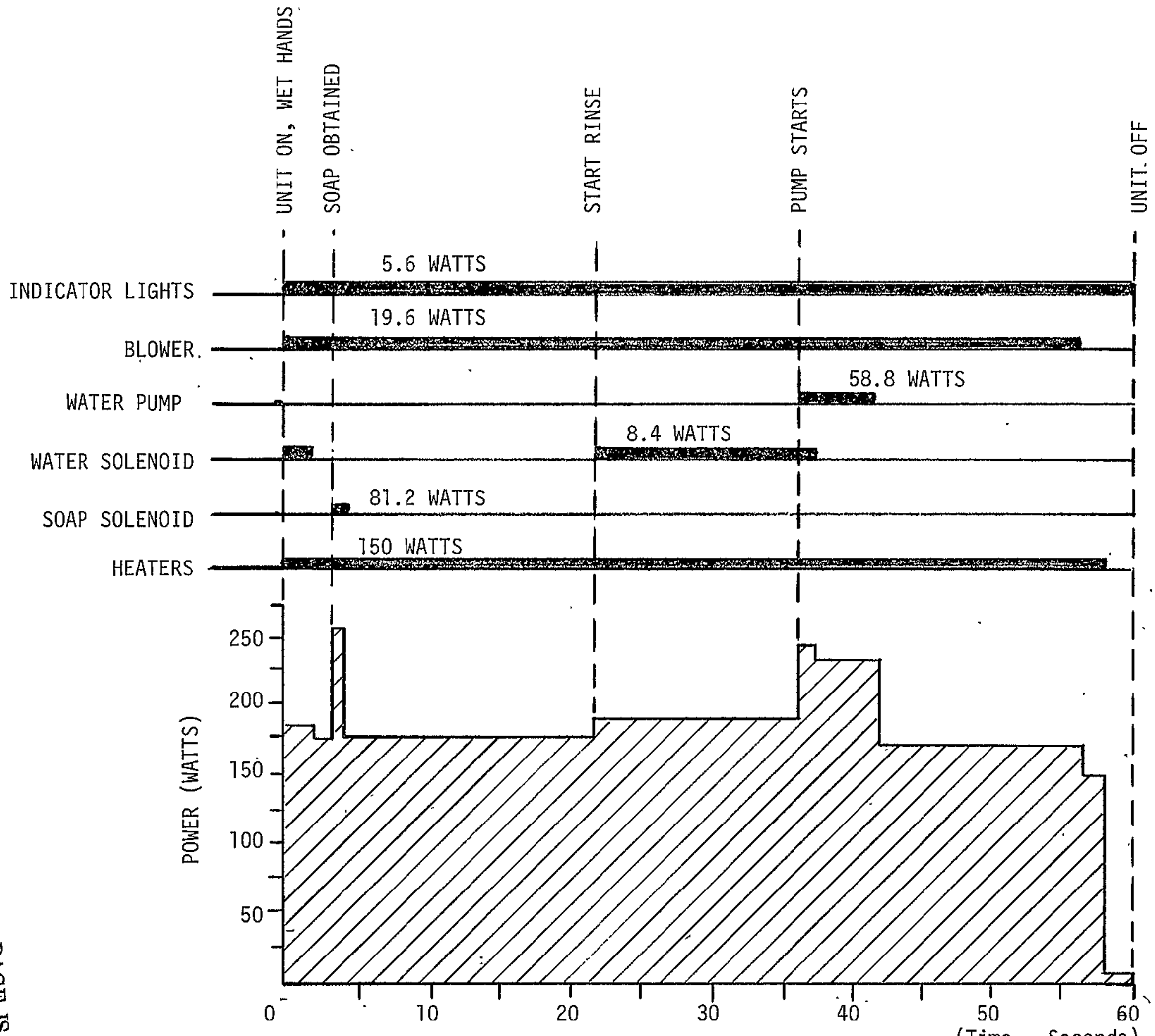

FIGURE 8-3 POWER/TIME CHART

8.2.2 Test Location

All one-gravity tests performed on the prototype hardware is conducted at the Power Systems Laboratory in the Space Systems Building at Martin Marietta.

8.2.3 Test Setup

Mechanically - the unit described in Section 6.0 is set up in the test lab in an area close to electrical power and a water source/drain.

Electrically - The unit is interfaced with a standard 120 VAC outlet and with a 10-amp DC power supply.

Fluids - The potable water is pumped into the supply water bladder tanks using a hand pumped compression tank and monitoring volume by occasionally connecting the tank line to the main system and reading residual pressure in the system. The liquid soap system is handled in a similar manner.

8.2.4 Test Procedure

See Test Report MCR-78-600 for a detailed description of the test procedure. During this test observations will be made to verify overall system performance and data will be recorded from fixture instrumentation shown in Figure 8-4.

8.2.5 Test Results

8.2.5.1 Handwashing

Approximately 40 different test subjects performed the hand washing task. Figure 8-5 shows one of the female test subjects washing her hands. The following data was recorded or analytically obtained from the test results.

a. Handwashing Cycles - The supply water tank was filled on four occasions. The number of washings were 144, 203, 136 and 132 for an average of 154 per 7.4 gallons of water. This number exceeds the predicted average requirement of 140 handwashings per tank.

b. Water Usage - The average handwashing used 1.8 x $10^{-4} m^3$ (0.048 gallons) of water. In terms of weight, this amounts to .18 Kg (0.4 lbs) of water per usage.

c. Time Profile - Table 8-5 lists a typical sequence of operations with corresponding elapsed time. Total time varied from 30 to 120 seconds (.5 - 2 minutes) depending on user.

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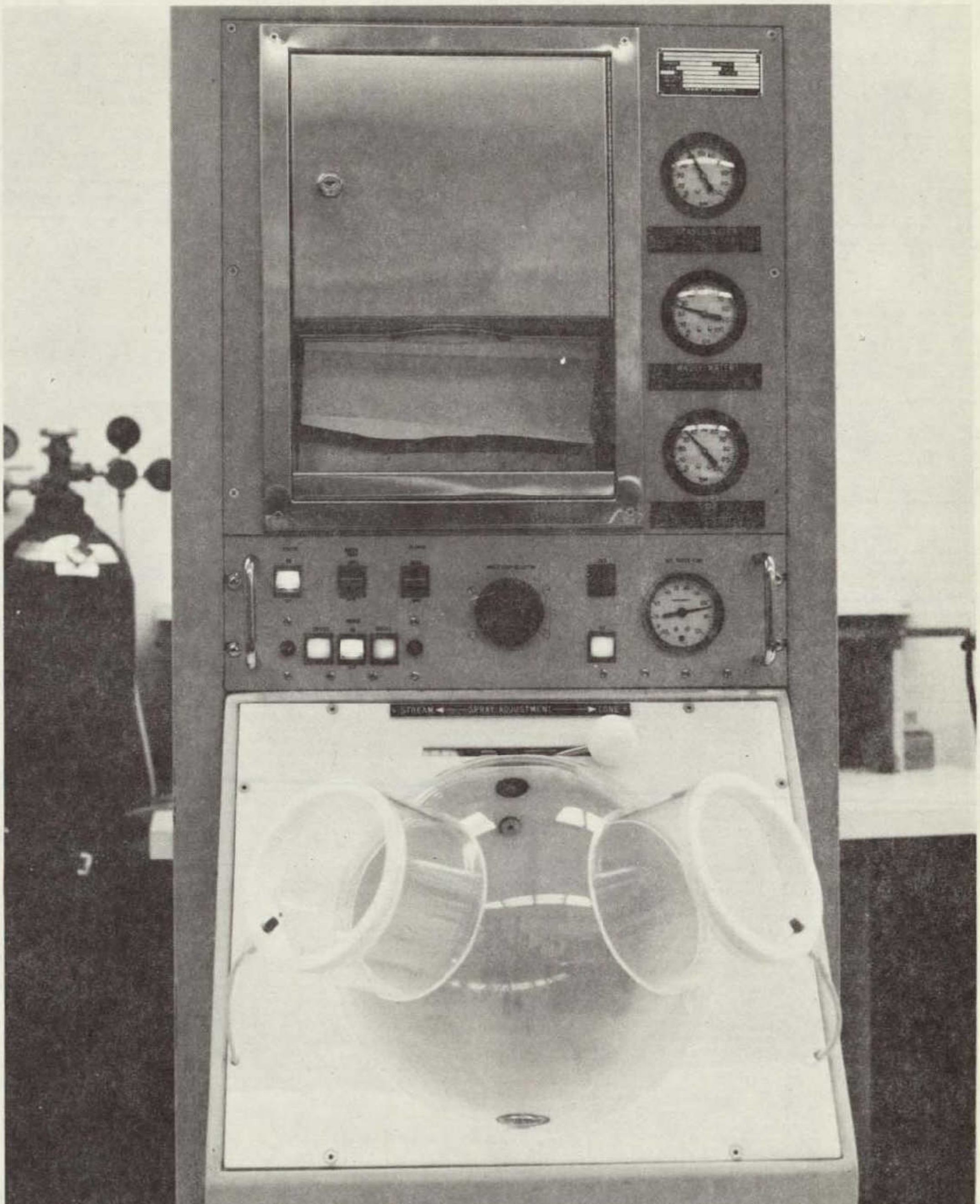

FIGURE 8-4 WASHING ENCLOSURE, CONTROLS AND INSTRUMENTATION

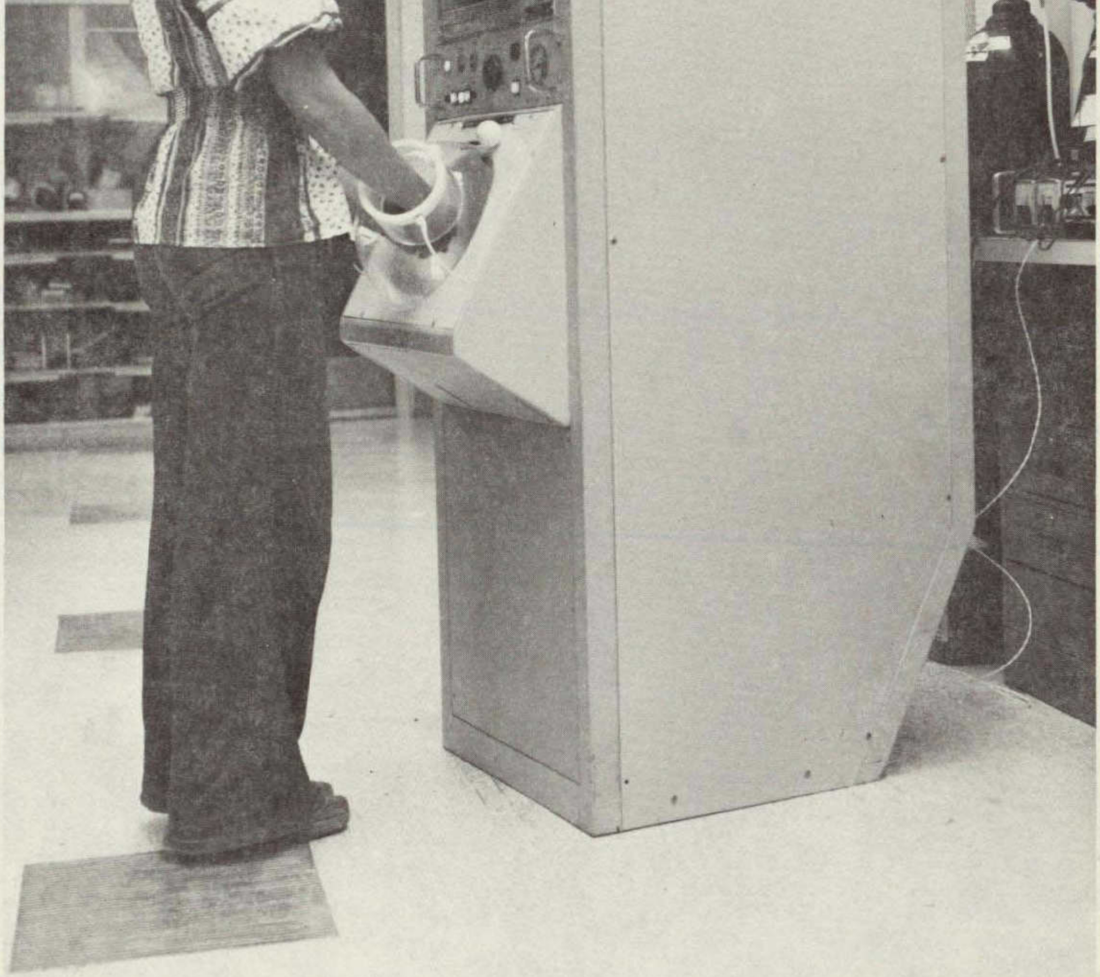

FIGURE 8-5 TEST SUBJECT PERFORMING HANDWASHING OPERATION

TABLE 8.5 HANDWASHING TIME PROFILE

OPERATION	OPERATION TIME (SECONDS)	ACCUMULATED (SECONDS)
Activate System	0	0
Wet Hands	3	3
Soap Hands	2	5
Wash Hands	15	20
Rinse Hands	12	32
Remove Water From Enclosure	5	37
Dry Hands	10	47
Deactivate System	0 (Automatic)	47

d. Soap Usage - The liquid soap tank was filled only initially, no servicing was required. For the 614 uses, only 1135.6 cc (0.3 gallons) of the available 3028.3 cc (0.8 gallons) was used. This amounts to an average of 1.85cc (.11 in ^{3}) per usage.

e. Liquid Level Sensor Performance - During the cyclic tests, the sensor at times performed erratically requiring frequent adjustments. A later investigation revealed a corroded and broken thermister probe. This probe was replaced with a set of stainless steel probes that sensed the water level through means of conductance of the fluid media. This latter method proved very successful in that varying from hot to cold water did not affect the repeatability and sensitivity of the unit. Also, the sensor could be adjusted to a point where light suds would not trigger the system.

f. Check Valve Performance - The check valve located between the pump and the bladder tank in the waste water system prevents water from back flowing through the pump when it is not operating. Early in the tests, the valve was apparently sticking open. Dismantling and cleaning the unit was only a temporary fix. Replacing the 1.38×10^4 (2 psi) unit with 6.89×10^4 N/m^2 (10 psi) unit resolved the problem. The stronger return spring has a faster response time and creates a larger pressure imbalance to close the valve when the pump is not operating. No back flow occurred after the new check valve was installed.

g. Cleaning/Disinfecting Enclosure - Early in the breadboard tests an extensive study of microbial burden and disinfection was performed. From this examination it was concluded that once-a-day cleaning with a disinfectant would be sufficient to limit the number and growth of micro-organisms. The testing performed used Wescodyne as the cleaning and disinfecting agent. In the prototype tests, Betadyne was used as the cleaning and disinfecting agent. It was concluded that the early test results would apply to the prototype testing since the only difference is the brand of disinfectant used. The recommendation of daily cleaning and disinfectig still applies. This test data is available in Martin Marietta test report "Spacelab/Utensil Hand Cleansing Fixture Test Report," MCR-77-433, Contract NAS9-15012.

h. Hardware Improvements - Minor hardware improvements resulted from the comments made by test subjects These included larger surface area on water/soap control buttons, and an adjustable electronic timer on the soap dispensing system to limit quantity of soap dispensed per activation.

8.2.5.2 Oral Hygiene

A brushing of a test subjects teeth was accomplished with limited success. Good visibility within the washing enclosure provided the test subject with excellent control of his actions. Figure 8-6 shows the test subject inserting the tooth brush into the enclosure. The tooth brush is quickly and efficiently cleaned with the straight stream spray pattern.

The segment of the test that was inefficient was that of the test subject discharging the excess from his mouth into the fixture. When the test subject spat into the fixture, the paste/saliva was drawn-out (stringy) and some unavoidably landed on the splash guard tube. This created a distastefully messy enclosure to be cleaned. A means other than spitting must be used to transfer the excess from the mouth into the enclosure. A more sanitary method would be to discharge the excess into a small cup held at the crewmans mouth and then transfer the cup to the enclosure for rinsing and washing. Other techiques include discharging into a disposable bag or wipe and using the washing enclosure for only rinsing the toothbrush.

8.2.5.3 Shaving

The shaving task was very successful. The test subject, with use of a mirror, had no problems applying lather, wetting razor, shaving and removing whiskers/lather from the razor. Figure 8-7 shows the test subject starting the shaving task and Figure 8-8 demonstrates the subject inserting the razor into the enclosure for rinsing. Both spray pattern extremes were sufficient in cleaning the razor although the straight stream was most efficient.

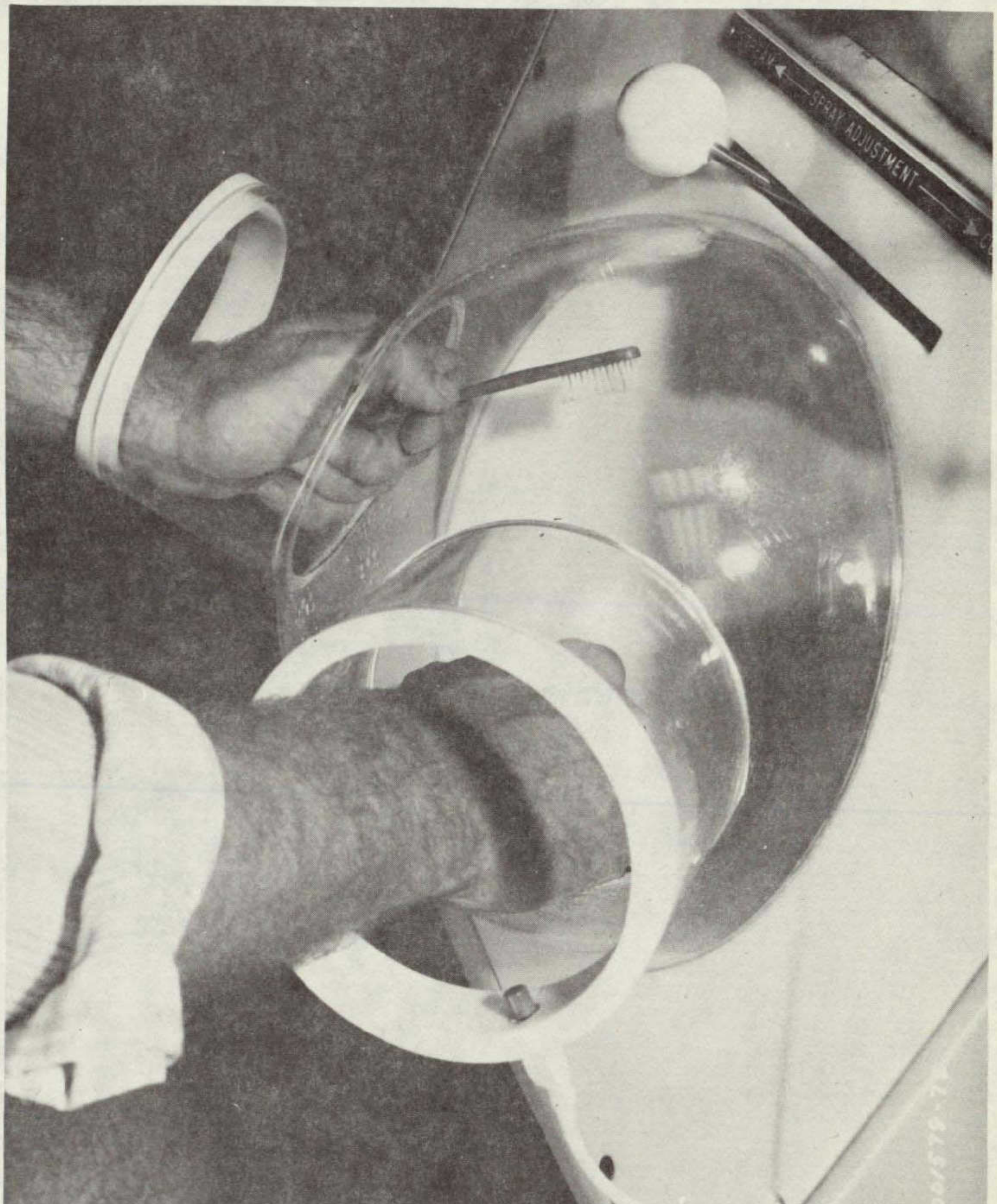

FIGURE 8-6 TEST SUBJECT INSERTING TOOTH BRUSH INTO FIXTURE

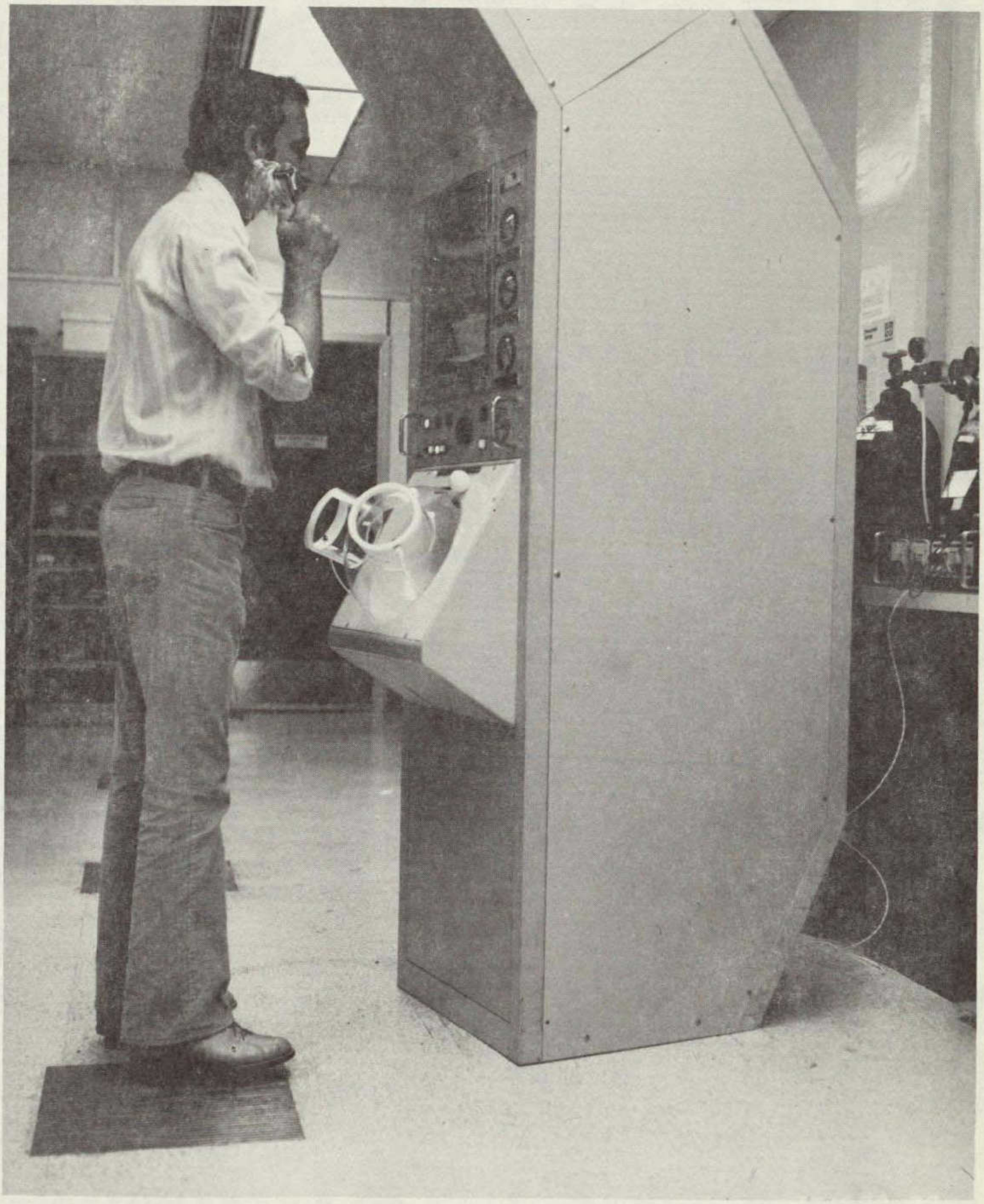

FIGURE 8-7 TEST SUBJECT SHAVING

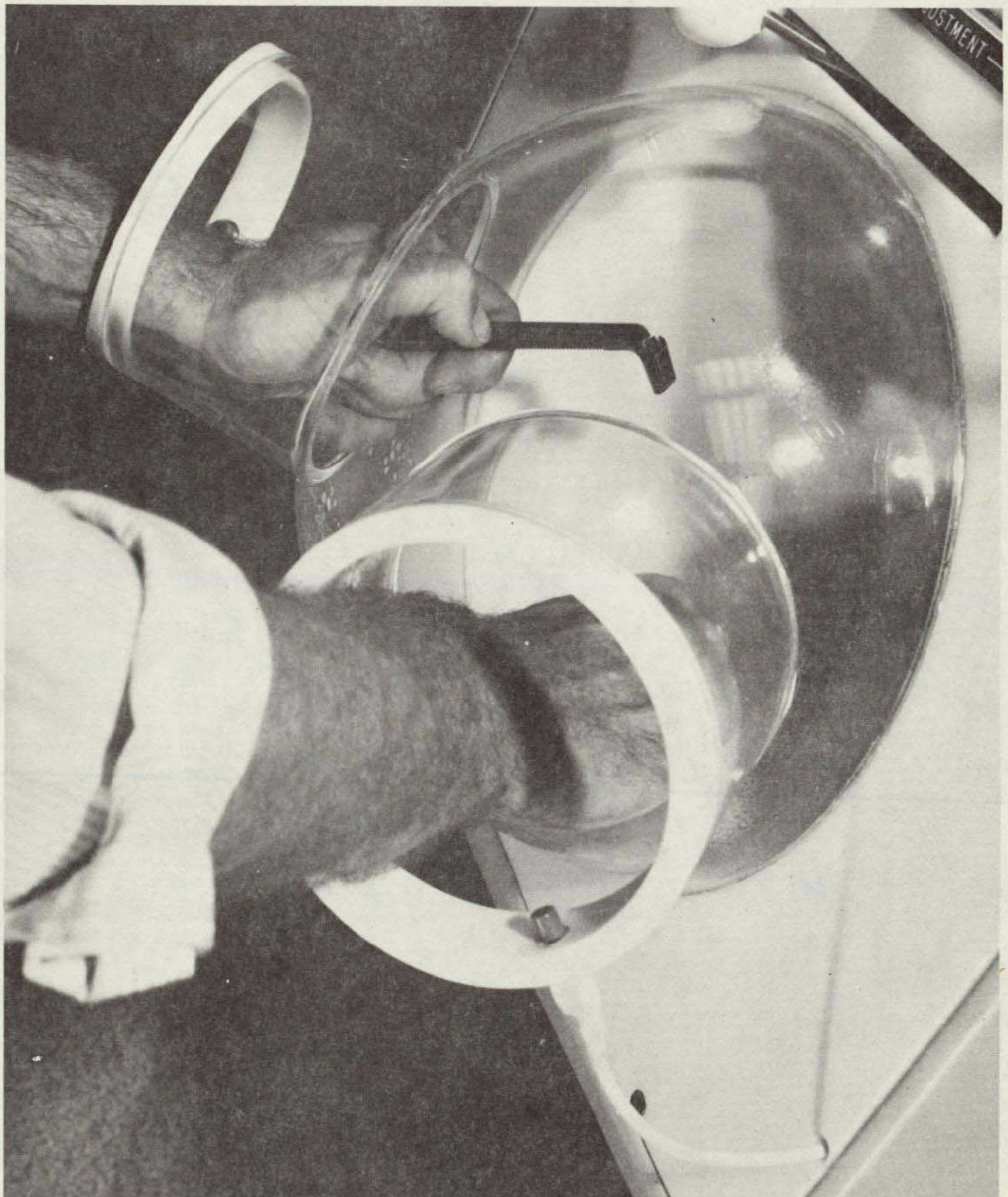

FIGURE 8-8 SHAVER INSERTED INTO WASHING ENCLOSURE

8.2.5.4 Utensil Cleansing

Utensils, such as the one shown in Figure 8-9, were easily inserted into the washing enclosure. The enclosure has an inside diametral clearance of 0.3 m (12 inches) with splash guard tubes having an inside diameter of 0.12 m (4.75 inches). These dimensions limit the size of an article that can be cleaned in the fixture. Objects 0.15 - 0.2 m (6-8 inches) long are easily handled. The user has excellent visibility due to the protruding clear spherical enclosure that allows room lighting to illuminate the interior. The white colored enclosure back enhances visibility due to the light reflecting properties. The adjustable nozzle provided fast and efficient rinsing.

8.2.5.5 Body Washing

The best approach to body and hair washing is to use a washcloth in conjunction with the cleansing fixture. The washcloth can be wetted and/or soaped in the enclosure and transferred to the body for the washing task. The washcloth can then be inserted into the enclosure for rinsing and wringing out. The test results showed no problems with the absorbing of water onto the washcloth or wringing out of the dirty water within the enclosure.

8.2.6 Conclusion

All cleansing functions can be satisfactorily accomplished with the prototype fixture. Handwashings are efficiently performed with low water, soap and electrical power usage. All oral hygiene operational steps can be performed efficiently except for the mouth discharging into the enclosure which can be accomplished in a more sanitary method. Shaving in conjunction with the prototype fixture and a mirror was easily completed. Small utensils can be cleaned thoroughly. And washing of the body and hair can be accomplished with a washcloth and the prototype fixture.

8.3 Prototype Man-Machine Interfacing Test

8.3.1 Test Objective

Future space missions will use a more varied crew including men and women. Therefore, the equipment must be capable of being used by personnel ranging from anthropometric sizes of a 5 percentile female to a 95 percentile male. In addition an attempt is made to make the usage of the washing fixture comfortable for both size extremes in a one and zero-gravity environment.

8.3.2 Test Location

All one-gravity tests performed on the prototype hardware is conducted at the Power Systems Laboatory in the Space Systems Building at Martin Marietta.

8.3.3 Test Setup

The unit described in Section 6.0 is set up in the test lab in an area close to electrical power and a water source/drain. The unit is electrically interfaced with a standard 120 VAC outlet and with a 10-amp DC power supply adjusted to 28 volts. The potable water is pumped into the supply water bladder tank using a hand pumped compression tank and monitoring volume by occasionally connecting the tank line to the main system and reading residual pressure in the system. The liquid soap system is handled in a similar manner.

FIGURE 8-9 UTENSIL INSERTED INTO WASHING ENCLOSURE

Also, a set of suction cup restraint shoes are available for zero-gravity position simulation testing. These will be worn by the male test subject.

8.3.4 Test Procedure

Test subjects that meet the requirements of being a 5 percentile female and a 95 percentile male will use the washing fixture and comment on the following:

- o Reach the controls
- o Ease of operation
- o Comfort level

The subjects will wash their hands per the procedures in Section 8.2.4 in both a one-gravity and zero-gravity body position. The suction cup restraint shoes will be worn in the zero-gravity body position.

8.3.5 Test Results

The following observations were made during the test:

1. Approximately 40 different personnel performed hand washing tasks and none experienced any form of discomfort.

2. Figure 8-10 shows approximately a 5th percentile female using the fixture in a one-gravity body position. Figure 8-11 shows the same test subject in a simulated zero-gravity body position using the fixture. In both cases, the test subject could reach the controls, read the indicators and easily complete the washing task in comfort.

3. Figure 8-12 shows approximately a 95th percentile male using the fixture in a one-gravity body position. Figure 8-13 shows the same test subject in a simulated zero-gravity body position using the fixture. As with the female test subject, the male could reach the controls, read the indicators and easily complete the washing task in comfort.

4. The configuration and position of the washing enclosure provided excellent visibility for the washing operation.

5. Room lighting was sufficient to illuminate the interior of the washing enclosure and perform the washing tasks.

6. The suction cup straint shoes add approximately 2.54×10^{-2}m (1 inch) to the height of the test subject. Since the zero gravity body position lowers the height of the crew, the restraint shoes reduce the difference between zero and one-gravity.

7. The washing task can easily be accomplished with the test subjects feet in a stationary fixed position, as would be the case with the use of restraint shoes. The test subject in Figure 8-13 is wearing the suction cup restraint shoes.

FIGURE 8-10 SHORT FEMALE TEST SUBJECT USING WASHING FIXTURE IN A ONE-GRAVITY BODY POSITION

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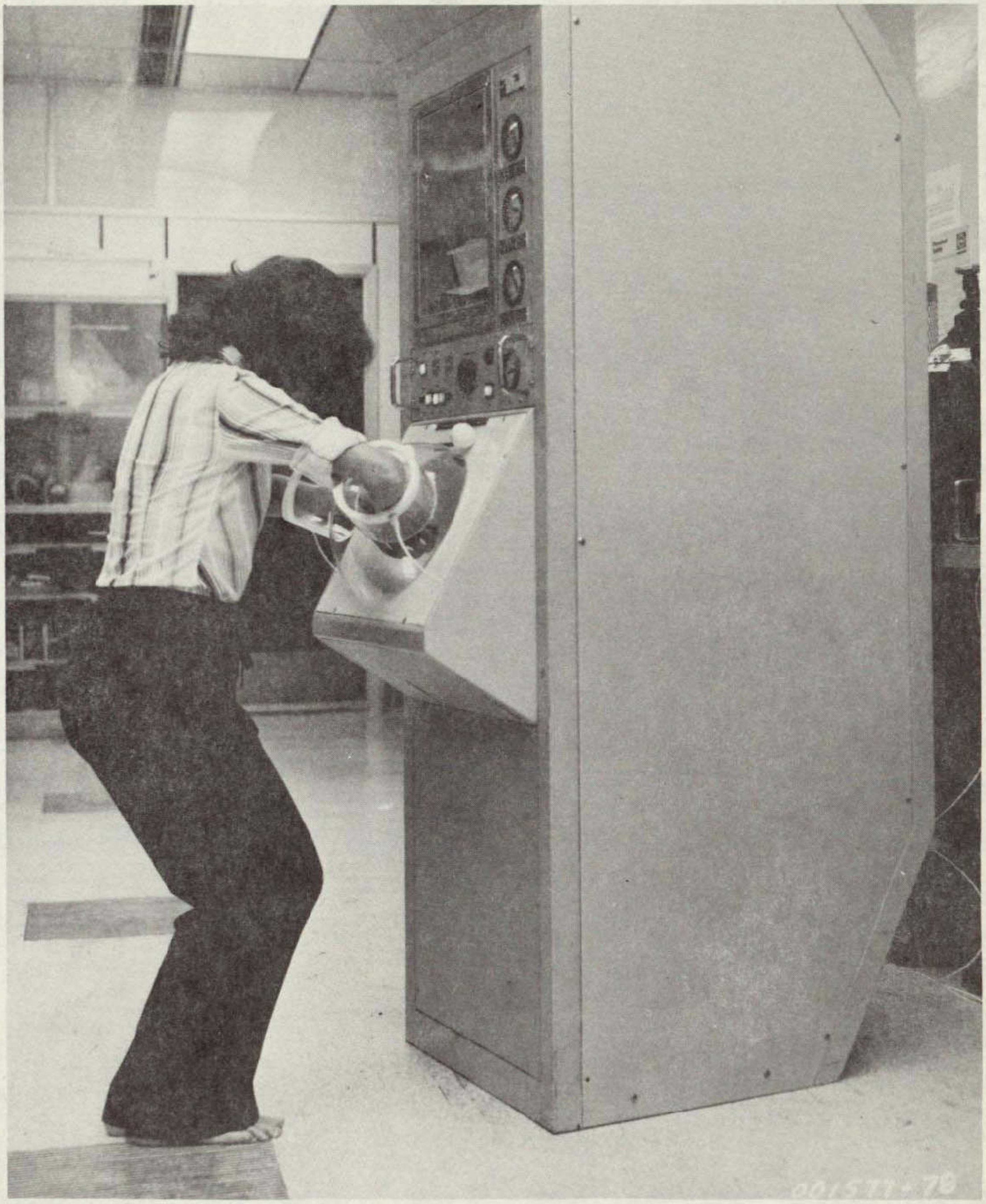

FIGURE 8-11 SHORT FEMALE TEST SUBJECT USING WASHING FIXTURE IN A SIMULATED ZERO-GRAVITY BODY POSITION

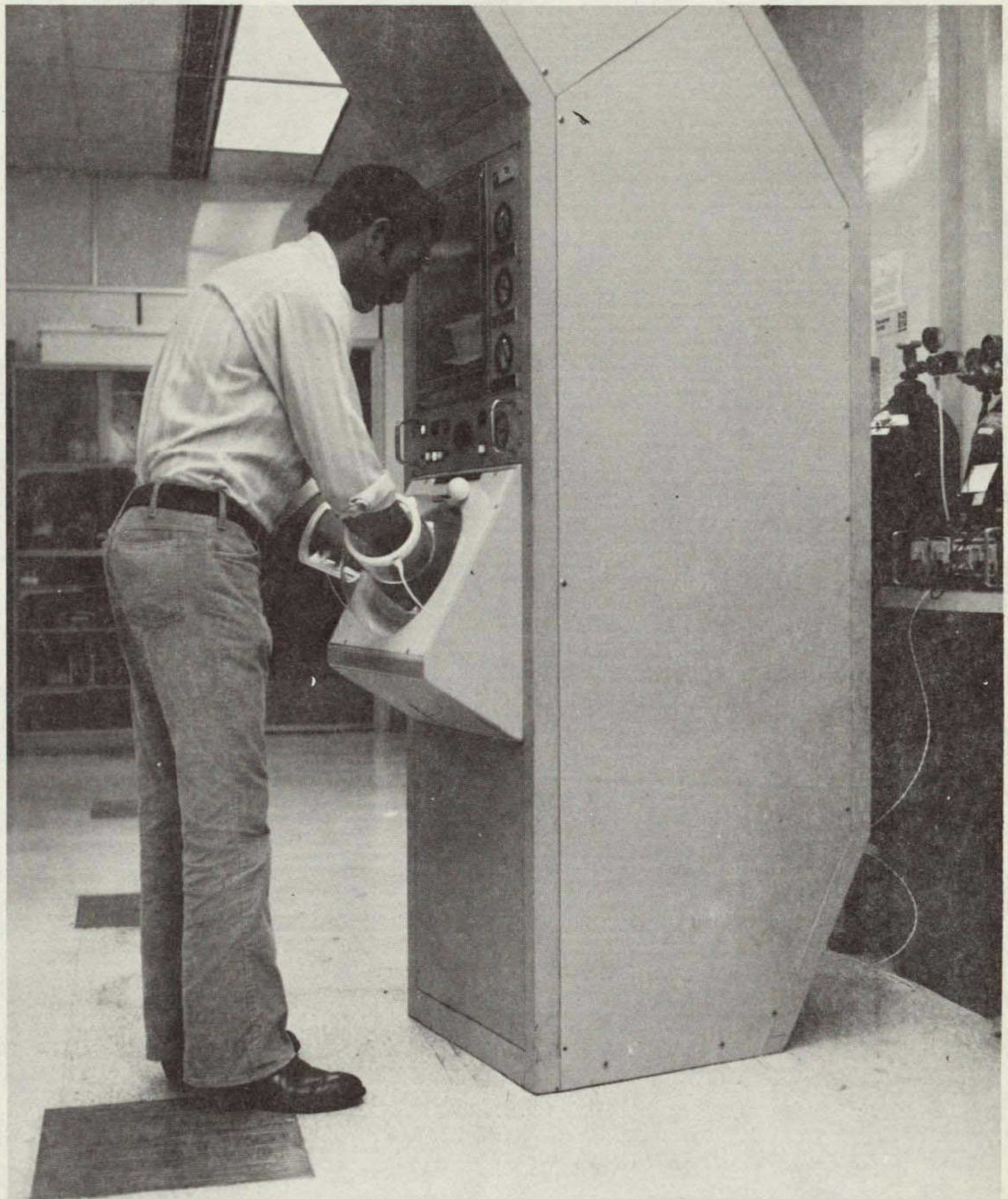

FIGURE 8-12 TALL MALE TEST SUBJECT USING THE WASHING FIXTURE IN A ONE-GRAVITY BODY POSITION

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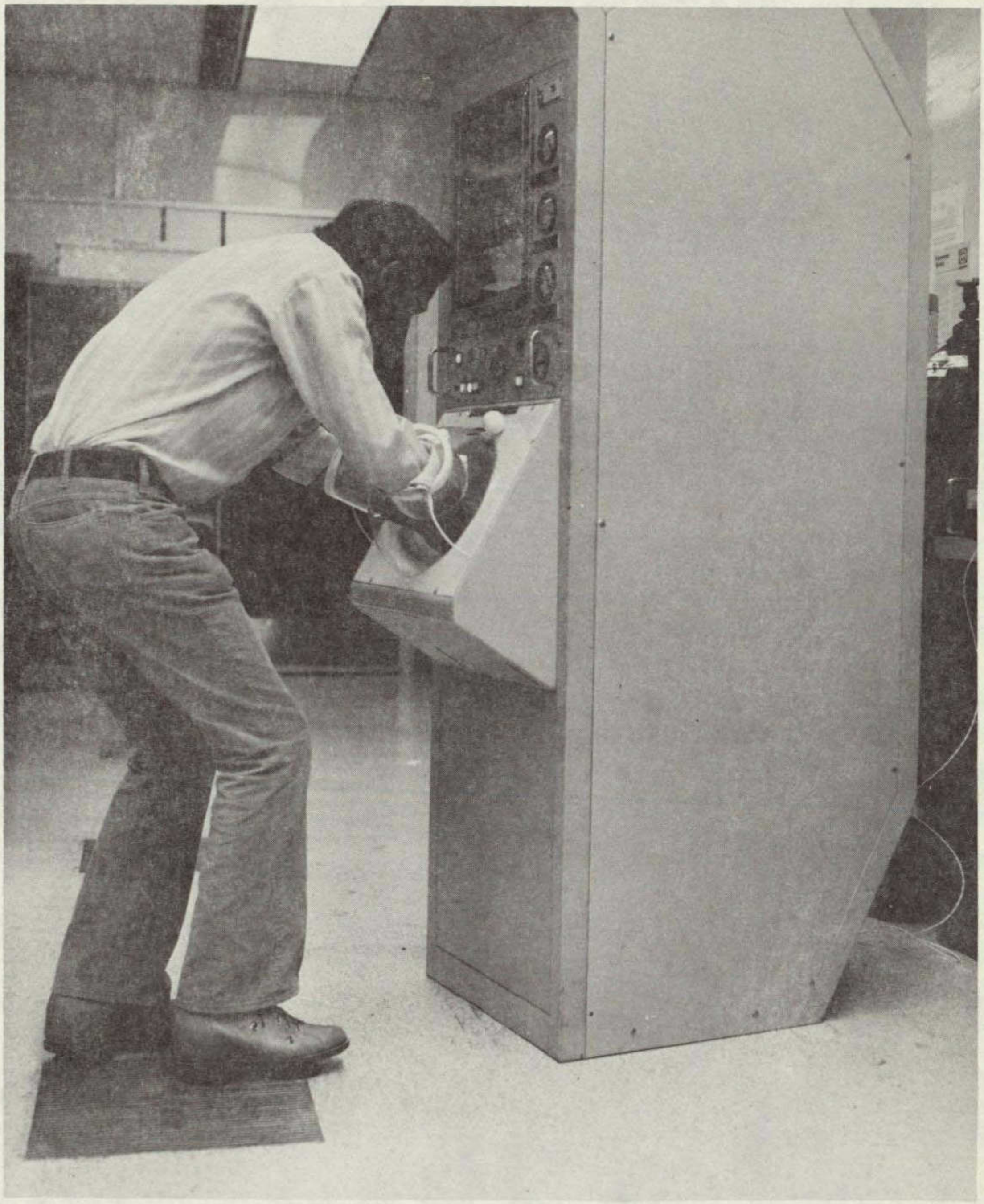

FIGURE 8-13 TALL MALE TEST SUBJECT USING THE WASHING FIXTURE IN A SIMULATED ZERO-GRAVITY BODY POSITION

8.3.6 Conclusion

Both male and female users can comfortably interface with the prototype cleansing fixture. This was verified with test subjects that spanned the anthropometric range of 5 through 95 percent. It was also determined that body configurations in both zero and one-gravity positions adapted well to the fixture. The height and configuration of the enclosure and associated equipment has been optimized.

8.4 Prototype Maintainability Test

8.4.1 Test Objective

The test objective is to demonstrate the maintainability aspects of the cleansing fixture in both a scheduled and unscheduled condition during cyclic tests.

8.4.2 Test Location

[illegible]sts performed on the prototype hardware is conducted at the Power [illegible] Laboratory in the Space Systems Building at Martin Marietta.

8.4.3 Test Setup

The cleansing fixture, as described in Section III, is setup in the test lab in an area close to electrical power and a water source/drain. The unit is electrically interfaced with a standard 120 VAC outlet and with a 10-amp DC power supply adjusted to 28 volts. The potable water and liquid soap system is filled per the operating procedures in Section 8.4-4. Access to the unit is available from the front and rear. Figure 8-14 shows the back view of the fixture with the rear panel removed. From this side there is access to the water tanks and flex lines, charcoal filter, water flow control valve, hot water tank thermostat and adjustment for amount of soap dispensed. From the front, the electrical panel can be removed revealing the adjustments for the blower timer, pump timer and water level sensor sensitivity. By removing the lower front panel, access is made to the soap tank, water pump and liquid gas separator.

8.4.4 Test Procedure

The following items pertain to the maintenance, both scheduled and unscheduled, of the prototype cleansing fixture:

1. Filling potable Water Tank - For the maintenance test, filling will be accomplished with use of the hand pumped compression tank. The following steps will be followed:

    1) Disconnect the tank line from the system;
    2) Fill and seal compression tank;
    3) Connect the compression tank line to the supply tank line;
    4) Pump by hand until compression tank is empty;
    5) Break Q.D. connection and re-connect supply tank to system and read pressure gage;
    6) Repeat operation until pressure reading is in the 3.79×10^5 N/m^2 (55 - 65 psig) range. Limit input to max of 8 gallons.

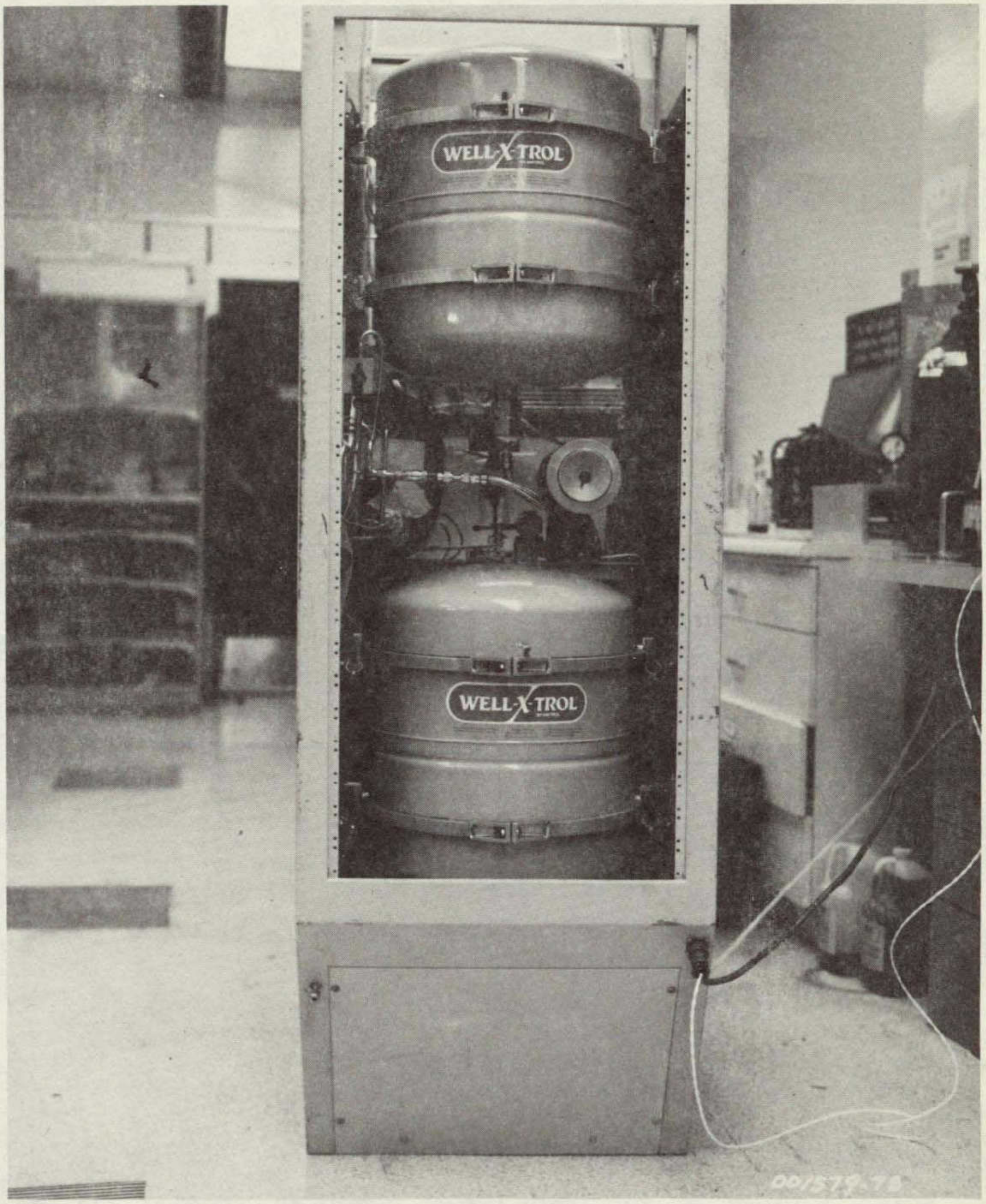

FIGURE 8-14 REAR VIEW OF CLEANSING FIXTURE

2. Filling Liquid Soap Tank - This can be accomplished in the same manner as the potable water, except that the pressure reading shall not exceed 3.45 x 10^5 N/m^2 (50 psig) which corresponds to a maximum input of 3.03 x $10^3$$m^3$ (0.8) gallons.

3. Cyclic Tests - The series of tests described in Section paragraph 8.2 will be performed.

4. Scheduled Maintenance - The potable water tank will be refilled as outlined in the steps in Item -1 when the pressure gage indicates a residual pressure at 1.38 x 10^5 N/m^2 (20 psig).

   The waste water tank will be drained per the following steps using a flexible line with a mating disconnect and a shutoff valve when the pressure gage indicates residual pressure at 3.79 x 10^5 N/m^2 (55 psig):

   1) Disconnect the tank line from the system;
   2) Turn off hand valve;
   3) Connect tank line to drain line;
   4) Open hand valve and drain system;
   5) Re-connect tank line to system.

   The soap tank will be refilled as outlined in the steps in Item 2 when the pressure gage indicates a residual pressure of 1.38 x 10^5N/m^2 (20 psig).

   The charcoal filter is scheduled to be replaced after each 30-day mission. This is not anticipated to be an inflight maintenance item.

5. Unscheduled Maintenance - All unscheduled maintenance that is required during the test period will be documented as to type of failure, ease of component access and replacement time.

8.4.5 Test Results

The following data was recorded or analytically obtained from the test results.

1. Filling Potable Water Tank - The potable water tank was filled four times with the hand compression tank. This is a tedious operation, but it does charge up the tanks to the desired level. Access to the quick disconnect was easily accommodated.

2. Filling Liquid Soap Tank - The soap tank did not reach the level requiring servicing. The original fill was accomplished using the same equipment used for the water system. During the original fill, the access to the quick disconnect line was easily accommodated.

3. Cyclic Tests - 614 handwashings were performed as described in the results in section 8.2.5.. The results pertaining to maintenance are described in items 4 and 5.

4. Scheduled Maintenance - The potable water tank was serviced four times without any mishaps. The waste water tank was drained four times. The soap tank did not require servicing.

5. Unscheduled Maintenance - Two items required repair or replacement. These were the check valve located in the waste water system, and the liquid level sensor on the sump of the liquid-gas separator.

Check Valve - The check valve is downstream of the water pump in the waste water system. Its function is to prevent backflow of waste water through the pump and separator. Early in the cyclic tests the check valve was sticking open. The unit was removed, dismanteled, cleaned, reassembled and installed back in the system. The reworked unit worked satisfactorily for a time, but after a series of runs the valve again stuck open. It was determined that the reaction time of the $1.37 \times 10^5 N/m^2$ (2 psi) check valve may be too slow, allowing the high pressure fluid downstream of the valve to surround the plunger and preventing the normal closure. A $6.89X10^4 N/m^2$ (10 psi) check valve was installed replacing the original $1.37X10^5 N/m^2$ (2 psi) unit. The stronger return spring does react faster and worked satisfactorily during the remainder of the cyclic test. Replacement of the check valve required approximately 600 sec (10 minutes).

Liquid Level Sensor - The original liquid level sensor located in the sump of the liquid-gas separator consisted of a thermister and related electronics. As the water reached the thermister, the temperature change would be sensed as a change in current flow and would start the water pump. Once started, the pump would run for a preset time and then shut off. This system had marginal success, but erratic sensing at times did occur due to different water temperatures and sudsing. Toward the end of the cycle tests, the sensor became inoperative. Removing the sensor revealed excessive corrosion and deteriation. A new method of sensing water level was required, one that was insensitive to water temperature and corrosion resistant. The method used consisted of two stainless steel probes electrically powered which completes a circuit when water bridges the gap between the probes. All the electronics are kept the same as previously. Included in the electronics is an adjustable "comparator" component. This unit adjusts the sensitivity of the probe. For example it can be adjusted to sense thin soap bubbles or highly mineralized water. A compromise setting that works well is one that will react to slightly aerated water.

8.4.6..Conclusion

Scheduled maintenance occurs on 7-day increments based on selected tank size and actual usage rate. This time is reasonable and a compromise between weight/volume versus maintenance intervals. The method of servicing depends on the resources available, that is areas that have:

(1) No pressurized water or air available.
(2) Pressurized water is available (high)
(3) Pressurized air is available
(4) Pressurized water is available (low)

Conditions (2) through (3) apply to one gravity situation and condition (4) could apply to a zero gravity situation. The tests used equipment for condition (2), considered to be worst case. For condition (4) the equipment would include a fluid line that mates with the low pressure source followed by a $4.48X10^5 N/m^2$ (65 psi) pump, a check valve, pressure gage and finally a disconnect that mates with the disconnect on the bladder tank flex line. The following procedures would be followed:

1. remove tank from system and transfer to fill station
2. Connect tank line to fill line.
3. Turn on pump.
4. Turn off pump and read tank pressure on pressure gage.
5. Repeat steps 3 and 4 until $3.79X10^5$ - $4.48X10^5 N/m^2$ (55-65 psig) is monitored on gage.

An alternate method for condition (4) would use a flow meter in place of the pressure gage in the previous technique. The procedures for filling the tank would then be:

1. Remove tank from system and transfer to fill station.
2. Connect tank line to fill line turn on pump.
3. Turn on pump
4. Monitor flow meter.
5. Shut off system when flow meter indicates $2.8X10^{-2} M^3$ (7.5 gallons) were transferred.

Another alternative for condition (4) would use a different approach. Here the fill line would consist of a line that mates with the low pressure source followed by a flow meter and the disconnect that mates with the disconnect on the bladder tank flex line. One the bladder tank air side would be a 3-way valve. One port of the valve would be for venting. The other would be for the attachment of a hand pump and pressure gage. The procedure for filling the tank would be as follows:

1. Remove tank from system and transfer to fill station.
2. Position 3-way valve to vent air side of bladder tank.
3. Connect tank line to fill line.
4. Shut off system when flow meter indicates ($0.028m^3$) 7.5 gallons were transferred (break Q.D. connection).
5 Position 3-way valve for pressurizing bladder tank.
6 Manually pump air into air side of bladder tank until $4.48X10^5 N/m^2$ (65 psig) is indicated on pressure gage.

Access from both front and rear of the prototype provides sufficient room to perform both scheduled and unscheduled maintenance.

9.0 TASK 8 - DELIVERY OF PROTOTYPE

After all testing was completed, the cleansing fixture was prepared for shipping. All tanks were drained and purged, electrical power cable removed and leads identified, and the unit generally cleaned. The cleansing unit and associated fill and drain equipment was transferred to the shipping area. There a crate was constructed to contain the hardware and packing was installed to protect the unit's more fragile areas. The unit was then transported to NASA-JSC.

10.0 TASK 9 - RLSE COORDINATION

Contact has been maintained with Hamilton Standard and NASA-JSC RLSE integration personnel. During the early phases of the contract, FMEA's and mechanical schematics were revised to show the inter-relationship between the hand cleansing fixture and the whole body shower. The latest design interfaces were constantly being exchanged throughout the contracting period. Information exchanged included items like lab water temperature and pressure, equipment access, interface locations, type of fittings and electrical connectors. Figure 10-1 is a layout of the RLSE lab area and shows the location of the handwasher relative to the other equipment.

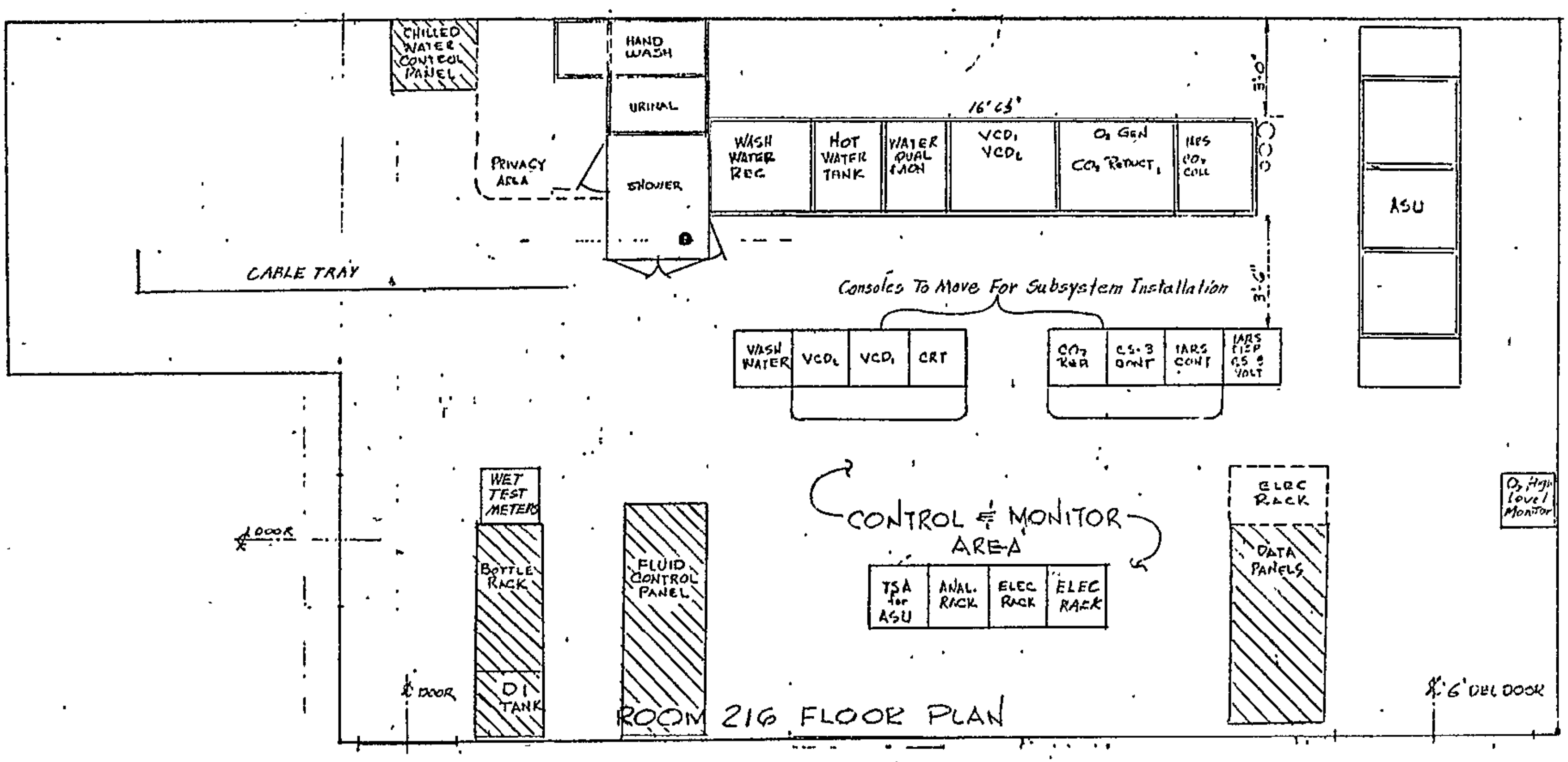

FIGURE 10-1 RLSE LAB EQUIPMENT LAYOUT