MAINTENANCE MANUAL

for

ULTRAMAGIC HOT AIR BALLOONS

H 31 42 56 65 77
V 25 56 65 77 90 105
S 50 90 105 130 160
T 150 180 210
F Special Shapes

M 42 56 56C 65 65C 77 77C 90 105 120 130 145 160
N 180 210 250 300 355 425 500
Z 90

Serial number	_____
Approval	**Rev. 16**
(EASA Approval 10041973)	
Date	_____

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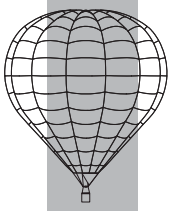
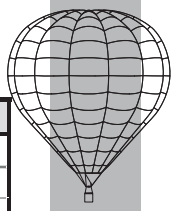


LIST OF APPROVED REVISIONS

See list of effective pages.
Note- From revision 7 any new or amended text in the revised page will be indicated by a black vertical line in the left margin, and the revision number will be shown at the top of the page.

Revision Nº	Modifications (Brief description)	Date
1	Supplements 1, 2 and 3	24-Sep-03
2	Supplement 4	19-Apr-04
3	Supplement 5	01-Sep-04
4	Supplement 6	15-Dec-05
5	Supplement 7 Changes on Inspections and renumbering	26-May-06
6	Supplements 8 and 9	15-Nov-06
7	FAA of USA requirements Section 7 Airworthiness Limitations Supplement 10	17-Apr-07
8	Supplement 4 revision Supplement 11 BMK-008 Single Burner Supplement 12 BMK-008 Double Burner Supplement 13 BMK-050 Burner	01-May-07
9	Supplement 14 MK21 Vapour Pilot Light Supplement 15 MK21 Improved Filtering	15-Feb-08
10	Supplement 13 BMK-050 Burner revision FAA requirements introduced	20-Jun-08
11	Corrections to section 2 and 6 Correction to Appendix 2 Supplement 5 Disabled Pax Basket revision	17-Dec-08
12	Amendment to sections 0, 2, 4, 6, A2 Supplement 17 'Tekno' Envelopes (added) Supplement 18 'Tekno' Baskets (added) Supplement 19 'FuelTek' System (added)	24-Mar-10
13	Amendment to sections 0, 1, 2, 4, 6, A2 Supplement 18 'Tekno' Baskets (revised)	10-Sep-10
14	SUPERSEDED	N/A
15	Supplement 21 "F-35 R4TS" Amendment to sections 0, 1, 2, 3, 4, 6	10-Dec-12
16	Section 7 (EASA Approval 10041973)	10-Dec-12



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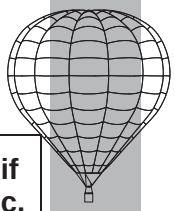
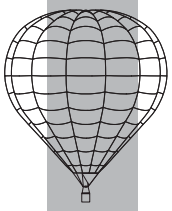


LIST OF APPROVED SUPPLEMENTS

Supplement No.	Description	Issue		Tick if Applic.
		Number	Date	
1	Mk 21 Double burner electric blast valve	2	Sept-03	
2	Mk 10 Burner maintenance, double, triple and quad.	2	Sept-03	
3	Use of “Quick Links” for flying wire replacement.	2	Sept-03	
4	Solo & Duo Maintenance	3	Apr-04	
5	Disabled Passengers Basket	3	Dec-08	
6	Cruise Control	2	Dec-05	
7	Butane Burner	2	May-06	
8	Centre Gimbal Assembly	2	Nov-06	
9	Fastflat Quick Release Coupling	2	Nov-06	
10	U.S. units conversion table to I.S. units	2	Apr-07	
11	BMK-008 Single Burner	2	May-07	
12	BMK-008 Double Burner	2	May-07	
13	BMK-050 Double, Triple & Quad Burner Rev. 10	2	May-08	
14	MK21 Vapour Pilot Light	2	Feb-08	
15	MK21 Improved Filtering	2	Feb-08	
17	‘Tekno’ Envelopes	1	Mar-10	
18	‘Tekno’ Baskets	2	Sep-10	
19	‘FuelTek’ Fuel Control System	1	Mar-10	
21	Special shape F-35 “R4TS”	1	Nov-12	



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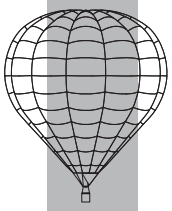


1.1.3 Basket

Cleaning
Re varnishing or oiling of wicker
Repair or replacement of suede or leather top trim
Repair or replacement of rawhide bottom trim.
Removal / Replacement of foam floor
Removal / Replacement of side wall padding
Removal / replacement of anti slip floor strips.

1.1.4 Fuel Cylinders

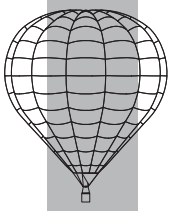
Removal / Repair / replacement of padded jackets
Removal/Replacement of top padding rings.
Any lubrication not requiring disassembly
Replacement of Rego-type seals.
Substitution or addition of fuel cylinders for occasional use: *Cylinders approved for use in the Ultramagic Flight Manual and Supplements may be added or substituted, by the pilot, to the balloon system´s existing cylinders on a flight by flight basis. This action is subject to details of written proof showing current airworthiness of these cylinders and a copy of this document (e.g. Form1, UM RMCY01 card, UK document IR6 or similar) is made available with the cylinders during the flight.*
Pilots are reminded of the requirement of pre-flight checks of all cylinders.

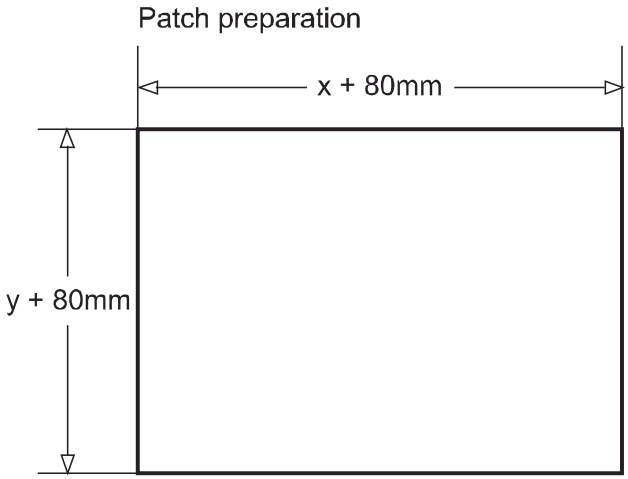
1.1.5 Burner

Overall cleaning using only soap and water
Cleaning of liquid pilot light regulator.
Replacement of pilot light jets and filters
Lubrication not requiring disassembly
Replacement or adjustment of piezzo.
Adjustment of burner gimblal friction.
Removal and refitting of burner in frame.
Replacement of seals in Tema couplings

1.1.6 Burner Frame

Removal and replacement of gimbal bolts, nuts, washers and friction sections.
Removal and replacement of burner frame heat shields.





Preferred method patch preparation

Starting at the centre of one edge fold the fabric to give the required fell seam and carefully stitch round, pin in place if necessary. There should be a minimum overlap/back-tack at the start end point of 25mm (1") This method requires considerable skill and practise. Practise should be carried out on spare fabric first. If needed the patch can only be removed and refitted once after which a larger hole should be prepared with a larger patch.

Where possible, it is preferable to extend the cut of the patch to the original edge of the fabric, replacing existing stitching instead of adding new seam.

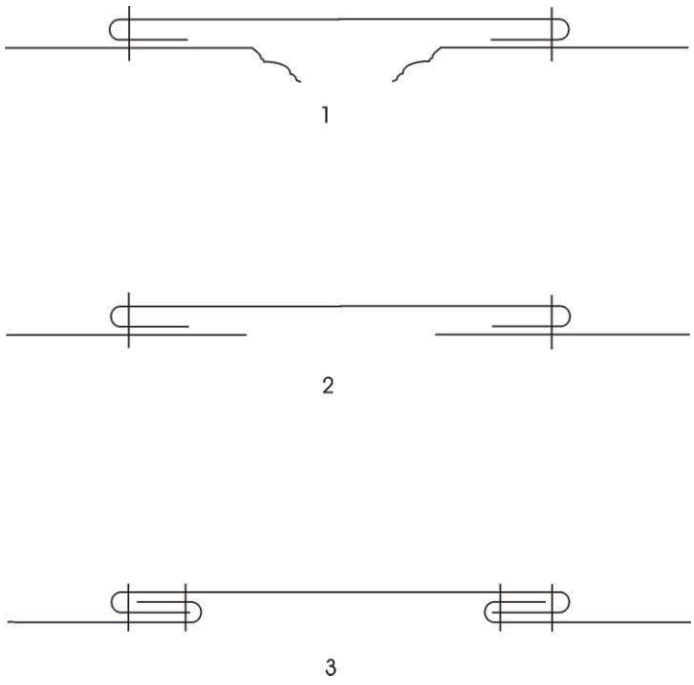
Where difficulty is being encountered in producing the above patch repair the following method may be used. This method below produced well, is preferable to a poorly produced seam shown above.

2.4.2 Alternative patch method

Cut a rectangular patch in line with the weave large enough to overlap the damage with sufficient extra to allow for folding. Fold the edges of the patch over by 13mm (1/2") and sew to the balloon around the outside edges only.
Carefully and accurately cut away the damaged area leaving 10mm (3/8") overlap.

Fold the edges of the original panel under the edges of the patch, cutting at the corners and add the second row of stitching resulting in the finished patch as shown below.

Note: Where the damage comes to within 25mm (1") of an existing balloon seam then that seam should be un-picked with the patch extended to the panel edge. The seam should be re-sewn with a double fell seam (French or balloon seam)



Alternative patch method

2.5 **Adhesive or repair tape Patches** - (Only in the bottom third.)

This method may be used for minor damage i.e. in the lower third of the envelope or if above this area, no hole greater than 25mm (1") in any direction or tears no greater than 75mm (3") in any direction.

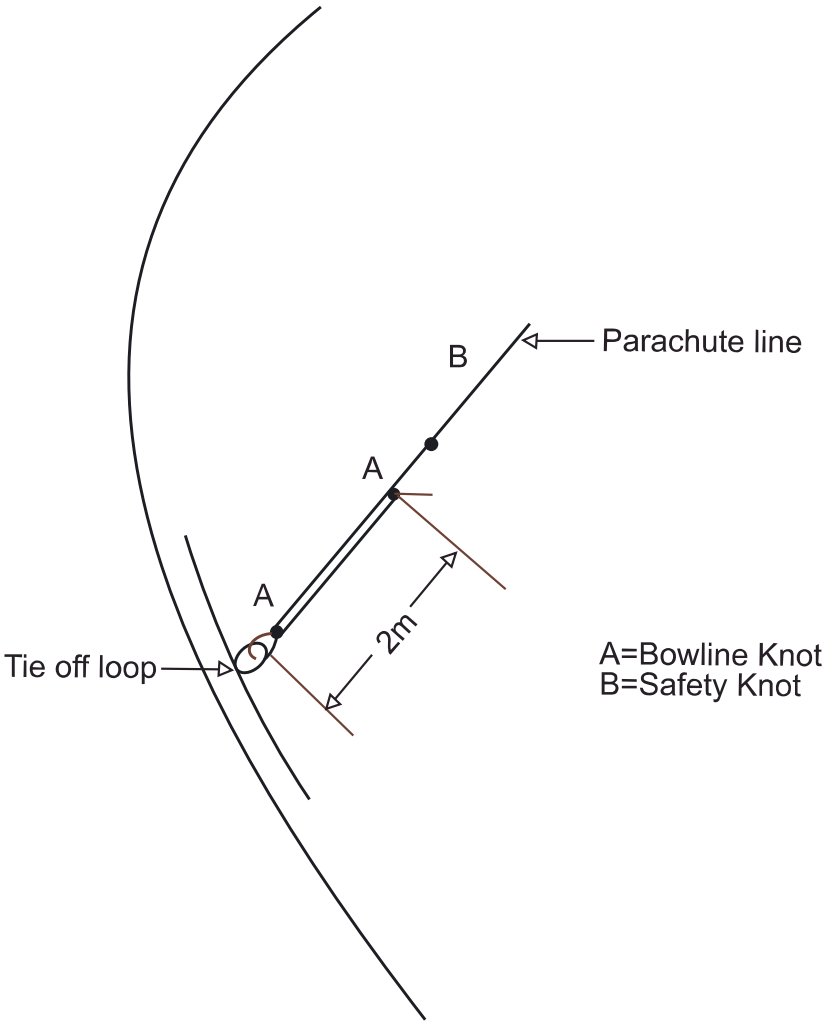
Cut a circular patch of fabric that overlaps the damage by at least 25mm (1") all round. This should then be fixed to the balloon with a good quality impact adhesive. It is then preferred that the patch be then sewn around to maintain permanency.

An alternative to gluing balloon fabric, where there are simple short tears, is the use of rip stop self-adhesive repair tape. However with this method it is compulsory to sew around the edge where the tear is above the lower third of the balloon envelope.

Note: The adhesive patch or repair tape method should not be used with Ultralast fabric unless it is sewn all around. Similarly the adhesive patch or repair tape method must not be used where damage is closer than 25mm (1") to a load tape. In both cases a sewn repair must be used.

2.10.4 Parachute control line

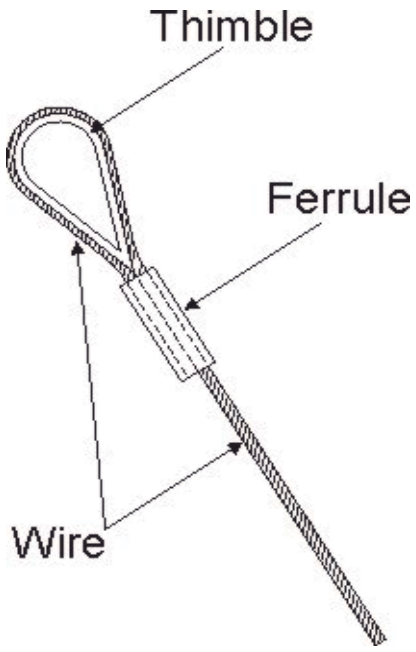
These are installed with an excess stored in a loop at the fixed end. If burn damage occurs within the first metre close to the free end then the damaged section can be removed and the excess stored rope may be let out to accommodate. Any damage other than this requires careful consideration to ensure no joints from a partial replacement interfere with the operation of the balloon. In doubt, replace the complete line or contact Ultramagic. Parachute lines should be tied with two bowline knots and the safety knot as shown below. The safety knot should be big enough to jam in the parachute pulley in the event of the end-fixing failing.



Parachute control line tie off

When fitting new lines then refit as the original with spare at the tie off end. This is best done with the balloon cold inflated and by following the path of the old one with the new one. Care should be taken to avoid crossing or tangling the lines. The balloon should then be fully inflated to set the length of the line. Any slack in the line should be taken out with the balloon fully pressurised and without applying too much tension to the line. The required length can then be marked and cut off and sealed with a hot knife or flame.

	77c 90 105 120 130 145 160		
N	180 210	3	500
	250 300 355 425 500	4	900
Z	90	4	900



The wire ends are produced by the fitment of a thimble and then by a swaging of a copper ferrule. This is a special process, which requires special tooling controlled to exacting standards. Therefore wires may only be used that are produced and supplied by Ultramagic S.A. Any variation to this rule is only allowed by written authority by Ultramagic S.A.

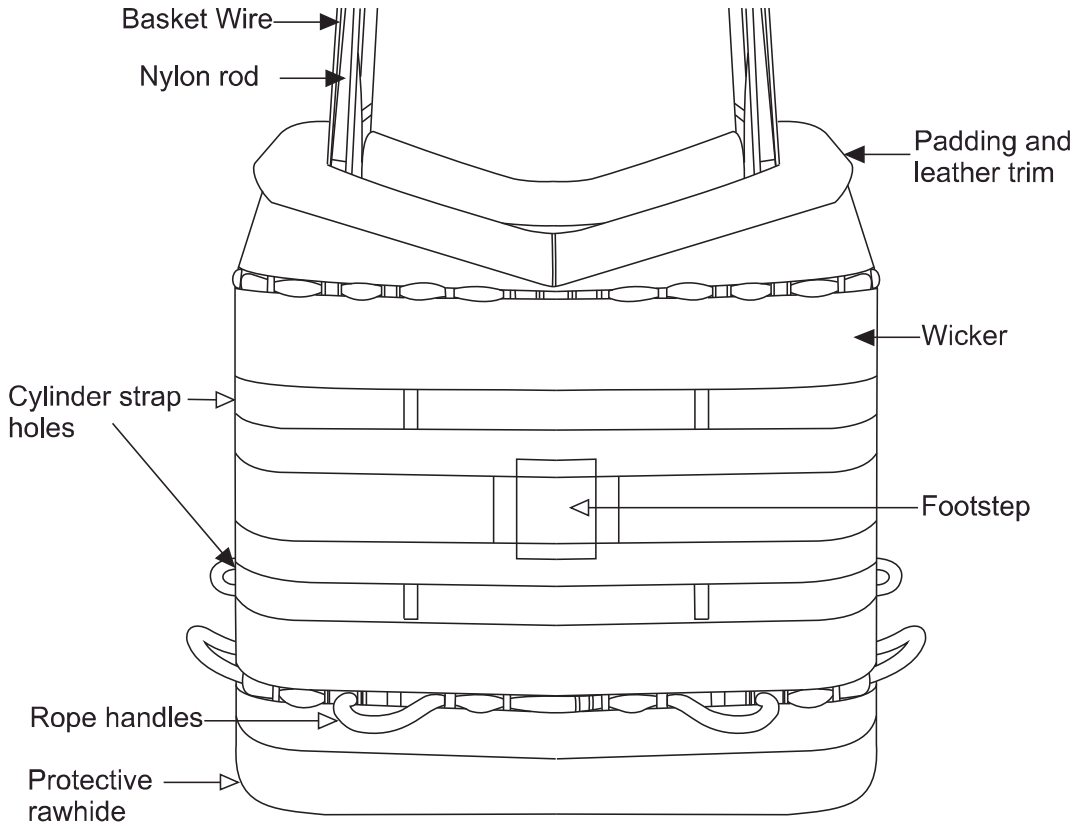
2.12.5 Ropes and Chords

The ropes and chords used in Ultramagic balloons have been selected and tested to meet their various requirements and are made of synthetic material. The following specifications must be adhered to.

1. Parachute retaining lines are 3mm. diameter Kevlar when a standard parachute is fitted. When a FDS rapid deflation system is installed in the balloon then the Parachute retaining/release lines are Kevlar core with a polyester outside and are 2.5mm diameter.
2. Parachute release lines on a parachute only system are 3mm diameter Kevlar.
3. Parachute control line is Kevlar core with polyester outside and is 8 to 10mm diameter. When a parachute only is installed then this line is red. When a FDS rapid deflation system is fitted to the envelope then the parachute line is white.
4. FDS control line is Kevlar core with polyester on the outside. This line is always red and is 8 to 10mm in diameter.
5. Rotation Vent lines are Kevlar core with polyester on the outside and are of 5mm diameter, or alternatively 4mm for envelopes not above size 210. The right is blue and the left is black
6. Crown Line is 8 to 10 mm polyester in white with a red stripe.

Section 3 - Basket Repairs

3.1 General Maintenance

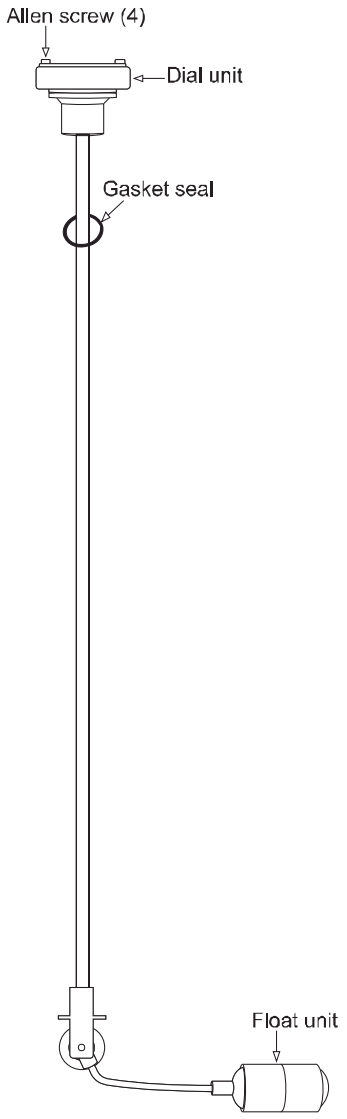


Basket general view

The basket should regularly be cleaned and inspected. The basket may be washed with soapy water (no strong detergents.) It must then be allowed to dry before storing. Internal floor padding / foam (if present) must be removed to enable proper drying.

The basket may be varnished with any good quality varnish. This is best done after washing and before the wicker has totally dried out. This allows the wicker to remain flexible and prevents it from becoming brittle. Alternatively the wicker may be treated with Linseed or Danish oil.

The leather or suede trim may be treated with any proprietary suede or leather cleaner.

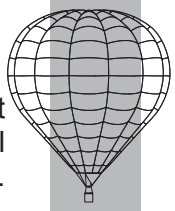


Side view of Gauge

The fuel contents gauge fitted is a Livello float type with magnetically coupled dial indicator. Care should be taken to ensure that the correct length is installed. Each time the gauge is removed the gasket must be inspected and replaced if damaged or worn. New gauges are always supplied with a new gasket.

The gauge action can be tested by rolling the cylinder on the ground. If the float unit is moving but not registering on the gauge then the dial unit is faulty and must be replaced. This can be replaced without emptying the cylinder by removing the 2 screws as shown in gauge top view.

If the float is not moving then the cylinder must be emptied and the gauge removed for inspection by removing the 4 Allen screws. It is possible that the gear action needs cleaning however if this does not solve the problem then the complete gauge assembly must be replaced. Only parts supplied by Ultramagic SA. may be used as replacement.



4.2.14 Pressure Relief Valve (PRV)

This valve is a Tecval and is set to discharge at 375 psi. Only Ultramagic supplied part can be used. Should the valve not be sealing it must be replaced immediately. This will require the emptying of the cylinder. The valve is removed and replaced by using 27mm. wrench.

4.2.15 Maxi Fill valve or “Bleed Valve”

This valve has a dip tube fitted, which sets the liquid fill volume for the cylinder. The type of valve used is a Ceodeux and only parts supplied by Ultramagic may be used. If the bleed valve leaks when closed then the whole valve must be replaced. This will require the cylinder to be emptied. The valve is removed and replaced using a 16mm wrench.

4.2.16 Vapour Regulator (Where fitted)

The outlet of the vapour valve is fitted with a left hand POL thread. The regulator is screwed into this outlet. The pressure setting on the regulator can be adjusted. Where the regulator is found to be faulty it can be replaced without emptying the cylinder. The vapour valve must be fully closed in the clockwise direction before removal and during replacement. The vapour connector is a separate component, which, benefits from occasional lubrication with silicone. Should this be found to be faulty, then the complete connecter should be replaced.

The type of connector used is Legris and only Ultramagic supplied parts may be used.

The type of regulator used is a Calor1476p and only Ultramagic supplied parts may be used.

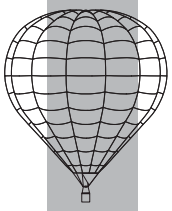
4.2.17 Vapour Valve (Where fitted)

When a vapour valve is fitted then it takes the position where the PRV is normally fitted. The vapour valve has an integral Maxi Fill valve and Pressure Relief valve (PRV). In this case special blanks are fitted in the cylinder in the redundant threaded boss positions in the cylinder.

If the vapour valve is found to be faulty then the complete valve must be replaced. There are no serviceable parts in the valve. The vapour valve is a Rego type and is removed and refitted using a special 30mm. wrench.

4.2.18 Pressure Check and Functional Check

A full pressure check and functional check must be carried out if any of the cylinder valve components have been removed or replaced. This to be carried out in accordance with the Inspection Schedule (see section 6)



4.3 MK 21 DOUBLE, TRIPLE AND QUAD BURNER MAINTENANCE

4.3.1 Replacement Parts and Procedures

The burner has been designed and constructed using carefully selected components and materials. In order to ensure the continued airworthiness of the burner, it is essential that only parts supplied by Ultramagic or by a supplier approved by Ultramagic be used. The use of parts from any other source is strictly forbidden.

Maintenance procedures must be carried out in accordance with the instructions contained in this manual.

4.3.2 Approved Maintenance and Inspection Personnel

In order to ensure the continued airworthiness of the burner, maintenance and formal inspection may only be carried out by Ultramagic, organisations approved by Ultramagic or by organisations approved by the national airworthiness authority in the country of registration.

4.3.3 Welding and Welders

If for any reason a repair requires the use of welding, the following limitations apply:

- All welding must be of the TIG (Tungsten Inert Gas) electric arc type.
- All welding must be carried out by a coded welded approved to the appropriate standard by the national airworthiness authority in the country of registration.

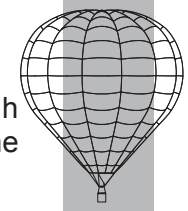
4.3.4 Maintenance Records

Whenever maintenance work of any kind is carried out on the burner, the work must be inspected and approved by a person or organisation approved by the national airworthiness authority in the country of registration. Maintenance work must be recorded by a suitable entry in the equipment maintenance record and must include the following information:

- A description of the work performed.
- The completion date of the work.
- The name of the person (and organisation if applicable) performing the work.
- The name of the inspector approving the work.

4.3.5 Technical Support

If technical assistance is required, contact Ultramagic. Always quote the burner part and serial numbers.



4.3.6 Safety

When connected to a fuel cylinder, the burner is capable of generating a very large, high temperature flame. Exercise care when carrying out maintenance work and observe the following rules.

- Always wear protective eyeglasses.
- Observe the usual rules for the handling of LPG.
- When test firing, wear suitable protective gloves.
- Always make sure that the burner has been completely vented of fuel before removing any components.
- Always make sure that the burner is cool before commencing work.
- Never look down onto the coil when the burner is connected to a fuel cylinder or when pressure remains inside the burner.
- When test firing, never stand down wind of the burner.
- Prior to test firing, make sure that the area is clear of personnel and animals.
- When test firing, make sure that the burner is properly supported and not able to fall or tilt unexpectedly.
- Never smoke or allow naked flames or other sources of ignition near the burner.
- Always use the correct tool for the job

4.3.7 Technical Description

4.3.7.1 General

Fuel is supplied to the burner through the flexible hoses. The fuel is distributed to the various valves and pressure gauge in readiness for use.

Each burner “pot” is fitted with the following major features:

- Burner can.
- Main Burner Vaporising coil
- Fuel hoses
- Main valve assembly
- Liquid valve assembly.
- Pilot regulator valve assembly
- Igniter Assembly
- Pressure gauge assembly.
- Liquid fire jet assembly.
- Pilot light assembly.
- Slurper tube assembly.
- Fuel inlet post.
- Hydraulically operated main valve (optional fit).

Note that all burner maintenance work must be conducted in a clean environment.

The burner is available in single, double, triple and quad variants. See section 4.4 for single burner.

The burners are constructed on a modular basis and utilise common components and assemblies. For simplicity therefore, the double burner will be described and the differences associated with the triple and quad will be described separately.

The double burner may be seen in figure 1 and the feature and functions detailed above are described in the following paragraphs:

ITEM	DESCRIPTION	PART NUMBER
1	BURNER CAN	2022-0600
2	VAPOURISATION COIL	2022-0500
3	SUPPORT BAR	2022-0012
4	CROSS TUBE ASSEMBLY	2022-0002
5	FUEL HOSE ASSEMBLY	2022-0001
6	FUEL CONNECTOR	REFERENCE
7	HANDLE TUBE	2022-0011
8	MAIN VALVE ASSEMBLY	2022-1200 (LH) 2022-1400 (RH)
9	LIQUID VALVE ASSEMBLY	2022-1100
10	PILOT REGULATOR VALVE ASSEMBLY	2022-0800
11	IGNITER ASSEMBLY	2022-0900
12	PRESSURE GAUGE ASSEMBLY	2022-1300
13	LIQUID FIRE JET ASSEMBLY	2022-1000
14	PILOT LIGHT ASSEMBLY	2022-0700
15	SLURPER TUBE ASSEMBLY	2022-1500
16	FUEL INLET POST	2022-0313
17	LH VALVE BLOCK	2022-0411
18	RH VALVE BLOCK	2022-0311
19	3/8" BSP BONDED SEAL	MA-FE-0600
20	M10 X 55 ST STL CAP HEAD SCREW	MA-FE-0512
21	M6 X 15 ST STL CAP HEAD SCREW	MA-FE-0513
22	M6 ST ST AEROTITE LOCK NUT	MA-FE-0510
23	M6 ST STL PLAIN WASHER	MA-FE-0511
24	M3 X 6 ST STL C.SINK SCREW	MA-FE-0514

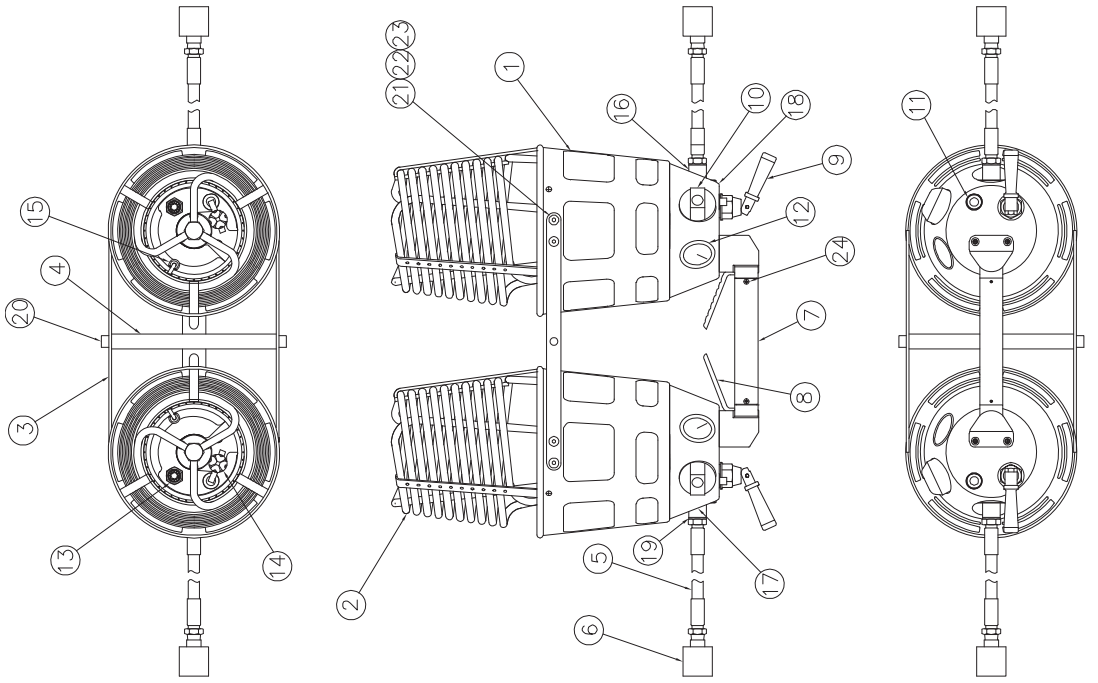


FIGURE 1
MK 21 DOUBLE BURNER CONFIGURATION

4.3.7.2 Burner Can

The burner can is a welded stainless steel construction. It provides a degree of mechanical protection to the components mounted inside the burner. The can is mounted onto the valve block using screw fixings and provides the mechanical support for the vaporisation coil and attachment to the burner frame.

4.3.7.3 Vaporisation Coil

The vaporisation coil is connected to the outlet of the main valve using a machined coil post. The function of the coil is to preheat the fuel before leaving the jet ring in readiness for combustion. The coil is a three start, welded assembly and is constructed from stainless steel tube, a special jet ring with fixed jets, coil supports and a mounting adapter.

When the main valve is opened, fuel enters the coil at is base. The fuel rises to the top of the coil and then descends through the coil spiral until it exits through the jet ring.

4.3.7.4 Fuel Hoses

The fuel hoses link the burner to the fuel cylinders. They are terminated with a choice of either Rego or Tema self-sealing connectors. The hoses are specially selected to withstand the operational fuel pressures and the wear and tear associated with use and handling. The fuel hose is supplied as a pre-fabricated assembly using armoured hose and swaged end fittings.

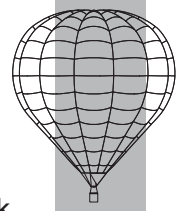
The process of swaging the end fitting onto the hose requires the use of special tooling. The use of any fuel hose other than that supplied by Ultramagic is therefore strictly forbidden.

4.3.7.5 Main Valve Assembly

The main valve is used to control the main burner function of the burner by the activation of a “squeeze” type handle. The valve is of a plunger type and uses a special sprung loaded rubber seal bearing against a machined seat in the valve block to create the seal. The seal is connected to a stem by a rotating joint. When the valve handle is operated, a cam action causes the stem and seal to lift off the seat in the valve block, thus allowing the flow of fuel.

The stem is housed in a machined aluminium valve bonnet. A pressure tight seal is achieved between the stem and bonnet with the use of a primary and secondary “O” seal. The bonnet is sealed to the valve block using a bonded washer.

The valve bonnet is provided with a press fit bush where the stem exits. This bush resists the axial forces imparted to the valve stem when the valve is operated and provides excellent wear resistance.
The stem is secure to the handle by means of a round pin and circlip.



4.3.10 Preventative Maintenance

4.3.10.1 General

It is recommended that the burner is subject to periodic preventative maintenance check and preventative maintenance measures implemented if necessary. The recommended period between checks is of 25 hours of operation, although this can be varied based on the experience gained during the operation of each burner. The checks must incorporate the areas detailed below.

4.3.10.2 General Cleaning

Check for the excessive build up of sooty deposits on the vaporisation coil and can. Some accumulation of soot is inevitable and is not detrimental to the burner function. However, excessive deposits are indicative of inefficient fuel combustion. If this is considered to be the case, the burner must be returned to Ultramagic.

Sooty deposits may be removed from the burner can and coil using a suitable cleaning solvent. When using a solvent, follow the manufacturers' safety instructions, particularly with regard to the use of breathing apparatus and ventilation.

4.3.10.3 Vaporisation Coil

4.3.10.3.1 Main Jets

Check the main jets in the coil jet ring for excessive soot deposits and for the presence of foreign bodies within individual jet holes. Blocked jets can cause a reduction in the fuel flow rate and thus lead to an increase in the operating temperature of the coil. This could result in damage to the coil especially when operating at low fuel pressure. In the event that blocked jets are detected, they must be cleaned as specified in section 4.3.11.3.2

4.3.10.3.2 Coil Fixings

Check the fixings in the coil supports. Loose fixings must be tightened as described in section 4.3.11.3.3

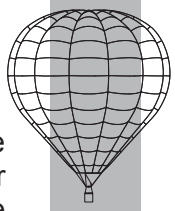
Check the fixings securing the coil supports to the burner can. Loose fixings must be tightened as described in section 4.3.11.3.4

4.3.10.3.3 Coil Tubing

Check the tube used in the construction of the coil for damage including signs of cracking, serious (> 0,3 mm deep) indentation and deterioration of welded joints.

Serious indentation cannot be repaired and the coil must be replaced as described in section 4.3.11.3.1. Refer to Ultramagic or one of its representatives if there is any doubt.

If the coil tube has cracked or a welded joint has failed, the coil must be returned to Ultramagic for investigation. Replace the coil as described in section 4.3.11.3.1



4.3.10.4 Pilot Light Strength

Check the strength and height of the pilot light flame. A weak or short flame is indicative of a blockage or partial blockage of the pilot light jet or a fault with the pilot regulator valve. In the event that the pilot light flame is considered to be unacceptable, clean the pilot light jet as described in section 4.3.11.11. If this fails to improve the pilot light flame, check the function of the pilot regulator valve as described in section 4.3.11.8

4.3.10.5 Igniter spark

Check the strength of the igniter spark. A weak spark will make pilot like ignition difficult or impossible when using the igniter. If it is considered that the igniter spark is weak, adjust the spark gap as described in section 4.3.11.10. If this fails to improve the spark, then refer to igniter maintenance section of 4.3.11.10.

4.3.10.6 Fuel Hoses

Check the condition of the fuel hoses. Look for any signs of abrasion, kinking or other forms of damage. If any of the above are detected, the hose must be replaced in accordance with the instructions in section 4.3.11.4

Fuel hoses must be obtained from Ultramagic.

4.3.10.7 Pressure Gauge

Check the function of the pressure gauge as follows:

- Make sure that the burner is fully vented. Visually inspect the position of the gauge pointer and check that it is indicating zero pressure.
- Connect the burner to a fuel cylinder or a 7 Bar (100 psi) compressed air supply. Visually inspect the position of the gauge pointer and check that it is correctly indicating the pressure.

Upon completion of the test, ensure that the burner is safely vented.

If either of the above tests indicates that the gauge is faulty, the gauge must be replaced in accordance with the instructions in section 4.3.11.9

Note: The pressure gauge is a sealed item with no serviceable parts. No attempt must be made to repair a faulty gauge. Gauge repair is by replacement only.

4.3.11.2 Burner Can

The burner can is a welded stainless steel assembly and of a relatively robust construction. Indentation to the can as well as cracks are acceptable provided that the integrity of the fixings supporting the coil, valve block or burner mountings are not compromised and that the gimbal action of the burner is unaffected. Sharp edges as a result of indentations or cracks that could cause injury to the pilot or passengers are not acceptable and must be repaired before flight. Where doubt exists refer to Ultramagic S.A.

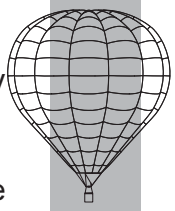
Cracks in the can may be repaired by welding (see section 4.3.3).

If it is considered that the can must be replaced, proceed as follows:

- Remove the vaporisation coil as described in section 4.3.11.3
- For Double, Triple and Quadruple burners, undo and remove the fixings securing the burner support bars to the can (see figure 1).
- Undo and remove the six M6 fixings and washers securing the base of the can to the valve block using a 5mm Allen key.
- Remove the can.
- Prior to can re-assembly to the valve block, ensure that the large “O” seal, item 8, figure 2 is fitted within the groove in the upper surface of the valve block. Note that this seal is fitted to prevent water formed in the combustion process from seeping out. Damage to the seal does not affect the airworthiness of the burner.
- Re-assembly is the reverse process of dismantling. Note that the vaporisation coil must be re-assembled in accordance with the instructions contained in section 4.3.11.3
- Pressure test the coil to valve block joints as described in section 4.3.11.1

4.3.11.3 Vaporisation Coil

Since serious indentation in the coil tube cannot be repaired and weld faults must be returned to Ultramagic for inspection, coil maintenance is limited to the following areas:



- Remove the valve seat sleeve item 4 from the valve stem and vale seat seal.
- Separate the valve stem assembly from the valve seat assembly by withdrawing the stem sideways from the seat.
- Remove the nylon thrust washer item 6 from the recess in the valve bonnet item 1.
- Check the inside of the valve bonnet bore for signs of scratching. If any scratches are noted, then the valve bonnet must be replaced.
- Check the rubber seal in the valve seat for signs of damage or shrinkage. A small circular witness mark on the seal surface is normal and indicates the position of contact between the seal and the valve block. If the seal is damaged or shows signs of shrinkage, it must be replaced. When only the rubber seal is replaced instead of using a complete shutter assembly, make sure that the socket head screw retaining the assembly is fitted using Loctite 222 screwlock.
- Check the valve stem for signs of scratches or damage. If the stem is scratched or damaged, it must be replaced. Check the condition of the “O” seals fitted to the stem. If either of the seals show signs of deterioration or damage, they must be replaced.
- Re-assembly of the valve is the reverse procedure of disassembly. Prior to re-assembly, apply a thin smear of silicon grease to the valve bore and to the valve stem seals. Always fit a new circlip item 9 and a new bonded washer item 12.
- After re-assembly of the valve into the block, the gap between the nylon thrust washer item 6 and the valve handle must be checked. A gap of between 0.25mm and 0.5 mm must be present. This gap may be achieved by selecting the correct thrust washer thickness. A range of thrust washers in different thicknesses may be obtained from Ultramagic. Failure to set this gap may result in a failure of the valve to switch off the main burner after operation.
- When the valve has been re-assembled into the valve block, the valve to block joint and the position where the valve stem exits the valve body must be pressure tested. To achieve this, connect the burner to a 7 Bar (100 psi) air supply and check the joints using soapy water. If any bubbles are detected, then the problem must be rectified before further burner use.

4.3.11.7 Liquid Valve Assembly

Removal, inspection and maintenance of the liquid valve is identical to the main valve with the a few exceptions. To remove the liquid valve assembly, refer to figure 6 and proceed as follows:

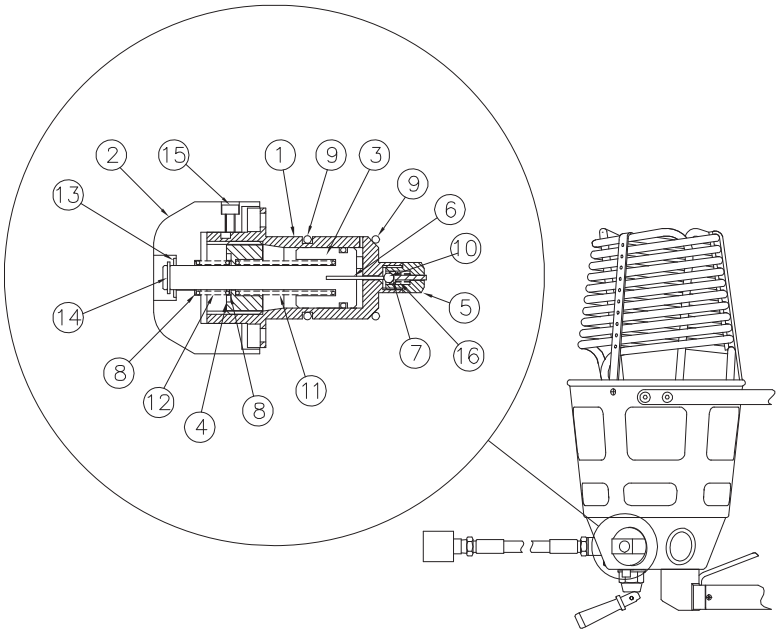
- Using the open ended spanner, remove the valve from the valve block as described in section 4.3.11.6.
- Rotate the valve handle item 17 to the vertical position. Using a 1.3mm Allen key, undo but do not remove the grub-screws item 16 on the underside of the handle cam.
- Remove the pivot pin item 15 connecting the handle to the valve stem item 2 and withdraw the handle.
- Further dismantling, inspection and re-assembly is as for the main valve and is described in section 4.3.11.6. Note that there is only one nylon thrust washer (item 18) used on the liquid valve. The thrust washer is thinner than those used on the main valve (item 6) in order to allow the valve handle to rest in an inclined position.
- When re-fitting the pivot pin item 15, ensure that the grub screws item 16 are tightened against the flat machined along one side of the pin. Grub screws can be secured using a small amount of Loctite 222 screwlock.

4.3.11.8 Pilot Regulator Valve

If the pilot light flame is weak and it is considered to be a fault of the pilot regulator valve, refer to figure 7 and carry out the following test:

- With the pilot light lit, gently press on the spindle which protrudes through the centre of the regulator knob. If when the spindle is pressed the flame improves, then it is likely that the regulator push rod length is too short. The push rod may be replaced by removing the complete assembly from the valve block and stripping it down.
- If the above test fails to improve the pilot light flame strength, then the entire assembly will require stripping down and inspecting.

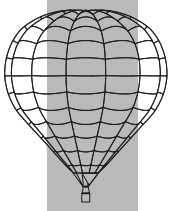
To remove, strip down and inspect the pilot regulator valve, refer to figure 7 and proceed as follows:



ITEM	DESCRIPTION	PART
16	ST STL SPRING TYPE D20520 CLOSED AND GROUND ENDS	MA-F
15	SPECIAL SCREW	2022.
14	ø8 STANDARD EXTERNAL CIRCLIP TO DIN 471	MA-F
13	THRUST WASHER (LARGE)	2022.
12	KNOB SPRING	2022.
11	ST STL SPRING TYPE D22220 CLOSED AND GROUND ENDS	MA-F
10	VITON BALL	MA-F
9	22 ID X 2.5 THICK HIGH NITRIL 'O' SEAL TYPE 206-122-5575	MA-F
8	THRUST WASHER	2022.
7	REGULATOR BALL GUIDE	2022.
6	REGULATOR PUSH ROD	2022.
5	REGULATOR GUIDE HOUSING	2022.
4	REGULATOR SPRING RETAINER	2022.
3	PISTON ASSY	2022.
2	REGULATOR KNOB	2022.
1	REGULATOR BODY	2022.

FIGURE 7
PILOT REGULATOR VALVE ASSEMBLY

- Rotate the regulator knob item 2 such that the holes in the front face line up with the fixing screws securing the regulator body to the valve block. Note that one of the fixings is offset slightly to ensure that the regulator is always positioned in the correct orientation within the valve block.
- Using an Allen key, remove the four fixings securing the regulator body to the valve block.
- Withdraw the complete assembly from the valve block.
- Remove the “O” seal item 9. This will probably have remained inside the valve block bore.
- Carefully remove the filter placed between the regulator and the block bore, and check for signs of blockage. Filter can be cleaned blowing compressed air through, but it must be replaced where there is any hesitation about its condition. Check also the condition of the filter o-ring, and replace if damaged or deteriorated.
- Using a pair of external circlip pliers, remove the circlip item 14 and the large thrust washer item 13.
- Undo and remove the two special screws item 15 securing the knob to the body.



- Withdraw the regulator knob item 2 from the body. Take care not to loose the small thrust washer item 8 from inside the knob.
- Remove the spring item 12.
- Undo and remove the regulator spring retainer item 4 from the regulator body.
- Remove the spring item 11.
- Carefully remove the piston assembly item 3 from the body by gently pulling on the piston shaft. Take care to prevent the regulator push rod item 6 from falling out of the end of the piston.
- Undo and remove the regulator guide-housing item 5 from the end of the body. A small viton ball Item 10, a spring, item 16, and regulator ball guide are located behind the housing. Remove the housing carefully to ensure that these components are not lost.
- Check the internal bore of the regulator body where the piston is housed for signs of damage or scratching. If any damage or scratching is detected, then the body must be replaced.
- Check that the piston movement inside the regulator is smooth and unimpeded.
- Check that the piston spindle is free to move inside the regulator spring retainer item 4.
- Check the condition of the springs. Damaged or broken springs must be replaced.
- Check the piston assembly for signs of damage or scratching on the piston barrel. If signs of damage or scratching are detected, then the piston assembly must be replaced.
- Check the condition of the piston “O” seal. If the seal is damaged or shows signs of deterioration, it must be replaced. The piston and “O” seal are usually supplied as a complete assembly, but when only the o-ring is to be replaced, take care at removal to prevent damage to the seal groove. Do not use hard or sharp objects.
- Check the small bore in the bottom of the regulator body for signs of blockage or accumulation of oily deposits. Remove any blockage with a 1mm diameter wire. Oily deposits must be removed with a suitable solvent. Ensure that all particles are removed with an air blast.
- Check that the regulator ball-guide, item 7, is free to move in the regulator guide-housing, item 5. Remove any blockage or oily deposits as described above.
- Check the condition of the two “O” seals item 9. If the “O” seals are damaged or show signs of deterioration, then they must be replaced. Take care when removing the body seal to prevent damage to the seal groove. Do not use hard or sharp objects to remove the seal.
- Re-assembly of the pilot regulator valve is generally the reverse procedure to disassembly. When replacing the piston, apply a thin smear of silicon grease to the seal and to the internal bore of the regulator body. Apply graphite grease to the cam grooves in the upper section of the body where the special screws, item 15, locate.
- When re-assembling the knob, ensure that when the knob is in the fully extended position, the “zero” engraved on the knob circumference is lowermost when the regulator fixing holes are correctly aligned with the holes in the valve block.
- Prior to re-assembling the complete assembly into the valve block, ensure that the seal item 9 has been placed at the bottom of the valve block bore.
- Having re-assembled the pilot regulator valve into the valve block, the joint between the regulator body and the valve block and the position where the piston spindle protrudes through the knob must be pressure tested. In addition, the annulus created by the circumference of the knob and the valve body must be tested. Do this by connecting the burner to a 7 Bar (100 psi) air supply and checking the joints with soapy water. This test must be carried out with the gauge in the on and off positions. If any bubbles are detected, then the problem must be rectified before further burner use.

- Hold the jet up to the light and check that the hole appears round.
- If the jet is blocked or partially blocked, carefully clear the hole using a suitable piece of stiff wire or similar. Ensure that the jet is clear and that no pieces of the cleaning wire remain in the jet. If necessary, soak the jet in petrol or paraffin to remove any oily deposits. Any damage of the jet implies its replacement.
- Where bulkhead is fitted with filter, it is accessible from the bottom face. Using circlip pliers, undo the stainless steel retaining nut and take out the two round meshes inside. These can be cleaned, if necessary, by soaking in petrol or paraffin and blowing through with compressed air. However, where a significant accumulation of deposits is found, it is recommended to replace the meshes.
- Replacement of the pilot light is the reverse procedure of removal. When replacing the pilot light assembly, always fit a new bonded washer item 6. Set the position of the pilot light element assembly to ensure the correct gap setting between the tag and the igniter electrode as specified in section 4.3.11.10
- Having replaced the pilot light, the joint between the bulkhead coupling and the valve block must be pressure tested. Connect a 7 Bar (100 psi) air supply to the burner. Turn the pilot regulator valve on. Check the joint using soapy water. If any bubbles are detected then the leak must be corrected before further burner use.

If the above procedure fails to improve the pilot light flame, then it is likely that a fault exists with the pilot regulator valve. For maintenance procedures on the pilot regulator valve, refer to section 4.3.11.8.

4.3.11.12 Liquid fire Jet Assembly

To remove and strip down the liquid fire jet assembly, refer to figure 11 and proceed as follows:

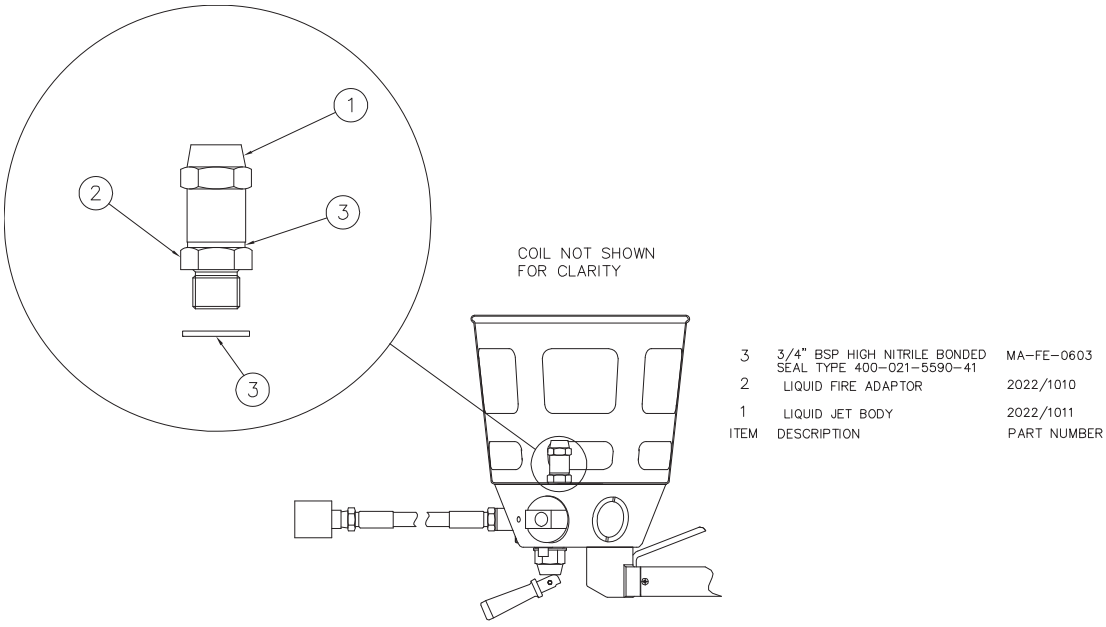


FIGURE 11
LIQUID FIRE JET ASSEMBLY

- Locate the liquid fire adapter item 2. Using a suitable spanner, undo and remove the entire assembly by unscrewing the adapter from the valve block.
- Remove the boded washer, item 3, from the valve block.
- Unscrew the liquid jet body item 1, from the adapter.
- Remove the bonded washer item 3, from the adapter.
- Re-assembly is generally the reverse procedure of removal. Always fit new bonded washers, item 3 when replacing the assembly.

4.4 MK 21 SINGLE BURNER MAINTENANCE

This section of the Manual provides the specific maintenance instructions applicable to the MK-21 Single burners, whilst most of the content is cross-referenced with the equivalent sections under 4.3.

For information about Replacement Parts and Procedures, Approved Maintenance and Inspection Personnel, Welding and Welders, Maintenance Records, Technical Support or Safety, refer to the appropriate sections from 4.3.1 to 4.3.6.

4.4.1 Technical Description

Technical description of the major features for the MK-21 Single burner is common to the Double, Triple and Quadruple models and can be found on section 4.3.7.
However, note that the single burner is fitted with a special block, with many of the assemblies duplicated but split in Left / Right circuits.

This particular distribution is summarized next:

- Single burner can.
- Unique main Burner Vaporising coil
- Left and Right circuit Fuel hoses
- Left and Right Main valve assemblies
- Left and Right Liquid valve assemblies.
- Left and Right Pilot Regulator Valve assemblies
- Left and Right Igniter assemblies
- Left and right Pressure gauge assemblies
- Left and Right Liquid fire jet assemblies
- Left and right Pilot light assemblies
- Single slurper tube assembly.
- Left and right Fuel inlet posts

The MK21 Single burner may be seen in Figure 1 and the features and functions detailed above are described in the following paragraphs:

ITEM	DESCRIPTION	PART NUMBER
1	BURNER CAN	2021-0011
2	VAPOURISATION COIL	2021-0500
3	SWIVEL BOSS	2021-0010
4		
5	FUEL HOSE ASSEMBLY	2022-0001
6	FUEL CONNECTOR	REFERENCE
7	BURNER HANDLE	2021-0313
8	MAIN VALVE ASSEMBLY	2021-1200 (LH) 2021-1400 (RH)
9	LIQUID VALVE ASSEMBLY	2022-1100 (LH) 2021-1600 (RH)
10	PILOT REGULATOR VALVE ASSEMBLY	2022-0800
11	IGNITER ASSEMBLY	2022-0900
12	PRESSURE GAUGE ASSEMBLY	2022-1300
13	LIQUID FIRE JET ASSEMBLY	2022-1000
14	PILOT LIGHT ASSEMBLY	2022-0700
15	SLURPER TUBE ASSEMBLY	2022-1500
16	FUEL INLET POST	2022-0313
17	SINGLE BURNER VALVE BLOCK	2021-0311
18	HANDLE POST	2021-0312
19	3/8" BSP BONDED SEAL	MA-FE-0600
20		
21	M6 X 10 ST STL CAP HEAD SCREW	MA-FE-0509
22	M6 X 70 ST STL CAP HEAD SCREW	MA-FE-0500
23	M6 ST STL PLAIN WASHER	MA-FE-0511
24	M3 X 6 ST STL SLOTTED PAN HD SCREW	MA-FE-0533

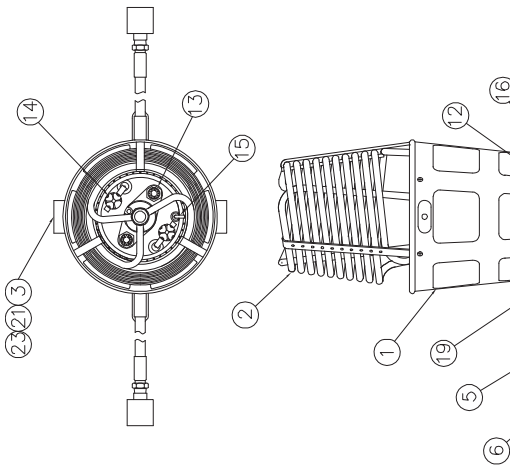
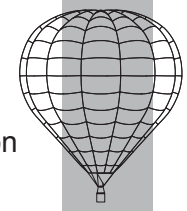


FIGURE 1
MK 21 SINGLE BURNER
ARRANGEMENT



4.4.2 Preventative Maintenance

For information about Preventative Maintenance and General Cleaning, refer to section 4.3.10.

4.4.3 Repair and Maintenance

4.4.3.1 General

This section describes the procedures necessary to enable the removal, repair and replacement of the various assemblies used within the burner. Maintenance other than that detailed in the Section 4.4.2, (Preventative Maintenance) and Section 6, (Annual / 100 Hour Inspection) should not be carried out unless it is clear that there is a fault or there is a noticeable deterioration in the performance of any part of the burner functions. Remember, “If it ain’t broke, don’t fix it”!

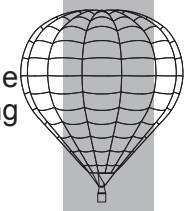
Whenever a part or assembly whose removal breaks the pressure integrity of the burner is removed and replaced, the re-assembled joint(s) must be subjected to a pressure test. Connect the burner to a 7Bar (100-psi) compressed air supply and test the joint using soapy water. If bubbles are detected during the test, there is a leak, which must be rectified before further burner use.

4.4.3.2 Burner Can

The burner can is a welded stainless steel assembly and of a relatively robust construction. Some indentation to the can is acceptable provided that the integrity of the fixings supporting the coil, valve block or burner mountings are not compromised and that the gimbal action of the burner is unaffected.

Small cracks in the can may be repaired by welding (see section 4.3.3).

If it is considered that the can must be replaced, proceed as follows:



- Using a 6mm Allen key, undo and remove the two M8 cap head screws fitted inside the swivel bosses (item 3, fig 1). **Do not** remove the M6 cap head screws securing the swivel bosses to the can.
- Remove the burner from the burner frame.
- Remove the vaporisation coil as described in section 4.4.3.3
- Undo and remove the six M6 fixings and washers securing the base of the can to the valve block using a 5mm Allen key.
- Remove the can.
- Prior to can re-assembly to the valve block, ensure that the large "O" seal, item 8, figure 2 is fitted within the groove in the upper surface of the valve block. Note that this seal is fitted to prevent water formed in the combustion process from seeping out. Damage to the seal does not affect the airworthiness of the burner.
- Re-assembly is the reverse process of dismantling. Note that any screw fixings not provided with a mechanical locking must be locked using Loctite 222.
- Pressure test the coil to valve block joints as described in section 4.4.3.1

4.4.3.3 Vaporisation Coil

Refer to section 4.3.11.3 for information on repairs and maintenance of the Vaporisation coil.

4.4.3.4 Removal of Fuel Hose

To replace a fuel hose, refer to section 4.3.11.4.

4.4.3.5 Left and Right Fuel Inlet Posts and Fuel Inlet Post Seals

Refer to section 4.3.11.5 for information on repairs and maintenance of the Fuel inlet posts.

4.4.3.6 Left and Right Main Valve Assemblies

To remove and strip down the left or right main valve assembly, refer to figure 6 and proceed as follows:

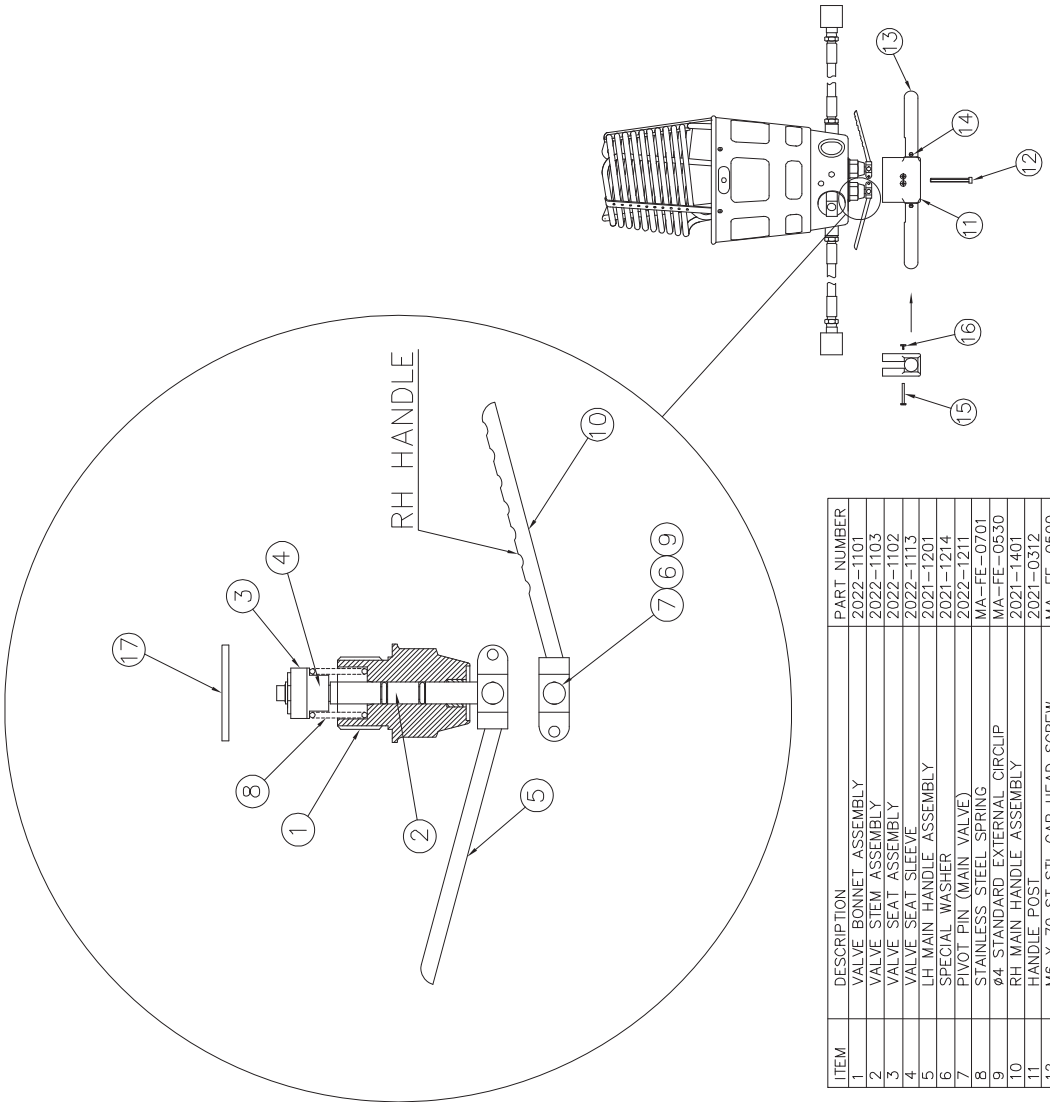
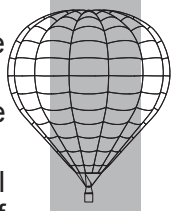


FIGURE 6
MAIN VALVE ASSEMBLY CONFIGURATION

ITEM	DESCRIPTION	PART NUMBER
1	VALVE BONNET ASSEMBLY	2022-1101
2	VALVE STEM ASSEMBLY	2022-1103
3	VALVE SEAT ASSEMBLY	2022-1102
4	VALVE SEAT SLEEVE	2022-1113
5	LH MAIN HANDLE ASSEMBLY	2021-1201
6	SPECIAL WASHER	2021-1214
7	PIVOT PIN (MAIN VALVE)	2022-1211
8	STAINLESS STEEL SPRING	MA-FE-0701
9	Ø4 STANDARD EXTERNAL CIRCLIP	MA-FE-0530
10	RH MAIN HANDLE ASSEMBLY	2021-1401
11	HANDLE POST	2021-0312
12	M6 X 70 ST STL CAP HEAD SCREW	MA-FE-0500
13	BURNER HANDLE	2021-0313
14	M3 X 6 ST STL SLOTTED PAN HEAD SCREW	MA-FE-0533
15	VALVE POST PIVOT PIN	2021-0317
16	PIVOT PIN END CAP	2021-0319
17	3/4" BSP NITRILE BONDED WASHER	MA-FE-0603

- Using a pair of flat bladed screw drivers, undo and remove the two valve post pivot pins item 15 and the two pivot pin end caps item 16 from the handle post item 11.
- Using a 5mm Allen key, undo and remove the two, cap head screws item12 securing the handle post item 11 and burner handles item 13 to the valve block. Withdraw the handle post and handles as a complete assembly.
- Using a 28mm open-ended spanner, undo and remove the left or right main valve from the valve block. In order to protect the finish on the valve bonnet, apply masking tape to the spanner jaws.
- Remove the bonded washer item 17 from the recess in the valve block.
- The valve may now be stripped down for further maintenance if required. Using a pair of external circlip pliers, remove the circlip item 9 and the special washer item 6 from the pivot pin item 7.
- Withdraw the pivot pin item 7 from the handle assembly item 5. Remove the handle.
- Withdraw the valve seat assembly item 3 and the valve stem assembly item 2 from the valve bonnet item 1.
- Remove the main spring item 8 from the valve stem.
- Remove the valve seat sleeve item 4 from the valve stem and vale seat seal.



- Separate the valve stem assembly from the valve seat assembly by withdrawing the stem sideways from the seat.
- Check the inside of the valve bonnet bore for signs of scratching. If any scratches are noted, then the valve bonnet must be replaced.
- Check the rubber seal in the valve seat for signs of damage or shrinkage. A small circular witness mark on the seal surface is normal and indicates the position of contact between the seal and the valve block. If the seal is damaged or shows signs of shrinkage, it must be replaced. When only the rubber seal is replaced instead of using a complete shutter assembly, make sure that the socket head screw retaining the assembly is fitted using Loctite 222 screwlock.
- Check the valve stem for signs of scratches or damage. If the stem is scratched or damaged, it must be replaced. Check the condition of the "O" seals fitted to the stem. If either of the seals show signs of deterioration or damage, they must be replaced.
- Re-assembly of the valve is the reverse procedure of disassembly. Prior to re-assembly, apply a thin smear of silicon grease to the valve bore and to the valve stem seals. Always fit a new circlip item 9 and a new bonded washer item 17.
- When the valve has been re-assembled into the valve block, the valve to block joint and the position where the valve stem exits the valve body must be pressure tested. To achieve this, connect the burner to a 7 Bar (100 psi) air supply and check the joints using soapy water. If any bubbles are detected, then the problem must be rectified before further burner use.

4.4.3.7 Liquid Valve Assembly

Removal, inspection and maintenance of the liquid valve are identical to the main valve with the a few exceptions. To remove the liquid valve assembly, refer to figure 7 and proceed as follows:

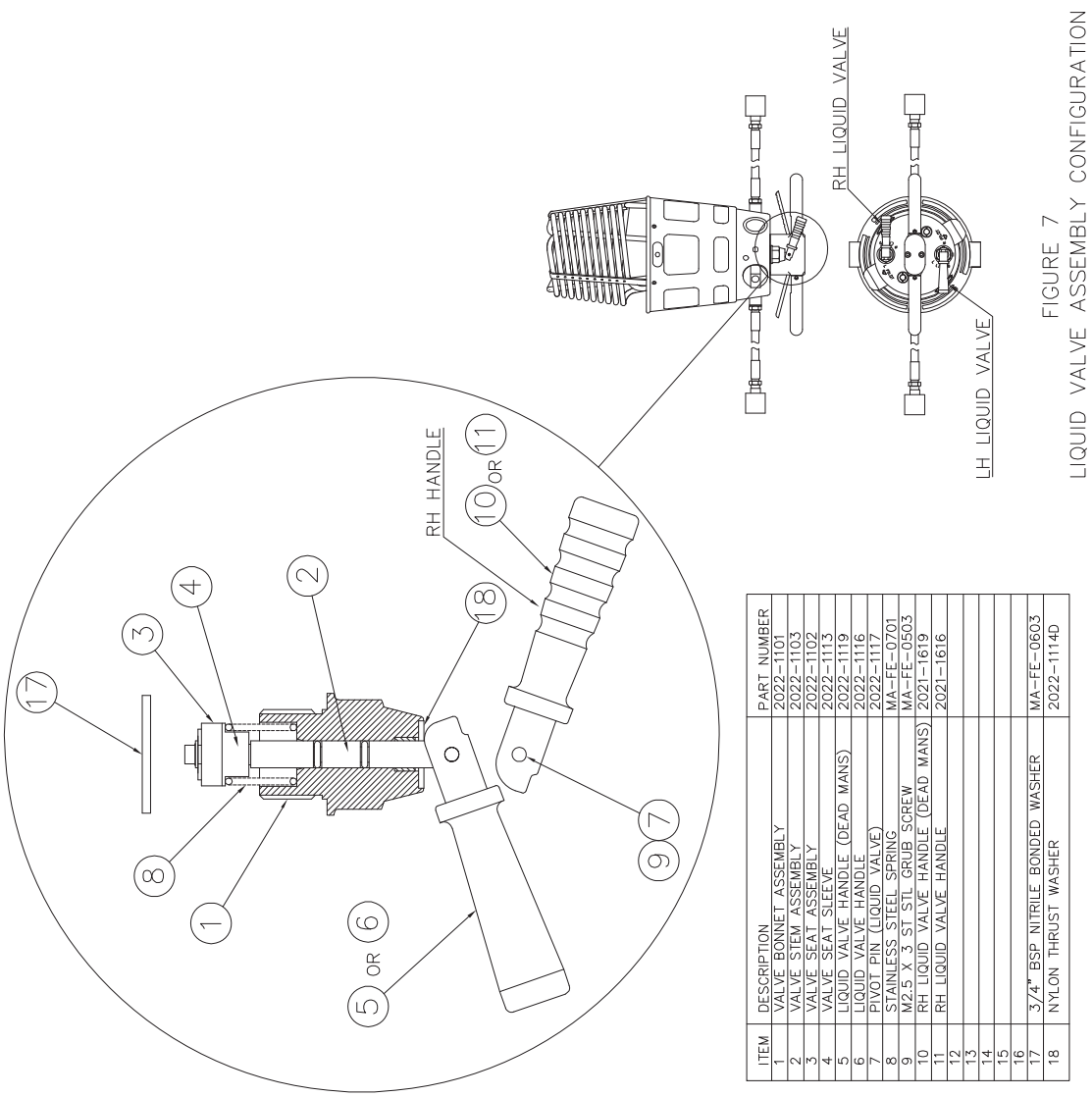
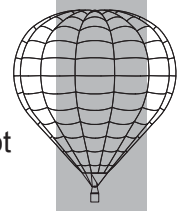


FIGURE 7
LIQUID VALVE ASSEMBLY CONFIGURATION

ITEM	DESCRIPTION	PART NUMBER
1	VALVE BONNET ASSEMBLY	2022-1101
2	VALVE STEM ASSEMBLY	2022-1103
3	VALVE SEAT ASSEMBLY	2022-1102
4	VALVE SEAT SLEEVE	2022-1113
5	LIQUID VALVE HANDLE (DEAD MANS)	2022-1119
6	LIQUID VALVE HANDLE	2022-1116
7	PIVOT PIN (LIQUID VALVE)	2022-1117
8	STAINLESS STEEL SPRING	MA-FE-0701
9	M2.5 X 3 ST STL GRUB SCREW	MA-FE-0503
10	RH LIQUID VALVE HANDLE (DEAD MANS)	2021-1619
11	RH LIQUID VALVE HANDLE	2021-1616
12		
13		
14		
15		
16		
17	3/4" BSP NITRILE BONDED WASHER	MA-FE-0603
18	NYLON THRUST WASHER	2022-1114D

- Using the 28mm open ended spanner, remove the valve from the valve block as described in section 4.4.3.6
- Rotate the valve handle item 5 to the vertical position. Using a 1.3 mm Allen key, undo but do not remove the grub-screws item 9 on the underside of the handle cam.
- Remove the pivot pin item 7 connecting the handle to the valve stem item 2 and withdraw the handle.
- Note that the liquid valve handle type is optional and may be either the standard or “Dead Man’s” version. The “Dead Man’s” handle is designed such that upon release, the valve will always return to the closed position.
- Further dismantling, inspection and re-assembly is as for the main valve and is described in section 4.4.3.6 Note that there is only one nylon thrust washer used on the liquid valve. The thrust washer is thinner than those used on the main valve in order to allow the valve handle to rest in an inclined position.
- When re-fitting the pivot pin item 7, ensure that the grub screws items 16 are tightened against the flat machined along one side of the pin.



4.4.3.8 Pilot Regulator Valve

Refer to section 4.3.11.8 for information on repairs and maintenance of the Pilot regulator valves.

4.4.3.9 Pressure Gauge Assembly

Refer to section 4.3.11.9 for information on repairs and maintenance of the pressure gauge assemblies.

4.4.3.10 Igniter Assembly

Refer to section 4.3.11.10 for information on repairs and maintenance of the igniter assemblies.

4.4.3.11 Pilot Light Assembly

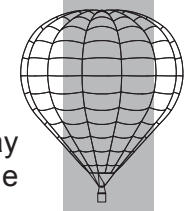
Refer to section 4.3.11.11 for information on repairs and maintenance of the pilot light assemblies.

4.4.3.12 Liquid fire Jet Assembly

Refer to section 4.3.11.12 for information on repairs and maintenance of the pilot light assemblies.

4.4.3.13 Slurper Tube Assembly

Refer to section 4.3.11.13 for information on repairs and maintenance of the pilot light assemblies.



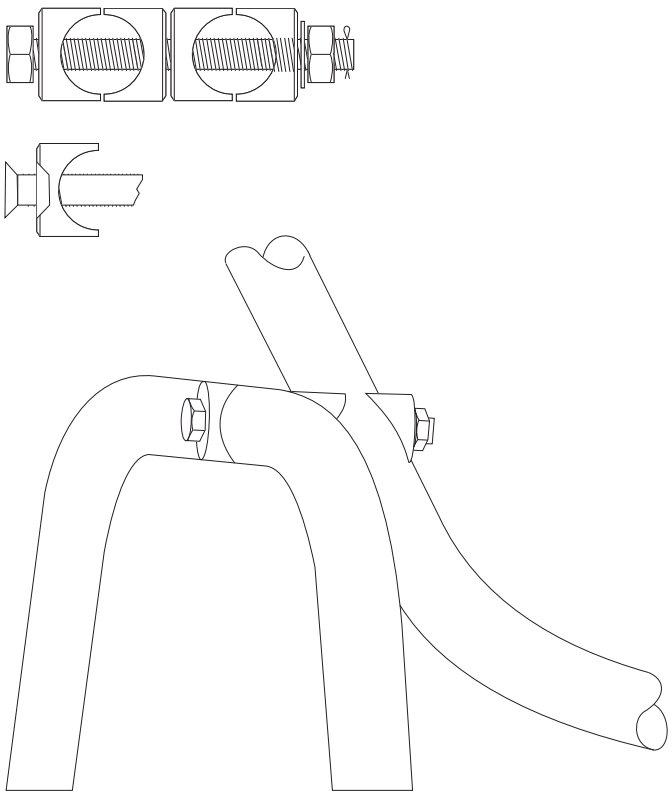
4.5 BURNER FRAME MAINTENANCE

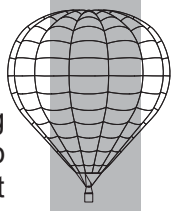
Ultramagic burner frames are require very little maintenance. The Gimbal system may need tightening occasionally. See drawing below which shows the bolts used and the assembly details of the Gimbal joint.

Should the main outer burner frame become damaged then it should be replaced completely with an Ultramagic supplied part. See below for dimensions of appropriate burner frames relating to baskets.

Burner Frame Denomination	Standard Burner Frame Dimensions [cm]	Tube nominal outside Diameter [mm]	Tube nominal inside Diameter [mm]	Bolt Size [M, mm]
QSQ0	65 x 50	25	22	M8 x 70
QSQ2	70 x 53	25	22	M8 x 70
QSQ3	80 x 70	25	22	M8 x 70
QSQ4	118 x 106	30	27	M10 x 100
QSQ6	160 x 135	35	32	M10 x 100
QSQ7	98 x 88	25	22	M10 x 90
QSQ8	200 x 135	35	32	M10 x 100

For details on burner frames fitted with centre gimbal, refer to the applicable supplement.





4.6 STANDARD TORQUE VALUES

The following torque settings are recommended when replacing the following components. However experience and training can take precedence. General workshop practice is applicable for the tightening of all other bolts and screws. Where any doubt exists then consult with Ultramagic S.A. or an approved representative.

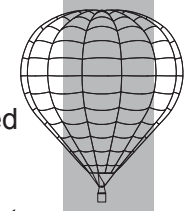
Burner Fuel Hoses

Fitting	Thread Form	Max. Torque (NM)
MK21 Liquid Hose	3/8 inch BSP	20
MK21 Liquid Hose	1/4 inch NPT	15-20

Fuel Cylinders

Fitting	Thread Form	Max. Torque (NM)
Fixed Liquid Level Gauge	1/4 inch NPT	28 - 50
Liquid Valve	3/4 inch NPT	110 - 200
Vapour Valve	3/4 inch NPT	110 - 200
Blanking Plug	3/4 inch NPT	110 - 200
Pressure Relief Valve	3/4 inch NPT	135 - 170
Contents Gauge Allen Bolt	M5	3 - 5

Note – 1 N × m = 0.737 lb × ft = 8.85 lb × in.



6.2 Unscheduled Inspections

These consist of inspections other than scheduled inspections, which need to be carried out, as and when required. They consist of.

1. Pre – Flight Inspections.(A Check) (These are covered in the Ultramagic Flight Manual)

2. Envelope Overheat Inspection (See section 6.7.1)

3. Powerline Contact Inspections (See section 6.7.2)

4. Hard Landing (See section 6.7.3)

6.3 100 hour/Annual inspection ("B type")

General Notes

This inspection is the minimum required for annual/renewal of the Certificate of Airworthiness on all Ultramagic balloons.

Validity of the C of A is subject to the log book containing an inspection certificate / certificate of release to service valid according to section 7.3 of this manual.

Additions are required to the schedule in some countries where national requirements dictate this. The appropriate Airworthiness Authority should be contacted for details of these requirements.

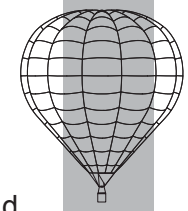
Any parts, which fail an inspection and cannot be repaired, should be dealt with in accordance with the local Airworthiness Authority requirements.

Annual inspections and inspection of overhaul and repair work must be carried out by an inspector approved by the local Airworthiness Authority.

Logbook

- ☐ Present at time of inspection
- ☐ Flight hours correct and up to date
- ☐ All repairs and modifications recorded.
- ☐ Equipment serial numbers agree with items submitted for inspection.
- ☐ For UK Transport Category balloons, the last Technical Log must be presented and remaining hours cross-referenced with hours in the balloon logbook.
- ☐ For UK balloons, satisfactory inspection to be shown by the issue of form IR4, the top layer to be retained in the balloon logbook
- ☐ For UK balloons, which fail inspection, the IR4 will be held for up to one month pending repair action and re-inspection, with repairs logged on the IR4.

Note: Where the balloon comprises of major components from different manufacturers, then the appropriate inspection forms should be used in conjunction with this schedule.



100 hour/Annual inspection ("B type")

Envelope

1. ☐ Check the envelope panel by panel or by inflating for holes and tears and ensure that any fabric damage does not exceed the Permitted Damage as follows. (Special shape envelopes must be inflated)

Damage to the fabric in the lower third of the envelope must be limited to an area affecting no more than 3 panels. These panels may be adjacent.
Holes no greater than 10mm in diameter 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 50mm to each other. No more than 3 panels in the upper two thirds of the envelope may have these small holes.

2. ☐ Ensure that all control ropes and chords are free of damage, securely attached, not twisted and work correctly.

3. ☐ Ensure that all pulleys and loops are well attached and are working freely.

4. ☐ Ensure that all stitching is correct and that no caught or broken threads exist.

5. ☐ Ensure all existing repairs have been carried out in accordance with the maintenance manual and that they have been recorded in the aircraft logbook.

6. ☐ Check the porosity of the fabric by blowing through it. If considerable air passes then carry out a test flight, only after a grab test is carried out to ensure that the balloon is safe to fly.

7. ☐ Ensure that the temperature link is still in place.

8. ☐ Inspect the temperature label. If the temperature label indicates over 127 degrees C then a grab test must be carried out and another temperature label fitted adjacent to the existing one.

9. ☐ Inspect the crown ring for damage.

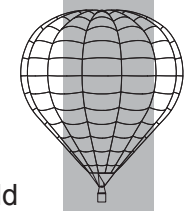
10. ☐ Inspect the load tapes at the crown ring for damage and friction burns. Check the stitching of the overlying tapes on the crown ring.

11. ☐ Inspect the stitching of the joints of the vertical load tapes to the top edge of the envelope.

12. ☐ Inspect the stitching of the joints between the vertical tapes and overlying tapes across the parachute.

13. ☐ Inspect the load tape attachment point with the flying wires for wear or heat damage. Ensure the nomex protectors are in place.

14. ☐ Inspect all vertical and horizontal load tapes for damage and pulled or loose stitching.



100 hour/Annual inspection ("B type")

15. ☐ Ensure that the Velcro tabs are in good condition and are able to hold attached.

16. ☐ Check the condition of the flying wires, especially around the eye and the ferrule.

17. ☐ Check the condition of the fabric at the edge of the parachute panel.

18. ☐ Inspect the parachute attachment and centralising lines especially at the attachment loops and pulley. Check all loop attachments.

19. ☐ Check all knots on the parachute lines.

20. ☐ Ensure that the parachute overlap is correct for giving a good seal. If there is any doubt then, a test inflation must be carried out to check.

21. ☐ Where rotation vents are fitted, check the condition of the turning vent, in particular the inside overlapped area of the envelope and also the pull triangular pieces. If any doubt exists then carry out a grab test in these areas.

22. ☐ Check the stitching around the rotation vents (where fitted) paying special attention to the top and bottom of the vent, the overlying tape attachments and the triangle flag attachment points.

23. ☐ Ensure that the rotation vents are not leaking. If any doubt exists then carry out a test inflation.

24. ☐ Where an FDS system is installed, carry out an additional inspection to the centralising/retaining lines checking for any signs of wear. Check that all rings are securely attached and are not showing signs of wear. Check the loop attachment point at the centre of the parachute. Check the parachute top anti stall strings for security and damage.

25. ☐ Ensure that the FDS can function correctly. If any doubt exists then carry out a test inflation with a full functional check.

Load Frame

1. ☐ Check that the karabiners are the correct type and work freely, lock and are not damaged or badly corroded.

2. ☐ Check that the burner frame is not bent or twisted.

3. ☐ Check all welds for cracks with a magnifying glass.

6.4 300 hour/3 year inspection ("C type")

This inspection must be carried out after 3 years or for every 300 hours of flight, whichever is sooner or lesser if deterioration is suspected beforehand. This inspection can be anticipated to meet a 100 hour/Annual check due.

Once this "C" type inspection has been carried out, every subsequent "C" type inspection must be carried out every year or 100 hours, whichever is sooner. However this inspection must be carried out immediately if deterioration is suspected whatever the period or hours.

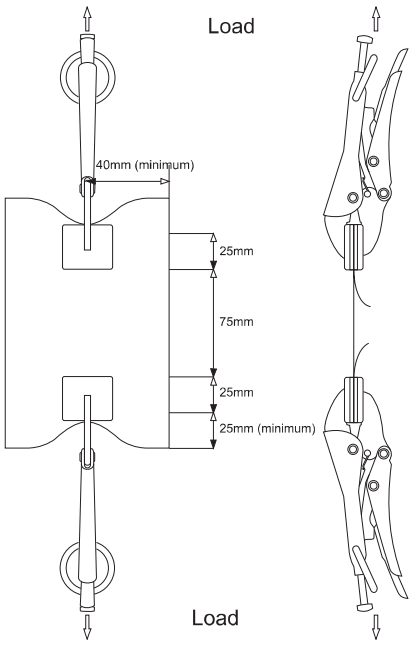
This inspection consists of all checks as indicated under type "B", with the addition of the following:

6.4.1 Envelope fabric "Grab Test"

This test must be performed on two different gores and all the different colours above the equator on both the warp and weft directions of the fabric in each area.

Procedure: Select an unrepaired area in the highest panel of each colour between the last horizontal load tape and the opening of the parachute. With a tension of 117N (or 25lbs) applied across a width of 25mm. The fabric should show no signs of weakness or fatigue. This test will be done in two different positions of each colour and in both directions (vertically and horizontally).

This test can be achieved in a number of ways using various purpose made test rigs. However it can be carried out also by using propriety available clamps as shown in the drawing below and a spring balance. The jaws of the clamp should be protected. In all cases when carrying out the test, it is important to maintain the dimensions as shown.



If the fabric fails below 117N (or 25 lbs) then all weak fabric in complete panels must be replaced in accordance with the maintenance manual and the envelope re-inspected.

6.6 Inspection Requirements

6.6.1 Log book – This must be present at the time of inspection and must be checked prior to commencing the inspection.

Ensure that all of the equipment listed in the logbook is present for inspection. Any change to this equipment must be noted.
(In the case of UK inspection, any changes must be noted on the IR4 form and in the front of the logbook)
Any additional equipment must conform to the items listed in the balloon flight manual for that particular type.

Check that the logbook hours are up to date and request confirmation that all flights have been logged including tethers. Check the record of all previous inspections including the first at manufacture to gain a knowledge of the history of the balloon.

Check for record of maintenance and repairs as these areas of the balloon will require extra attention during the inspection.

6.6.2 Envelope

Fabric - Pay particular attention to the look and the feel and the smell of the fabric. This is best done whilst the balloon is being unpacked and spread out. Check for porosity, discolouration or mould being present. Check the temperature tags for signs of overheating. A poorly looked after envelope will deteriorate must quicker than one that has been kept clean and dry and has not been overheated.

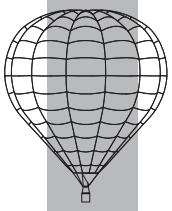
If any doubt exists about the condition of the fabric then a Grab Test should be carried out, even if the age or hours of the balloon are less than the requirement to do so.

Look closely at the areas of the fabric where there is an overlap. These are the parachute and rotation vents (where fitted). These areas can suffer from heat damage much earlier than the rest of the envelope. Again if any doubt exists, carry out a Grab Test at these positions.

Damage to the fabric in the lower third of the envelope must be limited to an area affecting no more than 3 panels. These panels may be adjacent.
Holes no greater than 10mm in diameter 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 50mm to each other. No more than 3 panels in the upper two thirds of the envelope may have these small holes.
On double layer envelopes, internal fabric panels may present any damage or be missing, while only external fabric is subject to the standard criteria

Velcro Tabs – Check the stitching and also that the taps still secure when attached. Check for shrinkage or heat damage, as this is also an indicator of overheating. Look closely at the fabric immediately adjacent to the tabs for possible damage caused by the tabs.

Load Tapes – Pay particular attention to attachment loops and wire and crown ring attachments, as these areas are susceptible to wear. Also look for burn damage where the wires are attached making sure to look underneath the nomex protection



Inspection procedure.

Check the temperature tags for indication of change of colour to black. No further inspection is required if the temperature indicated is less than 127 degrees Celcius (250 degrees Fahrenheit)

If the temperature indicated is greater than 127 degrees Celcius then proceed as follows.

1. Inspect the top of the envelope,both fabric and tapes for sighs of overheating.
2. Pay special attention to the edge of the parachute where fabric is overlapping.
3. Look for changes of colour or stiffness of the fabric.
4. Carry out a grab test in accordance with section 6.5.3
5. Fit the new temp tag.
6. Record the results of the lest in the balloon log book.

NOTE: If any doubt exists on the state of the balloon envelope during this inspection, then contact should be made with Ultramagic S.A.

6.7.2 Special Inspection after balloon has made contact with powerlines.

It is most important that a full annual/100 hour inspection is carried out if the balloon has made contact with live electrical power lines. Damage may have occurred to the metallic parts of the balloon, which may not be obvious on first inspection.

During this inspection, look closely at wires and fuel cylinders. Look for burn marks, especially on the under-floor of the basket where the basket suspension wires are covered in protective hide.

NOTE: If any doubt exists on the state of the balloon during this inspection, then contact should be made with Ultramagic S.A.

6.7.3 Hard Landing Inspection

Should a hard landing be experienced where there is any possible suspected damage having occurred to the balloon, then carry out a 100 Hr/Annual Inspection in accordance with 6.2 utilising Inspection Requirements 6.4. before the next flight. Any damage found resulting from the hard landing that prevents the balloon passing a 100 Hr/Annual Inspection must be reported to Ultramagic S.A. to determine the appropriate action. The balloon must not be flown until it is capable of passing a 100 Hr/Annual Inspection.

6.8 Service Life Limitations

Any items with a service life limitation must be replaced once the time set is reached. The old item must be labelled and discarded with in accordance with the appropriate authority regulations. Note of the change of parts must be recorded in the balloon logbook.

Component	Service Life Limitation
Fuel Cylinder pressure relief valve (PRV)	10 years from date of supply of the valve (if not marked, refer to D-Type inspection details on page 6.13)

Section 7 – Airworthiness Limitations

7.1 Approval Statement

The Airworthiness Limitations section is FAA approved and specifies maintenance required under Secs. 43.16 and 91.403 of the Federal Aviation Regulations.

7.2 Mandatory Replacement Time

There is only one component of any Ultramagic Balloon that has to be replaced in a specified length of time. This is as follows.

Fuel cylinder Safety valve or pressure relief valve (PRV) - At intervals not to exceed 120 calendar months from date of manufacture a new pressure relief valve must be installed. - ref. MM page 6.13

7.3 Structural Inspection Interval

Validity of the C of A is subject to the log book containing an inspection certificate / certificate of release to service valid according to the following inspection schedule:

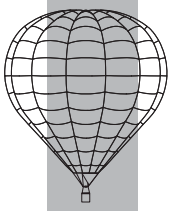
- **Envelopes, Baskets, Burners**: Every 100 flight hours or after one year since the date of last inspection, whichever occurs sooner.
- **Fuel Cylinders**: After one year since the date of last inspection.

Periods between inspections may be extended out of the limits above only where the following conditions are met:

- The extension is not greater than 30 days and 100 flight hours are not exceeded since the last inspection.
- The provision is not adopted as a regular basis.
- The extension is recorded and signed in the aircraft logbook.
- The extension is justified and approved by the person or organization responsible for the continued airworthiness management of the Balloon, prior to its execution.
- The extension does not concern Components subject to Service life limitations and/or Airworthiness Directives.
- No instructions against the use of the extension have been set beforehand on previous inspections.

7.4 Structural Inspection Procedure

Inspection Procedure is detailed in Section 6 of this manual and with a checklist included in Appendix 2



APPENDIX

Appendix 2.

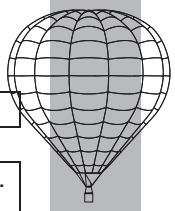
Ultramagic Balloon Inspection checklist.

OWNER			
REGISTRATION		**TYPE**	
SERIAL NO.			
LAST INSPECTION (HOURS)		**TOTAL HOURS RECORDED**	
TYPE OF INSPECTION		**NEXT INSPECTION (HOURS)**	
INSPECTOR		**DATE**	

CHECK	SECTION	ASPECTS	YES NO	INSP.
DOCUMENTATION	Logbook	Present at time of inspection		
		Flight hours correct and up to date		
		All repairs and modifications recorded.		
		Equipment serial numbers agree with items submitted for inspection.		
	Tech. Log (UK only)	For UK Transport Category balloons, the last Technical Log must be presented and remaining hours cross-referenced with hours in the balloon logbook.		
	IR4 (UK only)	For UK balloons, satisfactory inspection to be shown by the issue of form IR4, the top layer to be retained in the balloon logbook		

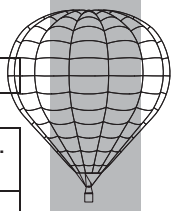
Requirement for special inspections Grab test and Cylinder pressure test to be established in accordance with the maintenance manual and age of balloon and hours logged.

Note: Where the balloon comprises of major components from different manufacturers, then the appropriate inspection forms should be used in conjunction with this schedule.



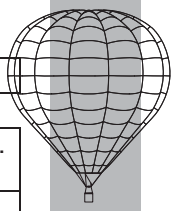
REGISTRATION		ENVELOPE S/N	

CHECK	SECTION	ASPECTS	YES NO	INSP.
ENVELOPE	Fabric	1. Check the envelope panel by panel or by inflating for holes and tears and ensure that any fabric damage does not exceed the Permitted Damage. (Special shape envelopes must be inflated)		
	Control lines	2. Ensure that all control ropes and chords are free of damage, securely attached, not twisted and work correctly.		
	Pulleys & loops	3. Ensure that all pulleys and loops are well attached and are working freely.		
	Sewing	4. Ensure that all stitching is correct and that no caught or broken threads exist.		
	Repairs	5. Ensure all existing repairs have been carried out in accordance with the maintenance manual and that they have been recorded in the aircraft logbook.		
	Fabric Porosity	6. Check the porosity of the fabric by blowing through it. If considerable air passes then carry out a test flight, only after a grab test is carried out to ensure that the balloon is safe to fly.		
	Temp. link	7. Ensure that the temperature link is still in place.		
	Temp. labels	8. Inspect the temperature label. If the temperature label indicates over 127 degrees C then a grab test must be carried out and another temperature label fitted adjacent to the existing one.		
	Crown ring	9. Inspect the crown ring for damage.		
	Crown tapes	10. Inspect the load tapes at the crown ring for damage and friction burns. Check the stitching of the overlying tapes on the crown ring.		
	Vertical tapes	11. Inspect the stitching of the joints of the vertical load tapes to the top edge of the envelope.		



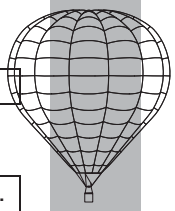
REGISTRATION		ENVELOPE S/N	

CHECK	SECTION	ASPECTS	YES NO	INSP.
ENVELOPE	Tape stitching	12. Inspect the stitching of the joints between the vertical tapes and overlying tapes across the parachute.		
	Flying wire attachment	13. Inspect the load tape attachment point with the flying wires for wear or heat damage. Ensure the nomex protectors are in place.		
	Load tapes	14. Inspect all vertical and horizontal load tapes for damage and pulled or loose stitching.		
	Velcro tabs	15. Ensure that the Velcro tabs are in good condition and are able to hold attached.		
	Flying wires	16. Check the condition of the flying wires, especially around the eye and the ferrule.		
	Parachute	17. Check the condition of the fabric at the edge of the parachute panel.		
	Parachute attachment	18. Inspect the parachute attachment and centralising lines especially at the attachment loops and pulley. Check all loop attachments.		
	Parachute lines	19. Check all knots on the parachute lines.		
	Parachute	20. Ensure that the parachute overlap is correct for giving a good seal. If there is any doubt then, a test inflation must be carried out to check.		
	Rotation vents	21. Where rotation vents are fitted, check the condition of the turning vent, in particular the inside overlapped area of the envelope and also the pull triangular pieces. If any doubt exists then carry out a grab test in these areas.		



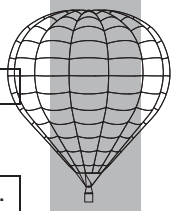
REGISTRATION		ENVELOPE S/N	

CHECK	SECTION	ASPECTS	YES NO	INSP.
ENVELOPE	Rotation vents	22. Check the stitching around the rotation vents (where fitted) paying special attention to the top and bottom of the vent, the overlying tape attachments and the triangle flag attachment points.		
	Rotation vents	23. Ensure that the rotation vents are not leaking. If any doubt exists then carry out a test inflation.		
	FDS	24. Where an FDS system is installed, carry out an additional inspection to the centralising/retaining lines checking for any signs of wear. Check that all rings are securely attached and are not showing signs of wear. Check the loop attachment point at the centre of the parachute. Check the parachute top anti stall strings for security and damage.		
	FDS	25. Ensure that the FDS can function correctly. If any doubt exists then carry out a test inflation with a full functional check.		
	Fabric	26. Carry out fabric Grab test in accordance with Maintenance Manual section 6.4.1 (If required)		



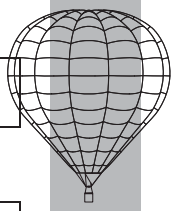
REGISTRATION		BURNER S/N	

CHECK	SECTION	ASPECTS	YES NO	INSP.
LOAD FRAME	Karabiners	1. Check that the karabiners are the correct type and work freely, lock and are not damaged or badly corroded.		
	Frame	2. Check that the burner frame is not bent or twisted.		
	Frame	3. Check all welds for cracks with a magnifying glass.		
BURNER	Burner	1. Check the complete burner for signs of wear or damage paying particular attention to the areas subjected to high temperatures.		
	Attachment	2. Check the burner attachment fittings are secure.		
	Leaks	3. Check the burner and all valves for leaks.		
	Pilot lights	4. Ensure that the pilot lights have a strong and quiet flame. If found to be weak then inspect the pilot light fuel filter and jet for contamination and replace if necessary.		
	Functional test	5. Carry out a full functional check of the burner ensuring all valves open and close correctly.		
	Hoses & connectors	6. Check the condition of the hoses and connectors. Ensure there are no cuts or damage.		



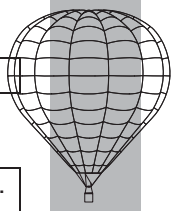
REGISTRATION		BASKET S/N	

CHECK	SECTION	ASPECTS	YES NO	INSP.
BASKET	Nylon poles	1. Check the condition of the nylon poles. Ensure that they are not badly bent or twisted.		
	Wicker	2. Check the general condition of the wickerwork for excessive damage (holes no larger than 60mm), dryness or damp rot.		
	Frame & sockets	3. Ensure that the frame/ pole sockets are not cracked and that there is no excessive distortion.		
	Wires	4. Check the condition of the basket wires, especially where they enter the basket and around the ferrules.		
	Floor	5. Ensure that the floor and wooden runners are free from cracks or damage.		
	Rawhide	6. Check that the protective hide on the bottom of the basket is free from excessive damage that would allow the basket itself to become damaged.		
	Internal handles	7. Check that the internal handles are serviceable.		
	Fire Extingui-sher	8. Check the type, attachment and charge condition of the Fire Extinguisher installed.		



REGISTRATION		CYLINDER S/N´S	

CHECK	SECTION	ASPECTS	YES NO	INSP.
CYLINDER	Date and validity	1. Check the date of construction and check that the latest test date is valid		
	Exterior	2. Visually inspect the exterior of the cylinders for dents or damage, especially in the lower part.		
	Pressure relief valve	3. Remove the dust cover of the pressure relief valve and inspect for contamination or corrosion. Check the date of the valve.		
	Valves	4. Check that the valves for signs of damage or corrosion and that they function correctly paying particular attention to the function of the “O” rings and flat faced seal on the Rego type male tank connection.		
	Fittings	5. Inspect all boss fittings and valve attachment points for damage or misuse.		
	Contents gauge	6. Check the freedom of movement of the contents gauges.		
	Leak check	7. Check all pressure holding joints with leak detector.		
CYLINDER	IF DUE	8. Carry out a hydraulic test of the system to a pressure of 30kg/cm2 in accordance with the maintenance manual. (If D type inspection is due or if damage is suspect.)		
	IF DUE	9. Check the thickness of the walls of the cylinders in accordance with the maintenance manual. (If D type inspection is due or if damage is suspect.)		
	IF DUE	10. Replace the pressure relief valve in accordance to 7,2.		



REGISTRATION		ENVELOPE S/N	

CHECK	SECTION	ASPECTS	YES NO	INSP.
ANCILLARY EQUIPMENT (WHERE FITTED)	Pilot Restraint	Pilot restraint harness – Check function and webbing for signs of wear.		
	Quick release system	Quick release system – Check function and associated restraint ropes, wire or webbing for wear.		
	Instruments	Instruments – Check that instruments are fitted (where required) and that they are shown to be functioning		