LINDSTRAND BALLOONS

FLIGHT MANUAL

For use with all Lindstrand Hot Air Balloons

LINDSTRAND BALLOONS
MAESBURY ROAD
OSWESTRY
SHROPSHIRE
SY10 8ZZ
TEL: (01691) 671717
FAX: (01691) 671122

LINDSTRAND BALLOONS

This Flight Manual has been prepared for the following balloon:

Registration: …….

Serial No.: …….

Volume: …….

Type: …….

Build Standard: …….

I hereby certify that this Flight Manual, as prepared for the above balloon and incorporating the amendments listed, conforms to the build standard of the above balloon at the time of issue of the Certificate of Airworthiness.

Signed: ..... Date: ……..
For Lindstrand Balloons
EASA Approval Ref. No. EASA.21J.175

Applicability

This Flight Manual applies to all natural shaped Lindstrand Balloons balloons. For special shaped balloons it must be used in conjunction with the relevant special shape Flight Manual Supplement. For an explanation of the build standard number see Section 1.7.

Certification Basis

The certification basis is BCAR 31, Issue 1 and to EASA Certification Specification 31 HB Draft CG9 dated February 2003. This Flight Manual provides information for the operation of Lindstrand Balloons balloons in all operational categories.

APPROVAL STATEMENT

The Civil Aviation Authority of the United Kingdom hereby signifies approval of the data listed in this document. This Flight Manual was first approved on 20 May 1993.

Signed & Sealed

Record of Amendments

No.	Date	Affected Pages	Approval
35	01/07	iii, iv, 3, 3a, 7a, 9a, 11a	EASA Approval EASA.BA.C.01063, dated 5 February 2007
36	05/07	iii, iv, v, vi, 1, 3b, 4, 12, 15a, 18, S13-1, S14-1	EASA Approval EASA.BA.C.01097, dated 18 June 2007
37	01/08	ii, iii, iv, v, vi, 1, 2, 3, 12, 13, 15b, 15c, 15d, 16, 17, 19, S1A-1.38-1, S15-1	EASA Approval EASA.BA.C.01149, dated 5 June 2008
38	04/09	iii, iv, 3, 3a, 3b, 7, 7a, 9, 9a, 11, 11a, 12, 14	EASA Approval EASA BA.C.01192, dated 29 April 2009
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40	10/10	iii, iv, v, vi, 3, S16-1,2,3.	EASA Approval EASA No. 10033664, dated 2nd February 2011

Amendments

This manual is kept up to date by amendments consisting of looseleaf pages, required to add new information or amend existing information. Pages affected by an amendment and the effective date are shown above. The pages themselves are identified by a change of the issue number at the bottom of each page. The number after the point in the issue number represents the amendment level of that page, eg the page marked Issue 1.4 is at Issue 1, modified by Amendment 4. The checklist of pages indicates the issue level of all pages included in this Flight Manual.

Change of Ownership

If the ownership of this balloon changes, it is important for the new owner to contact Lindstrand Balloons to ensure that they receive Flight Manual Amendments and Supplements, as appropriate. This can be simply achieved by photocopying Page ii of this manual and writing your name and full correspondence address on the reverse side and sending to Lindstrand Balloons.

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FLIGHT MANUAL SUPPLEMENTS

Supplement No.	Title	Tick if Applicable
1	Special Shape Supplement	
2	Superchute Deflation System	
3	Lindstrand Cloudhopper	
4	Removable Cross Partitions	
5	Passenger Protection System	
6	Q-Vent Deflation System	
7	60cm x 90 cm Lightweight Collapsible Basket	
8	LB 48L Envelope	
9	Series 2 Cloudhopper Bottom End	
10	152 x 260 cm Double-T Wheelchair Version Basket	
11	LB 60X	
12	Fire Balloons Operating Instructions	
13	Easy Access Baskets	
14	Basket Occupancy	
15	Ultramagic SA Equipment	
16	125 x 205/220 cm Panoramic Wheelchair Basket	

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SECTION 1
OPERATIONAL LIMITATIONS

1.1 Limitations

1.1.1 The balloon must not be flown if it has been modified without the approval of the national airworthiness authority in the state of registration.

1.1.2 The balloon must not be flown if there is any damage to the envelope fabric which is above the first 4 m and is larger than 25 mm (1") in any one direction, or closer than 19 mm (3/4") to any load tape. Unrepaired fabric damage in the bottom 4 m of the envelope must not appear on more than six individual panels. No unacceptable damage is permitted to load tapes, suspension system, burners or fuel system components.

1.1.3 Any damage must be repaired in accordance with the instructions contained in the approved Maintenance Manual. All repairs must be noted in the balloon log book and approved by the appropriate authority.

1.1.4 The minimum crew required is one pilot. The pilot must be suitably qualified to conduct the flight.

1.1.5 The fuel for the burner is water-free LPG. Propane is the preferred fuel, but some content of other hydrocarbons is permissible, provided that minimum recommended fuel pressures are maintained throughout the flight.

1.1.6 The balloon should not be flown in meteorological conditions that give rise to erratic and gusty winds, which could cause an increase of 10 knots above the mean wind speed. The maximum surface wind speed for take off and landing is 15 knots.

1.1.7 The balloon must not be flown into contact with power lines.

1.1.8 The maximum rate of climb and descent for all natural shaped envelopes is 5 m/s (1000 ft/min), with the exception of envelopes larger than 12,000 m³ (424,000 cu.ft.) when the maximum climb and descent rate is limited to 4 m/s (800 ft/min). When in flight, the parachute vent must not be held open for more than 3 seconds. If further venting of hot air is required, the parachute must be allowed to completely reseal before being operated again.

1.1.9 A minimum of one fuel cylinder for each burner coil of the burner assembly to be available on take-off. The fuel cylinders must be capable of supplying uncontaminated vapour to the burner if the particular burner assembly has vapour pilot lights.

1.1.10 The maximum continuous envelope temperature that is permitted is 125ºC (257ºF). The never exceed temperature for the envelope is 127ºC (261ºF).

1.1.11 The maximum weight must never be exceeded (see Section 1.5.1). In addition, the balloon loading must not exceed the figure specified in the universal loading chart in Section 1.5.3.

1.1.12 When conducting night VFR flights, navigation lights which satisfy the national regulations must be used.

1.2 Limitations for UK Passenger Transport Category

The following limitations only apply to balloons which have a UK Certificate of Airworthiness in the Transport Category. However, adherence is strongly recommended for all balloons, provided that this does not create conflict with any particular national requirements.

1.2.1 The balloon must not be flown without the nylon rods to support the burner in place.

1.2.2 The maximum number of passengers permitted is nineteen. The maximum number of occupants that are permitted in one compartment of a basket is six.

1.2.3 Only free flights may be undertaken in this certification category.

1.2.4 The baskets must provide at least one handhold per occupant.

1.2.5 The burner system must be fully duplicated so that no single failure will lead to loss of control of the balloon.

1.3 Limitations to Equipment Interchangeability

1.3.1 Fuel Cylinders

The baskets and burners listed in Sections 1.5 or 1.6 must only be used with the fuel cylinders listed in Tables 4, 7, 10, 13, 16, and 19 which are identified as being suitable for use with all baskets.

1.3.2 If a basket, burner and load frame which have been manufactured by Thunder & Colt Ltd, Cameron Balloons, Sky Balloons Ltd, Fire Balloons GmbH, or Ultramagic SA is required for use with a Lindstrand Balloons manufactured envelope, then the following conditions must be met:

a) The basket, burner and load frame must be manufactured by the same company. If this is not the case the combination of equipment will be subject to a specific approval statement by the Chief Engineer.
b) The combination of basket, burner and load frame must have been previously approved.

c) The type of basket and burner must appear in relevant tables contained in Section 1.6.

1.3.3 The serial numbers of the basket, burners, fuel cylinders, and envelope, must be recorded in the envelope log book, irrespective of the manufacturer. If any of the constituent parts of the balloon system are changed, this change must be recorded and approved (in the envelope log book) by a qualified inspector.

1.4 Limitations for Tethered Flights

1.4.1 The maximum surface wind speed for a tethered flight is 10 knots.

1.4.2 The maximum balloon loading must not exceed 75% of the Maximum Weight of the balloon, shown in Section 1.5.1, or the weight permitted under the ambient conditions, as shown in Section 1.5.3 if this is less than 75% of the Maximum Weight.

1.4.3 The basket of the balloon must not exceed a height of 30 m above ground level when tethering.

1.4.4 Only bulbous shaped (natural shaped) envelopes may be tethered.

1.5 Load Calculations

1.5.1 Maximum Mass

The Maximum Mass (MM) is the figure used in the design and certification of the envelope and this weight must never be exceeded. The Maximum Mass for all Lindstrand Balloons envelope sizes are tabulated below:

TABLE 1 - LINDSTRAND ENVELOPES

Balloon Type		Volume		FAI	Maximum Mass		Envelope Weight	
		cu.m	cu.ft	Class	kg	Lbs	kg	lbs
A-Type	42	1190	42000	AX5	420	924	46	101
A-Type	56	1590	56000	AX6	560	1232	62	136
A-Type	60	1700	60000	AX7	600	1320	65	143
A-Type	69	1950	69000	AX7	690	1518	76	167
A-Type	77	2180	77000	AX7	770	1694	84	185
A-Type	90	2550	90000	AX8	900	1980	99	218
A-Type	105	2970	105000	AX8	1050	2310	115	253
A-Type	120	3400	120000	AX9	1200	2640	132	290
A-Type	140	3964	140000	AX9	1400	3086	154	338
A-Type	150	4250	150000	AX10	1450	3190	161	363
A-Type	160	4530	160000	AX10	1600	3520	170	374
A-Type	180	5100	180000	AX10	1630	3586	176	387
A-Type	210	5950	210000	AX10	1890	4180	209	460
A-Type	240	6800	240000	AX11	1940	4268	242	532
A-Type	260	7362	260000	AX11	2270	4994	259	570
A-Type	310	8780	310000	AX11	2700	5940	291	640
A-Type	317	8976	317000	AX11	2760	6072	300	660
A-Type	330	9344	330000	AX12	2875	6325	305	671
A-Type	360	10194	360000	AX12	3132	6890	348	766
A-Type	400	11327	400000	AX12	3400	7480	350	770
A-Type	425	12034	425000	AX12	3610	7942	400	880

Balloon Type		Volume		FAI	Maximum Mass		Envelope Weight	
		cu.m	cu.ft	Class	Kg	Lbs	kg	lbs
S-Type	210	5950	210000	AX10	1890	4180	263	579
S-Type	260	7362	260000	AX11	2270	4994	331	728
S-Type	317	8976	317000	AX11	2930	6446	382	840

Balloon Type		Volume		FAI	Maximum Mass		Envelope Weight	
		cu.m	cu.ft	Class	Kg	lbs	kg	lbs
B-Type	56	1590	56000	AX6	560	1232	74	163
B-Type	69	1950	69000	AX7	690	1518	82	180
B-Type	77	2180	77000	AX7	770	1694	90	198
B-Type	90	2550	90000	AX8	900	1980	110	242
B-Type	105	2970	105000	AX8	1050	2310	121	266

Balloon Type		Volume		FAI	Maximum Mass		Envelope Weight	
		cu.m	cu.ft	Class	kg	lbs	kg	lbs
C-Type	400	11326	400000	AX12	3400	7480	350	770
C-Type	500	14158	500000	AX13	4250	9350	442	972
C-Type	600	16886	600000	AX14	5100	11220	530	1166

1.5.1.1 Minimum Landing Mass

The minimum landing mass is defined as the minimum mass of all of the balloon flight equipment, basket occupants and remaining fuel. For the larger sizes of balloons, the following minimum landing mass is recommended:

Envelope Size	Minimum Landing Mass		Envelope Size	Minimum Landing Mass	
	kg	lbs		kg	lbs
42	231	508	210	945	2079
56	252	554	240	970	2134
60	255	561	260	1135	2497
69	276	607	310	1350	2970
77	316	695	317	1465	3223
90	378	831	330	1437	3161
105	452	994	360	1566	3445
120	528	1161	400	1700	3740
140	586	1289	425	1800	3960
150	652	1434	500	2125	4675
160	720	1584	600	2550	5610
180	750	1650			

1.5.1.2 Reduced Mass Operations

If, for operational reasons the aircraft operator wishes to select a reduced Maximum Take Off Mass, MTOM, the following limits are advised by the company:

Envelope Size	Maximum Take-off Mass		Envelope Size	Maximum Take-off Mass	
	kg	lbs		kg	lbs
21	189	416	160	999	2200
25	225	495	180	999	2200
31	279	613	210	1701	3742
35	315	693	240	1746	3841
42	378	831	260	2043	4494
56	499	1100	310	2430	5346
60	499	1100	317	2484	5464
69	499	1100	330	2699	5951
77	499	1100	360	2699	5951
90	499	1100	400	2699	5951
105	999	2200	425	2699	5951
120	999	2200	500	3825	8415
140	999	2200	600	4590	10098
150	999	2200			

To achieve approval at these levels the operator must have a suitably qualified balloon inspector make a notation to that effect in the aircraft log book. It should be noted that operating to this Maximum Take Off Mass does not alter the operational limitations specified in section 1.5.3 and the continued airworthiness requirements remain in force, as published.

Restitution of the normal Maximum Weight Limitations as defined in section 1.5.1 are achieved by a qualified balloon inspector conducting an inspection in accordance with the Maintenance Schedule Ref. MS/BBAC/1-K and notifying the change in the aircraft log book

1.5.2 Empty Weight

The indicative empty weight for any balloon can be calculated by adding the weights of the individual components of the system. The weights of the differing models of Lindstrand Balloons baskets, burners and cylinders, are given below.

1.5.2.1 Baskets

TABLE 2 - LINDSTRAND BASKETS

BASKET NO.	BASKET SIZE CM	BASKET STYLE	ENVELOPE SIZE RANGE	EMPTY WEIGHT	
				KG	LBS
01	110 x 115	Open	42 - 105	69	152
02	110 x 130	Open	56 - 105	75	165
03	110 x 155	Open	69 - 120	88	194
04	100 x 85	Open	21 - 42	50	110
05	98 x 113	Open	42 - 90	61	134
06	100 x 125	Open	42 - 105	68	150
07	100 x 137	Open	56 - 105	70	154
08	122 x 145	Open	77 - 120	91	200
09	96 x 102	Open	42 - 90	55	121
10	125x 125	Open	105 - 120	80	176
11	125x 165	Open	90 - 160	101	222
12	125x 185	ST	90 - 160	158	348
13	125x 205	ST	120 - 180	169	372
14	125x 220	ST	120 - 180	180	396
15	125x 260	DT	120 - 210	207	455
16	125 x 175	Open	90 - 160	110	242
17	125 x 205	P	120 - 180	160	352
20	152 x 205	ST	150 - 210	198	436
21	152 x 240	ST	180 - 240	233	513
22	152 x 270	ST	180 - 310	260	572
23	152 x 260	DT	180 - 310	255	561
24	152 x 300	DT	180 - 400	300	660
25	152 x 350	DT	180 - 400	350	770
26	152 x 390	DT	240 - 500	390	858
27	152 x 430	DT	310 - 500	430	946
28	152 x 300	ST	180 - 350	289	636
29	152 x 325	DT	180 - 350	321	706
30	152 x 280	DT	180 - 310	285	627
31	140 x 270	DT	150 - 310	245	539
32	140 x 300	DT	180 - 350	272	598
33	140 x 390	DT	180 - 500	359	790
34	140 x 240	DT	120 - 240	218	480
35	140 x 240	ST	120 - 240	207	455
36	140 x 270	ST	150 - 310	242	532
37	140 x 340	DT	180 - 350	313	689
39	152 x 280	DP	180 - 310	275	605
40	129 x 247	ST	120 - 210	200	440
41	135 x 285	ST	150 - 310	245	539
45	152 x 550	DT	425 - 600	646	1421
204	170 x 360	DT	240 - 500	342	752
50	152 x 610	DT	500 - 600	684	1505

For notes on the use of the above table, see overleaf.

Notes

a) The basket dimensions refer to outside dimensions.

b) ST stands for Single T-Partition and similarly, DT stands for Double T-Partition. P stands for a single partition.

c) The applicable size range of envelopes includes the sizes given, eg 42 - 90 means any envelope in the range between 42,000 cu.ft and 90,000 cu.ft.

d) The empty weight figure is an indicative figure for the basket size, including the basket, padding, nylon support rods and covers. It should be noted that the actual basket weight is shown in the aircraft log book for each individual balloon.

1.5.2.2 Burners

TABLE 3 - LINDSTRAND BURNERS

BURNER NO.	BURNER TYPE	ENVELOPE SIZE RANGE	EMPTY WEIGHT	
			KG	LBS
1	Jetstream Single	42 - 90	17	37
2	Jetstream Double	42 - 210	22	48
3	Jetstream Double + CLF	120 - 317	25	55
4	Jetstream Triple	120 - 317	31	68
5	Jetstream Triple + CLF	150 - 500	35	77
6	Jetstream Quad	180 - 600	42	92
7	Jetstream Supersingle	42 - 105	18	40
8	Jetstream Series 2 Double	42 - 210	23	51
10	Jetstream Series 2 Triple	120 - 317	32	71
12	Jetstream Series 2 Quad	180 - 500	43	95
13	Jetstream Series 2 Super Quad	500 - 600	77	170

Notes

a) The applicable size range of envelopes includes the sizes given, in 1,000's cu.ft.

1.5.2.3 Cylinders

TABLE 4 - LINDSTRAND CYLINDERS

CYLINDER TYPE	EMPTY WEIGHT		FUEL CAPACITY		FULL WEIGHT		APPLICABLE BASKET RANGE
	KG	LBS	KG	LBS	KG	LBS	
Mini Worthington	3.6	8	3.4	7.5	7	15.5	All
Worthington	14	31	20	44	34	75	All
V20	14	31	20	44	34	75	All
V30	18	40	30	66	48	106	All
V40	20	44	40	88	60	132	All
H30	17	37	30	66	47	103	152 Width or Larger
H40	19	42	40	88	59	130	152 Width or Larger
H55	25	55	55	121	80	176	152 Width or Larger
T30	10	22	30	66	40	88	All

For notes on the use of the above table, see overleaf.

Notes

a) Under the column "applicable basket range" the appearance of the word "all" denotes that the cylinder can be used with all sizes of baskets in all operational categories, regardless of the basket manufacturer, provided the basket size appears in Section 1.5 or 1.6.

b) If the cylinder is restricted in its use to a particular width of basket, then this restriction refers to baskets manufactured by Lindstrand Balloons. Use of these cylinders with baskets not manufactured by Lindstrand Balloons is not permitted.

c) The Mini-Worthington cylinder is only for use as an independent vapour supply for use with burners that are equipped with vapour pilot lights.

d) All cylinders are available in both the master or standard configuration. Master cylinder denotes that both a liquid and vapour supply is available from the cylinder.

1.5.3 Payload Calculation

The payload weight that is available on a certain day depends upon the gross lift. The gross lift varies with the ambient temperature and the intended maximum altitude. The effect of these two factors can be assessed, and the gross lift calculated by using the universal load chart and table. There are three versions of the universal load chart and table, in metric, imperial and "UK units". The latter is a convenient mixture of the metric and imperial systems. The following example is conducted in metric units, but the principle involved is identical for the other units. The charts are based on an internal envelope temperature of 100ºC (212ºF) and on International Standard Atmosphere (ISA). This consists of an ambient temperature of 15ºC (59ºF), 1013.2 millibar (29.92 in.Hg) and an air density of 1.225 kg/m³ (0.07647 lb/ft³ or 0.002377 slug/ft³). Temperature correction curves are also provided for convenience.

Example 1 - Metric Units

Balloon Size:	Lindstrand 77A (2180 m³)
Maximum Altitude:	Sea level to 2,000 m
Ambient Temp.:	16ºC
Empty Weight:	160 kg
Fuel Carried:	2 V30 cylinders full @ 48 kg each = 96 kg

Using the metric universal load chart, first find the correct ambient temperature along the horizontal scale. Follow a line up vertically, until it intersects with the sea level curve. Draw a line with the same curvature as the ISA temperature correction curve downwards, until it intersects the 2000 m altitude line. From this point, follow the lines across horizontally, back to the vertical scale. The reading of 0.263 obtained, gives the gross lift per cubic metre.

If this figure is then multiplied by the balloon volume in cubic metres, which can be found in Table 1, Section 1.5.1, the result is the gross lift for the predicted flight plan. Whatever the resulting gross lift is calculated to be, it cannot be greater than the Maximum Weight given for each balloon size. For convenience, a ready reckoner table is provided for each of the universal load charts, in order to convert the lift per unit volume figure into a gross lift figure.

In this example the gross lift for the flight plan is 0.263 x 2180 = 573 kg

The payload is established by subtracting the empty weight from this gross lift:

573 - 160 - 96 = 317 kg

The total weight of the occupants must not exceed 317 kg. At an average weight of 77 kg each, this means that four people can be accommodated.

METRIC UNIVERSAL LOAD CHART

See end of Manual for Chart.

METRIC LIFT READY RECKONER

	ENVELOPE VOLUME CUBIC METRES (CU.FT/1000)													
LIFT INDEX kg/m³	595 (21)	708 (25)	878 (31)	991 (35)	1190 (42)	1590 (56)	1700 (60)	1950 (69)	2180 (77)	2550 (90)	2970 (105)	3400 (120)	4250 (150)	4530 (160)
0.170	101	120	149	168	202	270	289	331	371	433	505	578	722	770
0.175	104	123	153	173	208	278	297	341	381	446	520	595	744	793
0.180	107	127	158	178	214	286	306	351	392	459	535	612	765	815
0.185	110	130	162	183	220	294	315	361	403	472	549	629	786	838
0.190	113	134	166	188	226	302	323	370	414	484	564	646	807	860
0.195	116	138	171	193	232	310	331	380	425	497	579	663	829	883
0.200	119	141	175	198	238	318	340	390	436	510	594	680	850	906
0.205	121	145	179	203	243	326	349	400	447	523	609	697	871	928
0.210	124	148	184	208	249	334	357	409	458	535	624	714	892	951
0.215	127	152	188	213	255	342	365	419	469	548	638	731	914	974
0.220	130	155	193	218	261	350	374	429	480	561	653	748	935	996
0.225	133	159	197	222	267	358	383	439	490	574	668	765	956	1019
0.230	136	162	201	227	273	366	391	448	501	586	683	782	977	1042
0.235	139	166	206	232	279	374	399	458	512	599	698	799	999	1064
0.240	142	169	210	237	285	382	408	468	523	612	713	816	1020	1087
0.245	145	173	215	242	291	390	417	478	534	625	728	833	1041	1110
0.250	148	177	219	247	297	398	425	487	545	637	742	850	1062	1132
0.255	151	180	223	252	303	405	433	497	556	650	757	867	1084	1155
0.260	154	184	228	257	309	413	442	507	567	663	772	884	1105	1178
0.265	157	187	232	262	315	421	450	517	578	676	787	901	1126	1200
0.270	160	191	237	267	321	429	459	526	589	688	802	918	1147	1223
0.275	163	194	241	272	327	437	467	536	599	701	817	935	1169	1246
0.280	166	198	245	277	333	445	476	546	610	714	832	952	1190	1268
0.285	169	201	250	282	339	453	485	556	621	727	846	969	1211	1291
0.290	172	205	254	287	345	461	493	565	632	739	861	986	1232	1314
0.295	175	208	259	292	351	469	501	575	643	752	876	1003	1254	1336
0.300	178	212	263	297	357	477	510	585	654	765	891	1020	1275	1359
0.305	181	215	267	302	363	485	519	595	665	778	906	1037	1296	1382
0.310	184	219	272	307	369	493	527	604	676	790	921	1054	1317	1404
0.315	187	223	276	312	375	501	535	614	687	803	935	1071	1339	1427
0.320	190	226	280	317	381	509	544	624	698	816	950	1088	1360	1450
0.325	193	230	285	322	387	517	553	634	708	829	965	1105	1381	1472
0.330	196	233	289	327	393	525	561	643	719	841	980	1122	1402	1495
0.335	199	237	294	331	399	533	569	653	730	854	995	1139	1424	1518
0.340	202	240	298	336	405	541	578	663	741	867	1010	1156	1445	1540
0.345	205	244	302	341	410	548	587	673	752	880	1025	1173	1450	1563
0.350	208	247	307	346	416	556	595	682	763	892	1039	1190	1450	1586
0.355	210	250	310	350	420	560	600	690	770	900	1050	1200	1450	1600

METRIC LIFT READY RECKONER

	ENVELOPE VOLUME CUBIC METRES (CU.FT/1000)										
LIFT INDEX kg/m³	5100 (180)	5950 (210)	6800 (240)	7362 (260)	8780 (310)	9344 (330)	10194 (360)	11327 (400)	12036 (425)	14158 (500)	16990 (600)
0.170	867	1011	1156	1251	1492	1588	1733	1926	2046	2407	2888
0.175	892	1041	1190	1288	1536	1635	1784	1982	2106	2477	2973
0.180	918	1071	1224	1325	1580	1681	1835	2039	2166	2548	3058
0.185	943	1101	1258	1362	1624	1728	1886	2095	2227	2619	3143
0.190	969	1130	1292	1399	1668	1775	1937	2152	2287	2690	3228
0.195	994	1160	1326	1435	1712	1822	1988	2209	2347	2761	3313
0.200	1020	1190	1360	1472	1756	1868	2039	2265	2407	2832	3398
0.205	1045	1220	1394	1509	1800	1915	2090	2322	2467	2902	3482
0.210	1071	1249	1428	1546	1843	1962	2141	2379	2528	2973	3567
0.215	1096	1279	1462	1583	1887	2008	2192	2435	2588	3044	3652
0.220	1122	1309	1496	1619	1931	2055	2242	2491	2648	3115	3737
0.225	1147	1339	1530	1656	1975	2102	2294	2549	2708	3186	3822
0.230	1173	1368	1564	1693	2019	2149	2345	2605	2768	3256	3907
0.235	1198	1398	1598	1730	2063	2195	2396	2661	2828	3327	3992
0.240	1224	1428	1632	1767	2107	2242	2446	2718	2889	3398	4077
0.245	1249	1458	1666	1803	2151	2289	2497	2775	2949	3469	4162
0.250	1275	1487	1700	1840	2195	2336	2548	2831	3009	3540	4247
0.255	1300	1517	1734	1877	2238	2382	2599	2888	3069	3610	4332
0.260	1326	1547	1768	1914	2282	2429	2650	2945	3129	3681	4417
0.265	1351	1577	1802	1951	2326	2476	2701	3001	3190	3752	4502
0.270	1377	1606	1836	1987	2370	2522	2752	3058	3250	3823	4587
0.275	1402	1636	1870	2024	2414	2569	2803	3115	3310	3893	4672
0.280	1428	1666	1904	2061	2458	2616	2854	3171	3370	3964	4757
0.285	1453	1696	1938	2098	2502	2663	2905	3228	3430	4032	4842
0.290	1479	1725	1940	2135	2546	2709	2956	3285	3490	4106	4927
0.295	1504	1755	1940	2171	2590	2756	3007	3341	3551	4177	5012
0.300	1530	1785	1940	2208	2634	2803	3058	3398	3610	4247	5097
0.305	1555	1815	1940	2245	2677	2849	3109	3400	3610	4250	5100
0.310	1581	1844	1940	2270	2700	2875	3132	3400	3610	4250	5100
0.315	1606	1874	1940	2270	2700	2875	3132	3400	3610	4250	5100
0.320	1630	1890	1940	2270	2700	2875	3132	3400	3610	4250	5100
0.325	1630	1890	1940	2270	2700	2875	3132	3400	3610	4250	5100
0.330	1630	1890	1940	2270	2700	2875	3132	3400	3610	4250	5100
0.335	1630	1890	1940	2270	2700	2875	3132	3400	3610	4250	5100
0.340	1630	1890	1940	2270	2700	2875	3132	3400	3610	4250	5100
0.345	1630	1890	1940	2270	2700	2875	3132	3400	3610	4250	5100
0.350	1630	1890	1940	2270	2700	2875	3132	3400	3610	4250	5100
0.355	1630	1890	1940	2270	2700	2875	3132	3400	3610	4250	5100

U.K. UNIVERSAL LOAD CHART

See end of Manual for Chart.

UK LIFT READY RECKONER

	ENVELOPE VOLUME/1000 CU.FT.													
LIFT INDEX KG/1000 CU.FT.	21	25	31	35	42	56	60	69	77	90	105	120	150	160
4.8	100	120	148	168	201	269	288	331	370	432	504	576	720	768
5.0	105	125	155	175	210	280	300	345	385	450	525	600	750	800
5.2	109	130	161	182	218	291	312	359	400	468	546	624	780	832
5.4	113	135	167	189	227	302	324	373	416	486	567	648	810	864
5.6	117	140	173	196	235	314	336	386	431	504	588	672	840	896
5.8	121	145	179	203	244	325	348	400	447	522	609	696	870	928
6.0	126	150	186	210	252	336	360	414	462	540	630	720	900	960
6.2	130	155	192	217	260	347	372	428	477	558	651	744	930	992
6.4	134	160	198	224	269	358	384	442	493	576	672	768	960	1024
6.6	138	165	204	231	277	370	396	455	508	594	693	792	990	1056
6.8	142	170	210	238	286	381	408	469	524	612	714	816	1020	1088
7.0	147	175	217	245	294	392	420	483	539	630	735	840	1050	1120
7.2	151	180	223	252	302	403	432	497	554	648	756	864	1080	1152
7.4	155	185	229	259	311	414	444	511	570	666	777	888	1110	1184
7.6	159	190	235	266	319	426	456	524	585	684	798	912	1140	1216
7.8	163	195	241	273	328	437	468	538	601	702	819	936	1170	1248
8.0	168	200	248	280	336	448	480	552	616	720	840	960	1200	1280
8.2	172	205	254	287	344	459	492	566	631	738	861	984	1230	1312
8.4	176	210	260	294	352	470	504	580	647	756	882	1008	1260	1344
8.6	180	215	266	301	361	482	516	593	662	774	903	1032	1290	1376
8.8	184	220	272	308	370	493	528	607	678	792	924	1056	1320	1408
9.0	189	225	279	315	378	504	540	621	693	810	945	1080	1350	1440
9.2	193	230	285	322	386	515	552	635	708	828	966	1104	1380	1472
9.4	197	235	291	329	395	526	564	649	724	846	987	1128	1410	1504
9.6	201	240	297	336	403	538	576	662	739	864	1008	1152	1440	1536
9.8	205	245	303	343	412	549	588	676	755	882	1029	1176	1450	1568
10.0	210	250	310	350	420	560	600	690	770	900	1050	1200	1450	1600

UK LIFT READY RECKONER

	ENVELOPE VOLUME/1000 CU.FT.										
LIFT INDEX KG/1000 CU.FT.	180	210	240	260	310	330	360	400	425	500	600
4.8	864	1008	1152	1248	1488	1584	1728	1920	2040	2400	2880
5.0	900	1050	1200	1300	1550	1650	1800	2000	2125	2500	3000
5.2	936	1092	1248	1352	1612	1716	1872	2080	2210	2600	3120
5.4	972	1134	1296	1404	1674	1782	1944	2160	2295	2700	3240
5.6	1008	1176	1344	1456	1736	1848	2016	2240	2380	2800	3360
5.8	1044	1218	1392	1508	1798	1914	2088	2320	2465	2900	3480
6.0	1080	1260	1440	1560	1860	1980	2160	2400	2550	3000	3600
6.2	1116	1302	1488	1612	1922	2046	2232	2480	2635	3100	3720
6.4	1152	1344	1536	1664	1984	2112	2304	2560	2720	3200	3840
6.6	1188	1386	1584	1716	2046	2178	2376	2640	2805	3300	3960
6.8	1224	1428	1632	1768	2108	2244	2448	2720	2890	3400	4080
7.0	1260	1470	1680	1820	2170	2310	2520	2800	2975	3500	4200
7.2	1296	1512	1728	1872	2232	2376	2592	2880	3060	3600	4320
7.4	1332	1554	1776	1924	2294	2442	2664	2960	3145	3700	4440
7.6	1368	1596	1824	1976	2356	2508	2736	3040	3230	3800	4560
7.8	1404	1638	1872	2028	2418	2574	2808	3120	3315	3900	4680
8.0	1440	1680	1920	2080	2480	2640	2880	3200	3400	4000	4800
8.2	1476	1722	1940	2132	2542	2706	2952	3280	3485	4100	4920
8.4	1512	1764	1940	2184	2604	2772	3024	3360	3570	4200	5040
8.6	1548	1806	1940	2236	2666	2838	3096	3400	3610	4250	5100
8.8	1584	1848	1940	2270	2700	2875	3132	3400	3610	4250	5100
9.0	1620	1890	1940	2270	2700	2875	3132	3400	3610	4250	5100
9.2	1630	1890	1940	2270	2700	2875	3132	3400	3610	4250	5100
9.4	1630	1890	1940	2270	2700	2875	3132	3400	3610	4250	5100
9.6	1630	1890	1940	2270	2700	2875	3132	3400	3610	4250	5100
9.8	1630	1890	1940	2270	2700	2875	3132	3400	3610	4250	5100
10.0	1630	1890	1940	2270	2700	2875	3132	3400	3610	4250	5100

IMPERIAL UNIVERSAL LOAD CHART

See end of Manual for Chart.

IMPERIAL LIFT READY RECKONER

	ENVELOPE VOLUME/1000 CU.FT.													
LIFT INDEX lbs/1000 CU.FT.	21	25	31	35	42	56	60	69	77	90	105	120	150	160
10.50	220	262	325	367	441	588	630	724	808	945	1102	1260	1575	1680
10.75	225	268	333	376	451	602	645	742	828	967	1129	1290	1612	1720
11.00	231	275	341	385	462	616	660	759	847	990	1155	1320	1650	1760
11.25	236	281	348	393	472	630	675	776	866	1012	1181	1350	1687	1800
11.50	241	287	356	402	483	644	690	793	885	1035	1207	1380	1725	1840
11.75	246	293	364	411	493	658	705	811	905	1057	1234	1410	1762	1880
12.00	252	300	372	420	504	672	720	828	924	1080	1260	1440	1800	1920
12.25	257	306	379	428	514	686	735	845	943	1102	1286	1470	1837	1960
12.50	262	312	387	437	525	700	750	862	962	1125	1312	1500	1875	2000
12.75	267	318	395	446	535	714	765	880	982	1147	1339	1530	1912	2040
13.00	273	325	403	455	546	728	780	897	1001	1170	1365	1560	1950	2080
13.25	278	331	410	463	556	742	795	914	1020	1192	1391	1590	1987	2120
13.50	283	337	418	472	567	756	810	931	1039	1215	1417	1620	2025	2160
13.75	288	343	426	481	577	770	825	949	1059	1237	1444	1650	2062	2200
14.00	294	350	434	490	588	784	840	966	1078	1260	1470	1680	2100	2240
14.25	299	356	441	498	598	798	855	983	1097	1282	1496	1710	2137	2280
14.50	304	362	449	507	609	812	870	1000	1116	1305	1522	1740	2175	2320
14.75	309	368	457	516	619	826	885	1018	1136	1327	1549	1770	2212	2360
15.00	315	375	465	525	630	840	900	1035	1155	1350	1575	1800	2250	2400
15.25	320	381	472	533	640	854	915	1052	1174	1372	1601	1830	2287	2440
15.50	325	387	480	542	651	868	930	1069	1193	1395	1627	1860	2325	2480
15.75	330	393	488	551	661	882	945	1087	1213	1417	1654	1890	2362	2520
16.00	336	400	496	560	672	896	960	1104	1232	1440	1680	1920	2400	2560
16.25	341	406	503	568	682	910	975	1121	1251	1462	1706	1950	2437	2600
16.50	346	412	511	577	693	924	990	1138	1270	1485	1732	1980	2475	2640
16.75	351	418	519	586	703	938	1005	1156	1290	1507	1759	2010	2512	2680
17.00	357	425	527	595	714	952	1020	1173	1309	1530	1785	2040	2550	2720
17.25	362	431	534	603	724	966	1035	1190	1328	1552	1811	2070	2587	2760
17.50	367	437	542	612	735	980	1050	1207	1347	1575	1837	2100	2625	2800
17.75	372	443	550	621	745	944	1065	1225	1367	1597	1864	2130	2662	2840
18.00	378	450	558	630	756	1008	1080	1242	1386	1620	1890	2160	2700	2880
18.25	383	456	565	638	766	1022	1095	1259	1405	1642	1916	2190	2737	2920
18.50	388	462	573	647	777	1036	1110	1276	1424	1665	1942	2220	2775	2960
18.75	393	468	581	656	785	1050	1125	1294	1444	1687	1969	2250	2812	3000
19.00	399	475	589	665	798	1064	1140	1311	1463	1710	1995	2280	2850	3040
19.25	404	481	596	673	808	1078	1155	1328	1482	1732	2021	2310	2887	3080
19.50	409	487	604	682	819	1092	1170	1345	1501	1755	2047	2340	2925	3120
19.75	414	493	612	691	829	1106	1185	1363	1521	1777	2074	2370	2962	3160
20.00	420	500	620	700	840	1120	1200	1380	1540	1800	2100	2400	3000	3200
20.25	425	506	627	708	850	1134	1215	1397	1559	1822	2126	2430	3037	3240
20.50	430	512	635	717	861	1148	1230	1414	1578	1845	2152	2460	3075	3280
20.75	435	518	643	726	871	1162	1245	1432	1598	1867	2179	2490	3112	3320
21.00	441	525	651	735	882	1176	1260	1449	1617	1890	2205	2520	3150	3360
21.25	446	531	658	743	892	1190	1275	1466	1636	1912	2231	2550	3187	3400
21.50	451	537	666	752	903	1204	1290	1483	1655	1935	2257	2580	3190	3440
21.75	456	543	674	761	913	1218	1305	1501	1675	1957	2284	2610	3190	3480
22.00	462	550	682	770	924	1232	1320	1518	1694	1980	2310	2640	3190	3520

IMPERIAL LIFT READY RECKONER

	ENVELOPE VOLUME/1000 CU.FT.										
LIFT INDEX lbs/1000 CU.FT.	180	210	240	260	310	330	360	400	425	500	600
10.50	1890	2205	2520	2730	3255	3465	3780	4200	4462	5250	6300
10.75	1935	2257	2580	2795	3332	3547	3870	4300	4569	5375	6450
11.00	1980	2310	2640	2860	3410	3630	3960	4400	4675	5500	6600
11.25	2025	2362	2700	2925	3487	3712	4050	4500	4781	5625	6750
11.50	2070	2415	2760	2990	3565	3795	4140	4600	4888	5750	6900
11.75	2115	2467	2820	3055	3642	3877	4230	4700	4994	5875	7050
12.00	2160	2520	2880	3120	3720	3960	4320	4800	5100	6000	7200
12.25	2205	2572	2940	3185	3797	4042	4410	4900	5206	6125	7350
12.50	2250	2625	3000	3250	3875	4125	4500	5000	5313	6250	7500
12.75	2295	2677	3060	3315	3952	4207	4590	5100	5419	6375	7650
13.00	2340	2730	3120	3380	4030	4290	4680	5200	5525	6500	7800
13.25	2385	2782	3180	3445	4107	4372	4770	5300	5631	6625	7950
13.50	2430	2835	3240	3510	4185	4455	4860	5400	5738	6750	8100
13.75	2475	2887	3300	3575	4262	4537	4950	5500	5844	6875	8250
14.00	2520	2940	3360	3640	4340	4620	5040	5600	5950	7000	8400
14.25	2565	2992	3420	3705	4417	4702	5130	5700	6056	7125	8550
14.50	2610	3045	3480	3770	4495	4785	5220	5800	6163	7250	8700
14.75	2655	3097	3540	3835	4572	4867	5310	5900	6269	7375	8850
15.00	2700	3150	3600	3900	4650	4950	5400	6000	6375	7500	9000
15.25	2745	3202	3660	3965	4727	5032	5490	6100	6481	7625	9150
15.50	2790	3255	3720	4030	4805	5115	5580	6200	6588	7750	9300
15.75	2835	3307	3780	4095	4882	5197	5670	6300	6694	7875	9450
16.00	2880	3360	3840	4160	4960	5280	5760	6400	6800	8000	9600
16.25	2925	3412	3900	4225	5037	5362	5850	6500	6906	8125	9750
16.50	2970	3465	3960	4290	5115	5445	5940	6600	7013	8250	9900
16.75	3015	3517	4020	4355	5192	5527	6030	6700	7119	8375	10050
17.00	3060	3570	4080	4420	5270	5610	6120	6800	7225	8500	10200
17.25	3105	3622	4140	4485	5347	5692	6210	6900	7331	8625	10350
17.50	3150	3675	4200	4550	5425	5775	6300	7000	7438	8750	10500
17.75	3195	3727	4260	4615	5502	5857	6390	7100	7544	8875	10650
18.00	3240	3780	4268	4680	5580	5940	6480	7200	7650	9000	10800
18.25	3285	3832	4268	4745	5657	6022	6570	7300	7756	9125	10950
18.50	3330	3885	4268	4810	5735	6105	6660	7400	7863	9250	11100
18.75	3375	3937	4268	4862	5812	6187	6750	7480	7942	9350	11220
19.00	3420	3990	4268	4940	5890	6270	6840	7480	7942	9350	11220
19.25	3465	4042	4268	4994	5940	6325	6890	7480	7942	9350	11220
19.50	3510	4095	4268	4994	5940	6325	6890	7480	7942	9350	11220
19.75	3555	4147	4268	4994	5940	6325	6890	7480	7942	9350	11220
20.00	3586	4180	4268	4994	5940	6325	6890	7480	7942	9350	11220
20.25	3586	4180	4268	4994	5940	6325	6890	7480	7942	9350	11220
20.50	3586	4180	4268	4994	5940	6325	6890	7480	7942	9350	11220
20.75	3586	4180	4268	4994	5940	6325	6890	7480	7942	9350	11220
21.00	3586	4180	4268	4994	5940	6325	6890	7480	7942	9350	11220
21.25	3586	4180	4268	4994	5940	6325	6890	7480	7942	9350	11220
21.50	3586	4180	4268	4994	5940	6325	6890	7480	7942	9350	11220
21.75	3586	4180	4268	4994	5940	6325	6890	7480	7942	9350	11220
22.00	3586	4180	4268	4994	5940	6325	6890	7480	7942	9350	11220

1.6 Equipment Interchangeability

For each size of Lindstrand envelope, there are a range of different sizes of baskets, burners and cylinders which are designed to be used. The scope of fitment for each of these components is shown on tables 1 - 3 inclusive, in Section 1.5. Furthermore, because of the uniformity of interface between the envelope range manufactured by Lindstrand Balloons, and the load frames, basket, burners and cylinders manufactured by Cameron Balloons, Thunder & Colt Ltd, Sky Balloons Ltd, Fire Balloons, and Ultramagic Balloons, a degree of interchangeability exists such that basket, burner and load frames manufactured by these companies, can be used with Lindstrand Balloons manufactured envelopes. It should be noted that if any equipments that are manufactured by any of the above manufacturers are used with Lindstrand manufactured envelopes, then the operating limitations, maintenance schedules and instructions for continued airworthiness which have been published for those equipments must be adhered to. The scope of fitment for each of the components, along with the indicative empty weight is given in the following tables:

1.6.1 Cameron Balloons Equipment

Table 5 - CAMERON BASKETS

BASKET NO.	BASKET SIZE CM	BASKET STYLE	ENVELOPE SIZE RANGE	EMPTY WEIGHT	
				KG	LBS
61	112 x 112	Open	42	45	99
62	112 x 124	Open	56 - 69	60	132
63	112 x 147	Open	69 - 120	65	143
64	122 x 157	Open	90 - 120	70	154
65	122 x 189	Open	120 - 160	95	209
66	135 x 195	P	120 - 160	100	220
67	144 x 230	ST	150 - 180	165	363
68	170 x 236	ST	150 - 180	180	396
69	170 x 282	ST	210 - 240	185	407
70	170 x 266	DT	180 - 240	195	429
71	170 x 305	DT	210 - 310	225	495
72	170 x 347	DT	240 - 310	245	539
73	76 x 96 (CB3116)	Mini	31 - 56	45	99
74	Duo Air Chair (CB8340)	Seat	42 - 77	35	77
75	Folding Basket (CB3327)	Open	69 - 105	59	130
76	170 x 360 (CB3040)	DT	240 - 500	350	770
77	CB8320 Hopper	Seat	21 - 35	17	37

Notes

a) The basket dimensions refer to nominal outside dimensions.

b) The empty weight figure is an indicative figure. The actual basket weight is shown in the aircraft log book.

c) Under basket style 'P' stands for one partitioned wall.

TABLE 6 - CAMERON BURNERS

BURNER NO.	BURNER TYPE	ENVELOPE SIZE RANGE	EMPTY WEIGHT	
			KG	LBS
51	Mk 4 Single	42 - 90	17	37
52	Mk 4 Double	42 - 180	24	53
53	Mk 4 Super Double	42 - 180	24	53
54	Mk 4 Super Triple	120 - 260	44	97
55	Mk 4 Super Quad	180 - 425	55	121
56	Mk 4 Super Shadow Double	42 - 180	24	53
57	Mk 4 Super Shadow Triple	120 - 317	44	97
58	Mk 4 Super Shadow Quad	180 - 500	55	121
59	Stealth Double	42 - 180	24	53
60	Stealth Triple	120 - 260	45	99
61	Stealth Quad	180 - 500	56	123
62	Shadow Mini Burner	31 - 90	14	31
63	Shadow Single	42 - 90	19	42
64	Sirocco Double	42 - 210	24	53
65	Sirocco Triple	120 - 317	44	97
66	Sirocco Quad	180 - 500	52	115
67	Stealth & Shadow Quad (CB2097-2A)	180 - 500	52	115

TABLE 7 - CAMERON CYLINDERS

CYLINDER TYPE	EMPTY WEIGHT		FUEL CAPACITY		FULL WEIGHT		APPLICABLE BASKET RANGE
	KG	LBS	KG	LBS	KG	LBS	
CB 497	16	35	20	44	36	79	All
CB 599	17	37	22	48	39	85	All
CB 426	22	48	28	61	50	109	All
CB 959	26	57	35	77	61	135	All
CB 2380 (60)	14	31	28	62	42	93	All
CB 2383 (80)	16	35.2	35	77	51	112	All
CB 2385 (40)	12.5	27	20.5	45	33	73	All
CB 2387 (T60)	14	31	26	57	40	88	All
CB 2900 (45)	20	44	23	50	43	94	All
CB 2901 (60)	22	49	30	66	52	115	All
CB 2902 (54)	23	51	27	59	50	132	All
CB 2903 (72)	26	57	36	79	62	137	All
CB 8404	19	42	20	44	39	85	Air Chair Only
CB 250 (Worth.)	14	31	20	44	34	75	All

Notes

a) Under the column "Basket Range", the appearance of the word "All" denotes that the cylinder can be used with all sizes of baskets in all operational categories, regardless of the basket manufacturer, provided the basket size appears in Section 1.5 or 1.6.

1.6.2 Thunder & Colt Ltd Equipment

TABLE 8 - THUNDER & COLT BASKETS

BASKET NO.	BASKET SIZE INCHES / CM	BASKET STYLE	ENVELOPE SIZE RANGE	EMPTY WEIGHT	
				KG	LBS
91	40” x 40”	Open	42 - 77	48	106
92	40” x 48”	Open	56 - 90	57	125
93	40” x 54”	Open	69 - 105	67	147
94	40” x 60”	Open	77 - 120	69	152
95	48” x 68”	ST	105 - 160	105	231
96	48” x 82”	ST	120 - 180	132	290
97	60” x 87”	ST	150 - 180	160	352
98	60” x 90”	ST	180 - 210	170	374
99	60” x 102”	ST	180 - 240	206	453
100	60” x 98”	DT	180 - 240	252	554
101	60” x 118”	DT	180 - 310	284	625
102	60” x 126”	DT	180 - 310	415	913
103	165 x 445 cm CB8285	DT	300 - 425	416	915
104	Sky Chariot (SC-002)	Seat	31 - 56	16	35

Notes

a) The basket dimensions refer to outside dimensions.

b) The empty weight figure is an indicative figure. The actual basket weight is shown in the aircraft log book.

TABLE 9 - THUNDER & COLT BURNERS

BURNER NO.	BURNER TYPE	ENVELOPE SIZE RANGE	EMPTY WEIGHT	
			KG	LBS
81	C2 Double	42 - 180	17	37
82	C2 Triple	120 - 260	25	55
83	C2 Triple + CLF	150 - 310	26	57
84	C2 Quad	180 - 310	28	62
85	Magnum Double	42 - 180	20	44
86	Magnum Double + CLF	120 - 260	23	51
87	Magnum Triple	120 - 260	28	62
88	Magnum Triple + CLF	150 - 310	31	68
89	Magnum Quad	180 - 310	37	81
90	Stratus Double	42 - 210	24	53
91	Stratus Triple	120 - 300	44	97
92	Stratus Quad	180 - 415	52	115
93	C2 Single (B2-50)	31 - 90	13	29

TABLE 10 - THUNDER & COLT CYLINDERS

CYLINDER TYPE	EMPTY WEIGHT		FUEL CAPACITY		FULL WEIGHT		APPLICABLE BASKET RANGE
	KG	LBS	KG	LBS	KG	LBS	
V20	14	31	20	44	34	75	All
V30	18	40	30	66	48	106	All
V40	20	44	40	88	60	132	All
Worthington	14	31	20	44	34	75	All
H30 (SC2-106)	17	37	30	66	47	104	Sky Chariot

Notes

a) Under the column "Basket Range" the appearance of the word "All" denotes that the cylinder may be used with all sizes of baskets in all operational categories, regardless of the basket manufacturer, provided the basket size appears in either Section 1.5 or 1.6.

1.6.3 Sky Balloons Ltd Equipment

TABLE 11 - SKY BALLOONS BASKETS

BASKET NO.	BASKET SIZE CM	BASKET STYLE	ENVELOPE SIZE RANGE	EMPTY WEIGHT	
				KG	LBS
121	100 x 122	1000	42 - 77	75	165
122	112 x 148	2000	77 - 105	100	220
123	122 x 173	3000	105 - 120	125	275
124	150 x 200	10000	150 - 180	175	385
125	150 x 240	12000	150 - 210	215	473
126	150 x 280	14000	180 - 210	240	528
127	157 x 535	32000	400 - 500	701	1542

Notes

a) The basket dimensions refer to the nominal dimensions.

b) The empty weight figure is an indicative figure. The actual basket weight is shown in the aircraft log book.

TABLE 12 - SKY BALLOONS BURNERS

BURNER NO.	BURNER TYPE	ENVELOPE SIZE RANGE	EMPTY WEIGHT	
			KG	LBS
100	Sky Double	65 - 210	23	51
101	Sky Triple	150 - 300	33	73
102	Sky Quad	180 - 500	59	130

TABLE 13 - SKY BALLOONS CYLINDERS

CYLINDER TYPE	EMPTY WEIGHT		FUEL CAPACITY		FULL WEIGHT		APPLICABLE BASKET RANGE
	KG	LBS	KG	LBS	KG	LBS	
V30-1000	18	40	30	66	48	106	All
V30-2000	18	40	30	66	48	106	All
V30-3000	18	40	30	66	48	106	All
V30-4000	18	40	30	66	48	106	All

Notes

a) Under the column "Basket Range" the appearance of the word "All" denotes that the cylinder may be used with all sizes of baskets in all operational categories, regardless of the basket manufacturer, provided that the basket size appears in either Section 1.5 or 1.6.

1.6.4 Fire Balloons GmbH Equipment

TABLE 14 - FIRE BALLOONS BASKETS

BASKET NO.	BASKET SIZE CM	BASKET STYLE	ENVELOPE SIZE RANGE	EMPTY WEIGHT	
				KG	LBS
141	I/2 (107 x 95)	Open	42 - 69	47	103
142	II/3 (125 x 100)	Open	56 - 90	55	121
143	III/4 (130 x 115)	Open	77 - 105	63	138
144	V/5 (155 x 120)	Open	90 - 120	68	150
145	V-A/5 (155 x 120)	Open	90 - 120	68	150
146	VI/6 (175 x 125)	Open	90 - 150	78	172
147	VII/7 (180 x 140)	S-T	120 - 180	140	308
148	VIII/8 (215 x 140)	S-T	120 - 180	160	352
149	VIII/9 (235 x 140)	D-T	150 x 240	205	451
150	IX/11 (250 x 170)	D-T	180 - 240	245	539
151	X/13 (275 X 175)	D-T	180 - 240	290	638

a) The applicable size range of envelopes is given in 1,000’s of cubic feet.

TABLE 15 - FIRE BALLOONS BURNERS

BURNER NO.	BURNER TYPE	ENVELOPE SIZE RANGE	EMPTY WEIGHT	
			KG	LBS
141	Double FBV	42 - 180	22	48
142	Double FB6	42 - 180	23	51
143	Triple FBV	180 - 310	37	81
144	Triple FB6	180 - 310	39	86
145	Quad FBV	180 - 310	65	143
146	Quad FB6	180 - 310	66	145

a) The applicable size range of envelopes is given in 1,000’s of cubic feet.

TABLE 16 - FIRE BALLOONS CYLINDERS

CYLINDER TYPE	EMPTY WEIGHT		FUEL CAPACITY		FULL WEIGHT		APPLICABLE BASKET RANGE
	KG	LBS	KG	LBS	KG	LBS	
VA50	14.6	32	21.2	46.5	35.8	78.5	All
VA70	18.6	41.7	30	66.1	48.6	107.8	All

Notes

a) Under the column "applicable basket range" the appearance of the word "all" denotes that the cylinder can be used with all sizes of baskets in all operational categories, regardless of the basket manufacturer, provided the basket size appears in Section 1.5 or 1.6.

1.6.5 Ultramagic SA Equipment

TABLE 17 - ULTRAMAGIC BASKETS

BASKET NO.	BASKET SIZE CM		BASKET STYLE	ENVELOPE SIZE RANGE	EMPTY WEIGHT	
					KG	LBS
170	C0	70 x 80	Open	31 - 42	45	99
171	C1	100 x 120	Open	60 - 120	56	123
172	C2	100 x 100	Open	31 - 90	50	110
173	C3	110 x 130	Open	69 - 180	76	167
174	C4	120 x 160	Open	90 - 180	95	209
175	C5	140 x 220	S-T	120 - 240	160	352
176	C6	130 x 180	P	120 - 180	106	233
177	C7	140 x 200	P	120 - 180	122	268
178	C8	150 x 260	DT	180 - 260	175	385
179	C9	160 x 300	DT	210 - 330	250	550
180	C10	115 x 145	Open	60 - 120	85	187
181	C11	170 x 350	DT	210 - 425	340	748
182	C12	160 x 425	DT	300 - 425	360	792

Notes

a) The basket dimensions refer to the nominal dimensions.

b) The empty weight figure is an indicative figure. The actual basket weight is shown in the aircraft log book.

TABLE 18 - ULTRAMAGIC BURNERS

BURNER NO.	BURNER TYPE	ENVELOPE SIZE RANGE	EMPTY WEIGHT	
			KG	LBS
160	Mk 2 Simple	31 - 90	14	31
161	Mk 2 Double	56 - 180	19	42
162	Mk 2 Triple	105 - 260	25	55
163	Mk 2 Super Simple	31 - 90	15	33
164	Mk 2 Super Double	56 - 180	21	46
165	Mk 2 Super Triple	105 - 260	28	62
166	Mk 2 Super Quad	180 - 425	36	79
167	Mk 10 Simple	31 - 90	15	33
168	Mk 10 Double	56 - 180	21	46
169	Mk 10 Triple	105 - 260	28	62
170	Mk 10 Quad	180 - 425	35	77
171	Mk 21 Simple	31 - 105	17	37
172	Mk 21 Double and Electric	56 - 210	24	53
173	Mk 21 Triple	105 - 310	34	75
174	Mk 21 Quad	180 - 425	43	95
175	BMK-008 Single	31 - 105	11.9	26
176	BMK-008 Double	56 - 210	20.8	46
177	BMK-050 Double	180 - 300	19.9	44
178	BMK-050-Triple	250 - 425	30.1	66
179	BMK-050 Quad	355 - 425	40.8	90

TABLE 19 - ULTRAMAGIC CYLINDERS

CYLINDER TYPE	EMPTY WEIGHT		FUEL CAPACITY		FULL WEIGHT		APPLICABLE BASKET RANGE
	KG	LBS	KG	LBS	KG	LBS	
M20 & M20D	15	33	20	44	35	77	All
M30 & M30D	20	44	30	66	50	110	All
M40 & M40D	24	53	40	88	64	141	All

Notes

a) Under the column “applicable basket range” the appearance of the word “all” denotes that the cylinder can be used with all sizes of baskets in all operational categories, regardless of the basket manufacturer, provided the basket size appears in Section 1.5 or 1.6.

1.7 Build Standards

The Build Standard number is a quick reference number which identifies the various components which make up a particular balloon system

eg, 77A.03.02.0

This reference is comprised of four number groups. The first number group identifies the envelope size and type. In the above example, 77A means a 77,000 cu.ft envelope of the A-type pattern.

The second number group represents the type of basket being used, and may be cross-referenced with the basket numbers shown on Tables 2, 5 and 8 in Section 1. In this example, 03 represents a 110 cm x 155 cm size of basket.

The third number group shows which type of burner is being used and this number is cross-referenced to Tables 3, 6 and 9 in Section 1. In this example, 02 shows that a Jetstream Double burner is being used (Table 3).

The fourth number shows any modifications to the original design standard that apply to the overall balloon system. This number is the same as the applicable modification number. If there are no applicable modifications, then 0 is inserted as shown above.

SECTION 2
NORMAL PROCEDURES

2.1 Assembly of the Balloon

Correct assembly of the balloon is achieved either by the used of colour coded items or by identification of unique features. During assembly perform the pre-flight inspections required in the maintenance schedule.

2.1.1 Erecting the Burner

Insert the four nylon rods into the sockets provided on the burner frame. Stand the burner upright on the ground and lift the burner and rods up and over the sockets in the top frame of the basket. Orientation of the burner to the basket should be such that the support rods are straight and that the burner controls can be reached by the pilot, eg the offset type burner must be positioned over the pilot compartment in a T-partition type basket.

The stainless steel flying wires are attached to the burner frame by inserting the eye of the wire into the inverted U-shaped bracket on the burner frame. A carabiner is then passed through the hole in the bracket, through the eye of the wire and out the other side of the bracket. This procedure is repeated at each corner of the burner frame. On larger baskets, two wires are provided at each corner. In this case the second eye is also threaded on to the same carabiner so that it lies closest to the short side of the basket. Great care must be taken to ensure that all carabiners, once fitted in place, are securely closed by screwing the collar so that it covers the join in the gate. Cameron and Ultramagic burner frames are fitted with a plate instead of an inverted U-shaped bracket. In this case, the basket wire thimbles are positioned either side of the plate and the carabiner passed through all three items in the same way.

2.1.2 Installing the Fuel Cylinders

Fuel cylinders are strapped into the baskets. Four universal strap holes are provided for each cylinder in order to retain them in position. If a burner is being used with the balloon which is equipped with vapour type pilot lights, then the correct orientation of the cylinders in the basket must be achieved. During inflation, when the basket is laid onto its side, the cylinder must be orientated so that on all stainless steel upright cylinders, the maxfill valve is lowermost. Worthington aluminium cylinders can be similarly orientated by ensuring that the two round holes in the top collar are facing downwards. The downside of horizontal cylinders is indicated by a green label. If the burner being used is equipped with liquid pilot lights, the orientation of cylinders is not important, provided the cylinders are full for inflation.

2.1.3 Fuel Connections

Ensure that the tank valves and all burner valves are turned off. Attach the quick connectors for the liquid hoses and vapour hoses, if fitted. Check each connection for pressure integrity by turning on each cylinder valve in turn and observe by looking, listening and smelling the connection. If no leak can be detected, open the pilot light valve(s) and light the pilot light. Check that it is operating correctly. Open the liquid valve on the cylinder and open the main blast valve to ensure correct operation of the burner. Operate each function of the burner singly, eg liquid fire and cross over valve. If a hydraulic remote control is fitted, this should be connected and tested. When the hydraulic handle is depressed, the valve on the burner should open fully.

Once the burner test is successfully completed, close the cylinder valves and vent the remaining fuel through the burner. This test should be repeated for each coil of a burner, and each cylinder, to ensure fuel flow.

2.1.4 Rod Covers

Rod covers are fitted over the basket wires and the nylon rods, to provide protection. The liquid hoses, supplying the burners, can be fitted inside the covers or restrained to the outside of the covers for ease of changing the fuel supply during flight.

2.1.5 Passenger Briefing

It is best to conduct much of the passenger briefing at this stage of the preparations for flight, because there is no noise or haste to cause distractions. Items to include are identification of controls and their purpose, how and when to enter and exit the basket, position during flight, what to hold on to, etc.

2.1.6 Connection of Envelope

Lay the basket over on to its side with the burners pointing downwind, so that either of the longest basket sides is touching the ground. All baskets should be laid over so that cylinders will be correctly orientated, if necessary. Cameron open baskets should be laid over so that the footstep is uppermost. Thunder & Colt baskets should be laid over so that the basket wire with the red sleeving should be on the right hand side, closest to the ground. It is normal for T-partition baskets to be laid down with the pilot's compartment on the right hand side. Open the envelope bag and remove the mouth of the envelope. This is easily identified because of the nomex fabric. Spread the mouth of the envelope until the red marker is located. This marker signifies the middle point of the downside. This then permits the groups of flying wires to be identified and to be connected up to the respective corners of the burner frame. It is most important to ensure that the wires connected to each carabiner are not crossed, twisted or kinked. If a tethered flight is contemplated, a set of tether rings should be introduced between the carabiner on the load frame and the carabiner on the ends of the flying wires. Ensure that the restraint system is fitted on to either the tether rings or the upper set of carabiners. All the flying wires and the restraint system should be fitted, and the relevant carabiners locked prior to the remainder of the envelope being removed from the bag.

2.2 Inflation Procedure

2.2.1 Laying Out

Remove the remainder of the envelope from the bag by pulling the bag downwind. Fully deploy the crown line, ensuring that it is not wrapped around the overlying tapes. Spread out the envelope, making sure that the envelope is only handled on the load tapes.

2.2.2 Cold Inflation

Position the inflation fan on the left hand side of the basket so that it is directed at the parachute. Start it. Hold both sides of the balloon mouth open to begin the inflation.

2.2.3 Sealing the Parachute

The parachute vent must be retained in position during the inflation stages. This is achieved by pressing the velcro tabs together to hold the edge of the parachute close to the edge of the envelope. Correct alignment between the envelope and parachute is achieved by matching the gore identification labels on the top rim and on the edge of the parachute. Sealing the parachute is most easily achieved when the balloon is inflating.

2.2.4 Sealing a Combination Rip

The combination rip deflation system has a parachute embedded within a larger velcro rip panel. The parachute is sealed as described above. The rip panel is best sealed by progressing from one end, in panel by panel stages. For each panel two people should stretch both halves of the velcro, and once satisfied with the alignment, push the two halves together firmly. This process is repeated for all the panels of the rip panel. The resulting join is inspected to ensure that there are no wrinkles or puckers. If any are present, the complete process must be repeated. The riplocks are secured from inside the envelope. Care must be taken to ensure that the rip line is fed back through the rip locks, towards the tie off point, so that sufficient slack line exists between each lock. If a rip lock opens during inflation, the balloon must be partially deflated and the riplock secured.

2.2.5 Crown Line

The crown line crew should be instructed to prevent the crown of the balloon from moving side to side during the cold and hot inflation stages. During hot inflation a constant tension should be maintained on the crown line, with the crew slowly walking towards the basket as the balloon inflates. The crown line should not be wrapped around arms or legs, as this can cause severe injury if a gust of wind catches the balloon. Once inflation has been completed, the crown line should be tied off to the basket, on the pilots' instruction.

2.2.6 Envelope Mouth Crew

During the early stages of cold inflation, it is necessary to hold open the envelope mouth to allow the entry of air from the inflation fan. Once the envelope has filled, the mouth should support itself open by internal air pressure, provided a sufficiently large inflation fan is used. In calm conditions, the mouth crew can be dispensed with on hot inflation. In more windy conditions, two people assigned to hold the mouth open may be of assistance. Mouth crew should wear suitable heat protective gloves and clothing. Synthetic materials must not be used.

2.2.7 Hot Inflation

Check that all the control valves on the burner are off. Turn on only one liquid supply from a full fuel tank. Turn on the pilot light and ignite the pilot flame. Inflate the balloon using short bursts of heat. Keep the inflation fan running, directing the flow of air into the centre of the mouth. This practice assists in the mixing of hot air in the envelope and prevents localised "hot spots". Continue heating the envelope air until the envelope is standing upright. Once the balloon is upright, all available crew should lean their weight on the basket. The parachute should be operated to break all the velcro inflation tabs and to check for correct operation. If a second burner is fitted, the pilot light of that burner should be lit and the burner test fired to check for fuel flow.

2.2.8 Pre Take Off Checks

(a) Crown line attached to basket.
(b) Parachute tabs pulled and parachute OK.
(c) Riplocks secure and velcro panel in place.
(d) No unacceptable damage above first 4 m of fabric.
(e) Ripline and any control lines secured to basket.
(f) Flying wires straight and carabiner gates closed.

2.2.8 Pre Take Off Checks (continued)

(g) Pilot light flames strong and stable.
(h) Fuel cylinders secured and sufficient.
(i) Ignition - two sources present.
(j) Fire extinguisher charged, if used.
(k) Instruments present and set, including radios, if used.
(l) Maps for flight path present, if required.
(m) Telephone number for retrieval.
(n) Passengers completely briefed and in the basket.
(o) Maximum weight for conditions not exceeded.
(p) Required documents present and correct.

2.3 Flight Procedures

2.3.1 Take Off

Take off is achieved by increasing the internal temperature of the envelope by repeated use of the burner. The simplest way of establishing whether the lift is sufficient, is to use the traditional "hands off - hands on" method.

2.3.2 In-Flight Control

Balloons possess positive control in only the vertical dimension, by use of the burner to go up and the parachute, or natural cooling to descend.

When operating close to the minimum landing mass shown in Section 1.5.1.1, it should be noted that there is a significant reduction in response from the turning vents.

2.3.3 Changing Fuel Cylinders

The procedure for changing the fuel cylinder which is supplying the burner is as follows:

(a) Close the liquid valve on the empty cylinder.
(b) Open the burner blast valve to vent fuel from the hose.
(c) Disconnect the connector on the liquid hose and transfer to the full cylinder.
(d) Open the liquid valve, relight the pilot light if necessary, and test fire the burner.

2.3.4 Landing

Select a suitable landing site and initiate a descent towards it. Control the descent rate by using the parachute and burner. Immediately before touchdown, turn off the pilot lights and if possible close the liquid valves and vent the fuel lines. Pull the parachute line to begin the deflation process. Keep the parachute open to continue deflating the envelope. When the pilot thinks that the balloon is sufficiently heavy, a crew member can exit the basket and pull the crown line away from the basket. This contributes towards a faster deflation. If the balloon is fitted with a velcro rip system, this is operated in a similar manner, except there is more operating line to pull. If the liquid valves have not yet been turned off, this should now be done and the remaining fuel vented through the burner safely.

2.4 Fuel Pressurisation

The burner system power output is dependent upon the pressure of fuel in the cylinders. The operating pressure range of the burners is 4-15 bar (60-225 psi). However, flying with a fuel pressure below 5 bar (75 psi) requires caution. It is advised that the fuel pressure is increased if it is below this level. This may be achieved in a number of ways.

2.4.1 Cylinder Heating

Cylinders can be stored overnight before a flight, in a warm area to ensure that the pressure is acceptable. Alternatively, an approved cylinder heating jacket can be used to warm the fuel. It must be remembered that liquid propane expands rapidly with increasing temperature. For this reason, the heating of fuel cylinders must not result in an increase in temperature greater than 40ºC (104ºF), or a cylinder pressure greater than 15 bar (225 psi).

2.4.2 Nitrogen Pressurisation

2.4.2.1 Ground Based Pressurisation

Connect the inert gas supply line from the outlet side of the regulator to the liquid withdrawal valve on the flight cylinder.

Ensure that all valves on the high pressure gas cylinder, the feed line and the flight cylinder are closed. Unscrew the regulator adjustment handle to its maximum extent.

Using a suitable spindle key, gradually open the valve on top of the high pressure cylinder. Listen for any leaks and check all connections with soapy water. If any leaks are detected, close the high pressure cylinder immediately and rectify the leak. Check the high pressure gauge on the regulator which indicates the remaining contents.

Once a satisfactory supply has been achieved to the regulator, begin to screw in the regulator adjustment spindle until the downstream pressure gauge begins to move. This adjustment spindle controls the final regulator delivery pressure. The recommended delivery pressure is 10 bar (150 psi). The never exceed delivery pressure is 14 bar (203 psi). The adjustment spindle is screwed in until the desired delivery pressure is approached. Final adjustment of the exact pressure must be achieved in small steps with a 5 - 10 second pause between each step to allow for equilibrium to be achieved. Once the delivery pressure is set, it should not require changing and the spindle position can be locked with the locknut.

If it is required to set a lower pressure, then the adjustment spindle must be unscrewed and the downstream pressure vented by opening the bleed valve. The adjustment process is then repeated until the new delivery pressure is reached.

Having completed the regulator adjustment, check that the bleed valve is closed and open the feed line valve. Slowly open the liquid valve on the flight cylinder. It should be possible to hear the inert gas bubbling through the liquid propane.

The pressurisation process should be continued for two or three minutes after the bubbling noise has ceased, to allow for pressure stabilisation.

Close the feed line valve and the liquid valve and open the bleed valve to vent gas from the connection. Disconnect the feed line from the flight cylinder and re-connect to the next flight cylinder. Once pressurisation has been completed, close the high pressure cylinder valve and vent the feed line contents through the bleed valve.

Once the flight cylinder has been pressurised with inert gas, it must be clearly identified as such, especially if the cylinder is a master cylinder with a vapour withdrawal valve. Caution stickers are available from Lindstrand Balloons.

2.4.2.2 On-Board Pressurisation

The high pressure on-board cylinder is filled directly from the high pressure gas supply cylinder using the correct filling hose. The hose is connected to both cylinders. Check that the on-board cylinder and the hose bleed valve are both closed. Open the supply cylinder valve briefly, then close immediately. Check all connections in the hose for leaks, using soapy water. When satisfied, the gas supply cylinder valve may be opened. Read the gauge on the filling hose to ensure that there is sufficient contents remaining in the supply cylinder. Slowly open the valve on the on-board cylinder. Filling occurs by gas pressure equalisation. When there is no longer any flow noise, leave the two cylinders for a further two or three minutes to allow for stabilisation. Close both cylinder valves and evacuate the remaining contents of the filling hose through the bleed valve. Do not disconnect the filling hose without bleeding the contents, as this normally damages the O-ring seals.

On-board nitrogen systems feed the low pressure nitrogen through the vapour withdrawal valve on the flight cylinder, via an installed manifold. Provided that this manifold is correctly maintained, it should not require leak testing prior to every flight, but the connection of the regulator to the on-board high pressure cylinder should be leak tested every time it is connected. This is achieved by briefly opening and closing the on-board high pressure cylinder, whilst keeping the vapour valves on the cylinders closed. Test all connections in the manifold as necessary.

Some regulators supplied with on-board systems are pre-set at the factory and need no adjustment. If an adjustable regulator is supplied with the on-board system, adjustment to the correct delivery pressure is identical to the procedure described for ground based pressurisation.

It is best to introduce the inert gas pressure into the flight cylinders sequentially in order of usage. This is achieved by simply turning on the target flight cylinder vapour valve just prior to the cylinder being connected to the burner. Once all the liquid has been used in a flight cylinder, the gas supply through the vapour valve should be turned off.

2.4.3 General Instructions

2.4.3.1 Emptying Flight Cylinders

If inert gas pressurisation is no longer required in a flight cylinder, then the cylinder must be completely emptied of liquid propane. This is best achieved by using the fuel in the normal manner during a flight. Do not transfer any remaining liquid into another cylinder because most of the commonly used inert gases enter the liquid propane by solution to varying degrees. Once the cylinder is completely empty, open the bleed valve in an open, well ventilated area, to remove all the remaining internal pressurisation. Close off the bleed valve and remove any cautionary stickers. The flight cylinder may now be returned to normal service.

2.4.3.2 Refuelling Flight Cylinders

In most instances, cylinders which have been pressurised with inert gas can be refuelled in the normal manner. If a pressurised flight cylinder still contains a high level of pressurisation, above 10 bar (150 psi) and the propane refuelling is not pumped, then the refuelling process will be slightly slower. This can be avoided by opening the bleed valves for two to three minutes before starting to refuel.

2.4.3.3 Inert Gas Pressurisation and Vapour Pilot Lights

Burners which are fitted with vapour pilot lights must have a supply of fuel vapour which is uncontaminated with inert gas. This is achieved by either not pressurising all the master cylinders, leaving at least one to supply the pilot lights, or by installing a Worthington Mini cylinder purely for vapour supply to the pilot lights. This does not apply to burners with liquid pilot lights.

2.4.3.4 Flight Cylinder Storage

If full flight cylinders have been pressurised and are not used for flight, it is recommended that the pressurisation is removed from the cylinder prior to storage, if storage is going to be for a prolonged period. This can be achieved by opening the bleed valve for two to three minutes in an open, well ventilated area. The cylinder must still be considered as pressurised and should be labelled as such.

2.4.3.5 High Pressure Cylinders

It is important that pilots who wish to utilise inert gas pressurisation from high pressure cylinders, are completely familiar with the safety guidelines, correct handling procedures and any specific storage instructions associated with these cylinders. Local and national regulations for the usage of these cylinders must be adhered to. Frequently, the gas supply companies will provide the necessary information.

2.5 Dropping of Loads from the Balloon

2.5.1 Parachutists

Any Lindstrand Balloons balloons can be used to drop parachutists, providing that the balloon is operating within the limitations described in Section 1 of this Flight Manual, and meets any applicable national aviation regulations. It is recommended that no more than 30% of the balloons' maximum weight be released at any one time. The dropping of anything is subject to the specific permission of the UK CAA being granted. Ensure that the control lines and fuel hoses are secured out of the way. Initiate a descent of approximately 500 fpm and let it become stable. The parachutists may exit forward or backwards, whichever is more convenient. The balloon should be flown normally once it has stabilised.

2.5.2 Hang Gliders

There is a large variation in regulations controlling the dropping of hang gliders. Usually, approval is required, and such approval may be dependent upon a specific procedure being followed. The following method is the factory recommended version.

The hang glider is suspended below the basket by a kevlar cord. The kevlar cord is attached to a suitable lifting point on the top of the hang glider. The cord then passes up to one corner of the load frame, through the carabiner and then threaded through two more carabiners, so that the cord follows the shape of the burner frame exiting at the corner opposite. It then passes back down and is tied off at the hang glider hard point. This creates a suspension loop with no knots in it, except at the hang glider. Release is achieved by cutting the cord at the burner frame. There should be a separation of at least 6 m (20 ft) between the bottom of the basket and the hang glider wing. The cord to be used should be 6 mm (1/4") kevlar cord.

2.6 Tethered Flights

See Section 1.4 for Limitations.

To achieve a stable tether, it is recommended that the tether ropes are arranged to form a low pyramid structure with the balloon at the apex. If a relatively high tether is desired, then the length of the tether ropes should be increased and the tether points moved back from the balloon in order to preserve the low angle. This is the most effective way of providing resistance to gusts. In general, if a tether flight is required in high wind speeds, it is best to keep the height of the basket above the ground, as low as possible. Tether ropes should have a strength of 4000 kg as a minimum and the anchor points must also be capable of resisting this level of loading. The ropes should be attached to the load frame of the balloon, through the tether ring. Two ropes should be deployed upwind to provide the main resistance to movement. The angle between them should be approximately 90º. A third tether rope should be deployed downwind opposite the other two ropes, to complete the restraint system. The length of the ropes should be adjusted so that they will all three be carrying load when the balloon is in position and at the required height.

The pilot is responsible for the safety of all persons in the balloon and on the ground. If the wind speed increases, or becomes gusty, it is important to recognise this fact and terminate the exercise before injury or damage occurs.

SECTION 3
EMERGENCY PROCEDURES

3.1 General

Balloons are relatively simple aircraft. Therefore, equipment failure of a correctly maintained and inspected balloon is extremely rare. Emergency situations caused by adverse weather and incidents occurring on the ground can be prevented by correct pre-flight planning, crew training and good pilot judgement.

If an emergency does occur, these procedures should be followed and modified where necessary, by pilot judgement and experience, in order to prevent injury or damage.

If a situation arises such as an on-board fire while the balloon is on the ground, where evacuation of the basket is the safest course of action, the pilot must ensure that all other occupants leave the basket first and that due consideration has been given to preventing the subsequent take-off of the balloon. The simplest way of achieving this is to exit the basket with the deflation line in hand. It should be noted that leaving the basket while the balloon is still in flight can cause severe injury, even from relatively low heights. This practice is rarely the safest course of action and is to be avoided.

3.2 Emergency Landing Procedure

Two types of emergency landing situations are possible, "heavy" and "fast" landings. These are described below. The general procedure to be followed is:

a) Instruct the passengers that an emergency landing is necessary and identify the correct position to adopt, depending on the type of landing expected.

b) Ensure that the instructions have been followed.

c) It is good practice to inform the passengers when the impact is going to occur, especially in fast landings when they cannot see the ground. This procedure prevents passengers being caught unawares.

d) Before touchdown, jettison any ballast if this can be achieved without endangering people on the ground.

e) Turn off pilot lights, fuel valves on the cylinders, and vent the fuel lines if time permits.

f) The pilot must remember to remain in the basket as well.

g) Instruct the passengers when it is safe to exit the basket.

3.2.1 Fast Landing

A dramatic change in weather giving rise to increased wind speeds can cause a fast landing, where the forces involved in landing will be largely horizontal.

There are two major elements to a fast landing. Firstly, when the basket touches the ground, there is likely to be a violent tipping action with the basket rotating in a downwind direction. This will be followed by a long period of drag, which will consist of an erratic jumping motion. The basket occupants should be instructed to bend their knees and press their backs firmly against the downside of the basket. Their heads should be lower than the side of the basket. The internal rope handles should be used to prevent the occupants being pitched out of the basket. This position should be maintained until the pilot instructs the occupants that it is safe to leave the basket. The pilot should not leave the basket until all passengers are safe and the balloon has been made safe.

3.2.2 Heavy Landings

Heavy landings are situations in which the impact forces are largely vertical. They can arise from a situation such as a burner failure, or extreme thermic activity. The position adopted should be with knees slightly bent in order to absorb the compression on impact. Again, it is important to face away from the direction of travel and to hold onto the internal rope handles firmly. This will resist any pitching forwards motion that may also be present in any landing situation.

3.3 Burner Failure

3.3.1 Main Burner Failure

If a main burner fails, then change to the other fuel supply source. All approved burners have two independent fuel systems. If the failure is in the coil of a single burner, then the liquid fire system may be used. Land as soon as possible.

If both burners, or supply sources, are inoperable, check that the cylinders connected to the burner(s) are not empty, are correctly connected and are turned on. If this fails to achieve fuel flow, disconnect one supply and connect up to another cylinder. Repeat this procedure for all remaining cylinders until flow is is achieved. If this procedure does not rectify the fault, prepare for a heavy landing, as described above.

3.3.2 Pilot Light Failure

If a pilot light is extinguished and cannot be relit, first continue flying on the alternate burner system whilst investigating the failure as follows:

a) Ensure that the valves on the cylinder and burner are open.

b) If separate pilot supply hoses are fitted, make sure that they are properly connected.

c) Relight the pilot light using both the installed igniter system and a separate lighter or matches.

d) If pilot ignition still cannot be achieved, then one of two methods can be used.

3.3.2.1 Liquid Fire as Pilot Light

If a liquid fire which has a 90º ball valve is fitted to the burner, then this can be turned on and adjusted to give a 1 m (3 ft) high flame. This flame can then be used as the pilot light for the main burner until an emergency landing is completed. If the liquid fire valve is the toggle action type, then the toggle valve should be opened fully and the cylinder valve which is supplying the fuel should be adjusted until the resulting flame is 1.5 m (5 ft) in length. The alternative fuel system or burner should then be used to supply fuel to the main burner. In a double burner, cross-ignition will occur.

3.3.2.2 Second Burner as Pilot Light

In a similar manner to using the liquid fire as a pilot light, in a single burner with a dual fuel system (the minimum requirement) or a double burner system, the "second" burner can be used as a pilot light for the first. If the main blast valve for the burner is a ball valve action with no spring return system fitted, then the ball valve should be opened sufficiently to achieve a flame length of 1 m (3 ft). The flame should be ignited using a hand igniter such as matches or gas lighter. The other burner can then be used normally to achieve a controlled landing as soon as possible.

If the main blast valve for the burner is a toggle action type of valve, then the procedure is similar to that described above for the liquid fire. The blast valve should be opened fully and the cylinder valve adjusted so that the resulting flame is 1 m (3 ft) in length. The other burner should be used as normal to achieve a landing.

3.3.3 Partially Open Valves

In any of the above procedures, which include a valve being half opened to achieve a low fuel flow rate, it should be noted that this procedure will cause cooling of the valve which is partially open. This cooling effect will eventually result in freezing of the valve and is not recommended for prolonged periods. The technique should only be used in an emergency and even then, a landing should be made as soon as possible.

3.4 Arrest of Un-Premeditated Descents

A descent which results from extreme downdrafts or thermic activity, should be halted by using the burner. All available power should be utilised (all burners and all liquid fires fitted). A safe landing should be made as soon as possible.

The parachute valve can be used to vent hot air in the event of over-burning causing an ascent. If the descent is a result of a total burner failure or fuel exhaustion, then the descent cannot be stopped. Any available ballast, such as trail ropes, may be jettisoned provided that to do so will not endanger persons on the ground. The occupants should be briefed for a heavy landing.

3.5 Low Level Obstacles

Care must be used when flying close to the ground, in order to anticipate and correct changes in flight direction which could cause a collision. It is important to make the decision to ascend or descend and keep to the decision. It is always better to maintain or increase a vertical direction of motion than to reverse it. So if a balloon is in danger of a collision and is already going down, a quicker response will be achieved by pulling the parachute to increase the rate of descent.

Do not fly into powerlines. If powerlines are to be overflown, then it is good practice for the balloon to be ascending whilst the crossing is made. If contact is unavoidable, then descend as fast as possible so that any contact is with the envelope and not the flying wires or basket assembly. If the envelope is suspended in the wires, do not try to remove it until the power has been switched off. Do not allow crew to touch the basket if it is suspended above the ground and the power is still on.

3.6 Parachute Malfunction

If the parachute fails to open, the balloon can be successfully flown without it, relying on natural cooling to create a descent. The occupants should be warned of a long drag if the conditions are windy and the instructions under Section 3.2.1 should be followed.

If the parachute fails to close after it has been operated, first use the burner to slow or halt any descent. The line should be visually checked to see if the problem can be rectified. If it is found that the burners can be used to achieve level flight, then try to open the parachute briefly and release it quickly. This will sometimes release a jammed pulley. Use the burners afterwards to assist in reseating the parachute. If the problem cannot be corrected, do not use the parachute again until a landing has been made. Make an emergency landing as soon as possible, advising the occupants of the type of landing that is expected and the precautions to be taken.

3.7 Propane Fire

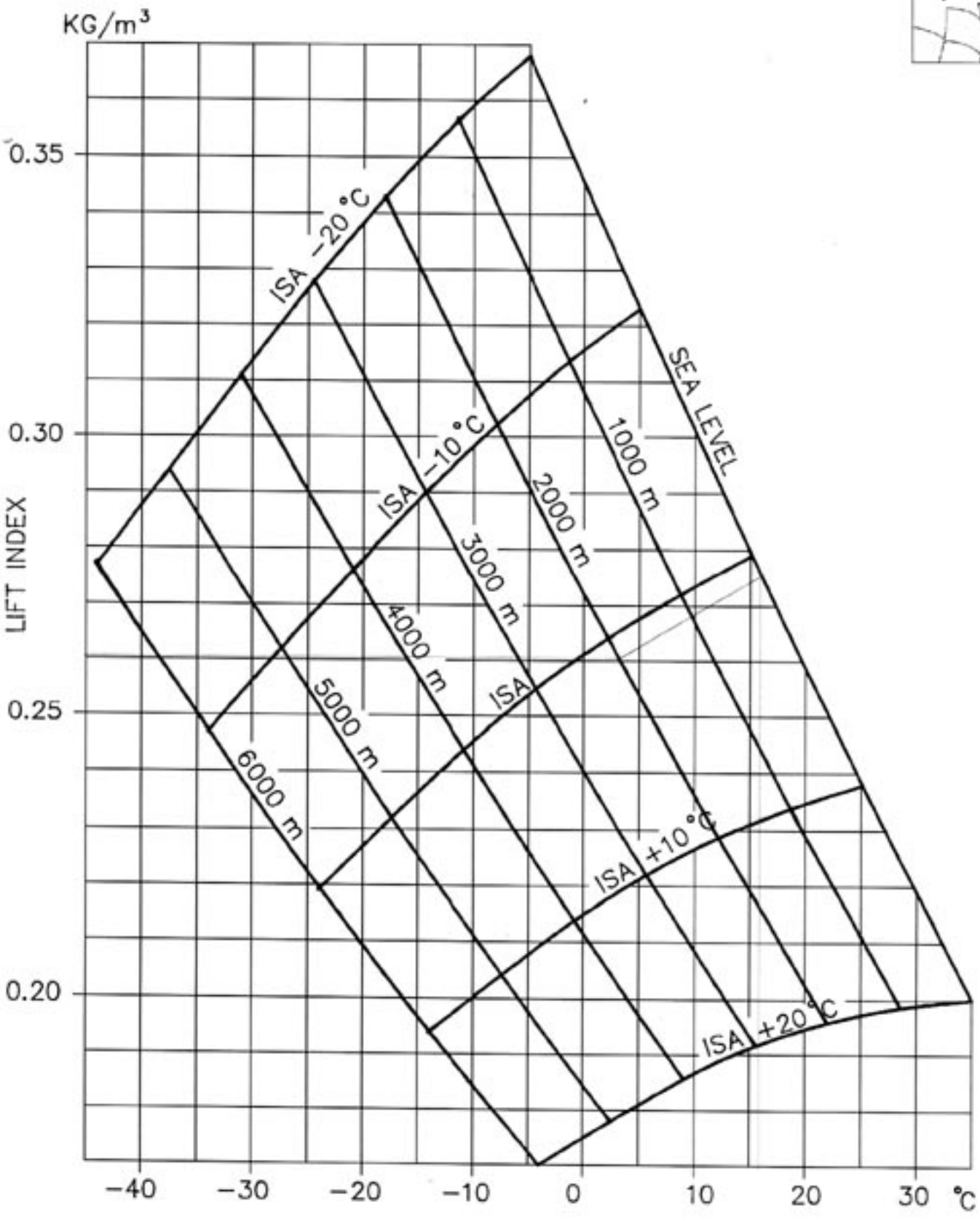
3.7.1 Ground Fire

Evacuate all other personnel to a safe area. Turn off the source of propane at the cylinder valve, if this is possible. Operate the fire extinguisher. If the fire is not put out in 20 seconds, then abandon the balloon because there is a strong risk of explosion. If the balloon is inflated, the deflation system should be operated prior to evacuating the basket to prevent subsequent take-off.

3.7.2 In-Flight Fire

Turn off the source of propane at the cylinder. Operate the fire extinguisher. Once the fire is totally extinguished and the leak of propane has been identified and stopped, an alternate fuel system should be turned on and the pilot light ignited. Use the alternate burner to make an emergency landing as soon as possible.

METRIC UNIVERSAL LOAD CHART



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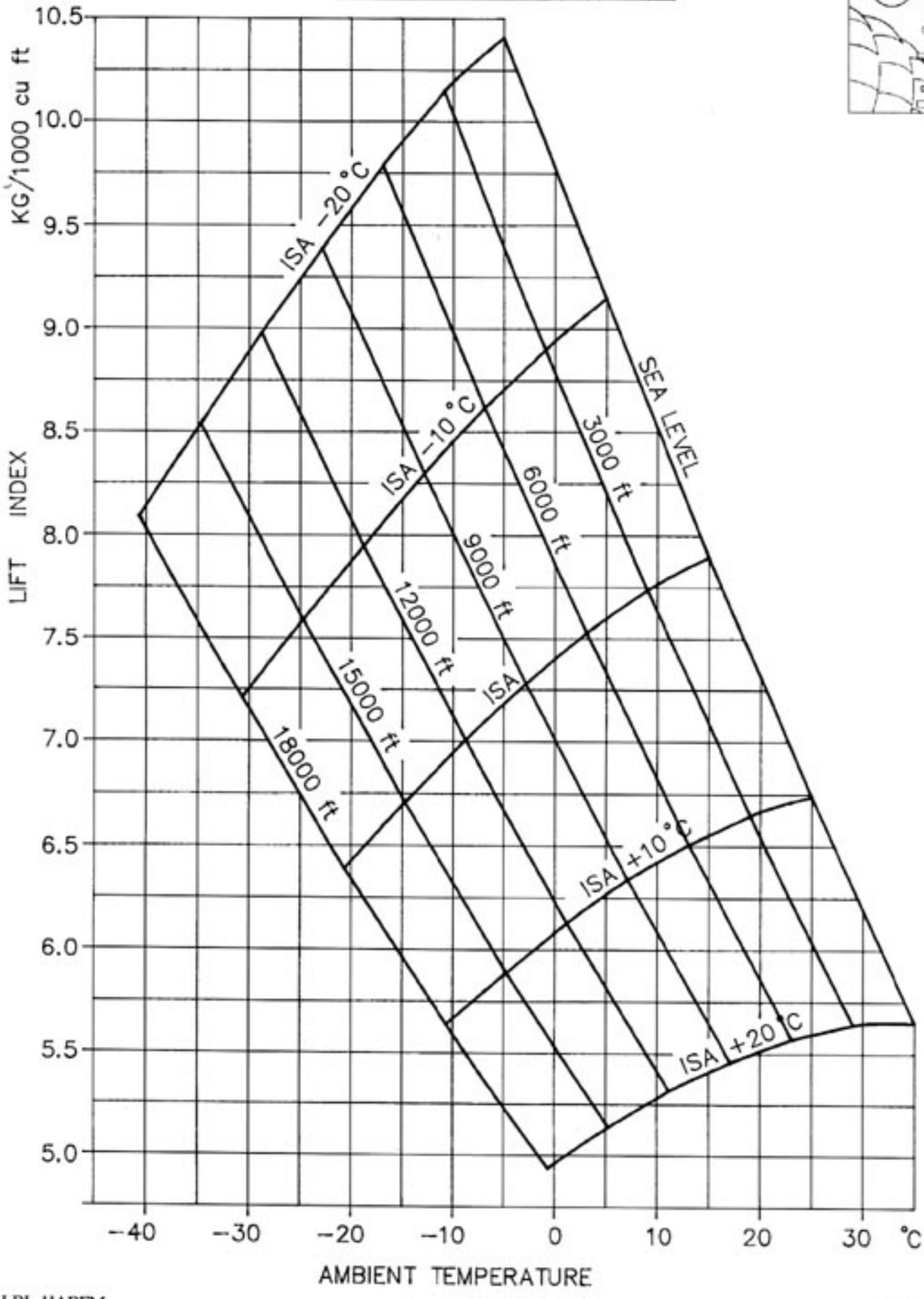

IMPERIAL UNIVERSAL LOAD CHART