APPENDIX B

Balloon Design Program - Input

The input data for the program consists of three cards per balloon to be designed. In order to stop the program without generating an error statement a similar set of three cards with no data is required.

Card 1. Format (F10.0, I10, F10.0, I10, F10.4, I10, F10.0, I10)

Columns	Variable	Description
1-10	P	Design payload in pounds
20	KEY	Altitude option: 1-Altitude in feet 2-Altitude in millibars
21-30	CONST	Design altitude in feet or millibars
40	CODEF	Film type: 1-Polyethelene; 2-Mylar
41-50	FTHICK	Film thickness in inches
60	CODET	Load tape type: 1-Polyester; 2-Kevlar
61-70	TLR	Tape load rating in pounds
71-80	NT	Number of load tapes

Card 2. Format (F10.2, F10.2, F10.2, F10.2, I10, F10.2, F10.2, F10.4)

Columns	Variable	Description
1-10	TL	Top load in pounds, (+) up, (-) down
11-20	TAUO	Stress constant, 0. for natural shape
21-30	TAUI	Stress constant, 0. for natural shape
31-40	ALPHA	Superpressure in feet
41-50	N	Print increment, 0 for all points
51-60	DSO	Nondimensional gore increment (ds/λ)
61-70	CSTART	Nondimensional gore position of edge of cap (S_{cap}/λ)
71-80	CAP	Film thickness including cap in inches

Card 3. Format (3I10, 2F10.0)

Columns	Variable	Description
10	KEY2	Output control (0-print only, 1-punch deck & print, 2-disk file generated)
11-20	MPT	Number of points desired in load-altitude curve
30	IGAS	Identify lifting gas, 1-Helium
31-40	PMIN	Minimum Recommended payload in pounds
41-50	PMAX	Maximum Recommended payload in pounds

The output of this program consists of a). the nondimensional shape parameters normalized with respect to λ; b). the dimensional manufacturers table coordinates; c) 100 equally spaced points needed for input into the analysis program; and d). the load-altitude curve. A sample of the printed output is as follows:

FILM TYPE	: POLYETHYLENE
FILM THICKNESS	: 0.0005 IN
TAPE TYPE	: POLYESTER
TAPE LOAD RATING	: 500. LBS
NUMBER OF TAPES	: 91
PAYLOAD	: 4030. LBS
(INCL TOPLOAD OF)	: -30. LBS
DESIGN ALTITUDE	: 100000. FT

NON-DIMENSIONAL QUANTITIES

SIGMA FILM	= 0.0301
LN	= 38.771
EC	= 38.771
EMC	= 19.386
SIGMA TAPE	= 0.0294
KT	= 162.6

MISC. PARAMETERS

TAU0	= 0.0
TAU1	= 0.0
ALPHA	= 0.0
DSO	= 0.025
CSTART	= 1.20
N	= 0

ITERATION RECORD (INITIAL AND FINAL ANGLES)

52.47168	-86.59433
54.29198	-90.23912
54.28452	-90.22377

MANUFACTURER'S TABLE LAYOUT

S	R	Z	T	TAUM	TAUC	GORE POSITION (FT)	HALF GORE WIDTH (IN)
0.0	0.0	0.0	1.70030	0.0	0.0	0.0	0.0
0.02500	0.02030	0.01460	1.70074	0.297	0.0	4.1	1.39
0.05000	0.04059	0.02920	1.70121	0.291	0.0	8.2	2.79
0.07500	0.06087	0.04382	1.70172	0.285	0.0	12.2	4.18
0.10000	0.08114	0.05845	1.70226	0.279	0.0	16.3	5.57
0.12500	0.10140	0.07310	1.70282	0.273	0.0	20.4	6.96
0.15000	0.12164	0.08777	1.70342	0.268	0.0	24.5	8.35
0.17500	0.14186	0.10247	1.70405	0.263	0.0	28.6	9.73
0.20000	0.16205	0.11721	1.70472	0.258	0.0	32.7	11.12
0.22500	0.18221	0.13200	1.70541	0.253	0.0	36.7	12.50
0.25000	0.20233	0.14684	1.70614	0.249	0.0	40.8	13.88
0.27500	0.22240	0.16175	1.70690	0.244	0.0	44.9	15.25
0.30000	0.24241	0.17673	1.70770	0.240	0.0	49.0	16.62
0.32500	0.26235	0.19181	1.70854	0.236	0.0	53.1	17.99
0.35000	0.28221	0.20700	1.70940	0.232	0.0	57.2	19.35
0.37500	0.30197	0.22230	1.71031	0.228	0.0	61.3	20.70
0.40000	0.32164	0.23774	1.71126	0.225	0.0	65.4	22.05
0.42500	0.34118	0.25333	1.71225	0.221	0.0	69.4	23.39
0.45000	0.36059	0.26909	1.71328	0.218	0.0	73.5	24.72
0.47500	0.37984	0.28504	1.71435	0.215	0.0	77.6	26.04
0.50000	0.39892	0.30119	1.71547	0.212	0.0	81.7	27.34
0.52500	0.41781	0.31756	1.71664	0.209	0.0	85.8	28.64
0.55000	0.43649	0.33418	1.71785	0.206	0.0	89.9	29.91
0.57500	0.45493	0.35106	1.71912	0.203	0.0	94.0	31.18
0.60000	0.47311	0.36822	1.72044	0.201	0.0	98.1	32.42
0.62500	0.49099	0.38569	1.72182	0.198	0.0	102.2	33.65
0.65000	0.50856	0.40347	1.72325	0.196	0.0	106.3	34.85
0.67500	0.52578	0.42160	1.72474	0.194	0.0	110.4	36.03
0.70000	0.54261	0.44008	1.72630	0.192	0.0	114.5	37.18
0.72500	0.55903	0.45894	1.72792	0.190	0.0	118.6	38.30
0.75000	0.57498	0.47818	1.72960	0.188	0.0	122.7	39.39
0.77500	0.59043	0.49784	1.73136	0.186	0.0	126.8	40.45
0.80000	0.60533	0.51791	1.73317	0.184	0.0	130.8	41.47
0.82500	0.61966	0.53840	1.73506	0.183	0.0	134.9	42.45
0.85000	0.63332	0.55933	1.73702	0.181	0.0	139.0	43.39

0.87500	0.64630	0.58070	1.73905	0.180	0.0	143.1	44.27
0.90000	0.65853	0.60250	1.74115	0.179	0.0	147.2	45.11
0.92500	0.66996	0.62473	1.74332	0.178	0.0	151.3	45.89
0.95000	0.68053	0.64738	1.74555	0.177	0.0	155.4	46.62
0.97500	0.69018	0.67044	1.74785	0.176	0.0	159.5	47.28
1.00000	0.69885	0.69389	1.75021	0.175	0.0	163.6	47.87
1.02500	0.70648	0.71769	1.75262	0.175	0.0	167.7	48.39
1.05000	0.71301	0.74182	1.75509	0.174	0.0	171.8	48.84
1.07500	0.71838	0.76624	1.75760	0.174	0.0	175.9	49.21
1.10000	0.72254	0.79089	1.76014	0.174	0.0	180.0	49.49
1.12500	0.72544	0.81571	1.76272	0.174	0.0	184.1	49.69
1.15000	0.72701	0.84066	1.76531	0.174	0.0	188.2	49.80
1.17500	0.72723	0.86566	1.76790	0.174	0.0	192.3	49.81
1.20000	0.72605	0.89063	1.77050	0.174	0.0	196.4	49.73

CAP STARTS AT S = 1.20 ... SIGMA CAP = 0.1385

1.22500	0.72345	0.91549	1.77308	0.175	0.0	200.5	49.55
1.25000	0.71940	0.94015	1.78224	0.176	0.0	204.6	49.28
1.27499	0.71392	0.96454	1.79125	0.178	0.0	208.7	48.90
1.29999	0.70700	0.98856	1.80005	0.179	0.0	212.8	48.43
1.32499	0.69867	1.01213	1.80860	0.181	0.0	216.9	47.86
1.34999	0.68895	1.03515	1.81686	0.183	0.0	221.0	47.20
1.37499	0.67788	1.05756	1.82479	0.185	0.0	225.1	46.44
1.39999	0.66550	1.07927	1.83235	0.187	0.0	229.2	45.59
1.42499	0.65185	1.10021	1.83951	0.190	0.0	233.2	44.66
1.44999	0.63700	1.12032	1.84625	0.192	0.0	237.3	43.65
1.47499	0.62101	1.13953	1.85256	0.195	0.0	241.4	42.55
1.49999	0.60395	1.15780	1.85841	0.198	0.0	245.5	41.39
1.52499	0.58590	1.17509	1.86380	0.201	0.0	249.6	40.15
1.54999	0.56692	1.19135	1.86874	0.204	0.0	253.7	38.85
1.57499	0.54710	1.20658	1.87321	0.207	0.0	257.8	37.50
1.59999	0.52650	1.22075	1.87725	0.211	0.0	261.9	36.09
1.62499	0.50522	1.23386	1.88085	0.215	0.0	266.0	34.63
1.64999	0.48332	1.24591	1.88404	0.218	0.0	270.1	33.13
1.67499	0.46088	1.25692	1.88683	0.222	0.0	274.2	31.59
1.69999	0.43796	1.26690	1.88926	0.226	0.0	278.3	30.03
1.72499	0.41463	1.27588	1.89135	0.231	0.0	282.3	28.43
1.74999	0.39095	1.28390	1.89313	0.235	0.0	286.4	26.81
1.77499	0.36698	1.29099	1.89462	0.240	0.0	290.5	25.17
1.79999	0.34277	1.29719	1.89585	0.245	0.0	294.6	23.51
1.82499	0.31835	1.30256	1.89686	0.250	0.0	298.7	21.83
1.84999	0.29378	1.30714	1.89766	0.255	0.0	302.8	20.15
1.87499	0.26908	1.31100	1.89830	0.261	0.0	306.9	18.46
1.89999	0.24428	1.31419	1.89878	0.266	0.0	310.9	16.76
1.92498	0.21942	1.31676	1.89915	0.272	0.0	315.0	15.05
1.94998	0.19450	1.31878	1.89941	0.279	0.0	319.1	13.35
1.97498	0.16955	1.32032	1.89959	0.285	0.0	323.2	11.64
1.99998	0.14457	1.32143	1.89970	0.292	0.0	327.3	9.92
2.02498	0.11958	1.32218	1.89977	0.299	0.0	331.3	8.21
2.04998	0.09459	1.32263	1.89981	0.307	0.0	335.4	6.49
2.07498	0.06959	1.32284	1.89983	0.315	0.0	339.5	4.78
2.09998	0.04459	1.32289	1.89983	0.323	0.0	343.6	3.06
2.12498	0.01959	1.32284	1.89982	0.332	0.0	347.7	1.35
2.14457	0.00000	1.32275	1.89982	0.0	0.0	350.8	0.00

FINAL QUANTITIES (LAMBDA = 164.8 FT):

VOLUME = 0.584E 07 FT3 INITIAL ANGLE = 54.285 DEG
AREA = 0.160E 06 FT2 FINAL ANGLE =-90.225 DEG

FILM WEIGHT = 965. LBS
TAPE WEIGHT = 262. LBS
TOT. WEIGHT = 1227. LBS

TOP LOAD REACTION = 30.058 LBS

GP(1) =	0.0	GW(1) =	0.0	GWT(1) =	0.005	GT(1) =	0.000
GP(2) =	3.544	GW(2) =	1.210	GWT(2) =	0.004	GT(2) =	0.000
GP(3) =	7.088	GW(3) =	2.420	GWT(3) =	0.005	GT(3) =	0.000
GP(4) =	10.632	GW(4) =	3.628	GWT(4) =	0.006	GT(4) =	0.000
GP(5) =	14.176	GW(5) =	4.836	GWT(5) =	0.006	GT(5) =	0.000
GP(6) =	17.720	GW(6) =	6.043	GWT(6) =	0.006	GT(6) =	0.000
GP(7) =	21.263	GW(7) =	7.249	GWT(7) =	0.006	GT(7) =	0.000
GP(8) =	24.807	GW(8) =	8.453	GWT(8) =	0.007	GT(8) =	0.000
GP(9) =	28.351	GW(9) =	9.656	GWT(9) =	0.007	GT(9) =	0.000
GP(10) =	31.895	GW(10) =	10.858	GWT(10) =	0.007	GT(10) =	0.000
GP(11) =	35.439	GW(11) =	12.057	GWT(11) =	0.008	GT(11) =	0.000
GP(12) =	38.983	GW(12) =	13.253	GWT(12) =	0.006	GT(12) =	0.000
GP(13) =	42.527	GW(13) =	14.448	GWT(13) =	0.008	GT(13) =	0.000
GP(14) =	46.071	GW(14) =	15.639	GWT(14) =	0.008	GT(14) =	0.000
GP(15) =	49.615	GW(15) =	16.827	GWT(15) =	0.009	GT(15) =	0.000
GP(16) =	53.159	GW(16) =	18.011	GWT(16) =	0.009	GT(16) =	0.000
GP(17) =	56.702	GW(17) =	19.190	GWT(17) =	0.009	GT(17) =	0.000
GP(18) =	60.246	GW(18) =	20.365	GWT(18) =	0.010	GT(18) =	0.000
GP(19) =	63.790	GW(19) =	21.534	GWT(19) =	0.010	GT(19) =	0.000
GP(20) =	67.334	GW(20) =	22.697	GWT(20) =	0.010	GT(20) =	0.000
GP(21) =	70.878	GW(21) =	23.853	GWT(21) =	0.010	GT(21) =	0.000
GP(22) =	74.422	GW(22) =	25.002	GWT(22) =	0.011	GT(22) =	0.000
GP(23) =	77.966	GW(23) =	26.143	GWT(23) =	0.011	GT(23) =	0.000
GP(24) =	81.510	GW(24) =	27.275	GWT(24) =	0.011	GT(24) =	0.000
GP(25) =	85.054	GW(25) =	28.396	GWT(25) =	0.011	GT(25) =	0.000
GP(26) =	88.598	GW(26) =	29.506	GWT(26) =	0.012	GT(26) =	0.000
GP(27) =	92.141	GW(27) =	30.604	GWT(27) =	0.012	GT(27) =	0.000
GP(28) =	95.685	GW(28) =	31.690	GWT(28) =	0.012	GT(28) =	0.000
GP(29) =	99.229	GW(29) =	32.762	GWT(29) =	0.012	GT(29) =	0.000
GP(30) =	102.773	GW(30) =	33.818	GWT(30) =	0.013	GT(30) =	0.000
GP(31) =	106.317	GW(31) =	34.859	GWT(31) =	0.013	GT(31) =	0.000
GP(32) =	109.861	GW(32) =	35.879	GWT(32) =	0.013	GT(32) =	0.000
GP(33) =	113.405	GW(33) =	36.880	GWT(33) =	0.013	GT(33) =	0.000
GP(34) =	116.949	GW(34) =	37.860	GWT(34) =	0.014	GT(34) =	0.000
GP(35) =	120.493	GW(35) =	38.817	GWT(35) =	0.014	GT(35) =	0.000
GP(36) =	124.036	GW(36) =	39.750	GWT(36) =	0.014	GT(36) =	0.000
GP(37) =	127.580	GW(37) =	40.658	GWT(37) =	0.014	GT(37) =	0.000
GP(38) =	131.124	GW(38) =	41.538	GWT(38) =	0.015	GT(38) =	0.000
GP(39) =	134.668	GW(39) =	42.385	GWT(39) =	0.015	GT(39) =	0.000
GP(40) =	138.212	GW(40) =	43.198	GWT(40) =	0.015	GT(40) =	0.000
GP(41) =	141.756	GW(41) =	43.976	GWT(41) =	0.015	GT(41) =	0.000
GP(42) =	145.300	GW(42) =	44.717	GWT(42) =	0.015	GT(42) =	0.000
GP(43) =	148.844	GW(43) =	45.420	GWT(43) =	0.016	GT(43) =	0.000
GP(44) =	152.388	GW(44) =	46.081	GWT(44) =	0.016	GT(44) =	0.000
GP(45) =	155.932	GW(45) =	46.699	GWT(45) =	0.016	GT(45) =	0.000
GP(46) =	159.475	GW(46) =	47.270	GWT(46) =	0.016	GT(46) =	0.000
GP(47) =	163.019	GW(47) =	47.784	GWT(47) =	0.016	GT(47) =	0.000
GP(48) =	166.563	GW(48) =	48.246	GWT(48) =	0.016	GT(48) =	0.000
GP(49) =	170.107	GW(49) =	48.654	GWT(49) =	0.016	GT(49) =	0.000
GP(50) =	173.651	GW(50) =	49.005	GWT(50) =	0.016	GT(50) =	0.000
GP(51) =	177.195	GW(51) =	49.297	GWT(51) =	0.016	GT(51) =	0.000
GP(52) =	180.739	GW(52) =	49.527	GWT(52) =	0.016	GT(52) =	0.000
GP(53) =	184.283	GW(53) =	49.695	GWT(53) =	0.017	GT(53) =	0.000
GP(54) =	187.827	GW(54) =	49.788	GWT(54) =	0.017	GT(54) =	0.000
GP(55) =	191.371	GW(55) =	49.810	GWT(55) =	0.017	GT(55) =	0.000
GP(56) =	194.914	GW(56) =	49.761	GWT(56) =	0.017	GT(56) =	0.000
GP(57) =	198.458	GW(57) =	49.642	GWT(57) =	0.017	GT(57) =	0.000

G(58) =	202.002	GW(58) =	49.452	GWT(58) =	0.032	GT(58) =	0.000				
G(59) =	205.546	GW(59) =	49.190	GWT(59) =	0.059	GT(59) =	0.000				
G(60) =	209.090	GW(60) =	48.856	GWT(60) =	0.059	GT(60) =	0.000				
G(61) =	212.634	GW(61) =	48.447	GWT(61) =	0.058	GT(61) =	0.000				
G(62) =	216.178	GW(62) =	47.958	GWT(62) =	0.058	GT(62) =	0.000				
G(63) =	219.722	GW(63) =	47.400	GWT(63) =	0.057	GT(63) =	0.000				
G(64) =	223.266	GW(64) =	46.773	GWT(64) =	0.056	GT(64) =	0.000				
G(65) =	226.810	GW(65) =	46.079	GWT(65) =	0.055	GT(65) =	0.000				
G(66) =	230.353	GW(66) =	45.321	GWT(66) =	0.055	GT(66) =	0.000				
G(67) =	233.897	GW(67) =	44.500	GWT(67) =	0.054	GT(67) =	0.000				
G(68) =	237.441	GW(68) =	43.619	GWT(68) =	0.053	GT(68) =	0.000				
G(69) =	240.985	GW(69) =	42.673	GWT(69) =	0.052	GT(69) =	0.000				
G(70) =	244.529	GW(70) =	41.670	GWT(70) =	0.051	GT(70) =	0.000				
G(71) =	248.073	GW(71) =	40.617	GWT(71) =	0.049	GT(71) =	0.000				
G(72) =	251.617	GW(72) =	39.517	GWT(72) =	0.048	GT(72) =	0.000				
G(73) =	255.161	GW(73) =	38.372	GWT(73) =	0.047	GT(73) =	0.000				
G(74) =	258.705	GW(74) =	37.185	GWT(74) =	0.046	GT(74) =	0.000				
G(75) =	262.248	GW(75) =	35.961	GWT(75) =	0.044	GT(75) =	0.000				
G(76) =	265.792	GW(76) =	34.699	GWT(76) =	0.043	GT(76) =	0.000				
G(77) =	269.336	GW(77) =	33.402	GWT(77) =	0.042	GT(77) =	0.000				
G(78) =	272.879	GW(78) =	32.078	GWT(78) =	0.040	GT(78) =	0.000				
G(79) =	276.423	GW(79) =	30.729	GWT(79) =	0.039	GT(79) =	0.000				
G(80) =	279.967	GW(80) =	29.357	GWT(80) =	0.037	GT(80) =	0.000				
G(81) =	283.510	GW(81) =	27.966	GWT(81) =	0.036	GT(81) =	0.000				
G(82) =	287.054	GW(82) =	26.557	GWT(82) =	0.034	GT(82) =	0.000				
G(83) =	290.598	GW(83) =	25.133	GWT(83) =	0.033	GT(83) =	0.000				
G(84) =	294.142	GW(84) =	23.696	GWT(84) =	0.031	GT(84) =	0.000				
G(85) =	297.685	GW(85) =	22.246	GWT(85) =	0.029	GT(85) =	0.000				
G(86) =	301.229	GW(86) =	20.789	GWT(86) =	0.028	GT(86) =	0.000				
G(87) =	304.773	GW(87) =	19.324	GWT(87) =	0.026	GT(87) =	0.000				
G(88) =	308.316	GW(88) =	17.853	GWT(88) =	0.025	GT(88) =	0.000				
G(89) =	311.860	GW(89) =	16.377	GWT(89) =	0.023	GT(89) =	0.000				
G(90) =	315.404	GW(90) =	14.897	GWT(90) =	0.021	GT(90) =	0.000				
G(91) =	318.948	GW(91) =	13.414	GWT(91) =	0.020	GT(91) =	0.000				
G(92) =	322.491	GW(92) =	11.929	GWT(92) =	0.018	GT(92) =	0.000				
G(93) =	326.035	GW(93) =	10.442	GWT(93) =	0.016	GT(93) =	0.000				
G(94) =	329.579	GW(94) =	8.953	GWT(94) =	0.015	GT(94) =	0.000				
G(95) =	333.122	GW(95) =	7.463	GWT(95) =	0.013	GT(95) =	0.000				
G(96) =	336.666	GW(96) =	5.973	GWT(96) =	0.012	GT(96) =	0.000				
G(97) =	340.210	GW(97) =	4.481	GWT(97) =	0.010	GT(97) =	0.000				
G(98) =	343.753	GW(98) =	2.989	GWT(98) =	0.008	GT(98) =	0.000				
G(99) =	347.297	GW(99) =	1.496	GWT(99) =	0.007	GT(99) =	0.000				
G(100) =	350.841	GW(100) =	0.002	GWT(100) =	0.005	GT(100) =	0.000				

LOAD - ALTITUDE DATA

GROSS AIRBORN WEIGHT - (KG)	ALTITUDE - (KM)
0.2386813E 04	0.3045546E 02
0.2398161E 04	0.3042964E 02
0.2409509E 04	0.3040402E 02
0.2420859E 04	0.3037819E 02
0.2432207E 04	0.3035216E 02
0.2443556E 04	0.3032632E 02
0.2454904E 04	0.3030070E 02
0.2466252E 04	0.3027509E 02
0.2477602E 04	0.3024968E 02
0.2488950E 04	0.3022426E 02
0.2500298E 04	0.3019905E 02
0.2511647E 04	0.3017384E 02
0.2522995E 04	0.3014885E 02
0.2534345E 04	0.3012405E 02
0.2545693E 04	0.3009926E 02
0.2557041E 04	0.3007446E 02
0.2568390E 04	0.3005008E 02
0.2579738E 04	0.3002550E 02
0.2591088E 04	0.3000133E 02
0.2602436E 04	0.2997694E 02
0.2613784E 04	0.2995297E 02
0.2625133E 04	0.2992880E 02
0.2636481E 04	0.2990504E 02
0.2647831E 04	0.2988129E 02
0.2659179E 04	0.2985753E 02
0.2670527E 04	0.2983397E 02
0.2681875E 04	0.2981041E 02
0.2693224E 04	0.2978706E 02
0.2704574E 04	0.2976372E 02
0.2715922E 04	0.2974059E 02
0.2727270E 04	0.2971744E 02
0.2738618E 04	0.2969450E 02
0.2749967E 04	0.2967157E 02
0.2761316E 04	0.2964885E 02
0.2772665E 04	0.2962611E 02
0.2784015E 04	0.2960359E 02
0.2795361E 04	0.2958107E 02
0.2806709E 04	0.2955835E 02
0.2818059E 04	0.2953561E 02
0.2829408E 04	0.2951309E 02
0.2840756E 04	0.2949059E 02