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MANUFACTURE AND DELIVERY OF COMPOSITE
MOTOR CASES. VOLUME II

Roger J. Dale

Hercules, Incorporated

Prepared for:

Army Missile Command

April 1973

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A0-255-135-01-012

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COMPOSITE MOTOR CASES

VOLUME II

FINAL TECHNICAL REPORT

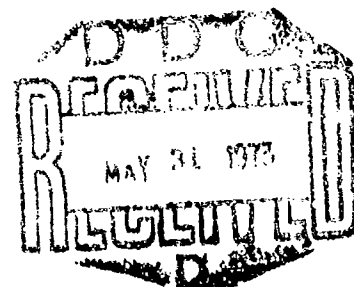
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DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) Hercules Incorporated Allegany Ballistics Laboratory P. O. Box 210 Cumberland, Maryland 21502		2a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	
		2b. GROUP	
3. REPORT TITLE Manufacture and Delivery of Composite Motor Cases			
4. DESCRIPTIVE NOTES (Type of report and inclusive dates) Final Report (May 8, 1972 to April 30, 1973)			
5. AUTHOR(S) (First name, middle initial, last name) Roger J. Dale			
6. REPORT DATE April 1973		7a. TOTAL NO. OF PAGES 155	7b. NO. OF REFS
8a. CONTRACT OR GRANT NO. DAAH01-72-C-0829		9a. ORIGINATOR'S REPORT NUMBER(S) AO-255-135-01-012	
b. PROJECT NO.		9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)	
c.			
d.			
10. DISTRIBUTION STATEMENT Approved for public release; distribution unlimited			
11. SUPPLEMENTARY NOTES		12. SPONSORING MILITARY ACTIVITY U. S. Army Missile Command Research, Development, Engineering and Missile Systems Laboratory Propulsion Directorate	
13. ABSTRACT This report covers the design, fabrication, experimental design verification, manufacture and delivery of 20 fiberglass and 20 PRD-49 Type III three-inch diameter composite rocket motor cases for application to SMAWT (Short Range Man Portable Anti-Tank Weapons Technology). Both motor case designs had open aft ends to permit propellant to be cast and case bonded to the case wall or the insertion and bonding of a cartridge-loaded grain.			

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14	KEY WORDS	LINK A		LINK B		LINK C	
		ROLE	WT	ROLE	WT	ROLE	WT
	Composite rocket motor cases						
	Filament winding						
	PRD-49 fiber						
	S904 fiberglass						
	SMAWT (Short Range Man Portable Anti-Tank Weapons Technology)						

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APPENDIX B

ADVANCED MATERIAL DESIGN DISCLOSURE

- B-1. Design Calculations
- B-2. Case Sketches
- B-3. Tooling Sketches
- B-4. Manufacturing and Inspection Records

APPENDIX B-1

DESIGN CALCULATIONS

PREPARED BY: T. White	HERCULES INCORPORATED SYSTEMS GROUP	PAGE NO 1	OF
DATE: 5-31-72		REF. NO.	
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TITLE: Composite Motor Case - PRD Configuration

Design Parameters

$$bw = .156$$

$$P_{design} = 11,400 \text{ psi}$$

$$\frac{P_{design}}{1.5} = 7600 \text{ psi}$$

$$R_i = 1.367 \text{ in.}$$

$$r_z = .961 \text{ in.}$$

$$A_z = 2.9013 \text{ in.}^2$$

$$r_{exit} = 1.473 \text{ in.}$$

$$A_{exit} = 6.818 \text{ in.}^2$$

$$E = 2.35$$

$$\alpha = 15^\circ$$

$$\text{For } \gamma = 1.14$$

see level conditions

$$C_F = 1.4778$$

$$\text{Thrust} = 32,585 \text{ lb @ } p = 7600$$

Forward Dome

$$\text{Revise } \alpha = 17.7^\circ$$

Centerport Opening - 1/4 NPT

2.7 circuits/layer

$$r_{rev} = .24 + 12$$

$$r_{rev} = .26$$

$$\bar{R}_{exit} = 1.390$$

$$\sin \alpha = \frac{.30}{1.37} = .2590$$

$$\alpha = 15^\circ$$

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TITLE:

for $\alpha = 15^\circ$

$$\sin^2 \alpha = .0670$$

$$\cos^2 \alpha = .9330$$

$$\tan^2 \alpha = .0718 \quad 1 - \frac{1}{2} \tan^2 \alpha = .9641$$

$$N_\phi = 7792 = n_\phi (685 \times 10^{-5}) (2.88 \times 10^4) (.933)$$

$$= 19725 (.933) n_\phi$$

$$= 1840.6 n_\phi$$

$$n_\phi = 4.23 / 10^4 \text{ layers}$$

Assume 4 radial layers in second dom.
 $S_d = 364,360$

For static study

$$T_{max} = 32,200$$

$$J = .70$$

For hydrotant

$$J = \frac{2.713}{6.07} = .478$$

$$1 - J = .522$$

$$N_{\phi_{cyl}} = .522 (7792) = 4067 \text{ lbs.}$$

Assume $n_\phi = 30 \text{ layers}$

radial layers required in cyl. section: $S_d = 212,121$

$$n_\phi = \frac{212,121}{7792} = 27.2 \text{ layers}$$

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TITLE:

Hoop layers required

for $m_0 = 3.0$
and hydrotest conditions
 $m_0 N T_{90} = 292$

$$m_0 = \frac{N_0}{N_{90} T_0} (1 - \frac{1}{2} \tan^2 \alpha)$$

$$N_0 = pR = 11400 (1.39) \\ = 15846$$

$$N_{90} T_0 = .00685 (320,000) \\ = 2192$$

$$m_0 = \frac{15846 (.9641)}{2192}$$

$$m_0 = \frac{15846 - 292}{2192}$$

$$m_0 = 6.97 \text{ layers}$$

$$m_{0, \text{right}} = 7.10 \text{ layers}$$

Assume $m_0 = 7.0 \text{ layers @ } 70^\circ$

In cylindrical section:

3 layers @ 150°

$$t_2 = .036$$

7 layers @ 90°

$$t_0 = .070$$

$$t_c = .106$$

$$\bar{R} = 1.3674 .053 \\ = 1.420$$

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In cylinder

$$R_o = 1.3677 \cdot 106$$

$$= 1.473 \text{ in.}$$

$$O.D. = 2.946 \text{ in.}$$

$$\max R_o = \frac{3.150}{2} = 1.575$$

$$t_{\max} = 1.575 - 1.367$$

$$= .208 \text{ in.}$$

Nozzle Retention

During hydrotest:

$$F_{\text{act nozzle}} = 11,400 \pi (1.869 - .923)$$

$$= 35,814 (.946)$$

$$= 33,850 \text{ lb.}$$

$$\text{circ}_{\text{act}} = 8.559 \text{ in.}$$

$$F/\text{in} = \frac{33,850}{8.551} = 3944 \text{ lb/in}$$

Using a steel retaining ring

$$S_{\text{allow}} = 95,000$$

$$t_{\text{reqd}} = \frac{3944}{95,000} = .042 \text{ in}$$

See bearing strength = 40,000 psi in composite

$$\Delta R_{\text{reqd}} = \frac{3,944}{40,000} = .099 \text{ in.}$$

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using 36 $\phi .125$ in dia. pins.

$$A_{pin} = .01227 \text{ in}^2$$

for 36 pins

$$A_{Total} = 36(.01227) \\ = .4417 \text{ in}^2$$

$$J = \frac{33,880}{.4417} = 76,704 \text{ psi}$$

in bearing

$$A_{br} = .125(.20) \\ = .025$$

$$\text{Total } A_{br} = 36(.025) \\ = .9 \text{ in}^2$$

$$36(.125) = 4.50 \text{ in.}$$

$$\text{circ.} = 8.589$$

$$\text{spacing} = \frac{8.589 - 4.5}{36} = .114 \text{ in.}$$

$$\sigma_{br} = \frac{33,880}{.9} = 37,644 \text{ psi}$$

Tension in composite between pins

$$F_T = \frac{33,880}{4.071(.2)} = \frac{33,880}{.8142} = 41,428 \text{ psi}$$

Force on Forward Shift

During hydrotest.

$$F = 11,401(2.9013) = 33,075 \text{ lb.}$$

During static firing;

$$F = 1.5(32,301) = 48,450$$

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$$22.6 \bar{R} \approx 9.217$$

$$7.327$$

$$F_{in} = 358 \text{ lb/in} \quad \text{Hydrotest}$$

$$34.47$$

$$T = 19,489$$

$$= 5256 \text{ lb/in} \quad \text{Static Firing}$$

$$R_s = 1.575$$

$$\text{For } F_c = 39,000$$

$$z = .175$$

Winding Sequence

X O M O X O O X O O O

Forward Dome Contour

$$R_c = 1.367 \text{ in}$$

$$t_d = .048 \text{ in. (including mat)}$$

$$Z = \frac{.048}{2.782} = .01725$$

$$\bar{R}_{dome} = 1.391 \text{ in.}$$

$$\alpha = 15.0$$

X	y	t'	$\bar{R}$	Y	$t_{1/2}$	R_c	Y	t
1.0	0	4.00	1.3910	0	.024	1.367	0	
.94	.24311	4.376	1.3075	.3382	.0257	1.360	.1	
.88	.33528	4.577	1.2241	.4664	.0276	1.336	.2	
.82	.40615	4.966	1.1406	.5566	.0298	1.275	.3	
.76	.4499	5.407	1.0572	.6259	.0324	1.237	.4	.055
.70	.48742	5.941	.9737	.6808	.0356	1.158	.5	.058
.64	.52129	6.601	.8902	.7251	.0376	1.039	.6	.066
.58	.54712	7.444	.8068	.7610	.0447	.848	.7	.082
.52	.56803	8.567	.7233	.7901	.0514	.710	.74	.104
.46	.58489	10.160	.6399	.8136	.0610	.520	.76	.200
.40	.59843	12.669	.5564	.8324	.0760	.238	.764	.300
.34	.60940	17.524	.4729	.8477	.1051			
.2817	.61857	20.368	.4328	.8542	.1342			

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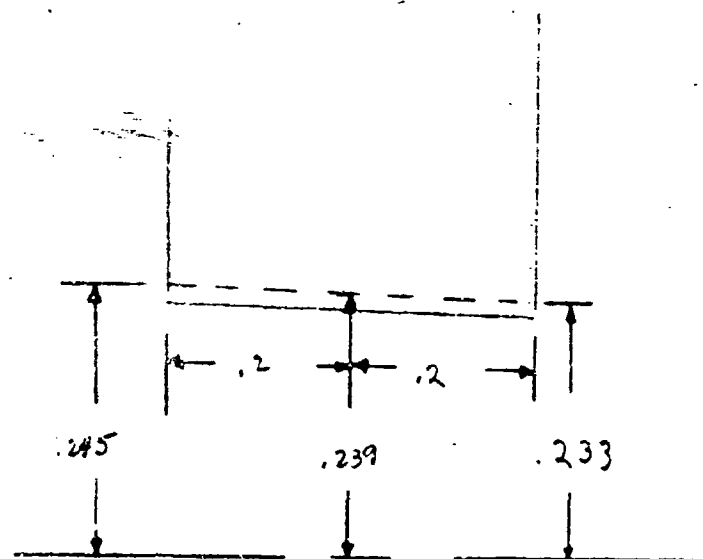
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Forward part thread strength

$$F_{plug} = 11,400 \pi (.2607)^2$$

$$= 11,400 (.2138)$$

$$F = 2,437.16$$



$$\tan \phi = \frac{.245 - .239}{.2}$$

$$= \frac{.006}{.2}$$

$$= .0300$$

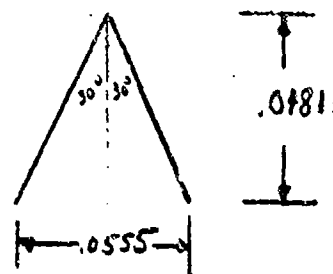
$$\phi = 1^{\circ}43'$$

for 18 threads/inch

$$1 \text{ thread} = .0555 \text{ in}$$

$$F-G = .2387 - .2165$$

$$= .0222$$



$$\tan 30^{\circ} = \frac{x}{.04811}$$

$$x = .04811 (.57735)$$

$$= .02778$$

$$2x = .0555$$

$$\text{Assume } \bar{R} = .237$$

$$2\pi \bar{R} = 1.489$$

$$\text{for } t = .300 \text{ in}$$

$$\text{No. threads} = \frac{.300}{.0555} = 5.4 \text{ threads}$$

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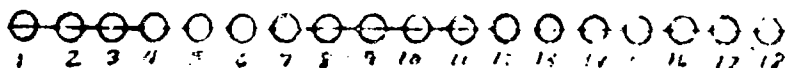
$$A_{shur} = 1.477 (5.4) (.024)$$

$$= .173$$

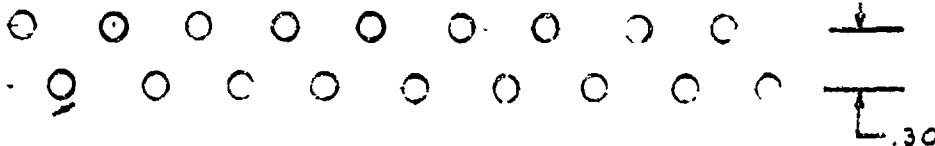
$$J = \frac{2437}{.173} = 12,627 \text{ psi}$$

Pin Spacing

single row



double row



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Weight Estimate

$$\text{Forward Dome: } \alpha = 15^\circ \quad Z = .01725$$

$$\text{Shell Vol.} = .275 \times \frac{.01725^3 (1.11)^3}{.02} \pi (.338)(.194 \times .27)$$

$$= .2372(2.692) + 2.124(.0524)$$

$$= .6385 + .1113$$

$$\text{Shell Vol.} = .7498$$

$$\text{for } \rho_c = .048 \text{ lb/in}^3$$

$$\text{Wt}_{\text{dome}} = .75(.048)$$

$$\text{Wt}_{\text{dome}} = .036 \text{ lb.}$$

Basic Cylinder:

$$L = 6.86$$

$$t = .106$$

$$\bar{R} = 1.367 + .053$$

$$= 1.42$$

$$2\pi\bar{R} = 8.922$$

$$\text{Vol}_{\text{shell}} = 2\pi\bar{R} t L$$

$$= 8.922(.106)(6.86) = 6.488$$

$$\text{wt.} = 6.488(.048) = .311 \text{ lb.}$$

$$\text{Aft Skirt } t = .102$$

$$\bar{R} = 1.575 - .051 = 1.524$$

$$\text{wt} = 9.576(.1425)(.048) = .066 \text{ lb.}$$

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Fwd skirt $t = .175$

$22.8 \cdot 1.217$

$L = 1.94$

$wt = 4.217 (.37)(.04)$

$= .15013$

$wt_{PRU\ comp.} = .036 + .311 + .066 + .150$

$= .56316$

wt of pins (4)

$A_{pin} = .01227$

$L_{pin} = .42$

$Vol_{pin} = .00512 in^3$

Sec 36 pins = .1854

$wt_{pins} = .1854(.284) = .05276$

$wt_{nozzle} = .275 lb.$

Comp.

Wt. - lb.

chamber

.563

nozzle

.2754

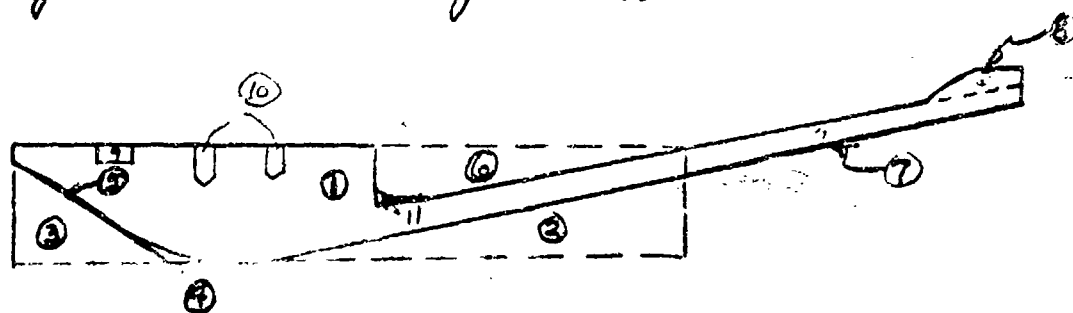
pins

.1854

1.0238 lb.

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Weight Estimate for Fiberglass Nozzle



Section	R_i	R_o	b	h	$\bar{R}$	A	$\bar{R}A$	wt.
1	.961	1.3655	2.427	.4645	1.16325	.98172	+1.1420	+.5023
2	.961	1.320	1.411	.359	1.0807	-.25327	-.2737	-.1204
3	.961	1.340	.53	.379	1.0873	-.10044	-.1092	-.0480
4	-	-	.316	.054	.987	-.00853	-.0084	-.0037
5	-	-	.28	.012	1.260	-.00168	-.0021	-.0009
6	-	1.3655	1.027	.256	1.2802	-.03146	-.1683	-.0740
7	-	-	.592	.048	1.424	+.0284	+.0404	+.0178
8	-	-	.336	.092	1.520	+.0309	+.0470	+.0207
9	1.2455	1.3655	.235	.120	1.3055	-.02820	-.0368	-.0162
10	-	-	-	-	-	-	-	-.0083
11	-	-	.270	.044	1.172	+.0119	+.0139	+.0061
								<u>+.2754</u>

Assume $\rho = .070$

$$2789 = .439824$$

(36) holes: dia = .125

depth = .268

$$Vol_{hole} = \pi (.125)^2 (.268)$$

$$= .0105 (.0156)$$

$$= .003289$$

$$wt_{36 holes} = 36 (.07) (.003289)$$

$$= .0083$$

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SMAWT PRD Case Stresses

Centerport Plug Retention - PRD threaded joint

$$@ p = 11,400 \text{ psi}$$

$$F = 2,437 \text{ lb.}$$

Assuming:

5.40 threads engaged (.300 in. thick boss)

effective thread width = 1.024 in. (mean thread thick.)

$$\underline{S = 12,627 \text{ psi.}}$$

Forward Skirt:

Ultimate Compressive Load

$$\text{Hydrotest: } F = -33,075 \text{ lb.} \quad F/in = 3588 \text{ lb/in}$$

$$\text{Static Firing: } F = -48,450 \text{ lb.} \quad F/in = 5256 \text{ lb/in}$$

$$\text{Skirt thickness} = 0.182 \text{ in}$$

Ultimate Compressive Stress

$$\text{Hydrotest: } \sigma = 19,714 \text{ psi} \quad \text{M.S.} = +.52$$

$$\text{Static Firing: } \sigma = 28,879 \text{ psi} \quad \text{M.S.} = +.04$$

Ultimate Average Shear Stress at Joint

$$L_{\text{shear}} = 1.4 \text{ in.}$$

$$\text{Hydrotest: } J = 2,543 \text{ psi}$$

$$\text{Static Firing: } J = 3,758 \text{ psi}$$

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TITLE:

Nozzle to Chamber Joint: 36 - $\frac{1}{8}$ " pins.

Ult. Axial Force:

During Hydrotest: $F = 35,880 \text{ lb}$ $F/in = 3,944 \frac{1}{2} \text{ lb/in}$

Static Firing: $F = 24,878 \text{ lb}$ $F/in = 2,896 \frac{1}{2} \text{ lb/in}$

Bearing Stress During Ultimate Hydrotest:

in Chamber: $\sigma_{br} = 37,644 \text{ psi}$

in Nozzle: $\sigma_{br} \approx 37,644 \text{ psi}$

Tensile stress in chamber between pins:

$$\sigma_T = 41,428 \text{ psi}$$

Shear stress in pins (average)

$$J = 76,704 \text{ psi}$$

Case-in-case Design

Adhesive Shear Stresses

$$\text{Ave. } J = 1,332 \text{ psi}$$

$$\text{Fwd edge peak } J = 12,432 \text{ psi} \quad (K = 9.3)$$

$$\text{Aft edge peak } J = 1,664 \text{ psi} \quad (K = 2.0)$$

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LAW PKC Case Design. Change.

Failure of the joint initiated at $p = 4500$ psiTotal failure @ $p = 8535$ psi

Force on nozzle during hydrotest:

$$F = p \pi \left[(1.367)^2 - (.761)^2 \right]$$

$$= 11,700 (1.967 - .923)$$

$$= 11,400 (2.472)$$

$$F = 33,981 \text{ lb. @ ultimate pressure}$$

Using 36 voluntary pins length of pin = .500

$$F/\text{pin} = 741.17 \text{ lbf.}$$

$$d_{\text{in. pin}} = .125$$

Basic pressure vessel geometry:

$$\left. \begin{array}{l} 7 \text{ layers @ } 7.0^\circ \\ 3 \text{ layers @ } 12.7^\circ \end{array} \right\} t = .106 \text{ in.}$$

Additional all over winding of pins:

$$\left. \begin{array}{l} 6 \text{ layers @ } 12.7^\circ \\ 1 \text{ layer @ } 12.7^\circ \end{array} \right\} t = .102$$

1.1 in. section

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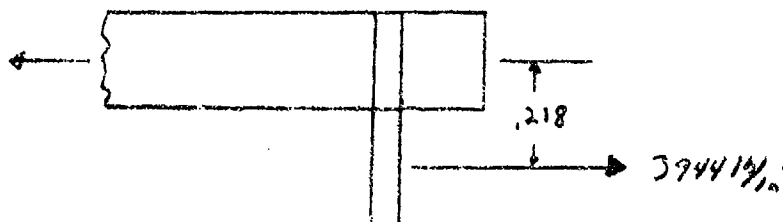
$$\text{for } t = .208$$

$$A_{br} = .125(.008) = .026$$

$$\tau_{br} = \frac{941.14}{.026} = 36,198 \text{ psi.}$$

$F = 25,000 \text{ lb}$ capability
on uniaxial test

$$\text{equiv } p_c = \frac{25000}{2.972} = 7,402 \text{ psi}$$



$$M \cong 3944(.218) = 860 \text{ in lb}$$

$$f_t = \frac{6M}{t^2} = \frac{6(860)}{(.208)^2} = \frac{5160}{.043264} = 119,268 \text{ psi.}$$

Allowable Compressive Strengths

all glass cloth 31,000

all 90° windings 21,000

all 15° windings 54,000

$$\text{SKIRT } R_0 = 1.575$$

$$R = 1.575 - .104 = 1.471$$

$$\text{OAR} = 9.243$$

for 18 - .125 dia pins $w = 2.25$

$$\text{eff cov.} = 9.243 - 2.25 = 6.993 \text{ in}$$

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Tensile stress between pins

$$\sigma = \frac{F}{t \times w} = \frac{338.1}{.203 (6.975)} = \frac{23,251}{1.454}$$

$$\sigma_T = 23,712 \text{ psi}$$

Recommend substitution ^{of glass cloth} S 34-701 glass cloth in place of PVE cloth in ratios (with layup in axis direction)

1 layer cloth to one hoop layer

2 layers cloth to one hoop layer

For design 1

at fixed end: X O X O X O X O | ^{2 layers} C H C H C H C H | C H C H C H C H C O
at aft end: X O X O X O X O | ——— | C H C H C H C H C O

For design 2

at fixed end: X X X X X O | ^{2 layers} C C C C C C C C | C C C C C C C C
at aft end: X O X O X O X O | ——— | C C C C C C C C

Wind sufficient material to secure maximum diameter of 1.575 2.575 at fixed aft ends.

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TITLE: **LAW II - Nozzle for PRD Case**

Nozzle Composite Thickness Estimate

at aft equator; $R_c = 1.432$

$$n_a = 4.0 \text{ layers @ } 42^\circ$$

$$t_a = .046$$

$$\bar{R}_{eqtr} = 1.432 + .023 = 1.455$$

$$\bar{R} \sin \alpha = 1.455 (.66913) = .97358$$

$$+ \bar{R} \cos \alpha = 1.455 (.74314) (.046) = .0497$$

at throat; $R_c = .961$
 $\alpha = 65^\circ$

$$t \approx \frac{.046 (1.432) (.74314)}{.961 (.47262)} = \frac{.0490}{.4061}$$

$$t \approx .1207$$

$$\bar{R} = .961 + .06 = 1.021$$

$$t = \frac{.049}{.4315} = .114$$

$$\bar{R} = .961 + .057 = 1.018$$

$$t = \frac{.049}{.4302} = .114$$

$$\sin \gamma_{end} = \frac{.973}{1.018} = .9564$$

$$\gamma_{end} = 73^\circ 21'$$

PREPARED BY: J. White	HERCULES INCORPORATED CHEMICAL PROPULSION DIVISION	PAGE NO 2	OF
DATE:		REF NO	
CHECKED BY:	PLANT:		
TITLE:			

At equator $\bar{R} = 1.455$ $\bar{R} \cos 42^\circ = 1.050$
 $\bar{R}_1 = 1.432$ $\bar{R} \sin 42^\circ = .7736$
 $\bar{L} = .046$

At throat $\bar{R} = 1.018$ $\bar{R} \cos 45^\circ = .7302$
 $\bar{R}_1 = .961$ $\bar{R} \sin 45^\circ = .7226$
 $\bar{L} = .114$

$\bar{R}$	$\frac{\bar{R}}{\bar{R}_{eq}}$	$\frac{\bar{R} \sin 42^\circ}{\bar{R}}$	α_{good}	1.455	δ	δ	α_{actual}
1.018	.6997	.4564	73° 2'	.437	8.033°	8° 2'	65°
1.050	.7216	.4772	68°	.405	7.445°	7° 27'	60° 33'
1.10	.7560	.4851	62° 16'	.355	6.526°	6° 32'	55° 44'
1.15	.7904	.4966	57° 51'	.305	5.607°	5° 36'	52° 15'
1.20	.8247	.5113	54° 13'	.255	4.688°	4° 41'	49° 32'
1.25	.8591	.5259	51° 10'	.205	3.769°	3° 46'	47° 24'
1.30	.8935	.5409	48° 30'	.155	2.851°	2° 51'	45° 39'
1.35	.9278	.5516	46° 07'	.105	1.930°	1° 56'	44° 13'
1.40	.9622	.5604	44° 04'	.055	1.11°	1° 07'	42° 57'
1.455	1.0	.6611	42°	0		0	42°

$$\bar{R} \sin \alpha_{good} = \bar{R}_{eq} \sin 42^\circ$$

$$\sin \alpha_{good} = \frac{\bar{R}_{eq} \sin 42^\circ}{\bar{R}} = \frac{.7736}{\bar{R}}$$

$$\delta_r = 73^\circ 2' - 65^\circ$$

$$= 8^\circ$$

$$\Delta R = 1.455 - 1.018 = .437$$

$$\delta = \frac{1.455 - \bar{R}}{.437} \times 8.0333$$

$$= 18.583(1.455 - \bar{R})$$

Best Available Copy

PREPARED BY: T. White	HERCULES INCORPORATED CHEMICAL PROPULSION DIVISION	PAGE NO. 3
DATE:		REF. NO.
CHECKED BY:	PLANT:	

TITLE:

$\bar{R}$	$\cos \alpha$	$\bar{R} \cos \alpha$	t_a	$S \bar{R}$	$5(\frac{t_a}{\bar{R}})$
1.018	.4726	.4802	.1155	5.090	.289
1.050	.4917	.5163	.0963	5.250	.241
1.10	.5630	.6193	.0803	5.50	.201
1.15	.6122	.7040	.0706	5.75	.177
1.20	.649	.7788	.0638	6.00	.160
1.25	.6769	.8461	.0587	6.25	.147
1.30	.6990	.9087	.0547	6.50	.137
1.35	.7167	.9725	.0514	6.75	.129
1.40	.7320	1.0248	.0485	7.00	.121
1.45	.7431	1.0812	.0460	7.25	.115

$$t = \frac{.0497}{\bar{R} \cos \alpha}$$

PREPARED BY: T. White	HERCULES INCORPORATED SYSTEMS GROUP	PAGE NO. 1	OF
DATE: 8-14-73		REF. NO.	
CHECKED BY:	PLANT:		

TITLE:

LAW II Forward Skirt Analysis

$$R_i = 1.417$$

$$R_o = 1.500$$

$$t_c = .083$$

Geometry: $X \times X \times X \times X$

$$t_d = .035$$

$$t_b = .045$$

$$t_c = .083$$

$$\text{for } t_c = .065$$

$$\bar{R} = 1.417 + .042$$

$$= 1.459 \text{ in}$$

$$2\pi \bar{R} = 9.167 \text{ in}$$

$$2\pi \bar{R} t = .7609$$

$$\bar{R} = 1.417$$

$$\text{skirt } t = .5918 \text{ in}$$

$$\text{at } p = 5950 \text{ psi}$$

$$T_{\text{comp}} = 27,197 \text{ psi}$$

$$A_T = 2.901$$

$$A_{\text{piston}} = .196$$

$$A_{\text{force}} = 2.705 \text{ in}^2$$

$$\text{at } p = 7000 \text{ psi}$$

$$F = 7000(2.705) \quad 5750(2.705)$$

lb.

$$= 18,935 \text{ lb.} \quad 16,075$$

$$\text{at } p = 11,400$$

$$F = 11,400(2.705) \quad 11,400(2.911)$$

$$= 30,837 \text{ lb.} \quad 33,071 \text{ lb.}$$

$$T_{br} = \frac{18,935}{.7609}$$

$$= 24,885 \text{ psi} \quad 21,152$$

$$T_{br} = 40,527 \text{ psi.}$$

$$C_p = \frac{24,885}{1.757 \times 10^4} = .0139 \quad .0109$$

PREPARED BY: T. White	HERCULES INCORPORATED SYSTEMS GROUP	PAGE NO. 2	OF
DATE: 8-14-72		REF. NO.	
CHECKED BY:	PLANT:		

TITLE:

Rohm & Haas LAW units

$$R_i = 1.222$$

$$R_o = 1.310$$

$$t_c = .088$$

$$\bar{R} = 1.222 + .044$$

$$\bar{R} = 1.266$$

$$2\pi \bar{R} = 7.955$$

$$2\pi \bar{R} t = .700$$

Static Fire $F_{u17} = 31,890 \text{ lb.}$

$$\sigma_{br} = 45,557 \text{ psi.}$$

Hydrotest $A_{piston} = .4418$

@ $p = 13,850$
 $F = 6,119 \text{ lb.}$

@ $p = 20,000$
 $F = 8,836 \text{ lb.}$

$$\sigma_{br} = 8,741 \text{ psi}$$

PREPARED BY: T. White	HERCULES INCORPORATED SYSTEMS GROUP	PAGE NO. 3
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TITLE: **1. AW II Forward Skid Analysis**

For 3 layers - 4-2
5 layers - 11

	$\alpha = 90^\circ$	$\alpha = 42^\circ$	Comp.
m	5	3	8
E	.648	.635	.083
C_{66}	7.945	2.109	5.617
C_{44}	1.452	3.070	2.105
C_{22}	.380	1.820	.981
C_{88}	.555	1.939	1.139
w_r	.24	.28	

$R_i = 1.417$ $E_0 = 5.156 \times 10^6$
 $R = 1.459$ $E_\phi = 1.932 \times 10^6$

$\nu_{6\phi} = .469$
 $\nu_{\phi 8} = .176$

$\tau_{cr \text{ buckling}} = 164,100 \text{ psi.}$

Longitudinal Compressive Strength

0°	173,000
90°	27,000

Bearing Strength for $0^\circ/45^\circ/45^\circ/0^\circ = 53,100 - 61,700$
 $0^\circ/45^\circ/145^\circ/20^\circ = 61,600 - 63,000$

PREPARED BY: T. White	HERCULES INCORPORATED SYSTEMS GROUP	PAGE NO. 4	OF
DATE: 8-15-72		REF. NO.	
CHECKED BY:	PLANT:		

TITLE:

Skirt Modification

Required increase in strength

$$R_i = 1.417$$

$$\frac{11,400}{7000} = 1.629$$

$$\text{Assume } t = .065 \text{ in.}$$

$$1.629(.065) = .106$$

Add the following to existing skirt:

C O C O C O

$$t_{\text{cloth}} = .015 / \text{layer}$$

$$t = .045 + .030 \\ = .075$$

$$t_{\text{skirt}} = .065 + .075 \\ = .140$$

$$\bar{R} = 1.417 + .07 \\ = 1.487$$

$$\pi \bar{R} t = 1.308$$

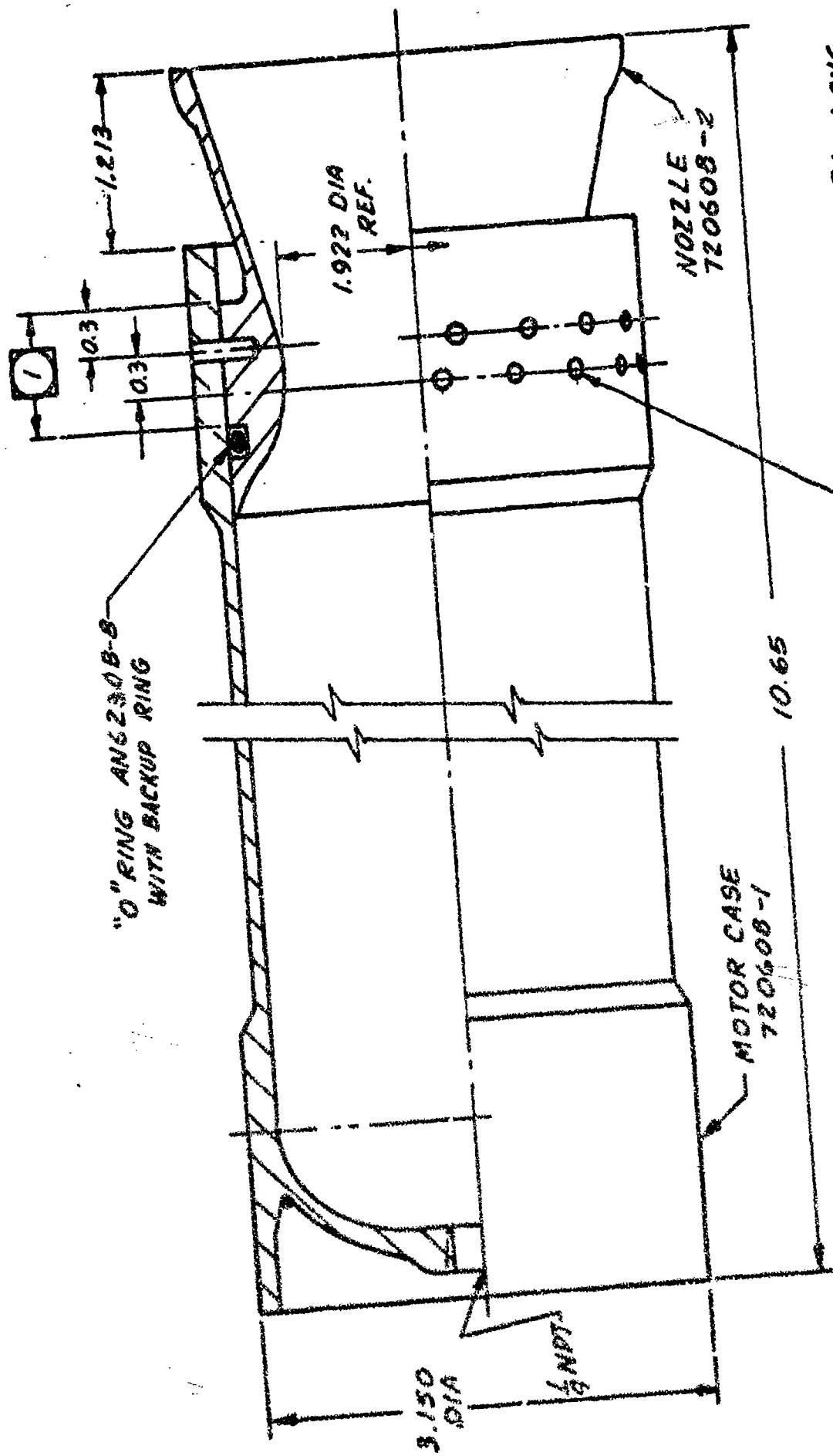
$$@ p = 11,400 \\ F = 30,837 \text{ lb.}$$

$$\sigma_{\text{comp}} = 23,576 \text{ psi}$$

Actual $F = 37,900 \text{ lb.}$ in axial compression test

APPENDIX B-2

ADVANCED MATERIAL DESIGN CHAMBER AND NOZZLE



36 PINS - .125 D X 7/16 LONG
2 ROWS STAGGERED 15°, EQUALLY
SPACED.

NOTE : 1 EPON 946, APPLIED TO NOZZLE SURFACE
BY BRUSHING

MOTOR ASSEMBLY
1/1 SCALE 720608

R	Y
1.367	0
1.360	.10
1.336	.20
1.359	.30
1.237	.40
1.158	.50
1.059	.60
.848	.70
.710	.74
.520	.76
.238	.764

1. SYMBOL INDICATES RESULTS TO BE REPORTED BY FABRICATOR.
 2. REPEAT TO ASSURE 3.150 MINIMUM DIAMETER AFTER MACHINING.
 1. WINDING SEQUENCE

PRESSURE VESSEL	X O X X X	O O O	
FORWARD SKIRT		C H ₄ C O C O C O C H(C H)	(2)
AFT DOUBLER	X O C X O C X O C X O	C O C O C O C H(C H)	

2-400P

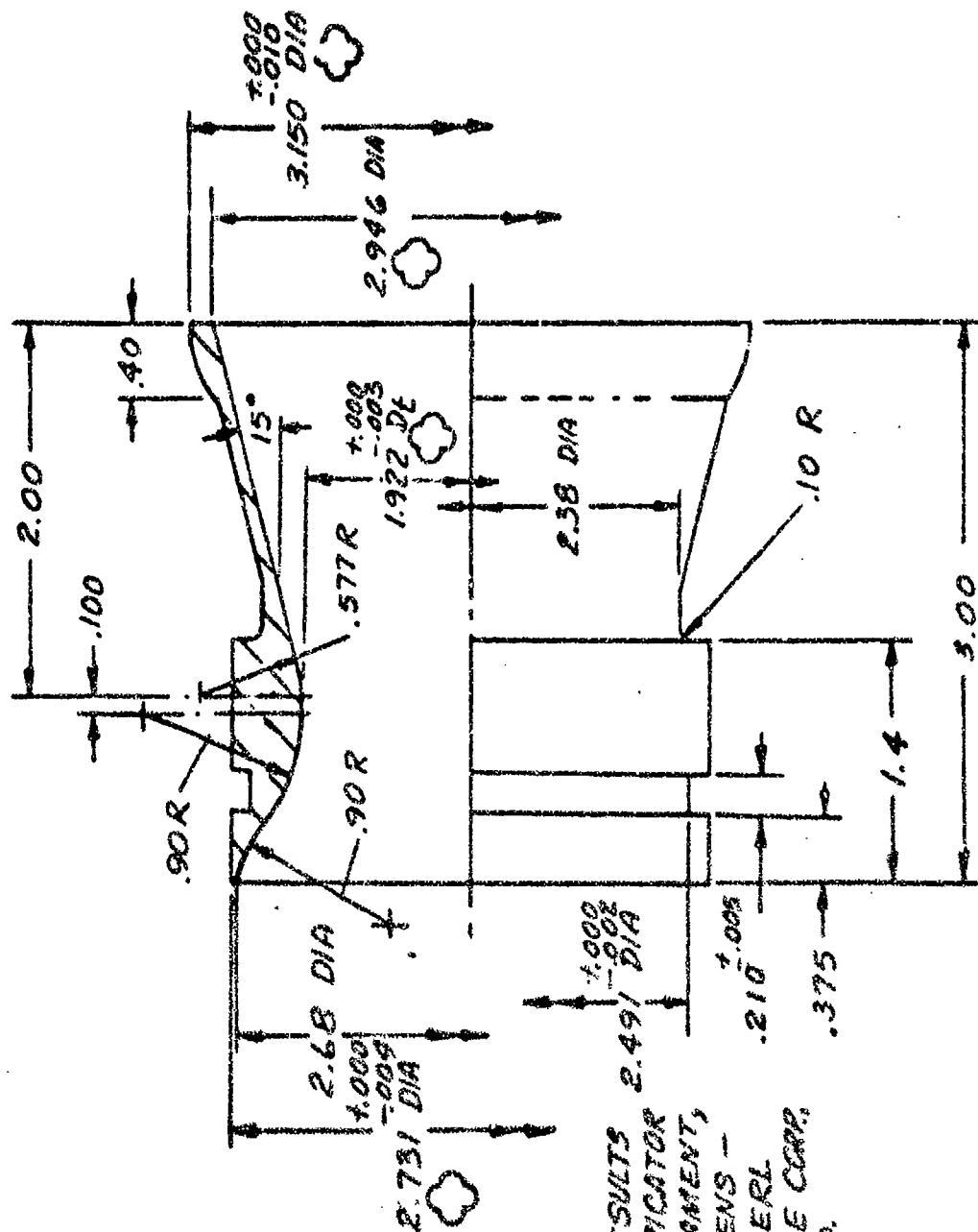
GAZ. O. 1

H&P FILL WITH HOOP AT O-RING, H - HOOP OVER SKIRT & DOUBLER

MATERIAL: DUPONT PRD-49 TYPE III, 12 END ROVING;
ERL 2256 RESIN, UNION CARBIDE CORP., TONOX 6040,
UNIROYAL CO.; FIBER GLASS CLOTH, 5901-34, OWENS
CORNING FIBERGLASS CORP.

4 SCALE

720608



NOTES:

1. SYMBOL  INDICATES RESULTS TO BE REPORTED BY FABRICATOR.
2. MATERIAL: FIBERGLAS FILAMENT, 9-90%, 12 LVD RYING, OWENS - CORNING FIBERGLAS CORP. ERL 2256 RESIN, UNION CARBIDE CORP. TONOX 6040, UNIROVAL CO.

NOZZLE
1/1 SCALE

720608-2

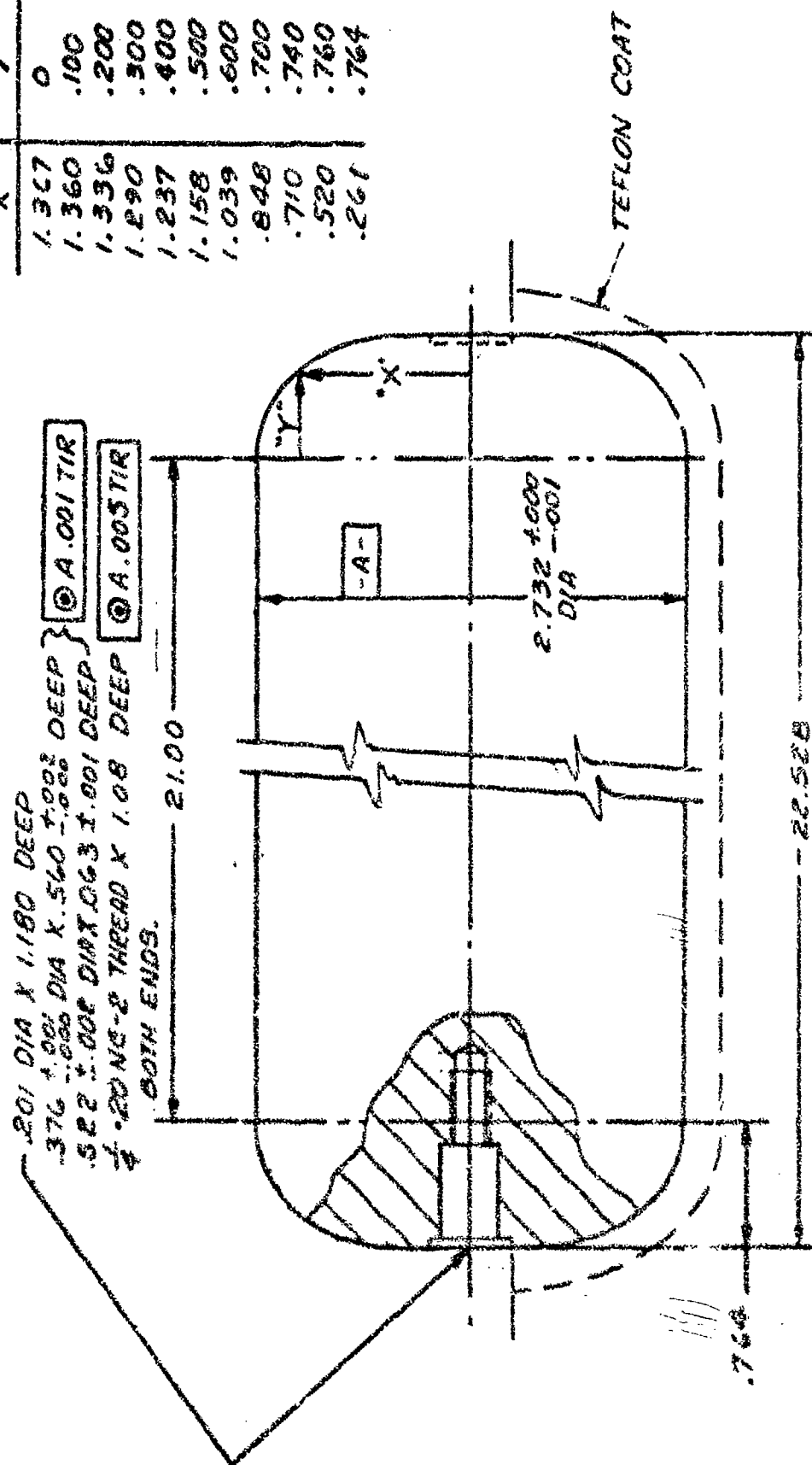
APPENDIX B-3

ADVANCED MATERIAL DESIGN TOOLING SKETCHES *

* N.B. Portions of the nozzle tooling are compatible with the CIC design presented in Appendix A-3.

IXOME COORDINATES.

X	Y
1.317	0
1.360	.100
1.336	.200
1.290	.300
1.237	.400
1.158	.500
1.039	.600
.848	.700
.710	.740
.520	.760
.261	.764

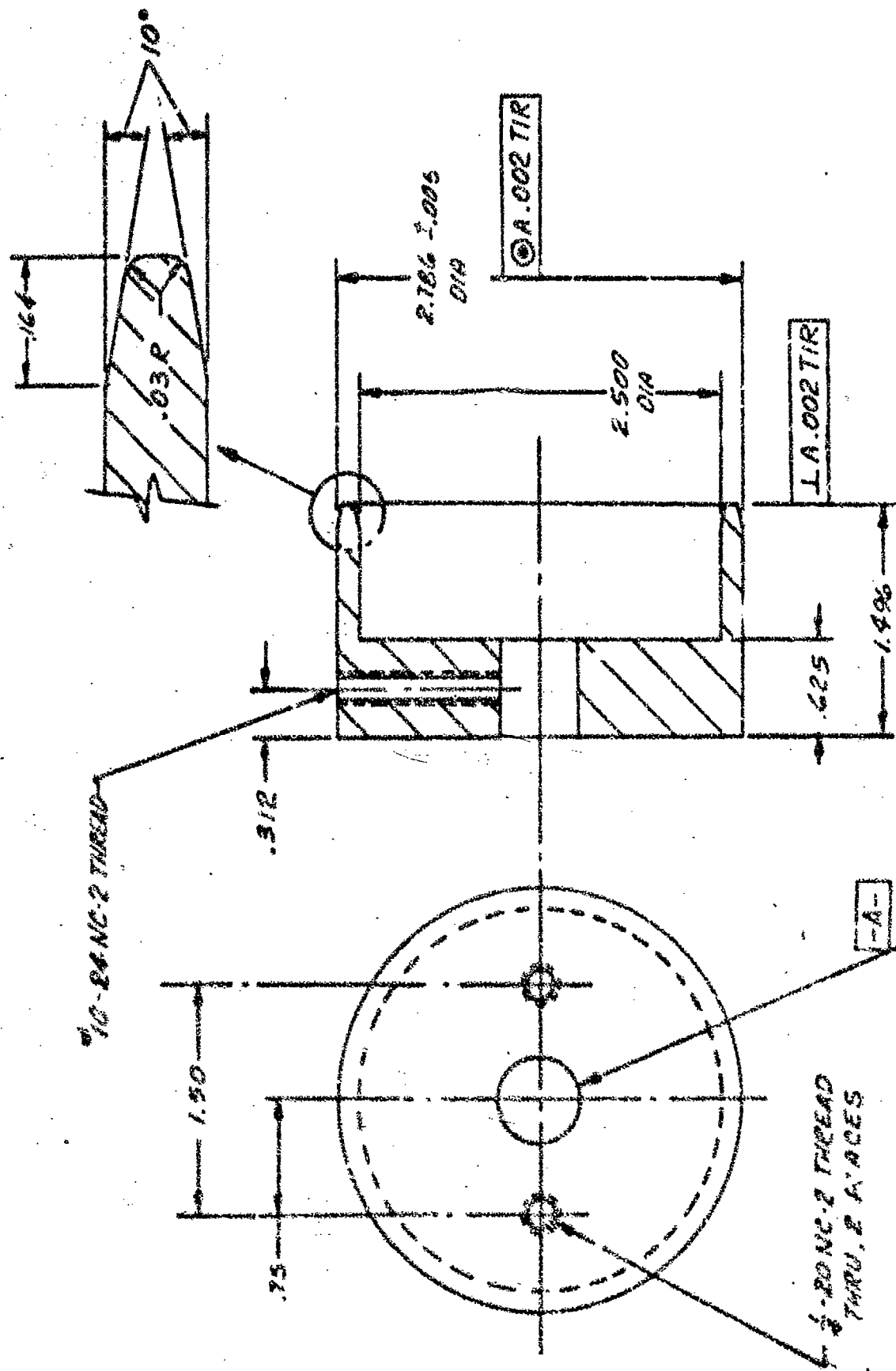


6704

1. MATERIAL : 2024 T 351 ALUMINUM OR EQUAL.
2. REMOVE ALL BURRS AND SHARP EDGES, .005 MAX R
3. SURFACE FINISH $\sqrt{V}$ ALL OVER.
4. DIMENSIONS TYPICAL FOR BOTH ENDS.
5. DIMENSIONS SHOWN ARE BEFORE TEFLON COATING.
6. GRIT BLAST AREA TO BE TEFLON COATED.
7. TEFLON COAT TO .001 MAX WHERE INDICATED.

PRO CASE MANDREL

7 SCALE 720619-1



- NOTES:
1. FINISH $\sqrt{\text{V}}$ ALL OVER
 2. MATERIAL: 2024 TH ALUM OR EQUIV.
 3. REMOVE ALL BURRS AND SHARP EDGES TO .010 R.

PRD SKIRT MANDREL
2-REQ'D
+ SCALE 720620-1

APPENDIX B-4

ADVANCED MATERIAL DESIGN MANUFACTURING AND INSPECTION RECORDS

ROGER DALE

Manufacturing & Inspection Record

3.0 Dia. x 8.05 in. Motor Case

P.R.D. Shell Fabrication

Dwg. 720608-1

Operator No.

1. Windline Preparation

Machine set up installed. Level wind set to .312 lead.

Shaft extension T. I. R. .025

O-rings, screws, adapters and holes waxed.

Mandrel cleaned properly

(2) O-rings assembled properly.

Roving (P.R.D., Type III, 12-end) installed. Lot No. _____

Roving tension: 1. 13 2. 7

2. Winding

Resin mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>22.56</u>	<u>100</u>	<u>402-17</u>
Catalyst	<u>100% 60/50</u>	<u>29</u>	<u>AB1-7</u>

2. Winding (cont.)

Sequence check off:

X	O	M	C-1A	C-1A	O	X	O	O	X	C-1F	C-1F	R	R
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Level wind reset to 0.156

OF	OF	C-2F	C-2F	OF	CF	C-3F	C-3F	OF	OF	C-4F	C-4F	OF	OF	C-5F	C-5F
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Level wind reset to 0.312

O	C-6F	C-6F	C-2A	C-2A	O	C-7F	C-7F	C-3A	C-3A	C	L	L	C	C-8F	DO	C-8F	DO	C-4A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

DO	C-4A	DO	C-5F	DO	C-9F	DO	C-5A	DO	C-5A	DO	C-10F	DO	C-10F	DO	C-6A	DO	C-6A	DO
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

DO	DO		
✓	✓		

NOTE: X designates Helix
O " Full 90°
L " Label
C " Cloth
F " Fwd

A designates Aft
R " O-Ring
OF " 90° Fill
DO " Doubler 90°

Doubler dia. measurements:

Unit serial No. S/N 601 S/N 602

Outboard winding 3.170 3.151

Inboard winding 3.152 3.179

CENTER

Excess resin removed without distorting winding

Operator No.

502

788

788

788

788

788

3. B-Stage and Cure

Operator No. 4168

B-Stage: Time Started 2130 Time Completed 0045

4168

Date 8-2-72

4168

Cure: Time Started 0115 at 300 °F.

Time Completed 0415 at 300 °F.

Date 8-2-72

4168

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>001</u>		S/N <u>002</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 Fwd - .010 dia.	3.150	3.150	3.150	3.149
3.150 + .000 Aft - .010 dia.	3.150	3.150	3.150	3.149
2.734 + .004 - .000 dia.	2.735	2.735	2.735	2.735
.43 ± .030	.437	.436	.435	.437
8.05 ± .030	8.045	8.047	8.045	8.042
.060 ± .010	.060	.055	.065	.062

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>	
Adhesive	<u>Epon 846A</u>	<u>100</u>	<u>ABL-56</u>	<u>782</u>
Catalyst	<u>Epon 846B</u>	<u>15</u>	<u>ABL-56</u>	<u>782</u>
Thinner	<u>Qctone</u>	<u>80</u>	<u>ABL-69</u>	<u>782</u>

Cure: Time Started 1300 at 125 °F.Time Complete 2100 at 125 °F.Date 5-7-72 1184

Clean up work performed satisfactorily.

1894Final Wt.: S/N CC1, S/N CC2Wt. 26.5 GRAMS, Wt. 26.4 GRAMS399Supervisor Review [Signature] Date 8-10-72

Engineer Review _____ Date _____

Manufacturing & Inspection Record3.0 Dia. x 8.05 in. Motor CaseP.R.D. Shell Fabrication

S/N 003 Dwg. 720608-1 Rev. A

S/N 004 Dwg. 720608-1 Rev. B

Operator No.1. Winding Preparation

Machine set up installed. Level wind set to .312 lead.

826Shaft extension T. I. R. .0302125

O-rings, screws, adapters and holes waxed.

2125

Mandrel cleaned properly

2125

(2) O-rings assembled properly.

2125Roving (P.R.D., Type III, 12-end) installed. Lot No. S.72125Roving tension: 1. 2 lb 2. 2 lb21252. Winding

Resin mixed correctly:

2125

	<u>Ingredient</u>	<u>Weight, lbs.</u>	<u>Lot No.</u>
Resin	<u>2254</u>	<u>500</u>	<u>13429</u>
Catalyst	<u>Tenox</u>	<u>145</u>	<u>4017</u>

2125

2. Winding (Con't)

Sequence check off for S/N 003 & 004

X	O	C-1A	C-1A	R	O	C-2A	C-2A	X	O	C-3A	C-3A	X	O	C-1F	C-1F	R	OF	OF
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Operator No.

8125

Sequence continued S/N 004 Headstock

C-2F	C-3F	DO	C-4F	C-5F	C-4A	C-5A
X	X	X	✓	✓	✓	✓

Sequence continued S/N 003 Tailstock

C-2F	DO	C-3F	DO	C-4A
X	X	X	X	✓

Sequence continued S/N 004 Headstock

O	C-5F	C-5F	C-5A	C-5A	C-5F	C-5F	C-5A	C-5A	C-5A	C-5A	C-5A	C-5A	C-5A	C-5A	C-5A	C-5A	C-5A	C-5A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Sequence continued S/N 003 Tailstock

O	C-5F	C-5A	C-5A	C-5F	C-5F	C-5A	C-5A	C-5A	C-5A	C-5A	C-5A	C-5A	C-5A	C-5A	C-5A	C-5A	C-5A	C-5A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

NOTE:

X Designates Helix
O Full 90°
L Label
C Cloth
F Fwd

A Designate: Aft
R " O-ring
OF " 90° Fill
DO " Doubler 90°

Doubler diameter measurements:

Unit serial No.	S/N	S/N
Outboard winding	3 191	3 185
Inboard winding	3 241	3 240
Excess resin removed without distorting winding		

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3. B-Stage and Cure

Operator No.

B-Stage: Time Started 0700 ^{1/4/73} Time Completed 1100 ^{1/4/73} 3970
 Date 1/4/73 3910

Cure: Time Started 1200 ^{1/4/73} at 350 °F.
 Time Completed 1500 at 305 °F.
 Date 1/4/73 3970

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>003</u>		S/N <u>004</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 $\pm$.000 Dia.	3.150	3.149	3.150	3.150
3.150 $\pm$.000 Dia.	3.1485	3.148	3.148	3.147
2.734 $\pm$.004 Dia.	2.735	2.740	2.737	2.739
.83 $\pm$.030	.832		.827	
8.437 $\pm$.030	8.437		8.427	
.060 $\pm$.010	.060		.065	

1147

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, lbs.</u>	<u>Lot No.</u>	
Adhesive	<u>SL-M</u>	<u>50</u>	<u>HL 53</u>	<u>185</u>
Catalyst	<u>SL-B</u>	<u>7 1/2</u>	<u>HL 55</u>	<u>185-1</u>

Cure: Time Started 0200 at 140 °F.

Time Complete 1000 at 140 °F.

Date 1-9-73 2125

Clean up work performed satisfactorily.

Final Wt.: S/N 003, S/N 004

Wt. 477 lbs., Wt. 476 lbs.

2125

Supervisor Review

M. Lucare

Date

1-9-73

Engineer Review

F. B. Rine

Date

1-9-73

Manufacturing & Inspection Record

S/N's 005 & 006

3.0 Dia. x 2.05 in. Motor Case

P.R.D. Shell Fabrication

Dwg. 720608-1 Rev. A

Operator No.

1. Winding Preparation

Machine set up installed. Level wind set to .312 lead.

Shaft extension T. I. R. .015.

O-rings, screws, adapters and holes waxed.

Mandrel cleaned properly

(2) O-rings assembled properly.

Roving (P.R.D., Type III, 12-end) installed. Lot No. 68-10-5-2

Roving tension: 1. 2 1/2 2. 3

2. Winding

Resin mixed correctly.

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>2157</u>	<u>570</u>	<u>11131</u>
Catalyst	<u>1000</u>	<u>145</u>	<u>2019</u>

2. Winding (Cont)

Sequence check off

X	O	C-1A	C-1A	X	O	C-2A	C-2A	X	O	C-3A	C-3A	X	O	C-1F	C-1F	R	R	OF	OF
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Operator No.

2125

Sequence continued

C-2F	C-2F	OF	OF	C-3F	C-3F	OF	OF	C-4F	C-4F	C-5A	C-4A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

4168

Sequence continued

O	C-5F	C-5F	C-5A	C-5A	O	C-6F	C-6F	C-6A	C-6A	O	C-7F	C-7F	C-7A	C-7A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

2125

Sequence continued

DO	DO	DO	DO	C-8A	C-8A	DO	DO	C-9A	C-9A	DO	DO	L	L
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

4168

NOTE:

X Designates Helix
O " Full 90°
L " Label
C " Cloth
F " Fwd

A Designates Aft
R " O-ring
OF " 90° Fill
DO " Doubler 90°

Doubler diameter measurements:

Unit serial No.

S/N 005

S/N 006

Outboard winding

3.197

3.197

Inboard winding

3.200

3.212

2125

Excess resin removed without distorting winding

2125

3. B-Stage and Cure

Operator No. 669

B-Stage: Time Started 2130 Time Completed 2445

Date 2-15-73

669

669

Cure: Time Started 0515 at 300 °F.

Time Completed 0800 at 300 °F.

Date 2/15/73

3967

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>005</u>		S/N <u>006</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 $\pm$.000 Rad				
- .010 dia.	3.148	3.144	3.148	3.146
3.150 $\pm$.000 Rad				
- .010 dia.	3.147	3.145	3.147	3.147
2.734 $\pm$.002				
- .003 dia.	2.740	2.739	2.7405	2.740
.43 $\pm$.030	.442		.431	
8.437 $\pm$.030	8.442	8.441	8.443	8.442
.060 $\pm$.010	.065		.064	

1147

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, lbs.</u>	<u>Lot No.</u>	
Adhesive	<u>ERL 1256</u>	<u>11.5</u>	<u>APL-93-</u>	<u>827</u>
Catalyst	<u>TUP-X 304</u>	<u>39</u>	<u>APL-8</u>	<u>827</u>

Cure: Time Started 11:20²⁻²⁴⁻⁷⁸ at 140 °F.
Time Complete 2:30 at 140 °F.

Date 2/11/78 667

Clean up work performed satisfactorily.

Final Wt.: S/N 005, S/N 006
Wt. 302, Wt. 304

Supervisor Review _____ Date _____

Engineer Review _____ Date _____

Manufacturing & Inspection Record

S/N's 007 & 008

3.0 Dia. x 3.05 Lg. Motor Case

P.R.D. Shell Fabrication

Dwg. 720608-1 Rev. A

Operator No.

1. Winding Preparation

Machins set up installed. Level wind set to .312 lead.

Shaft extension T. I. R. .015

O-rings, screws, pins and bolts waxed.

Waxdrel cleaned properly

(2) O-rings assembled properly.

Reeling (P.R.D., Type III, 12-end) installed. Lot No. 201-2

Reeling tension: 1. 2 1/2 2. 2 1/2

2. Winding

Resin mixed correctly:

	<u>Ingredient</u>	<u>Weight, lbs.</u>	<u>Lot No.</u>
Resin	<u>2014</u>	<u>5.00</u>	<u>201 21</u>
Catalyst	<u>775/1</u>	<u>14.5</u>	<u>112 9</u>

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2. Winding (Con't)

Sequence check off

X	O	C-1A	C-1A	X	O	C-2A	C-2A	X	O	C-3A	C-3A	X	O	C-1F	C-1F	R	R	OF	OF
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Sequence continued

C-2F	C-2F	OF	OF	C-3	C-3F	OF	OF	C-4F	C-4F	C-4A	C-4A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Sequence continued

O	C-3F	C-3F	C-3A	C-3A	O	C-4F	C-4F	C-4A	C-4A	O	C-7F	C-7F	C-7A	C-7A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Sequence continued

DO	DO	DO	DO	C-4A	C-4A	DO	DO	C-4A	C-4A	DO	DO	L	L
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

NOTE:

X Designates Helix
O " Full 90°
L " Label
C " Cloth
F " Fwd

A Designates Aft
R " G-ring
OF " 90° Fill
DO " Doubler 90°

Doubler diameter measurements:

Unit serial No. S/N 007 S/N 008
Outboard winding 3.252 3.201
Inboard winding 3.230 3.211

Excess resin removed without distorting winding

Operator No.

786

786

786

1874

1874

1874

3. B-Stage and Cure

Operator No. 832

B-Stage: Time Started 0330 Time Completed 1330

Date 2-20-73

832

832

Cure: Time Started 1415 at 285 °F.

Time Completed 1715 at 200 °F.

Date 2-20-73

293

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>007</u>		S/N <u>008</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 $\pm$.000 Fwd - .010 dia.	3.148	3.1475	3.149	3.147
3.150 $\pm$.000 Aft - .010 dia.	3.147	3.146	3.148	3.147
2.734 $\pm$.004 - .000 dia.	2.7395	2.739	2.740	2.7395
.43 $\pm$.030	.429		.435	
8.437 $\pm$.030	8.444	8.443	8.442	8.440
.060 $\pm$.010	.060		.063	

1147

Operator No.

S. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>	
Adhesive	<u>EPK-2256</u>	<u>100</u>	<u>A9L-95</u>	<u>827</u>
Catalyst	<u>TENEX 6140</u>	<u>29</u>	<u>A3L-8</u>	<u>807</u>

Cure: Time Started 1500-2-28-73 at 140 °F.
Time Complete 2300 at 140 °F.

Date 2/11/73 669

Clean up work performed satisfactorily.

Final Wt.: S/N 007, S/N 008
Wt. 299, Wt. 301

Supervisor Review _____ Date _____

Engineer Review _____ Date _____

Manufacturing & Inspection Record

S/N's 009 & 010

3.0 Dia. x 8.05 in. Motor Case

P.R.D. Shell Fabrication

Fig. 720608-1 Rev. A

Operator No.

1. Winding Preparation

Machine set up installed. Level wind set to .312 lead.

Shaft extension T. I. R. .015

O-rings, screws, adapters and holes waxed.

Mandrel cleaned properly

(2) O-rings assembled properly.

Roving (P.R.D., Type III, 12-end) installed. Lot No. CC-01051

Roving tension: 1. 2 2. 2

2. Winding

Resin mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>62.56</u>	<u>100</u>	<u>AS427</u>
Catalyst	<u>T-110X</u>	<u>29</u>	<u>AS418</u>

2. Winding (Con't)

Sequence check off

X	O	C-1A	C-1A	X	O	C-2A	C-2A	X	O	C-3A	C-3A	X	O	C-1F	C-1F	R	R	OF	OF
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Sequence continued

C-2F	C-2F	OF	OF	C-3F	C-3F	OF	OF	C-4F	C-4F	C-4A	C-4A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Sequence continued

O	C-5F	C-5F	C-5A	C-5A	O	C-6F	C-6F	C-6A	C-6A	O	C-7F	C-7F	C-7A	C-7A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Sequence continued

DO	DO	DO	DO	C-8A	C-8A	DO	DO	C-9A	C-9A	DO	DO	L	L
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

NOTE:

X Designates Helix
O " Full 90°
L " Label
C " Cloth
F " Fil

A Designates Aft
R " O-ring
OF " 90° Fill
DO " Doubler 90°

Doubler diameter measurements:

Unit serial No. S/N 009 S/N 010
Outboard winding 3.172 3.173
Inboard winding 3.225 3.220

Excess resin removed without distorting winding

Operator No

2125

2125

2125

2125

2125

2125

3. B-Stage and Cure

Operator No.

B-Stage: Time Started 1515 Time Completed 2115 669

Date 2-22-73 669

Cure: Time Started 2130 at 300 °F.

Time Completed 2230 at 300 °F.

Date 2-23-73 782

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>009</u>		S/N <u>010</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 Pwd - .010 dia.	3.147	3.147	3.148	3.147
3.150 + .000 Alt - .010 dia.	3.147	3.146	3.149	3.148
2.734 + .004 - .000 dia.	2.741	2.740	2.741	2.740
.43 ± .030	.422		.429	
8.437 ± .030	8.442	8.441	8.444	8.443
.060 ± .010	.060		.060	

1147

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>	
Adhesive	<u>ERL-2256</u>	<u>100</u>	<u>APL-20</u>	<u>824</u>
Catalyst	<u>TONIX 6140</u>	<u>29</u>	<u>APL-8</u>	<u>823</u>

Cure: Time Started 1400-2-25-73 at 140 °F.

Time Complete 2300 at 140 °F. ✓

Date 3/28/73 669

Clean up work performed satisfactorily. _____

Final Wt.: S/N 009, S/N 010

Wt. 307, Wt. 301 _____

Supervisor Review _____ Date _____

Engineer Review _____ Date _____

Manufacturing & Inspection Record

S/N's 011 & 012

3.0 Dia. x 8.05 1-1/2" Poror Case

P.R.D. Shell Fabrication

Dwg. 720603-1 Rev. A

Operator No.

1. Winding Preparation

Machine set up installed. Level wind set to .312 lead.

Shaft extension T. I. R. .012

O-rings, screws, adapters and holes waxed.

Mandrel cleaned properly

(2) O-rings assembled properly.

Roving (P.R.D., Type III, 12-end) installed. Lot No. 2.08
2.11

Roving tension: 1. 1 2. 1 1/2

2. Winding

Resin mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>2.25</u>	<u>2.00</u>	<u>40.27</u>
Catalyst	<u>1.50</u>	<u>1.50</u>	<u>41.28</u>

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2. Winding (Con't)

Sequence check off

X	O	C-1A	C-1A	X	O	C-2A	C-2A	X	O	C-3A	C-3A	X	O	C-1F	C-1F	R	R	OF	OF
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Operator No.

2125

Sequence continued

C-2F	C-2F	OF	OF	C-3F	C-3F	OF	OF	C-4F	C-4F	C-4A	C-4A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

2125

Sequence continued

O	C-5F	C-5F	C-5A	C-5A	O	C-6F	C-6F	C-6A	C-6A	O	C-7F	C-7F	C-7A	C-7A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

2125

Sequence continued

DO	DO	DO	DO	C-8A	C-8A	DO	DO	C-9A	C-9A	DO	DO	L	L
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

2125

NOTE:

X Designates Helix
O " Full 90°
L " Label
C " Cloth
P " Pad

A Designates Aft
R " O-ring
OF " 90° Fill
DO " Doubler 90°

Doubler diameter measurements:

Unit serial No.

S/N 011

S/N 012

Outboard winding

3.184

3.189

Inboard winding

3.244

3.234

2125

Excess resin removed without distorting winding

2125

3. B-Stage and CureOperator No. 788B-Stage: Time Started 1300 Time Completed 1800Date 2-27-73Cure: Time Started 1900 at 300 °F.Time Completed 2300 at 300 °F.Date 2-27-73. 3934. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>011</u>		S/N <u>012</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 Fed - .010 dia.	3.148	3.1475	3.147	3.146
3.150 + .000 A/c - .010 dia.	3.146	3.145	3.146	3.145
2.734 + .004 - .000 dia.	2.7405	2.740	2.741	2.7405
.43 ± .030	.427		.427	
8.437 ± .030	8.440		8.440	
.060 ± .010	.065		.065	

1147

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, lbs.</u>	<u>Lot No.</u>	
Adhesive	<u>ERL-2256</u>	<u>100</u>	<u>ARL-27</u>	<u>4168</u> <u>827</u>
Catalyst	<u>TOMEX 6040</u>	<u>29</u>	<u>ARL-8</u>	<u>4168</u> <u>827</u>

Cure: Time Started 1130-3-1-53 at 140 °F.
 Time Complete 1430 at 140 °F.

Date 3/1/53 4210

Clean up work performed satisfactorily.

3924Final Wt.: S/N 011, S/N 012Wt. 303 GRAMS, Wt. 302 GRAMS880-4311

Supervisor Review A. Q. Bassell Date 3/14/53

Engineer Review _____ Date _____

Manufacturing & Inspection Record

S/N's 013 & 014

3.0 Dia. x 8.05 in. Motor Case

P.R.D. Shell Fabrication

Dwg. 720608-1 Rev. A

Operator No.

1. Winding Preparation

Machine set up installed. Level wind set to .312 lead.

826

Shaft extension T. I. R. .022

832

O-rings, screws, adapters and holes waxed.

832

Mandrel cleaned properly

832

(2) O-rings assembled properly.

832

Winding (P.R.D., Type III, 12-end) installed. Lot No. _____

Winding tension: 1. 2[#] 2. 2[#]

832

2. Winding

Resin mixed correctly:

832

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>22.56</u>	<u>500</u>	<u>ABL-27</u>
Catalyst	<u>fenox 6-40</u>	<u>145</u>	<u>ABL-8</u>

832

2. Winding (Con't)

Sequence check off

X	O	C-1A	C-1Z	A	O	C-2A	C-2Z	R	O	C-3A	C-3A	X	O	C-1F	C-1F	R	O	F	O	F
X	O	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Operator No

786

Sequence continued

C-2F	C-2F	O	O	C-3F	C-3F	O	O	C-4F	C-4F	C-4A	C-4A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

786

Sequence continued

O	C-5F	C-5F	C-5A	C-5A	O	C-5F	C-5F	C-5A	C-5A	O	C-7F	C-7F	C-7A	C-7A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

786

Sequence continued

DO	DO	DO	DO	C-6A	C-6A	DO	DO	C-9A	C-9A	DO	DO	L	L
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

786

NOTE:

X Designates Helix
O " Full 90°
L " Label
C " Clock
F " Fed

A Designates Aft
R " G-ring
OF " 90° Fill
DO " Doubler 90°

Doubler diameter measurements:

Unit serial No. S/N 013 S/N 014
Outboard winding 3.194 3.200
Inboard winding 3.253 3.261
Excess resin removed without distorting winding

786

786

3. B-Stage and Cure

Operator No. 880

B-Stage: Time Started 2215 Time Completed 0130

880

Date 3-1-73

880

Cure: Time Started 0200 at 285 °F.

Time Completed 0500 at 300 °F.

Date 3-1-73

880

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>013</u>		S/N <u>014</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 $\pm$.000 Fed + .010 dia.	3.150		3.144	
3.150 $\pm$.000 Afc + .010 dia.	3.147		3.145	
2.734 $\pm$.004 + .000 dia.	2.741	2.740	2.740	2.740
.43 $\pm$.030	.437		.443	
8.437 $\pm$.030	8.431		8.446	
.060 $\pm$.010	.065		.065	

1147

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, lbs.</u>	<u>Lot No.</u>	
Adhesive	<u>2256</u>	<u>100</u>	<u>ABL 27</u>	<u>669</u>
Catalyst	<u>Tenax 690</u>	<u>29</u>	<u>ABL 8</u>	<u>669</u>

Cure: Time Started 1615 at 145 °F.Time Complete 0015 at 145 °F.Date 3/1/73 4210

Clean up work performed satisfactorily.

3924Final Wt.: S/N 013, S/N 014Wt. , Wt. 311 Gm:3924This unit was used
for Bonding.Supervisor Review C. J. J. J. Date 3/1/73Engineer Review Date

Manufacturing & Inspection Record

S/N's 015 & 016

3.0 Dia. x 8.05 in. Motor Case

P.R.D. Shell Fabrication

Dwg. 720608-1 Rev. A

Operator No.

1. Winding Preparation

Machine set up installed. Level wind set to .312 lead.

149

Shaft extension T. I. R. 025

2125

O-rings, screws, adapters and holes waxed.

2125

Mandrel cleaned properly

2125

(2) O-rings assembled properly.

2125

Roving (P.R.D., Type III, 12-end) installed. Lot No. 2022
711

2125

Roving tension: 1. 2 2. 2

2125

2. Winding

Resin mixed correctly:

2125

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>2250</u>	<u>100</u>	<u>49-27</u>
Catalyst	<u>Taxol</u>	<u>27</u>	<u>49-27</u>

2125

2. Winding (Con't)

Sequence check off

X	O	C-1A	C-1A	X	O	C-2A	C-2A	X	O	C-3A	C-3A	X	O	C-1F	C-1F	R	R	OF	OF
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Operator No.

786

Sequence continued

C-2F	C-2F	OF	OF	C-3F	C-3F	OF	OF	C-4F	C-4F	C-4A	C-4A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

786

Sequence continued

O	C-5F	C-5F	C-5A	C-5A	O	C-6F	C-6A	C-6A	O	C-7F	C-7F	C-7A	C-7A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	7

786

Sequence continued

DO	DO	DO	DO	C-8A	C-8A	DO	DO	C-9A	C-9A	DO	DO	L	L
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

786

NOTE:

X Designates Helix
O " Full 90°
L " Label
C " Cloth
F " Fed

A Designates Aft
R " O-ring
OF " 90° Fill
DO " Doubler 90°

Doubler diameter measurements:

Unit serial No.	S/N <u>015</u>	S/N <u>016</u>
Outboard winding	<u>3.211</u>	<u>3.190</u>
Inboard winding	<u>3.236</u>	<u>3.250</u>
Excess resin removed without distorting winding		

786

786

3. B-Stage and Cure

Operator No. 880

B-Stage: Time Started 2045 Time Completed 2400

Date 3-1-73

880

Cure: Time Started 0030 at 300 °F.

Time Completed 0315 at 300 °F.

Date 3-2-73

880

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>015</u>		S/N <u>016</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 Fwd - .010 dia.	3.145	3.144	3.147	3.147
3.150 + .000 Aft - .010 dia.	3.147	3.146	3.146	3.145
2.734 + .004 - .000 dia.	2.7405	2.740	2.741	2.7405
.43 ± .030	.429		.430	
8.437 ± .030	8.454	8.453	8.450	8.449
.060 ± .010	.060		.062	

1147

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>	
Adhesive	<u>Epon 94611</u>	<u>50.0</u>	<u>ABL-60</u>	<u>782</u>
Catalyst	<u>Epon 94613</u>	<u>7.5</u>	<u>ABL-60</u>	<u>782</u>
Acetone	<u> </u>	<u>40.0</u>	<u>ABL-78</u>	<u>782</u>

Cure: Time Started 1630 at 130 °F.Time Complete 0030 at 130 °F.Date 3-6-73 776

Clean up work performed satisfactorily.

3924Final Wt.: S/N 015, S/N 016

Wt. 301 GRAMS, Wt. 297
302 GRAMS
3-14-73
23

880-4211Supervisor Review AD Smith Date 3/14/73Engineer Review Date

Manufacturing & Inspection Record

S/N's 017 & 018

3.0 Dia. x 8.05 ls. Motor Case

P.R.D. Shell Fabrication

Dwg. 720608-1 Rev. A

Operator No.

1. Winding Preparation

Machine set up installed. Level wind set to .312 lead.

832

Shaft extension T. I. R. .017

832

O-rings, screws, adapters and holes waxed.

832

Mandrel cleaned properly

832

(2) O-rings assembled properly.

832

Roving (P.R.D., Type III, 12-end) installed. Lot No. 66C16

832

Roving tension: 1. 2 1/4 2. 2 1/4

832

2. Winding

Resin mixed correctly:

832

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>2256</u>	<u>576</u>	<u>ABC-27</u>
Catalyst	<u>fenox 4640</u>	<u>145</u>	<u>ABC-9</u>

832

2. Winding (Con't)

Sequence check off

X	O	C-1A	C-1A	X	O	C-2A	C-2A	X	O	C-3A	C-3A	X	O	C-1F	C-1F	R	OF	OF
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Operator M

786

Sequence continued

C-2F	C-2F	OF	OF	C-3F	C-3F	OF	OF	C-4F	C-4F	C-4A	C-4A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

786

Sequence continued

O	C-5F	C-5F	C-5A	C-5A	O	C-6F	C-6F	C-6A	C-6A	O	C-7F	C-7F	C-7A	C-7A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

786

Sequence continued

DO	DO	DO	DO	C-8A	C-8A	DO	DO	C-9A	C-9A	DO	DO	L	L
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

786

NOTE: X Designates Helix
 O " Full 90°
 L " Label
 C " Cloth
 F " Fwd
 A Designates Aft
 R " O-ring
 OF " 90° Fill
 DO " Doubler 90°

Doubler diameter measurements:

Unit serial No.	S/N <u>017</u>	S/N <u>018</u>
Outboard winding	<u>3.174</u>	<u>3.195</u>
Inboard winding	<u>3.225</u>	<u>3.226</u>
Excess resin removed without distorting winding		

786
786

3. B-Stage and Cure

Operator No.

B-Stage: Time Started 1145

Time Completed 1745

880

Date 3-16-73

880

Cure: Time Started 1800 at 290 °F.

Time Completed 2100 at 300 °F.

Date 3-16-73

880

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>017</u>		S/N <u>018</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 Fed - .010 dia.	3.148		3.148	
3.150 + .000 Act - .010 dia.	3.147 3.147 3.147		3.149	
2.734 + .004 - .000 dia.	2.7405	2.746	2.7395	2.739
.43 ± .030	.433		.440	
8.437 ± .030	8.449	8.448	8.440	8.459
.060 ± .010	.065		.067	

1147

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, lbs.</u>	<u>Lot No.</u>	
Adhesive	<u>946 A</u>	<u>50</u>	<u>ABL-60</u>	<u>880</u>
Catalyst	<u>946 B</u>	<u>7 1/2</u>	<u>ABL-60</u>	<u>880</u>
Acetone	<u>ACETONE</u>	<u>40</u>	<u>ABL-78</u>	<u>880</u>

Cure: Time Started ⁴⁻¹⁸⁻⁷³ 1945 at 75 °F.
 Time Complete 1948 at 75 °F.

Date 4-19-73 4210

Clean up work performed satisfactorily.

4210

Final Wt.: S/N 017, S/N 018
 Wt. 298, Wt. 300

4210Supervisor Review AG-Bazzoli Date 4/19/73

Engineer Review _____ Date _____

Manufacturing & Inspection RecordS/N's 019 & 0202.0 Dia. x 8.05 ls. Motor CaseGlass Nozzle Fabrication

Dwg. 720608-2

Operator lo.1. Winding PreparationMachine set up installed. 226Shaft extension T. I. R. 025 2125O-rings waxed only. 2125Mandrel cleaned properly 2125(4) O-rings and mandrel assembled properly. 2125Roving (S904, 12-end) installed. Lot No. AB15 2125Roving tension: 1. 2 2. 1 1/2 3. 2 21252. WindingResin mixed correctly: 2125

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>	
Resin	<u>2256</u>	<u>100</u>	<u>AB127</u>	
Catalyst	<u>Tenox</u>	<u>29</u>	<u>A1318</u>	<u>2115</u>

Operator

2. Winding (cont.)

Sequence check off:

X	X	X	X	0	0	0	0	0	0	C1	C2	0	C3	C4	0	C5	C6	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

C7	C8	0	C9	C10	0	C11	C12	0	C13	C14	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

2125

Throat dia. measurements:

Unit Serial No.

S/N 019S/N 020

After (6) 90° Winding:

2.2752.277

After cloth/90° Buildup:

2.7502.7502125

Excess resin removed without distorting winding

2125

Doubliers wound correctly at each end

2125

3. B-Stage and Cure

Operator No. 786

B-Stage: Time Started 1500 Time Completed 1830

Date 3-2-73

Cure: Time Started 1900 at 275 °F.

Time Completed 2200 at 300 °F.

Date 3-2-73

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>019</u>		S/N <u>020</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 - .010 dia.	3.145		3.149	
2.491 + .000 - .002 dia.	2.490		2.490	
Throat Dia.-Record 1.922 + .000 - .003 dia.	1.922	1.9215	1.9225	1.922
2.731 + .000 - .004 dia.	2.729	2.728	2.729	2.7285
2.946 I.D. Exit Plane-Record	2.950	2.955	2.960	2.955
.210 ± .005	.212		.210	

1147

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>	
Adhesive	<u>Epoxy 944A</u>	<u>50.0</u>	<u>BB4-60</u>	<u>702</u>
Catalyst	<u>Epoxy 944B</u>	<u>7.5</u>	<u>BB4-60</u>	<u>732</u>
Thinner	<u>Acetone</u>	<u>40.0</u>	<u>BB4-78</u>	<u>782</u>

Cure: Time Started 1630 at 130 °F.Time Complete 0030 at 130 °F.Date 3/6/73 776

Clean up work performed satisfactorily.

3924Final Wt.: C/W 019, S/W 020Wt. 136 GRAMS, Wt. 135 GRAMS880 - 421Supervisor Review A. J. P. SmithDate 3/14/73

Engineer Review _____

Date _____

Manufacturing & Inspection Record

S/N's 019 & 020

3.0 dia. x 8.03 lg. Motor Case

P.R.D. Shell Fabrication

Dwg. 720608-1 Rev. A

Operator No.

1. Winding Preparation

Machine set up installed. Level wind set to .312 lead.

Shaft extension T. I. R. 624

O-rings, screws, adapters and holes waxed.

Mandrel cleaned properly

(2) O-rings assembled properly.

Winding (P.R.D., Type III, 12-end) installed; Lot No. 27

Winding tension: 1. 1.5 2. 2

2. Winding

Resin placed correctly:

	<u>Ingredient</u>	<u>Weight, lbs.</u>	<u>Lot No.</u>
Resin	<u>22.16</u>	<u>1.0</u>	<u>A96 27</u>
Catalyst	<u>77.01</u>	<u>1.45</u>	<u>A96 4</u>

2. Winding (Con't)

Sequence check off

X	O	C-1A	C-1A	X	O	C-2A	C-2A	X	O	C-3A	C-3A	X	O	C-1F	C-1F	R	R	OF	OF
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Operator No

1184

Sequence continued

C-2F	C-2F	OF	OF	C-3F	C-3F	OF	OF	C-4F	C-4F	C-4A	C-4A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

1184

Sequence continued

O	C-3F	C-3F	C-3A	C-3A	O	C-6F	C-6F	C-6A	C-6A	O	C-7F	C-7F	C-7A	C-7A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

1184

Sequence continued

DO	DO	DO	DO	C-3A	C-3A	DO	DO	C-9A	C-9A	DO	DO	L	L
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

1184

NOTE:

X Designates Helix
O " Full 90°
L " Label
C " Cloth
F " Pad

A Designates Aft
R " O-ring
OF " 90° Fill
DO " Doubler 90°

Doubler diameter measurements:

Unit serial No. S/N 019 S/N 020
Outboard winding 3.206 3.192
Inboard winding 3.287 3.287
Excess resin removed without distorting winding

1184

1184

3. B-Stage and Cure

Operator No.

B-Stage: Time Started 1045 Time Completed 1645 776

Date 3/20/73 776

Cure: Time Started 1700 at 300 °F.

Time Completed 2000 at 300 °F.

Date 3/20/73 827

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>019</u>		S/N <u>020</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 Fwd - .010 dia.	3.148		3.149	
3.150 + .000 Aft - .010 dia.	3.147		3.146	
2.734 + .004 - .000 dia.	2.7415	2.741	2.741	2.7405
.43 ± .030	.445		.422	
8.437 ± .030	8.447	8.446	8.452	8.451
.060 ± .010	.062		.060	

1147

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best available copy.

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>	
Adhesive	<u>946 A</u>	<u>50</u>	<u>ABL-60</u>	<u>880</u>
Catalyst	<u>946 B</u>	<u>7 1/2</u>	<u>ABL-60</u>	<u>880</u>
Acetone	<u>ACETONE</u>	<u>40</u>	<u>ABL-78</u>	<u>880</u>

Cure: Time Started ⁴⁻¹⁸⁻⁷³ 1945 at 75 °F.
 Time Complete 1945 at 75 °F.

Date 4-18-73 4210

Clean up work performed satisfactorily.

4210

Final Wt.: S/N 019, S/N 020
 Wt. 306, Wt. 303

4210

Supervisor Review

W. B. B. B.

Date

4/19/73

Engineer Review

Date

Manufacturing & Inspection Record

S/N's 021 & 022

3.0 Dia. x 8.05 L. Motor Case

P.R.D. Shell Fabrication

Dwg. 720608-1 Rev. A

Operator No.

1. Winding Preparation

Machine set up installed. Level wind set to .312 lead.

2125

Shaft extension T. I. R. 027

2125

O-rings, screws, adapters and holes waxed.

2125

Mandrel cleaned properly

2125

(2) O-rings assembled properly.

2125

Roving (P.R.D., Type III, 12-end) installed. Lot No. 8-2

2125

Roving tension: 1. 2 2. 2 1/2

2125

2. Winding

Resin mixed correctly:

2125

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>2256</u>	<u>100</u>	<u>48627</u>
Catalyst	<u>TONOX</u>	<u>29</u>	<u>A369</u>

2125

2. Winding (Con't)

Sequence check off

X	O	C-1A	C-1A	X	O	C-2	C-2	X	O	C-3A	C-3A	X	O	C-1F	C-1F	R	OF	OF
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Sequence continued

C-2F	C-2F	OF	OF	C-3F	C-3F	OF	OF	C-4F	C-4F	C-4A	C-4A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Sequence continued

O	C-5F	C-5F	C-5A	C-5A	O	C-6F	C-6F	C-6A	C-6A	O	C-7F	C-7F	C-7A	C-7A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Sequence continued

DO	DO	DO	DO	C-8A	C-8A	DO	DO	C-9A	C-9A	DO	DO	L	L
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

NOTE:

X Designates Helix
O " Full 90°
L " Label
C " Cloth
F " Fwd

A Designates Aft
R " O-ring
OF " 90° Fill
DO " Doubler 90°

Doubler diameter measurements:

Unit serial No.	S/N	021	S/N	022
Outboard winding		3.190		3.193
Inboard winding		3.243		3.253

Excess resin removed without distorting winding

Operator No.

2125

2125

2125

2125

2125

2125

3. B-Stage and Cure

Operator No.

B-Stage: Time Started 2315 Time Completed 2430

Date 3-28-73

786

786

Cure: Time Started 0500 at 255 °F.

Time Completed 0800 at 300 °F.

Date 3-28-73

782

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>021</u>		S/N <u>022</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 Fwd - .010 dia.	3.148		3.149	
3.150 + .000 Aft - .010 dia.	3.145		3.146	
2.734 + .004 - .000 dia.	2.740	2.7395	2.741	2.740
.43 ± .030	.440		.437	
8.437 ± .030	8.451	8.4505	8.451	8.450
.060 ± .010	.061		.055	

1147

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, lbs.</u>	<u>Lot No.</u>	
Adhesive	<u>946 A</u>	<u>50</u>	<u>ABL-60</u>	<u>880</u>
Catalyst	<u>946 B</u>	<u>7 1/2</u>	<u>ABL-60</u>	<u>880</u>
Acetone	<u>ACETONE</u>	<u>40</u>	<u>ABL-78</u>	<u>880</u>

Cure: Time Started 4-18-73 1945 at 75 °F.
 Time Complete 1945 at 75 °F.

Date 4-19-73 4210

Clean up work performed satisfactorily.

4210

Final Wt.: S/N 021, S/N 022
 Wt. 302, Wt. 301

4210Supervisor Review AA Baruti Date 4/19/73

Engineer Review _____ Date _____

Manufacturing & Inspection Record

S/N's 023 & 024

3.0 Dia. x 8.05 in. Motor Case

P.R.D. Shell Fabrication

Dwg. 720608-1 Rev. A

Operator No.

1. Winding Preparation

Machine set up installed. Level wind set to .312 lead.

Shaft extension T. I. R. .011

O-rings, screws, adapters and holes waxed.

Mandrel cleaned properly

(2) O-rings assembled properly.

Roving (P.R.D., Type III, 12-end) installed. Lot No. 977

Roving tension: 1. 2 2. 17

2. Winding

Resin mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>2256</u>	<u>200</u>	<u>110927</u>
Catalyst	<u>10102</u>	<u>145</u>	<u>110929</u>

2. Winding (Con't)

Sequence check off

X	O	C-1A	C-1A	X	O	C-2A	C-2A	X	O	C-3A	C-3A	X	O	C-1F	C-1F	R	R	OF	OF
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Operator No.

4164

Sequence continued

C-2F	C-2F	OF	OF	C-3F	C-3F	OF	OF	C-4F	C-4F	C-4A	C-4A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

4168

Sequence continued

O	C-5F	C-5F	C-5A	C-5A	O	C-6F	C-6F	C-6A	C-6A	O	C-7F	C-7F	C-7A	C-7A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

785

Sequence continued

DO	DO	DO	DO	C-8A	C-8A	DO	DO	C-9A	C-9A	DO	DO	L	L
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

788

NOTE:

X Designates Helix
O " Full 90°
L " Label
C " Cloth
F " Fwd

A Designates Aft
R " O-ring
OF " 90° Fill
DO " Doubler 90°

Doubler diameter measurements:

Unit serial No.	S/N 023	S/N 024
Outboard winding	3.190	3.195
Inboard winding	3.250	3.258

786

Excess resin removed without distorting winding

786

3. B-Stage and Cure

Operator No.

B-Stage: Time Started 0130 Time Completed 0530 669

Date 3-29-73 669

Cure: Time Started 0545 at 300 °F.

Time Completed 0845 at 300 °F.

Date 3-29-73 782

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>023</u>		S/N <u>024</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 Fwd - .010 dia.	3.1485		3.149	
3.150 + .000 Aft - .010 dia.	3.146		3.147	
2.734 + .004 - .000 dia.	2.741	2.7405	2.741	2.7405
.43 ± .030	.475		.440	
8.437 ± .030	8.447	8.448	8.452	8.451
.060 ± .010	.064		.064	

11817

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, lbs.</u>	<u>Lot No.</u>	
Adhesive	<u>946A</u>	<u>50</u>	<u>ABL-60</u>	<u>880</u>
Catalyst	<u>946B</u>	<u>7 1/2</u>	<u>ABL-60</u>	<u>880</u>
Acetone	<u>ACETONE</u>	<u>40</u>	<u>ABL-78</u>	<u>880</u>

Cure: Time Started 4-18-73 1945 at 75 °F.
 Time Complete 1945 at 75 °F.

Date 4-19-73 4210

Clean up work performed satisfactorily.

4210

Final Wt.: S/N 023, S/N 024
 Wt. 297, Wt. 297

4210Supervisor Review Al Basile Date 4/19/73

Engineer Review _____ Date _____

Manufacturing & Inspection Record

S/N's 025 & 026

3.0 Dia. x 8.05 L. Motor Case

P.R.D. Shell Fabrication

Dwg. 720608-1 Rev. A

Operator No.

1. Winding Preparation

Machine set up installed. Level wind set to .312 lead.

716

Shaft extension T. I. R. C 2 3

716

O-rings, screws, adapters and holes waxed.

716

Mandrel cleaned properly

716

(2) O-rings assembled properly.

716

Roving (P.R.D., Type III, 12-end) installed. Lot No. 0475-7

716

Roving tension: 1. 1 3/4 2. 2

716

2. Winding

Resin mixed correctly:

716

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>2256</u>	<u>100</u>	<u>AML 27</u>
Catalyst	<u>TN 11 00/40</u>	<u>24</u>	<u>AML 9</u>

716

2. Winding (Con't)

Sequence check off

X	O	C-1A	C-1A	X	O	C-2A	C-2A	X	O	C-3A	C-3A	X	O	C-1F	C-1F	R	R	OF	OF
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Sequence continued

C-2F	C-2F	OF	OF	C-3F	C-3F	OF	OF	C-4F	C-4F	C-4A	C-4A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Sequence continued

O	C-5F	C-5F	C-5A	C-5A	O	C-6F	C-6F	C-6A	C-6A	O	C-7F	C-7F	C-7A	C-7A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Sequence continued

DO	DO	DO	DO	C-8A	C-8A	DO	DO	C-9A	C-9A	DO	DO	L	L
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

NOTE:

X Designates Helix
O " Full 90°
L " Label
C " Cloth
F " Fwd

A Designates Aft
R " O-ring
OF " 90° Fill
DO " Doubler 90°

Doubler diameter measurements:

Unit serial No.

S/N 025 S/N 026

Outboard winding

3.193 3.182

Inboard winding

3.265 3.269

Excess resin removed without distorting winding

Operator No.

1891

1891

1891

1891

1891

1891

3. B-Stage and Cure

Operator No.

B-Stage: Time Started 1130 Time Completed 1450 782

Date 3-30-73 792

Cure: Time Started 1500 at 300 °F.

Time Completed 1800 at 300 °F.

Date 3/30/73 776

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>025</u>		S/N <u>026</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 $\pm$.000 Fed - .010 dia.	3.148		3.148	
3.150 $\pm$.000 Aft - .010 dia.	3.147		3.148	
2.734 $\pm$.004 - .000 dia.	2.741	2.740	2.741	2.741
.43 $\pm$.030	.441		.441	
8.437 $\pm$.030	8.449	8.448	8.448	8.447
.060 $\pm$.010	.060		.061	

1147

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, grs.</u>	<u>Lot No.</u>	
Adhesive	<u>946 A</u>	<u>50</u>	<u>ABL-60</u>	<u>880</u>
Catalyst	<u>946 B</u>	<u>7 1/2</u>	<u>ABL-60</u>	<u>880</u>
Acetone	<u>ACETONE</u>	<u>40</u>	<u>ABL-78</u>	<u>880</u>

Cure: Time Started 4-18-73 1945 at 75 °F.Time Complete 4-18-73 1945 at 75 °F.Date 4-19-73 4210

Clean up work performed satisfactorily.

4210Final Wt.: S/N 025, S/N 026Wt. 302, Wt. 300 gms4210Supervisor Review Al Banelli Date 4/19/73

Engineer Review _____ Date _____

R. J. DALE

W/O C402:041

Manufacturing & Inspection Record

3.0 Dia. x 8.05 lg. Motor Case

Glass Nozzle Fabrication

Dwg. 720608-2

Operator No.

1. Winding Preparation

Machine set up installed. Level wind set to

Shaft extension T. I. R. .014

786

O-rings waxed only.

786

Mandrel cleaned properly

786

(4) O-rings and mandrel assembled properly.

786

Roving (S904, 12-end) installed. Lot No. 2053

786

Roving tension: 1. R. 0 2. 1 3/4 3. 1 1/2

786

2. Winding

Resin mixed correctly:

786

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>2256</u>	<u>150</u>	<u>ABL 17</u>
Catalyst	<u>TENOX 69/40</u>	<u>29</u>	<u>ABL 7</u>

786

Operator

2. Winding (cont.)

Sequence check off:

X	X	X	X	0	0	0	0	0	0	C1	C2	0	C3	C4	✓	C5	C6	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

C7	C8	0	C9	C10	0	C11	C12	0	C13	C14	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

→ 86

Throat dia. measurements:

Unit Serial No.

S/N 001

S/N 002

After (6) 90° Winding:

2.283

2.282

After cloth/90° Buildup:

2.770

2.774

786

Excess resin removed without distorting winding

786

Doublers wound correctly at each end

1894

3. B-Stage and Cure

Operator No.

B-Stage: Time Started 1000 Time Completed 1415 1894
Date 7-21-72 1894

Cure: Time Started 1445 at 285 °F.
Time Completed 1745 at 300 °F.
Date 7/21/72 776

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>001</u>		S/N <u>002</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 $\pm$.000 - .010 dia.	3.148	3.147	3.150	3.149
2.491 $\pm$.000 - .002 dia.	2.491	2.490	2.491	2.490
1.922 $\pm$.000 - .003 dia.	1.9205 2.9205 DN.	1.9205 2.9205 DN.	1.9225 2.9225 DN.	1.9225 2.9225 DN.
2.731 $\pm$.000 - .004 dia.	2.730	2.729	2.729	2.728
2.946 $\pm$.010 dia.	2.945	2.944	2.945	2.944
.210 $\pm$.005	.210	.210	.210	.210

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>	
Adhesive	<u>946 A</u>	<u>50</u>	<u>ABL 55</u>	<u>786</u>
Catalyst	<u>946 B</u>	<u>72</u>	<u>ABL 55</u>	<u>786</u>
Thinner	<u>Acetone</u>	<u>40</u>	<u>ABL 69</u>	<u>786</u>

Cure: Time Started 1830 at 136 °F.Time Complete 2230 at 130 °F.Date 7/25/72 3924

Clean up work performed satisfactorily.

3924Final Wt.: S/N 001, S/N 002Wt. 137 grms., Wt. 134 gr.
302 lb .2953924Supervisor Review A. D. Borelli Date 7/25/72Engineer Review J. H. Rivers Date 7/26/72

Manufacturing & Inspection Record

3.0 Dia. x 8.05 lg. Motor Case

Glass Nozzle Fabrication

Dwg. 720508-2

Operator No.

1. Winding Preparation

Machine set up installed. Level wind set to

Shaft extension T. I. R. 015

O-rings waxed only.

Mandrel cleaned properly

(4) O-rings and mandrel assembled properly.

Roving (S904, 12-end) installed. Lot No. 2053

Roving tension: 1. 2 1/4 2. 1 1/4 3. 1 1/4

2. Winding

Resin mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>20.50</u>	<u>20.5</u>	<u>2053</u>
Catalyst	<u>1.0000</u>	<u>1.0</u>	<u>2053</u>

Operator

2. Winding (cont.)

Sequence check off:

X	X	X	X	0	0	0	0	0	0	C1	C2	0	C3	C4	0	C5	C6	0
/	/	/	/	/	/	/	/	/	/	-	-	-	-	-	-	-	/	-

C7	C8	0	C9	C10	0	C11	C12	0	C13	C14	0
/	/	/	/	/	/	/	/	/	/	/	/

Throat dia. measurements:

Unit Serial No.

S/N 003

S/N 002

After (6) 90° Winding:

2.273

2.261

After cloth/90° Buildup:

2.718

2.770

1.897

Excess resin removed without distorting winding

1.850

Doublers wound correctly at each end

1.821

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3. B-Stage and Cure

Operator No. 2125

B-Stage: Time Started 0730 Time Completed 1015 2125
 Date 7/31/72 2125

Cure: Time Started 1100 at 500 °F.
 Time Completed 1400 at 500 °F.
 Date 7/31/72 2125

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>003</u>		S/N <u>004</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 - .010 dia.	3.1465	3.146	3.147	3.1475
2.491 + .000 - .002 dia.	2.490	2.4895	2.490	2.4895
1.922 + .000 - .003 dia.	1.922	1.920	1.9225	1.922
2.731 + .000 - .004 dia.	2.731	2.731	2.731	2.731
2.946 ± .010 dia.	2.948	2.942	2.947	2.942
.210 ± .005	.210	.210	.210	.210

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>	
Adhesive	<u>Epoxy 946 A</u> <u>Att -</u>	<u>50.0</u>	<u>ABL-58</u>	<u>782</u>
Catalyst	<u>Epoxy 946 B</u>	<u>7.5</u>	<u>ABL-58</u>	<u>782</u>
Thinner	<u>Acetone</u>	<u>40.0</u>	<u>ABL-69</u>	<u>782</u>

Cure: Time Started 1400 at 120 °F.

Time Complete 2700 at 120 °F.

Date 8/10/72 3924

Clean up work performed satisfactorily.

3924

Final Wt.: S/N 117, S/N 102

Wt. 117.5, Wt. 102.5 3926

Supervisor Review A. J. Bonelli Date 8/10/72

Engineer Review Date

C402.323

Manufacturing & Inspection Record

3.0 Dia. x 8.05 in. Motor Case

Glass Nozzle Fabrication

Dwg. 720608-2

Operator No.

1. Winding Preparation

Machine set up installed. Level wind set to

826

Shaft extension T. I. R. 25

4125

O-rings waxed only.

4211

Mandrel cleaned properly

4128

(4) O-rings and mandrel assembled properly.

4211

Roving (S904, 12-end) installed. Lot No. ABL-4

4128

Roving tension: 1. 2 lbs 2. 2 1/2 lbs 3. 2 lbs

689

2. Winding

Resin mixed correctly:

668

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>2256</u>	<u>100</u>	<u>ABL-24</u>
Catalyst	<u>TONOX 10/40</u>	<u>29</u>	<u>ABL-7</u>

668

Operator

2. Winding (cont.)

Sequence check off:

X	X	X	X	0	0	0	0	0	0	C1	C2	0	C3	C4	0	C5	C6	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

C7	C8	0	C9	C10	0	C11	C12	0	C13	C14	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

2.284

Throat dia. measurements:

Unit Serial No.

S/N 005

S/N 006

After (6) 90° Winding:

2.272

2.281

After cloth/90° Buildup:

2.296

2.292

1.196

Excess resin removed without distorting winding

1.197

Doublers wound correctly at each end

1.198

3. B-Stage and Cure

Operator No.

B-Stage: Time Started 2130 Time Completed 2030 3924

Date 12-16-72 3924

Cure: Time Started 6015 12-18-72 at 360 °F.

Time Completed 6330 12-18-72 at 310 °F.

Date 12-18-72 776

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>665</u>		S/N <u>666</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 - .010 dia.	3.147		3.148	
2.491 + .000 - .002 dia.	2.491	2.490	2.490	2.4885
1.922 + .000 - .003 dia.	1.9225	1.922	1.922	1.921
2.731 + .000 - .004 dia.	2.735		2.735	
2.946 ± .010 dia.	2.940	2.938	2.942	2.940
.210 ± .005	.208		.210	

1147

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, lbs.</u>	<u>Lot No.</u>	
Adhesive	<u>946 CARIA</u>	<u>50</u>	<u>BAI-10</u>	<u>4127</u>
Catalyst	<u>946 CARIA</u>	<u>7 1/2</u>	<u>BAI-10</u>	<u>4127</u>
Thinner	<u>ACEICONE</u>	<u>40</u>	<u>BAI-10</u>	<u>4127</u>

Cure: Time Started 1000 at 170 °F.Time Complete 1800 at 170 °F.Date 12-20-72 399

Clean up work performed satisfactorily.

399Final Wt.: S/N 005, S/N 006Wt. 145 gm, Wt. 140 gm399Supervisor Review C. O. Smith Date 12/21/72Engineer Review F. H. Rivers Date 12/21/72

Manufacturing & Inspection Record

S/N's 007 & 008

3.0 Dia. x 8.05 lg. Motor Case

Glass Nozzle Fabrication

Dwg. 720608-2

Operator No.

1. Winding Preparation

Machine set up installed.

Shaft extension T. I. R. 0.25

2125

O-rings waxed only.

2125

Mandrel cleaned properly

2125

(4) O-rings and mandrel assembled properly.

2125

Roving (S904, 12-end) installed. Lot No. AB127

2125

Roving tension: 1. 2 2. 24 3. 2

2125

2. Winding

Resin mixed correctly:

2125

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>2256</u>	<u>500</u>	<u>AB127</u>
Catalyst	<u>TENOX</u>	<u>145</u>	<u>AB127</u>

2125

Operator

2. Winding (cont.)

Sequence check off:

X	X	X	X	0	0	0	0	0	0	C1	C2	0	C3	C4	0	C5	C6	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

C7	C8	0	C9	C10	0	C11	C12	0	C13	C14	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

786

Throat dia. measurements:

Unit Serial No.

S/N 007

S/N 008

After (6) 90° Winding:

2.272

2.276

After cloth/90° Buildup:

2.747

2.276
RPY 2/15/73

2.746

786

Excess resin removed without distorting winding

786

Doublers wound correctly at each end

786

3. B-Stage and Cure

Operator No.

B-Stage: Time Started 0600 Time Completed 1000

880

Date 2-15-73

880

Cure: Time Started 1000 at 300 °F.

Time Completed 1300 at 200 °F.

Date 2-15-73

885

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>007</u>		S/N <u>008</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 - .010 dia.	3.148		3.146	
2.491 + .000 - .002 dia.	2.490		2.489	
1.922 + .000 - .003 dia.	1.9215	1.921	1.924	1.921
2.731 + .000 - .004 dia.	2.728		2.7275	
2.946 ± .010 dia.	2.952	2.942	2.950	2.947
.210 ± .005	.209		.208	

1147

Operator No.

5. Finishing

Coating mixed correctly:

S/N 007

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>	
Adhesive	<u>946A</u>	<u>50</u>	<u>ABL64</u>	<u>4145</u>
Catalyst	<u>946B</u>	<u>7 1/2</u>	<u>ABL64</u>	<u>4145</u>
Thinner	<u>Acetone</u>	<u>40</u>	<u>ABL78</u>	<u>4145</u>

Cure: Time Started 2230 at 130 °F.Time Complete 0630 at 130 °F.Date 2-20-73 152

Clean up work performed satisfactorily.

176Final Wt. S/N 007, S/N 008Wt. 149, Wt. _____782

Supervisor Review

M. L. Linn

Date

2/20/73

Engineer Review

John P. Linn

Date

2/21/73

Manufacturing & Inspection Record

S/N's 009 & 010

3.0 Dia. x 8.05 in. Motor Case

Glass Nozzle Fabrication

Dwg. 720608-2

Operator No.

1. Winding Preparation

Machine set up installed.

Shaft extension T. I. R. 0.020

O-rings waxed only.

Mandrel cleaned properly

(4) O-rings and mandrel assembled properly.

Roving (S904, 12-end) installed. Lot No. 14BL4

Roving tension: 1. 2 2. 2 3. 2

2. Winding

Resin mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>2256</u>	<u>500</u>	<u>14BL27</u>
Catalyst	<u>TCAC</u>	<u>145</u>	<u>14BL9</u>

Operator

2. Winding (cont.)

Sequence check off:

X	X	X	X	0	0	0	0	0	0	C1	C2	0	C3	C4	0	C5	C6	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

C7	C8	0	C9	C10	0	C11	C12	0	C13	C14	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

189f

Throat dia. measurements:

Unit Serial No.

S/N 009

S/N 010

After (6) 90° Winding:

2.282

2.279

After cloth/90° Buildup:

2.815

2.795

189f

Excess resin removed without distorting winding

189f

Doublers wound correctly at each end

1114

3. B-Stage and Cure

Operator No.

B-Stage: Time Started 1440 Time Completed 1840 2125
 Date 2-15-73 2125

Cure: Time Started 1845 at 300 °F.
 Time Completed 2145 at 300 °F.
 Date 2-15-73 2125

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>009</u>		S/N <u>010</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 +.000 -.010 dia.	3.146		3.145	
2.491 +.000 -.002 dia.	2.490		2.490	
1.922 +.000 -.003 dia.	1.925	1.924	1.921	1.9205
2.731 +.000 -.004 dia.	2.729		2.729	
2.946 ±.010 dia.	2.944	2.945	2.947	2.946
.210 ±.005	.205		.207	

1147

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>	
Adhesive	<u>946A</u>	<u>50</u>	<u>ABL 64</u>	<u>4145</u>
Catalyst	<u>946B</u>	<u>7 1/2</u>	<u>ABL 64</u>	<u>4145</u>
Thinner	<u>ACE TONE</u>	<u>40</u>	<u>ABL 78</u>	<u>4145</u>

Cure: Time Started 2230 at 130 °F.

Time Complete 0630 at 130 °F.

Date 2-20-73 782

Clean up work performed satisfactorily.

Final Wt.: S/N 009, S/N 010

Wt. 159, Wt. 138

782

Supervisor Review

M. L. L...

Date

2/20/73

Engineer Review

J. J. L...

Date

2/21/73

Manufacturing & Inspection RecordS/N's 011 & 0123.0 Dia. x 8.05 lg. Motor CaseGlass Nozzle Fabrication

Dwg. 720608-2

Operator No.1. Winding Preparation

Machine set up installed.

821Shaft extension T. I. R. 019786

O-rings waxed only.

243

Mandrel cleaned properly

243

(4) O-rings and mandrel assembled properly.

293Roving (S904, 12-end) installed. Lot No. AP-4786Roving tension: 1. 2 1/4 2. 2 3. 2 3/47862. Winding

Resin mixed correctly:

786

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>2250</u>	<u>530</u>	<u>AP-27</u>
Catalyst	<u>TDV-80113</u>	<u>145</u>	<u>801 9</u>

786

Operator

2. Winding (cont.)

Sequence check off:

X	X	X	X	0	0	0	0	0	0	C1	C2	0	C3	C4	0	C5	C6	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

C7	C8	0	C9	C10	0	C11	C12	0	C13	C14	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

786

Throat dia. measurements:

Unit Serial No.

S/N 011

S/N 012

After (6) 90° Winding:

2.278

2.277

After cloth/90° Buildup:

2.276

2.262

786

Excess resin removed without distorting winding

786

Doublers wound correctly at each end

786

3. B-Stage and Cure

Operator No.

B-Stage: Time Started 2200 Time Completed 0030 782

Date 3-21-73 782

Cure: Time Started 0045 at 270 °F.

Time Completed 0345 at 200 °F.

Date 3-21-73 782

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>011</u>		S/N <u>012</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 - .010 dia.	3.1485		3.144	
2.491 + .000 - .002 dia.	2.4875		2.491	
Throat Dia.-Record 1.922 + .003 - .003 dia.	1.923	1.922	1.923	1.9215
2.731 + .000 - .004 dia.	2.727		2.728	
2.946 I.D. Exit Plane-Record	2.954	2.950	2.948	2.946
.210 ± .005	.205		.215	

1147

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Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Wt. in gms.</u>	<u>Lot No.</u>	
Adhesive	<u>946 A</u>	<u>100</u>	<u>ABL 64</u>	<u>716</u>
Catalyst	<u>946 B</u>	<u>.5</u>	<u>ABL 64</u>	<u>716</u>
Thinner	<u>Acetone</u>	<u>80</u>	<u>ABL 78</u>	<u>716</u>

Cure: Time Started 2-23-73 at 7:15 ^{AM} 7-23-73
2:00 at 7:15 ^{PM} °F.
Time Complete 2-26-73 at 7:50 °F.
00:30

Date 2/26/73 4210

Clean up work performed satisfactorily.

4210

Final Wt.: S/N 011, S/N 012

Wt. 140 gms. Wt. 139 gms. 4210

Supervisor Review A. K. Brownell Date 4/26/73

Engineer Review L. J. Luntz Date 2/26/73

Manufacturing & Inspection Record

S/N's 013 ~~6-2774~~

3.0 Dia. x 8.05 in. Motor Case

Glass Nozzle Fabrication

Dwg. 720608-2

Operator No.

1. Winding Preparation

Machine set up installed.

826

Shaft extension T. I. R. .018

786

O-rings waxed only.

786

Mandrel cleaned properly

786

(4) O-rings and mandrel assembled properly.

786

Woving (S904, 12-end) installed. Lot No. AA 4

4211

Woving tension: 1. 2.5 2. 2.0 3. 2.0

786

2. Winding

Resin mixed correctly:

4211

	<u>Ingredient</u>	<u>Weight, lbs.</u>	<u>Lot No.</u>
Resin	<u>2254</u>	<u>500</u>	<u>AA 27</u>
Catalyst	<u>Tenex</u>	<u>145</u>	<u>AA 3</u>

4211

Operator

2. Winding (cont.)

Sequence check off:

X	X	X	X	0	0	0	0	0	0	C1	C2	0	C3	C4	0	C5	C6	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

C7	C8	0	C9	C10	0	C11	C12	0	C13	C14	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

786

Throat dia. measurements:

Unit Serial No.

S/N 013

S/N 014 *if*

After (6) 90° winding:

2.240

2.279

After clock/90° Buildup:

2.772

2.762

785

Excess resin removed without distorting winding

785

Doublers wound correctly at each end

785

3. B-Stage and Cure

Operator No. 1894

B-Stage: Time Started 02145 Time Completed 0045

Date 2-23-73

Cure: Time Started 0100 at 300 °F.

Time Completed 0400 at 300 °F.

RD 223-73

Date 2-23-77

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>013</u>		S/N <u>014</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 - .010 dia.	3.149		3.147	
2.491 + .000 - .002 dia.	2.491		2.489	
Throat Dia.-Record 1.942 + .000 - .003 dia.	1.923	1.922	1.924	1.924
2.731 + .000 - .004 dia.	2.729		2.730	
2.946 I.D. Exit Plane-Record	2.953	2.948	2.958	2.954
.210 ± .005	.206		.205	

1147

Reproduced from
best available copy.

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>	
Adhesive	<u>945A</u>	<u>100</u>	<u>ABL 64</u>	<u>786</u>
Catalyst	<u>946B</u>	<u>15</u>	<u>ABL 64</u>	<u>786</u>
Thinner	<u>Acetone</u>	<u>80</u>	<u>ABL 78</u>	<u>786</u>

Cure: Time Started 2:22:73 at 75° MP 2:23:73Time Complete 2/26/73 0030 at 75° °F.Date 2/26/73 4210

Clean up work performed satisfactorily.

4210Final Wt.: S/N 013, S/N 014 *gm*Wt. 1.34 gms., Wt. _____4210Supervisor Review *[Signature]* Date 2/26/73Engineer Review *[Signature]* Date 2/26/73

Manufacturing & Inspection Record

S/N's 015 & 016

3.0 Dia. x 8.05 lg. Motor Case

Glass Nozzle Fabrication

Dwg. 720608-2

Operator

1. Winding Preparation

Machine set up installed.

Shaft extension T. I. R. .020

O-rings waxed only.

Mandrel cleaned properly

(4) O-rings and mandrel assembled properly.

Roving (S904, 12-end) installed. Lot No. APL 41

Roving tension: 1. 2 2. 2 3. 2

2. Winding

Resin mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>APL 2256</u>	<u>500</u>	<u>APL 27</u>
Catalyst	<u>Torcon 64</u>	<u>145</u>	<u>APL 8</u>

Operator

2. Winding (cont.)

Sequence check off:

X	X	X	X	0	0	0	0	0	0	C1	C2	0	C3	C4	0	C5	C6	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

C7	C8	0	C9	C10	0	C11	C12	0	C13	C14	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

786

Throat dis. measurements:

Unit Serial No.

S/N 015

S/N 016

After (6) 90° Winding:

2.282

2.281

After cloth/90° Buildup:

2.765

2.772

786

Excess resin removed without distorting winding

786

Doublers wound correctly at each end

786

3. B-Stage and Cure

Operator No. 1894

B-Stage: Time Started 2045 Time Completed 0100

Date 2-28-73

Cure: Time Started 0115 at 235 °F.

Time Completed 0430 at 300 °F.

Date 2-28-73

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>015</u>		S/N <u>016</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 +.000 -.010 dia.	3.146		3.1475	
2.491 +.000 -.002 dia.	2.489		2.490	
Throat Dia.-Record 1.922 +.000 -.003 dia.	1.923	1.922	1.9235	1.923
2.731 +.000 -.004 dia.	2.731		2.731	
2.946 I.D. Exit Flange-Record	2.946	2.945	2.951	2.949
.210 ± .005	.211		.210	

1147

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>	
Adhesive	<u>946 A</u>	<u>50</u>	<u>ABL-64</u>	<u>832</u>
Catalyst	<u>946 B</u>	<u>7 1/2</u>	<u>ABL-64</u>	<u>832</u>
Thinner	<u>ACETONE</u>	<u>40</u>	<u>ABL-78</u>	<u>832</u>

Cure: Time Started 1545 at 134 °F.

Time Complete 2345 at 140 °F.

Date 3/1/23 669

Clean up work performed satisfactorily.

3924

Final Wt.: S/N 015, S/N 016

Wt. 141, Wt. 144

782

Supervisor Review A. W. Biscotti Date 3/1/23

Engineer Review _____ Date _____

Manufacturing & Inspection Record

S/N's 017 & 018

3.0 Dia. x 8.0" lg. Motor Case

Glass Nozzle Fabrication

Dwg. 720608-2

Operator No.

1. Winding Preparation

Machine set up installed.

3924

Shaft extension T. I. R. 1.120

786

O-rings waxed only.

669

Mandrel cleaned properly

659

(4) O-rings and mandrel assembled properly.

659

Roving (S904, 12-end) installed. Lot No. 102415

786

Roving tension: 1. 2 2. 2 3. 2

786

2. Winding

Resin mixed correctly:

786

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>2256</u>	<u>225</u>	<u>102 27</u>
Catalyst	<u>3.42/1</u>	<u>145</u>	<u>102 8</u>

786

Operator

2. Winding (cont.)

Sequence check off:

X	X	X	X	0	0	0	0	0	0	C1	C2	0	C3	C4	0	C5	C6	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

C7	C8	0	C9	C10	0	C11	C12	0	C13	C14	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

786

Throat dia. measurements:

Unit Serial No.

S/N 017

S/N 018

After (6) 90° Winding:

2.274

2.272

After clock/90° Buildup:

2.760

2.766

786

Excess resin removed without distorting winding

786

Doublers wound correctly at each end

1897

3. B-Stage and Cure

Operator No.

B-Stage: Time Started 0100 Time Completed 0400

Date 2-28-73

1894

1894

Cure: Time Started 0430 at 300 °F.

Time Completed 0730 at 300 °F.

Date 2-28-73

1894

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>017</u>		S/N <u>018</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 +.000 -.010 dia.	3.147		3.1455	
2.491 +.000 -.002 dia.	2.490		2.4895	
Throat Dia.-Record				
1.922 +.000 -.003 dia.	1.923	1.9225	1.9245	1.9245
2.731 +.000 -.004 dia.	2.727		2.7275	
2.946 I.D. Exit Plane-Record	2.947	2.945	2.943	2.942
.210 ± .005	.217		.215	

1147

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>	
Adhesive	<u>946 A</u>	<u>50</u>	<u>ABL-64</u>	<u>832</u>
Catalyst	<u>946 B</u>	<u>7½</u>	<u>ABL-64</u>	<u>832</u>
Thinner	<u>ACETONE</u>	<u>40</u>	<u>ABL-78</u>	<u>832</u>

Cure: Time Started 1545 at 134 °F.

Time Complete 2345 at 140 °F.

Date 3/1/73 669

Clean up work performed satisfactorily.

3924

Final Wt.: S/N 017, S/N 018

Wt. 135, Wt. 136

782

Supervisor Review

J. D. [Signature]

Date 3/2/73

Engineer Review

_____ Date _____

Manufacturing & Inspection Record

S/N's 019 & 020

3.0 Dia. x 8.05 In. Motor Case

Glass Nozzle Fabrication

Dwg. 720608-2

Operator No.

1. Winding Preparation

Machine set up installed.

Shaft extension T. I. R. .0025.

O-rings waxed only.

Mandrel cleaned properly

4) O-rings and mandrel assembled properly.

Roving (S904, 12-end) installed. Lot No. AR15.

Roving tension: 1. 2 2. 1 1/2 3. 2

2. Winding

Resin mixed correctly:

	<u>Ingredient</u>	<u>Weight, lbs.</u>	<u>Lot No.</u>
Resin	<u>2256</u>	<u>100</u>	<u>AB127</u>
Catalyst	<u>T0110X</u>	<u>29</u>	<u>01348</u>

Barator

2. Winding (cont.)

Sequence check off:

X	X	X	X	0	0	0	0	0	0	C1	C2	0	C3	C4	0	C5	C6	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

C7	C8	0	C9	C10	0	C11	C12	0	C13	C14	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

2125

Throat dia. measurements:

Unit Serial No.

S/N 019

S/N 020

After (6) 90° Winding:

2.275

2.277

After close/90° Buildup:

2.750

2.750

2125

Excess resin removed without distorting winding

2125

Doublers wound correctly at each end

2125

3. B-Stage and Cure

Operator No. 786

B-Stage: Time Started 1500 Time Completed 1830 786

Date 3-2-73 786

Cure: Time Started 1900 at 205 °F.

Time Completed 2200 at 300 °F.

Date 3-2-73 786

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>010</u>		S/N <u>020</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 - .010 dia.	3.145		3.149	
2.491 + .000 - .002 dia.	2.490		2.490	
Throat Dia.-Record 1.922 + .000 - .002 dia.	1.922	1.9215	1.9225	1.922
2.731 + .000 - .004 dia.	2.729	2.728	2.729	2.7285
2.946 I.D. Exit Plug-Record	2.958	2.955	2.960	2.955
.210 ± .005	.212		.210	

1147

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best available copy.

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, lbs.</u>	<u>Lot No.</u>	
Adhesive	<u>Epoxy 946A</u>	<u>50.0</u>	<u>081-60</u>	<u>782</u>
Catalyst	<u>Epoxy 946B</u>	<u>7.5</u>	<u>086-60</u>	<u>782</u>
Thinner	<u>Acetone</u>	<u>40.0</u>	<u>081-78</u>	<u>782</u>

Cure: Time Started 1630 at 130 °F.

Time Complete 0030 at 130 °F.

Date 3/6/73 776

Clean up work performed satisfactorily.

2924

Final Wt.: S/N 019, S/N 020

Wt. 136 GRAMS, Wt. 135 GRAMS

880 - 4211

Supervisor Review [Signature]

Date 3/11/73

Engineer Review _____

Date _____

Manufacturing & Inspection Record

S/N's 021 & 022

3.0 Dia. x 8.05 lg. Motor Case

Glass Nozzle Fabrication

Dwg. 720608-2

Operator No.

1. Winding Preparation

Machine set up installed.

3970

Shaft extension T. I. R. .024

786

O-rings waxed only.

786

Mandrel cleaned properly

786

(4) O-rings and mandrel assembled properly.

786

Reving (S904, 12-end) installed. Lot No. RLC 5

786

Reving tension: 1. 2 1/4 2. 2 1/4 3. 2

786

2. Winding

Resin mixed correctly:

786

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>2256</u>	<u>520</u>	<u>RLC 27</u>
Catalyst	<u>TDH 50/40</u>	<u>145</u>	<u>RLC 8</u>

786

Operator

2. Winding (cont.)

Sequence check off:

X	X	X	X	0	0	0	0	0	0	C1	C2	0	C3	C4	0	C5	C6	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

C7	C8	0	C9	C10	0	C11	C12	0	C13	C14	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

786

Throat dia. measurements:

Unit Serial No.

S/N 021

S/N 022

After (A) 90° Winding:

2.271

2.273

After cloth/90° Buildup:

2.755

2.760

786

Excess resin removed without distorting winding

786

Doublers wound correctly at each end

786

3. B-Stage and Cure

Operator No.

B-Stage: Time Started 1545 Time Completed 1915 782

Date 3-5-73 782

Cure: Time Started 1930 at 285 °F.

Time Completed 2230 at 300 °F.

Date 3-5-73 782

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>021</u>		S/N <u>022</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 - .010 dia.	3.147		3.148	
2.491 + .000 - .002 dia.	2.490		2.490	
Throat Dia.-Record 1.922 + .000 - .003 dia.	1.9235	1.923	1.925	1.9245
2.731 + .000 - .004 dia.	2.728		2.728	
2.946 I.D. Exit Plug-Record	2.951	2.949	2.950	2.954
.210 ± .005	.210		.210	

1147

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>	
Adhesive	<u>941 PPRT-A</u>	<u>50 gms</u>	<u>ABL-66</u>	<u>4128</u>
Catalyst	<u>941 PPRT-B</u>	<u>7 1/2 gms</u>	<u>ABL-66</u>	<u>4128</u>
Thinner	<u>PCEIONE</u>	<u>40 gms</u>	<u>ABL-66</u> JUN 2 1966	<u>4128</u>

Cure: Time Started 0350 at 1300 °F.Time Complete 1100 at 130 °F.Date 3-25-73 782

Clean up work performed satisfactorily.

782Final Wt.: S/N 021, S/N 022Wt. 140 Gms., Wt. 139 Gms782Supervisor Review [Signature] Date 3/25/73Engineer Review [Signature] Date 3/25/73

Manufacturing & Inspection Record

S/N's 023 & 024

3.0 Dia. x 2.05 in. Motor Case

Glass Nozzle Fabrication

Dwg. 720608-2

Operator No.

1. Winding Preparation

Machine set up installed.

Shaft extension T. I. R. .013

O-rings waxed only.

Mandrel cleaned properly

(4) O-rings and mandrel assembled properly.

Roving (5904, 12-end) installed. Lot No. ABN 5

Roving tension: 1. 2.4 2. 2 3. 2

2. Winding

Resin mixed correctly:

	<u>Ingredient</u>	<u>Weight, lbs.</u>	<u>Lot No.</u>
Resin	<u>22.56</u>	<u>100</u>	<u>ABN 27</u>
Catalyst	<u>10.000</u>	<u>2.9</u>	<u>ABN 9</u>

Operator

2. Winding (cont.)

Sequence check off:

X	X	X	X	0	0	0	0	0	0	C1	C2	0	C3	C4	0	C5	C6	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

C7	C8	0	C9	C10	0	C11	C12	0	C13	C14	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

4/68

Throat dia. measurements:

Unit Serial No.

S/N 023

S/N 024

After (6) 90° Winding:

2.269

2.275

After cloth/90° Buildup:

2.750

2.748

4/68

Excess resin removed without distorting winding

4/68

Doublers wound ~~correctly~~ at each end

4/68

3. B-Stage and Cure

Operator No. 788

B-Stage: Time Started 2140 Time Completed 3170

Date 3-21-73

Cure: Time Started 3145 at 285 °F.

Time Completed 0445 at 300 °F.

Date 3-21-73

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>023</u>		S/N <u>024</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 - .010 dia.	<u>3.148</u>		<u>3.147</u>	
2.491 + .000 - .002 dia.	<u>2.490</u>		<u>2.490</u>	
Throat Dia.-Record 1.922 + .000 - .003 dia.	<u>1.9235</u>	<u>1.9225</u>	<u>1.9235</u>	<u>1.923</u>
2.731 + .000 - .004 dia.	<u>2.729</u>		<u>2.728</u>	
2.945 I.D. Exit Flange-Record	<u>2.948</u>	<u>2.947</u>	<u>2.953</u>	<u>2.951</u>
.210 ± .005	<u>.212</u>		<u>.2155</u>	

1147

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, lbs.</u>	<u>Lot No.</u>	
Adhesive	<u>944-TAB-A</u>	<u>50 gms.</u>	<u>ABL-66</u>	<u>4128</u>
Catalyst	<u>944-RPRT-B</u>	<u>7 1/2 gms.</u>	<u>ABL-66</u>	<u>4128</u>
Thinner	<u>ACE TONE</u>	<u>40 gms.</u>	<u>ABL-78</u>	<u>4128</u>

3-29-73

Cure: Time Started 9:30 at 130 °F.Time Complete 11:00 at 130 °F.Date 3-29-73 782

Clean up work performed satisfactorily.

982Final Lt.: S/N 023, S/N 024Wt. 137 Gms. Wt. 141 Gms.712Supervisor Review [Signature] Date 3/30/73Engineer Review [Signature] Date 3/30/73

Manufacturing & Inspection Record

S/N's 025 & 026

3.0 Dia. x 8.05 in. Motor Case

Glass Nozzle Fabrication

Dwg. 720608-2

Operator No.

1. Winding Preparation

Machine set up installed.

Shaft extension T. I. R. C/H

O-rings waxed only.

Mandrel cleaned properly

(4) O-rings and mandrel assembled properly.

Woving (S904, 12-end) installed. Lot No. 11175

Woving tension: 1. 7 2. 7 3. 7

2. Winding

Resin mixed correctly:

	<u>Ingredient</u>	<u>Weight, lbs.</u>	<u>Lot No.</u>
Resin	<u>2756</u>	<u>600</u>	<u>11175</u>
Catalyst	<u>10444</u>	<u>145</u>	<u>11175</u>

Operator

2. Winding (cont.)

Sequence check off:

X	X	X	X	0	0	0	0	0	0	C1	C2	0	C3	C4	0	C5	C6	0
✓	✓	✓	✓	✓	-	-	-	-	-	✓	✓	✓	-	-	-	-	-	-

C7	C8	0	C9	C10	0	C11	C12	0	C13	C14	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

1714

Throat dia. measurements:

Unit Serial No

S/N 025

S/N 026

After (6) 90° winding:

2.775

2.768

After cloth/90° Buildup:

2.755

2.765

1.851

Excess resin removed without distorting winding

1.41

Doublers wound correctly at each end

832

3. B-Stage and Cure

Operator No.

B-Stage: Time Started 0930 Time Completed 1240
Date 4-4-73

4168
21168

Cure: Time Started 1250 at 300 °F.

Time Completed 1535 at 300 °F.

Date 4/4/73

4168

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>025</u>		S/N <u>026</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 - .010 dia.	3.147		3.146	
2.491 + .000 - .002 dia.	2.490		2.491	
Throat Dia.-Record 1.922 + .000 - .003 dia.	1.9235	1.923	1.923	1.9225
2.731 + .000 - .004 dia.	2.729		2.729	
2.945 I.D. Exit Plane-Record	2.942	2.941	2.941	2.940
.210 ± .005	.209		.210	

1147

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>	
Adhesive	<u>946 A</u>	<u>60</u>	<u>ABL 60</u>	<u>4168</u>
Catalyst	<u>946 B</u>	<u>7 1/2</u>	<u>ABL 60</u>	<u>4168</u>
Thinner	<u>ACETONE</u>	<u>40</u>	<u>ABL 69</u>	<u>4168</u>

Cure: Time Started 1300 4/5/73 at 130 °F.Time Complete 2100 at 130 °F.Date 4-5-73 39.5

Clean up work performed satisfactorily.

659Final Wt.: S/N 025, S/N 026Wt. 132 gms, Wt. 141 gms669Supervisor Review (Signature)Date 4-5-73

Engineer Review _____

Date _____

Manufacturing & Inspection Record

S/N's 027 & 028

3.0 Dia. x 8.05 lg. Motor Case

Glass Nozzle Fabrication

Dwg. 720608-2

Operator No.

1. Winding Preparation

Machine set up installed.

776

Shaft extension T. I. R. 0.034

776

O-rings waxed only.

4211

Mandrel cleared properly

4211

(4) O-rings and mandrel assembled properly.

4211

Roving (SYC4, 12-end) installed. Lot No. ABL 5

786

Roving tension: 1. 2 lb 2. 2 lb 3. 2 lb

4211

2. Winding

Resin mixed correctly:

786

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>8456</u>	<u>100</u>	<u>ABL 37</u>
Catalyst	<u>Tonyk 62</u>	<u>20</u>	<u>ABL 9</u>

786

Operator

2. Winding (cont.)

Sequence check off:

X	X	X	X	0	0	0	0	0	0	C1	C2	0	C3	C4	0	C5	C6	0
/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

C7	C8	0	C9	C10	0	C11	C12	0	C13	C14	0
/	/	/	/	/	/	/	/	/	/	/	/
-	-	-	-	-	-	-	-	-	-	-	-

2211

1894

Throat dia. measurements:

Unit Serial No.

S/N 027S/N 028

After (6) 90° Winding:

2.2752.276

After cloth/90° Buildup:

2.7802.7501194

Excess resin removed without distorting winding

1574

Doubliers wound correctly at each end

1591

3. B-Stage and Cure

Operator No. 1171

B-Stage: Time Started 8:33 Time Completed 8:38

Date 4/5/73

Cure: Time Started 8:45 at 285 °F.

Time Completed 9:15 at 300 °F.

Date 4/5/73

4168

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>027</u>		S/N <u>028</u>	
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 - .010 dia.	3.150	3.149	3.150	3.1498
2.491 + .000 - .002 dia.	2.491	2.491	2.491	2.4899
Throat Dia.-Record 1.922 + .000 - .003 dia.	1.922	1.921	1.924	1.924
2.731 + .000 - .004 dia.	2.731	2.731	2.731	2.7305
2.946 I.D. Exit Plane-Record	2.946	2.946	2.947	2.945
.210 ± .005	.210	.210	.210	.210

U006A

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>	
Adhesive	<u>2 1/2 A</u>	<u>50</u>	<u>RR-60</u>	<u>4210</u>
Catalyst	<u>9/16 B</u>	<u>7 1/2</u>	<u>RR-60</u>	<u>4210</u>
Thinner	<u>RR-78</u>	<u>40</u>	<u>RR-78</u>	<u>4210</u>

Cure: Time Started 1:50 4/19/73 at 75° °F.Time Complete 2:30 4/19/73 at 75° °F.Date 4-24-73 2125

Clean up work performed satisfactorily.

2125Final Wt.: S/N 027, S/N 028Wt. 132.9 gms. Wt. 139.1 gms.2125

Supervisor Review

M. L. Lauer

Date

4/24/73

Engineer Review

Date

Manufacturing & Inspection Record

S/N's 029 & 030

3.0 Dia. x 3.03 L. Motor Case

Glass Nozzle Fabrication

Dwg. 720608-2

Operator No.

1. Winding Preparation

Machine set up installed.

776

Shaft extension T. I. R. .024

786

O-rings waxed only.

4211

Mandrel cleaned properly

4211

(4) O-rings and mandrel assembled properly.

4211

Roving (S904, 12-end) installed. Lot No. ABC 5

4211

Roving tension: 1. 2nd 2. 2nd 3. 2nd

4211

2. Winding

Resin mixed correctly:

4211

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>
Resin	<u>2256</u>	<u>700</u>	<u>27</u>
Catalyst	<u>Tenex</u>	<u>29</u>	<u>9</u>

4211

Operator

2. Winding (cont.)

Sequence check off:

X	X	X	X	0	0	0	0	0	0	C1	C2	0	C3	C4	0	C5	C6	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

C7	C8	0	C9	C10	0	C11	C12	0	C13	C14	0
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

4211
4211

Throat dia. measurements:

Unit Serial No.

S/N 029

S/N 030

After (6) 90° Winding:

2.278

2.279

After clock/90° Buildup:

2.779

2.761

4211

Excess resin removed without distorting winding

7/6

Doublers wound correctly at each end

1571

3. B-Stage and Cure

Operator No. 782

B-Stage: Time Started 0045 Time Completed 0500 782

Date 4-6-73 782

Cure: Time Started 0515 at 290 °F.

Time Completed 0815 at 290 °F.

Date 4-6-73 832

4. Machining and Stripping

Parameter	Actuals			
Unit Identification	S/N <u>029</u>	S/N <u>030</u>		
Dimensions Measured	Max.	Min.	Max.	Min.
3.150 + .000 - .010 dia.	3.150	3.1495	3.149	3.1485
2.491 + .000 - .002 dia.	2.491	2.4905	2.491	2.4905
Throat Dia.-Record 1.922 + .000 - .003 dia.	1.922	1.9215	1.922	1.9215
2.731 + .000 - .004 dia.	2.731	2.731	2.731	2.731
2.946 I.D. Exit Flange-Record	2.946	2.9455	2.947	2.946
.210 ± .005	.210	.210	.210	.210

U0064

Operator No.

5. Finishing

Coating mixed correctly:

	<u>Ingredient</u>	<u>Weight, gms.</u>	<u>Lot No.</u>	
Adhesive	<u>9-16 A</u>	<u>50</u>	<u>00210</u>	<u>4210</u>
Catalyst	<u>9-16 B</u>	<u>7 1/2</u>	<u>00210</u>	<u>4210</u>
Thinner	<u>60-100-1</u>	<u>40</u>	<u>002173</u>	<u>4210</u>

Cure: Time Started 12:00 4/24/73 at 75 °F.Time Complete 0230 4/24/73 at 75 °F.Date 4-24-73 2125

Clean up work performed satisfactorily.

2125Final Wt.: S/N 029, S/N 030Wt. 142.3 gms., Wt. 139.2 gms.2125

Supervisor Review

M. Lawrence

Date

4/24/73

Engineer Review

Date