FLIGHT MANUAL

for

ULTRAMAGIC HOT AIR BALLOONS

This manual and its approved supplements contain the Instructions for Operation of all Ultramagic Hot Air Balloons included in the Ultramagic Type Certificates EASA BA.014 and BA.517

The technical content of this document is approved under the authority of the DOA, ref.: EASA.21J.351

This copy of the Flight Manual has been customized for the following aircraft:

Registration:			
Model:		Serial Nr.:	
Signed:		Date:	
		Organization:	

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This Flight Manual has been prepared for an Ultramagic Hot Air Balloon with the following Build Standard:

BUILD STANDARD

REGISTRATION ____________

Lmax ____________ EMPTY MASS ____________

ENVELOPE

TYPE ____________ VOLUME ____________

SERIAL NO. ____________ YEAR OF MANUF. ____________

MTOM ____________ MASS ____________

BASKET

MAKE ____________ MODEL ____________

SERIAL NO. ____________ MASS ____________

BURNER

MAKE ____________ MODEL ____________

SERIAL NO. ____________ MASS ____________

APPLICABLE SUPPLEMENTS

Supplement Nr.	Issue	Description

NOTE: whenever necessary for space reasons, list can be extended to a separate signed document

I hereby certify that this Flight Manual, as prepared for the above balloon, incorporating the amendments issued to the present date and the supplements listed, conforms to the build standard of the balloon.

Signed: ____________ Organization: ____________ Date: ____________

Alternative Equipment

Alternative baskets or burners to those listed in the Build Standard of this manual may only be substituted subject to meeting the following:

1. Equipment must meet the requirements of 5.4 (Table of compatibility) and/or requirements listed and stated in Supplements concerning other Manufacturers Equipment.
2. All equipment must be inspected as airworthy by the appropriate designated National Inspection Authority.
3. All equipment must be listed noting all serial numbers and weights. This list must be approved and available on board, together with all the applicable operational information (e.g. manuals, supplements).

WARNING

- Any changes to the equipment listed on the Build Standard sheet without meeting the above requirements will invalidate the Certificate of Airworthiness.
- Latest editions and revisions of the Flight Manual and their supplements are published in the web www.ultramagic.com.
- To subscribe/unsubscribe to automatically receive information on the approved updates of the Flight Manual, contact support@ultramagic.com.

LIST OF APPROVED REVISIONS

Rev	Description	Approval	
		Date	Reference
1	Sup. 3, 4, 5 added	17/Sep/03	DGAC - Spain
2	Sup. 6, 7 added	18/Oct/03	DGAC - Spain
3	Sup. 9 added; V-25 model added; Section 8 amended	14/Feb/06	EASA BA.C.01011
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6	Sup. 12 added	31/Jul/06	EASA BA.A.01001
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8	Sup. 8 added	03/Mar/08	EASA BA.C.01028
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23	Section 0, 1, 4, 5, 6 amended; Appendix B amended; Sup. 2, 10, 19, 22, 39 amended; Sup. 46, 48, 49 added	21/Jan/15	DOA 21J.351 PD1-05 028
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26	Minor revision to sections 2.14, 4.8.2.2, 4.13, 6.2.2.5, Appendix B and Appendix E	09/Oct/20	DOA 21J.351 PD1-05 063
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	N-550 envelope & C-15 basket addition.		EASA Project 60087942
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SECTION 1

GENERAL INFORMATION

1.1 Introduction

This balloon flight manual has been prepared to provide pilots and instructors with information for the safe operation of all Ultramagic free hot air balloons.

1.2 Certification Basis

All types of balloons for which this manual is applicable have been certified and approved by E.A.S.A.

1.3 Warnings, cautions and notes

The following definitions apply to warnings, cautions and notes used in this flight manual.

WARNING – means that the non-observation of the corresponding procedures leads to an immediate or important degradation of flight safety.

CAUTION – means that the non-observation of the corresponding procedure leads to a minor degradation to flight safety or to a long term degradation of flight safety.

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

1.4 General Description

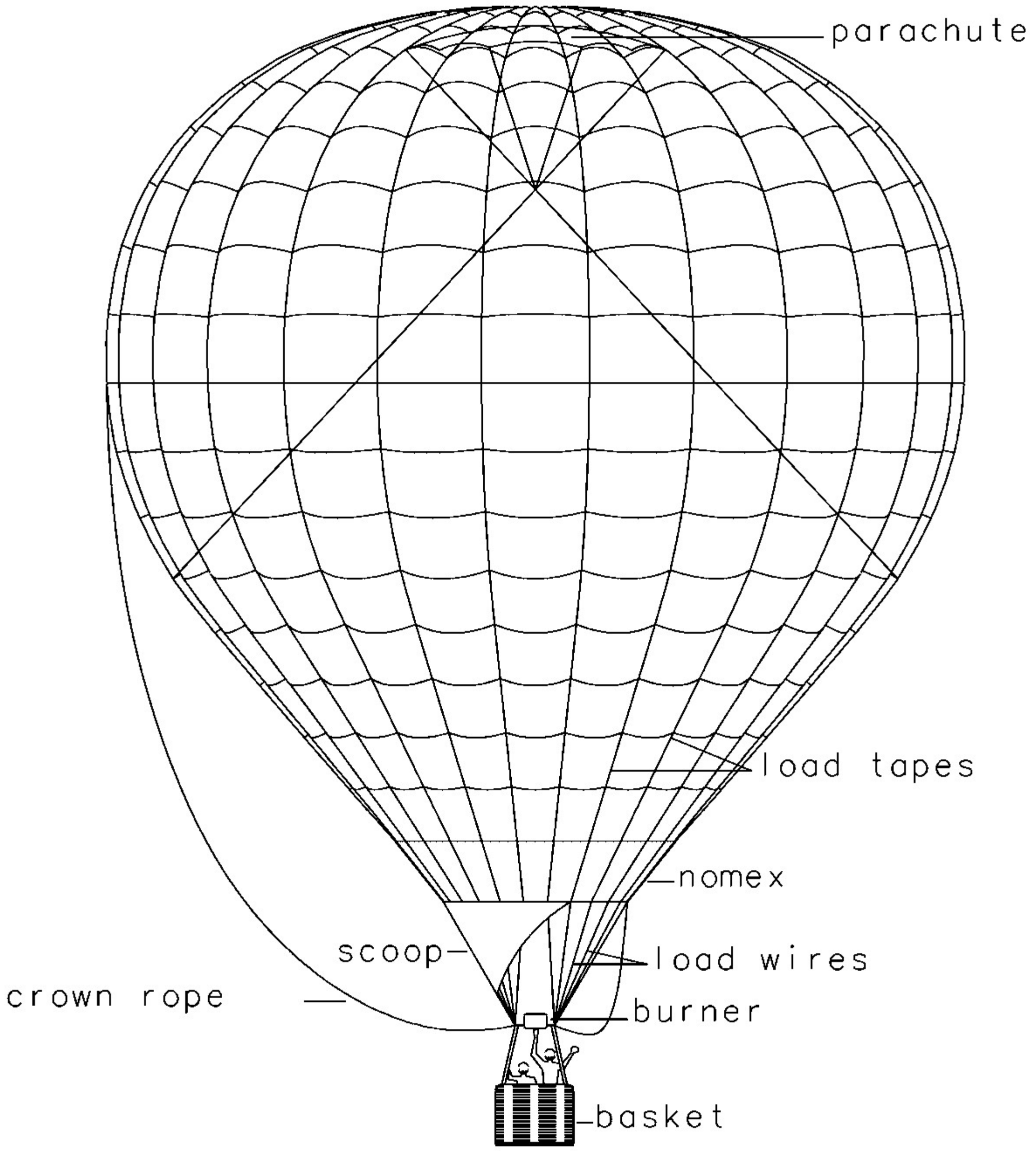
A hot air balloon is a free balloon in which the lifting force consists of hot air produced by means of a propane burner, using this gas in its liquid form. All balloons belong to one of the FAI categories indicated in the tables of Section 6.3.

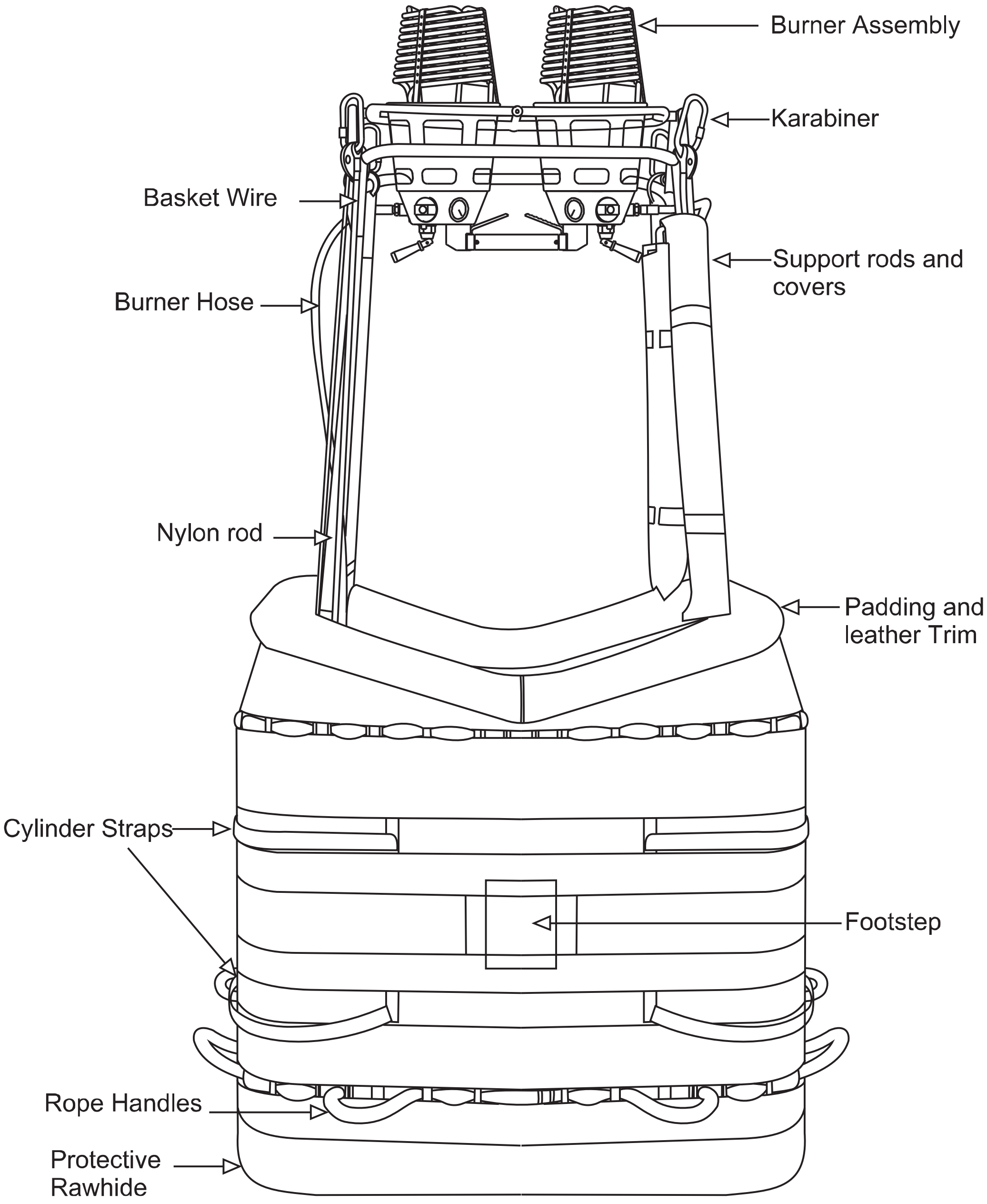
The aerostat is remarkably simple in its conception and handling. It consists of three main parts: Envelope, fuel system (burner with load frame and fuel cylinders) and finally a basket of woven construction or seat to carry the pilot and passengers.

Envelopes are made of high resistance polyamide fabric reinforced by polyester load tapes. These tapes carry the forces due to loading and transmit the forces to the load frame.

The burner is a high output device for converting the fuel (liquid propane) stored in the fuel cylinders into heat energy.

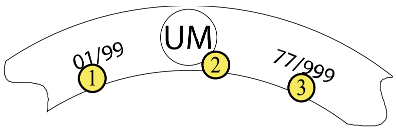
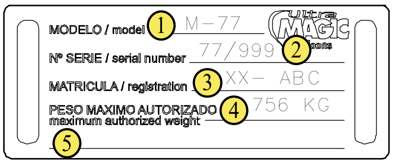
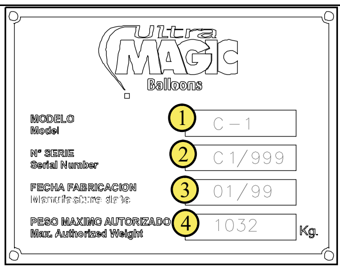
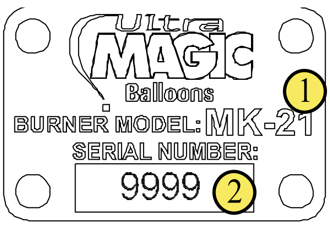
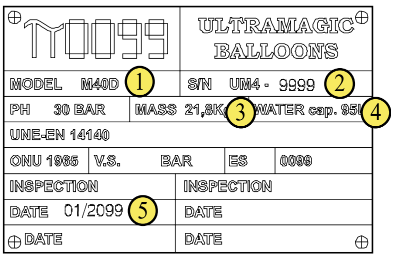
See section 6 for a detailed description of the balloons and their systems.


parachute
load tapes
nomex
scoop
load wires
crown rope
burner
basket


Burner Assembly
Karabiner
Basket Wire
Support rods and covers
Burner Hose
Nylon rod
Padding and leather Trim
Cylinder Straps
Footstep
Rope Handles
Protective Rawhide

1.5 Identification of parts

Ultramagic parts and components are identified as follows[1][3]:

	PICTURE	POSITION	DESCRIPTION
ENVELOPE		Crown Ring[2]	Data engraved over Aluminium or Steel: 1) Manuf. Date [MM/YY] 2) Ultramagic acronym 3) Serial Number
ENVELOPE		Nomex mouth (1 to 3 posns.)	Model painted over PVC support.
ENVELOPE		Nomex mouth (Load tape #9 usually)	Data engraved over Steel plate on a leather support: 1) Model 2) Serial Number 3) Registration 4) Maximum Authorized Weight 5) Others (if due)
BASKET		Basket wall, inside, pilot partition	Data engraved over Steel plate on a leather support: 1) Basket model 2) Serial Number 3) Manufacture Date 4) Maximum Authorized Weight
BURNER		MK-21: valve block bottom face MK-32: Valve block Side BMK-008: Valve block Side	Model (#1) and Serial Number (#2) engraved on a Steel plate riveted to the block
BURNER	N/A	BMK-008 & BMK-050, valve block, bottom face[4]	Information engraved on the Aluminium block: 1) Model and Serial number (valve) 2) Serial number (coil)
CYLINDER		Top protection ring, outside	Data engraved on a Steel plate riveted to the collar: 1) Model 2) Serial number 3) Empty Mass (kg) 4) Water Capacity (L) 5) Initial inspection [MM/YYYY]

[1] *For older identification means, contact Ultramagic. Specific requirements from certain National CAAs may also introduce changes to the identification means.*
[2] *S-50, S-70, B-70 envelopes may not have crown ring identification.*
[3] *Envelope Registration marks not described (depend on local requirements).*
[4] *Only older BMK-008 burner units uses this identification means.*

SECTION 2

LIMITATIONS OF USE

2.1 Introduction

Section 2 details the operating limitations for the balloon, standard systems and standard equipment.

The limitations included in this section and in Section 2 of the applicable supplements to this Flight Manual have been **approved** by EASA.

WARNING: Compliance with the approved limitations is mandatory.

2.2 Meteorological Limitations

There should be no, or only very weak thermal activity.
There should be no sign of storms, either active or building.
Adhere to the following wind limitation:

	Maximum surface wind speed	
Balloon Model	N-500, N-550	All others
Speed	12 kt 6.2 m/s 22 km/h 13.8 mph	15 kt 7.5 m/s 27 km/h 17.3 mph

2.3 Condition of balloon

WARNING:
The balloon must not take off if it fails any of the pre-flight checks.
The balloon must not take off with any major damage above the lower third of the envelope, or if there is any damage to wires, cables, tapes, load carrying parts below this level, the fuel system, or the burner.
The balloon must not take off if it has not been maintained and inspected in accordance with the manufacturer's maintenance manual.

2.3.1 Acceptable Damage:

Damage to the fabric in the lower third of the envelope must be limited to an area affecting no more than 3 panels, though they can be completely damaged. These panels may be adjacent.
Holes no greater than 10mm in diameter (e.g. cigarette burn) are permitted elsewhere on the envelope.
These holes must not be within 25mm of a load tape, with no more than 5 in any one panel and be no closer than 50 mm to each other. No more than 3 panels in the upper two thirds of the envelope may have these small holes.

No damage is permitted to any part of the burner, fuel or load suspension system.

2.4 Safety Equipment (Minimum equipment)

All of the following equipment must be in fully working order and must be carried in the balloon basket.

1 One fire extinguisher of 2 kg (or two of 1 kg) conform to EN3 which use dry powder or with an approved equivalent level of safety.

2 Sufficient auxiliary means of ignition (matches, lighter or similar).

3 Protective gloves for the pilot.

4 An envelope temperature indicator, which either gives a warning signal or a continuous reading type instrument.

5 Fuel gauges on each cylinder.

6 A means of measuring fuel consumption (e.g. watch or stop watch) must be carried.

7 Altimeter.

8 Variometer to measure rate of climb and descent.

On flights when it is intended to climb higher than 300 m (1000 ft), an ambient temperature thermometer and a load chart provided by the manufacturer must be available at the take-off site.

2.5 Fuel

A minimum of one cylinder per burner is to be carried for flight except in the case of a single burner where two cylinders must be used (observe exceptions on Solo or single seater bottom ends). These cylinders must be full at take off. Where vapour pilot lights are fitted to the burner then a vapour supply must be provided for each pilot light.

Aluminium Worthington cylinders may be used as long as the propane fuel is free of caustic soda. In all other cases then stainless steel cylinders must be used.

The approved fuel is commercial propane, which can contain some butane.

Butane may also be used as long as the pressure is greater than 3 bar. This pressure can be achieved by warming or by pressurising the cylinders with nitrogen or other inert gas such as CO_2.

Fuel tanks pre-pressurized with nitrogen or other inert gas such as CO_2 must not be used to provide fuel to “vapour” pilot light.

Gas for refuelling must be completely clean and the use of a fuel filter is strongly recommended.

WARNING: Adhere to the following fuel pressure limitations:

	Balloon Model	
	N-500, N-550	All others
Min Fuel Pressure	6 bar 87 psi	3 bar 43.5 psi
Max Fuel Pressure	12 bar 174 psi	

CAUTION: extra care should be taken when operating at low burner pressures.

2.6 Loading

The total take off weight must never exceed the upper limit determined with the use of the load chart supplied by the manufacturer. At no time must the maximum lift (Lmax) listed in the Built Standard (page 0.1) be exceeded.

At the time of landing the actual weight must never be less than that specified in the table supplied by the manufacturer in section 5.5. This applies to all balloons of Volume greater than 90,000 cu ft.

Enough room must always remain in the basket for the pilot to readily access all flight and fuel system controls and for all occupants to prepare for a hard landing. The minimum space requirements for passengers must be maintained in accordance with appendix D.

2.7 Crew

Minimum: 1 pilot

2.8 Vertical velocities

Adhere to the following vertical speed limitations:

	Maximum Vertical Speeds			
Balloon Model(s)	M-56Z / M-60Z / M-65Z / M-70Z / M-74Z	M-56C / M-65C/ M-77C	N-500 / N-550	All others
Ascent	3 m/s / 9 m/s* 600 ft/min / 1800 ft/min*	3 m/s / 7 m/s* 600 ft/min / 1400 ft/min*	3 m/s / 4 m/s* 600 ft/min / 800 ft/min*	3 m/s / 5 m/s* 600 ft/min / 1000 ft/min*
Descent	8 m/s 1600 ft/min	5 m/s / 7 m/s* 1000 ft/min / 1400 ft/min	4 m/s 800 ft/min	5 m/s 1000 ft/min

* If an internal envelope temperature indicator is carried and the maximum permitted temperature is not exceeded.

2.9 Internal temperature

In normal use, the maximum continuous internal temperature adjacent to the fabric is 120 °C (250 ºF).
The internal temperature adjacent to the fabric must never exceed 130 ºC (266 ºF).

2.10 Deflation systems

WARNING: It is forbidden to use the red rope of the FDS rapid deflation system at an altitude higher than 10 m (30 feet) above the ground.

CAUTION: In flight use of the parachute vent system should be no longer than 3 seconds at any one time. Re use must not be attempted until the envelope has re-inflated.

CAUTION: [For MZ Racer models] At high descend rates the envelope profile may suffer perceptible deformations, especially below the equator, adopting a characteristic funnel shape. During such manoeuvres, it is forbidden to use the parachute until the balloon has been reinflated and has returned to its normal shape.

2.11 Baskets

2.11.1 Rotation vents must be fitted to envelopes when used with partitioned baskets.
2.11.2 The maximum number of occupants in any one compartment of a basket is six.

2.12 Minimum Burner requirements.

The following table provides a summary of the burner capability regarding the envelope volume range. For detailed compatibility, refer to section 5.4.

BURNER ARRAY	BURNER MODEL	MIN VOLUME	MAX VOLUME
Single	MK-2 / MK-10	31,000 ft^3 / 900 m^3	77,000 ft^3 / 2,200 m^3
	MK-21	25,000 ft^3 / 708 m^3	105,000 ft^3 / 2,950 m^3
	BMK-008		120,000 ft^3 / 3,400 m^3
Double	MK-2 / MK-10	56,000 ft^3 / 1,590 m^3	160,000 ft^3 / 4,550 m^3
	MK-21 / BMK-008		210,000 ft^3 / 6,000 m^3
	MK-32		225,000 ft^3 / 6,370 m^3
	BMK-050	180,000 ft^3 / 5,100 m^3	300,000 ft^3 / 8,500 m^3
Triple	MK-2 / MK-10	105,000 ft^3 / 2,950 m^3	210,000 ft^3 / 2,070 m^3
	MK-21		300,000 ft^3 / 8,500 m^3
	MK-32	120,000 ft^3 / 3,400 m^3	315,000 ft^3 / 8,920 m^3
	BMK-050	250,000 ft^3 / 7,000 m^3	450,000 ft^3 / 12,750 m^3
Quadruple	MK-2 / MK-10	180,000 ft^3 / 5,100 m^3	425,000 ft^3 / 12,000 m^3
	MK-21 / MK-32		550,000 ft^3 / 15,574 m^3
	BMK-050	355,000 ft^3 / 10,000 m^3	600,000 ft^3 / 17,000 m^3

NOTE: Check section 2.5 for requirements on fuel.

2.13 Fuel Cylinders

1. All cylinders must be fitted with a padded jacket.
2. A minimum of two cylinder straps of an approved design must be fitted to each cylinder. These should be fitted so as not to allow any up and down as well as lateral movement.
3. No part of any cylinder must protrude above the top of the basket.

2.14 Tethered Flight

When performing tethered operations, consider the following additional surface wind speed limitations. These limits apply as a function of the total envelope volume (particularly when flying special shape envelopes):

- **Up to 120,000 ft^3 (included): 15 kt (10 kt with passengers)**
- **Greater than 120,000 and up to 180,000 ft^3 (incl.): 9 kt**
- **Greater than 180,000 and up to 275,000 ft^3 (incl.): 5 kt**
- **Greater than 275,000 ft^3: Calm (~1 kt)**

An area of at least the radius of the height of the balloon plus the length of the tether line should be allowed for a good margin of safety.

2.15 Other Manufacturers equipment

Baskets and Burners produced by certain other manufacturers may be used with Ultramagic envelopes. (See equipment listed in Supplement 19).

2.16 Night Flying

Night flying is permitted when according with the regulations on equipment, licensing and laws of the country to fly. Refer to the applicable supplement.

SECTION 3

EMERGENCY PROCEDURES

3.1 Introduction

Section 3 provides checklists and amplified procedures for coping with emergencies that may occur.

This section is **approved** by EASA.

3.2 Pilot light failure

3.2.1 Single burner unit

If for any reason the pilot light should go out, try to relight it immediately with the piezoelectric ignition system, matches or other igniters.
In case of failure to re-ignite proceed as follows

1. Close the vapour and liquid take-off valve(s) on the corresponding cylinder.
2. Open completely the blast valve on the burner.
3. Open slightly the liquid take-off valve on the cylinder on the same side to allow a small flow of propane.
4. Ignite the main burner, and regulate the flame using the liquid valve on the cylinder, taking care not to allow it to extinguish.
5. Land as soon as possible

3.2.2 Burner with additional "quiet" burner

1. Open the valve on the "quiet" burner very slightly and ignite it.
2. Adjust the level of the "quiet" burner to act as an adequate pilot light.
3. Continue to use the main burner as usual, carefully monitoring the "quiet" burner valve for freezing. If freezing occurs, follow 3.2.1.
4. Land as soon as possible.

3.2.3 Double, triple or quadruple burner unit

1. Continue the flight with another burner while trying to re-ignite. If further pilot lights fail, proceed as described in 3.2.1 or 3.2.2, whichever is appropriate.
2. Land as soon as possible.

3.3 Icing of the regulator on systems using a vapour pilot light.

When the fuel cylinders are horizontal during inflation, the regulator on the vapour take off is not fed with gas, but with liquid propane. If the time taken for inflation is too long, ice may form, which could extinguish the pilot light. If this happens, shut down the vapour take-off valve at the cylinder. Wait until all the liquid in the regulator and connections has burned off, and the icing melts, then reopen the valve and re-ignite the pilot light.

3.4 Failure of a burner valve

In case of malfunction of one main valve, transfer control immediately to another burner or with a single burner to the other fuel supply.

- If the blast valve is stuck in the open position or it is leaking, close down the corresponding valve on the cylinder, and burn out the line if necessary, and use the other valve.
- If the blast valve is stuck in the closed position, use the other valve.
- Land as soon as possible.

3.5 Dropping of the temperature flag

If the envelope temperature flag drops during flight then proceed as follows:

1. Take all precautions to reduce envelope temperature.
2. Descend immediately and land as soon as possible.
3. Inspect the temperature tags to determine if the envelope has been overheated (ref. Ultramagic Maintenance Manual section 6.7).
4. Carry out a fabric test if the fabric shows to be overheated.
5. Repair or replace fabric as required in accordance with the maintenance manual.
6. Refit the temperature flag (or replace with a new one if damaged or lost).

NOTE: The dropping of the flag does not automatically mean that the envelope has been overheated. In many cases this is just a warning of the potential to overheat.

3.6 Envelope damage

Should the envelope be damaged in flight proceed as follows:

1. Increase the rate of burning to compensate for the loss of heat depending on the size of the hole.
2. Land as soon as possible.

3.7 Emergency landing

If a hard landing or a high wind landing is anticipated, proceed as follows:

1. Brief everyone to brace with knees slightly bent, to hold on firmly to the handles inside the basket, and to watch the progress of the landing.
2. Warn the passengers not to leave the basket until instructed.
3. Take off all glasses and instruct passengers to do so also.
4. Warn everybody of a possible second impact.
5. Throw overboard any unnecessary ballast, taking all possible care not to cause any damage below when doing so.
6. Extinguish the pilot lights.
7. Shut down all cylinder valves and vent the fuel lines before impact.

3.8 Fire in the air

Should a fire occur during flight then follow the instructions below in the order shown:

1. Turn off the propane valve at the cylinder.
2. Use the fire extinguisher on the source of the flame.
3. Once the fire is extinguished, determine the location of the fire and correct it if possible.
4. Use another burner/valve unit if necessary.
5. Maintain control of the height of the balloon all times.
6. Land as soon as possible.

3.9 Fire on the ground

Should a fire occur on the ground, follow the instructions below in the order shown:

1. Turn off the propane valve at the cylinder.
2. Use the fire extinguisher on the source of the flame.
3. Once the fire is extinguished determine the reason and correct it completely, otherwise abort the flight.

WARNING:
If fire stays more than 20 seconds around a cylinder, abandon the basket making sure not to allow the balloon to lift off when the weight is reduced. The pilot must be the last to exit the basket, if possible with the rip line in his hand.

3.10 Contact with power lines

Any contact with electric power lines is extremely dangerous and should be avoided at all costs. If contact cannot be avoided then steps should be taken to ensure that contact is made only with the envelope above the flying wire level. This may best be achieved by descending which will also mean the basket is closer to the ground to allow escape.

If time permits close all fuel lines and vent off fuel before contact. If safety conditions permit, try to avoid touching the ground until you have been informed that the power line has been switched off.

After having made contact with live electrical power lines the pilot must report the incident and make sure that an unscheduled inspection is carried to the balloon before any further flight according to Section 6.7.2 “Contact with Powerlines” of the UM Maintenance Manual Rev.18.

3.11 Accidental operation of FDS in flight.

Immediately release the vent line and re-close the parachute by pulling on the parachute line and turn on the burner to replace as much lost heat as possible.

WARNING-
The FDS line will not automatically retract when released neither will the panel re-seal unless it is closed by using the parachute line.

SECTION 4

STANDARD PROCEDURES

4.1 Introduction

Section 4 provides checklists and amplified procedures for the conduct of normal operation. Normal procedures associated with optional systems and operations can be found in Section 9

This section is **approved** by EASA.

4.2 Choosing an inflation site

The selected location must fulfil the following conditions:

- A flat even surface of sufficient size for safe inflation free of vertical obstructions, sharp stones, thorny bushes or anything else that might cause damage to the envelope, and if possible sheltered from the prevailing wind. There should be sufficient space for positioning of vehicle/s for tethering to.
- The surface should preferably be grass, but without any risk of fire. If there is any risk of setting fire to vegetation, place a Nomex blanket between the burner and the base of the envelope.

4.3 Meteorological Conditions

When planning a flight the limitations set in 2.2 must be adhered to. In addition one should consider the possibility of severe weather approaching, the possible effect of sea breezes and also wind direction. Care should be taken to ensure that the wind direction would not take you into a prohibited area or controlled place. The actual weather conditions should be continually considered during preparation and flight with a view to modifying plans if required. The effect of ambient temperature on fuel pressure must also be considered.

4.4 Load chart

Before each flight it is necessary to calculate the total all up weight and check that it is below the maximum permitted loading capacity. The maximum payload varies with ambient air temperature and altitude, and is found by consulting the load chart supplied by the manufacturer.
Excess weight will result in a high internal temperature, which can damage the envelope fabric. If an ascent to over 300 m (1000 ft) is to be made, it may be necessary to consult the load chart during the flight. The change in temperature and altitude, together with the weight loss due to fuel consumption, may make the pilot change the flight parameters, particularly as far as altitude is concerned. Use of the load chart is explained in Section 5.3.

4.5 Preparing the aerostat for flight

Brief crew as to the roles they are to perform.

4.5.1 Initial Pre-flight checks

Before preparing for every flight, the balloon should be inspected to comply with the following requirements:

4.5.1.1 – Documents

Balloon Flight Manual including AD's and SB's, an airworthiness certificate, a certificate of registration, a certificate of the fuel cylinders and a certificate of burner, basket and/or fuel cylinders in case any part of the bottom end is from another manufacturer.

4.5.1.2 - Envelope and deflation system:

No holes or tears in the fabric exceed the permitted damage as per Section 2.1 of the UM Maintenance Manual Rev.18.
All horizontal and vertical load tapes in good condition.
All cords and pulleys well attached and working correctly.
The parachute or FDS lines are free of tangles and operating correctly.
Flying wires are free of kinks or damage

4.5.1.3 - Burner and fuel system:

Check the burner and blast valves, the condition of the hoses, and their connections to the fuel tanks, making sure that there are no leaks. Perform a burner test checking also the pilot lights.

4.5.1.4 - Basket:

General condition, tanks firmly held in, correct attachment of burner frame and wires.

4.5.1.5 – Other Equipment:

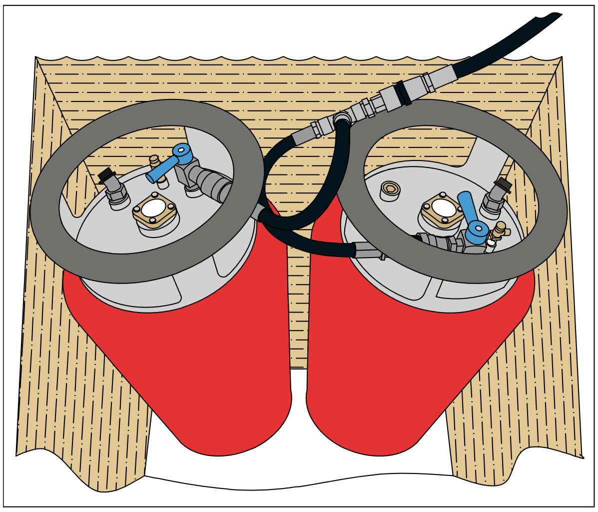
Check Altimeter, variometer and thermometer. Also matches, gloves, First Aid kit and Fire Extinguisher all to be in proper condition.

4.5.2 Rigging the basket and burner

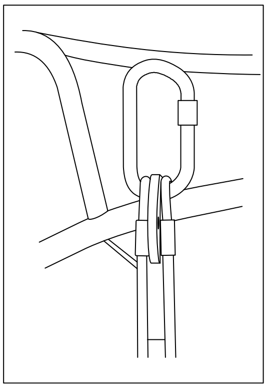
- Place the basket upright where the inflation is to take place.
- Check the wires of the basket for damage.
- Ensure that the fuel cylinders are firmly strapped into the basket, and that their contents are sufficient for the flight. Check also that the cylinders to be used for

inflation are full and correctly orientated. Cylinders to be used for liquid supply during inflation must be positioned so that the liquid valve is in the lower position when the basket is laid on its side. Where a vapour supply is also required the cylinder should be positioned so that the vapour valve is uppermost when the basket is laid on its side

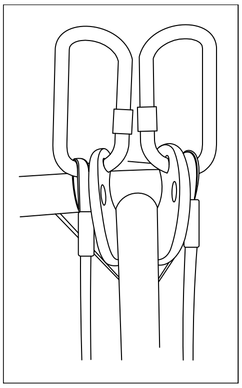
- Check the position of the hoses, avoiding unnecessary loose hose entering the space of the pilot, as well as acute bends. Do not align inwards the liquid takeoffs of the cylinder to prevent stress in the event of a hard landing. Hoses must not be tight, particularly when using fuel manifolds (also known as T-connections). Coupling adaptors (i.e. Tema to Rego, etc) are not allowed.



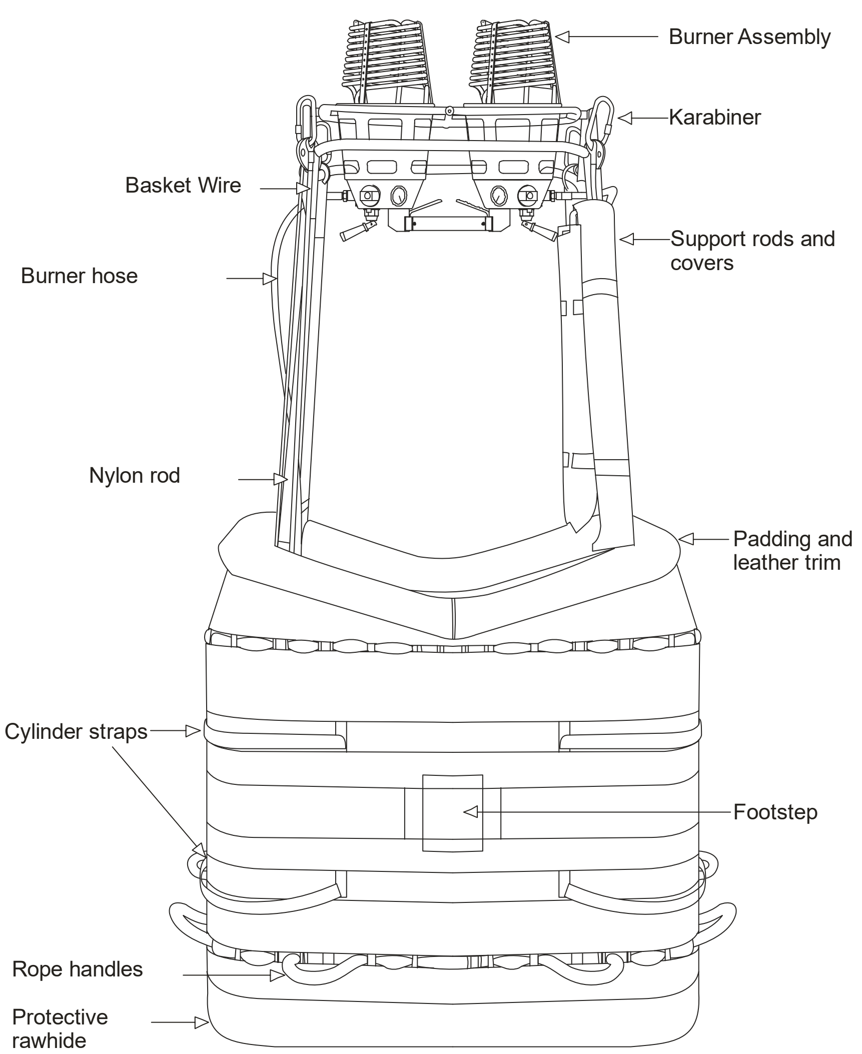
- Place the support rods to support the burner in their sockets in the basket, then position the upper end of the rods in the sockets on the burner frame. Connect the basket cables to the burner frame using karabiners. On baskets with double corner lugs then each cable fits with its own lug. See following drawings.
Certain non-ultramagic frames may fit a corner lug consisting of an inverted U-shaped bracket, where the eye of the wire is inserted into the U and the karabiner is passed through the hole in the bracket, through the eye of the wire and out the other side of the bracket. On larger baskets with two wires at each corner, the eye of the second wire is also threaded on to the same karabiner so that it lies closest to the short side of the basket. Check the applicable supplement on equipment from other manufacturers.



Ultramagic single corner lug



Ultramagic double corner lug

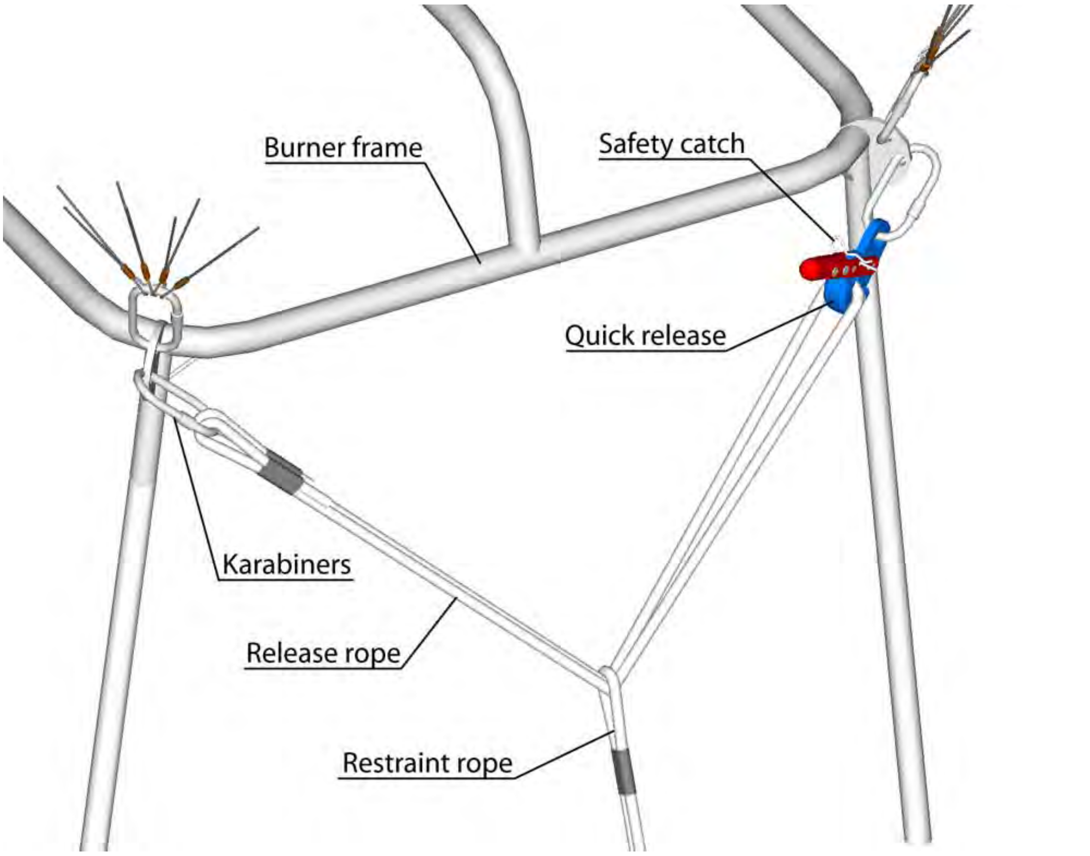


General View

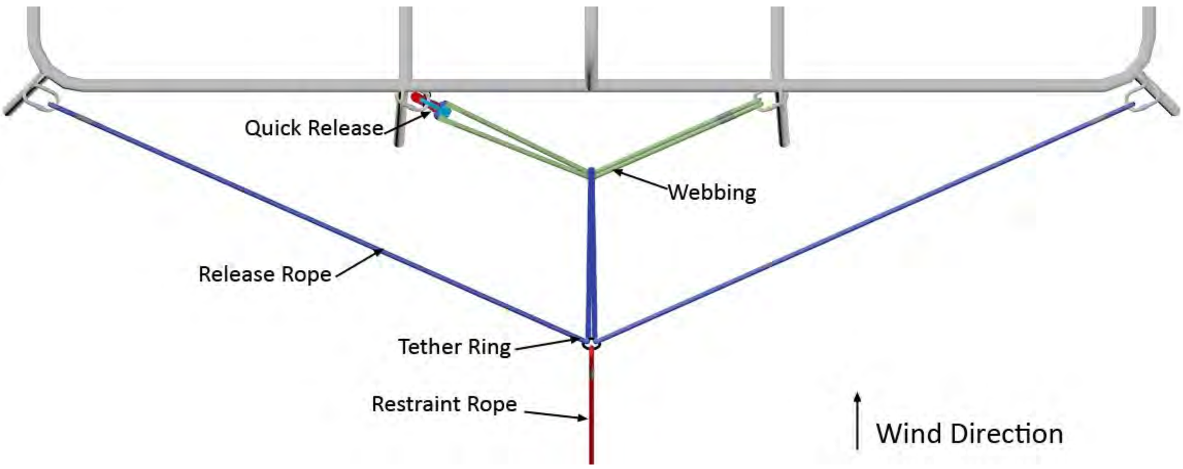
- Check that all fuel lines are in good condition, and then connect them to the cylinders, the vapour feeds (where fitted) to the regulators, and the liquid feeds to the main valves.

- Put the protective covers round the burner supports, making sure that the fuel lines are not pinched by the covers, and that smooth gimballing of the burner is possible. Check that the fuel lines are not kinked in any way that may prevent the free circulation of fuel or cause increased stress to the fuel system.

- Restrain the balloon securing the burner frame (upwind side) to a vehicle or solid fixed object. Unless the wind conditions are very calm, it is strongly recommended to use the Bonanno Quick Release system (see section 6.5) in the interface with the frame.
Observe the restraint assembly in the following example showing the use of an additional release (webbing) rope combined with a Quick Release.

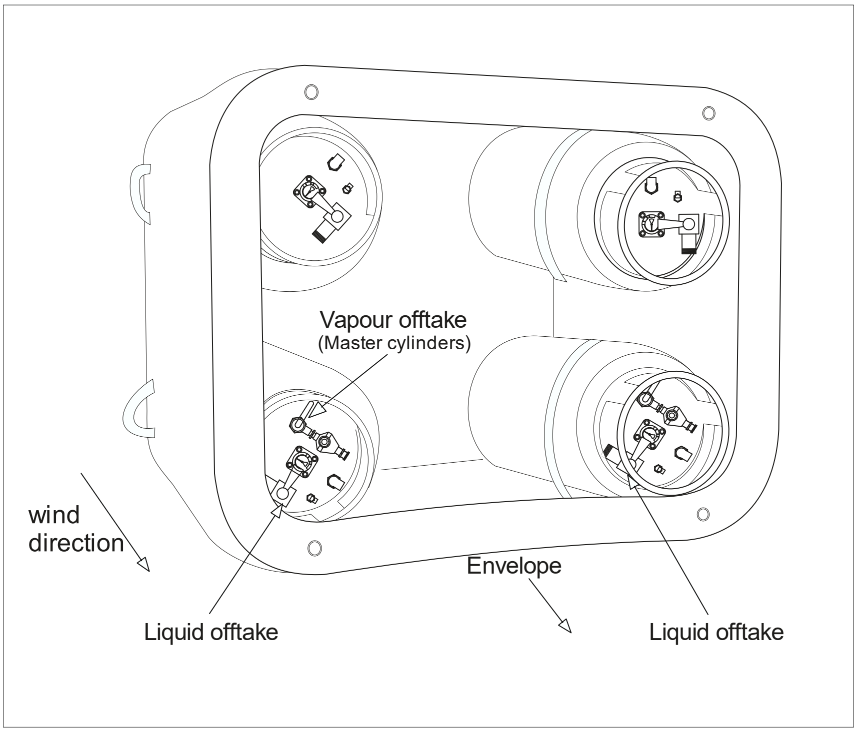


- Alternatively, if a 4-point quick release system is used (large frames only), attach the restraint rope to the quick release by means of a double release rope and a tether ring, always upwind, as shown on the following diagram. All the materials to be used must be supplied or approved by Ultramagic.



When available, the basket wall restraint points shown below can be alternatively used for the assembly of the quick release system:

- Prepare the burner for test as described in Section 4.5.3, then lie the basket down on a long side, with the burner pointing downwind. If vapour outlets are to be used (master cylinders), ensure that they are uppermost when the basket is laid over (see below). Check that the liquid outlets of the cylinders used for the inflation are at the bottom.



-Note also that for a T-partitioned basket, the pilot compartment should be on the right when looking from the basket into the mouth of the envelope.

4.5.3 Testing the burner

- With all the burner valves closed, turn on first the liquid fuel supply at the fuel cylinder and then (where applicable) the vapour supply valves at the fuel cylinder. Check that there are no leaks by listening and checking for smell.
- Light the pilot light to one burner, and check the flow, and ensure that the flame is strong. Where a vapour pilot light is fitted adjust the setting of the regulator if required.
- Open the main blast valve on the burner, and check that the flame is burning evenly. Check the pressure gauge reading. This should be between a minimum of 3 bars in winter to a maximum of 10 bars in summer.
- Follow the same procedure for each burner in any configuration.
- Check that the cross-flow valve (where fitted) operates correctly (checking 2 or 3 burners that are fuelled from the same fuel cylinder).
- Check that the "quiet" burner operates correctly (where fitted).
- If a hydraulic remote control valve is fitted, this should be connected and tested. The valve on the burner should open fully when the hydraulic handle is depressed.
- Close the liquid valves on the fuel cylinders, burn the remaining gas in the fuel lines, then shut the main blast valve.
- Close the vapour feed valves (where fitted) on the fuel cylinders, wait until the pilot light goes out, then close the pilot light valves.

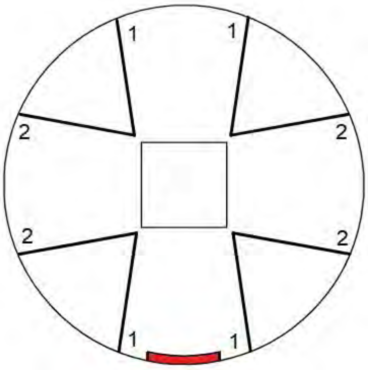
4.5.4 Envelope

- Open the envelope bag and take out the cables and the lower part of the envelope. Find the coloured tape sewn to the bottom of the Nomex and place it in the centre of the lower part of the envelope. Maintaining this configuration, attach the envelope wires to the load frame with karabiners, making sure they are not twisted at each other. Cables must be attached as shown in Flying wire connection diagrams.

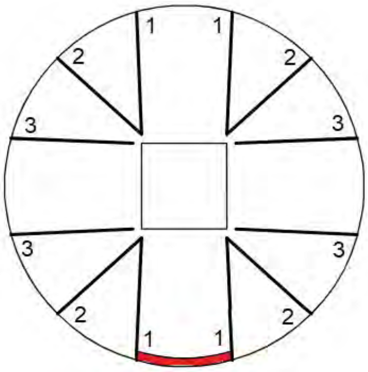
- A basket fitted with double corner lugs will have two karabiners at each corner. Where a basket has eight poles then there will be a karabiner at the top of each pole. The envelope cables may be left connected to a separate set of karabiners. In the case of an eight-pole basket then there should be eight envelope karabiners. Where two adjacent corner lugs are fitted to the load frame then they should not be joined by a single karabiner from the envelope.

We can find in the following pages different drawings to clarify the position of the red tape of the mouth of the envelope according to the situation of the wires connected to the burner frame.

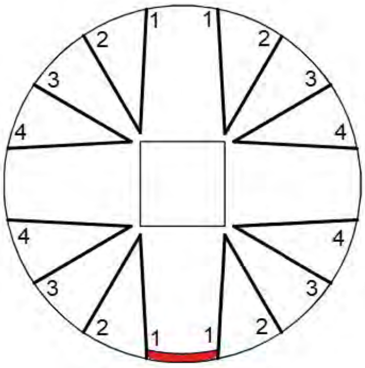
8 WIRES



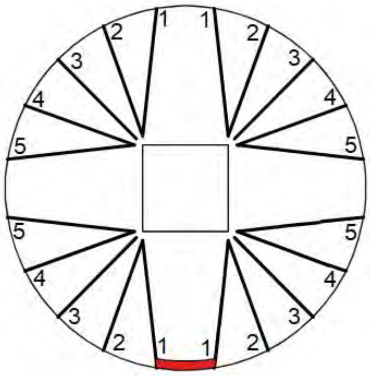
12 WIRES



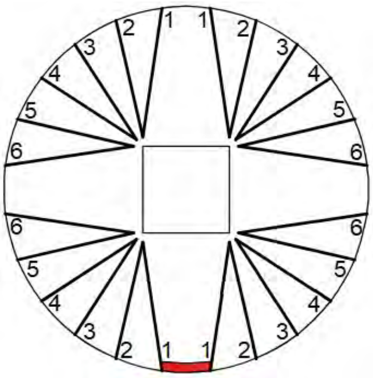
16 WIRES



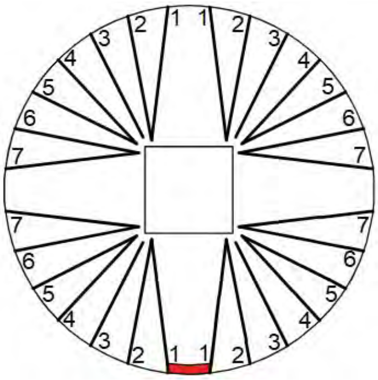
20 WIRES



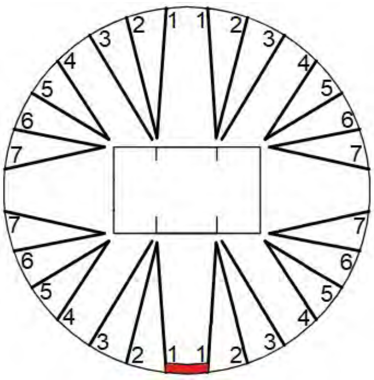
24 WIRES



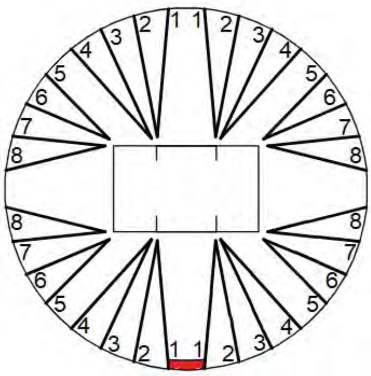
28 WIRES - 4 FRAME LUGS



28 WIRES – 8 FRAME LUGS



32 WIRES - 8 FRAME LUGS



- Close all karabiner screw gates.
- Connect the deflation line to the burner frame.
- Once the envelope is correctly attached, take it out of its bag by pulling the bag downwind.
- Spread the envelope out as much as possible, and lay the crown line out downwind.

4.6 Deflation system

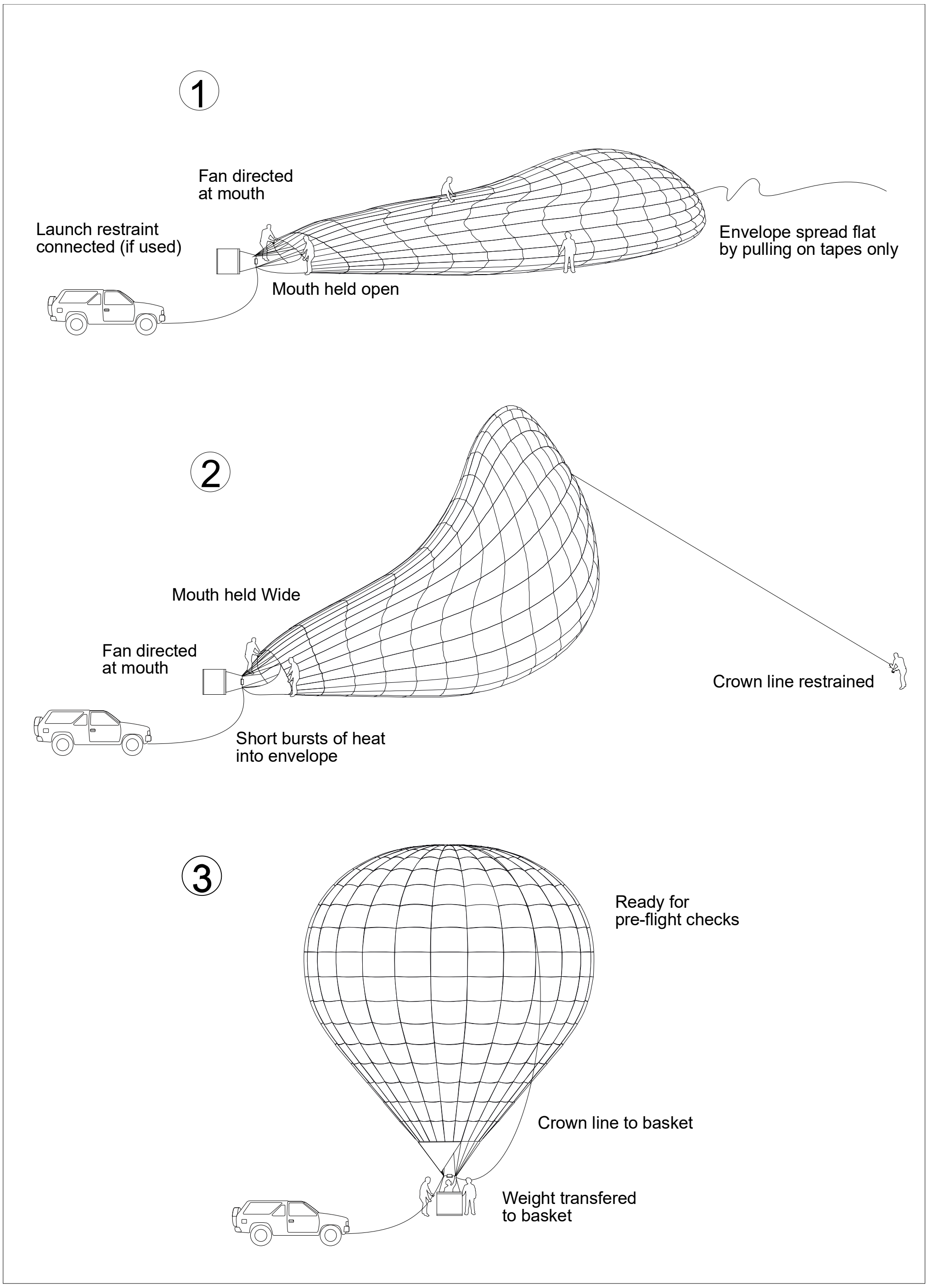
4.6.1 Parachute

It is easier to carry this operation out at the beginning of cold inflation.
- Check that all lines to the parachute are not tangled.
- Pull at the centre of the parachute until it closes against the opening in the balloon.
- Attach the Velcro patches on the edge of the parachute to the corresponding ones on the edge of the balloon opening.

4.6.2 Fast Deflation System (FDS)

- Proceed the same as with a standard parachute system ensuring that all ropes are free from tangles. Check that all lines are free to slide and that no damage can occur.

4.7 Inflation



Fill the envelope with cold air using the fan. During this process the mouth is best held open by two crew, whilst one or a maximum of two, keep the crown rope taut. When the envelope is as full as possible, inflation is completed using the burner. Light the burner using the procedure in Section 4.5.3.

Use the burner only in short bursts, leaving gaps between burns, to allow the air inside the balloon to be heated slowly and evenly.

As the balloon inflates, the crew holding the crown rope allow(s) the crown to rise. The fan should be kept running until the mouth of the balloon leaves the ground. It is useful to have a crewmember to angle the fan to direct air into the balloon.
As the balloon becomes upright, the crew on the mouth of the envelope let go and transfer their weight to the basket as the pilot climbs into the basket whilst the balloon becomes upright.

NOTE: At the pilot's discretion, the crew on the mouth of the balloon may be dispensed with, if the balloon is fully cold inflated.
Also at the pilot’s discretion, if the prevailing wind is sufficient to hold the crown down, under the pressure created by the fan, the crown crew may also be dispensed with unless lateral control is necessary.

CAUTION: The crown crew should be made aware of the following instructions.

1. Leather gloves and strong good grip shoes are advisable.
2. Do not take help from onlookers unless instructed by the pilot as this may create too much force to hold down the envelope resulting in too much lift being generated during inflation.
3. Advise the pilot during cold inflation if problems occur at the top of the envelope.
4. Stay at the end of the rope holding secure.
5. Do not wrap the rope about their person or feed out the rope.

WARNING: All crewmembers must be instructed that they must not allow their feet to come off the ground during the inflation and pre-flight period whilst holding either the basket or the crown rope. They must let go immediately.

4.8 Preparation for Take off

4.8.1 Checks –

Note: refer also to appendix C.

Once the balloon is upright carry out the following checks:
- Envelope: Check the condition of the fabric, and that there are no tears that would prevent the flight.
- Parachute/Deflating system: Pull the parachute line to release all the Velcro fasteners, making sure it closes properly afterwards and the line works freely.
- Karabiners: Screw gates all closed.
- The passengers may now be loaded. The pilot should ensure that each passenger has a handhold and that they have sufficient room. Once the passengers are aboard then they should be briefed (See 4.8.2 passenger briefing).

Continue checks:

- Pilot light: Normal function and no freezing.
- Burner: Check again that all fuel lines and valves are operating correctly as per Section 4.5.3.
- Fuel: Check again the contents of the fuel tanks.
- Equipment: Matches or a lighter, compulsory flight instruments.

- Check again for downwind obstacles and obstructions.
- Instruct crew to stand clear

4.8.2 Passenger Briefing

4.8.2.1 Open Baskets

- Always follow the instructions of the pilot, that will prevail over those here, depending on the landing situation.
- Hold on to rope handles or (except when landing) padded uprights.
- Do not at any time hold on to hoses, valves or control lines.
- When instructed to do so, safely stow all cameras, binoculars etc.
- When instructed to do so, take up the landing position as follows.
  - Ensure that long hair is safely kept inside cloths or tied back.
  - Stand at the front of the basket and face the direction of travel.
  - Keep your knees together and bend them slightly. Do not sit or squat.
  - Keep hands inside the basket at all times and hold on to the rope handles.
  - Progress the landing and brace for touchdown.
  - Be aware that the basket may tip over and drag after touch down.
  - Do not leave the basket until the pilot instructs to do so.

4.8.2.2 Partitioned Baskets

- Always follow the instructions of the pilot, that will prevail over those here, depending on the landing situation.
- Hold on to rope handles or (except when landing) padded uprights.
- Do not at any time hold on to hoses, valves or control lines.
- When instructed to do so, safely stow all loose items, cameras, etc.
- When instructed to do so, take up the landing position as follows:
  - Ensure that long hair is safely kept inside cloths or tied back.
  - Scarves, neck-straps or other long neckwear should be removed before landing
  - Stand squarely with your back against the basket facing away from the direction of travel. Push the back against the basket wall. Alternatively, stand sideways to the direction of travel, at the front edge of the basket, facing the pilot in the basket. Hold on the rope handles with both hands, one on each side.
  - Keep your knees together and bend them slightly. Do not sit or squat.
  - Keep hands inside the basket at all times and hold on to the rope handles.
  - Watch progress of the landing and brace for touchdown.
  - Be aware that the basket may tip over and drag after touch down. Continue to hold on until the basket comes to rest.
  - Do not leave the basket until the pilot instructs to do so.

4.9 Take Off

Take off by increasing the temperature in the envelope with repeated burns, and operate the quick release.
Be ready to use the burner again once the balloon has lifted off and stabilised.

4.9.1 Windy Conditions, Sheltered Site

An apparent loss of lift can occur as the balloon first encounters faster moving air just above the surface during windy conditions. When the balloon is static on the ground, the faster moving air above it creates an area of low pressure which creates lift in the same way as an aeroplane wing. This extra lift or “false lift” adds to the sustentation created by the balloon itself and could let the pilot think that the balloon is hot enough to start the take-off manoeuvre.

As the balloon takes-off, this effect diminishes causing the balloon to descent unless more heat is added. The burner flame will also be deflected which may prevent heating to replace the lost lift.

In windy conditions build up excess lift before leaving the ground either by using crew in a ‘hand on’ and ‘hands off’ drill, or a restraining device. Burn while ascending and use the angle control on the burner to counteract the deflection of the flame by the wind. The balloon should be launched with the open side of the scoop (if fitted) facing upwind.

WARNING: In low temperature the propane pressure at the burner will be very low, resulting in less burner power and consequently much slower response from the balloon. This may be alleviated by heating or pressurisation techniques. Please refer to section 4.12 of this Manual.

4.10 Control during flight

4.10.1 Manoeuvring in flight

The altitude of the balloon is controlled by the operation of the burner, which is either fully on or fully off. Note that the heat output depends on the fuel pressure. The pilot must judge the length and frequency of burns necessary to control his balloon. Remember the limitations on vertical velocities from section 2.8.

When a "quiet" burner (also known as whisper or liquid valve) is fitted, it is recommended that this is used in the vicinity of livestock. As it is quieter than the main burner it causes less disturbance, as well as allowing fine control of the balloon.

The parachute may be opened briefly for up to 3 seconds at any one time to increase the descent rate, or halt a climb. Always check to ensure that it has resealed after use. In very lightly loaded conditions a small burn may be required where over-venting has occurred.

WARNING:
The FDS rapid deflation system must never be used higher than 10 m. (30 ft) from the ground, as this is to be used for final landing only.

The maximum vertical velocity, the altitude drop required to attain that velocity, and altitude drop required to recover from a descent at that velocity are determined in Appendix A for each balloon size.

4.10.2 Fuel management

The burner has two completely separate fuel supplies as an additional safety factor, however only one should be used at any time under normal conditions. The gauges on the top of the fuel cylinders indicate when they are becoming empty, at the same time the sound of the burner will change and the pressure at the burner will drop. In the case of any of these symptoms, change to the other supply to the burner and continue flying on that side until the source of the problem is clear.
In order to change fuel tanks, carry out the following procedure:
- Shut down the liquid take-off on the empty fuel cylinder.
- Open the burner valve until all liquid in the fuel line has been burned, then close the burner valve.
- Disconnect the fuel line from the empty tank and connect it to a full one.
- Open the liquid feed valve on the full fuel cylinder.
- Check that the burner operates correctly from this new supply.

Continue to fly on the new fuel cylinder. When only two cylinders remain, it is advisable to transfer onto the final one leaving about 25% in reserve, so that there is always fuel in both systems.

If a tank is also supplying a vapour pilot light a reserve of approximately 3% per hour of flight must be left for this purpose, and the pilot must be aware that the pressure available to the burner will reduce with time.

4.10.3 Gusting

The balloon may encounter sudden changes in wind speed or direction. This will cause a slight flattening of one side of the balloon until it stabilises in the new air stream, with a consequent loss of volume and hence lift, together with a sensation of a breeze in the basket. The pilot must compensate for this by burning.

4.10.4 Thermals

WARNING: It is forbidden to intentionally fly in conditions of thermal activity.

However, if thermals are encountered, the internal temperature of the balloon should be maintained as stable as possible, with the balloon at a safe height of over 3000 ft above ground level until a landing is attempted.

4.11 Landing

Before making any landing carry out the following checks:
- Burner: Connected, if possible, to a fuel cylinder filled to at least 40% of its capacity.

- Handling line: In light winds, conveniently fastened to the load frame, and ready for easy deployment.
- Rip line at hand during approach
- Passengers briefed.
- The selected landing site is free of obstructions, power lines and animals and is large enough to safely land the balloon in the current weather conditions.

4.11.1 Landing without wind, with parachute

The landing should be made with practically no vertical velocity, the parachute being opened immediately after touch down only long enough to stabilise the balloon on the ground.

4.11.2 Landing with wind, parachute

The technique is similar to 4.11.1 but horizontal travel must be minimised to avoid downwind obstacles. To achieve this, a steeper angle of descent is chosen, rounded out by a long burn to achieve straight and level flight at about 20ft (6 m) above the ground. The parachute is then opened fully and kept open until the envelope is fully deflated.
The pilot lights will be extinguished and all cylinder valves should be closed before landing.

4.11.3 Landing with wind, FDS

When approaching the ground, open moderately the parachute and when arriving at the selected landing place, open as fast as possible the FDS with the red rope. The FDS should never be used at a height above 10 m. The FDS system has the advantage that if the rope is released, the opening remains as it was left. In case of aborting the landing, the white-red line must be pulled to reseal the parachute.
The pilot lights will be extinguished and all cylinder valves should be closed before landing.

4.11.4 Landing Large Balloons.

Care should be taken when landing large balloons to ensure that the basket is correctly positioned on the approach to allow touchdown on the long side. This is particularly important with partitioned baskets. The basket is correctly positioned by rotating the balloon using the rotation vents. Be aware that the use of the rotation vents does vent off hot air whilst rotating the balloon, so allowance should be made for this, particularly when close to the ground.

4.12 Cylinders - Nitrogen or other inert gases (CO_2) pressurisation

The use of commercial fuels with low natural pressures and/or the operation under cold conditions may lead to the use of cylinders pressurised with Nitrogen or other inert gases such as CO_2, in order to increase the fuel pressure in flight.

The nitrogen or other inert gas (CO_2) source must be adjustable and able to deliver pressures adequate for this purpose. It must be operated as per suppliers instructions.

WARNING: Pressurisation must never be carried out with air or oxygen.

CAUTION: Whenever possible, the use of nitrogen or other inert gas pressurisation should be limited to slave fuel cylinders. If a master cylinder is to be pressurised, identify it clearly as cylinders pressurised with nitrogen or other inert gas (CO_2) become unusable as vapour source until the cylinder is emptied and filled again with fuel only. If your burner needs a vapour phase supply, make sure that you have a suitable source for the flight.

CAUTION: Cylinder pressurisation must be carried out immediately before the flight (or the road transportation to the inflation site). Whenever a pressurised cylinder is to be stored, its pressure must be reduced by purging to a maximum of 7 bar (100 psi).

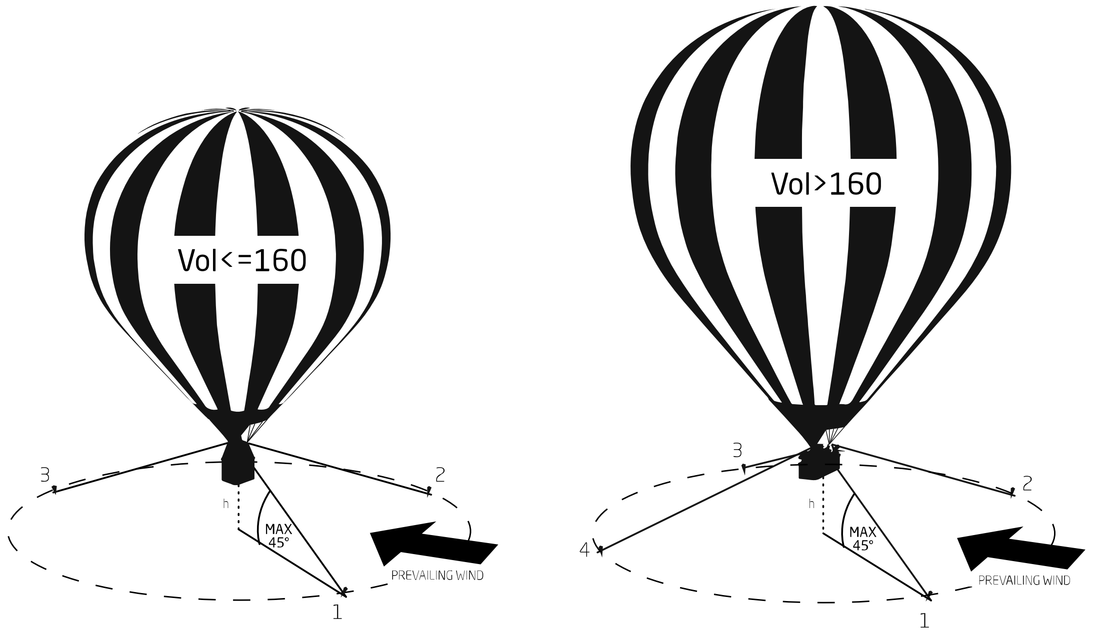
Nitrogen or other inert gas (CO_2) pressurisation of Ultramagic cylinders must be developed as follows:

- Ensure that the Ultramagic cylinder is already filled with fuel.
- Ensure that all valves in the nitrogen or other inert gas supply and the fuel cylinder are closed.
- Connect the nitrogen or other inert gas supply to the liquid coupling of the fuel cylinder.
- Open the main valve of the fuel cylinder.
- Open the feeding valve of the source.
- If applicable, adjust the maximum pressure delivered by the source (refer to section 2.5).
- Await for the pressures to balance (the noise caused by the flow stops).
- Close the valves on the supply and the fuel cylinder. Release the hose.

4.13 Tethered Operation

Prior to undertake tethered operations, observe the following figure and proceed following the next considerations:

- All equipment must be checked carefully before the flight.
- Check all ropes and cords for absence of undue knots/entanglements.



Envelope sizes up to 160,000 ft^3 (*Total volume*)

> The balloon must be attached, at least, by two ropes forming a V on the upwind side and an additional rope on the downwind side. Materials for tether must be supplied by ULTRAMAGIC (Ø14mm ropes min) or be clearly rated in the following way: minimum 4500 kg for ropes and minimum 3000 kg for karabiners (break strength).

Envelope sizes above 160,000 ft^3 (*Total volume*)

> The balloon must be attached, at least, by two ropes forming a V on the upwind side and two more ropes on the downwind side. Materials for tether must be supplied by ULTRAMAGIC (Ø20mm ropes) or be clearly rated in the following way: minimum 6000 kg for ropes and minimum 4000 kg for karabiners (break strength).

The use of gear and materials showing signs of damage or significant wear must be avoided.

The tether lines should be connected to the karabiners rigging the envelope to the bottom end (either directly or using linking rings EM-01-0040) or, where present, to the free hole in the corner lugs of the burner frame. Refer to the figures on the Ultramagic Flight Manuals section 4.5.2.

WARNING: Bridles used for inflation restraints must not be used for tethering
WARNING: Quick-release devices must not be installed on tethering gear
NOTE: Local operational and/or license requirements on tethering may apply and must be adhered to

Check that the tether points are absolutely secure and that all karabiner gates are locked/secured.

The height to which the balloon is able to rise should be decreased if the wind increases, and ropes should never form an angle beyond 45º with the ground. Under no circumstance a height of 30 m (100 ft) above ground can be exceeded – with regard to the basket floor –.

Tether flight must be terminated in presence of changing winds, unless a new clear wind direction is identified and the tether lines can be safely relocated accordingly.

During tether, pilot must infer that the loads applied to the tethering assembly are not excessive at anytime. To do so, pilot must have a mean to check the wind speed (e.g. a handheld anemometer, windsock, etc). Should the winds exceed the parameters from section 2.14, the tethered flight is to be terminated as soon as possible.

SECTION 5

LOADING

5.1 Introduction

For the given volume, the lift of a balloon is limited by the internal temperature. This is affected by the ambient temperature and the altitude of the proposed flight.
This section shows how the Lift is calculated considering all these parameters, without surpassing the maximum authorised load. Maximum Lift takes account of the basket used because it can be lower than the Maximum Lift permitted for the envelope.

This section is **approved** by EASA.

5.2 Table of Empty Weight and Maximum Lift

The following table provides **orientative figures** for the **Empty Weight** and **Maximum Lift** available per envelope/basket combination. Actual figures must be calculated with the specific mass of each balloon component (page 0.1).

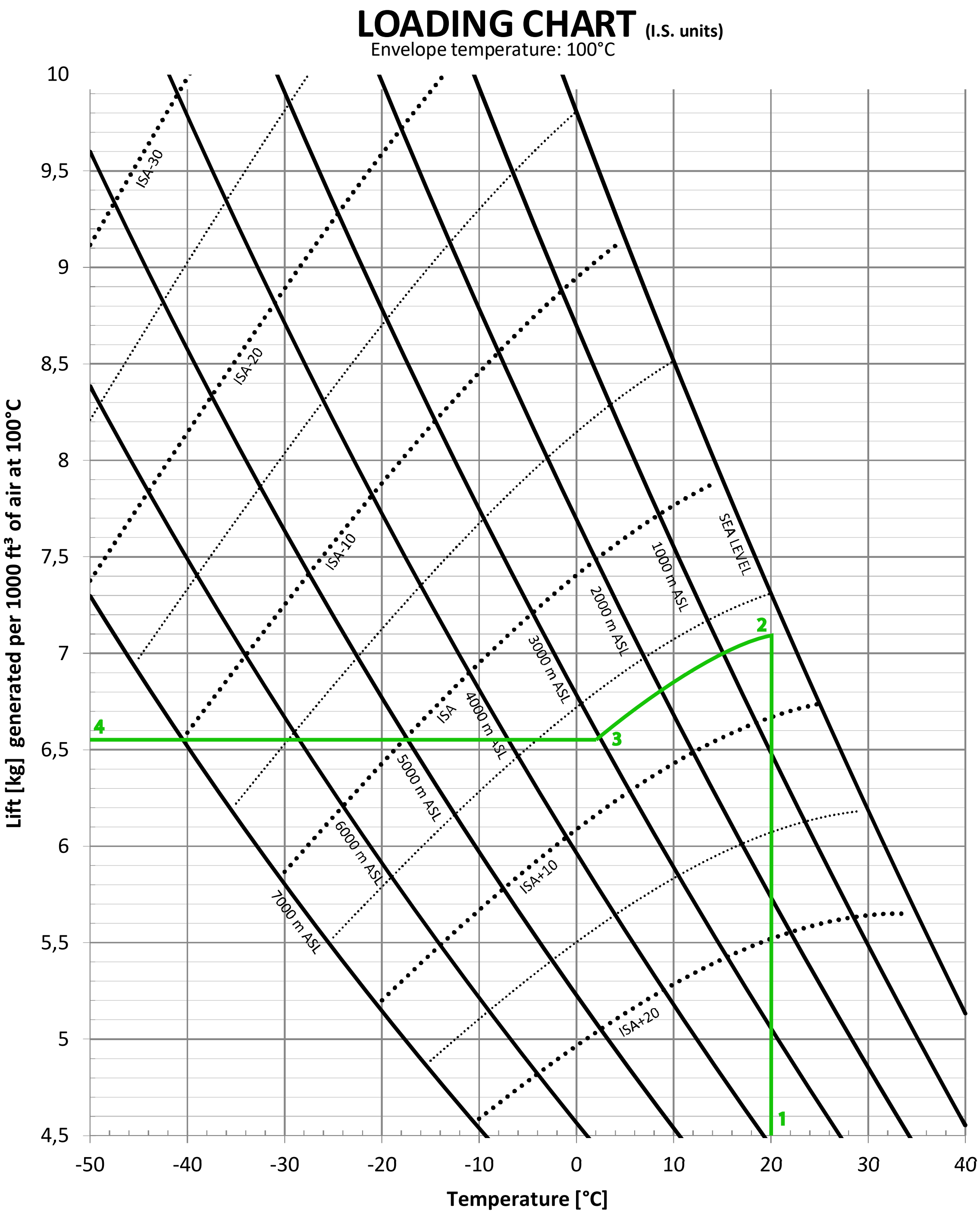
Model	Basket	Pv	Lmax
V-25	SOLO	61	250
H-31	C-0	132	307
	C-2	139	307
H-42	C-0	138	396
	C-2	145	416
	C-1	150	416
M-42	C-0	140	398
	C-2	147	414
	C-1	152	414
H-56	C-2	158	549
	C-0	151	422
	C-1	163	549
V-56	C-2	175	549
	C-0	168	426
	C-1	180	549
M-56 / M-56C	C-2	169	550
	C-0	162	422
	C-1	174	550
M-56Z	C-2	177	549
	C-1	182	549
	C-3	194	549
	C-10	210	549
	C-4	215	549
M-60Z	C-2	179	588
	C-1	184	588
	C-3	196	588
	C-10	212	588
	C-4	217	588
H-65	C-1	183	638
	C-2	178	638
	C-3	195	638
	C-10	211	638
V-65	C-1	186	638
	C-2	181	638
	C-3	198	638
	C-10	214	638
M-65 / M-65C	C-1	195	638
	C-2	190	638
	C-3	207	638
	C-10	223	638
M-65Z	C-2	194	636
	C-1	199	636
	C-3	211	636
	C-10	227	636
	C-4	232	636
M-70Z	C-2	197	686
	C-1	202	686
	C-3	211	686
	C-10	230	686
	C-4	235	686
M-74Z	C-2	203	710
	C-1	208	710
	C-3	220	710
	C-10	236	710
	C-4	241	710
H-77	C-1	190	756
	C-2	185	756
	C-3	202	756
	C-10	218	756
	C-4	223	756
V-77	C-1	193	756
	C-2	188	756
	C-3	205	756
	C-10	221	756
	C-4	226	756
M-77 / M-77C	C-1	209	756
	C-2	204	756
	C-3	221	756
	C-10	237	756
	C-4	242	756
S-90	C-3	237	878
	C-1	209	878
	C-2	204	878
	C-4	242	878
	C-10	237	878
V-90	C-3	224	878
	C-1	212	878
	C-2	207	878
	C-4	245	878
	C-10	240	878
M-90	C-10	244	880
	C-1	216	880
	C-2	211	880
	C-3	228	880
	C-4	249	880
Z-90	C-3	221	894
	C-1	209	894
	C-2	204	894
	C-4	242	894
	C-10	237	894

Model	Basket	Pv	Lmax
G-90	C-3	215	878
	C-1	203	878
	C-2	198	878
	C-4	236	878
	C-10	231	878
S-105	C-4	255	1 032
	C-1	222	1 032
	C-3	234	1 032
	C-10	250	1 032
V-105	C-4	269	1 032
	C-1	236	1 032
	C-3	248	1 032
	C-10	264	1 032
M-105	C-4	254	1 032
	C-1	221	1 032
	C-3	233	1 032
	C-10	249	1 032
M-120	C-4	265	1 173
	C-1	232	1 173
	C-3	244	1 173
	C-5	357	1 173
	C-6	271	1 173
	C-7	287	1 173
	C-10	260	1 173
S-130	C-4	281	1 365
	C-1	248	1 280
	C-3	260	1 365
	C-5	373	1 365
	C-6	287	1 363
	C-7	303	1 365
	C-10	276	1 276
M-130	C-4	276	1 365
	C-1	243	1 275
	C-3	255	1 365
	C-5	368	1 365
	C-6	282	1 358
	C-7	298	1 365
	C-10	271	1 271
M-145	C-6	297	1 373
	C-3	270	1 436
	C-4	291	1 436
	C-5	383	1 436
	C-7	313	1 436
	C-10	286	1 286
T-150	C-3	280	1 465
	C-10	296	1 296
	C-4	301	1 465
	C-5	393	1 465
	C-6	307	1 383
	C-7	323	1 465
S-160	C-5	391	1 569
	C-4	299	1 569
	C-6	305	1 381
	C-7	321	1 569
	C-10	294	1 294
M-160	C-5	394	1 569
	C-4	302	1 569
	C-6	308	1 384
	C-7	324	1 569
	C-10	297	1 297

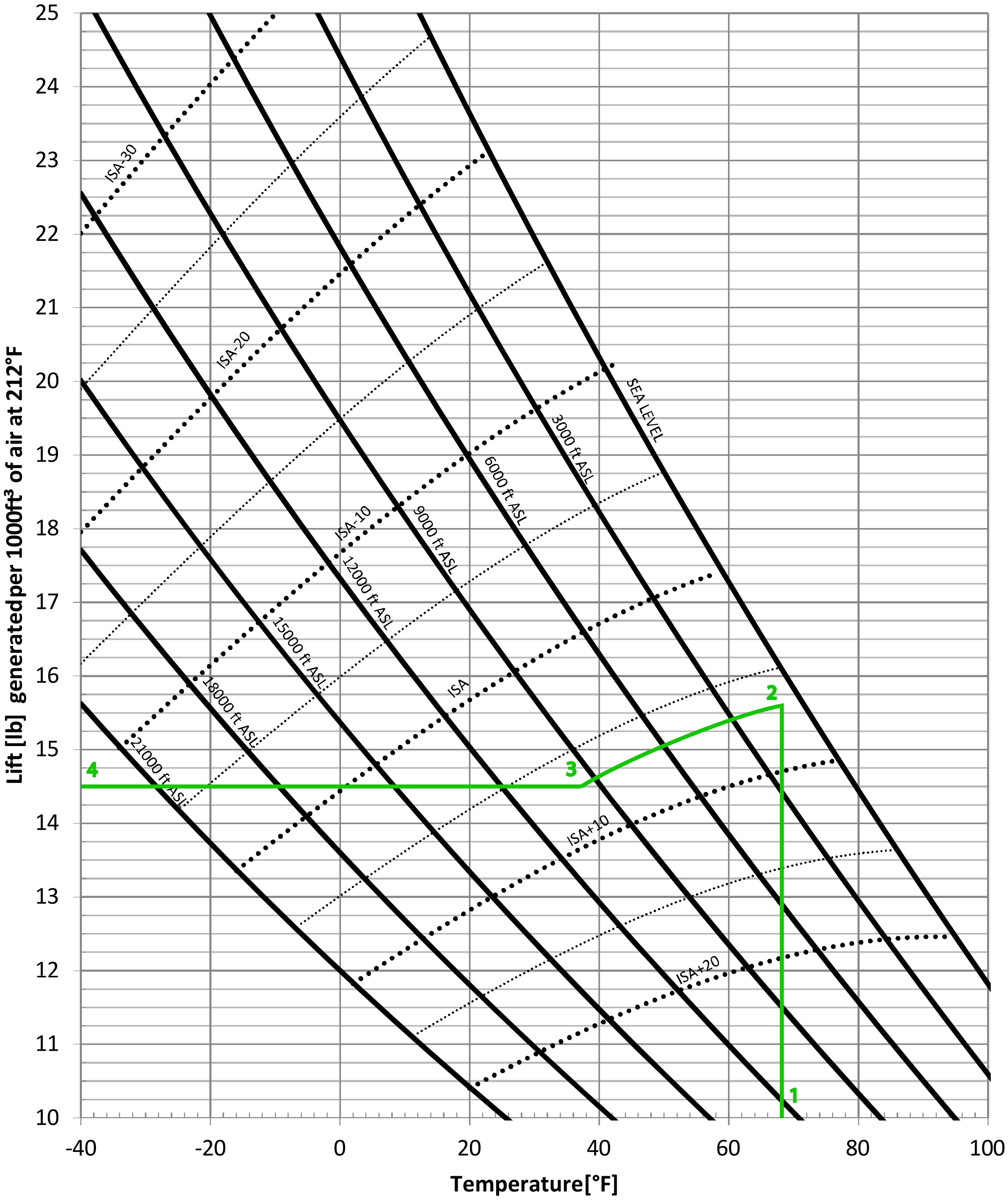
Model	Basket	Pv	Lmax
T-180	C-5	422	1 754
	C-6	336	1 412
	C-7	352	1 640
	C-8	405	1 754
	C-9	515	1 754
N-180	C-5	421	1 754
	C-6	335	1 411
	C-7	351	1 639
	C-8	404	1 754
	C-9	514	1 754
T-210	C-8	437	2 070
	C-5	454	2 023
	C-7	384	1 672
	C-9	547	2 070
	C-11	618	2 070
N-210	C-8	438	2 064
	C-5	455	2 024
	C-7	385	1 673
	C-9	548	2 064
	C-11	619	2 064
N-250	C-8	478	2 272
	C-5	495	2 064
	C-9	588	2 408
	C-11	659	2 408
N-300	C-9	623	2 831
	C-5	530	2 099
	C-8	513	2 307
	C-11	694	2 924
	C-12	795	2 924
N-355	C-9	654	2 862
	C-5	561	2 130
	C-8	544	2 338
	C-11	725	3 405
	C-12	826	3 450
N-370	C-12	858	3 450
	C-11	757	3 405
	C-9	686	2 862
	C-8	621	2 338
	C-5	593	2 130
N-425	C-12	860	3 860
	C-11	759	3 439
	C-9	688	2 896
	C-5	595	2 164
	C-8	578	2 372
	C-14	948	4 140
N-450	C-14	954	4 140
	C-12	878	3 878
	C-11	777	3 457
	C-9	706	2 914
	C-5	613	2 182
	C-8	641	2 435
N-500	C-12	865	3 813
	C-14	1055	5 000
	C-15	1170	5 000
N-550	C-12	1018	4 018
	C-14	1103	5 000
	C-15	1220	5 000

Pv = Empty Weight (no cylinders) [kg]
Lmax = Maximum Lift [kg]

5.3 Load Chart



LOADING CHART (Imperial Units)
Envelope temperature : 212°F



This graph is used to find the lift available per thousands of cubic feet volume at various altitudes and ambient temperatures, for a temperature of 100° C inside the envelope.
The total loading capacity is the difference between the total lift available and the weight of the various parts of the balloon itself. The empty weight of the balloon does not include empty cylinders or fuel. These should be deducted from the loading capacity.
See the graphs of pages 5.3 in S.I. (m) and 5.4 in US units (lb-ft).

NOTE: Blank loading charts are available in the ultramagic.com website.
NOTE: Ultramagic Flightpack App uses the calculation parameters of this section.

5.3.1 Calculation Example: Using the graphic load chart

Flight parameters:

Balloon type H-65
Ambient air temperature: 20° C (68 ºF)
Altitude of launch site: 300 m (984 ft)
Maximum altitude planned: 3000 m (9842 ft)

1. Starting from the ambient air temperature on the base line (1), follow vertically until the intersection of the 300 m (984 ft) curve (2).

2. From this point trace a curve parallel to the I.S.A. curve to intersect with the 3000 m (9842 ft) curve at (3).

3. From (3) trace horizontally across to the vertical axis at (4). Read off 6.55 kg per 1000 ft^3 (14.5 lb/1000 ft^3).

4. In our 65,000 ft^3 envelope, the total lift is 6.55 x 65 = 426 kg. (65 x 14.5 = 942 lb)

5. Loading Capacity = Total lift - empty weight with a C-2 basket
= 426 - 178 = 248 kg (= 942 – 392 = 550 lb ≈ 248 Kg)

These 248 kg (~550 lb) have to be distributed between fuel cylinders, fuel, crew, luggage and accessories. This mass must fall within any maximum authorized weight applicable to the bottom end.

If instead, we are planning the same flight in a colder day with an ambient temperature of 10ºC (18ºF), the total lift would be of approximately 488 kg (1075 lb), which results in 62 kg (133 lb) of additional lift capacity when compared to the first scenario.

NOTE: Load chart calculation is a graphic approach method which may lead to negligible deviations when compared with precise mathematical calculations.

5.3.2 Calculation Example: Using the FlightPack App

When available, official Ultramagic FlightPack App can be alternatively used to determine the lift available before the flight. The process is as follows:

- Access the application, click on 'Load Calculator' section.
- Adjust the Balloon volume and weight parameters as per the actual values (as listed in the build standard or a valid weight list).
- Establish the flight parameters (take off elevation and temperature, max. altitude, etc).
- Establish the fuel cylinders carried on board. Check that the Total Fuel Weight shown is correct.
- The available lift is calculated in the left column. Add then the masses of the occupants (an estimation is initially provided by the software).
- Software finally shows whether if the configuration is valid or not in terms of lift.

NOTE: Any further requirements applicable such as compatibility and particular loading limits (restrictions to the bottom ends, etc.) of the equipment are not checked by the software, but must be adhered to.

5.4.Table of compatibility

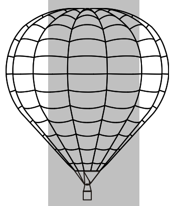
See next pages.

NOTE: Shaded cells indicate a compatible assembly

Envelope Model	BASKETS						BURNERS									OTHER		
	C-0	C-2	C-1	C-3	C-10	C-4	MK-2 Single	MK-10 Single	MK-21 Single	BMK-008 Single	MK-2 Double	MK-10 Double	MK-21 Double	BMK-008 Double	MK-32 Double	FDS	Rotation Vents	Min Cylinders
V-25									■	■						■	■	1
H-31	■	■					■	■	■	■						■	■	½
H-42	■	■	■				■	■	■	■						■	■	½
M-42	■	■	■					■	■	■						■	■	½
H-56	■	■	■				■	■	■	■	■	■	■	■	■	■	■	2
V-56	■	■	■				■	■	■	■	■	■	■	■	■	■	■	2
M-56	■	■	■				■	■	■	■	■	■	■	■	■	■	■	2
M-56C	■	■	■				■	■	■	■	■	■	■	■	■	■	■	2
H-65		■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	2
V-65		■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	2
M-65		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	2
M-65C		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	2
H-77		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	2
V-77		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	2
M-77		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	2
M-77C		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	2
S-90		■	■	■	■	■			■	■	■	■	■	■	■	■	■	2
V-90		■	■	■	■	■				■	■	■	■	■	■	■	■	2
M-90		■	■	■	■	■			■	■	■	■	■	■	■	■	■	2
Z-90		■	■	■	■	■			■	■	■	■	■	■	■	■	■	2

Envelope Model	BASKETS							BURNERS											OTHER		
	C-1	C-3	C-10	C-4	C-6	C-7	C-5	MK-21 Single	BMK-008 Single	MK-2 Double	MK-10 Double	MK-21 Double	BMK-008 Double	MK-32 Double	MK-2 Triple	MK-10 Triple	MK-21 Triple	MK-32 Triple	FDS	Rotation Vents	Min Cylinders
S-105	■	■	■	■				■	■	■	■	■	■	■	■				■	■	2
V-105	■	■	■	■					■	■	■	■	■	■	■	■	■		■	■	2
M-105	■	■	■	■				■	■	■	■	■	■	■	■	■	■		■	■	2
M-120	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	2
S-130	■	■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	2
M-130	■	■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	2
M-145		■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	2
T-150		■	■	■	■	■	■			■	■	■	■	■		■	■	■	STD	STD	2
S-160			■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	2
M-160			■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	2

5 LOADING



Envelope Model	BASKETS							BURNERS														OTHER		
	C-6	C-7	C-5	C-8	C-9	C-11	C-12	MK-10 Double	MK-21 Double	BMK-008 Double	MK-32 Double	MK-2 Triple	MK-10 Triple	BMK-050 Double	MK-21 Triple	MK-32 Triple	MK-2 Quad	MK-10 Quad	BMK-050 Triple	MK-21 Quad	MK-32 Quad	FDS	Rotation Vents	Min Cylinders
T-180																						STD	STD	2
N-180																						STD	STD	2
T-210																						STD	STD	2
N-210																						STD	STD	2
N-250																						STD	STD	3
N-300																						STD	STD	3

Envelope Model	BASKETS							BURNERS						OTHER		
	C-5	C-8	C-9	C-11	C-12	C-14	C-15	MK-2 Quad	MK-10 Quad	BMK-050 Triple	MK-21 Quad	MK-32 Quad	BMK-050 Quad	FDS	Rotation Vents	Min Cylinders
N-355														STD	STD	4
N-370														STD	STD	4
N-425														STD	STD	4
N-450														STD	STD	4
N-500														STD	STD	4
N-550														STD	STD	4

5.5.Minimum Take off Mass

The total take off mass must never be less than that specified in the following table. This applies to all balloons of Volume greater than 90,000 ft³.

Explanation note: These values provide for an appropriate internal pressure of the envelope which results in less vulnerability to envelope deformation (loss of hot air) by gusts.

Volume [ft³]	Volume [m³]	Maximum TOM [kg]	Minimum TOM [kg]
25,000	708	250	n/a
31,000	900	307	n/a
42,000	1 200	414 (M-42) 416 (H-42)	n/a
50,000	1 415	500	n/a
56,000	1 650 (V-56) 1 590 (All others)	549 (V-56/M-56Z/H-56) 550 (M-56/M-56C)	297 (M-56Z only)
60,000	1 700	588	299
65,000	1 840	635 (M-65C) 636 (M-65Z) 638 (M-65/V-65/H-65)	303 (M-65Z only)

Volume [ft^3]	Volume [m^3]	Maximum TOM [kg]	Minimum TOM [kg]
70,000	1 982	686	306
74,000	2 100	710	312
77,000	2 190 (H-77/V-77) 2 200 (M-77/M-77C)	756	n/a
90,000	2 550	878 (G-90/S-90/V-90) 880 (M-90) 894 (Z-90)	n/a
105,000	2 950	1 032	480
120,000	3 400	1 173	544
130,000	3 680	1 365	588
145,000	4 105	1 436	656
150,000	4 245	1 465	679
160,000	4 550	1 569	728
180,000	5 100	1 754	816
210,000	6 000	2 064 (N-210) 2 070 (T-210)	960
250,000	7 000	2 408	1 120
300,000	8 500	2 924	1 360
355,000	10 000	3 450	1 600
370,000	10 480	3 450	1 600
425,000	12 000	4 140	1 920
450,000	12 750	4 140	1 920
500,000	14 412	5 000	2 300
550,000	15 574	5 000	2 500

5.6. Reduced Maximum TO Mass Operation

Under certain operational conditions it may be necessary for the balloon operator to select a reduced Maximum Take-Off Mass. Under these circumstances the following limits are advised by Ultramagic S.A.

Volume [1000 x ft^3]	R.MTOM [kg]
25	238
31	295
42	399
56	532 531 (M-56Z)
60	568
65	618 615 (M-65Z)
70	663
74	687
77	732
90	855
105	998
120	1140

Volume [1000 x ft^3]	R.MTOM [kg]
130	1235
145	1378
150	1425
160	1506
180	1710
210	1995
250	2375
300	2845
355	3373
370	3370
425	3995
450	3995
500	3995
550	4100

Approval of these reduced limits must be recorded in the balloon log book by a qualified balloon inspector.

Operational limitations as specified in section 5.2 and 5.5 and all continued airworthiness requirements must be maintained whilst operating at the reduced Maximum Take-Off Mass.

Normal Maximum Take-Off Mass limitations as section 5.2 and 5.5 can only be restored to the balloon by a qualified inspector making an full inspection of the balloon. This change to the normal MTOM must then be recorded in the balloon logbook by the inspector

5.7. Basket loading

Each Ultramagic basket has a maximum load associated, shown in the basket identification plate (see section 1.5, 'Maximum Authorised Weight'). This maximum load corresponds to the maximum mass that can be carried inside the basket and/or suspended from the basket structure, but excluding the mass of the empty basket itself.

Regardless of the lift available resulting from section 5.3, the basket maximum load must not be exceeded at any time.

Ultimate limitation is indicated in the plate. However, the default basket's maximum loads are defined as follows:

Model	Loading
C-0	258 kg 569 lb
C-2	756 kg 1 667 lb
C-1	1 032 kg 2 275 lb
C-3	1 365 kg 3 009 lb
C-10	1 000 kg 2204 lb

Model	Loading
C-4	1 569 kg 3 459 lb
C-6	1 076kg 2 372 lb
C-7	1 288 kg 2 840 lb
C-5	1 569 kg 3 459 lb
C-8	1 794 kg 3 955 lb

Model	Loading
C-9	2 208 kg 4868 lb
C-11	2 680 kg 5 908 lb
C-12	3 000 kg 6 614 lb
C-14	5 000 kg 11 023 lb
C-15	5 000 kg 11 023 lb

SECTION 6

BALLOON AND SYSTEMS DESCRIPTION

6.1 Introduction

Section 6 provides a description and operation of the balloon and its systems. Optional equipment and systems are detailed in section 9 – Supplements.

6.2 Description

The aerostat is remarkably simple in its conception and handling. It consists of three main parts: Envelope, fuel system (burner with load frame and fuel cylinders) and finally a basket.

6.2.1 Envelope

The envelope is composed of a certain number of gores as indicated in the tables of Section 6.3. It is made of high resistance polyamide fabric, reinforced by several polyester load tapes. These load tapes bear forces due to loading, and transmit them via stainless steel cables to the load frame. The lowest part of the envelope is made of heat resistant Nomex.

In the top of the envelope is a large hole, where there is no fabric but the mesh of load tapes continues. This hole is covered, from the inside of the balloon by a loose panel of fabric, centred by a system of cords, which makes it resemble a parachute. It is kept closed by the internal pressure of the balloon, so that it seals tightly against the opening and the mesh of load tapes. It is opened from the basket by pulling a cord, a process that is completely reversible, as when the rope is released the parachute reseals.

FDS (Fast Deflation System) is a parachute system but with extra opening capabilities. It’s a parachute that can be gathered in the top centre pulling the red line, and therefore allowing a great outflow of hot air for fast deflating; allowing also the recovery in case of necessity by pulling the red/white line. Also pre-flight preparation is similar to a standard parachute system.

The rotation vents are two vertical valves positioned in the equator of the envelope. These may be operated independently to cause rotation of the balloon about its vertical axis in either direction.

6.2.2 Burner and burner frame.

6.2.2.1 Burner General

The burner is a device for converting the fuel (liquid propane) stored in the fuel cylinders into heat energy. This energy is used to heat the air inside the balloon envelope and thus provide the means of inflation and altitude control during flight.

Fuel is supplied to the burner through the flexible hoses. The fuel enters a machined valve block via a fuel inlet post. The fuel is then distributed to the various valves and pressure gauge in readiness for use. Fuel flow is controlled by an on/off valve called the blast or main valve.

Each burner "pot" is fitted with the following major features:

- Burner can.
- Main Burner Vaporising coil
- Fuel hoses
- Main valve assembly (Blast Valve)
- Liquid valve assembly. (Quiet burner or liquid fire burner valve)
- Pilot regulator valve assembly
- Igniter Assembly
- Pressure gauge assembly.
- Liquid fire jet assembly.
- Pilot light assembly.
- Slurper tube assembly.
- Fuel inlet post.

The burner is available in single, double, triple and quad variants.
A minimum of two blast valves and two fuel supplies are always fitted. With a double, triple or quad burner each coil has its own blast valve and fuel supply, while in a single burner both fuel supplies connect to the same burner coil but via separate blast valves.

The main or blast valve allows fuel to pass through the coil to be pre-heated and then burns at the jet or diffuser outlet. This part of the burner gives the maximum power. This valve has a squeeze action
The MK 10 burner has a maximum power of 2,5 million Kcal/h at a pressure of 6 bars, using liquid propane gas.

- 6, 18 or 24 jets or a diffuser to project the vaporised propane.

- The Mark 21 Burner gives 2,8 million Kcal/h at a pressure of 6 bar, using liquid propane gas.

The liquid fire or quiet burner valve feeds fuel directly to a multi hole jet assembly without passing through the coil. This valve has a toggle action on the Mk21 and a twist action on the Mk10. This provides a less powerful but quieter flame for use when flying near animals. This part of the burner is not meant for general use and should not be used to inflate the balloon or when wind shear is present. Excessive use of this burner may cause the inside of the envelope to become black.

Ignition to both heat flames is provided by a pilot light flame. The pilot light is fitted with a shutoff valve and piezoelectric igniter

6.2.2.2 Double, triple and quadruple burners

Double MK-21 Burner

Triple array of the MK-21 Burner

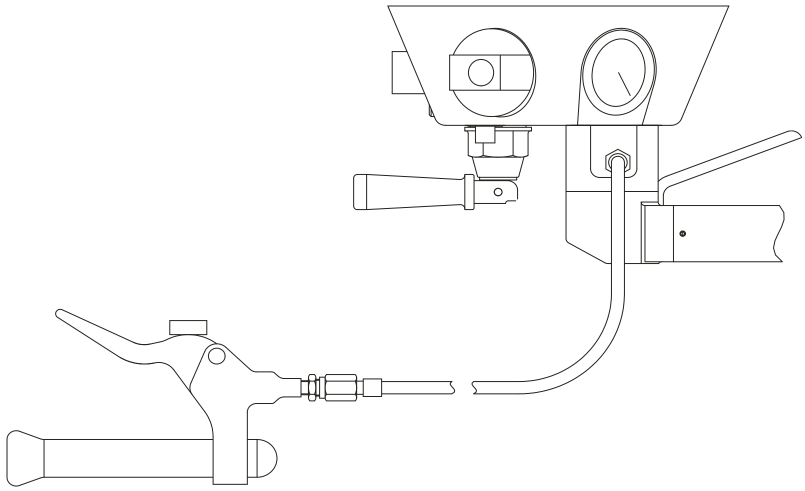
MK-21 Quadruple

6.2.2.3 Load frame

This is a stainless steel frame that establishes the link between the envelope, the burner and the basket. The burner is mounted in the centre of the frame by being swivel mounted on a gimbal. The frame is supported on nylon rods, which are fitted into sockets, which are welded to each of the corners of the load frame. The basket and envelope are attached via the load wires to the corners of the frame with karabiners linked to lugs. These lugs are welded to the frame.

6.2.2.4 Hydraulically actuated remote burner valve

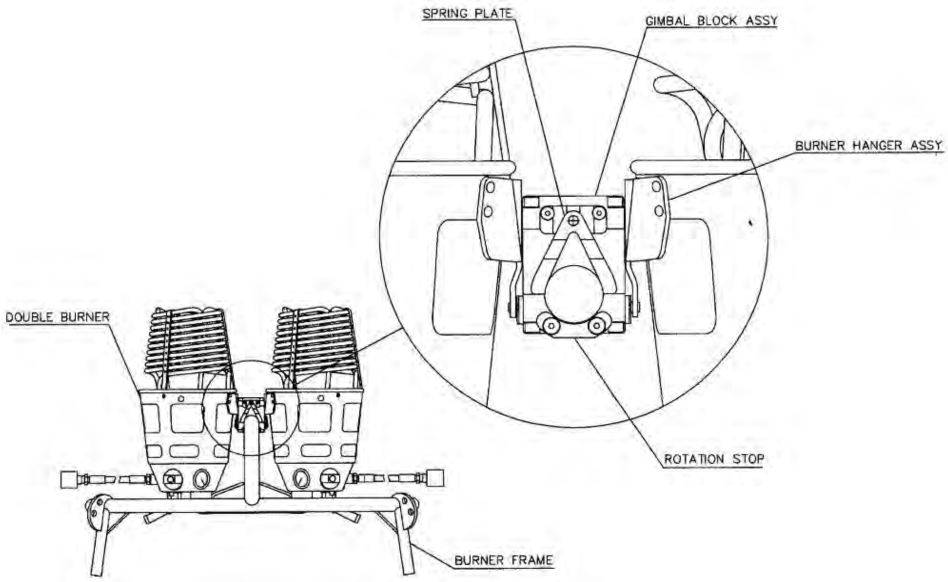
The hydraulically operated main valve is an optional fit on the Mk21 burner. This enables the burner valve to be actuated without toughing the burner. It does not interfere with the normal valve action of the burner.



HYDRAULIC MAIN VALVE ASSEMBLY

6.2.2.5 Centre Gimbal Block

The Centre Gimbal eliminates the need for an inner frame. It is available on the multiple burner arrays of MK-21, BMK-008, BMK-050 and MK32. Since the Gimbal Assembly changes the method of burner attachment to the burner frame, the burner frames have been re-designed to eliminate the inner frame and provide mounting with the use of a central tube. The Gimbal Block Assembly is shown in Figure 1 in the double burner configuration.



The Gimbal Assembly is provided with a mechanical detent mechanism. This provides the pilot with an indication that the burner is positioned vertically. For the double burner, the detent is provided in both axes. Due to the different balance requirements for the triple and quad burners, the detent is only provided in one axis. However, the triple and quad burner mounting is provided with tension gas springs which automatically return the burner to the vertical in the other axis, when released.

6.2.3 Basket

The basket is made from woven willow and cane on a marine plywood base.
Various openings are woven in to accommodate step holes and strap holes for cylinders.
The basket is connected to the load frame by a minimum of four stainless steel cables that pass down the sides and through and under the base. These cables are continuous in pairs. Tube stiffening and tube sockets are woven in various positions depending on the size and type of basket.
The sockets are to accept the nylon rods, which support the burner load frame. These support rods, cables as well as burner hoses are kept inside padded zipped covers when erected.

The floors are reinforced and protected on the outside with hardwood runners, which are bonded and coach bolted to the floor. The bottom edge of the basket, where the wicker joins with the floor, is covered in rawhide for protection from damage.

The top edge of the basket is padded with foam and covered in either leather or suede both to enhance appearance and also to offer passenger protection. The sides of the basket can also be padded and covered on the inside in a hardwearing waterproof canvas type material.

A fire extinguisher is fitted to the inside of the basket inside a special padded bag.

6.2.3.1 Sports Basket

Ultramagic sports baskets are available in various sizes capable of carrying between 1 and 6 passengers. They can be either straight top or swept.

6.2.3.2 Partitioned Baskets

Larger baskets for large balloons are supplied in a number of configurations with various partitioned compartments. These can be T, double T or C partitioned. The pilot and fuel are generally in a separate compartment to the passengers. The sides of the baskets are higher than with the sports basket. The number of support rods and rigging points can also vary depending on the type and size of basket.

As these baskets are considerably longer on one side than the other the balloon should always be landed on the long side. Consequently to achieve this, the envelope should always be fitted with rotation vents with partition baskets.

6.2.4 Fuel Cylinders

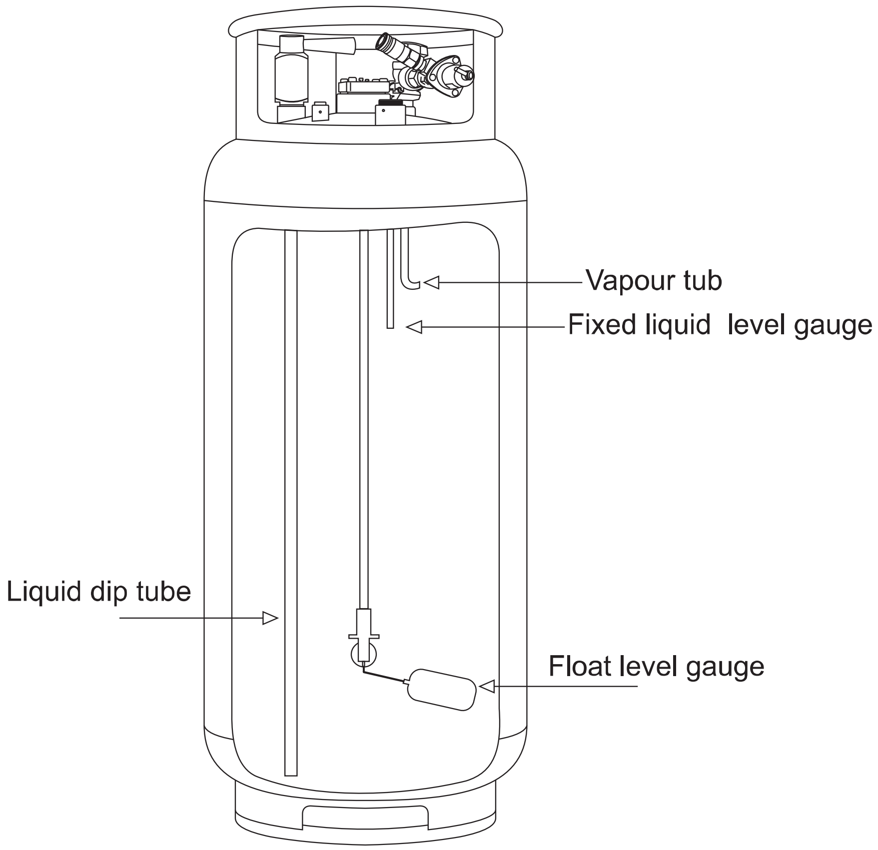
The fuel (liquid propane) is carried under pressure in cylinders, which are made from aluminium (Worthington) or stainless steel especially manufactured for Ultramagic. Worthington cylinders have a nominal volume of 40 litres. Ultramagic cylinders are available in sizes of 40, 60 and 80 litres. These cylinders now generally supply liquid propane only and are commonly called slave cylinders. Certain burner models require a pressure regulated vapour supply also, in order to feed the pilot lights. These cylinders fitted with this valve and regulator are commonly called 'masters'.

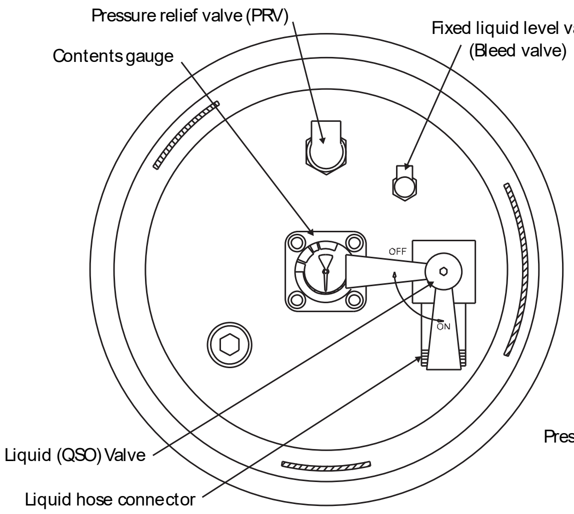
Liquid fuel is delivered via a dip tube from the bottom of the cylinder and is controlled by an on/off quick shut off valve. This valve then has either a Tema push on connector or a Rego screw on connector for connecting to the burner liquid supply hose.

The pressure regulator for vapour supply is fitted to a hand wheel type valve and is opened by turning anti clockwise. The regulator is adjustable and is fitted with a push fit connector for use with burners where a vapour pilot light is fitted.

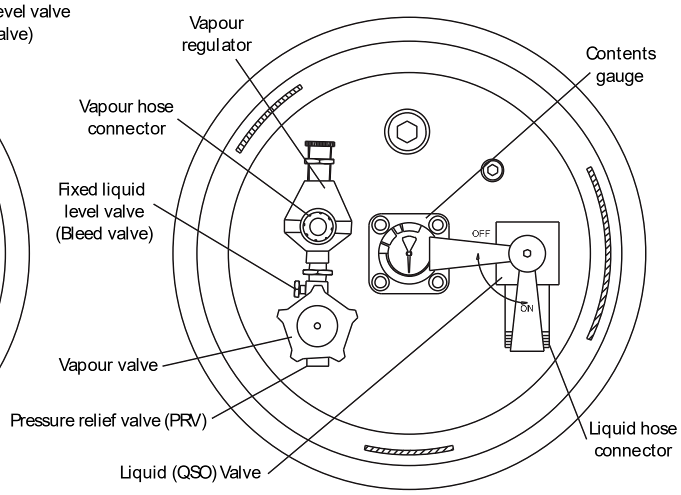
A contents gauge is fitted to all cylinders, which only start to register when reaching the last third of fuel contents. A bleed valve is fitted with a dip tube, which is used for refuelling by volume. A pressure relief valve (PRV) is fitted to prevent the cylinders being over pressurised.

The cylinders must be securely strapped vertically in the basket, taking note of their rotation for cylinders to be used during inflation. Cylinders to be used for liquid supply during inflation must be positioned so that the liquid valve is in the lower position when the basket is laid on its side. Where a vapour supply is also required the cylinder should be positioned so that the vapour valve is uppermost when the basket is laid on its side.





STANDARD SLAVE CYLINDER



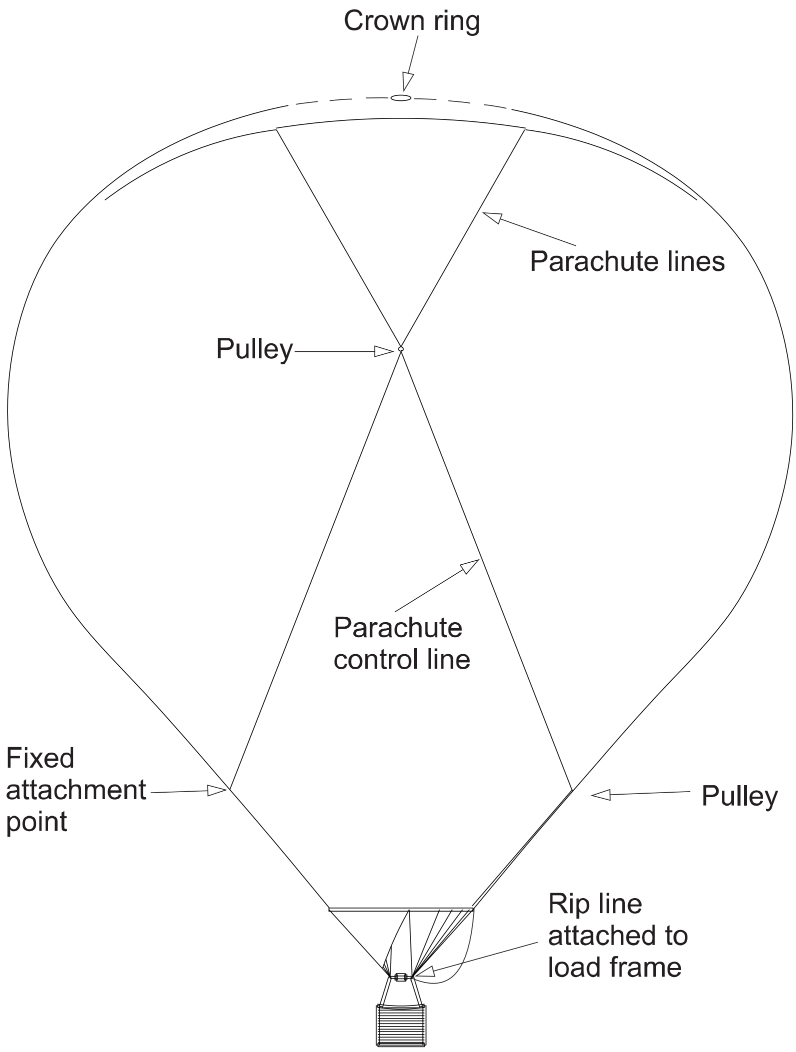
STANDARD MASTER CYLINDER

6.2.5 Flight controls

6.2.5.1 Burner Controls

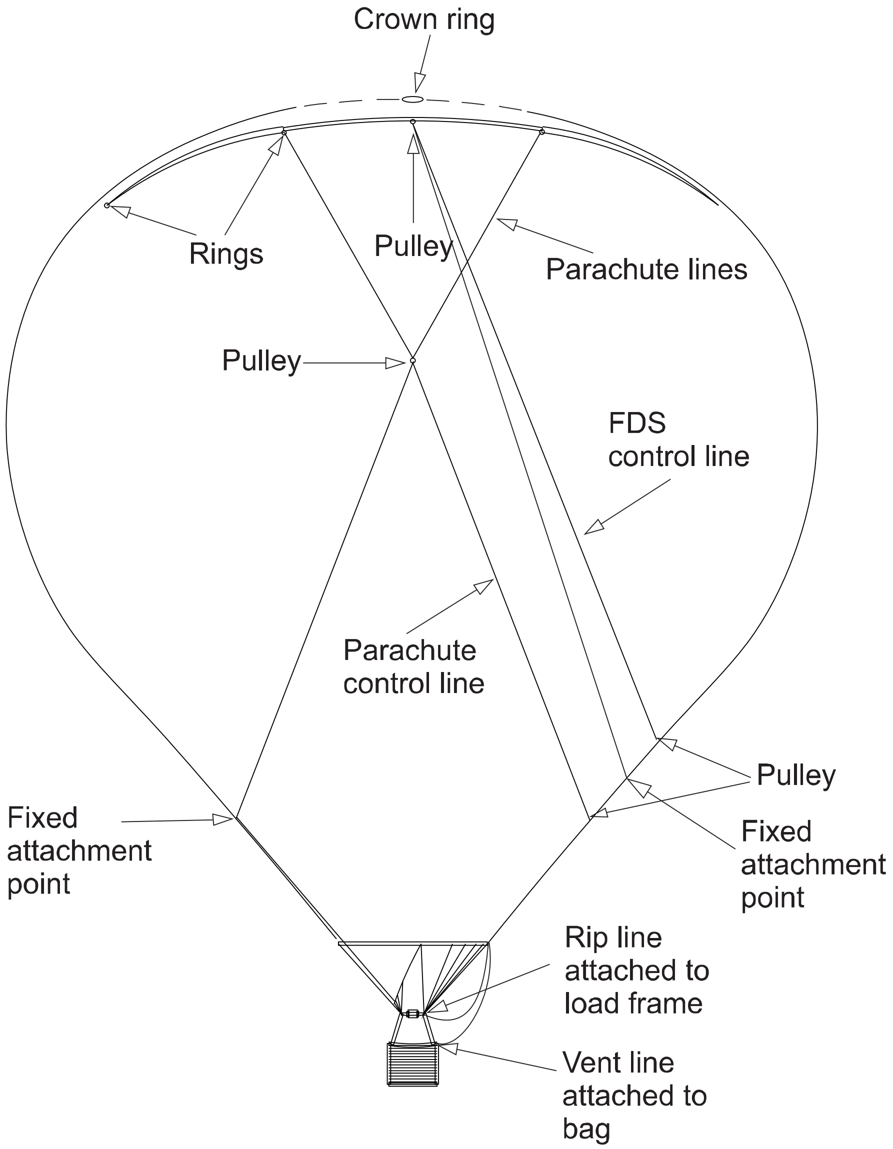
The burner is controlled by an On-Off valve mounted below the burner, and within easy reach of the pilot.

6.2.5.2 Parachute control



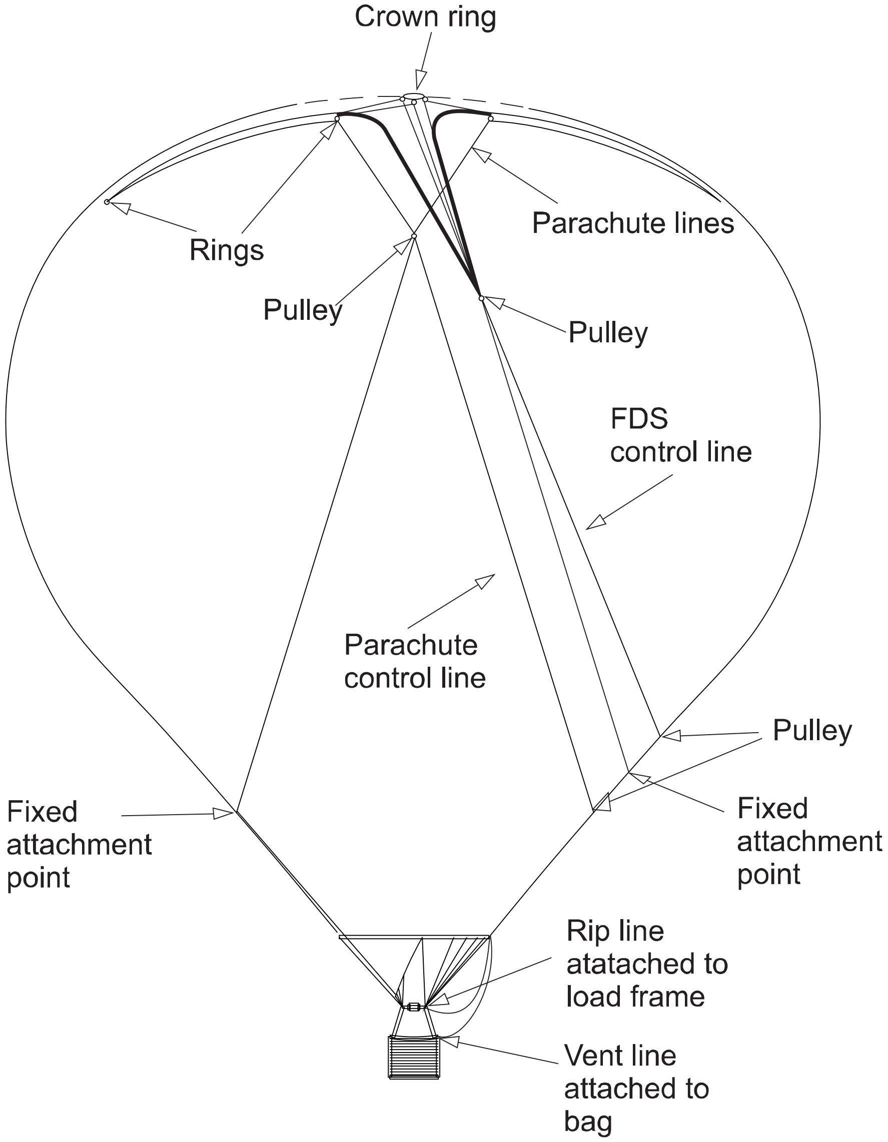
The parachute control line activates the parachute vent or valve. This can either vent off hot air or can totally deflate the envelope. This is the standard method of control on the majority of balloons. The parachute control line which is red (or red/white) polyester on the outside with a Kevlar inside, runs through a pulley inside the envelope to the parachute lines at a pulley and then back to a fixed point on the inside of the envelope. The pulleys reduce the effort required to open the parachute. By pulling the parachute rip line the parachute is opened. The parachute goes back in place when the line is released after a few seconds. Final deflation is achieved by pulling the line completely and holding in this position.

6.2.5.3 FDS Fast Deflating control



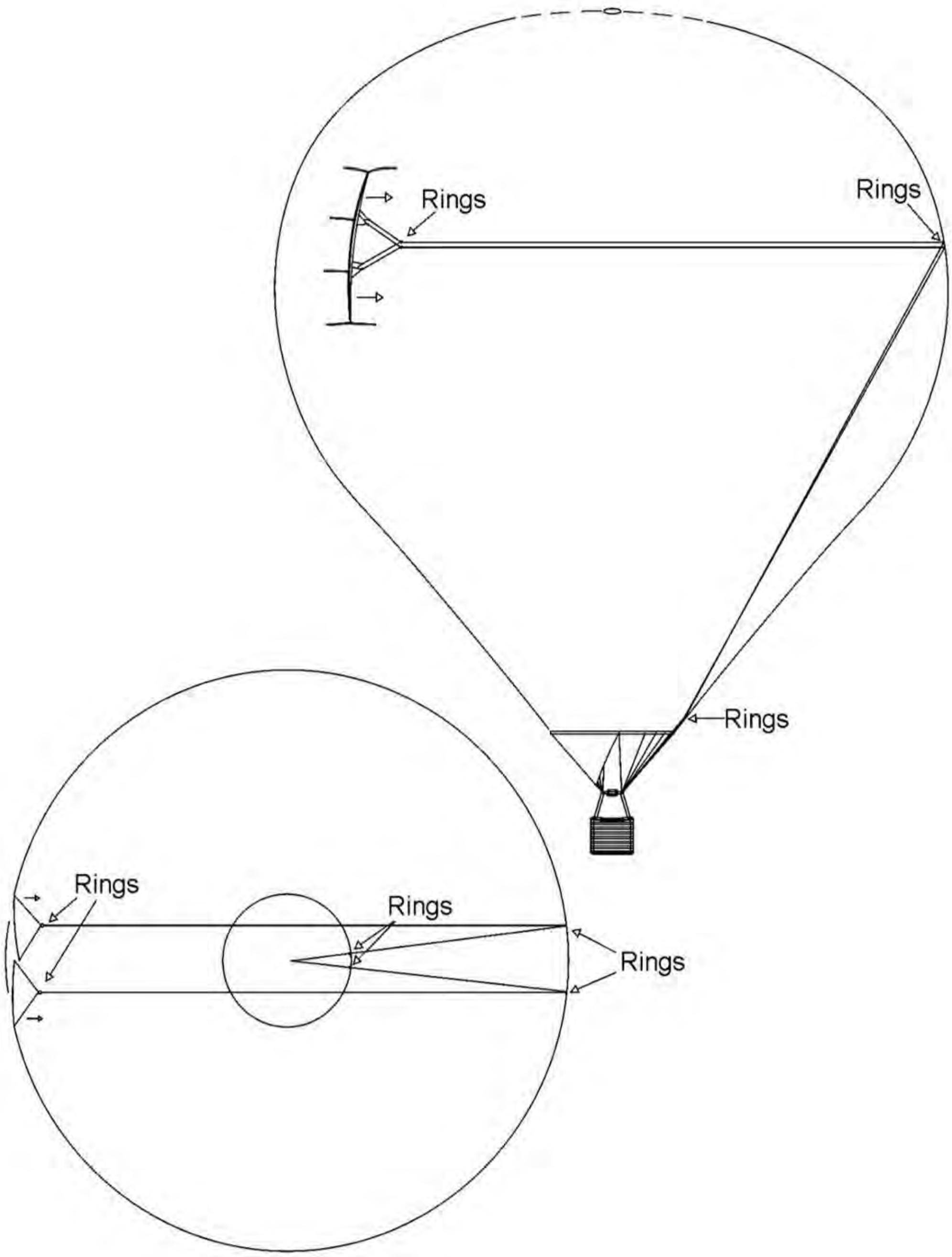
FDS system closed

The FDS system is a rapid deflation system, which incorporates a parachute venting system. The balloon can be vented and deflated as a parachute system by activating the white (or white/red) parachute line. The final rip line, which is red, pulls the centre of the parachute together creating a large opening for final deflation. This line must not be used for venting. The opening action of the red rip line (FDS) can be reversed by pulling on the white (or white/red) parachute (vent) line.



FDS System open

6.2.5.4 Rotation vent control



Rotation vents are fitted to balloons when it is necessary to rotate the balloon either to position the long side of the basket for landing or for general positioning of the balloon. This rotation is about the vertical axis. This is achieved by venting air through a panel about the equator of the balloon. Where fitted there are vents to turn either way. The green line (or blue, in early units) rotates clockwise and the black line anticlockwise. The panel reseals against its overlap panel when the rope is released. Diagram above displays a single-side turning vent assembly; an equivalent double-side turning vent assembly is installed instead in large envelopes.

6.3. Dimensions and weights

The following tables provide general standard dimensions and weights of the Ultramagic equipment.

Envelope weights assume the following fabric configurations:

- Envelopes up to 120,000 ft^3: Ripstop, with top third in Ultralast.
- Envelopes above 120,000 ft^3: Bottom half in Ripstop, top half in Ultralast.

Note that final weights are dependent on final fabric specification, artwork, accessories, basket partitions, etc. Balloon weights for each particular aircraft are recorded in the Aircraft Build Standard pages (Section 0) and/or an approved equivalent weight list.

SERIES H

Type	**31**	**42**	**56**	**65**	**77**
Vol. (m3)	900	1200	1590	1840	2190
Number of gores	12	12	12	12	12
FAI class	AX4	AX5	AX6	AX7	AX7
Total height (m)	16.2	17.3	19.0	19.9	20.9
Standard basket	C-0	C-0	C-2	C-1	C-1
Envelope					
Height (m)	12.8	13.6	15.0	16.0	17.0
Diameter at the Equator (m)	12.5	13.8	15.5	16.3	17.3
Diameter at the Mouth (m)	2.1	2.8	3.6	3.6	3.6
Weight (Kg)	60	66	79	92	99
Parachute					
Diameter (m)	4.0	4.0	5.5	5.5	5.5

SERIES S

Type	**90**	**105**	**130**	**160**
Vol. (m3)	2550	2950	3680	4550
Number of gores	16	16	16	16
FAI class	AX8	AX8	AX9	AX10
Total height (m)	21.9	22.9	24.5	26.2
Standard basket	C10	C4	C4	C5
Envelope				
Height (m)	18	18.9	20.5	22.1
Diameter at the Equator (m)	18.2	19.1	20.5	22.1
Diameter at the Mouth (m)	3.6	3.8	3.9	3.9
Weight (Kg)	118	131	157	175
Parachute				
Diameter (m)	6.0	6.0	6.5	6.5 FDS

SERIES V

Type	**25**	**56**	**65**	**77**	**90**	**105**
Vol. (m3)	708	1650	1840	2190	2550	2950
Number of gores	24	24	24	24	24	24
FAI class	AX4	AX6	AX7	AX7	AX8	AX8
Total height (m)	14.6	19	19.9	20.9	21.9	22.9
Standard basket (1)	SOLO	C2	C1	C1	C10	C4

Envelope

Height (m)	11.5	15	16	17	18	18.9
Diameter at the Equator (m)	11.9	15.5	16	16.6	17.9	18.7
Diameter at the Mouth (m)	3.0	3.6	3.6	3.6	3.6	3.6
Weight (Kg)	52	89	95	102	121	145

Parachute

Diameter (m)	4.0	5.5	5.5	5.5	6.0	6.0

SERIES M

Type	**42**	**56**	**56C**	**65**	**65C**	**77**	**77C**
Vol. (m3)	1200	1590	1590	1840	1840	2200	2200
Number of gores	24	24	24	24	24	24	24
FAI class	AX5	AX6	AX6	AX7	AX7	AX7	AX7
Total height(m)	17.5	18.8	21.5	20	22.3	21	24.0
Standard basket	C2	C2	C2	C1	C1	C1	C1
Envelope							
Height (m)	14.4	14.8	17.3	16	18.0	17	19.8
Diameter at the Equator (m)	13.6	14.9	13.8	16	14.7	16.9	15.5
Diameter at the Mouth (m)	2.8	3.7	3.5	3.6	3.6	3.6	3.5
Weight (Kg)	68	90	94	104	102	118	118
Parachute							
Diameter (m)	4.0	5.5	5.5	5.5	5.5	5.5	5.5

SERIES M

Type	**90**	**105**	**120**	**130**	**145**	**160**
Vol. (m3)	2550	2950	3400	3680	4105	4550
Number of gores	24	24	24	24	24	24
FAI class	AX8	AX8	AX9	AX9	AX10	AX10
Total height(m)	21.6	23.1	23.4	24.6	24.7	26.3
Standard basket	C10	C4	C4	C4	C6	C5

Envelope

Height (m)	17.6	19	19.6	20.5	21	22.1
Diameter at the Equator (m)	17.4	18.8	19.2	20.2	19.6	21.6
Diameter at the Mouth (m)	3.7	3.8	3,8	4	4	4
Weight (Kg)	125	130	141	152	167	178

Parachute

Diameter (m)	6	6.0	6.5	6.5	6.5	6.5 FDS

SERIES M

Type	56Z	60Z	65Z	70Z	74Z
Vol. (m3)	1,590	1,700	1,840	1,980	2,100
Number of gores	24	24	24	24	24
FAI class	AX-6	AX-7	AX-7	AX-7	AX-7
Total height(m)	22.0	22.5	23.0	23.5	24.0
Standard basket	C-1	C-1	C-1	C-1	CT-02
Envelope					
Height (m)	18.1	18.6	19.1	19.6	20.1
Diameter at the Equator (m)	13.7	14.0	14.3	14.7	15.0
Diameter at the Mouth (m)	3.4	3.4	3.4	3.4	3.4
Generic Mass (Kg)	103	105	109	112	118
Parachute					
Diameter (m)	6	6.0	6.5	6.5	6.5

SERIES N

Type	180	210	250	300	355
Vol. (m3)	5100	6000	7000	8500	10000
Number of gores	28	28	28	28	28
FAI class	AX10	AX10	AX11	AX11	AX12
Total height(m)	27.3	28.9	30.3	32.4	33.3
Standard basket	C5	C5	C8	C8	C11
Envelope					
Height (m)	23	24.4	25.5	27.2	29.0
Diameter at the Equator (m)	22.5	23.8	24.9	26.6	27.5
Diameter at the Mouth (m)	4/5	4/5	4/5	4/5	4/5
Weight (Kg)	195	220	260	295	326
Parachute					
Diameter (m)	6.5 FDS	6.5 FDS	6.5 FDS	7.5 FDS	7.5 FDS

SERIES N

Type	**370**	**425**	**450**	**500**	**550**
Vol. (m3)	10480	12000	12750	14415	15574
Number of gores	28	28	28	32	32
FAI class	AX12	AX12	AX12	AX13	AX13
Total height(m)	33.2	35.5	35.2	36.2	37.3
Standard basket	C11	C12	C12	C14	C15
Envelope					
Height (m)	29.1	31.2	30.9	32.2	33.3
Diameter at the Equator (m)	28.2	29.5	30.0	31.1	32.1
Diameter at the Mouth (m)	4/5	4/5	5.5	5.5	5.5
Weight (Kg)	360	375	390	422	472
Parachute					
Diameter (m)	8.25 FDS	7.5/8.25 FDS	8.25 FDS	9.0 FDS	9.0 FDS

	SERIES Z	SERIES G
Type	**90**	**90**
Vol. (m3)	2 550	2 550
Number of gores	16	8
FAI class	AX8	AX8
Total height(m)	21.9	21.1
Standard basket	C-10	C-3
Envelope		
Height (m)	18	17.1
Diameter at the Equator (m)	18.2	18.34
Diameter at the Mouth (m)	3.6	3.8
Weight (Kg)	118	112
Parachute		
Diameter (m)	6.0	6.0

SERIES T

Type	**150**	**180**	**210**
Vol. (m3)	4245	5100	6000
Number of gores	20	20	20
FAI class	AX10	AX10	AX10
Total height(m)	25,0	27.3	28,6
Standard basket	C7	C5	C5

Envelope

Height (m)	21,23	22,7	24,3
Diameter at the Equator (m)	20,95	22,2	24,3
Diameter at the Mouth (m)	4	4	4
Weight (Kg)	177	196	219

Parachute

Diameter (m)	6.5 FDS	6.5 FDS	6.5 FDS

BURNER AND FRAME

The following table provides orientative figures for the weight of the burner (burner frame not included)

Model MK-2	**Simple**	**Double**	**Triple**	**Quadruple**
Total Mass (Kg)	14	19	25	
Model MK-2 Super				
Total Mass (kg)	15	21	28	36
Model MK-10				
Total Mass (kg)	15	21	28	35
Model MK-21				
Total Mass (kg)	17	24	34	43
Model PowerPlus BMK-008				
Total Mass (kg)	12	21		
Model PowerPlus Maxi BMK-050				
Total Mass (kg)		20	30	41

BASKET

Model	C-0	C-1	C-2	C-3	C-4	C-5	C-6	C-7
Length (m)	0.7	1.2	1	1.3	1.6	2.2	1.8	2.0
Width (m)	0.8	1	1	1.1	1.2	1.4	1.3	1.4
Height (m)	1.06	1.10	1.10	1.10	1.15	1.15	1.15	1.15
Typical Empty Mass (Kg)	55	67	62	79	100	192	141	174

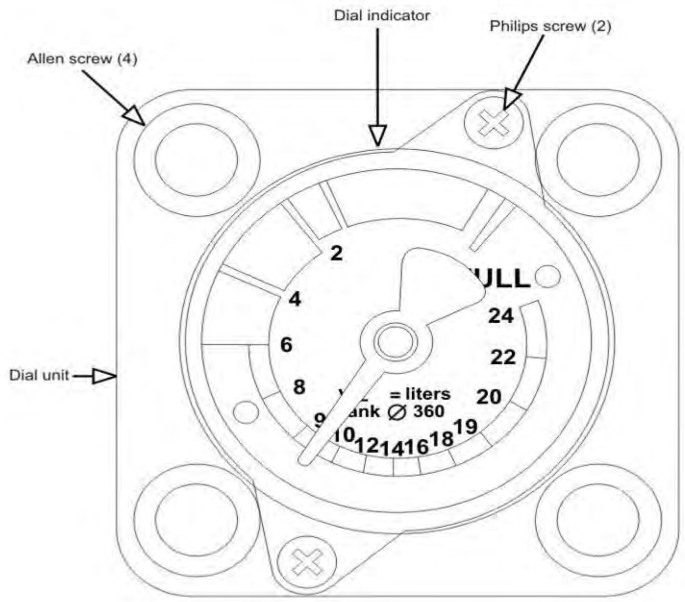
Model	C-8	C-9	C-10	C-11	C-12	C-14	C-15
Length (m)	2.6	3	1.45	3.5	$4.25_{\pm 0.25}$	5.2	$6.1_{\pm 0.3}$
Width (m)	1.5	1.6	1.15	1.7	$1.6_{\pm 0.1}$	1.7	$1.6_{\pm 0.1}$
Height (m)	1.15	1.15	1.15	1.15	1.15	1.15	$1.2_{\pm 0.1}$
Typical Empty Mass (Kg)	220	285	95	356	457	533	650

FUEL CYLINDERS

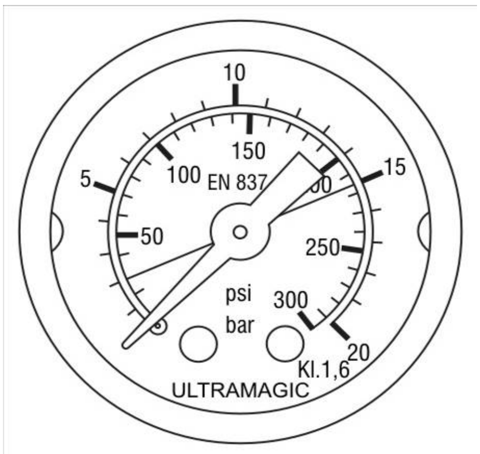
Model	Worthington 4100-U4-27	M 20 M-20D	M 30 M-30D	M 40 M-40D	T-25
Material	Al	Stainless. Steel	Stainless. Steel	Stainless. Steel	Ti
Height (m)	0.87	0.85	0.92	1.07	0.95
Diameter (m)	0.30	0.30	0.35	0.38	0.33
Empty Mass (Kg)	14	15	20	24	11.5
Full Mass (Kg)	34	35	50	64	36.5

6.4 Monitoring Instruments

6.4.1 Fuel System



The fuel tanks have gauges in the top showing the percentage of fuel remaining in the tank. Beware that the gauge is effective only when fuel is below one third of the cylinder capacity.



Mk21 pressure gauge

A pressure gauge on the burner indicates the input pressure to the burner.

6.4.2 Envelope Internal temperature

A bimetallic clamp attached to a small flag is located in the upper part of the balloon. Above 125° C the bimetal opens, releasing the flag and indicating a possible overheat. Alternatively the flag may be held by a soldered link, which melts at 125 °C.

A temperature sensor can optionally be installed on inside top of the envelope, transmitting the signal to the indicator on the basket. To allow the sensor entrance inside the balloon, a small hole with burnt edge is made next to load tape number 9 or 9½, close to envelope's top edge. Adhere to the setup and operation instructions of the transmitter's manufacturer.

A label is placed inside top of parachute, the colour of which changes progressive and irreversibly as the temperature increases.

6.4.3 Flight Instruments

The requirements for the carrying of flight instruments vary from country to country. The carriage of an altimeter and rate of climb indicator is mandatory. In some countries a thermister is also required for measuring internal envelope temperature during the flight. See Appendix B for a list of instruments recommended by Ultramagic S.A.

6.5 Bonanno Quick Release

This is a device used to restrain the balloon during inflation and preparation for take off. Its use is recommended during windy conditions to prevent the balloon taking off prematurely or dragging across the ground. However it must not be used to tether the balloon.

The release mechanism is a form of latch, which is attached to the load frame by means of Karabiners and can also be used with wire, rope or webbing bridles. The restraint rope is fitted into the latch and at the other end to a secure point or braked vehicle.

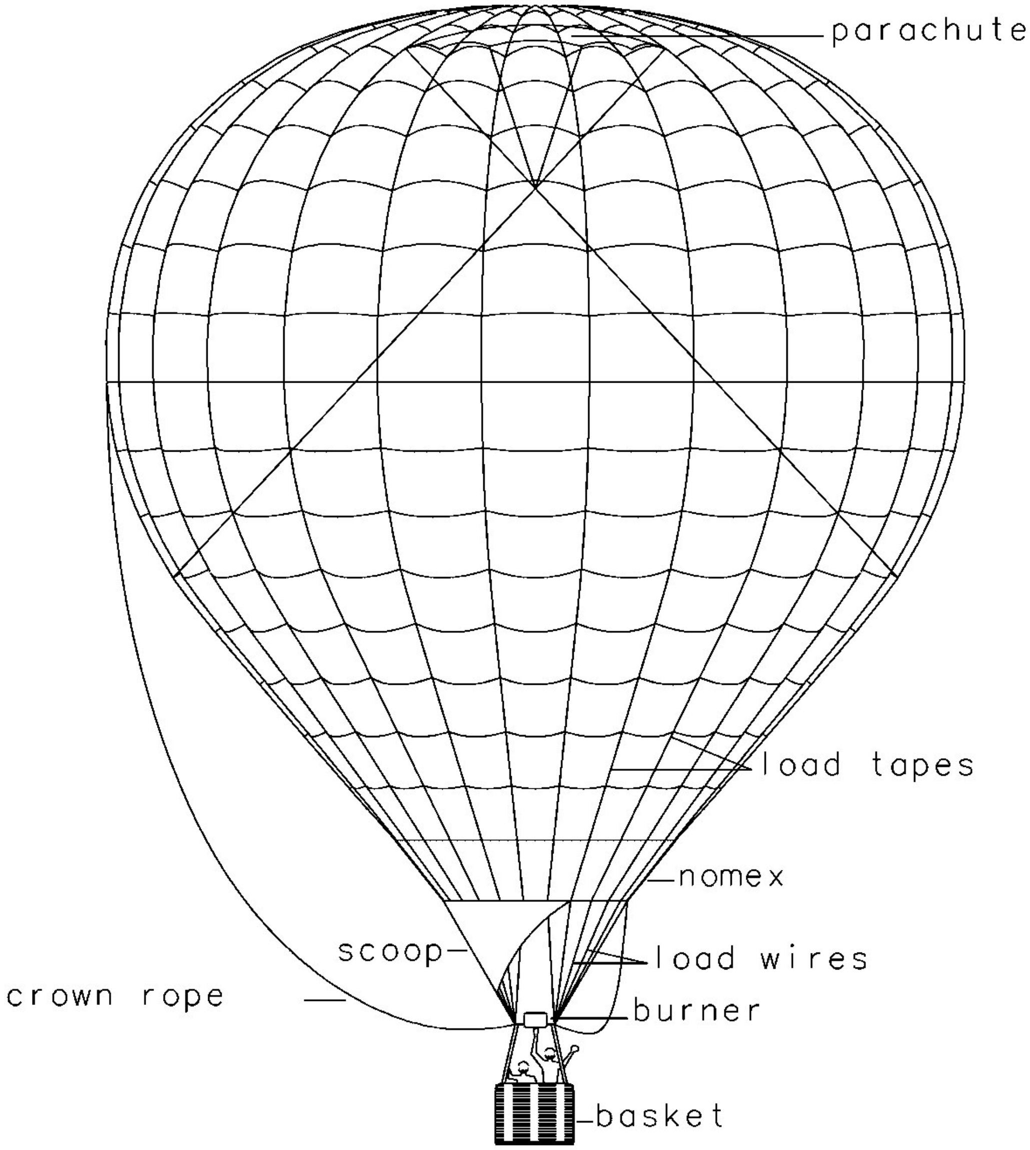
The device is provided with a safety pin to avoid an inadvertent release of the mechanism.

The Bonnano release and all associated restraint equipment must be regularly inspected for damage and deterioration.

6.6 Occupant Restraint Harness

If fitted, this harness is designed to secure an occupant in position during hard landings (restraint harnesses are not a substitute for adopting a good landing position and using internal handles).
The harness fits around the waist and is fixed to an attachment point on the basket floor, preferably on the long side opposite to the landing direction. The harness has a special quick release buckle to enable the occupant to remove it in an emergency or whenever instructed by the pilot.
Local regulations must be adhered to regarding obligatory requirements of the harnesses.

6.7 General illustration



SECTION 7

BALLOON MAINTENANCE HANDLING AND CARE

7.1 Introduction

This section contains the recommended procedures for proper ground handling and servicing of the balloon.

7.2 Inspection periods

Refer to the Ultramagic Maintenance Manual for inspection periods

7.3 Alterations or repairs

No alterations to the balloon may be undertaken without first contacting the appropriate airworthiness authority.

WARNING: Any alterations to the balloon without authority approval will invalidate the Certificate of Airworthiness.

Refer to the Ultramagic Maintenance Manual for all repair procedures.

7.4 Ground Handling and Transportation

When not being used the envelope must always be packed for transportation in its protective bag. This will help prevent the fabric from being damaged by sharp or abrasive objects. The envelope in its bag should be prevented from getting wet.

The burner system must be disconnected from the fuel cylinders and all fuel must be vented from the lines.

The basket and burner system must always be de-rigged when being transported. Failure to do so could increase wear on the structure of the support system and load frame.

Whenever possible, fuel cylinders should be transported in a vertical position. Failure to do so may prevent the correct function of the pressure relief valve.

All equipment should be well secured in its means of transport to ensure minimum movement and should also be protected from sharp or abrasive surfaces.

Should the balloon equipment be transported by air, sea or rail it is imperative that the service provider is contacted prior to travel. Each operator has varying requirements relating to the transportation of fuel cylinders, inflation fans and fire extinguishers and these must be planned for and adhered to.

7.4.1 Securing the basket to the trailer

Whenever basket is being road transported, it should preferably be secured to the trailer or vehicle using the lateral attachment rings shown below (if installed). It is not recommended to use the handle ropes for this purpose.

7.4.2 Basket Towing

If a large basket needs to be towed in the ground, it is recommended to use the restraint attachment points (shown above), putting attention not to damage the wicker. For a recurrent operation, approved optional towing attachments are available - contact Ultramagic.

7.5 Storage

The complete balloon system should always be stored in a clean dry place. If stored in an outside utility building e.g. garage or barn, then ensure that adequate protection is in place against possible damage by vermin especially during long periods of storage.

7.5.1 Envelope

The envelope must not be stored wet or damp as the moisture can cause fabric deterioration caused by mould or mildew. Should the envelope have to be packed wet because of weather conditions then the following must be carried out within a few days.

1. Spread the envelope out in a clean dry area.
2. Cold inflate the envelope with an inflation fan and turn the envelope over until completely dry.
3. Ensure that the storage bag is dry before packing the envelope.

CAUTION: Hot inflating a very wet envelope may cause damage to the fabric.

7.5.2 Basket

The basket should always be stored in a clean and dry condition. All mud should be removed as failure to do so may cause damage over a period of time to the wicker, floor and hide. Always use clean water and allow to dry naturally as fast drying may make the wicker brittle and weaken its integrity.

7.5.3 Burner

The burner should always be stored in a clean and dry condition. Ensure that the hose connectors are protected from ingress of dirt and that the fuel hoses are kept in a natural position avoiding any coiling or bending with small radius of curvature. If stored in an outside building it is advisable to cover the burner to prevent foreign matter getting into the jets.

7.5.4 Cylinders

Cylinders should always be stored vertically in a clean and dry condition. This must be a secure place and local regulations must be adhered to.

CAUTION: The valves must always be at the top in their normal operating position. Failure to do so will affect the correct operation of the Pressure Relief Valve (PRV)

CAUTION: Precautions should be taken to ensure that the cylinders do not become over-pressurised. Prevent the cylinders from long periods of direct sunlight or heating.

CAUTION: Do not store cylinders which have been nitrogen or other inert gas pressurised for a long period of time. Vent off the pressure in a safe area if the cylinders are not to be used.

7.6 Cleaning and Care

The envelope should be cleaned using clean water, although is better to dry-wash it whenever is possible. Avoid the use of strong detergents as these could damage the fabric. A gentle non-detergent soap may be used as long as it is rinsed clean with fresh water. Always ensure that the envelope is dry before packing.

The basket, burner and cylinders may be cleaned using clean water. Always ensure that all systems are dry before storing. If the basket is fitted with a cushion floor it is recommended to remove it from the basket before cleaning it to avoid moisture problems. Reinstall the cushion floor again when the basket is completely dry.

Refer to Ultramagic Maintenance Manual for further cleaning instructions.

SECTION 8: OTHER MANUFACTURERS EQUIPMENT

Ultramagic envelopes are approved for use with other manufacturers equipment as listed in Supplement 19. There is a uniformity of interface between the Ultramagic envelope ranges and the load frames, basket, burners and cylinders listed which allows this use. Ultramagic allow this use based on a number of requirements having been met.

8.1 Requirements

To establish compatibility of another basket, burner and tanks from other manufacturers with an Ultramagic envelope, the following conditions must have been met:

1) The equipment must be identifiable as a FAA, BCAR, LBA or other authority accepted by the EASA, type certified vehicle with the applicable Type Certificate Data Sheet.
2) Other manufacturer's equipment must accomplish all requirements and limitations expressed in the Ultramagic Flight Manual including the supplements.
3) The Maintenance Manual for each part remains applicable.
4) Other manufacturer's equipment must be on the lists of the Supplement 19.
5) Weight limitations on the complete balloon are based on the ULTRAMAGIC envelope and also on the basket used, if detailed by the manufacturer, and will be limited by the highest restriction.
6) Basket size (length x width = area) must fall within minimum and maximum limits as specified by the manufacturer.
7) Burner Type (Single, Double, Triple or Quadruple) and operation must be accomplished as defined by the manufacturer.
8) All burner frames with 4 rigging points must be attached with 4 karabiners up to size 180, and 8 or 12 karabiners on bigger envelopes (with the exception of some Balloon Works and Lindstrand equipment –see supplement 19-).

Ultramagic Restraint harnesses for occupants may continue to be used in baskets from other manufacturers subject to these having attachment points intended and approved for this use. Ultramagic harnesses must not replace any mandatory harness

SECTION 9: SUPPLEMENTS

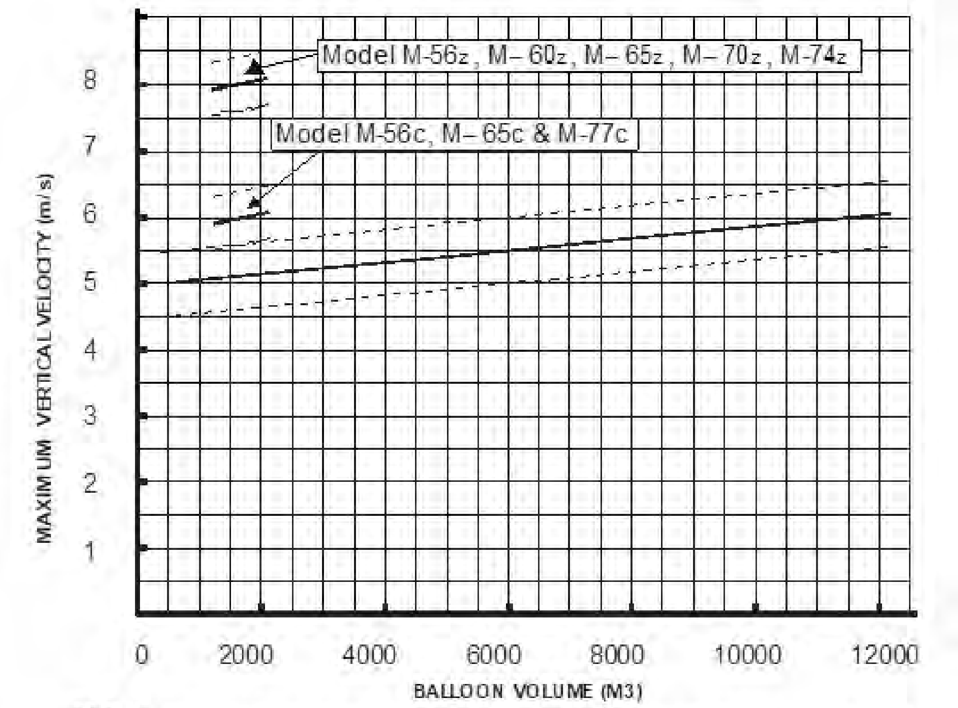
The supplements applicable to this balloon are listed in the Build Standard pages.

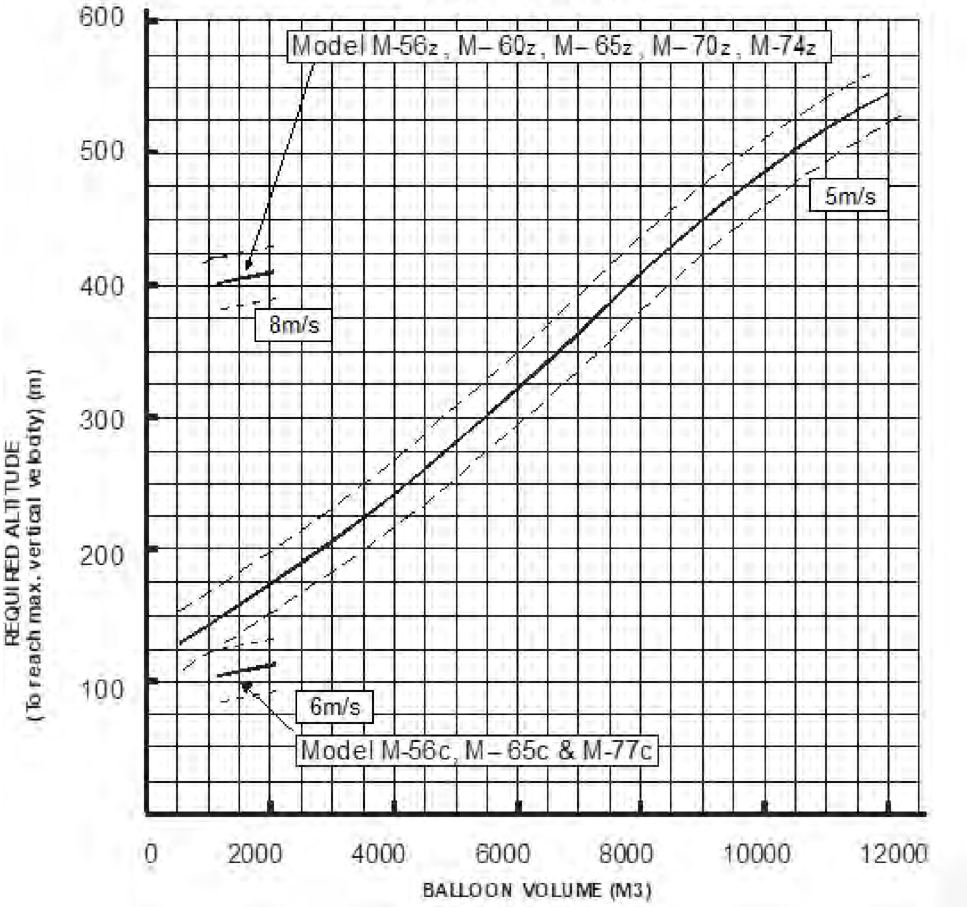
The list of supplements available can be found in the following Ultramagic website:

http://www.ultramagic.com

APPENDIX

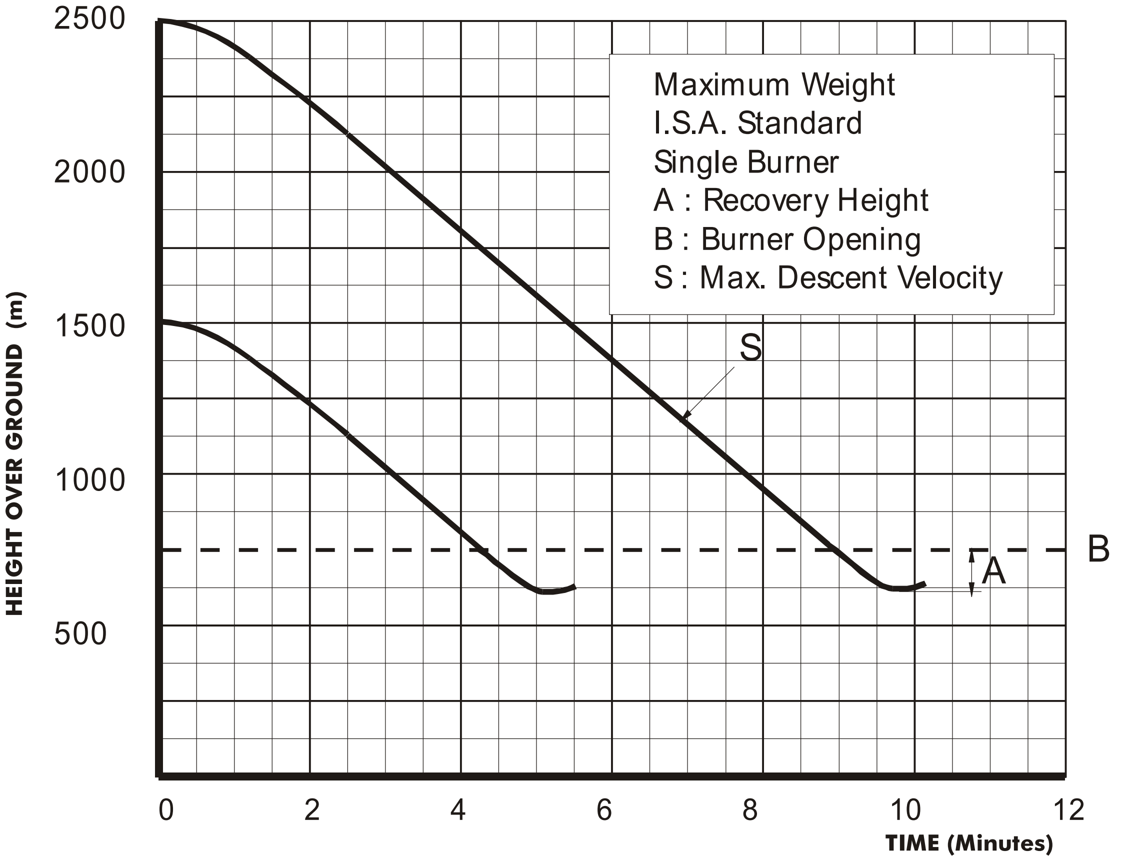
A. Vertical Velocities and Altitude recovery (Metric units)



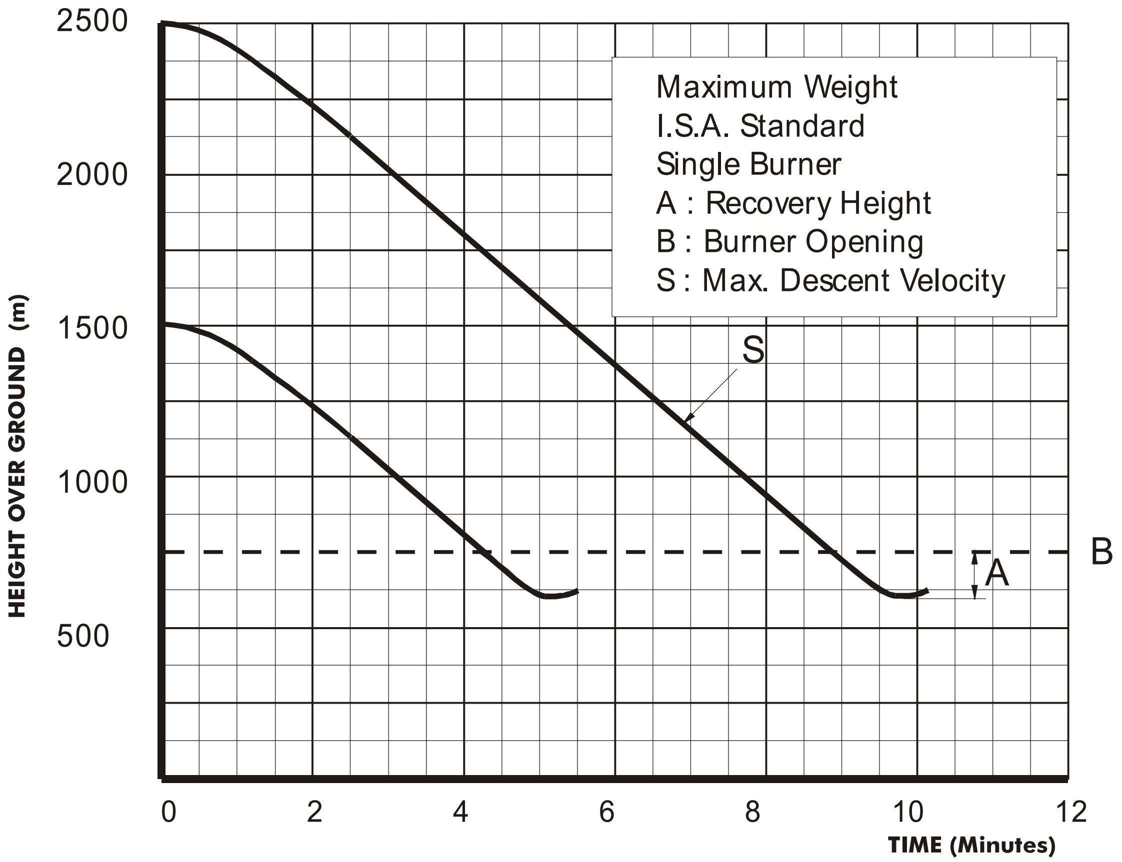


A VERTICAL VELOCITIES

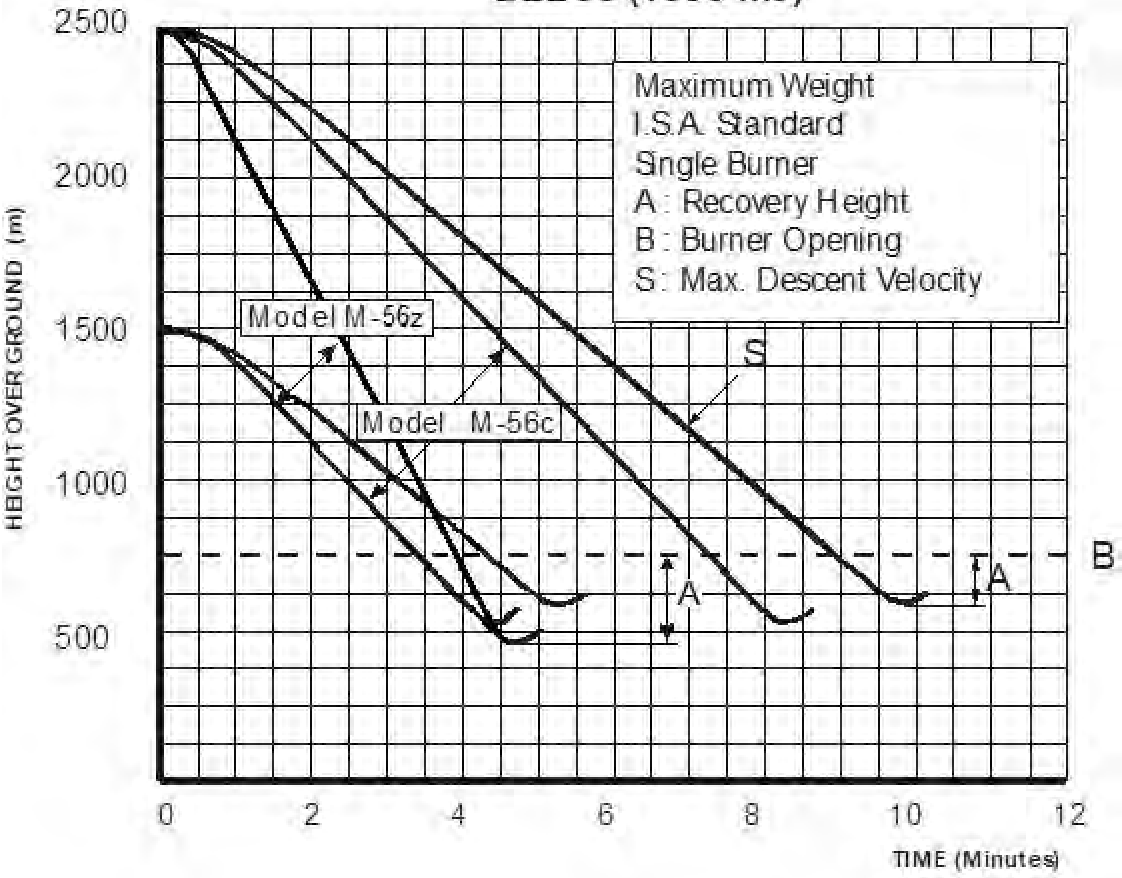
SIZE 31 (900 m3)



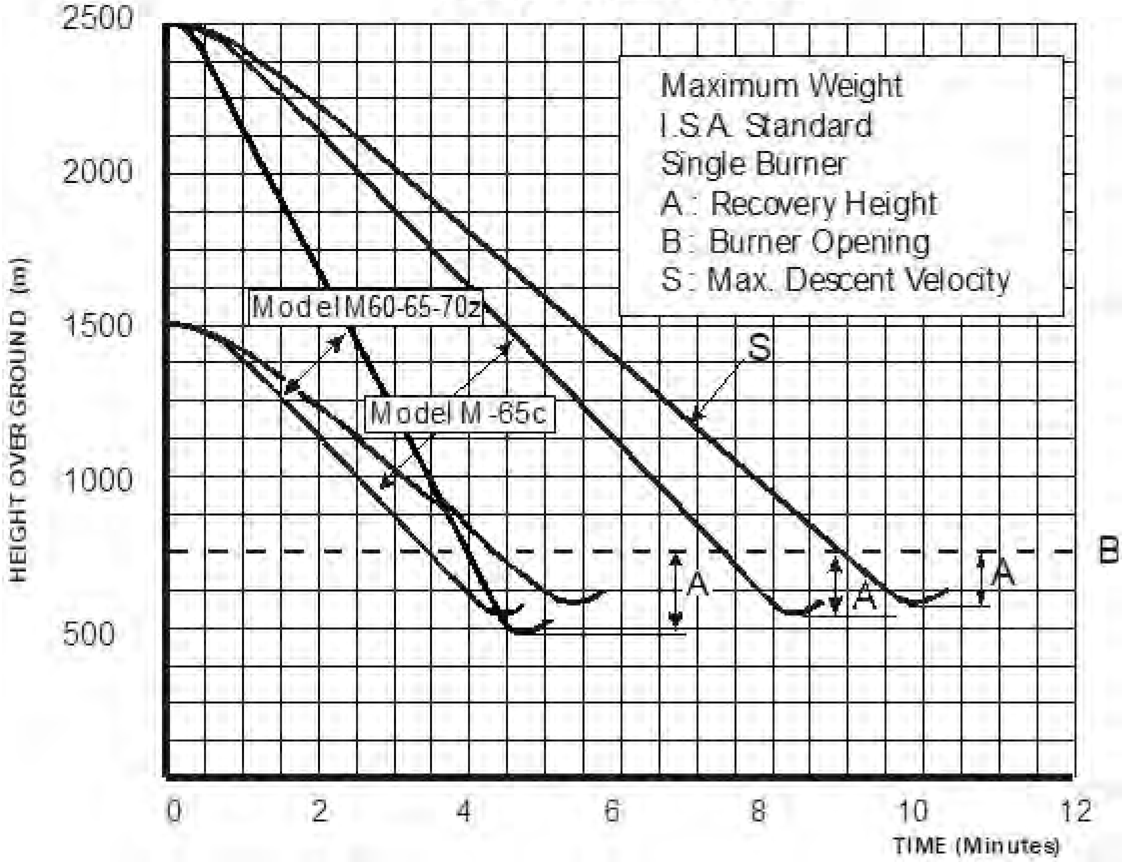
SIZE 42 (1200 m3)



SIZE 56 (1590 m3)

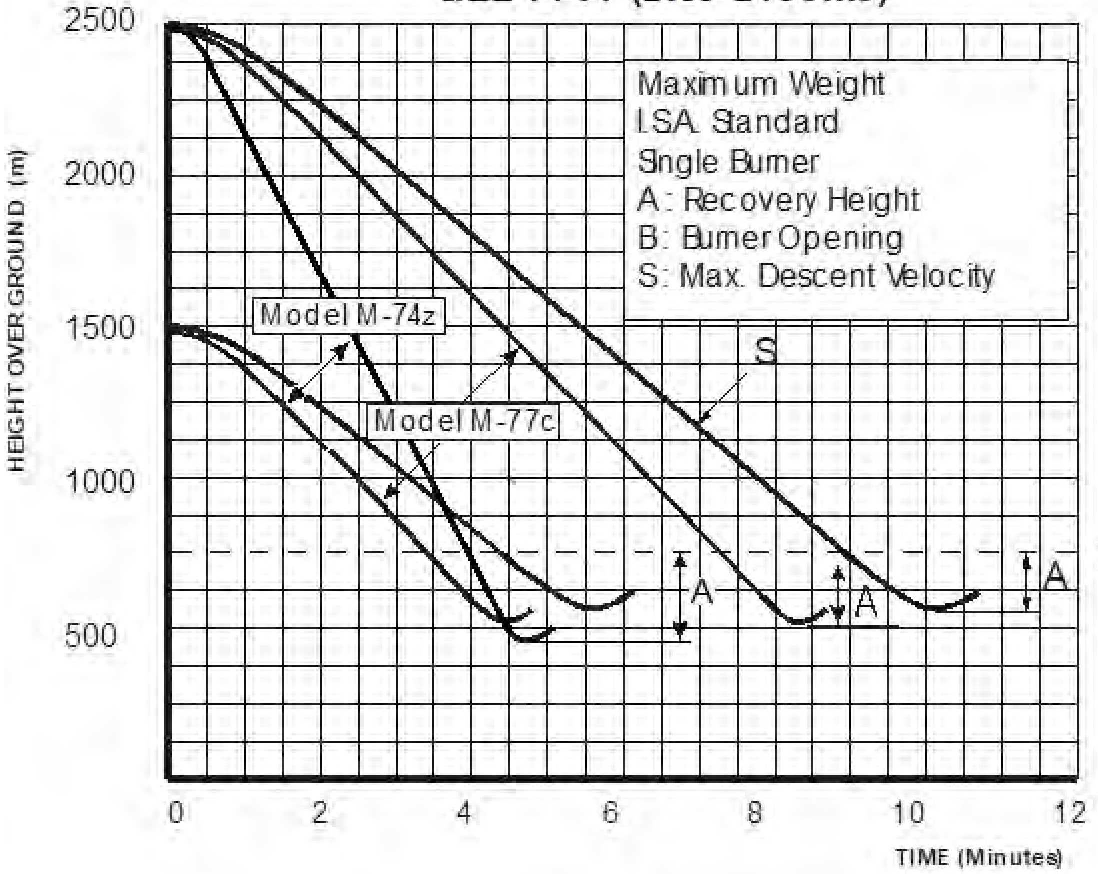


SIZE 60-70 (1700-1980m3)

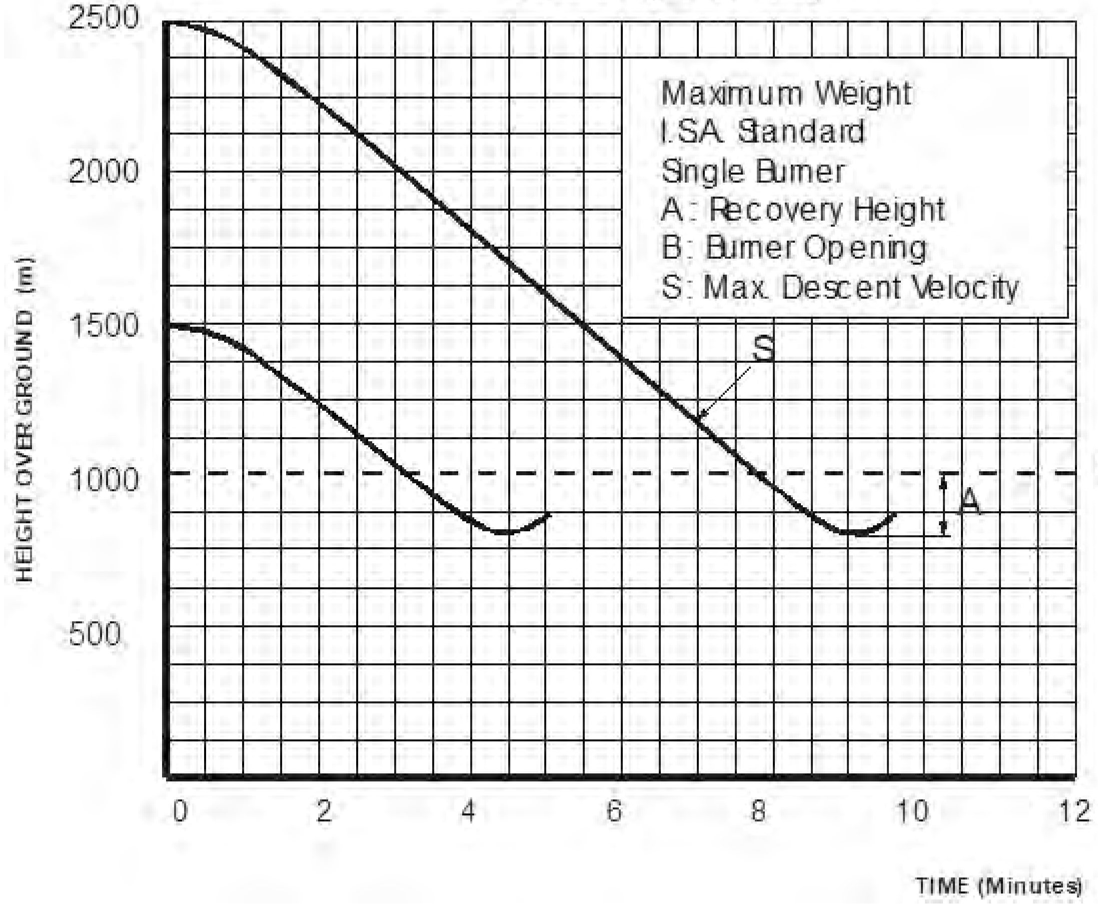


A VERTICAL VELOCITIES

SIZE 74-77 (2100-2190m3)

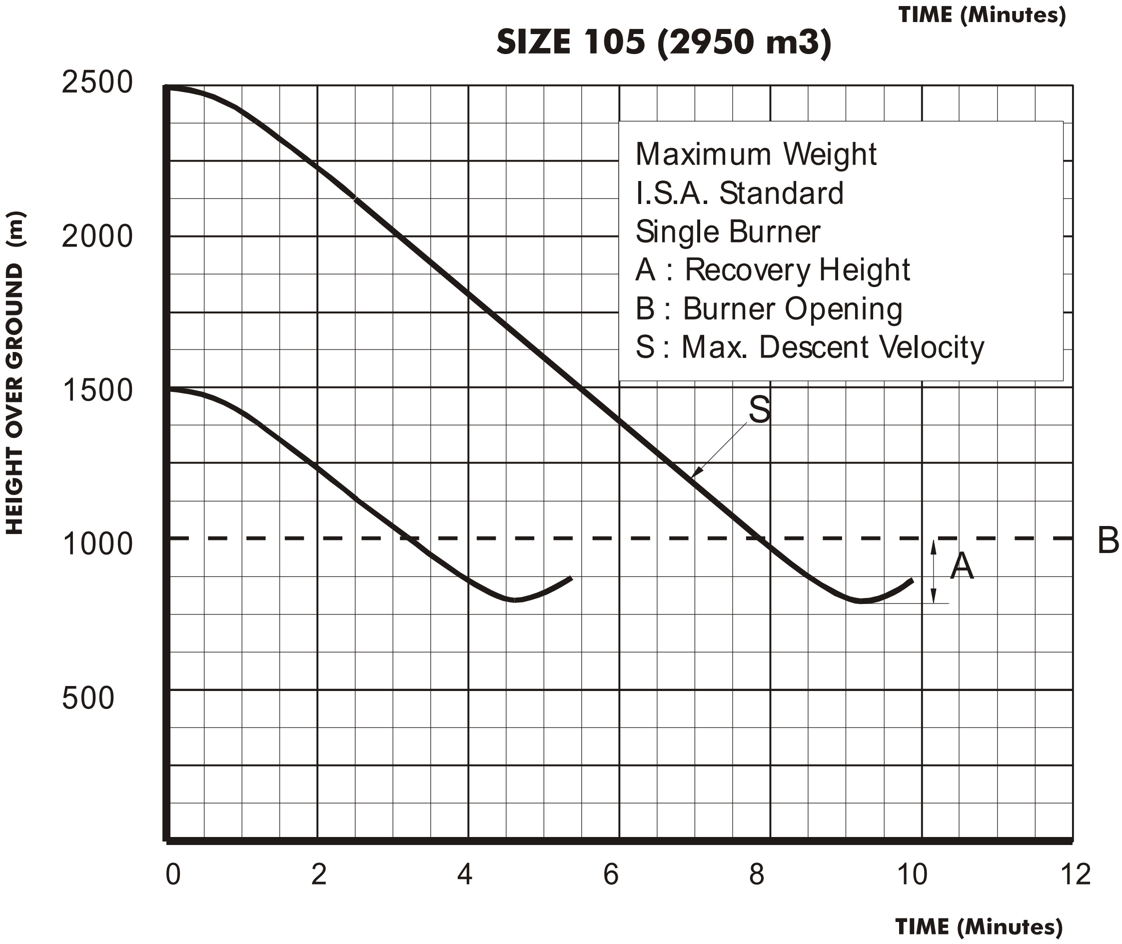


SIZE 90 (2550 m3)

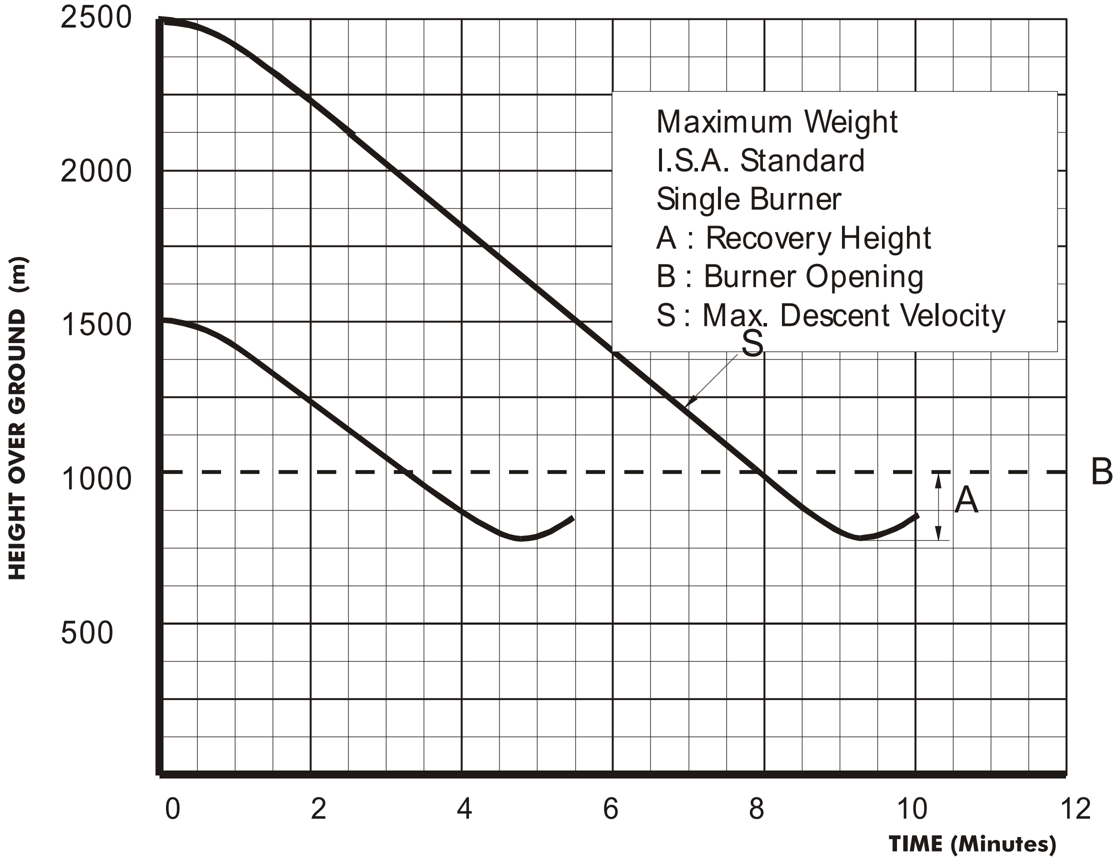


A VERTICAL VELOCITIES

SIZE 105 (2950 m3)



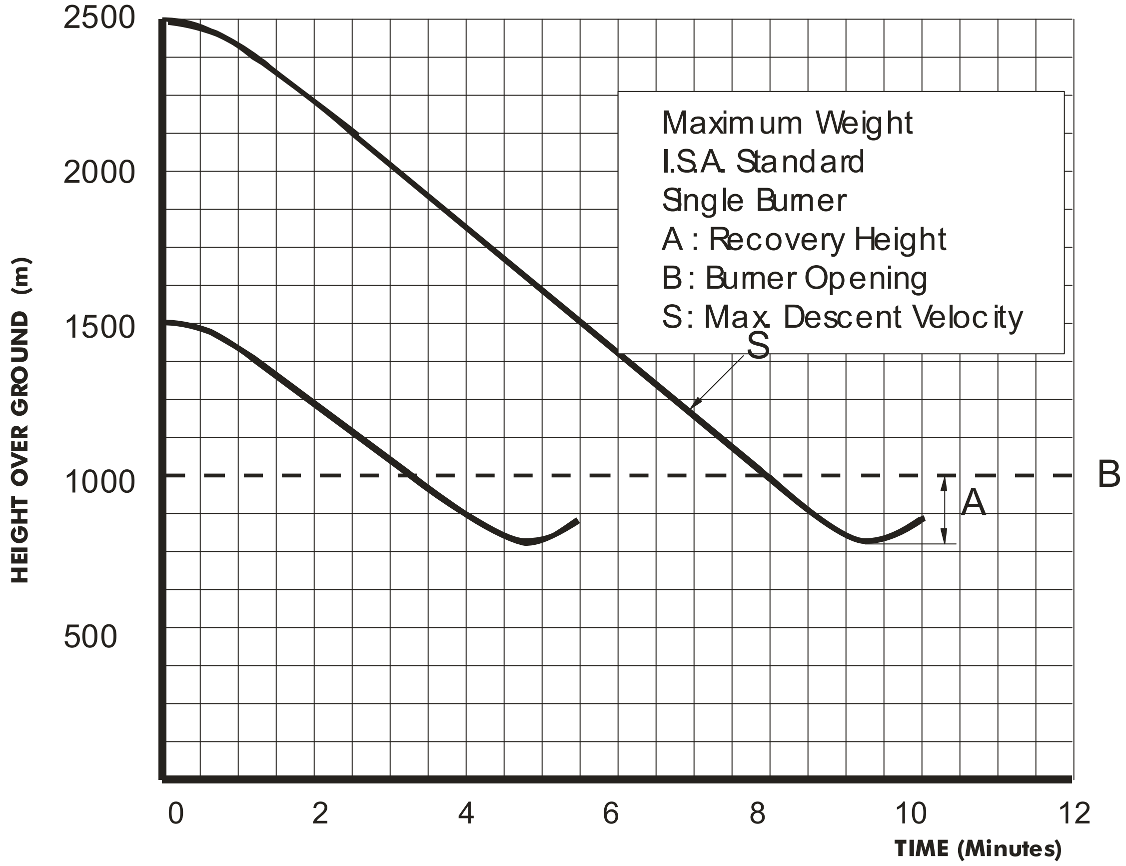
SIZE 120 (3400 m3)



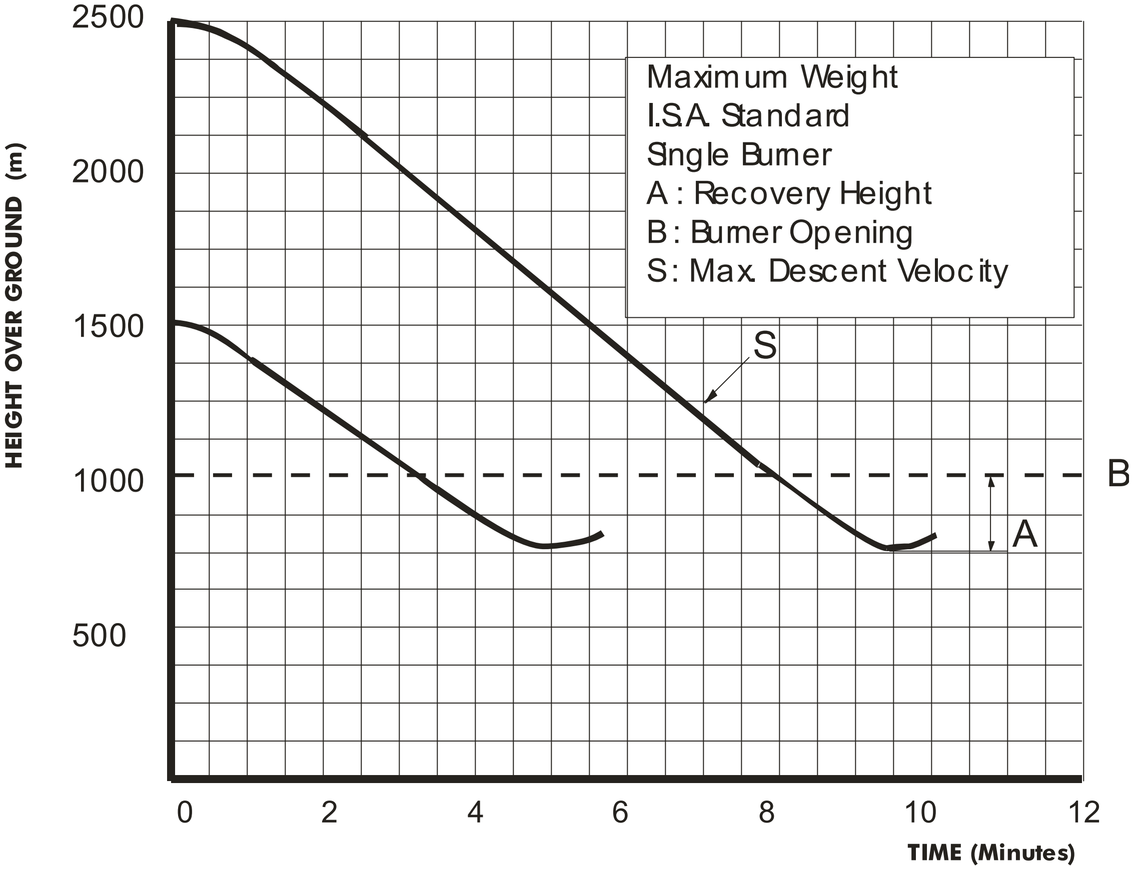
A VERTICAL VELOCITIES

A VERTICAL VELOCITIES

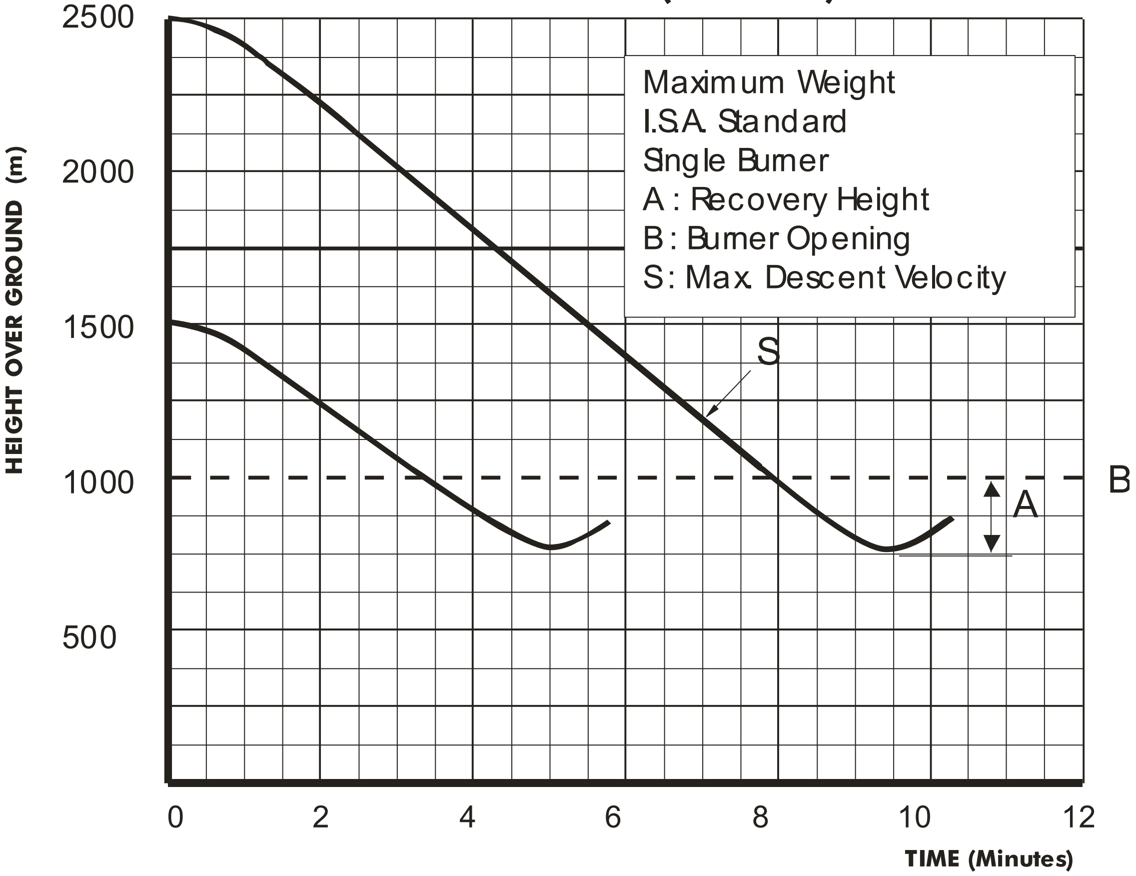
SIZE 130 (3680 m3)



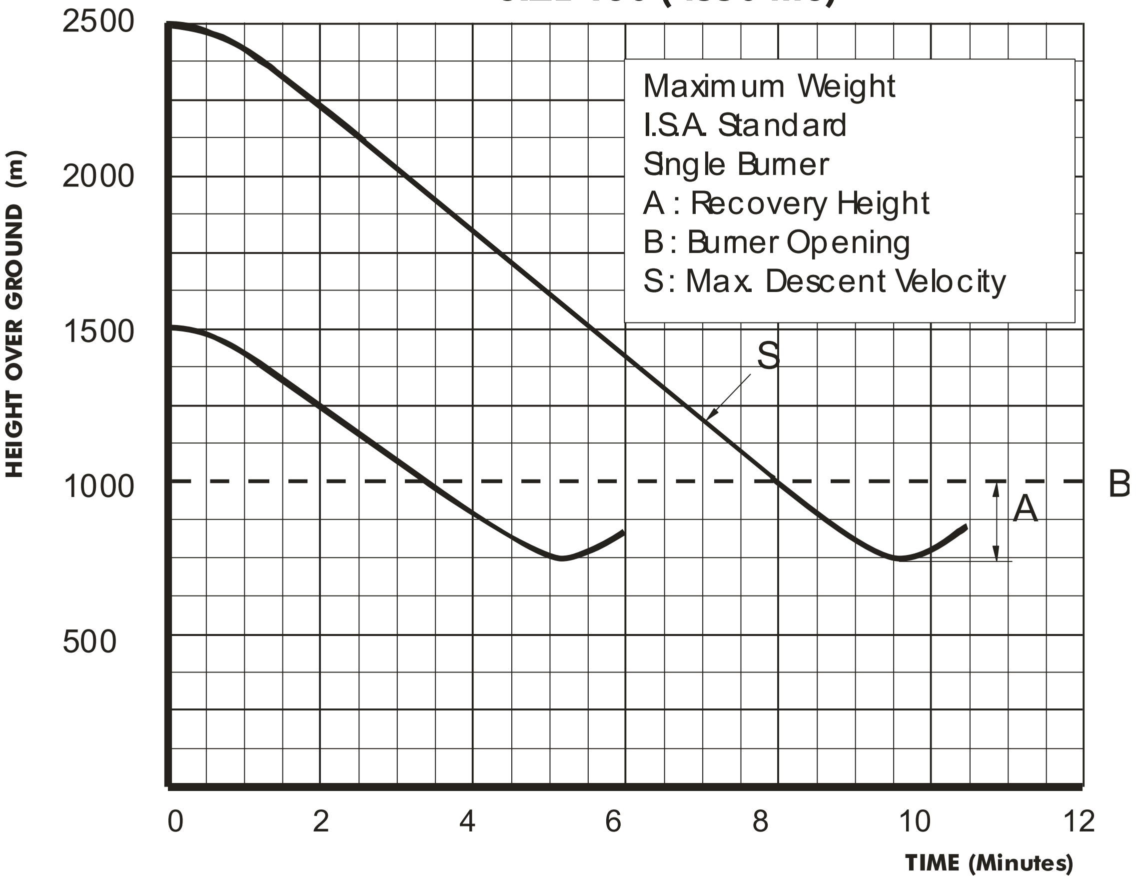
SIZE 145 (4100 m3)



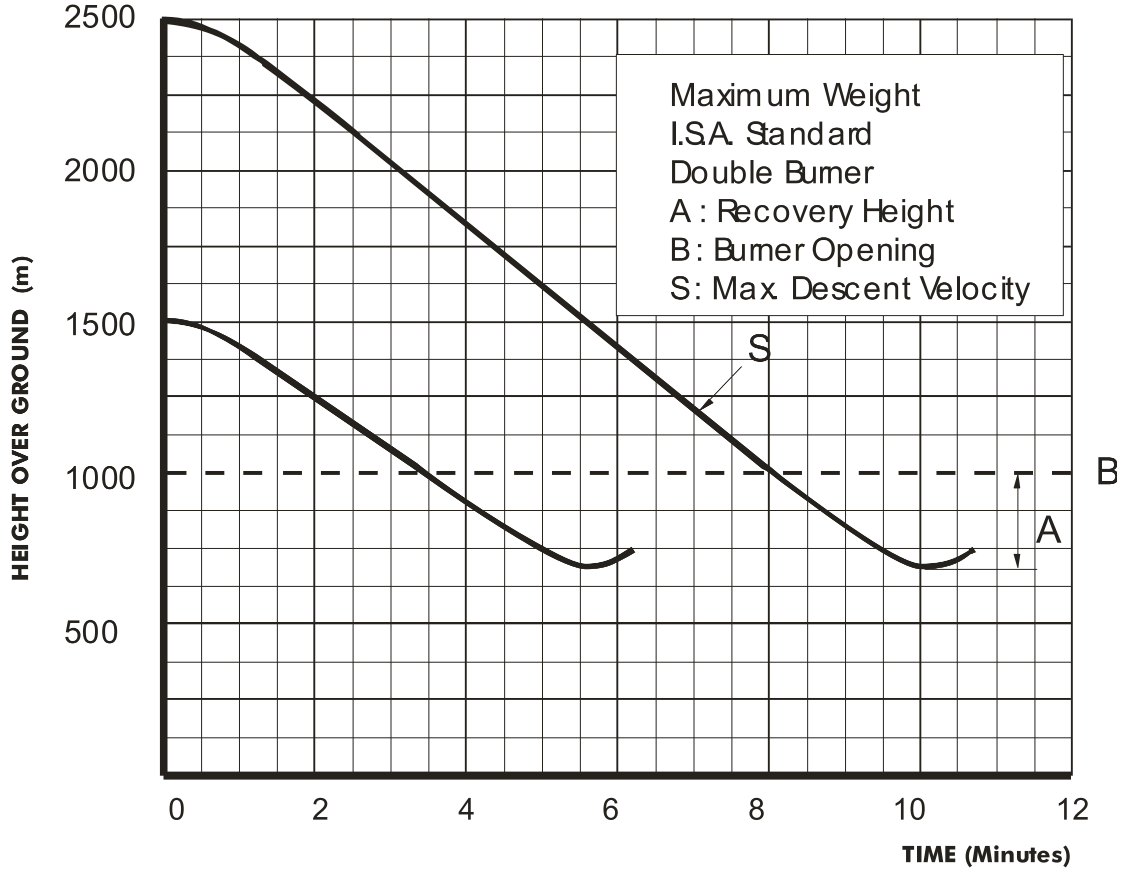
SIZE 150 (4245 m3)



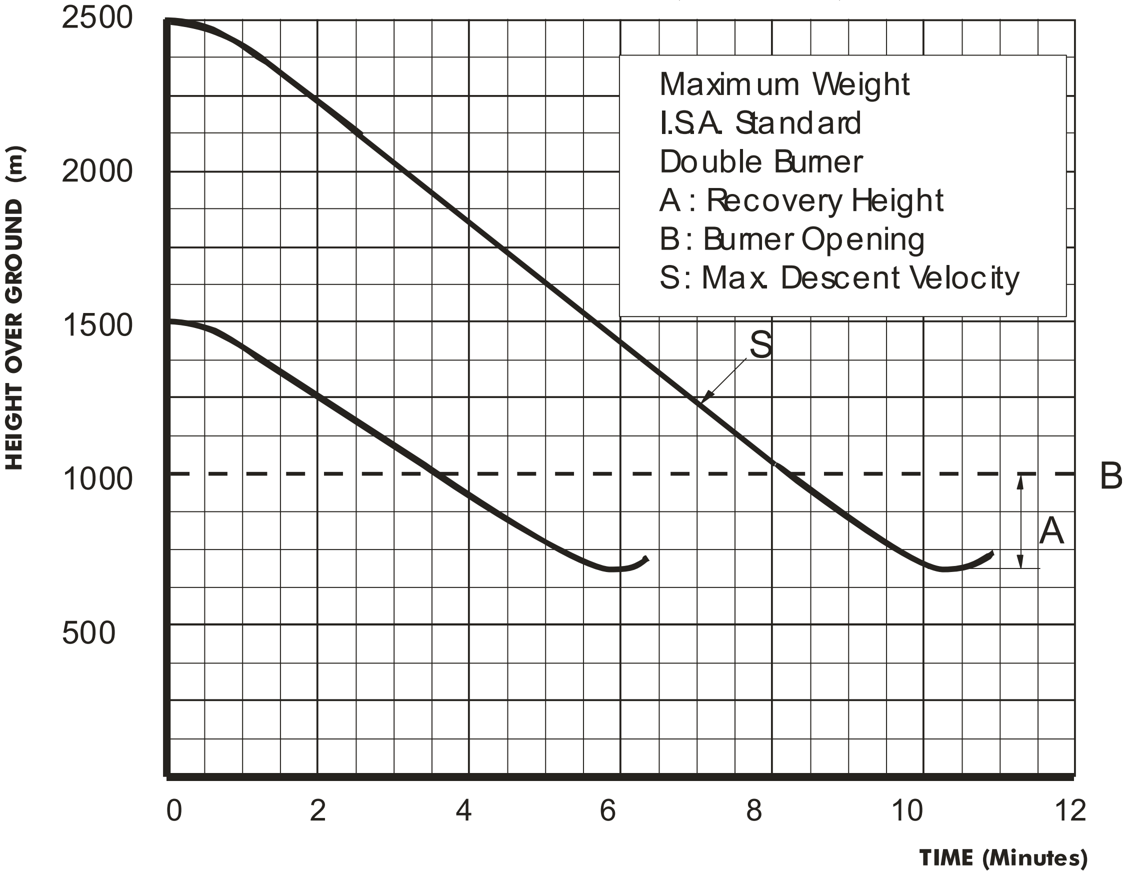
SIZE 160 (4550 m3)



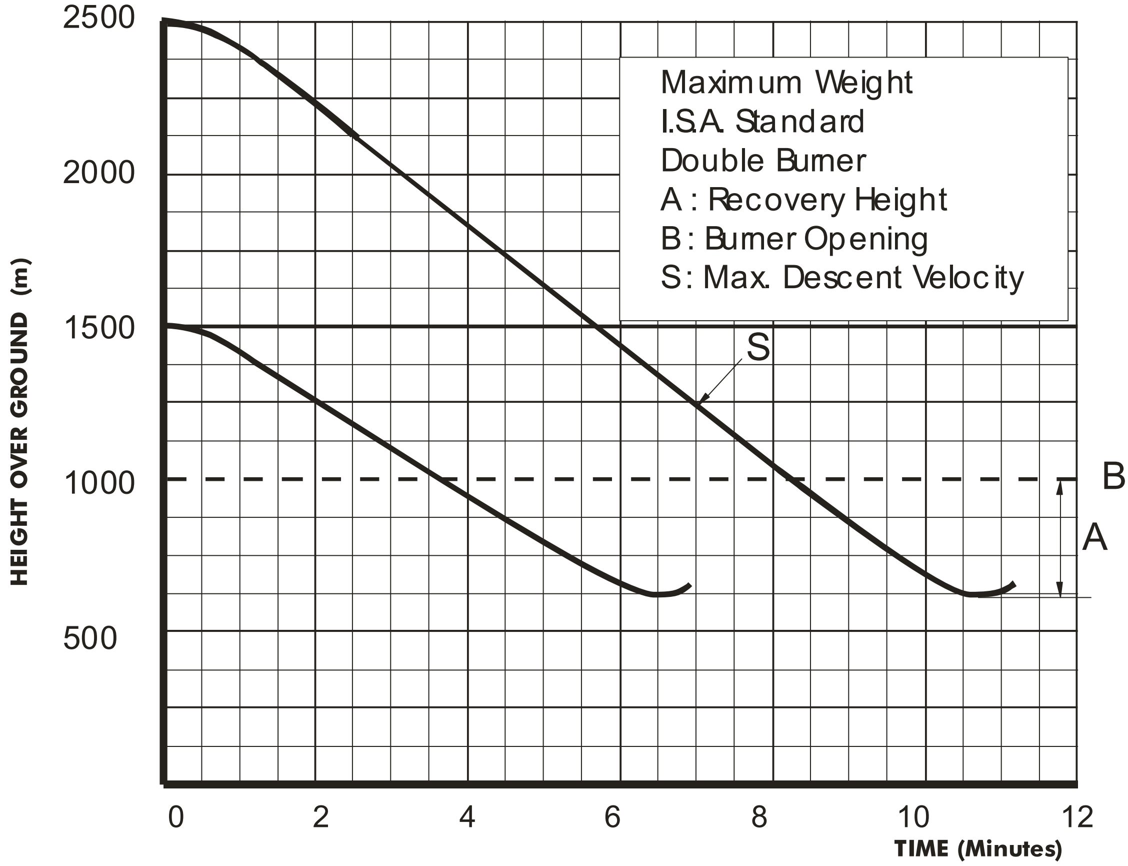
SIZE 180 (5100 m3)



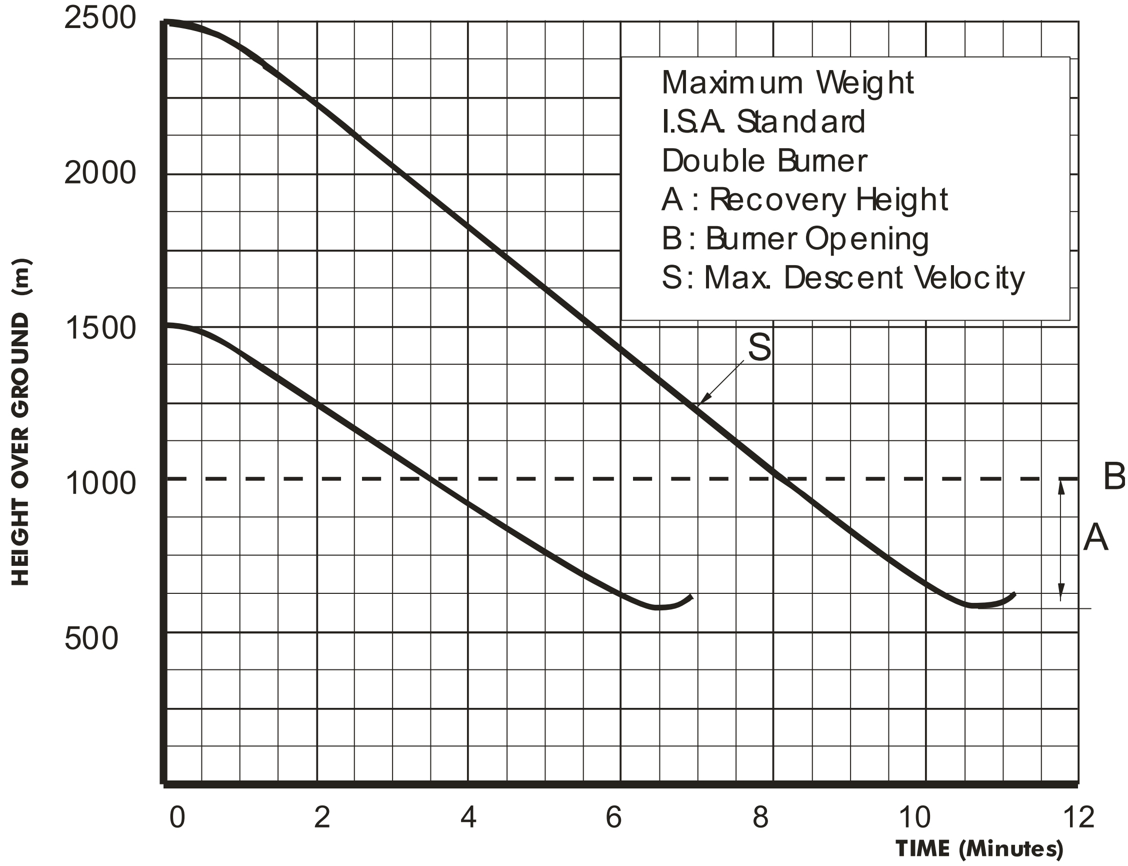
SIZE 210 (6000 m3)



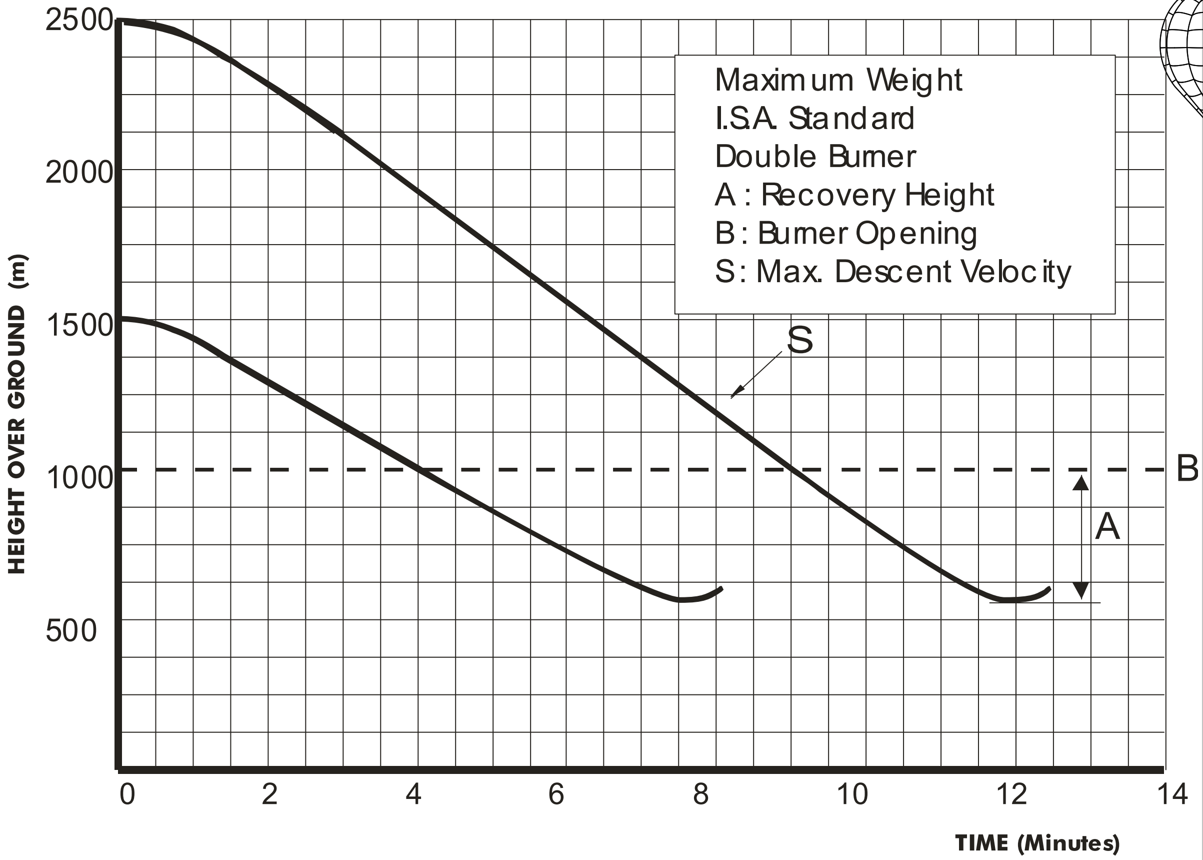
SIZE 250 (7000 m3)



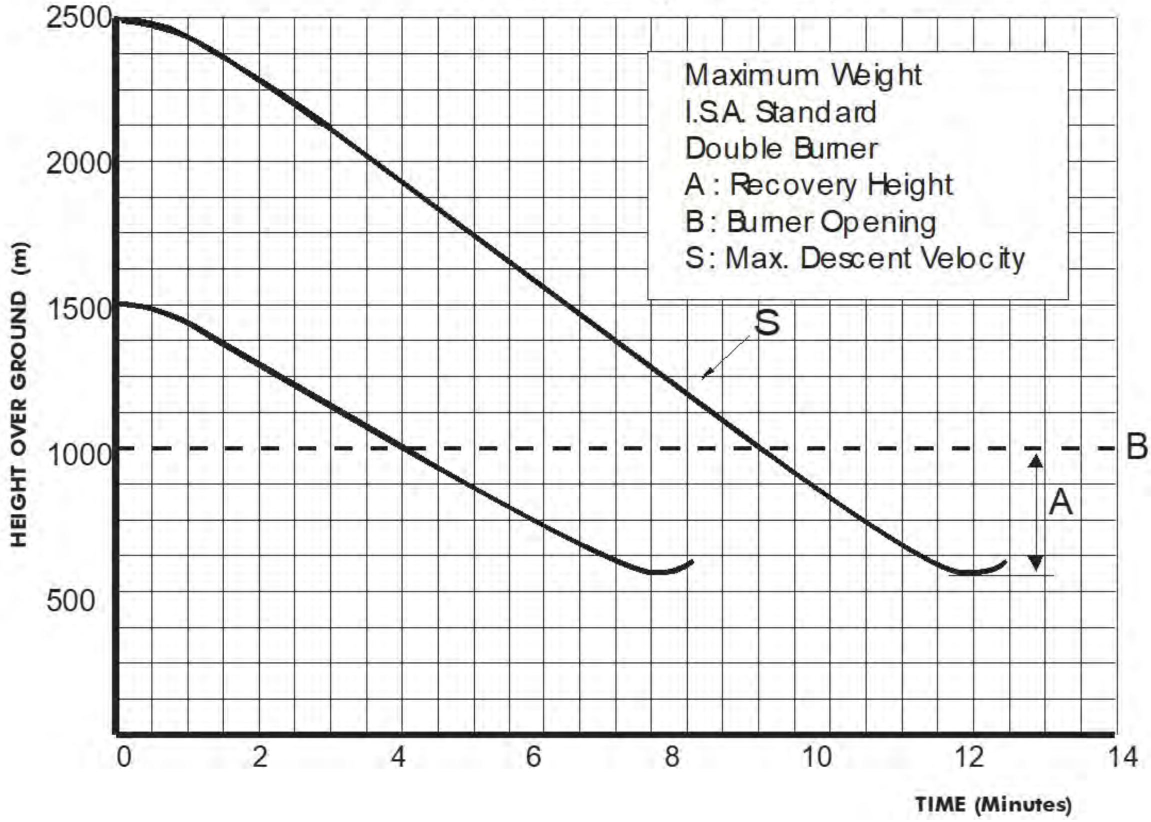
SIZE 300 (8500 m3)



SIZE 355 (10000 m³)

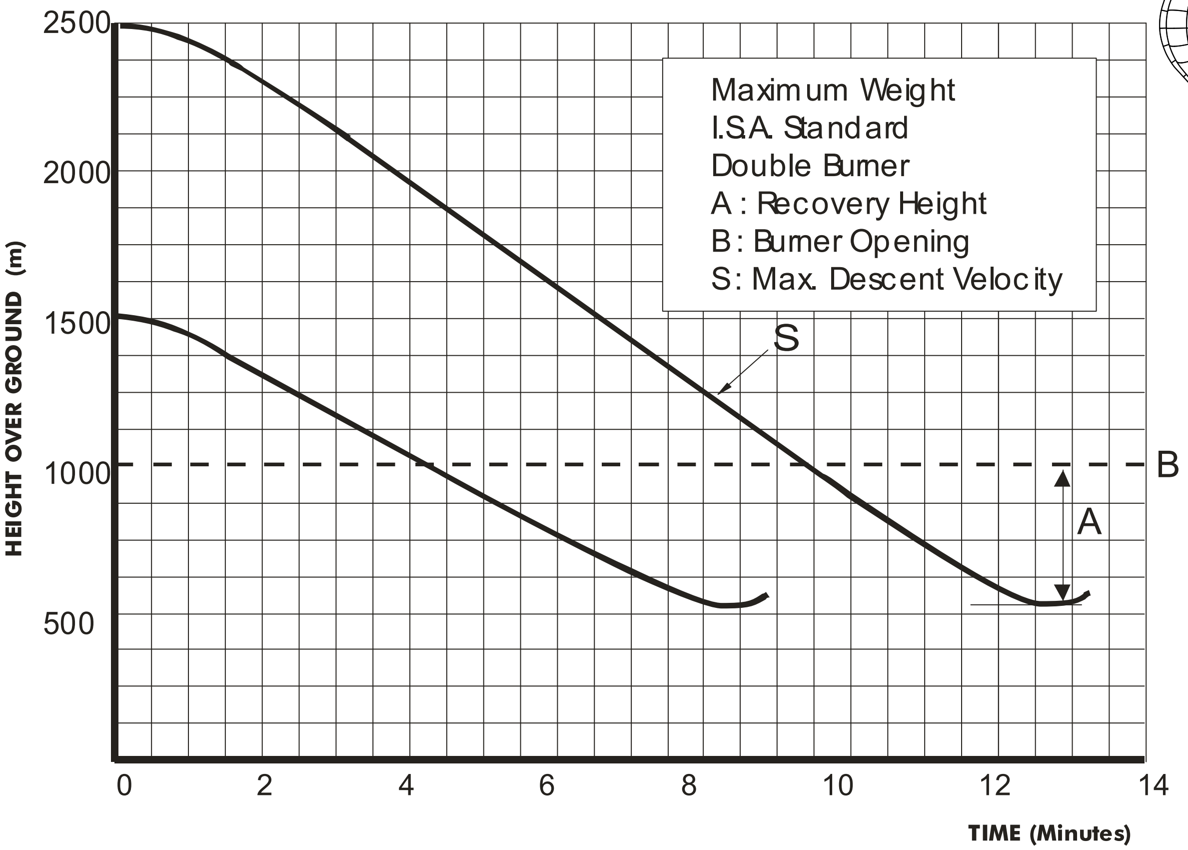


SIZE 370 (10480 m3)

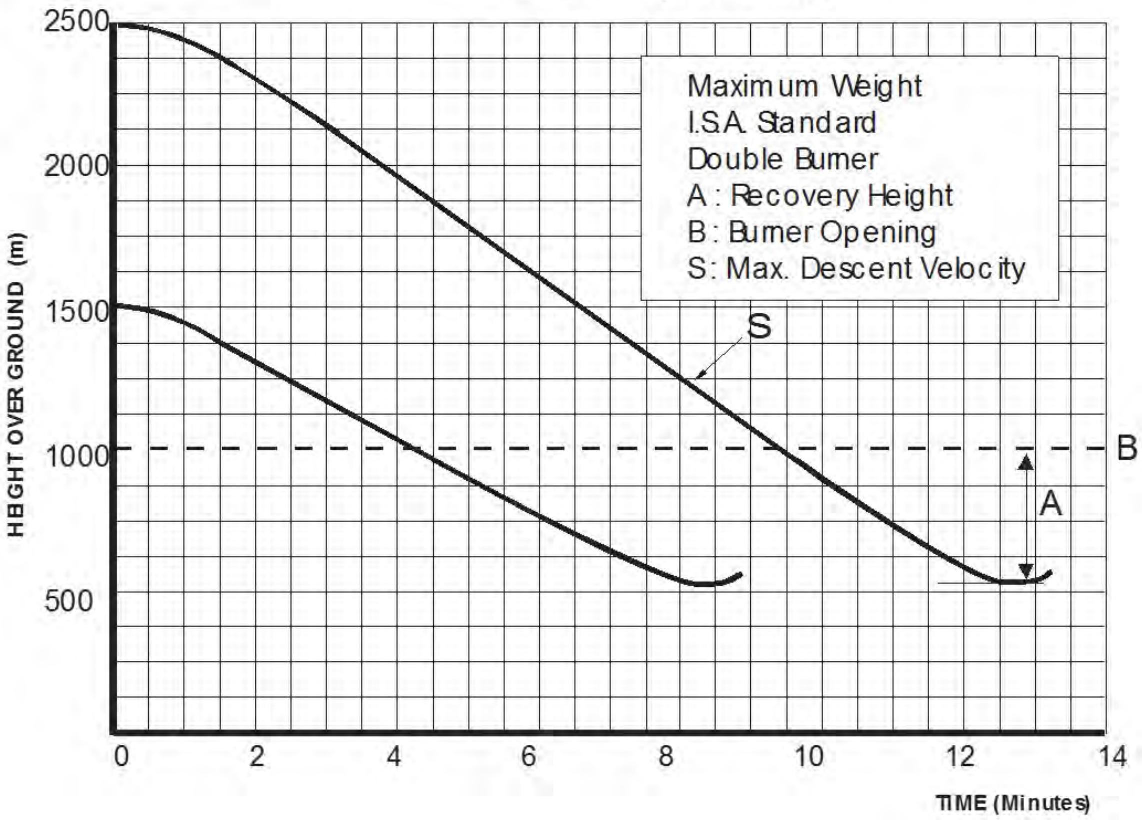


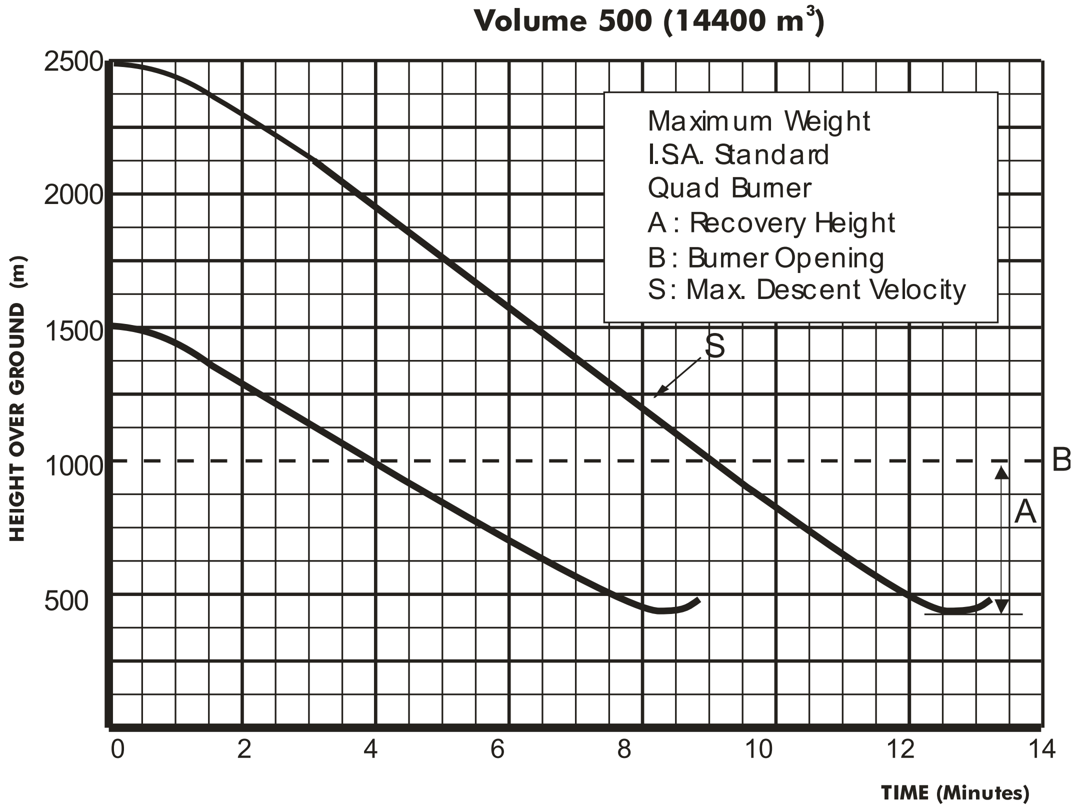
A VERTICAL VELOCITIES

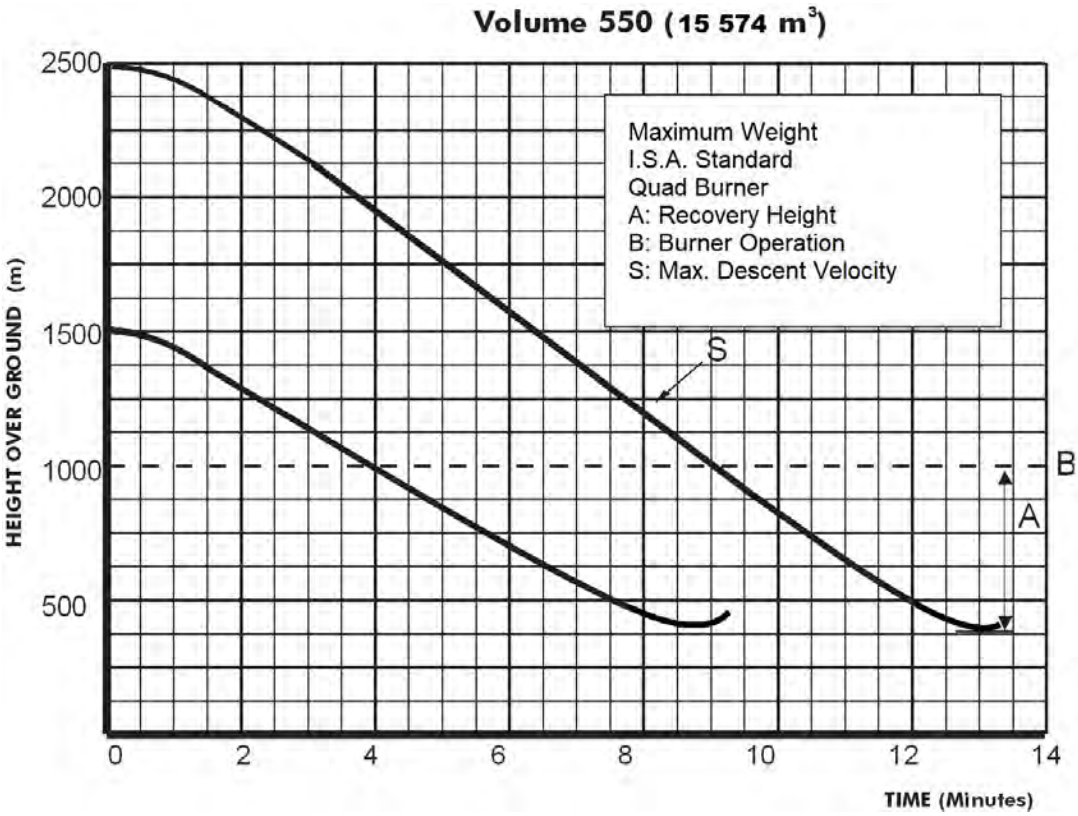
Volume 425 (12000 m3)



SIZE 450 (12750 m³)




Volume 500 (14400 m³)
Maximum Weight
I.SA. Standard
Quad Burner
A : Recovery Height
B : Burner Opening
S : Max. Descent Velocity
S
B
A
HEIGHT OVER GROUND (m)
2500
2000
1500
1000
500
0
2
4
6
8
10
12
14
TIME (Minutes)


Volume 550 (15 574 m³)
Maximum Weight
I.S.A. Standard
Quad Burner
A: Recovery Height
B: Burner Operation
S: Max. Descent Velocity
S
B
A
HEIGHT OVER GROUND (m)
2500
2000
1500
1000
500
0
2
4
6
8
10
12
14
TIME (Minutes)

APPENDIX

B – Flight Instruments.

The requirements for the carrying of flight instruments vary from country to country. However, the carriage of an altimeter and rate of climb indicator is mandatory. In some countries a thermister is also required for measuring internal envelope temperature during the flight. The list shown below indicates instruments that Ultramagic recommend and are generally approved for balloon use. This is by no means a list of the only instruments available for use in Hot air balloons. Ultimate approval for use is subject to the instrument being approved by the appropriate national organisation.

CAUTION: Under particularly extreme environments, ensure that the equipment used can withstand the humidity and temperature conditions referring to the specifications of the manufacturer. Batteries may last shorter than the expected under cold conditions.

Purpose-Built Platforms

Manufacturer	Instrument Model
Flytec	3040, 4005, 6005, 6040, TT34, FB4
Aircotec	Piccolo 5000, Piccolo 8000
Ball	655, M55, M57
Blue Sky Avionics	Pegasus HA
Brauniger	IQ, IQ Balloon Comfort
Winter	
Digital Balloon Instrument	

Multipurpose Mobile Platforms

Software	Device	
Ultramagic FlightPack	Samsung	Galaxy S3, S4, S5, S6+, Galaxy Note and later models
	Sony	Xperia Z3 and later models
	Google	Nexus 4, 5, 10 and later models
	Apple	iPad Air 2 and later models iPhone 6, 6+, 6s and later models

NOTE: Platform must be equipped with a suitable ambient pressure sensor (barometer). List above shows examples of proven devices, although the list is not limiting. Later iOS tablets/smartphones and Android smartphones may meet the requirements. Check the datasheet or the manufacturer of the device if in doubt.

CAUTION: Multipurpose platforms such as tablets or smartphones must have a dedicated use, so that its function as altimeter/variometer cannot be unexpectedly interrupted.

APPENDIX

C – Quick reference pre – flight checklist.

This appendix may be copied and used as a quick reference in conjunction with Section 4 - Standard Procedures.

Appendix C - Quick Reference Pre–Flight Checklist.

The following inspections and checks must be carried out before every flight.

Envelope

1. ☐ Ensure that any fabric damage does not exceed the Permitted Damage.
2. ☐ Ensure that there is do damage to any load tapes.
3. ☐ Ensure that there is no damage to the flying wires and that they are free of twists.
4. ☐ Ensure that flying wires are connected correctly and that karabiners are closed, screwed shut and loaded lengthways.
5. ☐ Ensure that all control ropes and chords are free of damage, securely attached, not twisted and work correctly.
6. ☐ Ensure that all pulleys and loops are well attached and are working freely.
7. ☐ Ensure that all controls lines are connected to the load frame.
8. ☐ Carry out a functional check on parachute system.
9. ☐ Carry out a functional check on the FDS rapid deflation system where fitted.

Burner and Fuel System

1. ☐ Check the burner, all valves and hoses for damage and leaks.
2. ☐ Ensure the hoses are connected and secure to the cylinders and that the connections are leak free.
3. ☐ Ensure that the cylinders are securely attached, free of damage and that there are no signs of leaks.
4. ☐ Check fuel pressure is in accordance with stated requirements.
5. ☐ Carry out burner functional check on all burners ensuring all valves open and close correctly.
6. ☐ Check that pilot light is burning correctly and is strong and not too noisy or too quiet.
7. ☐ Check that all cylinders are functioning correctly.

Basket

1. ☐ Check the general condition of the basket for damage.
2. ☐ Ensure that the basket wires are free of damage and twists.
3. ☐ Ensure that the burner frame and poles fit correctly and are free of damage.
4. ☐ Ensure that the attachment points are secure and that all karabiners are screwed locked.
5. ☐ Check for the presence of a fire extinguisher in state of readiness.
6. ☐ Check that cylinder straps are in place and cylinders are secured.

Fuel

1. ☐ Ensure sufficient fuel is on board for the required duration of the flight.

Equipment

1. ☐ Ensure that the following information and equipment is on board.
    a) ☐ Alternative source of ignition – matches, lighter, striker
    b) ☐ Watch or time piece.
    c) ☐ Instruments – Altimeter and Variometer – set and working.
    d) ☐ Fire extinguisher - in readiness for use.
    e) ☐ Gloves
    f) ☐ Temperature flag or Envelope Temperature indicator
    g) ☐ Kit of tethering components (If applicable)
    h) ☐ Radio/Transponder (if applicable) – set and working.
    i) ☐ Any other required equipment – subject to local CAA / nature of the Operation

Passengers

1. ☐ Ensure that all passengers are on board and have sufficient space,
2. ☐ Ensure that passengers are briefed for take off and that all equipment is stowed securely.

Loading

1. ☐ Check the ambient temperature at Take-Off site
2. ☐ Check the load calculations are in accordance with the Flight Manual and Operational requirements.

Restraint Harnesses

1. ☐ Ensure harnesses are worn and connected (If applicable)

General Conditions

1. ☐ Ensure downwind area is still free of obstacles.
2. ☐ Ensure weather conditions have not changed to the detriment of the safety of the flight.

APPENDIX

D – Minimum basket space requirements

The following table provides guidance on the number of persons that may occupy each basket type (including crew), taking into account the space available and the number of fuel cylinders on board. Basket occupancy shall not take precedence to loading limitations (see Sections 2 and 5). Figures given must not be exceeded unless written approval from Ultramagic or the National CAA is furnished.

The Ultramagic basket types are listed on the left column. Where baskets from another manufacturers have been approved for use, an equivalence in size can be adopted, without prejudice of the basket capacity established by the manufacturer.
On baskets with a separate pilot / fuel compartment, it is permissible to carry occupants other than the pilot, subject to having enough space. Where cylinders of different size are used, the most conservative case must be considered.
When an odd number of occupants is to be distributed between a pair number of equal compartments, judgement must be made by the pilot considering the size of the occupants, or reduce the number of passengers if in doubt.

EXAMPLE 1: A C-6 open (single compartment) basket can carry up to 6 occupants (pilot included) and up to 6 M-30 cylinders.
EXAMPLE 2: A Double-T C-11 basket can carry 4 M-40 cylinders and the pilot in the centre compartment, whilst 16 passengers are distributed in groups of 4 on each lateral compartment.

Basket Denomination		Type/Number of Cylinders on pilot's compartment														
		M-20/Worthington					M-30					M-40				
		2	3	4	5	6	2	3	4	5	6	2	3	4	5	6
C-0	O	2	1	1	n/a	n/a	1	1	n/a	n/a	n/a	1	1	n/a	n/a	n/a
C-2	O	2	2	2	1	1	2	2	1	1	n/a	2	1	1	n/a	n/a
C-1	O	3	3	2	2	2	3	2	2	1	1	3	2	2	1	1
C-3	O	4	4	3	3	2	4	3	3	2	2	4	3	2	2	1
C-10	O	5	4	4	4	3	5	4	4	3	3	4	4	3	3	2
C-4	O	6	5	5	5	4	6	5	5	4	4	5	5	4	4	3
C-6	O	6	6	6	6	6	6	6	6	6	5	6	6	6	5	5
	S	5 (3)	5 (2)	5 (2)	5 (1)	5 (1)	5 (2)	5 (2)	5 (1)	5 (1)	5 (1)	5 (2)	5 (2)	5 (1)	5 (1)	5(0)
C-7	O	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	S	6 (3)	6 (3)	6 (2)	6 (2)	6 (2)	6 (3)	6 (2)	6 (2)	6 (2)	6 (1)	6 (3)	6 (2)	6 (2)	6 (1)	6 (1)
	ST	6 (3)	6 (3)	6 (2)	6 (2)	6 (2)	6 (3)	6 (2)	6 (2)	6 (2)	6 (1)	6 (3)	6 (2)	6 (2)	6 (1)	6 (1)
C-5	D	6 (3)	6 (3)	6 (3)	6 (2)	6 (2)	6 (3)	6 (3)	6 (2)	6 (2)	6 (1)	6 (3)	6 (3)	6 (2)	6 (1)	6 (1)
	ST	6 (3)	6 (3)	6 (3)	6 (2)	6 (2)	6 (3)	6 (3)	6 (2)	6 (2)	6 (1)	6 (3)	6 (3)	6 (2)	6 (1)	6 (1)
C-5$_{(L)}$	D	8 (3)	8 (3)	8 (3)	8 (2)	8 (2)	8 (3)	8 (3)	8 (2)	8 (2)	8 (1)	8 (3)	8 (3)	8 (2)	8 (1)	8 (1)
	ST	8 (3)	8 (3)	8 (3)	8 (2)	8 (2)	8 (3)	8 (3)	8 (2)	8 (2)	8 (1)	8 (3)	8 (3)	8 (2)	8 (1)	8 (1)
C-8	D	8 (4)	8 (3)	8 (3)	8 (3)	8 (2)	8 (4)	8 (3)	8 (3)	8 (2)	8 (2)	8 (3)	8 (3)	8 (2)	8 (2)	8 (1)
	ST	8 (4)	8 (3)	8 (3)	8 (3)	8 (2)	8 (4)	8 (3)	8 (3)	8 (2)	8 (2)	8 (3)	8 (3)	8 (2)	8 (2)	8 (1)
C-8$_{(L)}$	D	10 (4)	10 (3)	10 (3)	10 (3)	10 (2)	10 (4)	10 (3)	10 (3)	10 (2)	10 (2)	10 (3)	10 (3)	10 (2)	10 (2)	10 (1)
	ST	10 (4)	10 (3)	10 (3)	10 (3)	10 (2)	10 (3)	10 (3)	10 (3)	10 (2)	10 (2)	10 (3)	10 (3)	10 (2)	10 (2)	10 (1)
C-9	ST	12 (4)	12 (4)	12 (3)	12 (3)	12 (3)	12 (4)	12 (3)	12 (3)	12 (2)	12 (2)	12 (4)	12 (3)	12 (3)	12 (2)	12 (2)

	DT	12 (4)	12 (4)	12 (3)	12 (3)	12 (3)	12 (4)	12 (3)	12 (3)	12 (2)	12 (2)	12 (4)	12 (3)	12 (3)	12 (2)	12 (2)
C-11	DT	16 (4)	16 (4)	16 (4)	16 (3)	16 (3)	16 (4)	16 (4)	16 (3)	16 (3)	16 (2)	16 (4)	16 (4)	16 (3)	16 (2)	16 (2)
C-12	DT	n/a	20 (4)	20 (4)	20 (3)	20 (3)	n/a	20 (4)	20 (3)	20 (3)	20 (2)	n/a	20 (3)	20 (3)	20 (2)	20 (2)
C-12(S)	DT	n/a	16 (4)	16 (4)	16 (3)	16 (3)	n/a	16 (4)	16 (3)	16 (3)	16 (2)	n/a	16 (3)	16 (3)	16 (2)	16 (2)
C-14	DT	n/a	n/a	24 (4)	24(3)	24 (3)	n/a	n/a	24 (3)	24 (3)	24 (2)	n/a	n/a	24 (3)	24 (2)	24 (2)
	QT	n/a	n/a	28 (4)	28 (3)	28 (3)	n/a	n/a	28 (3)	28 (3)	28 (4)	n/a	n/a	28 (3)	28 (2)	28 (2)
C-14(L)	QT	n/a	n/a	28 (4)	28 (3)	28 (3)	n/a	n/a	28 (3)	28 (3)	28 (4)	n/a	n/a	28 (3)	28 (2)	28 (2)
C-15	QT	n/a	n/a	28 (4)	28 (3)	28 (3)	n/a	n/a	28 (3)	28 (3)	28 (4)	n/a	n/a	28 (3)	28 (2)	28 (2)

NOTES:

Basket styles: O = / S = / D = / ST = / DT = / QT =

Table above lists the most frequent basket configurations in terms of overall dimensions and partition wall distribution. For particular basket configurations or if in doubt, contact Ultramagic.

On Partitioned baskets, pilot compartment capacity is shown in brackets (pilot included) - the most frequent compartment width is assumed on each model.

Figures listed above show total occupancy; pilot and crew must be included in them.

The maximum number of occupants in the same compartment is of 6. In partitioned baskets, occupants must be uniformly distributed. For room calculations with more than 6 cylinders on board, contact Ultramagic.

Further to occupancy calculations, easy access to hand holds must be ensured for all the occupants at any time.

Observe additional room restrictions (i.e. carrying wheelchairs / seats on board); contact Ultramagic if in doubt.

APPENDIX

E – Conversion Charts

LENGTH CONVERSION CHART

Meters (m) = Feet (ft) x 0.305

S.I. > IMPERIAL

m	ft	m	ft
1	3,3	51	167,3
2	6,6	52	170,6
3	9,8	53	173,9
4	13,1	54	177,2
5	16,4	55	180,4
6	19,7	56	183,7
7	23,0	57	187,0
8	26,2	58	190,3
9	29,5	59	193,6
10	32,8	**60**	196,9
11	36,1	61	200,1
12	39,4	62	203,4
13	42,7	63	206,7
14	45,9	64	210,0
15	49,2	65	213,3
16	52,5	66	216,5
17	55,8	67	219,8
18	59,1	68	223,1
19	62,3	69	226,4
20	65,6	**70**	229,7
21	68,9	71	232,9
22	72,2	72	236,2
23	75,5	73	239,5
24	78,7	74	242,8
25	82,0	75	246,1
26	85,3	76	249,3
27	88,6	77	252,6
28	91,9	78	255,9
29	95,1	79	259,2
30	98,4	**80**	262,5
31	101,7	81	265,7
32	105,0	82	269,0
33	108,3	83	272,3
34	111,5	84	275,6
35	114,8	85	278,9
36	118,1	86	282,2
37	121,4	87	285,4
38	124,7	88	288,7
39	128,0	89	292,0
40	131,2	**90**	295,3
41	134,5	91	298,6
42	137,8	92	301,8
43	141,1	93	305,1
44	144,4	94	308,4
45	147,6	95	311,7
46	150,9	96	315,0
47	154,2	97	318,2
48	157,5	98	321,5
49	160,8	99	324,8
50	164,0	**100**	328,1

IMPERIAL > S.I.

ft	m	ft	m
1	0,3	51	15,5
2	0,6	52	15,8
3	0,9	53	16,2
4	1,2	54	16,5
5	1,5	55	16,8
6	1,8	56	17,1
7	2,1	57	17,4
8	2,4	58	17,7
9	2,7	59	18,0
10	3,0	**60**	18,3
11	3,4	61	18,6
12	3,7	62	18,9
13	4,0	63	19,2
14	4,3	64	19,5
15	4,6	65	19,8
16	4,9	66	20,1
17	5,2	67	20,4
18	5,5	68	20,7
19	5,8	69	21,0
20	6,1	**70**	21,3
21	6,4	71	21,6
22	6,7	72	21,9
23	7,0	73	22,3
24	7,3	74	22,6
25	7,6	75	22,9
26	7,9	76	23,2
27	8,2	77	23,5
28	8,5	78	23,8
29	8,8	79	24,1
30	9,1	**80**	24,4
31	9,4	81	24,7
32	9,8	82	25,0
33	10,1	83	25,3
34	10,4	84	25,6
35	10,7	85	25,9
36	11,0	86	26,2
37	11,3	87	26,5
38	11,6	88	26,8
39	11,9	89	27,1
40	12,2	**90**	27,4
41	12,5	91	27,7
42	12,8	92	28,0
43	13,1	93	28,3
44	13,4	94	28,7
45	13,7	95	29,0
46	14,0	96	29,3
47	14,3	97	29,6
48	14,6	98	29,9
49	14,9	99	30,2
50	15,2	**100**	30,5

LENGTH CONVERSION CHART

Meters (m) = Feet (ft) x 0.305

S.I. > IMPERIAL

m	ft	m	ft
1	3,3	51	167,3
2	6,6	52	170,6
3	9,8	53	173,9
4	13,1	54	177,2
5	16,4	55	180,4
6	19,7	56	183,7
7	23,0	57	187,0
8	26,2	58	190,3
9	29,5	59	193,6
10	32,8	**60**	196,9
11	36,1	61	200,1
12	39,4	62	203,4
13	42,7	63	206,7
14	45,9	64	210,0
15	49,2	65	213,3
16	52,5	66	216,5
17	55,8	67	219,8
18	59,1	68	223,1
19	62,3	69	226,4
20	65,6	**70**	229,7
21	68,9	71	232,9
22	72,2	72	236,2
23	75,5	73	239,5
24	78,7	74	242,8
25	82,0	75	246,1
26	85,3	76	249,3
27	88,6	77	252,6
28	91,9	78	255,9
29	95,1	79	259,2
30	98,4	**80**	262,5
31	101,7	81	265,7
32	105,0	82	269,0
33	108,3	83	272,3
34	111,5	84	275,6
35	114,8	85	278,9
36	118,1	86	282,2
37	121,4	87	285,4
38	124,7	88	288,7
39	128,0	89	292,0
40	131,2	**90**	295,3
41	134,5	91	298,6
42	137,8	92	301,8
43	141,1	93	305,1
44	144,4	94	308,4
45	147,6	95	311,7
46	150,9	96	315,0
47	154,2	97	318,2
48	157,5	98	321,5
49	160,8	99	324,8
50	164,0	**100**	328,1

IMPERIAL > S.I.

ft	m	ft	m
1	0,3	51	15,5
2	0,6	52	15,8
3	0,9	53	16,2
4	1,2	54	16,5
5	1,5	55	16,8
6	1,8	56	17,1
7	2,1	57	17,4
8	2,4	58	17,7
9	2,7	59	18,0
10	3,0	**60**	18,3
11	3,4	61	18,6
12	3,7	62	18,9
13	4,0	63	19,2
14	4,3	64	19,5
15	4,6	65	19,8
16	4,9	66	20,1
17	5,2	67	20,4
18	5,5	68	20,7
19	5,8	69	21,0
20	6,1	**70**	21,3
21	6,4	71	21,6
22	6,7	72	21,9
23	7,0	73	22,3
24	7,3	74	22,6
25	7,6	75	22,9
26	7,9	76	23,2
27	8,2	77	23,5
28	8,5	78	23,8
29	8,8	79	24,1
30	9,1	**80**	24,4
31	9,4	81	24,7
32	9,8	82	25,0
33	10,1	83	25,3
34	10,4	84	25,6
35	10,7	85	25,9
36	11,0	86	26,2
37	11,3	87	26,5
38	11,6	88	26,8
39	11,9	89	27,1
40	12,2	**90**	27,4
41	12,5	91	27,7
42	12,8	92	28,0
43	13,1	93	28,3
44	13,4	94	28,7
45	13,7	95	29,0
46	14,0	96	29,3
47	14,3	97	29,6
48	14,6	98	29,9
49	14,9	99	30,2
50	15,2	**100**	30,5

LENGTH CONVERSION CHART

Centimeters (cm) = Inches (in) x 2.54

S.I. > IMPERIAL

cm	in	cm	in
1	0,39	51	20,08
2	0,79	52	20,47
3	1,18	53	20,87
4	1,57	54	21,26
5	1,97	55	21,65
6	2,36	56	22,05
7	2,76	57	22,44
8	3,15	58	22,83
9	3,54	59	23,23
10	3,94	**60**	23,62
11	4,33	61	24,02
12	4,72	62	24,41
13	5,12	63	24,80
14	5,51	64	25,20
15	5,91	65	25,59
16	6,30	66	25,98
17	6,69	67	26,38
18	7,09	68	26,77
19	7,48	69	27,17
20	7,87	**70**	27,56
21	8,27	71	27,95
22	8,66	72	28,35
23	9,06	73	28,74
24	9,45	74	29,13
25	9,84	75	29,53
26	10,24	76	29,92
27	10,63	77	30,31
28	11,02	78	30,71
29	11,42	79	31,10
30	11,81	**80**	31,50
31	12,20	81	31,89
32	12,60	82	32,28
33	12,99	83	32,68
34	13,39	84	33,07
35	13,78	85	33,46
36	14,17	86	33,86
37	14,57	87	34,25
38	14,96	88	34,65
39	15,35	89	35,04
40	15,75	**90**	35,43
41	16,14	91	35,83
42	16,54	92	36,22
43	16,93	93	36,61
44	17,32	94	37,01
45	17,72	95	37,40
46	18,11	96	37,80
47	18,50	97	38,19
48	18,90	98	38,58
49	19,29	99	38,98
50	19,69	**100**	39,37

IMPERIAL > S.I.

in	cm	in	cm
1	2,54	51	129,5
2	5,08	52	132,1
3	7,62	53	134,6
4	10,16	54	137,2
5	12,70	55	139,7
6	15,24	56	142,2
7	17,78	57	144,8
8	20,32	58	147,3
9	22,86	59	149,9
10	25,40	**60**	152,4
11	27,94	61	154,9
12	30,48	62	157,5
13	33,02	63	160,0
14	35,56	64	162,6
15	38,10	65	165,1
16	40,64	66	167,6
17	43,18	67	170,2
18	45,72	68	172,7
19	48,26	69	175,3
20	50,80	**70**	177,8
21	53,34	71	180,3
22	55,88	72	182,9
23	58,42	73	185,4
24	60,96	74	188,0
25	63,50	75	190,5
26	66,04	76	193,0
27	68,58	77	195,6
28	71,12	78	198,1
29	73,66	79	200,7
30	76,20	**80**	203,2
31	78,74	81	205,7
32	81,28	82	208,3
33	83,82	83	210,8
34	86,36	84	213,4
35	88,90	85	215,9
36	91,44	86	218,4
37	93,98	87	221,0
38	96,52	88	223,5
39	99,06	89	226,1
40	101,6	**90**	228,6
41	104,1	91	231,1
42	106,7	92	233,7
43	109,2	93	236,2
44	111,8	94	238,8
45	114,3	95	241,3
46	116,8	96	243,8
47	119,4	97	246,4
48	121,9	98	248,9
49	124,5	99	251,5
50	127,0	**100**	254,0

LENGTH CONVERSION CHART

Centimeters (cm) = Inches (in) x 2.54

S.I. > IMPERIAL

cm	*in*	cm	*in*
1	*0,39*	51	*20,08*
2	*0,79*	52	*20,47*
3	*1,18*	53	*20,87*
4	*1,57*	54	*21,26*
5	*1,97*	55	*21,65*
6	*2,36*	56	*22,05*
7	*2,76*	57	*22,44*
8	*3,15*	58	*22,83*
9	*3,54*	59	*23,23*
10	*3,94*	**60**	*23,62*
11	*4,33*	61	*24,02*
12	*4,72*	62	*24,41*
13	*5,12*	63	*24,80*
14	*5,51*	64	*25,20*
15	*5,91*	65	*25,59*
16	*6,30*	66	*25,98*
17	*6,69*	67	*26,38*
18	*7,09*	68	*26,77*
19	*7,48*	69	*27,17*
20	*7,87*	**70**	*27,56*
21	*8,27*	71	*27,95*
22	*8,66*	72	*28,35*
23	*9,06*	73	*28,74*
24	*9,45*	74	*29,13*
25	*9,84*	75	*29,53*
26	*10,24*	76	*29,92*
27	*10,63*	77	*30,31*
28	*11,02*	78	*30,71*
29	*11,42*	79	*31,10*
30	*11,81*	**80**	*31,50*
31	*12,20*	81	*31,89*
32	*12,60*	82	*32,28*
33	*12,99*	83	*32,68*
34	*13,39*	84	*33,07*
35	*13,78*	85	*33,46*
36	*14,17*	86	*33,86*
37	*14,57*	87	*34,25*
38	*14,96*	88	*34,65*
39	*15,35*	89	*35,04*
40	*15,75*	**90**	*35,43*
41	*16,14*	91	*35,83*
42	*16,54*	92	*36,22*
43	*16,93*	93	*36,61*
44	*17,32*	94	*37,01*
45	*17,72*	95	*37,40*
46	*18,11*	96	*37,80*
47	*18,50*	97	*38,19*
48	*18,90*	98	*38,58*
49	*19,29*	99	*38,98*
50	*19,69*	**100**	*39,37*

IMPERIAL > S.I.

in	*cm*	in	*cm*
1	*2,54*	51	*129,5*
2	*5,08*	52	*132,1*
3	*7,62*	53	*134,6*
4	*10,16*	54	*137,2*
5	*12,70*	55	*139,7*
6	*15,24*	56	*142,2*
7	*17,78*	57	*144,8*
8	*20,32*	58	*147,3*
9	*22,86*	59	*149,9*
10	*25,40*	**60**	*152,4*
11	*27,94*	61	*154,9*
12	*30,48*	62	*157,5*
13	*33,02*	63	*160,0*
14	*35,56*	64	*162,6*
15	*38,10*	65	*165,1*
16	*40,64*	66	*167,6*
17	*43,18*	67	*170,2*
18	*45,72*	68	*172,7*
19	*48,26*	69	*175,3*
20	*50,80*	**70**	*177,8*
21	*53,34*	71	*180,3*
22	*55,88*	72	*182,9*
23	*58,42*	73	*185,4*
24	*60,96*	74	*188,0*
25	*63,50*	75	*190,5*
26	*66,04*	76	*193,0*
27	*68,58*	77	*195,6*
28	*71,12*	78	*198,1*
29	*73,66*	79	*200,7*
30	*76,20*	**80**	*203,2*
31	*78,74*	81	*205,7*
32	*81,28*	82	*208,3*
33	*83,82*	83	*210,8*
34	*86,36*	84	*213,4*
35	*88,90*	85	*215,9*
36	*91,44*	86	*218,4*
37	*93,98*	87	*221,0*
38	*96,52*	88	*223,5*
39	*99,06*	89	*226,1*
40	*101,6*	**90**	*228,6*
41	*104,1*	91	*231,1*
42	*106,7*	92	*233,7*
43	*109,2*	93	*236,2*
44	*111,8*	94	*238,8*
45	*114,3*	95	*241,3*
46	*116,8*	96	*243,8*
47	*119,4*	97	*246,4*
48	*121,9*	98	*248,9*
49	*124,5*	99	*251,5*
50	*127,0*	**100**	*254,0*

MASS CONVERSION CHART

Kilograms (kg) = Pounds (lb) x 0.454

S.I. > IMPERIAL

kg	*lb*	kg	*lb*
1	*2,2*	51	*112*
2	*4,4*	52	*115*
3	*6,6*	53	*117*
4	*8,8*	54	*119*
5	*11,0*	55	*121*
6	*13,2*	56	*123*
7	*15,4*	57	*126*
8	*17,6*	58	*128*
9	*19,8*	59	*130*
10	*22,0*	**60**	*132*
11	*24,3*	61	*134*
12	*26,5*	62	*137*
13	*28,7*	63	*139*
14	*30,9*	64	*141*
15	*33,1*	65	*143*
16	*35,3*	66	*146*
17	*37,5*	67	*148*
18	*39,7*	68	*150*
19	*41,9*	69	*152*
20	*44,1*	**70**	*154*
21	*46,3*	71	*157*
22	*48,5*	72	*159*
23	*50,7*	73	*161*
24	*52,9*	74	*163*
25	*55,1*	75	*165*
26	*57,3*	76	*168*
27	*59,5*	77	*170*
28	*61,7*	78	*172*
29	*63,9*	79	*174*
30	*66,1*	**80**	*176*
31	*68,3*	81	*179*
32	*70,5*	82	*181*
33	*72,8*	83	*183*
34	*75,0*	84	*185*
35	*77,2*	85	*187*
36	*79,4*	86	*190*
37	*81,6*	87	*192*
38	*83,8*	88	*194*
39	*86,0*	89	*196*
40	*88,2*	**90**	*198*
41	*90,4*	91	*201*
42	*92,6*	92	*203*
43	*94,8*	93	*205*
44	*97,0*	94	*207*
45	*99,2*	95	*209*
46	*101*	96	*212*
47	*104*	97	*214*
48	*106*	98	*216*
49	*108*	99	*218*
50	*110*	**100**	*220*

IMPERIAL > S.I.

lb	*kg*	lb	*kg*
1	*0,5*	51	*23,1*
2	*0,9*	52	*23,6*
3	*1,4*	53	*24,0*
4	*1,8*	54	*24,5*
5	*2,3*	55	*24,9*
6	*2,7*	56	*25,4*
7	*3,2*	57	*25,9*
8	*3,6*	58	*26,3*
9	*4,1*	59	*26,8*
10	*4,5*	**60**	*27,2*
11	*5,0*	61	*27,7*
12	*5,4*	62	*28,1*
13	*5,9*	63	*28,6*
14	*6,4*	64	*29,0*
15	*6,8*	65	*29,5*
16	*7,3*	66	*29,9*
17	*7,7*	67	*30,4*
18	*8,2*	68	*30,8*
19	*8,6*	69	*31,3*
20	*9,1*	**70**	*31,8*
21	*9,5*	71	*32,2*
22	*10,0*	72	*32,7*
23	*10,4*	73	*33,1*
24	*10,9*	74	*33,6*
25	*11,3*	75	*34,0*
26	*11,8*	76	*34,5*
27	*12,2*	77	*34,9*
28	*12,7*	78	*35,4*
29	*13,2*	79	*35,8*
30	*13,6*	**80**	*36,3*
31	*14,1*	81	*36,7*
32	*14,5*	82	*37,2*
33	*15,0*	83	*37,6*
34	*15,4*	84	*38,1*
35	*15,9*	85	*38,6*
36	*16,3*	86	*39,0*
37	*16,8*	87	*39,5*
38	*17,2*	88	*39,9*
39	*17,7*	89	*40,4*
40	*18,1*	**90**	*40,8*
41	*18,6*	91	*41,3*
42	*19,1*	92	*41,7*
43	*19,5*	93	*42,2*
44	*20,0*	94	*42,6*
45	*20,4*	95	*43,1*
46	*20,9*	96	*43,5*
47	*21,3*	97	*44,0*
48	*21,8*	98	*44,5*
49	*22,2*	99	*44,9*
50	*22,7*	**100**	*45,4*

PRESSURE CONVERSION CHART

Bar = psi x 0.069

S.I. > IMPERIAL

Bar	*psi*	Bar	*psi*
0,5	*7,3*	15,5	*224,8*
1,0	*14,5*	16,0	*232,1*
1,5	*21,8*	16,5	*239,3*
2,0	*29,0*	17,0	*246,6*
2,5	*36,3*	17,5	*253,8*
3,0	*43,5*	18,0	*261,1*
3,5	*50,8*	18,5	*268,3*
4,0	*58,0*	19,0	*275,6*
4,5	*65,3*	19,5	*282,8*
5,0	*72,5*	**20,0**	*290,1*
5,5	*79,8*	20,5	*297,3*
6,0	*87,0*	21,0	*304,6*
6,5	*94,3*	21,5	*311,8*
7,0	*101,5*	22,0	*319,1*
7,5	*108,8*	22,5	*326,3*
8,0	*116,0*	23,0	*333,6*
8,5	*123,3*	23,5	*340,8*
9,0	*130,5*	24,0	*348,1*
9,5	*137,8*	24,5	*355,3*
10,0	*145,0*	**25,0**	*362,6*
10,5	*152,3*	25,5	*369,8*
11,0	*159,5*	26,0	*377,1*
11,5	*166,8*	26,5	*384,4*
12,0	*174,0*	27,0	*391,6*
12,5	*181,3*	27,5	*398,9*
13,0	*188,5*	28,0	*406,1*
13,5	*195,8*	28,5	*413,4*
14,0	*203,1*	29,0	*420,6*
14,5	*210,3*	29,5	*427,9*
15,0	*217,6*	**30,0**	*435,1*

IMPERIAL > S.I.

psi	*Bar*	psi	*Bar*
5	*0,3*	160	*11,0*
10	*0,7*	170	*11,7*
15	*1,0*	180	*12,4*
20	*1,4*	190	*13,1*
25	*1,7*	200	*13,8*
30	*2,1*	210	*14,5*
35	*2,4*	220	*15,2*
40	*2,8*	230	*15,9*
45	*3,1*	240	*16,5*
50	*3,4*	**250**	*17,2*
55	*3,8*	260	*17,9*
60	*4,1*	270	*18,6*
65	*4,5*	280	*19,3*
70	*4,8*	290	*20,0*
75	*5,2*	300	*20,7*
80	*5,5*	310	*21,4*
85	*5,9*	320	*22,1*
90	*6,2*	330	*22,8*
95	*6,6*	340	*23,4*
100	*6,9*	**350**	*24,1*
105	*7,2*	360	*24,8*
110	*7,6*	370	*25,5*
115	*7,9*	380	*26,2*
120	*8,3*	390	*26,9*
125	*8,6*	400	*27,6*
130	*9,0*	410	*28,3*
135	*9,3*	420	*29,0*
140	*9,7*	430	*29,6*
145	*10,0*	440	*30,3*
150	*10,3*	**450**	*31,0*

TEMPERATURE CONVERSION CHART

Celsius (ºC) = (ºF - 32) x 0.556
Fahrenheit (ºF) = (ºC x 1.8) + 32

S.I. > IMPERIAL

ºC	ºF	ºC	ºF	ºC	ºF	ºC	ºF
-49	*-56,2*	1	*33,8*	51	*124*	101	*214*
-48	*-54,4*	2	*35,6*	52	*126*	102	*216*
-47	*-52,6*	3	*37,4*	53	*127*	103	*217*
-46	*-50,8*	4	*39,2*	54	*129*	104	*219*
-45	*-49,0*	5	*41,0*	55	*131*	105	*221*
-44	*-47,2*	6	*42,8*	56	*133*	106	*223*
-43	*-45,4*	7	*44,6*	57	*135*	107	*225*
-42	*-43,6*	8	*46,4*	58	*136*	108	*226*
-41	*-41,8*	9	*48,2*	59	*138*	109	*228*
-40	*-40,0*	**10**	*50,0*	**60**	*140*	**110**	*230*
-39	*-38,2*	11	*51,8*	61	*142*	111	*232*
-38	*-36,4*	12	*53,6*	62	*144*	112	*234*
-37	*-34,6*	13	*55,4*	63	*145*	113	*235*
-36	*-32,8*	14	*57,2*	64	*147*	114	*237*
-35	*-31,0*	15	*59,0*	65	*149*	115	*239*
-34	*-29,2*	16	*60,8*	66	*151*	116	*241*
-33	*-27,4*	17	*62,6*	67	*153*	117	*243*
-32	*-25,6*	18	*64,4*	68	*154*	118	*244*
-31	*-23,8*	19	*66,2*	69	*156*	119	*246*
-30	*-22,0*	**20**	*68,0*	**70**	*158*	**120**	*248*
-29	*-20,2*	21	*69,8*	71	*160*	121	*250*
-28	*-18,4*	22	*71,6*	72	*162*	122	*252*
-27	*-16,6*	23	*73,4*	73	*163*	123	*253*
-26	*-14,8*	24	*75,2*	74	*165*	124	*255*
-25	*-13,0*	25	*77,0*	75	*167*	125	*257*
-24	*-11,2*	26	*78,8*	76	*169*	126	*259*
-23	*-9,4*	27	*80,6*	77	*171*	127	*261*
-22	*-7,6*	28	*82,4*	78	*172*	128	*262*
-21	*-5,8*	29	*84,2*	79	*174*	129	*264*
-20	*-4,0*	**30**	*86,0*	**80**	*176*	**130**	*266*
-19	*-2,2*	31	*87,8*	81	*178*	131	*268*
-18	*-0,4*	32	*89,6*	82	*180*	132	*270*
-17	*1,4*	33	*91,4*	83	*181*	133	*271*
-16	*3,2*	34	*93,2*	84	*183*	134	*273*
-15	*5,0*	35	*95,0*	85	*185*	135	*275*
-14	*6,8*	36	*96,8*	86	*187*	136	*277*
-13	*8,6*	37	*98,6*	87	*189*	137	*279*
-12	*10,4*	38	*100*	88	*190*	138	*280*
-11	*12,2*	39	*102*	89	*192*	139	*282*
-10	*14,0*	**40**	*104*	**90**	*194*	**140**	*284*
-9	*15,8*	41	*106*	91	*196*	141	*286*
-8	*17,6*	42	*108*	92	*198*	142	*288*
-7	*19,4*	43	*109*	93	*199*	143	*289*
-6	*21,2*	44	*111*	94	*201*	144	*291*
-5	*23,0*	45	*113*	95	*203*	145	*293*
-4	*24,8*	46	*115*	96	*205*	146	*295*
-3	*26,6*	47	*117*	97	*207*	147	*297*
-2	*28,4*	48	*118*	98	*208*	148	*298*
-1	*30,2*	49	*120*	99	*210*	149	*300*
0	*32,0*	**50**	*122*	**100**	*212*	**150**	*302*

TEMPERATURE CONVERSION CHART

Celsius (ºC) = (ºF - 32) x 0.556
Fahrenheit (ºF) = (ºC x 1.8) + 32

IMPERIAL > S.I.

ºF	ºC	ºF	ºC	ºF	ºC	ºF	ºC
-48	-44,5	52	11,1	152	66,7	252	122,3
-46	-43,4	54	12,2	154	67,8	254	123,4
-44	-42,3	56	13,3	156	68,9	256	124,5
-42	-41,1	58	14,5	158	70,1	258	125,7
-40	-40,0	**60**	15,6	**160**	71,2	**260**	126,8
-38	-38,9	62	16,7	162	72,3	262	127,9
-36	-37,8	64	17,8	164	73,4	264	129,0
-34	-36,7	66	18,9	166	74,5	266	130,1
-32	-35,6	68	20,0	168	75,6	268	131,2
-30	-34,5	**70**	21,1	**170**	76,7	**270**	132,3
-28	-33,4	72	22,2	172	77,8	272	133,4
-26	-32,2	74	23,4	174	79,0	274	134,6
-24	-31,1	76	24,5	176	80,1	276	135,7
-22	-30,0	78	25,6	178	81,2	278	136,8
-20	-28,9	**80**	26,7	**180**	82,3	**280**	137,9
-18	-27,8	82	27,8	182	83,4	282	139,0
-16	-26,7	84	28,9	184	84,5	284	140,1
-14	-25,6	86	30,0	186	85,6	286	141,2
-12	-24,5	88	31,1	188	86,7	288	142,3
-10	-23,4	**90**	32,2	**190**	87,8	**290**	143,4
-8	-22,2	92	33,4	192	89,0	292	144,6
-6	-21,1	94	34,5	194	90,1	294	145,7
-4	-20,0	96	35,6	196	91,2	296	146,8
-2	-18,9	98	36,7	198	92,3	298	147,9
0	-17,8	**100**	37,8	**200**	93,4	**300**	149,0
2	-16,7	102	38,9	202	94,5	302	150,1
4	-15,6	104	40,0	204	95,6	304	151,2
6	-14,5	106	41,1	206	96,7	306	152,3
8	-13,3	108	42,3	208	97,9	308	153,5
10	-12,2	**110**	43,4	**210**	99,0	**310**	154,6
12	-11,1	112	44,5	212	100,1	312	155,7
14	-10,0	114	45,6	214	101,2	314	156,8
16	-8,9	116	46,7	216	102,3	316	157,9
18	-7,8	118	47,8	218	103,4	318	159,0
20	-6,7	**120**	48,9	**220**	104,5	**320**	160,1
22	-5,6	122	50,0	222	105,6	322	161,2
24	-4,4	124	51,2	224	106,8	324	162,4
26	-3,3	126	52,3	226	107,9	326	163,5
28	-2,2	128	53,4	228	109,0	328	164,6
30	-1,1	**130**	54,5	**230**	110,1	**330**	165,7
32	0,0	132	55,6	232	111,2	332	166,8
34	1,1	134	56,7	234	112,3	334	167,9
36	2,2	136	57,8	236	113,4	336	169,0
38	3,3	138	58,9	238	114,5	338	170,1
40	4,4	**140**	60,0	**240**	115,6	**340**	171,2
42	5,6	142	61,2	242	116,8	342	172,4
44	6,7	144	62,3	244	117,9	344	173,5
46	7,8	146	63,4	246	119,0	346	174,6
48	8,9	148	64,5	248	120,1	348	175,7
50	10,0	**150**	65,6	**250**	121,2	**350**	176,8

VOLUME CONVERSION CHART

Cubic Feet (ft³) = Cubic Meters (m³) x 35.3

UM ENVELOPES

ft³ x 1000	*m³*
1	*28.33*
25	*708*
26	*735*
31	*878*
40	*1143*
42	*1189*
50	*1416*
55	*1549*
56	*1586*
60	*1715*
65	*1841*
70	*1982*
77	*2180*
90	*2549*
100	*2832*
105	*2973*
120	*3398*
130	*3681*
145	*4106*
150	*4248*
160	*4531*
180	*5097*
210	*5947*
250	*7079*
300	*8495*
355	*10052*
425	*12035*
450	*12750*
500	*14160*
600	*16990*