

The technical content of this document is approved under the authority of DOA ref. UK.21J.0140 (C976)

8.46 LINDSTRAND ENVELOPES

8.46.1 GENERAL INFORMATION

This supplement shall be inserted in the Flight Manual, in Section 8: 'Supplements' with the revisions record sheet amended accordingly.

Information contained herein supplements, or in the case of conflict, supersedes that contained in the basic Flight Manual. For Limitations, Procedures, and Performance Data not contained in this supplement, consult the basic Hot Air Balloon Flight Manual.

Issue 6 of this supplement consists of twelve pages.

Supplement 7.46 to Maintenance Manual issue 10 is required to ensure Continued Airworthiness.

8.46.1.1 Certification Basis

The types of balloon for which this supplement is applicable have been approved by CAA under the following Type Certificate.

UK.TC.BA.00003: Lindstrand A Type
 Lindstrand A Type Cloudhopper
 Lindstrand B Type
 Lindstrand C Type
 Lindstrand L Type
 Lindstrand S Type
 Lindstrand X Type

8.46.2 LIMITATIONS

8.46.2.5 PERMITTED DAMAGE

1. 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.

8.46.2.8 ENVELOPE TEMPERATURE AND LOADING

3. The maximum continuous envelope temperature that is permitted is 125°C (257°F).
The never exceed temperature for the envelope is 127°C (261°F).

8.46.2.10 RATES OF CLIMB AND DESCENT**8.46.2.10.3 Conventionally Shaped Balloons (excluding X Types)**

1. The maximum rate of climb and descent for balloons up to a volume of 424,000 cu.ft (12,000 m³) is 1000 ft/min (5 m/sec).
2. The maximum rate of climb and descent for balloons with a volume greater than 424,000 cu.ft (12,000 m³) is 800 ft/min (4m/sec).

8.46.2.10.3 X Series Balloons

1. The maximum rate of climb and descent for X Series balloons is 1700 ft/min (8.5m/sec), except where the RDS is fitted, when the maximum rates of climb and descent are limited to 1000 ft/min (5 m/sec).

8.46.2.12 Rapid Deflation Systems

1. The Superchute deflation system must not be operated in flight.
2. The Q-Vent deflation system can be tested prior to take-off but the rapid deflation aspect of the system must not be operated at a height above ground level greater than 2m.

8.46.2.14 Tethered Flight

1. The LBL 48L envelope must not be tethered.

8.46.2.18 Modifications

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.

8.46.2.19 Power lines

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

8.46.2.20 Night VFR Flight

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

Table 1: Envelope Weight Limits And Volumes

Variant	Volume		Standard MTOM		Reduced MTOM		MLM		FAI Class. AX
	ft³	m³	kg	lb	kg	lb	kg	lb	
21	21 000	595	210	462	189	416	-	-	3
25	25 000	708	250	551	225	496	-	-	4
31	31 000	878	310	683	279	615	-	-	4
35	35 000	991	350	771	315	694	-	-	5
42	42 000	1189	420	925	378	833	231	508	5
48	48 000	1359	413	912	413	912	-	-	6
56	56 000	1586	560	1234	499	1100	252	554	6
60	60 000	1700	600	1322	499	1100	255	561	7
69	69 000	1954	690	1521	499	1100	276	607	7
77	77 000	2180	770	1697	499	1100	316	696	7
90	90 000	2549	900	1984	499	1100	378	833	8
105	105 000	2974	1050	2314	999	2202	452	996	8
120	120 000	3398	1200	2645	999	2202	528	1164	9
140	140 000	3965	1400	3086	999	2202	586	1291	9
150	150 000	4248	1450	3196	999	2202	652	1437	10
160	160 000	4531	1600	3527	999	2202	720	1587	10
180	180 000	5098	1630	3593	999	2202	750	1653	10
210	210 000	5947	1890	4166	1701	3750	945	2083	10
240	240 000	6797	1940	4276	1746	3849	970	2138	11
260	260 000	7363	2270	5004	2043	4503	1135	2502	11
310	310 000	8780	2700	5952	2430	5357	1350	2976	11
317	317 000	8976	2760	6084	2484	5476	1437	3168	11
330	330 000	9344	2875	6338	2699	5951	1465	3229	12
360	360 000	10194	3132	6904	2699	5951	1566	3452	12
400	400 000	11328	3400	7495	2699	5951	1700	3747	12
425	425 000	12036	3610	7958	2699	5951	1800	3968	12
450	450 000	12744	3825	8432	2699	5951	1900	4188	13
500	500 000	14158	4250	9369	3825	8432	2125	4684	13
600	600 000	16992	5100	11243	4590	10119	2550	5621	14

8.46.3 EMERGENCY PROCEDURES

No change.

8.46.4 NORMAL PROCEDURES

8.46.4.2.4 Envelope Rigging

8.46.4.2.4.4 Superchute Deflation System

8.46.4.2.4.4.1 Parachute Rigging

The positions of the six (24 gore), or seven (28 gore) centring lines are indicated by a coloured marker on the overlying tapes which align with each of the centring lines.

The rings on the ends of the centring lines are pulled towards the crown ring from the stop ring which is situated just inside the envelope next to the parachute edge tape. The rings are inserted onto the lower half of the lock, ensuring that the centring lines are not twisted around the overlying tapes. The system is locked by inserting the lower half of the lock into the upper half by pushing on the sprung-loaded centre button on the lower lock half. The system is then made safe by the addition of an arming pin which is inserted through the recessed hole situated on the top of the crown ring. The arming pin is attached to a black and yellow spiral coloured line, which runs through guides situated both on the inside of the envelope and on one of the overlying tapes.

Fitted into the arming line is an indicator flag. When the Superchute is safe, the flag sits on the outside of the parachute and is not visible from the basket. Once the arming pin is removed, by pulling on the arming line, the flag becomes visible to the pilot, indicating that the system is armed.

Pull the parachute up towards the crown ring and using the numbered tabs, align the parachute correctly and press the Velcro tabs together. This is best achieved as the envelope is inflated. Ensure that the black and yellow arming line is pulled back into the envelope during inflation to provide as much slack as possible.

8.46.4.2.4.5 Q-Vent Deflation System

8.46.4.2.4.5.1 Parachute Rigging

Ensure that the red rapid deflation line and the parachute line are pulled back into the envelope during inflation to provide as much slack as possible.

8.46.4.3 INFLATION

8.46.4.3.2 Hot Inflation

8.46.4.3.2.1 X Series Envelopes

For the X Type, with its' greater length and smaller maximum diameter, care should be taken when first turning on the burners. If the envelope has been filled with too much cold air, the burner flame can be pushed radially outwards by out-flowing cold air. This can cause burn damage to the flying wire/envelope connection in extreme conditions.

The best method for avoiding this is to turn the fan down to a lower speed setting for the start of the hot inflation.

8.46.4.3.2.2 Superchute Deflation System

If the Superchute system is fitted, it is recommended that the slack in the red operating line and the black and yellow arming line is stored under the Velcro straps on the rod covers, to prevent inadvertent operation.

8.46.4.3.2.3 Q-Vent Deflation System

Ensure that the rapid deflation line, arming line (if fitted) and the parachute line are pulled back into the envelope during inflation to provide as much slack as possible.

8.46.4.4 TAKE-OFF

8.46.4.4.1 Pre Take-Off Checks

8.46.4.4.1.5 Q-Vent Deflation System

Check the operation of the Q-Vent System by pulling the red rapid deflation line until the parachute is clear of the rim of the aperture. Release the red line, then pull on the red and white parachute line until the parachute is taut, and release the parachute line. Ensure that there is sufficient slack in the parachute line to allow it to feed into the envelope as the red rapid deflation line is pulled.

8.46.4.5 CONTROL IN FLIGHT

8.46.4.5.7 X Series Envelopes

The X Series Racer balloon has been specifically designed to move vertically through the air quickly. One consequence of this design change is that this balloon shape is much more responsive. When you first fly the balloon, it is advised that you pay close attention to your vertical speed.

8.46.4.6 LANDING

8.46.4.6.2 Touchdown

8.46.4.6.2.4 Superchute Deflation System

If the envelope is fitted with the Superchute system, it is operated after contact with the ground. Operation is achieved by first pulling the black and yellow arming line and then pulling the red line until the lock has released and the parachute has been removed from the aperture.

8.46.4.6.2.5 Q-Vent Deflation System

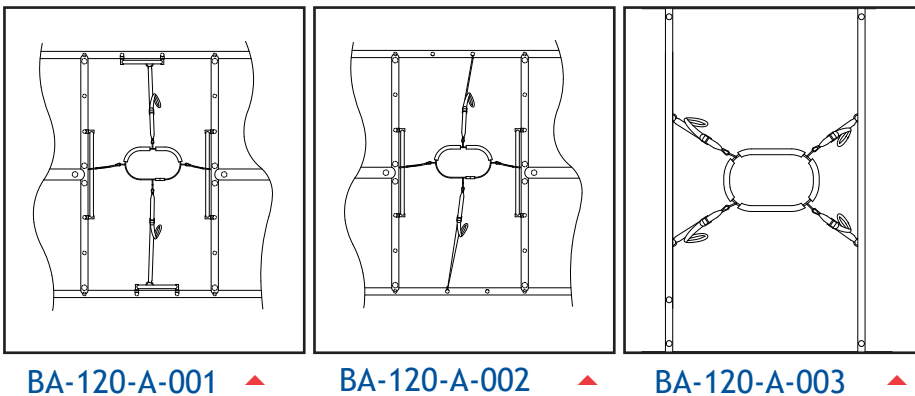
If the envelope is fitted with the Q-Vent, the rapid deflation system is operated after contact with the ground. Operation is achieved by pulling the red rapid deflation line until the parachute has been removed from the aperture.

8.46.4.7 PILOT RESTRAINT HARNESS (ALTERNATIVE DESIGN)

The LHABL 4-point pilot restraint harness (BA-120-A-001, BA-120-A-002 or BA-120-A-003) is anchored to 4 points on the basket upper frame.

The pilot restraint harness may be worn at any time, but must be worn during low level flight. Before the landing approach, the pilot should ensure that the harness is attached at a minimum of two points.

Where the Lindstrand single point restraint harness is used (BA-999-A-246), Section 4.7 of the base manual applies.



8.46.5 WEIGHT CALCULATIONS

Table 2 (additional): Total Permitted Lift (kg)

Balloon Size	Lift (lb) per 1000 cu.ft.												
	10	11	12	13	14	15	16	17	18	19	20	21	22
21	95	105	114	124	133	143	152	162	171	181	190	200	210
25	113	125	136	147	159	170	181	193	204	215	227	238	249
31	141	155	169	183	197	211	225	239	253	267	281	295	309
35	159	175	191	206	222	238	254	270	286	302	318	333	349
42	191	210	229	248	267	286	305	324	343	362	381	400	419
48	218	239	261	283	305	327	348	370	392	414	435	457	479
56	254	279	305	330	356	381	406	432	457	483	508	533	559
60	272	299	327	354	381	408	435	463	490	517	544	571	599
69	313	344	376	407	438	469	501	532	563	595	626	657	688
77	349	384	419	454	489	524	559	594	629	663	698	733	768
90	408	449	490	531	571	612	653	694	735	776	816	857	898
105	476	524	571	619	667	714	762	810	857	905	952	1000	1048
120	544	599	653	707	762	816	871	925	980	1034	1088	1143	1197
140	635	698	762	825	889	952	1016	1079	1143	1206	1270	1333	1397
150	680	748	816	884	952	1020	1088	1156	1224	1293	1361	1429	1450
160	726	798	871	943	1016	1088	1161	1234	1306	1379	1451	1524	1596
180	816	898	980	1061	1143	1224	1306	1388	1469	1551	1630	1630	1630
210	952	1048	1143	1238	1333	1429	1524	1619	1714	1810	1890	1890	1890
240	1088	1197	1306	1415	1524	1633	1741	1850	1940	1940	1940	1940	1940
260	1179	1297	1415	1533	1651	1769	1887	2005	2122	2240	2270	2270	2270
310	1406	1546	1687	1828	1968	2109	2249	2390	2531	2671	2700	2700	2700
317	1438	1581	1725	1869	2013	2156	2300	2444	2588	2732	2760	2760	2760
330	1497	1646	1796	1946	2095	2245	2395	2544	2694	2844	2875	2875	2875
360	1633	1796	1959	2122	2286	2449	2612	2776	2939	3102	3132	3132	3132
400	1814	1995	2177	2358	2540	2721	2902	3084	3265	3400	3400	3400	3400
425	1927	2120	2313	2506	2698	2891	3084	3277	3469	3610	3610	3610	3610
450	2041	2245	2449	2653	2857	3061	3265	3469	3673	3825	3825	3825	3825
500	2268	2494	2721	2948	3175	3401	3628	3855	4082	4250	4250	4250	4250
600	2721	2993	3265	3537	3810	4082	4354	4626	4898	5100	5100	5100	5100

 = Maximum Take-off Mass

Table 3 (additional): Total Permitted Lift (lb)

Balloon Size	Lift (lb) per 1000 cu.ft.												
	10	11	12	13	14	15	16	17	18	19	20	21	22
21	210	231	252	273	294	315	336	357	378	399	420	441	462
25	250	275	300	325	350	375	400	425	450	475	500	525	550
31	310	341	372	403	434	465	496	527	558	589	620	651	682
35	350	385	420	455	490	525	560	595	630	665	700	735	770
42	420	462	504	546	588	630	672	714	756	798	840	882	924
48	480	528	576	624	672	720	768	816	864	912	960	1008	1056
56	560	616	672	728	784	840	896	952	1008	1064	1120	1176	1232
60	600	660	720	780	840	900	960	1020	1080	1140	1200	1260	1320
69	690	759	828	897	966	1035	1104	1173	1242	1311	1380	1449	1518
77	770	847	924	1001	1078	1155	1232	1309	1386	1463	1540	1617	1694
90	900	990	1080	1170	1260	1350	1440	1530	1620	1710	1800	1890	1980
105	1050	1155	1260	1365	1470	1575	1680	1785	1890	1995	2100	2205	2310
120	1200	1320	1440	1560	1680	1800	1920	2040	2160	2280	2400	2520	2640
140	1400	1540	1680	1820	1960	2100	2240	2380	2520	2660	2800	2940	3080
150	1500	1650	1800	1950	2100	2250	2400	2550	2700	2850	3000	3150	3190
160	1600	1760	1920	2080	2240	2400	2560	2720	2880	3040	3200	3360	3520
180	1800	1980	2160	2340	2520	2700	2880	3060	3240	3420	3594	3594	3594
210	2100	2310	2520	2730	2940	3150	3360	3570	3780	3990	4166	4166	4166
240	2400	2640	2880	3120	3360	3600	3840	4080	4276	4276	4276	4276	4276
260	2600	2860	3120	3380	3640	3900	4160	4420	4680	4940	5004	5004	5004
310	3100	3410	3720	4030	4340	4650	4960	5270	5580	5890	5952	5952	5952
317	3170	3487	3804	4121	4438	4755	5072	5389	5706	6023	6084	6084	6084
330	3300	3630	3960	4290	4620	4950	5280	5610	5940	6270	6338	6338	6338
360	3600	3960	4320	4680	5040	5400	5760	6120	6480	6840	6904	6904	6904
400	4000	4400	4800	5200	5600	6000	6400	6800	7200	7495	7495	7495	7495
425	4250	4675	5100	5525	5950	6375	6800	7225	7650	7958	7958	7958	7958
450	4500	4950	5400	5850	6300	6750	7200	7650	8100	8432	8432	8432	8432
500	5000	5500	6000	6500	7000	7500	8000	8500	9000	9369	9369	9369	9369
600	6000	6600	7200	7800	8400	9000	9600	10200	10800	11243	11243	11243	11243

 = Maximum Take-off Mass

8.46.6 BALLOON AND SYSTEMS DESCRIPTION

8.46.6.2 Envelope

There are seven additional Lindstrand envelope types, all of which are of the conventional 'inverted teardrop' shape. Approved volumes and variants are listed in the Type Certificate Data Sheets listed in Section 1 of this supplement.

Lindstrand Types	No. of Gores	Suspension Cables	Profile
A Type	16-32	16-32	Smooth
A Type Cloudhopper	16-32	16-32	Smooth
B Type	16	16	Semi-Bulbous
C Type	12-32	12-32	Smooth
L Type	12	12	Smooth
S Type	20	20	Semi-Bulbous
X Type	24-32	24-32	Smooth

8.46.6.5.4.1 Pilot Restraint Harness

The system is comprised of a padded belt with four integral attachment points equispaced around it. The four anchorage points are either fixed or sliding rings which are part of the basket top frame. A restraining strap is attached between the belt and each basket anchor point. The straps are adjustable in length. A quick release buckle is provided on the belt to permit fast exit for the pilot.

8.46.7 BALLOON MAINTENANCE, HANDLING AND CARE

No change.

8.46.8 SUPPLEMENTS

The following supplements remain valid and must be inserted in Section 8 of the flight manual if applicable to the envelope in use.

SS-FM-Sup-01 to -40 Special Shaped Envelope Supplements

8.46.9 EQUIPMENT LIST

Table 5: Envelopes (additional)

Envelope Type	Drawing Number	Applicable Burners	Applicable Baskets
LBL21A	EA-021-A-001	A	A
LBL25A	EA-025-A-001	A	A, B
LBL31A	EA-031-A-001	A	A, B
LBL35A	EA-035-A-001	A	A, B
LBL42A	EA-042-A-001	A, B	A, B, C, D
LBL56A	EA-056-A-001	A, B	A, B, C, D
LBL60A	EA-060-A-001	A, B	A, B, C, D
LBL69A	EA-069-A-001	A, B	A, B, C, D
LBL77A	EA-077-A-001	A, B	A, B, C, D
LBL90A	EA-090-A-001	A, B	A, B, C, D, E, F, G
LBL105A	EA-105-A-001	B	A, B, C, D, E, F, G
LBL120A	EA-120-A-001	B, C	D, E, F, G
LBL140A	EA-140-A-001	B, C	G, H, I, J
LBL150A	EA-150-A-001	B, C	G, H, I, J
LBL160A	EA-160-A-001	B, C	G, H, I, J, K, L, M
LBL180A	EA-180-A-001	B, C, D	I, J, K, L, M, N
LBL210A	EA-210-A-001	B, C, D	I, J, K, L, M, N
LBL240A	EA-240-A-001	C, D	I, J, K, L, M, N
LBL260A	EA-260-A-001	C, D	I, J, K, L, M, N
LBL310A	EA-310-A-001	C, D	N, O, P, Q
LBL317A	EA-317-A-001	C, D	N, O, P, Q
LBL330A	EA-330-A-001	D	N, O, P, Q
LBL360A	EA-360-A-001	D	N, O, P, Q
LBL400A	EA-400-A-001	D	N, O, P, Q
LBL425A	EA-425-A-001	D	N, O, P, Q
LBL450A	EA-450-A-001	D	N, O, P, Q
LBL500A	EA-500-A-001	D	Q, R
LBL56B	EB-056-A-001	A, B	A, B, C, D
LBL69B	EB-069-A-001	A, B	A, B, C, D
LBL77B	EB-077-A-001	A, B	A, B, C, D
LBL90B	EB-090-A-001	A, B	A, B, C, D, E, F, G
LBL105B	EB-105-A-001	B	A, B, C, D, E, F, G
LBL400C	EC-400-A-001	D	Q
LBL500C	EC-500-A-001	D	Q, R
LBL600C	EC-600-A-001	D	R

Table 5: Envelopes (additional)

Envelope Type	Drawing Number	Applicable Burners	Applicable Baskets
LBL48L	EL-048-A-001	A, B	A, B, C
LBL210S	ES-210-A-001	B, C, D	I, J, K, L, M, N
LBL260S	ES-260-A-001	C, D	I, J, K, L, M, N
LBL317S	ES-317-A-001	C, D	N, O, P, Q
LBL60X	EX-060-A-001	A, B	A, B, C, D
LBL69X	EX-069-A-001	A, B	A, B, C, D
LBL77X	EX-077-A-001	A, B	A, B, C, D

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