B.0105

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Flight manual:

for use with the hot air balloon

Type:.....

Model: .....

Serial No.: .....

Registration: .....

Date of Issue: .....

Registered copy No.:.....

This manual [also] constitutes the FAA Approved Balloon Flight Manual for U.S. operations in accordance with FAR 21.29

Pages identified by „Appr." are approved by the FAA:

Signature:

Authority: Federal Aviation Authority

Stamp:

Original date of approval:

This balloon is to be operated in compliance with information and limitations contained herein. The Flight Manual has to be placed in the basket during flight.

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0.1 RECORD OF REVISIONS

Any revision of the present manual, except actual weighing data, must be recorded in the following table and in case of approved Sections endorsed by the responsible airworthiness authority.
The new or amended text in the revised page will be indicated by a black vertical line in the left hand margin, and the Revision No. and the date will be shown on the bottom of the page.

Rev. No.	Affected Section	Affected Pages	Date of Issue	Approval	Date of Approval	Date of Insertion	Signature

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1. GENERAL

1.1 Introduction

The Flight Manual (hereafter referred as the Manual) has been prepared to provide pilots and instructors with information for the safe and efficient operation of the manned BB and.
This manual includes the material required to be furnished to the pilot. It also contains supplemental data supplied by the balloon manufacturer.

Revisions to this Manual are published on the Kubicek Balloons web site at www.kubicekballoons.cz.

1.2 Certification Basis

BB Type balloons have been approved by the EASA in accordance with FAR Part 31, Amdt. 31-4 and 31-7 and validated by FAA.

1.3 Warnings, Cautions and Notes

The following definitions apply to Warnings, Cautions and Notes used in the Flight Manual.

WARNING:
Means that the non-observation of the corresponding procedure leads to an immediate or important degradation of the flight safety.

CAUTION:
Means that the non-observation of the corresponding procedure leads to a minor or to a more or less long term degradation of the flight safety.

NOTE:
Draws the attention on any special item not directly related to safety but which is important or unusual.

1.4 Descriptive Data

1.4.1 Envelopes

Envelope model table - technical data:

Envelope Size	Volume		Height		Equator Diameter		Gores	Mouth Diameter		Vent Aperture Diameter				Weight	
										Parachute		Smart Vent			
	[m³]	[cu ft]	[m]	[ft]	[m]	[ft]	[pc]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[kg]	[lb]
BB20GP	2000	71,000	17.9	59	15.4	51	24	3.8	13	5.0	16	-	-	90	198
BB22	2200	78,000	16.2	53	17.5	57	12	4.0	13	5.0	16	-	-	90	198
BB22N	2200	78,000	16.2	53	16.2	53	24	4.0	13	5.0	16	5.0	16	95	209
BB22Z	2200	78,000	16.2	53	16.2	53	24	4.0	13	5.0	16	5.0	16	95	209
BB26	2600	92,000	17.4	57	17.5	57	12	4.0	13	5.0	16	-	-	100	220
BB26N	2600	92,000	17.4	57	17.2	56	24	4.0	13	5.0	16	5.0	16	110	243
BB26Z	2600	92,000	17.4	57	17.2	56	24	4.0	13	5.0	16	5.0	16	110	243
BB30N	3000	106,000	18.8	62	18.4	60	24	4.0	13	5.0	16	6.0	20	120	265
BB30Z	3000	106,000	18.4	60	18.0	59	24	4.0	13	5.0	16	6.0	20	120	265
BB34Z	3400	120,000	19.3	63	18.9	62	24	4.0	13	6.0	20	6.0	20	140	309
BB37N	3700	131,000	20.0	66	19.7	65	24	4.0	13	6.0*	(20*)	6.0	20	145	320
BB37Z	3700	131,000	20.0	66	19.7	65	24	4.0	13	6.0	20	6.0	20	145	320
BB42Z	4200	148,000	20.7	68	20.3	67	24	4.5	15	6.0	20	6.4	21	155	342
BB45N	4500	159,000	21.1	69	20.7	68	24	4.5	15	6.0	20	6.4	21	160	353
BB45Z	4500	159,000	21.1	69	20.7	68	24	4.5	15	6.0	20	6.4	21	160	353
BB51Z	5100	180,000	22.1	73	21.6	71	24	4.5	15	6.0	20	6.4	21	180	397
BB60N	6000	212,000	23.6	77	22.9	75	32	4.5	15	-	-	6.4	21	205	452
BB60Z	5950	210,000	23.4	77	22.7	74	24	4.5	15	6.0	20	6.4	21	190	419
BB70Z	7000	247,000	24.6	81	24.8	81	24	5.0	16	-	-	7.0	21	220	485

* On early envelopes the vent aperture diameter is 5 m (16 ft)

NOTE:
The tabulated weights are indicative figures only. The actual weight is indicated by index plate on each envelope.

1.4.2 Baskets

Basket model table - technical data:

Basket Size	Width		Length		Height		Weight		Load Capacity		Max. No. Occupants
	[cm]	[in]	[cm]	[in]	[cm]	[in]	[kg]	[lb]	[kg]	[lb]	
K10	85±5	33±2	100 -116	39 - 46	110+5	43+2	60	132	600	1323	4
K12	116±5	46±2	116 - 126	46 - 50	110+5	43+2	80	176	700	1543	5
K12A	116±5	46±2	116 - 126	46 - 50	110+5	43+2	80	176	700	1543	5
K15	116±5	46±2	125 - 135	49 - 53	110+5	43+2	85	187	800	1764	5
K16	116±5	46±2	140 - 150	55 - 59	110+5	43+2	90	198	900	1984	6
K18	116±5	46±2	155 - 180	61 - 71	110+5	43+2	100	220	950	2094	7
K22	125±5	49±2	179 - 183	70 - 72	110+5	43+2	105	231	980	2160	8
K25P	125±5	49±2	208 - 226	82 - 89	110+5	43+2	140	309	1000	2205	9
K32T	125±5	49±2	241 - 245	95 - 96	115±5	45±2	160	353	1100	2425	10
K40Y	163±5	64±2	250 - 260	98 - 102	115±5	45±2	220	485	1200	2645	12

The basket dimensions refer to nominal outside dimensions; heights are measured from a basket floor to the basket edge.

NOTE:
The tabulated weights are an indicative figure only. The actual weight is indicated by index plate on each basket. The actual weight indicates the total weight including minimum equipment and burner rods.

1.4.3 Burners

Burner type table:

Type	Burner weight with hoses		Largest usable envelope volume	
	[kg]	[lb]	[m^3]	[cu ft]
IGNIS 2 units (K10-K18)	23	51	6000	212,000
IGNIS 2 units (K22)	24	53		
IGNIS 2 units (K25P)	26	57		
IGNIS 3 units (K25P-K32T)	41	90	7000	247,000
IGNIS 3 units (K40Y)	45	99		

NOTE:
The actual weight is pressed into the middle suspension between the burner units.

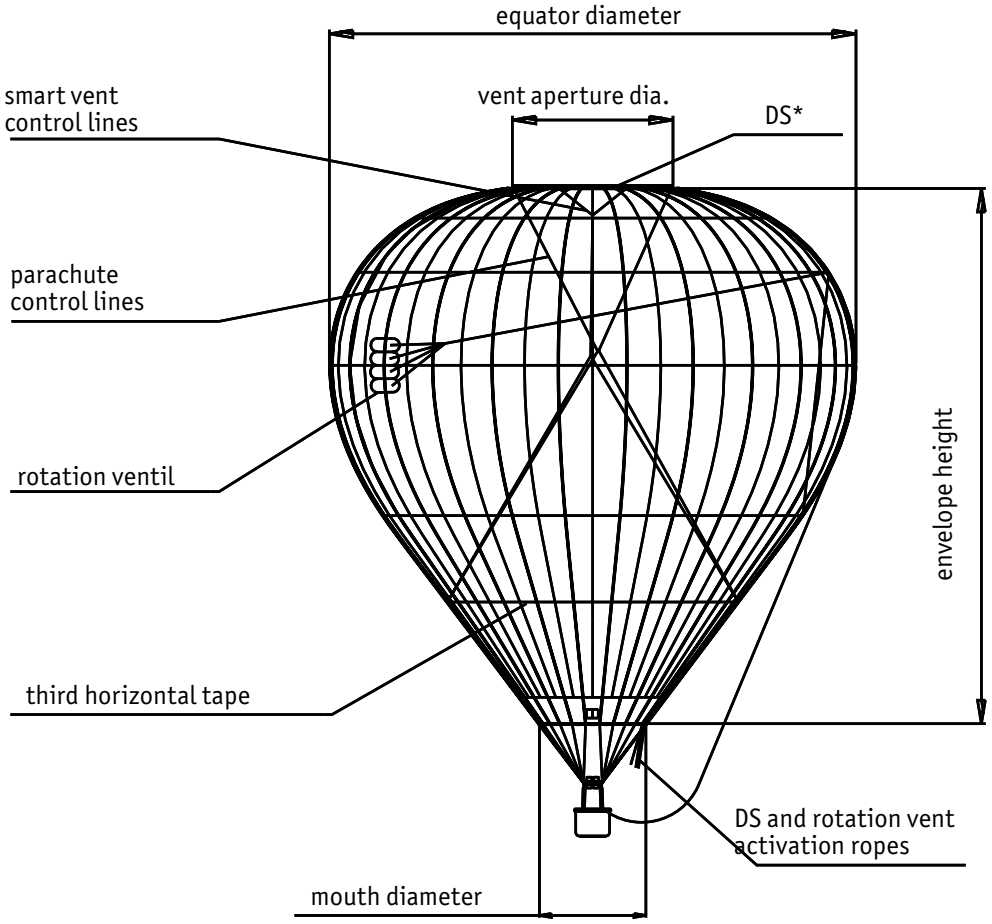
1.4.4 Fuel cylinders

For the balloons mentioned in this manual, the fuel cylinders tabulated below can be used with.

Cylinder type table:

Manufacturer	Material	Type	Volume				Confi-guration	Weight			
			Total		Usable			Empty		Full	
			[l]	[gal]	[l]	[gal]		[kg]	[lb]	[kg]	[lb]
Schroeder Fire Balloons	Stainless steel	VA 50	52.0	13.7	41.6	11.0	Master	14.9	32.9	36.1	79.6
							Standard	14.5	32.0	35.7	78.7
		VA 70	70.0	18.5	56.0	14.8	Master	18.3	40.3	48.3	106.5
							Standard	18.0	39.7	48.0	105.9
Cameron Balloons	Stainless steel	CB497	46.8	12.4	37.4	9.9	Master	15.8	34.8	34.4	75.8
							Standard	15.3	33.7	33.9	74.7
		CB599 (V20)	51.0	13.5	41.0	10.8	Master	19.6	43.2	41.0	90.4
							Standard	18.8	41.4	40.0	88.2
		CB20088 (V30 Tall)	65.0	17.2	52.0	13.7	Master	22.0	48.5	50.0	110.2
							Standard	21.2	46.7	49.0	108.0
		CB426 (30)	69.0	18.2	55.0	14.5	Master	21.7	47.8	51.0	112.4
							Standard	20.9	46.0	50.0	110.2
		CB959 (V40)	88.0	23.2	70.0	18.5	Master	25.1	55.3	62.0	136.7
							Standard	24.3	53.6	61.0	134.5
	Titanium	CB2385	51.0	13.5	41.0	10.8	Master	14.0	30.9	34.0	75.0
							Standard	13.6	30.0	33.0	72.8
		CB2387	65.0	17.2	52.0	13.7	Master	19.6	43.2	41.0	90.4
							Standard	18.8	41.4	40.0	88.2
		CB2380	69.0	18.2	55.0	14.5	Master	13.4	29.5	43.0	94.8
							Standard	12.6	27.8	42.0	92.6
		CB2383	88.0	23.2	70.0	18.5	Master	15.2	33.5	52.0	114.5
							Standard	14.4	31.8	51.0	112.4

1.5 Envelope Nomenclature



* Deflation System

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2. OPERATIONAL LIMITATIONS

2.1 Introduction

Section 2 includes operational limitations, instrument markings, and basic index plates, necessary for safe operation of the balloon, its standard systems and standard equipment.
The limitations included in this section and Section 9 have been approved by the FAA.

2.2 Meteorological Conditions

The maximum surface wind speed for free balloon take-off: 14 knots = 7.5 m/s.
The maximum surface wind speed for BB60, BB60Z balloon take-off using quick release with two attachments points on the burner frame (Y Type) : 11 knots = 6 m/s.
The maximum surface wind speed for BB70Z balloon take-off using quick release with two attachments points on the burner frame (Y Type) : 10 knots = 5.5 m/s.
The balloon should not be flown in meteorological conditions that give rise to erratic and gusty winds or in thermic conditions.

WARNING:
Flights near to ascending currents of thunderstorm clouds should be rigorously avoided. There is a risk of carrying up towards altitudes with oxygen insufficiency, very low temperature and dangerous turbulence.

The maximum surface wind speed for tethered balloon take-off and operating: **7.5 knots = 4 m/s.**

2.3 Temperatures

The maximum allowable envelope temperature depends on the fabric used above the third horizontal load tape (first one above the Nomex), and is defined as follows:

- Nylon, Polyurethane Coated Hot Air Balloons Fabric	max. 110 °C (230 F)
- Polyester, Polyurethane or Acrylic Coated Hot Air Balloons Fabric	max. 124 °C (248 F)

All these fabrics and temperatures are listed on the Envelope index plate – fabrics and maximum alowable temperatures (see 2.15). Fabrics used, above the third horizontal load tape, in a particular envelope is indicated by YES being marked against the fabric. The maximum envelope temperature is the lowest of all the fabrics used and this is indicated by YES marked against appropriate temperature.

☑ YES – this fabric is used / YES – this temperature is the max. allowable envelope temperature

☒ NO – this fabric is not used / NO – this temperature is not the max. allowable envelope temperature

CAUTION:
BB balloons up to the ser. number 211 including balloons with special shaped envelope are not equipped with this plate, however they were all built from Kubíček fabric and the maximum allowable envelope temperature is 124°C (248 F).
CAUTION:
If there is a suspicion of exceeding the 124°C (255 F) temperature (signalled by dropping of the melting link), it is necessary to do strength tests of envelope fabric (see the Maintenance Manual).

2.4 Rate of Climb and Descent

The maximum rate of climb (except BB20 GP):	**4.0 m/s (800 ft./min)**
The maximum rate of climb BB20 GP:	**6.0 m/s (1,200 ft./min)**
The maximum rate of descent:	**6.5 m/s (1,300 ft./min)**

2.5 Instrument Markings

Instrument markings and color code meaning are tabulated below.

Table of manometer indicated overpressure:

Instrument	Red Radial Line		Yellow Arc		Green Arc		Yellow Arc		Red Radial Line	
	Minimum Limit		Caution Range		Normal Operating		Caution Range		Maximum Limit	
	[bar]	[psi]	[bar]	[psi]	[bar]	[psi]	[bar]	[psi]	[bar]	[psi]
Fuel Pressure Manometer	2.8	40	2.8 - 4	40 - 60	4 -11	60 - 160	11 -12	160 - 175	12	175

2.6 Weight

The maximum take-off and minimum landing weights are tabulated below:

Envelope Size	Max Take - Off Weight		Min. Landing Weight	
	[kg]	[lb]	[kg]	[lb]
BB20 GP	730	1610	280	620
BB22	730	1610	300	660
BB22N	730	1610	300	660
BB22Z	730	1610	300	660
BB26	840	1850	340	750
BB26N	840	1850	340	750
BB26Z	840	1850	340	750
BB30N	945	2085	410	905
BB30Z	945	2085	410	905
BB34Z	1040	2295	455	1005
BB37N	1150	2535	500	1100
BB37Z	1150	2535	500	1100
BB42Z	1410	3110	630	1390
BB45N	1520	3350	670	1480
BB45Z	1520	3350	670	1480
BB51Z	1690	3725	780	1720
BB60N	1940	4275	930	2050
BB60Z	1940	4275	930	2050
BB70Z	2300	5070	1060	2335

The take-off weight in dependence on the ambient air temperature must never be higher than specified in Section 6, paragraph 6.2.
The maximum take-off weight does not have to be calculated if the balloon is to be flown below 2000 m (6,600 ft) MSL provided, with the balloon buoyant on the ground prior to take off,
the envelope temperature does not exceed + 90 °C (194 F) over a period of three minutes.

CAUTION:
The balloon must not be flown if there is a danger of exceeding the admissible take-off weight at any planned flight level.

2.7 Fuel

Approved fuel sort: G31 propane, G35 propane-butane

Max Admissible Fuel Pressure: 12 bar (175 psi)
In consideration of the pressure increasing into fuel cylinders, there is a possibility of NITROGEN technical gas use and its pressurization by means of the nitrogen pressurizing set, but the total pressure in a cylinder must not be higher than 12 bar (175 psi).

Min. Admissible Fuel Pressure: 2.8 bar (40 psi)
The min. fuel quantity required for take-off is two full cylinders, for envelopes of 4500 m^3 (159,000 cu ft) volume and higher, three full cylinders.

The gas weight in cylinders must be found out by weighing or by means of the max. fill bleed valve.

WARNING:
The fuel cylinders should not be directly exposed to sunshine or heater effect. In case of the cylinder filling above the max level and consecutive cylinder warming-up, the dangerous pressure increase and ensuing the pressure relief valve opening can occur.

NOTE:
During flights at about the upper limit of allowable fuel pressure, there is a long burner flame. It is necessary to avoid long uninterrupted heating so as not to damage parachute lines.

2.8 Operation of Deflation System (DS)

Parachute

The parachute must be closed:

- during descent with the cold balloon
- during heating
- during flying with the first indication of mouth deformation

Smart Vent, Lite Vent

Opening of the Smart Vent or Lite Vent by means of the red activation rope if the basket is higher than 2 metres (7 ft) above ground is prohibited.

2.9 Admissible Damage

Any damage of the envelope fabric below the third horizontal load tape is permitted. (for the location of the third horizontal load tape refer to paragraph 1.5).
A maximum size of an unrepaired tears or damages to the envelope fabric above the third horizontal load tape is **5 mm** (**0,2 in**).

2.10 Crew and Load

The minimum crew:	one pilot
The minimum load:	see table 2.6
The maximum occupants:	one pilot and the maximum number of of other occupants permitted according to the basket types listed in Paragraph 1.4.2
The maximum load:	the total sum of weights of all things and people in the basket, including full weights of cylinders, must not exceed the load capacity of the basket.

CAUTION:
During a solo flight (min. load) with the balloon of the max take-off weight higher than 1000 kg (2,200 lb), the low take-off weight imposes low inner overpressure in the envelope. As a result of the matter the envelope become inclined to deformations under worse weather conditions and it is more difficult to initiate the descend.

2.11 Operational Categories

VFR Day flights are permitted only.

2.12 Minimum Equipment

A range of prescribed balloon equipment must comprise for every flight:
- Altimeter
- Variometer
- Melting link for the envelope overheating check
- Fuel quantity gauge
- Two sources of ignition
- Drop line
- Fire extinguisher
- Heat-resistant cloth

The altimeter, variometer and thermometer can be replaced by a combined electronic instrument supplied with Type Approval for use in civil aviation in the manned balloon category.

CAUTION:
The melting link provides security against envelope over-heating above the permitted limit. There is the A124 melting link, which is cut-off at temperature of 124°C (225 F).

2.13 Fitment Interchangeability

The permitted scope of balloon fitment:

Envelope	BB20 GP			
Burner	IGNIS 2 units			
Basket	K10	K12	K12A	K15
Min. no. of fuel cylinders	2			

Envelope	BB22, BB22N, BB22Z			
Burner	IGNIS 2 units			
Basket	K10	K12	K12A	K15
Min. no. of fuel cylinders	2			

Envelope	BB26, BB26N, BB26Z, BB30, BB30Z					
Burner	IGNIS 2 units					
Basket	K12	K12A	K15	K16	K18	K22
Min. no. of fuel cylinders	2					

Envelope	BB34Z		
Burner	IGNIS 2 units		
Basket	K16	K18	K22
Min. no. of fuel cylinders	2		

Envelope	BB37N, BB37Z				
Burner	IGNIS 2 units				
Basket	K16	K18	K22	K25P	K232T
Min. no. fuelcylinders	2				

Envelope	BB42Z				
Burner	IGNIS 2 units, IGNIS 3 units				
Basket	K16	K18	K22	K25P	K32T
Min. no. of fuel cylinders	2				

Envelope	BB45N, BB45Z, BB51Z		
Burner	IGNIS 2 units, IGNIS 3 units		
Basket	K25P	K32T	K40Y
Min. No. of fuel cylinders	3		

Envelope	BB60N, BB60Z		
Burner	IGNIS 2 units, IGNIS 3 units		
Basket	K25P	K32T	K40Y
Min. no. of fuel cylinders	3		

Envelope	BB70Z		
Burner	IGNIS 3 units		
Basket	K25P	K32T	K40Y
Min. no. fuel cylinders	3		

NOTE:
Conditions for combination with envelopes, baskets and burners of other manufacturers are specified in the optional bulletin No. BB/22b-1.

2.14 Other Limitations

Burner
The operation of type approved balloons is permitted with burner backup only. The backup means a functional independent whisper burner as well.

Flight Level
The balloon without oxygen apparatuses and masks must not be flown at altitudes above 3050 m (10,000 ft).
Smoking
Smoking in the balloon and within 30 m (100 ft) is prohibited.

2.15 Index Plates

There are following kinds of index plates used on BB balloons.

Balloon index plate
A balloon index plate is fixed to the outside lower part of the envelope mouth.

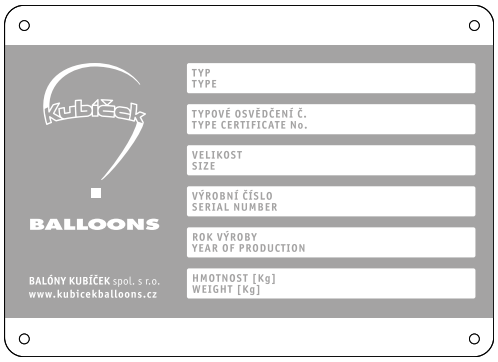
Envelope index plate
A new index plate is fixed to the outside lower part of the envelope mouth.

Basket index plate
A basket index plate is fixed inside the basket near the top rim It is identical to the envelope index plate.

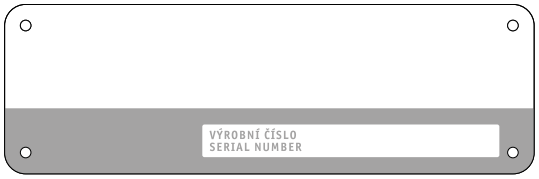
Burner index plate
The serial No. and the year of manufacture are pressed into the coils.

Envelope fabric index plate
The plate is sewed to the first horizontal tape of the envelope mouth.

Envelope and basket index plate:



Balloon index plate:



Index plate of the envelope fabric – fabric and maximum allowable temperature

Polyester, Polyurethane or Acrylic Coated Hot Air Balloons Fabric		max. 124 °C	
Nylon, Polyurethane Coated Hot Air Balloons Fabric		max. 110 °C	

NOTE:
Other index plates and labels are specified in the Maintenance Manual, related to the particular component.

3. EMERGENCY PROCEDURES

3.1 Introduction

Section 3 provides checklist and amplified procedures for coping with emergencies that may occur. The emergency situations are extremely improbable with proper pre-flight planning and properly inspected and maintained balloon. Should an emergency arise, the following guidelines are presented in this Section to be applied, in order to eliminate the collisions and resulting damage or injury.
If an emergency does occur, the pilot must ensure wind speed; his or her reaction should be quicker under stronger wind and deliberate under mild one. Fire and jumping or pitching out of a balloon are the greatest danger, and should be avoided.
The mentioned emergency procedures are valid for all makes and models of Balony Kubicek balloons covered by this Manual, as well as any allowed combinations of baskets, burners and envelopes.

3.2 Avoidance of Dangerous Obstacles

3.2.1 Contact with electric power lines

passengers .... brief people to adopt the correct position: transferred to the basket side remote from power lines, hold the internal rope handles and do not touch the cylinders or any metal parts, back to the direction to travel with head level lower than basket rim and bend knees
venting ..... venting so that any contact is with the envelope and not the flying wires or basket assembly, i.e. the balloon is not able to fly out
cylinders .... turn off cylinder fuel valves
basket exit ..... instruct the passengers when it is safe to exit the basket

3.2.2 Dangerous distance to obstacles

decision .... ensure whether the obstacles can be over-flown
passengers .... instruct people, transferred to the basket side remote from obstacles, face away from the direction to travel, hold the basket internal rope handles
venting ..... venting so as the balloon is not able to fly out after contact
basket ..... stabilise the basket position (e.g. attaching to the obstacle by means of the drop line)
basket exit ..... passengers to exit the basket on pilot's instructions

3.3 Emergency Landing

3.3.1 Fast landing

The wind speed is higher than 14 knots = 7.5 m/s.
passengers .... back to the direction to travel, hold the internal rope handles, fix objects
field .... a large sort of landing field or area protected behind a slope
descent .... gently
venting ..... open the parachute close to the ground
passengers .... instruct passengers not to leave the basket till it comes to the absolute stop

3.3.2. Heavy landing

The descent speed is higher than 8 knots = 4 m/s .

passengers .... stand with their knees together and slightly bent, hold by both hands to one internal rope handle, fix objects
fuel ..... turn off cylinder fuel valves, vent fuel hoses
information..... let the retrieve crew know about landing
passengers ..... fix or jettison free objects near by the ground, instruct passengers not to leave the basket till it comes to the absolute stop

3.3.3 DS malfunction under strong windy conditions

passengers ..... instruct people, fix objects field a large sort of landing area protected behind a slope, no electric power lines, higher trees or forest to the direction to fly
descent .... gently
passengers .... instruct passengers not to leave the basket till it comes to the absolute stop (the envelope leant on trees)

3.4 Over–Heating of Envelope – melting link dropping

heating..... reduce the amount of heat in the envelope immediately
descent..... keep gentle descent during a number of short burns, do avoid any sudden intense manoeuvres
approach..... descend immediately to altitude for a safe emergency landing to be made
landing ..... land on a suitable landing field

CAUTION:
It is necessary to do strength tests of envelope fabric after over-heating.

3.5 Failure of Main Blast Valve

3.5.1 Impossibility to turn off Main Blast Valve

valve lever..... press the lever from the lower level and at the same time turn it on right and left
cylinder ..... turn off the main valve
heating..... heat by means of the second burner or cylinder valve
landing ..... land as soon as possible

3.5.2 Fuel supply freezing

cylinder ..... connect another cylinder and try the burner
main valve..... heat the main valve by means of lighter
landing ..... heavy landing preparations

3.6 Burner Failure

cylinder ..... check of fuel, quantity/pressure, hose connection and the cylinder valve
heating..... heat by means of the second burner or the liquid fire/whisper burner valve
landing ..... land as soon as possible

3.7 Pilot Burner Failure

burner ..... ignite the flight burner for a short time
match-box..... re-light the pilot light using matches after turning off the blast valve of the flight burner
flame..... keep a small flame on the liquid fire/whisper burner valve or on jets of the flight burner
repairs..... repair defects and their reason

NOTE:
Main causes of the light failure are low gas pressure at the regulator, air turbulence, fuel shortage in cylinders, jet block and dropping off of pilot hose endings on the cylinder.

3.8 Fire

3.8.1 Propane in-flight fire

cylinders .... turn off source of propane at cylinders
hoses .... blow off gas from burner hoses
stop burning ..... put out the fire by means of the nomex heat-resistant cloth or operate the fire extinguisher landing land as soon as possible
passengers ..... prevent anybody from abandoning the basket till the moment of making sure that the balloon will not become airborne

CAUTION:
The fire extinguisher operates only for several seconds.
The fire extinguisher must be used in the vertical position.

3.8.2 Propane ground fire

cylinders..... turn off the source of propane with the cylinder valve
hoses..... blow off gas from burner hoses
stop burning..... put out the fire by means of the nomex cloth or operate the fire extinguisher
escape ..... abandon the basket in order to achieve the safe distance – more than 30 m (100 ft)

WARNING:
If extinguishing is not successful and gas temperature increases dangerously in cylinders, then evacuate all people to a safe area, as there is a strong risk of cylinder explosion.

3.9 Envelope Damage

heating..... supply overpressure in the envelope with a number of short burns
descent..... keep gentle descent
approach..... descend immediately to the altitude of safe landing

3.10 Other Emergency Procedures

Not applicable

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4. NORMAL PROCEDURES

4.1 Introduction

Section 4 provides checklist and amplified procedures for the conduct of normal operation. Normal procedures associated with optional systems can be found in Section 9.
The mentioned procedures are valid for all makes and models of Balony Kubicek balloons covered by this Manual, as well as any allowed combinations of baskets, burners and envelopes.

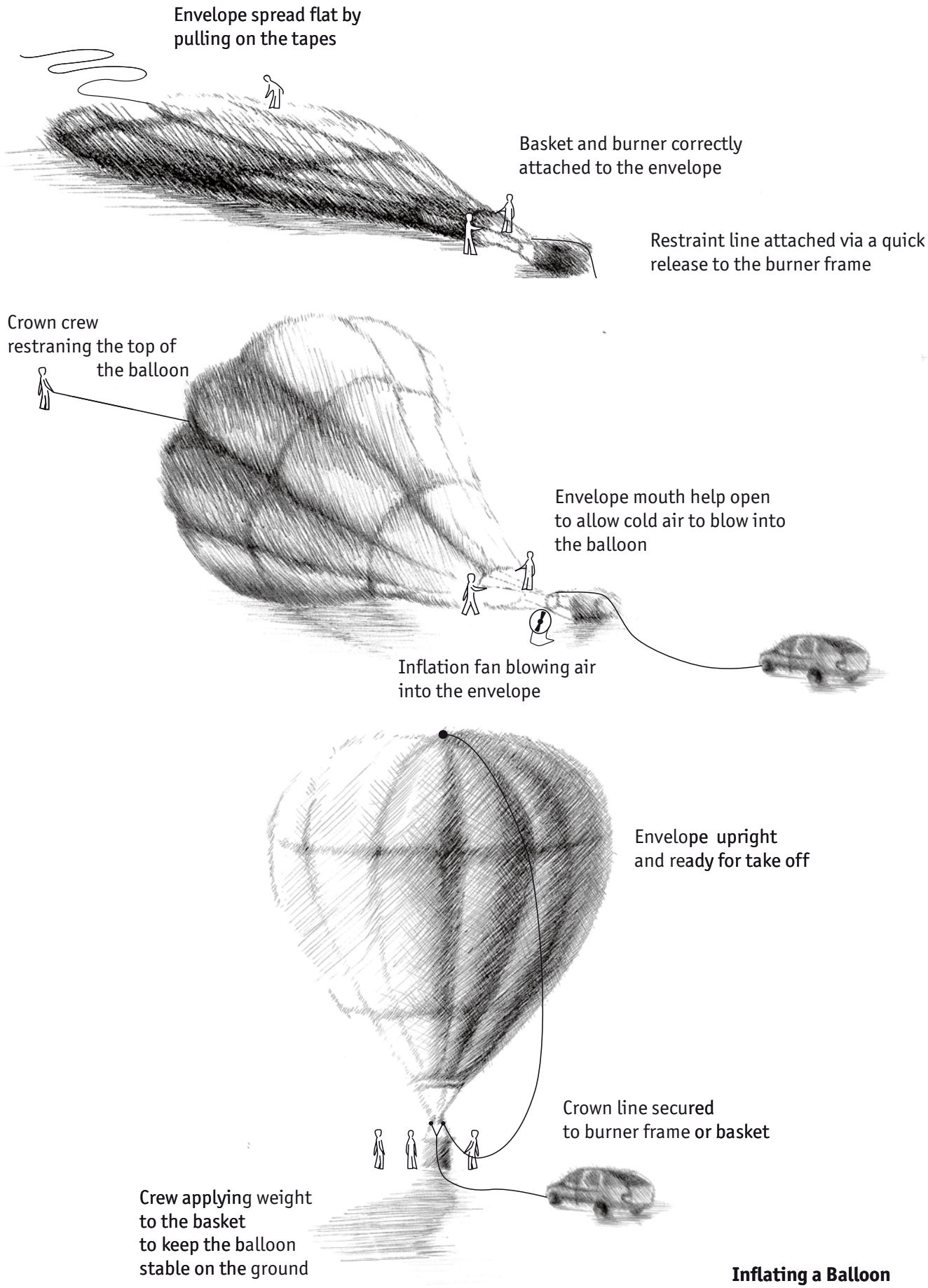
4.2 Assembly of Balloon and Pre Take-Off Checks

4.2.1 Balloon preparation:

Pull the envelope from carrying bag, roll up and spread it on a grassy field or launching canvas with the mouth against the wind. Fully deploy the crown line downwind and close the used deflation system (DS).
Place the basket about 3 meters (10 ft) in front of the envelope mouth. Strap fuel cylinders into the basket. On the swivel-mounted frame or by means of flexible changeable rods, lift and set the burner to the basket. Attach the load-bearing basket cables by carabiners to the burner frame. Connect supply hoses to cylinders; the burner hoses should be fastened so that the vapour phase supply cylinders will be spent as the last ones. Rod covers are fitted over the basket cables and the flexible rods or swivel- mounted frame, to provide protection. Enclose burner hoses inside the covers, equipped with zips and velcro tapes, and ensure that the hoses have sufficient slack at the top to allow the burner gimbal and all fuel cylinders will be available and within reach in the basket for case of changing fuel supply during flight.
Light the burner and check its correct assembly and operating. Instruments and accessories are fixed to the rod covers or inner basket side. Equipment and ballast should be attached to the inner basket side. Lay the basket over on to its side with burners pointing downwind, i.e. towards the envelope mouth, and manometers and the crossover valve control facing upwards. Lock the flying wire carabiners to the basket ones correctly orientated and screw their gates. Tether the basket to a strong anchoring point through envelope carabiners (see Section 4.3.5).
Spread out the mouth and tighten the downside. Fix the envelope scoop, control ropes and tapes to the lower burner frame side. Draw the temperature wire (if used) out of the envelope and connect it to the thermometer.
Position the fan near by the basket and secure it. You can begin to cold inflate the envelope after the fan starting up.

WARNING:
All cylinders and heavier objects should be fixed by means of prescribed straps or tapes and fastened in order not to be slackened during landing and cause any injury.
Attaching of objects (except textile banners, a transmitting aerial or envelope bag) on the outer basket side is prohibited.

NOTE:
If the balloon is fitted with a variable height burner frame then, before hot inflation, the burner unit must be locked in the down position. Once the balloon is inflated the burner unit may be moved to the most suitable height. When in the upper position the lateral movement of the burners is slightly restricted.



Inflating a Balloon

4.2.2 Pre take-off checks

Inspect the following:

documents ..... an airworthiness certificate, a certificate of registration, and any limitations, a balloon flight manual supplied with up to date AD's and Service Bulletins, a certificate of the fuel cylinders and a certificate of burner, basket and fuel cylinders in case the bottom end from another manufacturer is used

basket ..... assembly of load-bearing cables and wires to the burner frame and envelope, floor and basket wall condition, assembly correctness of the frame, rod cover fitting, slack allow the burner gimbal

cylinders ..... cylinder strapping in the basket, correctness and tightness of hose connection, accessible valves and fuel quantity, if there any doubts, check the used cylinder qualification in accordance with their certificates or on the index plate

equipment, instruments and accessories ..... function and installation of altimeter, variometer and thermometer, presence of matches (two sources of ignition), drop line, first aid kit, fire extinguisher and heat-resistant cloth

burners ..... assembly and tightness of complete burner unit, burner lighting, fuel pressure during heating, flame shape and dimension, function of flight, whisper and pilot burners, burner mobility

envelope securing .. envelope position, ensure that the wires connected to each carabiner are not twisted, crossed or kinked, carabiners closed and gates screwed shut

rope securing ..... strong enough securing of DS and rotation vent activation ropes, their availability from the basket

mouth load tape ..... observe whether connections of load tapes and flying wires at the envelope mouth are not damaged by fire

fabric ..... free from visible damage by heat

crown ring ..... no damage, the crown line is properly fixed and no damage to tape attaching

Observe entering the envelope after the cold inflation:

fabric damage ..... envelope fabric free from visible damage, holes or tears above the third horizontal load tape

vent hole closing .... velcro tabs matted (DS sealed) securing and rip locks secured

DS and rotation vent activation ropes ..... condition and fixing of DS activation ropes, theirs sufficient slack in pulleys, no tangles or twists

equipment ..... no kink or damage to melting link, clear line of the thermometer wire and the temperature indicator is at the right place in the envelope

DS and rotation vent lines ..... vent lines are not interrupted or tangled

CAUTION:
Fuel weight in cylinders must be found out by means of weighing or a max fill bleed valve.
The temperature sensor must be placed in the same distance from the envelope skin as the melting link.

WARNING:
NO FLIGHT IS PERMITTED during any fuel leakage out of the fuel system.

4.3 Normal Procedures

4.3.1 Decision-making about flight

weather ..... do not fly in thermals, turbulence or in the strong wind
launch site ..... protected, without obstacles
weight ..... the admissible take-off weight will not have to be exceeded
fuel ..... minimum is two full cylinders, for envelope above 4500 m^3 – min. three cylinders
landing ..... if you keep the above mentioned rules concerning current conditions of the weather, launch site, weight and fuel, you will be able to land safely

CAUTION:
NO FLIGHT IS PERMITTED if there is a suspicion that the wind speed during the flight exceeds limitations. Never attempt a balloon flight around thunderstorm activity, ahead of approaching frontal systems, or near severe weather of any kind (turbulence, thermic or wave currents etc.).

4.3.2 Inflation procedures

crew ..... briefed
tethering ..... safe balloon tethering
fan ..... cold inflation
heating ..... short bursts of heat to envelope
envelope lifting ..... put the basket in vertical position
heating up ..... heat up carefully

CAUTION:
Before hot inflating, the crown line crew should be instructed about their tasks (to prevent envelope from lifting during the cold inflation stage and from moving side to side), protection against line catching (hold the end of the crown line, not to wrap it around themselves, as this can cause severe injury if a gust wind hits the balloon), procedures in case of impossibility to keep the line (RELEASE the line IMMEDIATELY!!) and procedures after envelope standing upright (tied off the line to the basket). The crown line and envelope mouth crews should be equipped with leather gloves.

NOTE:
The aim is to keep the envelope mouth as open as possible by two crew members during inflating. It is recommended to begin heating after full cold inflation in order to prevent the envelope from lifting up with only a small amount of heated air inside. Keep the flying wires away from the burner flame.

4.3.3 Pre take-off steps

ignition sources ..... within pilot's easy reach
instruments ..... altimeter set, thermometer works
vent hole ..... closed, no damage to rip locks and securing, function test of return system (opening and closing)
carabiners ..... not twisted or crossed
people ..... passengers briefed and in the basket, ground crew has got keys of retrieve vehicle, retrieve number established, non-briefed people are in safe distance - away from the basket

4.3.4 Take-off

balance ..... the basket balanced
take-off ..... ground crews are "hands off ", released everything and are not entangled with the balloon rigging, quick release undone, heating as needed
basket check..... no person or free object is outside the basket
climbing..... obstacles will be overflown in a safe distance

CAUTION:
During taking-off or any obstacle overflying, the pilot has to take into consideration especially the wind direction and speed.

NOTE:
The wind shelter behind low objects is not suitable because the upper envelope part would be knocked down with the wind.
- *When conditions are windy special care is necessary on take-off and we must contemplate a tethered flight that means that the balloon must be always tied to a sufficiently firm and stationary anchoring point by means of a restraining device object. Never built up excess lift before leaving the ground only by using crew holding the basket (see Section 4.3.5).*
- *During climbing it is necessary to heat in the way to eliminate the possibility of the pilot light failure due to the wind cut effect after flying up from the wind shelter zone. During climbing the envelope, deformation and partial loss in lifting force must be take into account*

NOTE:
If the wind speed is stronger (more than 6 knots = 3.2 m/s), it is recommended to find a launch place protected from the wind as much as possible.

4.3.5 Take-off by using quick release

Take-off can be performed by means of the ensuring restraining devices:
- Bonnano quick release
- quick release supplied by the balloon manufacturer

Take - off by using the quick release can be only realized under the conditions:
- The Bonnano quick release can be applied in the range of all balloons mentioned in this Flight Manual.
- The quick release supplied by the manufacturer can utilise the envelopes up to max. volume of 2200 m^3 (78,000 cu ft).
- The rope/tape of the quick release should be connected to the uppermost envelope carabiners or the separate restraint lugs of the burner frame (if fitted) on the wider basket side by means of the two carabiners with closed gates and locked up.
- The rope length of the quick release should have sufficient slack in attaching point to the burner frame. Simultaneously this has to be of appropriate length for the pilot's easy release of the restrain device without any further rope or line.
- Strength of the restraining rope and the rope of the Bonnano quick release have to be min 29 kN (6,500 Lbf).
- Strength of the restraining rope and the rope of the quick release produced by the manufacturer have to be min. 15 kN (3400 Lbf).
- The restraining rope must be properly fixed to a sufficiently firm and stationary anchoring point and stretched out along the whole length.
- The restraining rope should not be made of a stretchy material so that the ground crew or any properties will be protect from its or the quick release recoiling, shooting up or falling towards the anchoring point caused to happen any injury or damage.
- The length of the restraining rope should be adequately modified according to the balloon size, weather conditions and launch field nature.
- When take-off is imminent, the final release should be made when the quick release is as loaded as possible and

the envelope air has to be sufficiently heated up. For this reason, the balloon should not touch the land right off after releasing the restraining device. The optimal situation arises out of the condition of the balloon with the restraining rope of approximately 7 m (23 ft) and the balloon hovered about 1 m (3 ft) above ground level.

- During the releasing procedure, the securing pin is withdrawn ready for the final release. After the last visual check of the people near by the basket, the final release of the restraining device should be performed by the pilot.
- The quick release must be unfastened from the burner frame and securely stored in the basket so that any personal injury can not occur while airborne.

Take-off by using quick release

tethering ..... restraining rope fasten and stretch properly, carabiners of the quick release with closed gates and secured
envelope ..... inflated and lifted
passengers ..... in the basket
ground crew/people near by the basket .. protection against the restraining rope or basket catching that can caused severe injury or fatal lifting up from the ground
heating up..... short burst of heat to envelope till the take-off mode
securing pin ..... withdrawn
check..... ground crew in a safe distance from the basket and warned imminently before the balloon release
quick release ..... undone
flight..... unlock the carabiners of the quick release from the burner frame, the quick release should be stored securely in the basket

4.3.6 Flight

burner ..... run only one cylinder down so that there are two cylinders of min 20 % fuel capacity for landing, flame check
temperature ..... melting link in place, temperature below limitations
envelope ..... mouth opened, DS closed, envelope sufficiently pressurised

4.3.7 Changing fuel cylinders

altitude .... the balloon is forced to climb and manipulation with cylinders begins at sufficient altitude
preparation... ..... start heating by means of the second burner, close the liquid valve on the spent cylinder, open the burner blast valve to vent fuel from the liquid hose (the rest of gas will be burnt up)
screw joint ..... disconnect the connector on the liquid hose and transfer to the full cylinder, open the liquid valve on the new cylinder and read fuel pressure, check the joint tightness
test ..... test the burner and its operation, do remember the time of changing cylinders

4.3.8 Approach

information..... inform retrieve crews about landing
passengers and objects ..... hold internal rope handles – hands in the basket, objects fixed
basket ..... by means of the rotation vent, turn the balloon with the longer basket side to the flight direction
burners..... both burners are supplied with sufficient fuel and OK
venting..... available activation ropes and not tangled or kinked
landing site..... free of electric power lines, obstructions or people on the ground
stabilization..... horizontal flight at the min flight level

4.3.9 Landing

descend ..... towards the level of 1 m (3 ft) above the ground
fuel ..... turn off the pilot lights
passengers ..... briefed for type of landing
venting ..... just close by the ground (immediately before touchdown)
basket movement ... check on people
pilot burners ..... check that pilot burners is turned off
basket leaving ..... instruction for leaving the basket

NOTE:
If the balloons land in calm, it is suitable to cool down the burner coil by means of not ignited gas so that the envelope fabric will be prevent from burning-up during a fall on a burner.

4.3.10 Post landing steps

cylinders ..... turn off valves on cylinders
burner ..... all flames put out
envelope ..... deflated safely
retrieve crew ..... informed

4.3.11 Tethered flight

Balloon tethering – a balloon should be tethered by means of two ropes:

The main rope with constant length and anchored on the basket windward side at two envelope carabiners (not basket carabiners) and firmly attached to strong points on the ground.

The handling rope with variable length that serviced as balloon landing guidance and ensured balloon stable position during changes of the wind directions. The handling rope should be held by a sufficient number of briefed team.

Take-off of tethered balloons

tethering ..... attaching points of ropes and rope conditions checked
ground rope team ... lines cannot snap taut and injure anybody on the ground or carry anybody up
temperature ..... admissible envelope temperature is not exceeded
climbing..... up to 1 m/s (2 knots), especially before rope tensioning

4.3.12 Dropping of parachutists

clean exit ..... ensure clean exit for the parachutists so that neither fuel, crown or control ropes nor balloon equipment (thermometer wire) is snagged as he or she leaves
area check ..... the area under the basket is free
preparation and instruction for dropping ..... tell the parachutist to sit on the basket edge for wards, holding the burner support system, and exit on pilot's instruction

NOTE:
Parachutists leave the basket individually. Another one can exit the basket at the moment when the admissible climbing is secured not to exceed by means of basket unloading.
The instruction for dropping parachutists can be only given by the pilot so that unexpected climbing or a threat to the air traffic area under the balloon can be eliminated.
The take off weight and number of dropped parachutists depend on the envelope size. Furthermore, all the other applicable national aviation regulations must be kept.

5. PERFORMANCE

5.1 Introduction

Section 5 provides approved data for performance during ascent and descent, take-off and non-approved additional information.
The data in the charts has been computed from realized flight tests with the balloons in good conditions and using average piloting techniques.

5.2 Approved data

5.2.1 Climb and descent

Balloon Type	Max Climb		Height after 60-s Climb		Max Descent		Distance To Max Descent		Distance To Stop Descent	
	[m/s]	[ft/min]	[m]	[ft]	[m/s]	[ft/min]	[m]	[ft]	[m]	[ft]
all BB except BB20 GP	4.0	800	95*	310	6.5	1,300	450	1,480	450	1,480
BB20 GP	6.0	1,200	135	440	6.5	1,300	490	1,610	250	820

* The min attainable height for all sizes of BB balloon envelopes.

5.3 Non-approved data

5.3.1 Consumption, endurance

Fuel consumption depends on the temperature in the envelope, load, ambient temperature, manoeuvring and flight level. Regarding earlier envelopes, there is a higher consumption caused by higher fabric air permeability.

Envelope Size	Consumption under 100 °C (212 F)		Endurance for 1 cylinder of 30 kg (66 lb) [min.]	Endurance for 1 cylinder of 20 kg (44 lb) [min.]
	[kg/flight hour]	[lb/flight hour]		
BB20 GP	36 - 44	79 - 97	41 - 50	27 - 33
BB22	32 - 40	71 - 88	45 - 56	30 - 38
BB22N	32 - 40	71 - 88	45 - 56	30 - 38
BB22Z	32 - 40	71 - 88	45 - 56	30 - 38
BB26	34 - 42	75 - 93	43 - 53	29 - 35
BB26N	34 - 42	75 - 93	43 - 53	29 - 35
BB26Z	34 - 42	75 - 93	43 - 53	29 - 35
BB30N	36 - 45	79 - 99	40 - 50	27 - 33
BB30Z	36 - 45	79 - 99	40 - 50	27 - 33
BB34Z	37 - 47	82 - 104	38 - 49	26 - 32
BB37N	38 - 50	84 - 110	36 - 47	24 - 32
BB37Z	38 - 50	84 - 110	36 - 47	24 - 32
BB42Z	45 - 55	99 - 121	33 - 40	22 - 27
BB45N	45 - 60	99 - 132	30 - 40	20 - 27
BB45Z	45 - 60	99 - 132	30 - 40	20 - 27
BB51Z	50 - 65	110 - 143	28 - 36	18 - 24
BB60N	55 - 70	121 - 154	26 - 33	17 - 22
BB60Z	55 - 70	121 - 154	26 - 33	17 - 22
BB70Z	80 - 100	176 - 220	18 - 22	12 - 15

NOTE:
The tabulated values of consumption and endurance are indicative figures only. Listing 30 kg and 20 kg cylinders does not restrict the operator to use only this size. For the list of suitable fuel cylinder refer to paragraph 1.4.4.

5.3.2. Ceiling

Balloon ceiling is limited by the envelope temperature and burner function.
- Burner putting out due to oxygen insufficiency was proved at levels higher than 23 000 ft ALT.

6. WEIGHT

6.1 Introduction

This Section provides a range of balloon loading under which the balloon should operate with respect to the ambient air temperature.

6.2 Admissible Weight

The gross (all up) lift must be calculated by using the tables below. Find the admissible gross lift per 1000 m^3 (35,310 cu ft) and multiply it by the Volume Multiplication Factor according to the table below. Furthermore, you should compare the result with the current actual balloon weight (see the sample calculations below).
In case the actual mass of each occupant is known it should be taken into account. Otherwise the 77-kg (170 lb) mass for each occupant can be considered.

Envelope size	Volume Multiplication Factor
BB20GP	2.0
BB22, BB22N, BB22Z	2.2
BB26, BB26N, BB26Z	2.6
BB30N, BB30Z	3.0
BB34Z	3,4

Envelope size	Volume Multiplication Factor
BB37N, BB37Z	3.7
BB42Z	4.2
BB45N, BB45Z	4.5
BB51Z	5.1
BB60N, BB60Z	6.0
BB70	7.0

The ambient air temperature at expected flight altitude could be determined either by taking the air temperature at take-off and converting it according to the ISA conditions (the temperature falls about 0.65 °C per each 100 m = 33 F per each 3,300 ft) or in compliance with the data obtained from a meteorological station.
No estimate of balloon part weights is permitted. The actual weight (empty weight in case of the fuel cylinder) of each balloon part is quoted on its index plate or pressed on the middle suspension in case of the burner.

CAUTION:
For calculating the maximum gross lift, no tables must be used where the internal envelope temperature exceeds the maximum allowable envelope temperature (see 2.3). The recommended standard table is the "100 °C" (212 F) table. This results in a reduced load, but will allow for a longer lifetime of the envelope.

Sample check calculation of the BB30N balloon loading:

Parameters..... 3050 m (10,000 ft) - maximum expected flight altitude
100 °C (212 F) - temperature in the envelope
10 °C (50 F) - ambient temperature at the height of 3050 m
Table ..... 182 kg (400 lb) - admissible gross lift per 1000 m^3 (35,310 cu ft)and for the parameters
Gross Lift ..... 182 x 3 = 546 kg (1,200 lb)-admissible gross lift at 3050 m (10,000 ft) and for the conditions
Take Off Weight..... envelope + basket + burner + cylinders + people + equipment + instruments + advertisements + ballast = 540 kg (1,190 lb) of the balloon weight
Check ..... **546 > 540**; the flight can be realized up to the height of 3050 m (10,000 ft)

CAUTION:
Regardless of the calculated gross lift of the balloon, the total pre take-off weight of the balloon must not be higher than the max take-off weight (see Section 2.6).

NOTE:
It is also necessary to check load at the warmest flight level if there is a strong inversion condition.

The gross lift per **1000 m³** (35,310 cu ft) in kilograms (lb) at an internal envelope temperature of **100°C (212 F)**

Ambient Temp.		Altitude, altimeter set at 1013 hPa (150 psi)																	
		600 m 2,000 ft		1200 m 3,900 ft		1850 m 6,100 ft		2450 m 8,000 ft		3050 m 10,000 ft		3650 m 12,000 ft		4250 m 14,000 ft		4900 m 16,000 ft		5500 m 18,000 ft	
[°C]	[F]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]
-35	-31	457	1008	427	941	396	873	370	816	347	765	324	714	304	670	284	626	266	586
-30	-22	429	946	401	884	372	820	348	767	325	717	305	672	285	628	266	586	250	551
-25	-13	402	886	375	827	349	769	326	719	305	672	285	628	268	591	250	551	234	516
-20	-4	377	831	351	774	326	719	305	672	285	628	267	589	250	551	233	514	219	483
-15	5	352	776	328	723	305	672	285	628	266	586	249	549	234	516	218	481	205	452
-10	14	328	723	306	675	284	626	265	584	248	547	232	512	218	481	203	448	191	421
-5	23	305	672	284	626	264	582	247	545	231	509	216	476	203	448	189	417	177	390
0	32	283	624	264	582	245	540	229	505	214	472	200	441	188	415	175	386	164	362
5	41	261	575	244	538	226	498	211	462	198	437	185	408	174	284	162	357	152	335
10	50	240	529	224	494	208	459	198	437	182	401	171	377	160	353	149	328	140	309
15	59	221	487	206	454	191	421	179	395	167	368	156	344	147	324	137	302	128	282
20	68	201	443	188	415	174	384	163	359	153	337	143	315	134	295	125	276	117	258
25	77	183	403	170	375	158	348	148	326	138	304	130	287	121	267	113	249	106	234
30	86	165	364	154	340	143	315	133	293	125	276	117	258	110	243	102	225	96	212
35	95	147	324	137	302	128	282	119	262	112	247	104	229	98	216	91	201	86	190

The gross lift per **1000 m³** (35,310 cu ft) in kilograms (lb) at an internal envelope temperature of **110°C (230 F)**

Ambient Temp.		Altitude, altimeter set at 1013 hPa (150 psi)																	
		600 m 2,000 ft		1200 m 3,900 ft		1850 m 6,100 ft		2450 m 8,000 ft		3050 m 10,000 ft		3650 m 12,000 ft		4250 m 14,000 ft		4900 m 16,000 ft		5500 m 18,000 ft	
[°C]	[F]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]
-35	-31	478	1054	446	983	415	915	387	853	363	800	339	747	318	701	297	655	279	615
-30	-22	450	992	420	926	390	860	365	805	341	752	320	705	299	659	279	615	262	578
-25	-13	423	933	395	871	367	809	343	756	321	708	300	661	281	620	263	580	246	542
-20	-4	398	877	371	818	344	758	322	710	301	664	282	622	264	582	247	545	231	509
-15	5	373	822	348	767	323	712	302	666	282	622	264	582	248	547	231	509	217	478
-10	14	349	769	325	717	302	666	282	622	264	582	247	545	232	512	216	476	203	448
-5	23	326	719	304	670	282	622	264	582	247	545	231	509	217	477	202	445	190	419
0	32	304	670	283	624	263	580	246	542	230	507	215	474	202	445	188	415	177	390
5	41	282	622	263	580	244	538	228	503	214	472	200	441	188	415	175	386	164	362
10	50	261	575	244	538	227	500	212	467	198	437	185	408	174	384	162	357	152	335
15	59	242	534	225	496	209	461	196	432	183	403	171	377	161	355	150	331	141	311
20	68	222	489	207	456	193	425	180	397	168	370	158	348	148	326	138	304	129	284
25	77	204	450	190	419	176	388	165	364	154	340	145	320	135	298	126	278	119	262
30	86	186	410	173	381	161	355	150	331	141	311	132	291	123	271	115	254	108	238
35	95	168	370	157	346	146	322	136	300	128	282	119	262	112	247	104	229	98	216

The gross lift per **1000 m³** (35,310 cu ft) in kilograms (lb) at an internal envelope temperature of **120°C (248 F)**

Ambient Temp.		**Altitude , altimeter set at 1013 hPa (150 psi)**																	
		600 m 2,000 ft		1200 m 3,900 ft		1850 m 6,100 ft		2450 m 8,000 ft		3050 m 10,000 ft		3650 m 12,000 ft		4250 m 14,000 ft		4900 m 16,000 ft		5500 m 18,000 ft	
[°C]	[F]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]
-35	-31	499	1100	465	1025	432	952	404	891	378	833	354	780	331	730	309	681	290	639
-30	-22	470	1036	439	968	408	899	381	840	356	785	334	736	313	690	292	644	274	604
-25	-13	444	979	414	913	384	847	359	791	336	741	315	695	295	650	275	606	258	569
-20	-4	418	922	390	860	362	798	338	745	316	697	296	653	278	613	259	571	243	536
-15	5	393	866	366	807	340	750	318	701	298	657	279	615	261	575	244	538	229	505
-10	14	369	814	344	758	320	705	299	659	279	615	262	578	245	540	229	505	215	474
-5	23	346	763	323	712	300	661	280	617	262	578	245	540	230	507	214	472	201	443
0	32	324	714	302	666	280	617	262	578	245	540	230	507	215	474	201	443	188	415
5	41	302	666	282	622	262	578	245	540	229	505	214	472	201	443	187	412	176	388
10	50	282	622	263	580	244	538	228	508	213	470	200	441	187	412	175	386	164	362
15	59	262	578	244	538	227	500	212	467	198	437	186	410	174	384	162	357	152	335
20	68	242	534	226	498	210	463	196	432	184	406	172	379	161	355	150	331	141	311
25	77	224	494	209	461	194	428	181	399	170	375	159	351	149	328	139	306	130	287
30	86	206	454	192	423	178	392	167	368	156	344	146	322	137	302	128	282	120	265
35	95	188	415	176	388	163	359	153	337	143	315	134	295	125	276	117	258	110	243

The gross lift per **1000 m³** (35,310 cu ft) in kilograms (lb) at an internal envelope temperature of **124°C (255 F)**

Ambient Temp.		**Altitude , altimeter set at 1013 hPa (150 psi)**																	
		600 m 2,000 ft		1200 m 3,900 ft		1850 m 6,100 ft		2450 m 8,000 ft		3050 m 10,000 ft		3650 m 12,000 ft		4250 m 14,000 ft		4900 m 16,000 ft		5500 m 18,000 ft	
[°C]	[F]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]
-35	-31	506	1116	472	1041	439	968	410	904	384	847	359	792	337	743	314	692	295	650
-30	-22	478	1054	446	983	414	913	387	853	362	798	339	747	318	701	297	655	278	613
-25	-13	451	994	421	928	391	862	365	805	342	754	320	706	300	661	280	617	263	580
-20	-4	425	937	397	875	369	814	345	761	322	710	302	666	283	624	264	582	248	547
-15	5	401	884	374	825	347	765	324	714	303	668	284	626	266	586	248	547	233	514
-10	14	377	831	351	774	326	719	305	672	285	628	267	589	255	551	234	516	219	483
-5	23	354	780	330	728	306	675	286	631	268	591	251	553	235	518	219	483	206	454
0	32	331	730	309	681	287	633	268	591	251	553	235	518	220	485	206	454	193	426
5	41	310	683	289	637	269	593	251	553	235	518	220	485	206	454	192	423	180	397
10	50	289	637	270	595	251	553	234	516	219	483	205	452	192	423	179	395	168	370
15	59	269	593	251	553	233	514	218	481	204	450	191	421	179	395	167	368	157	346
20	68	250	551	233	514	217	478	203	448	190	419	177	390	166	366	155	342	146	322
25	77	232	512	216	476	201	443	188	415	175	386	164	362	154	340	144	318	135	298
30	86	214	472	199	439	185	408	173	381	162	357	152	335	142	313	132	291	124	273
35	95	196	432	183	403	170	375	159	351	149	329	139	306	130	287	122	269	114	251

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7. DESCRIPTION OF BALLOON & UNITS

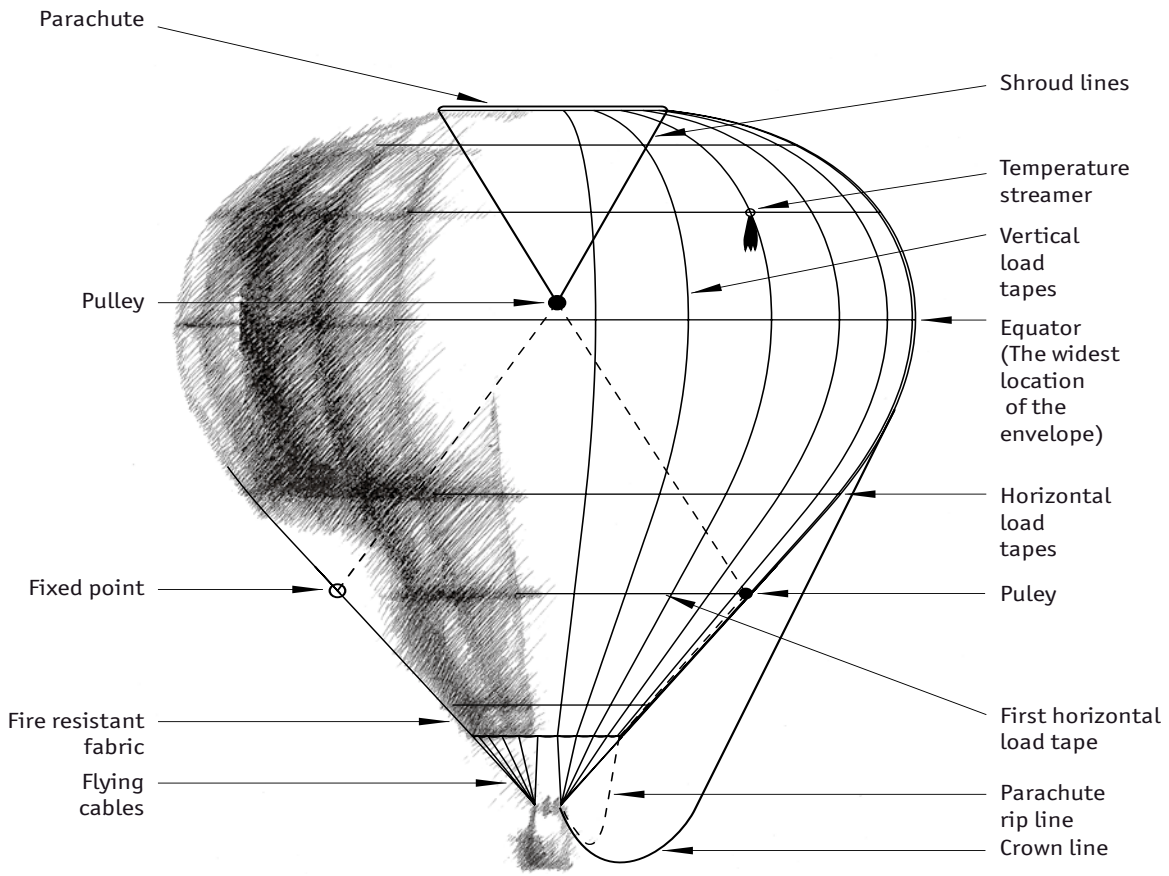
7.1 Introduction

This Section provides description and operation of the balloon and its systems. Refer to Section 9, Supplements for details of optional systems and equipment.

7.2 Balloon Description

7.2.1 Envelope

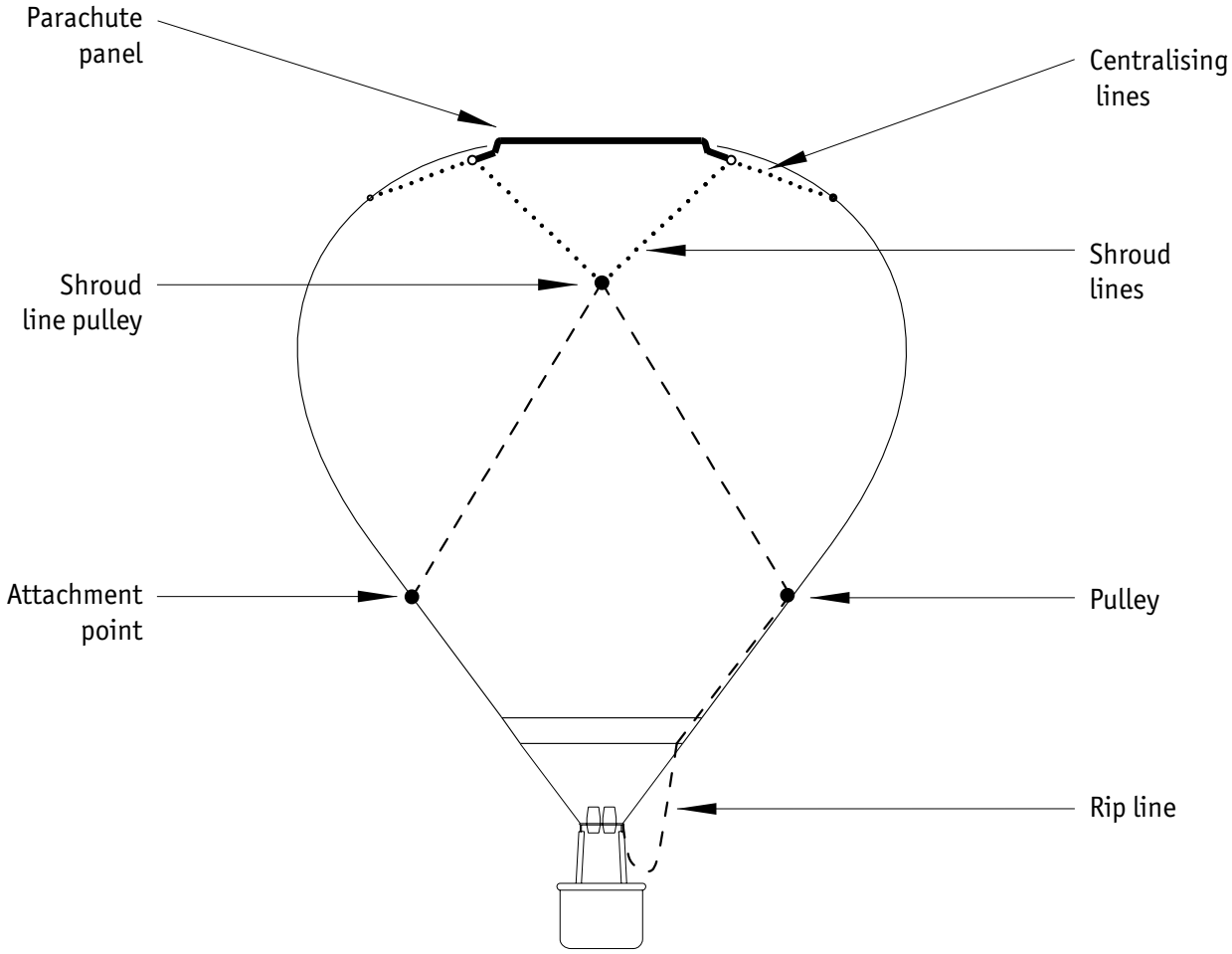
Natural shaped envelopes of vertical N type and horizontal O type or Z type are used as type approved balloons. A gore is the fabric section between two adjacent vertical load tapes and a number of gores are chosen in accordance with the envelope size and shape. Vent hole closing, hot air in-flight venting and final deflation is achieved with a DS (deflation system) of a parachute, Smart Vent or Lite Vent type. An optional envelope feature is double rotation vents located on the envelope equator. The lower part of the envelope is made of nomex fabric, which has a very high resistance to heat. The flying wires link the envelope to the burner frame and are connected to the burner and basket cables by means of locking carabiners. As an option balloons can be fitted with a scoop suspended in hook-up loops at the bottom of the envelope.



Envelope description

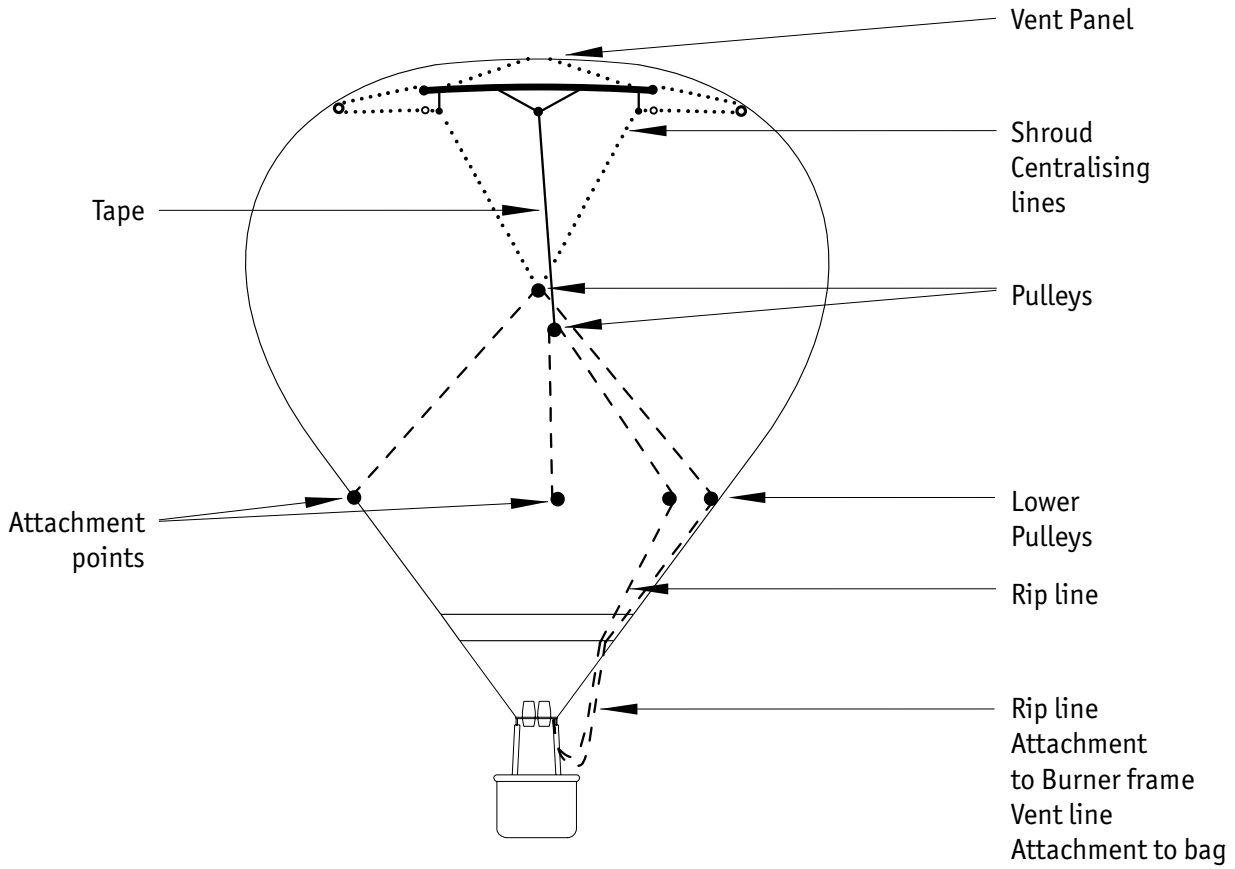
Parachute Vent

The parachute vent is a self-reseting system that provides controlled air deflation. A velcro tabs are sewed both at the edge of vent hole and parachute panels for the purpose of sealing them together during inflating. After envelope inflation the parachute is held in position by the internal overpressure that pushes it towards the inner load tapes of vent hole and closes tightly the envelope. The parachute is opened by a pull on an rip line and resets itself after rip line releasing.



Parachute valve

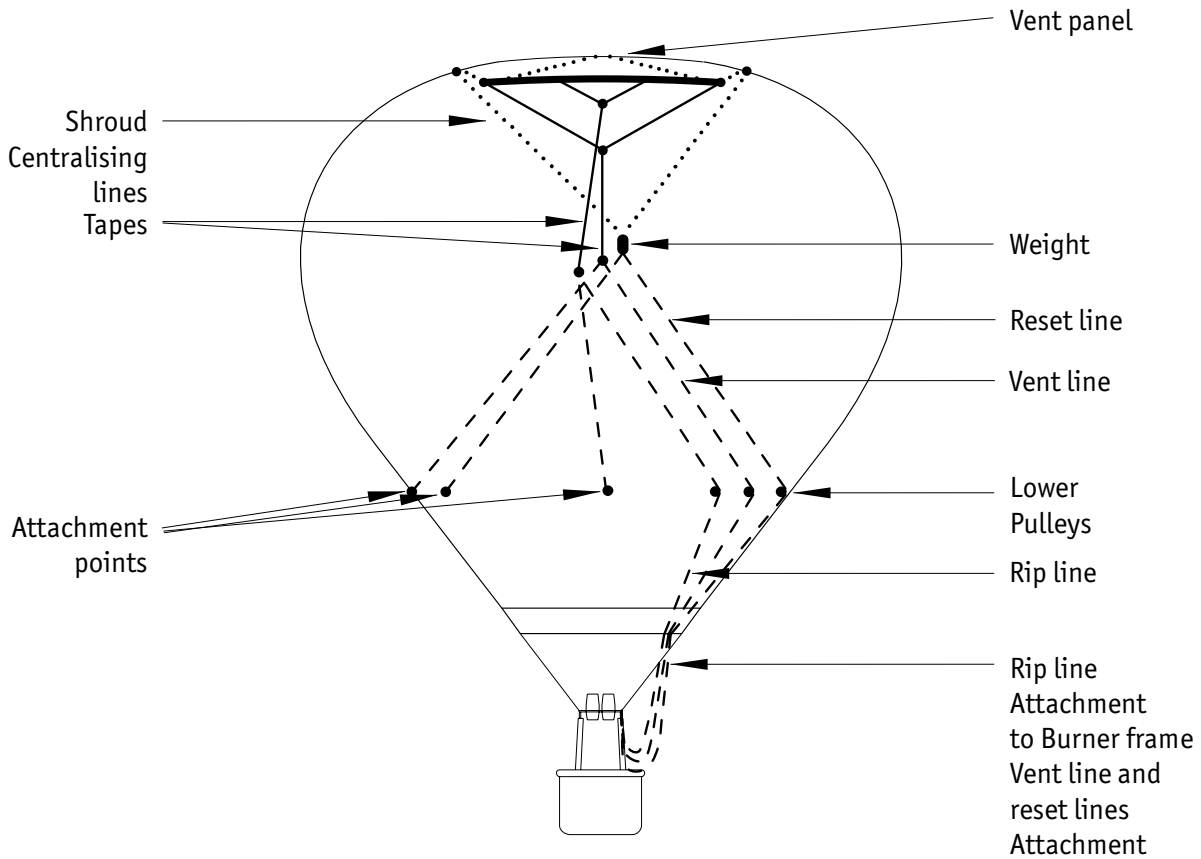
Smart Vent
The Smart Vent is similar in appearance and use to a parachute vent in all respects except during landing. Two activation ropes are fitted, one coloured red/white for in-flight controlled venting and for resetting the Smart Vent during intermediate landings and the other coloured red for central venting during landing and final venting.



Smart Vent

Lite Vent

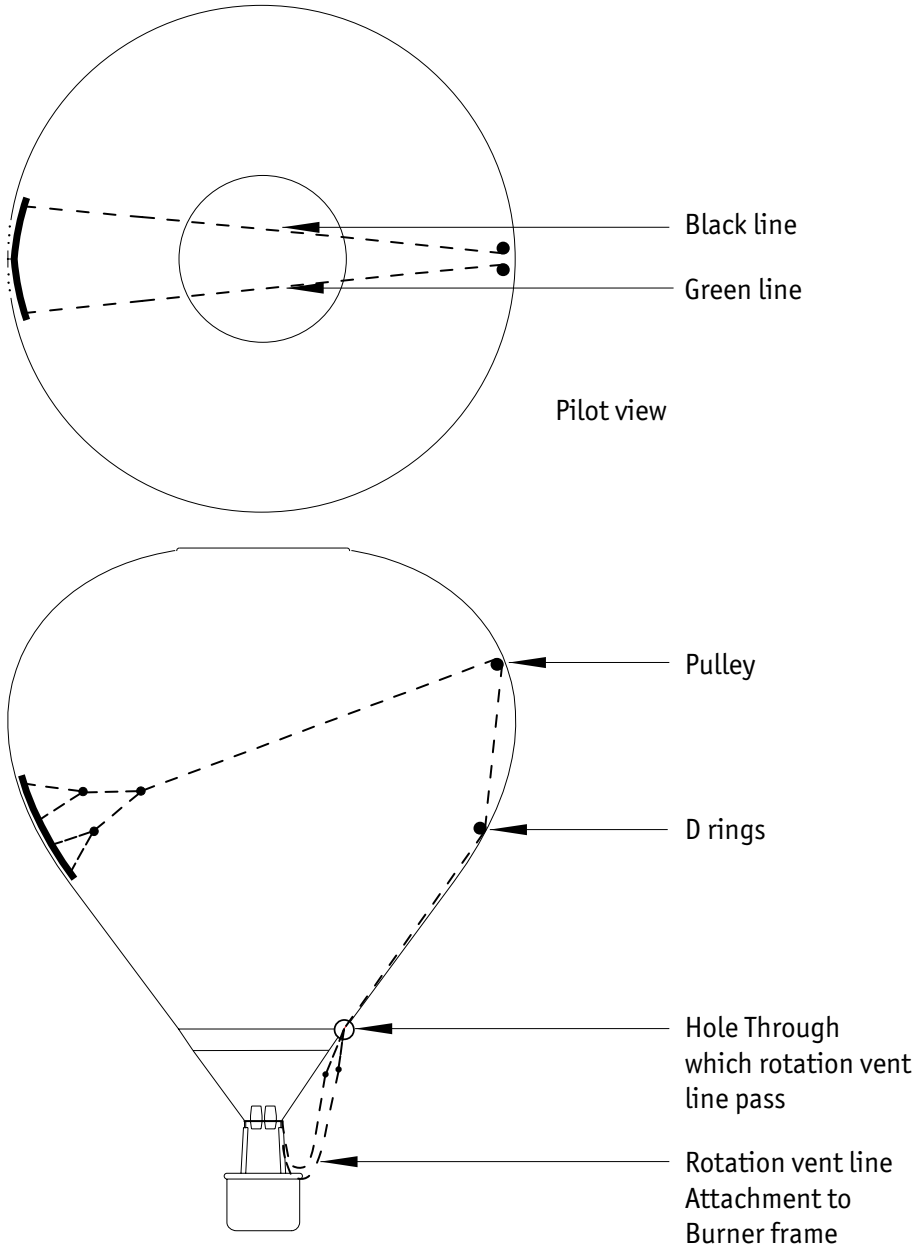
Lite Vent is a rapid deflation system, similar to a Smart Vent, which offers a more efficient venting action. It is fitted with three activation ropes. The red/white rope is for in-flight controlled venting only. The red rope has the same function as in a standard Smart Vent. The ripping action can be reversed by pulling on the white reset rope. Further pulling on the white rope holds the vent panel in place so that an inadvertent open caused e.g. by turbulence is avoided. The additional weight suspended under the vent panel makes its closing easier



Lite Vent

Rotation Vent

The rotation vent provides controlled balloon rotation about its vertical axis while airborne. When the arrangement activated, slits open sending out air tangentially and the effect causes the necessary force for envelope rotation. The rotation vent is controlled by means of two activation ropes, one coded black for left the other green for right hand rotation.



Rotation vent

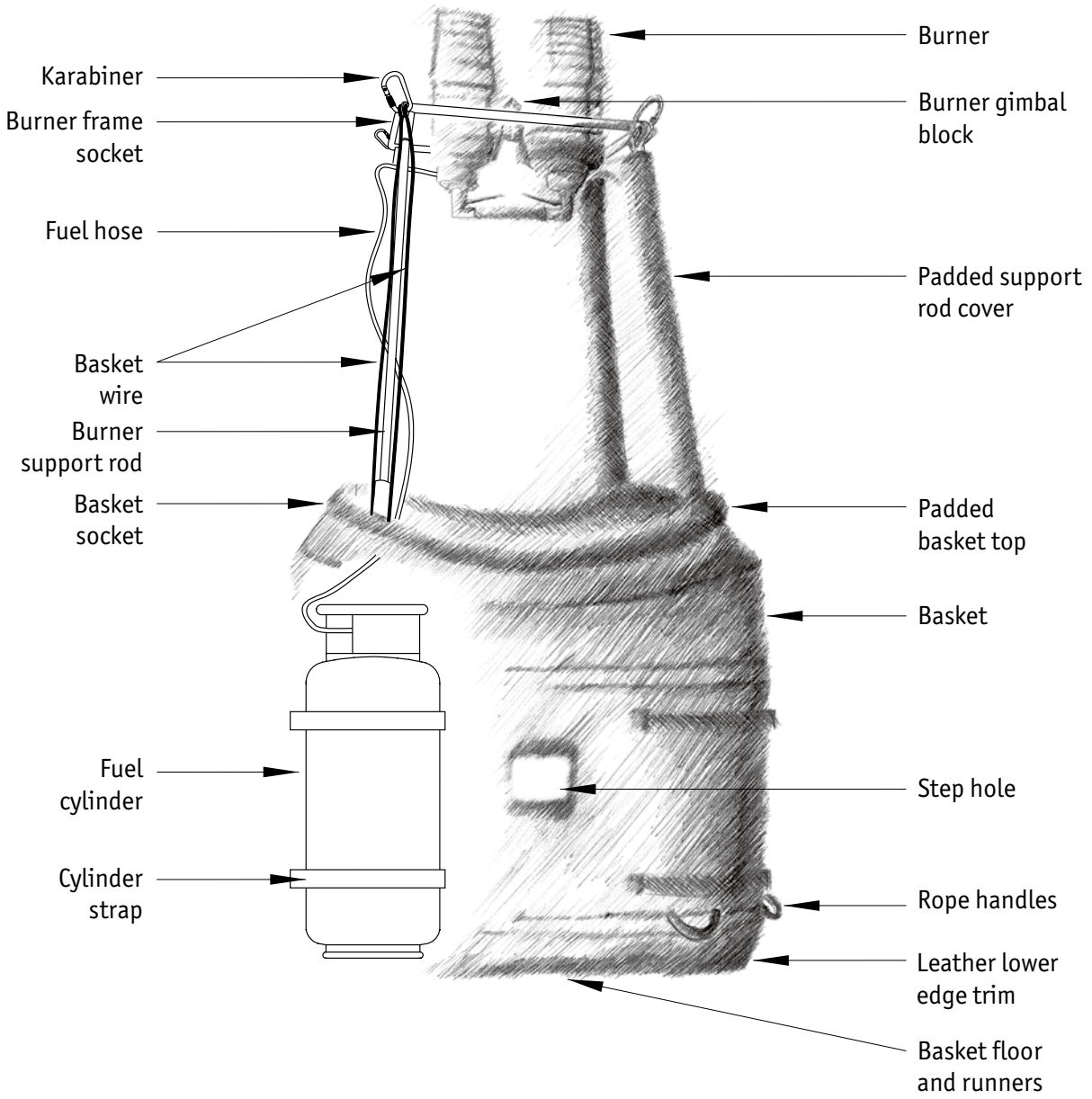
CAUTION:

For operating the Smart Vent, the white activation rope instead of the red/white one can be used regarding the BB balloons up to the including serial No. 177.

For operating the rotation vent, the white and black activation ropes can be used regarding the BB balloons up to the including serial No. 177.

7.2.2 Basket

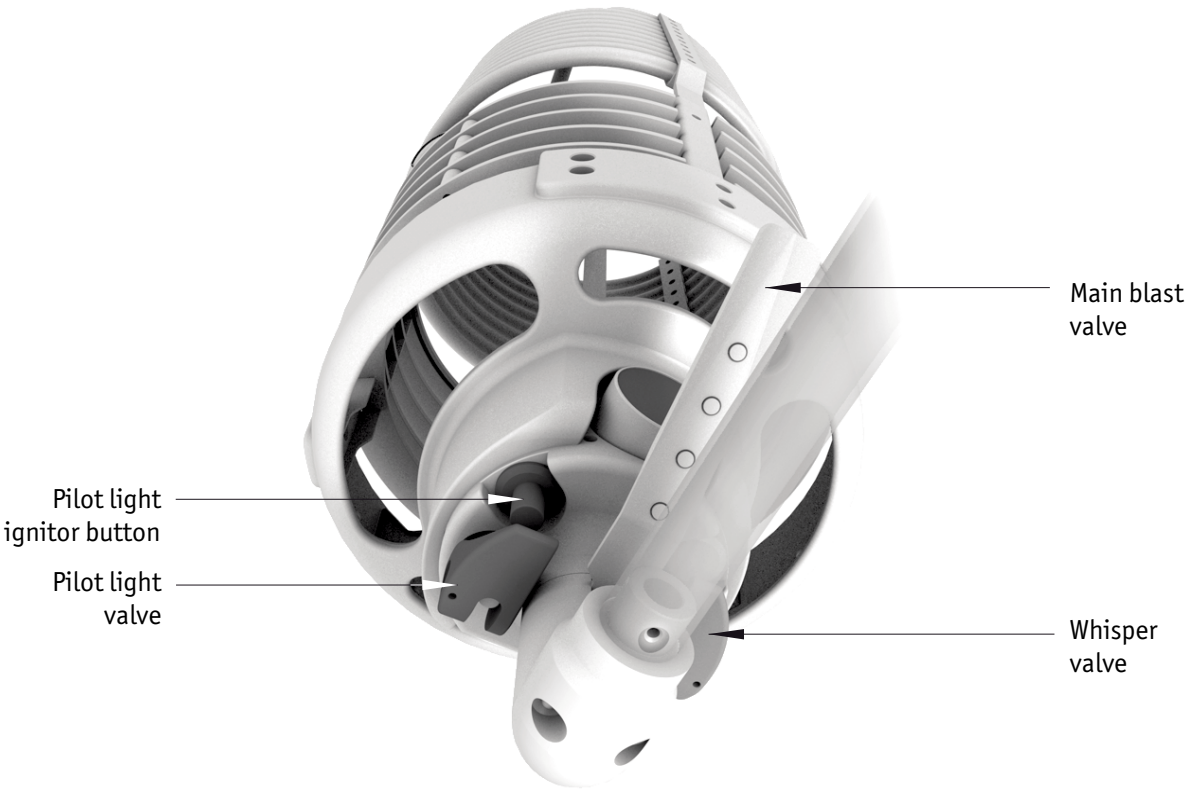
The basket serves with the aim of crew/load and fuel cylinders transporting. On the basket walls there are openings providing passages for strapping in fuel cylinders. Flexible rods fit into basket and burner frame sockets to support the overhead burner frame system. The load-bearing basket cables forms a continuous sling around the basket and together with the support rods are coated with padded suede covers. The prescribed basket equipment and instruments are secured to the inner basket side. The instrument box with LUN instruments should be attached to special basket through-holes. Electronic instruments should be strapped by means of velcro tapes to rod coverings. Along the basket top rim underneath, there are internal rope handles for use by passengers during landing.



Bottom End Description

7.2.3 Burner

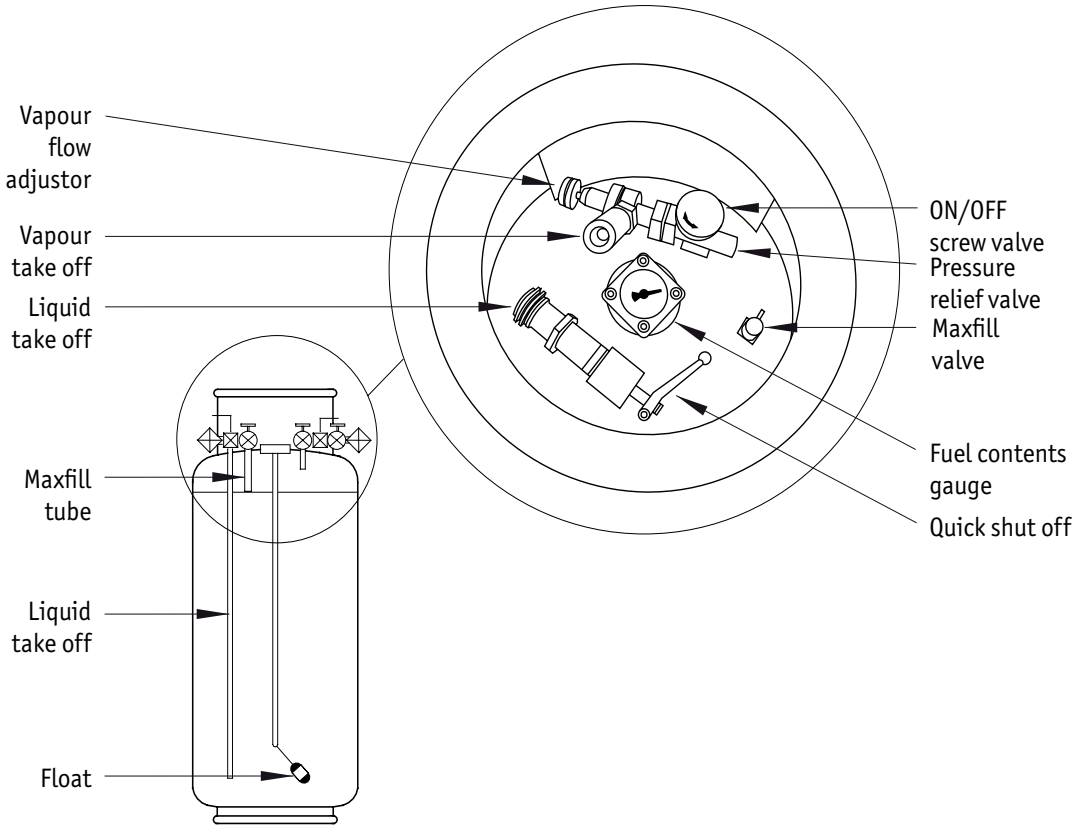
The burner consists of one or more burner units and burner frame.
The burner units itself is assembled from the main flight valve and vaporizing coil ended with jets. Flight burner ignition is achieved with a pilot burner. Late model burners utilise burner units equipped with a valve and whisper burner jet. In a double or more burner configuration, a transfer crossover valve/cock can be used (according to the burner type) providing a cross-feed capability between the two main flight valves.
The main flight burner / valve operates with the liquid phase of fuel gas supplied by a main liquid hose ending in hand operated couplings. It is operated by a flight valve lever / blast valve. Gas is automatically ignited by the pilot burner. With the view of fuel gas observing, there is a manometer connected to the main flight valve.
The pilot burner works with the vapour phase of fuel gas conducted by means of its private supply hose, or from hose main flight valve (liquid phase over pressure transformer). It stays igniting during the whole flight. The gas pressure is reduced to the operating pressure by a pressure regulator providing with the opportunity of an optimal flame setting. This is not applicable for burner with pressure transformen (without hose vapour phase). The pressure regulator is component of the conduct hose coupling or vapour phase valve on the cylinder valve (with respect to the type). The pilot burner utilises a piezoelectric igniter for easy operation. The piezo ignition system is controlled by repeated depressions or turnings (according to the type), until the pilot burner re-lights.
The whisper burner / liquid fire runs with the liquid phase of fuel gas conducted directly to the jet by a branch from the flight valve. It is controlled by means of a cock valve opening connected with the main flight burner room, or by whisper burner lever pulling (with respect to the type). The whisper burner is automatically ignited by the pilot light.
The burner frame is stainless tube frame. The burner units are swivel-mounted in the inner burner frame or joint, which in its turn is swivel-mounted in the outer frame (this provides a 2 - axis gimballed system). At each corner the burner frame has lugs, where the envelope and basket load-bearing carabiners hook up, and tube swinging or fixed sockets (see the type), to accept the nylon rods.



Ignis Burner

7.2.4 Fuel cylinders

Fuel cylinders are of stainless steel or light alloy coated with soft padded coverings. On all cylinders there are a liquid supply with proper screw joint and major fuel liquid valve. The float fuel quantity gauge and max fill bleed valve (liquid level gauge) serve for the purpose of checking. Every cylinder is also equipped with a safety blow-off valve. The master cylinder type (also a vapour supply) is fitted with a vapour valve.



Fuel Cylinder (master)

7.2.5 Equipment

Altimeter and variometer
Mechanical instruments: The instrument box fitted with a LUN altimeter and variometer. The box should be attached to special basket through-holes with fastening bolts and lock nuts.
Electronic combined instruments: They should be strapped by means of velcro tapes to support rod coverings.
Thermometer
The envelope temperature is read by thermometer fixed by velcro tapes to the support rod coverings. In accordance with the used type the thermometer is connected to the sensor which is located at the envelope top, by means of a sensor wire or wirelessly.

7.3 Control Systems

7.3.1 Envelope

Red activation rope of parachute vent
In case of the red rope activating by a pilot, the parachute panel is pulled down by all over area of its circumference at the same time and controlled air venting starts. When the red rope is released, the vent panel resets itself to the former position and closes the envelope vent hole.

Red/white activation rope of Smart Vent
In case of the red/white rope activating by a pilot, the centre of the vent panel is pulled the outer edges of the panel down at the same time and to allow controlled venting. When the red/white rope is released, the vent panel resets itself to the former position and closes the envelope vent hole. The rope should have sufficient slack in order not to stand in the way of the red rope venting.

Red activation rope of Smart Vent
In case of the red rope activating by a pilot, the centre of the vent panel is pulled down into the balloon. This caused the panel to form a vertical plume in the centre of the vent aperture to allow a clear path for air to escape quickly out of the envelope. The Smart Vent can be resealed by the red/white activation rope pulling.

Red/white activation rope of Lite Vent
In a Lite Vent the red/white rope is a vent rope. With the vent panel in place, pulling on the red/white rope curls the edges of the vent panel down whilst the centre of the panel remains in place. When the rope is released the vent panel res eats.
Red activation rope of Lite Vent
In a Lite Vent the red rope has exactly the same function as in Smart Vent. The Lite Vent may be resealed by pulling on the white activation rope.

White activation rope of Lite Vent
Pulling the white reset rope spreads the vent panel to the closed position. In turbulent conditions the vent panel may be held in place by pulling on the white rope.

Black and green activation ropes of rotation vent
In case of activating, left or right slits open sending out air caused controlled balloon rotation to the right or left; the black rope (tape) for left and the other green tape for right hand envelope rotation.

7.3.2 Burner

Main Blast valve
It opens the liquid phase inlet to the burner. After activating, the flight light burns.

Whisper Burner valve
It opens the liquid phase inlet to the burner. After opening, the whisper light burns.

Transfer crossover valve
The transfer valve provides a cross-feed capability between burner units behind the Blast valve. When activating, both burner units burn by any Blast valve opening.

Lever of pilot burner valve
The lever provides a gas phase entry to the pilot burner. After opening and igniting by the piezo system, the pilot light burns.

Piezo button
This exposes the piezo igniter to pressure. After (repeated) depressing, an ignition spark is produced and jumps over to the head of pilot burner.

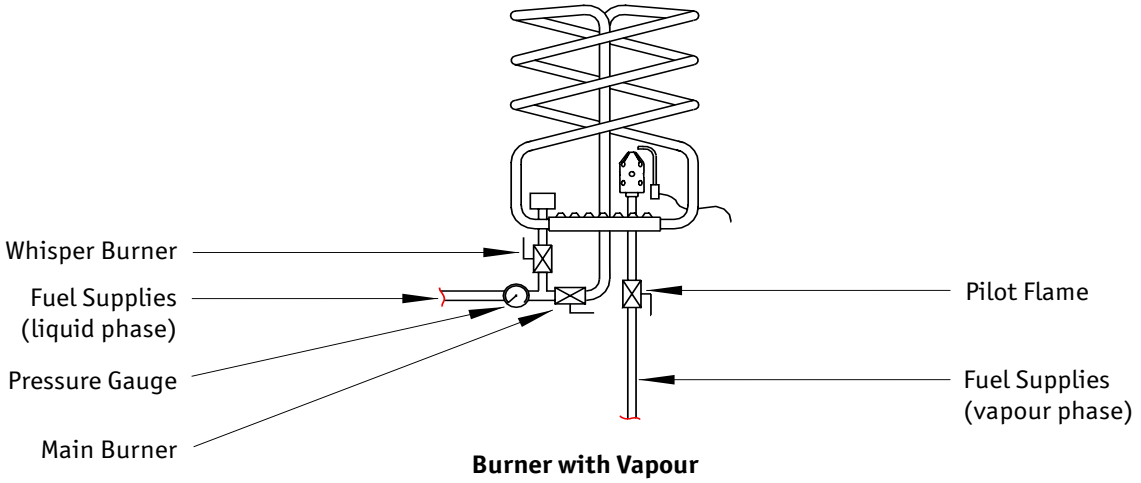
Gas spring lever on adjustable burner frame
The lever makes it possible to adjust the height of the burner on a burner fitted with an adjustable height burner frame. When the lever is depressed the burner height may be varied by moving the burner handle up or down. When the lever is released the burner will stay at the selected height.

7.3.3 Fuel cylinders

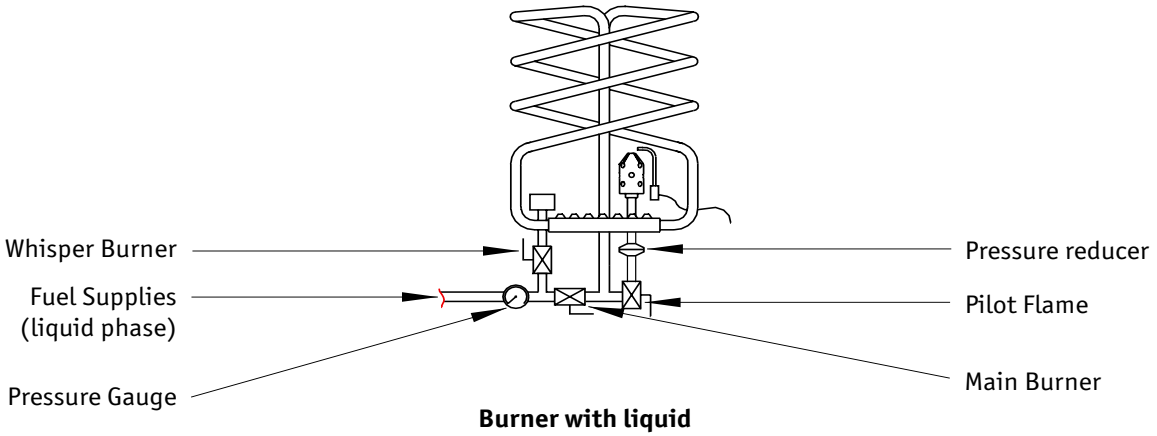
Major liquid valve
It turns on/off the cylinder liquid phase outlet of fuel gas.

Vapour valve
It turns on/off the cylinder vapour phase outlet of fuel gas.

Pressure regulator
It is joined to the vapour valve and reduces the gas pressure of the pilot burner.



Burner with Vapour Pilot Flame Supply



Burner with liquid Pilot Flame Supply

7.4 Fuel System

The fuel system consists of fuel cylinders and a burner. Supply hoses with connecting couplings are a part of each burner. The fuel system represents two circuits, a liquid phase circuit (primary one) and vapour phase circuit.
The major fuel closing - ball cock or valve, independent for each circuits, is a component of the fuel cylinder. The manometer indicating the fuel pressure is located on the control burner panel. The float gauge with indicator placed on the propane cylinder reads fuel quantity. The max fill bleed valve checks the max liquid fuel level in the cylinder.

7.5 Seats and Safety Harness

No seat is used. Crew should hold internal basket rope handles during taking-off and landing. Min. one handle must be available for each crew member. The pilot should control passenger moving in the basket.
Further safety harnesses for crews are not required.

7.6 Baggage Room

Baggage is transported in the basket area assigned to crew.
Their weight must be taken into account for the max take-off weight.
Baggage should not have any sharp, rough and dangerous edges and must be secured against motion in the basket.

7.7 Other Equipment

7.7.1 Drop line

It provides balloon handling near by the ground. The drop line, rolled up in a textile casing above the basket floor, is fixed to the basket wall. Free ending of the drop line is secured by means of a carabiner at the loop on the basket body. Before activating, the free end with carabiner should be clipped to an envelope flying wire carabiner and the line itself is cast from the basket with the view of handling by ground crews.

7.7.2 Fire extinguisher, heat-resistant cloth and first aid kit

The assessment mentioned above should be operated in case of fire or body injury only. The location is at separate holders or a combined wall-side pocket on the inner basket side.

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8. BALLOON OPERATION & MAINTENANCE

8.1 Introduction

This Section contains manufactur´s recommended procedures for proper ground handling and servicing of the balloon. It also identifies certain inspection and maintenance requirements which must be followed if the balloon is to retain that new-balloon performance and dependability.
Balloons are very simple air crafts. Therefore, the balloon parts not mentioned in this capture do not solicit any detailed comments on operation and maintenance.

8.2 Inspection Periods

The qualification on balloon airworthiness seems to be keeping prescribed inspections and further needed inspections not tabulated below but determined by any applicable nation, where the balloon is registered/operated, aviation regulations and instructions.
The scope, licence and procedures concerning the inspection carrying out are mentioned in the Maintenance Manual, related to the particular balloon.
Summary of inspections prescribed by the manufacturer:

Inspection Type	Operating Period	Applicable to
annual inspection	100 flight hours or 12 calendar months (1) (2)	balloon envelope, basket, burner, fuel cylinders, instruments, equipment and accessories
ten-year inspection	ten years (3)	fuel cylinders (see the Maintenance Manual)

(1) At operating period determination by both flight hours and calendar months limitations, the service period is applied that starts first. The 100th time limit can be exceeded up to max 5 hours, under condition that the breach is used for the flight completing started before the 100th limit reaching. The operating period, exceeding the 100th interval, must be included as a hours flown relating to the next 100th inspection.
(2) At operating period determination with calendar month limitations, the revision has to be made on the balloon or its parts till the last day of the month, in which the last inspection was carried out after the defined limit expiration.
(3) Determination of inspection term is based on the date of production or date of inspection if any marked on each cylinder.

8.3 Balloon Alterations and Repairs

Contact the balloon manufacturer before each adjustment and in case of serious revisions or repairs (affected the airworthiness) also with the FAA in advance.
All balloon adjustments and repairs should be done with respect to the Maintenance Manual, related to the particular balloon. Do not carry out any revision or repair that is not approved in the Maintenance Manual of your balloon and instead contact the manufacturer or approved repair shop.

8.4 Ground Handling / Road Transport

After the flight completing, pack the envelope and transport it in the original envelope bag only. The envelope should be sheltered against the rain during transporting.
Secure each component against any movement at the balloon conveyance in a car or trailer. Carry the fuel cylinders in vertical position and strap them properly. It is recommended to apply a burner bag for burner transport. Arrange the burner from overly swinging in case of taking assembled basket and burner for a short distance.
Always vent the fuel burner hoses, check that the fuel cylinder valves are closed and disconnect the supply hoses.
Follow the procedures recommended by your nation regulations valid for transport of liquefied oil gas tanks.

8.5 Cleaning and Care

8.5.1 Envelope

Besides common cleaning and keeping the below mentioned storage instructions, the envelope does not necessitate additional maintenance.

Cleaning
Use customary cleaning detergents, water diluted. Soiled areas should be cleaned by means of damped swabs. Then, before packing, the envelope should be dried thoroughly.

Storage
The rolled up balloon is best stored in a transport bag and at a dry airy place. Pack the envelope in an absolute dry condition and do not directly expose it to the sunshine or heater effect (recommended storage onto a pallet). In case of the wet envelope after the flight completing, ensure its complete drying as soon as possible and without fail. Spread the envelope on a dry shady field and keep airing. The wet envelope should be gently dried by keeping it cold-inflated with a fan, and then hot inflating it until the whole moisture has evaporated.

8.5.2 Basket

Cleaning
The basket necessitates periodical cleaning. The cane and floor should be clean with flowing water and a brush, or pressure water as far as possible (protect the upper suede rim against overly wetting through). Preserve cane from overly drying, the matter gets down its fragility resistance. Leather on the basket bottom and top rim is recommended to attend with common products for leather and suede care. If there is a suede cover on the upper rim, simply restore it by brushing with a special suede shoe-brush.

Storage
Care about the basket not exposing to floor moisture during storage. Under moisture conditions acting for a long time, there is a danger of mould and rot inception (recommended to storage onto a pallet).

8.5.3 Burner

Cleaning
Clean efficiently the burner from carbon black and condensates after each flight day. Check the moveable frame parts, frame suspension and connecting fittings for dry dust and mud fouling. Clean and lubricate with silicone oil as may be required.

Care
Check periodically quantities of motion of the flight valves control. Lubricate the flight valve with any suspicion of its function failure. Meet instructions, mentioned in the Maintenance Manual, during flight valve servicing.

Storage
There is not any special procedures concerning burner storage. Ensure only no burner damage, by a collision of hard or heavy objects, and no fouling to couplings of fuel hoses can occur during transport/storage. Take close attention to fuel hoses that should not be damaged by a fall or heavy object squeeze.

8.5.4 Fuel cylinders

Care
Check periodically quantities of motion of control valves and the pressure regulator adjustment. Submit cylinders

due to a review to an approved repair shop if there is any suspicion of their dysfunction. Lubricate O ring seals and the square sealing at the liquid phase ending with silicone vaseline once a month. Keep surroundings of valves and end connectors clean.

8.5.5 Instruments

Follow the Maintenance Manual, related to the individual instrument, during operating or servicing.

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9. SUPPLEMENTS

9.1 Introduction

This Section contains necessary supplements with information requisite for safe and reliable operating of the balloon differed in further equipment or other deviations from standard balloons.

9.2 List of Supplements

Date of Insertion	Supplement No.	Name of Supplement

9.3 Supplements

None

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