HOT AIR BALLOON HANDBOOK

1998
NOTHEISZ BALLON KFT.

HŐLÉGBALLON KÉZIKÖNYV
HOT AIR BALLOON HANDBOOK

Part I

Description of the hot-air balloon

Data of the hot-air balloon

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2.2. Flame proof skirt
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2.4. Crown rope

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Fuel system
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4.2. Fuel hose

The basket

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1.2. Characteristic data of the hot-air balloon

Type of the envelope:			
Envelope capacity:		m^3	
Permitted maximum operating temperature:		°C	
Maximum lifting capacity /at 1015 mb bar. pressure, 15 °C ambient air temperature and on 0 m altitude/:		kg	N
Maximum permitted payload /0,3 kg/m^3/:		kg	N
Maximum emergency temperature, pemitted only for a short time		°C	
Diameter of the envelope:		m	
Whole height:			
Mass of balloon and equipment:		kg	N
From this:	Mass of the envelope:	kg	
	Mass of the basket:		
	Mass of the burner:		
	Mass of accessories /fire-extinguisher, tools, first-aid kit, cassette of instruments, storing sack/	kg	
	Mass of the gas cylinder /full/		
	with a 22 kg-filling:	37 kg	
	with an 11 kg-filling:	20 kg	
Permitted maximum climb rate:		3 m/s	

Permitted maximum descent rate:	5 m/s
Permitted maximum wind speed:	8 m/s
Type of the burner /design number/:	
Norminal output	kW
Specific consuption /at continous regime/	

1.3. Loading chart

Fig. 1.2.

Parts of the balloon envelope

The envelope fabric is polyester, sealed with a coating to render it imporous.
The main load distribution of the envelope is provided by vertical load tapes. These make the main load bearing network of the balloon.

The envelope consists of gores, and the gores consist of sections.

The vertical load tapes are increasing the safety of the envelope, and restraining ruptures.

2.1. Vent panel with the parachute plug

The vent panel is part of the envelope.
the load tapes shall be passed through over the parachute plug independently from one another and of the parachute plug.
The parachute plug works on the same principle like an usual parachute – i.e. as a closing surface it is forced to the envelope by the inside pressure.
The way of closing is illustrated by Fig.2.1.
The parachute plug once opened in-flight is able to peel back itself – closing the opening.

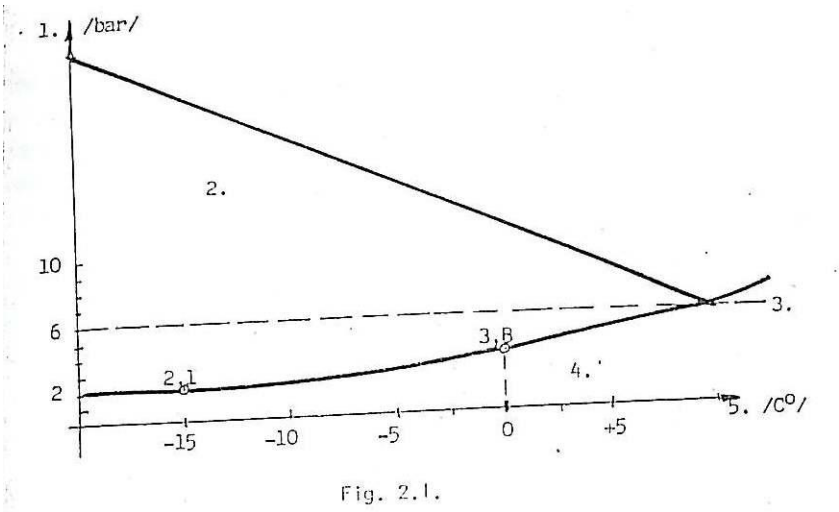


Fig. 2.1.

Fig.2.1.

1. Pressure
2. Pressure of nitrogen
3. Required gas-pressure
4. Gas-pressure in the cylinder
5. Temperature

2.2. Flameproof skirt /kerchief/

The skirt serves as a channel for the hot air and protects the balloon-envelope fabric from heat damage.

2.3. Load wires

The load wires of the envelope are made of steel and they transmit the envelope load to the basket through the burner frame.

2.4. Crown rope

There is a balloon height-length crown rope attached to the top of the balloon for helping handling during inflation.

3. The burner

The burner is working on natural gas and has a high catoric output./It is a static lift producting heat engine./ The liquid gas gets through the pre-heating coil to the jets, and through the jets into the air. The outgoing gas stream is ignited by the constantly running pilot flame. The so fired main flame heats the pre-heating coil too.

Fig. 3.1.
The burner

For the safe opration there is a dual fuel and burner system. The gas supply is controlled with a knock-on tap. The burner can be turned relatively to the vertical axis of the balloon with a force of 50 N at least, making use of the burner frame. This frame has the parts providing the relative distance between the burner and the envelope. The burner frame has a construction, by which it is attached to the joining of the envelope load wires and the basket wires.

4. The fuel system

4.1. The fuel tank

The fuel tanks are cylinders made from lightweight aluminium designed to contain natural gas. The syphon tube built into the cylinders ensure the liquid gas supply without turning over the cylinder.

4.2. Fuel hoses

Pilot flame supply hose: Its operating test pressure is 2,45 MPa /25 bar/. Pressure-tightness of the hose is 24,5 MPa /250 bar/. Length: 2,1 m. Its inner diameter: 6,25 m.
The hose a woven structure. The hose endings have M14x1 thread.
Main supply hose: Its operating test pressure is 14,7 MPa /150 bar/,pressure-tightness: 24,5 MPa /250 bar/. Suitable for liquid natural gas, braided with wire. Length: 2,1 m, end with M14x1 thread.
Refuelling hose: The same as the main supply hose. Fittings depend on applied refuelling and refuelled cylinder.

Caution!
After endings are fitted, seal them with the threads. If fuel supply hoses are damaged, they must be replaced with hoses and fittings to the above specifications.

5. The basket

The basket - wich carries the flight crew during the flight - has a special construction.

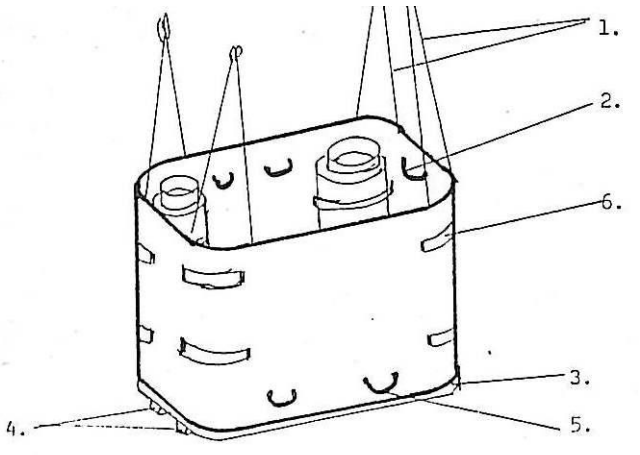


Fig. 5.1.

1. Basket wires
2. Basket handles
3. Plywood basket base
4. Hardwood runners
5. Transport-handles
6. Securing straps for the cylinders

The plywood base and the hardwood runners on it protect the occupants of the basket and the car wires. They also provide a structural stiffness to the basket to withstand landing stresses.

Handles positioned on the outside of the basket are for ground handling purposes.

5.2. Repairs

Repairs shall be carried out only with original fabric, or equivalent to it, according to the instruction No. 00-862 „Instruction for repairing parachute outfits”.

Handles on the inside of the basket are for passenger use. The basket carries the cylinders, which can be secured in it with strapes and bands firmly.

6. Grounding rope

The grounding rope has a 20 m length, it is free of knotes, and doesn’t get stuck. It has a breaking load of minimum 4000 N, and it serves for grounding, if necessary pulling down or towing away the balloon.

11. Operation instruction

Contents:

1./ Refuelling, transfuelling, using, storing and transpotting of the fuel cylinders.

2./ Preparation for flight.

3./ Inflation.

4./ Launch procedure.

5./ Flight.

6./ Landing procedure.

7./ Packing up.

8./ Emergency procedure.

1. Refuelling, transfuelling, using, storing and transporting of the fuel cylinders

Refuelling, transfuelling

A. Filling of fuel cylinders must be carried out only by an authorised filling station, or a licensed person.

B. Requirements on the site of refuelling, outside the filling station:

B.1. There must not be any buildings, machines or objects within 500 m distance on the downwind side which could set to fire outflowing gas;

B.2. There must not be within 300 m distance such depressions, pits or holes in which the effusing gas could accumulate.

B.3. There must not be other inflammable /explosive/ materials, buildings within a 50 m range of the refuelling. Smoking and using naked flame are prohibited in this area.

C. Safety rules

C.1. Winward ont the site of refuelling there must be at least one 5 kg dry-powder fire-extinguisher, which can be activated within 5 seconds;

C.2. Only the person who refuels the cylinders and his instructed helper may be pesent at the refuelling procedure.

C.3. In the case of refuelling several cylinders simultanously the refuelling of the different cylinders shall be taken place 5 m apart from one another in a line perpendicular to the direction of wind;

C.4. The refuelling person and his helper must wear a long-sleeved, buttoned through working dress without static charge and which does not melt under the influence of heat, footwear with rubber sole, and leather gloves.

Condition for use

A. Attaching:

A.1. Check closed position of the cylinder valve,
A.2. Unscrew and remove locking nut;
A.3. Check perfect condition of fittings /threads/ and sealings.

A.4. Attah the refuelling line.

B. Checking the joining up:

B.1. Close burner tap;

B.2. Open flight cylinder valve;

B.3. In the open, during the flight by means of smelling and haering, indoors by painting with soapy-water test connection for leakage.

C. Reduktion of pressure, pressure release:

C.1. Position cylinder to ensure the vapour phase outflow through the vent made for that purpose or through the joining element;

C.2. Open cylinder valve /it is recommended release the gas burned out through the burner of the aircraft.

C.3. Close the cylinder valve, remove pressure-geuge from the cylinder after cooling down of the cylinder /after reducing its pressure/, i.e. after appearence of the flame which indicates the complete effusion of nitrogen filled in to increase pressure.

D. Removing water and other contamination from the cylinder before transfuelling:

D.1. Place and secure the cylinder in such a position in which the outflowing gas at deepest point of the cylinder is in liquid phase in order to remove water and contaminations denser than liquid gas is;

D.2. Connect the burner to the cylinder according to „A” and check connection as prescribed in „B”;

D.3. Open the cylinder valve and keep open it for 5 seconds white pilot flame is burning and the control valve is open.

D.4. Close the cylinder valve, burn off the gas remaining in the connection line then disconnect the cylinder.

E. Increasing pressure:

E.1. Nitogen may be used for increasing gas pressure, but in the line between the nitrogen and gas cylinder must be connected:

a/ a pressure regulator /160/15 bar reducer/ for decreasing nitrogen pressure;

b/ a back-pressure valve;

c/ a blow-off valve, adjusted for a pressure of 15 bar;

d/ an emptying valve for releasing line-pressure;

E.2. Connect to the nitrogen cylinder and check the line conforming to E.1.:

a/ close the back-pressure valve;

b/ open the cylinder valve and adjust the pressure regulator for 15 bar;

c/ close the cylinder valve;

d/ connect the pressure intensifier line to the gas cylinder according to „A”;

e/ close the emptying valve;

f/ open the valve of the nitrogen cylinder; check functioning of the blow-off valve;

g/ close the back-pressure valve;

h/ open the gas cylinder valve, test that pressure in the gas cylinder does not reach the value adjusted on the blow-off valve;

E.3. Increase the pressure:

a/ open the back-pressure valve, check pressure at the low-pressure side of the pressure regulator /at first the pressure decreases to the value of the cylinder pressure, then it will be increasing gradually/;

b/ if necessary – at reaching not more than 15 bar – pressure /when the blow-off valve is functioning/ close the gas cylinder valve;

c/ close the nitrogen cylinder valve;

d/ open the emptying valve, release pressure from the line;

E.4. Disconnect the pressure intensifier line;

E.5. Put mark of intensified pressure in the gas cylinder.

F. Transfuelling of gas:

F.1. Prepare filling cylinder according to „D”;

F.2. Increase pressure in the filling cylinder in compliance with „E” and

F.3. Reduce pressure in the cylinder to be filled according to „C”;

F.4. Connecting and checking as prescribed in „A” and „B”,

F.5. Place and secure the filling cylinder in such a position in which there is a liquid phase outflow from it;

F.6. Open the cylinder valves;

F.7. Check flowing through /listening to the bubbling sound, weighing the gross mass of the cylinder under filling/,

F.8. Finished transfuelling disconnect according to „G”,

G. Disconnecting after refuelling:

G.1. Close the valve od the refuelled cylinder;

G.2. Close the valve of the refuelling cylinder;

G.3. Undo threaded connection sowly to allow pressure in the filling hose to reduce;

G.4. With slowing down of the outflow of gas connection must be undone continously until completing detachment.

H. Undoing connection of the burner:

/When changing of cylinders during the flight the balloon must be steered into a safe flight position – in weak wind it is to be placed onto an unobstructed spot. In other situation the balloon must be taken in a steady climb at a height of min. 300m./

H.1. Turn off empty cylinder supply tap;

H.2. Burn rest fuel out of hose;

H.3. Disconnect hose from the empty cylinder;

H.4. Connect hose to the new cylinder and check connection according to „A” and „B”;

H.5. Perform heating test with the new cylinder.

I. Pre-flight check on the ground:

I.1. Check perfect condition of the cylinders;

I.2. Check contents /avaible quantity of fuel/;

I.3. Secure cylinders according to the Hot-air balloon Manual;

I.4. Connect cylinder as prescribed in „A”;

I.5. Check joining up according to „B”;

I.6. Test functioning.

K. Inspection before transporting /road transport/;

K.1. Reduce pressure as in „C” /in the case of increased pressure/;

K.2. Check closing of the cylinder valve;

K.3. Screw on and tighten tail nut.

I.3. Transporting and storage of gas cylinders

Transport on the ground /road transport / and storage of filled gas cylinders must be carried out according to the technical safety regulation of the gas and oil industry.

2. Preparation for flight

2.1. Before flying check actual met conditions and th weather to be axpected:

I. You must be advised of wind speed and direction from your launching site to the planned maximum flight level.

II. You must know the likelihood of thermal or cumulo-nimbus activity.

III. You must know cloud cover and expected clouding.

IV. You must be advised of probable meteorological changes during planned flight time.

If there is a serious likelihood of thermal activity balloon flights may be performed only the greatest possible foresight and care. It is recommended not fly in thermic conditions at all.

Having a lasting thermal activity in the region of the balloon flight the flight must be interrupted urgently and a landing shall be made as soon as possible.

2.2. Low ambient air temperature

Lower ambient air temperature will result in cooling down fuel cylinder, lower gas pressure and less amount of flowing out gas.
Insulation against cold on cylinders will help maintain temperature, but do not forget that the balloon will take some time to respond to pilot’s manoeuvring action. This effect appears especially when manoeuvring at cold ambient air temperature. At burner gas pressures less then 0,68 MPa /7,6 m/ it is recommended progressively reduce the all-up mass of the balloon. With due experience it can be determined the all-up mass of the balloon for an optimal flight at given ambient temperature. All-up mass can be reduces by reducing the number of passengers or fuel tanks.

Gas pressure will be so low in cold weather that it will not be enough to supply the burner with gas.

In this situation in order to provide required gas pressure – taking into consideration permissible cylinder pressure, ambient air temperature and the given technical equipment – cylinder may be warmed up with an approved and inspected electric, hot-water, etc. heating system, or inert gas /nitrogen/ must be pressed into the cylinder /Fig. 2.1./.

However, in could weather it must be taken into account thath gas will contiously getting cooler and cylinder pressure decreases necessarliy. Therefore you must be prepared for a landing to be made as soon as possible and be fully aware that in the cylinder remains about 25 p.c. gas which cannot be burned out because of the low pressure and so the avaible amount of fuel is growing less.

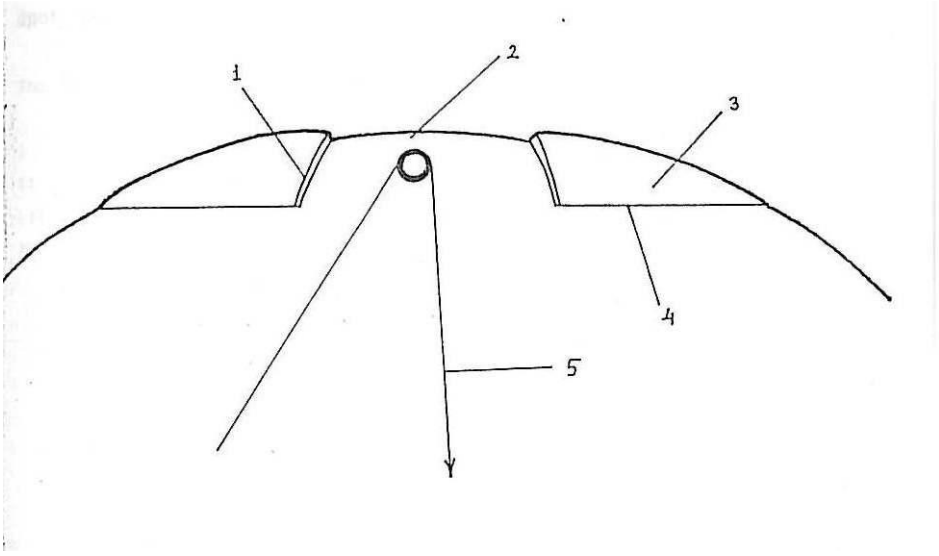


Fig. 2.1.

1. Envelope gore panel
2. Parachute plug
3. Envelope
4. Restainer tape
5. Rip line

2.3. Choosing a launching site

Bear in mind that when is calm no wind shetter is required for launching.
Calm air is when the wind velocity does not exceed 0-1,5m/s, the leaves and small branches of trees are barely moving.
In over 1,5 m/s-wind the launching site must have shelter.

Such a launching site must be chosen which gives an unobstructed flight path.
The faster the wind speed the more difficult the launch and the more sheltered the site required. /Although you always can choose a launching spot, you can setdom choose a landing site with the same ease./

The launching site should preferably be:

I grassy-crop-free and livestock-free;
II sheltered on the winward side;
III easily accessible;
IV free of any downwind obstructions /50-150 ms dependent upon wind speed/;

V about 15 ms away from the sheltering ground object /Fig. 2.2./

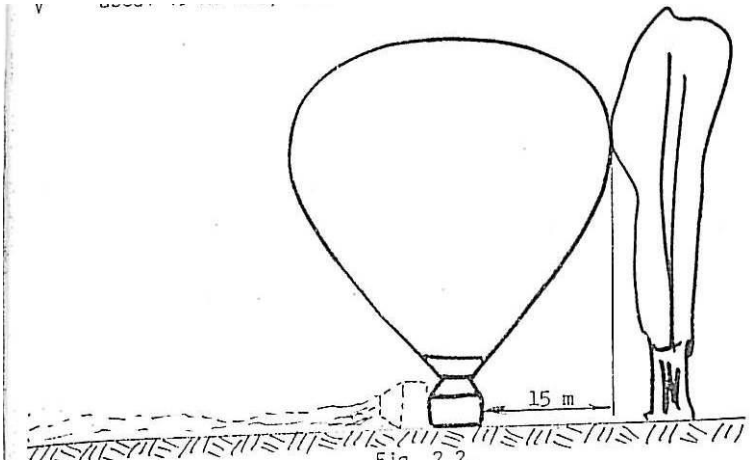


Fig. 2.2.

2.4. Load calculation

Load valculation must be made according to Part I considering conditions and flight plan.

2.5. Briefing for crew members

A/ Crown team

The pilot should make his decision pre-flight preparations on the required number of crown team.

It is very important not to change this number of crown team without the pilot’s knowledge, since he bases the expected balloon reactions on the original number of assisting team.

During inflation the pilot will ask ’how is the crown?’
The crown team will reply:

below 25 kgs lifting force ..... ’OK!’
up to 50 kgs lifting force ..... ’heavy!’
over 50 kgs lifting force ..... ’very heavy!’

if crown controll is accidentally lost – i.e. the team holding the crown rope accidentally loses hold of ot – the crew manning the crown must warn the pilot by shouting ’crown away!’ and immediately run to the basket to hold down the balloon lift produced by the momentum of the upswing.

It is of great importance that no crown crew member is lifted off during th inflation.

It is advisable to the crown team to wear heavy gloves to protect their hands and do not twist the rope around your wrist.

As the balloon rises from the ground, the crew hansling the crown rope should slowly let the crown up and walk towards the basket. An experienced ground crew will do this automatically, but it is common for the pilot to give instructions from the basket. /Fig. 2.3./

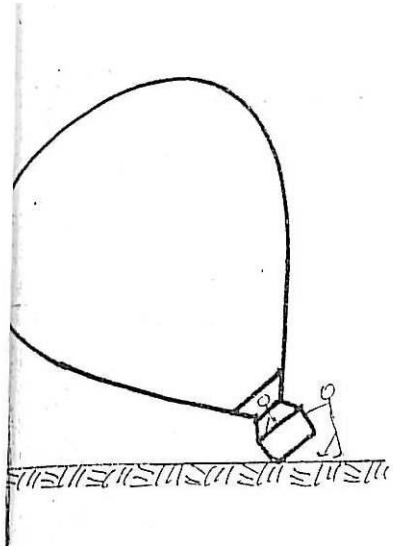


Fig.2.3.

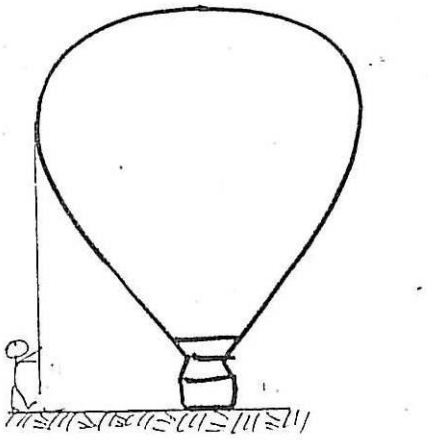


Fig 2.4.

In the final /uprisen/ crown position the crown team will find themeselves close to the basket and should hold the crown rope until the pilot gives an order to let the crown go /Fig. 2.4./.

If this crew will fly, they step into the basket, if not they will hold it using the outside handle. Some pilots are using long crown rope and get fastened it to the basket before flight.

Notes:

On windy days it is necessary to keep the crown under tight control, since the balloon will thrash and roll etc. It is important to keep the crown always directly down wind of the basket to avoid lateral or downing deflating the envelope. In a windy situation more people should be used on the crown and it should be 'walked up' very slowly, keeping the balloon as hot as possible.

B/ The mouth crew

The mouth of the balloon os not to be handled during inflation as follows:

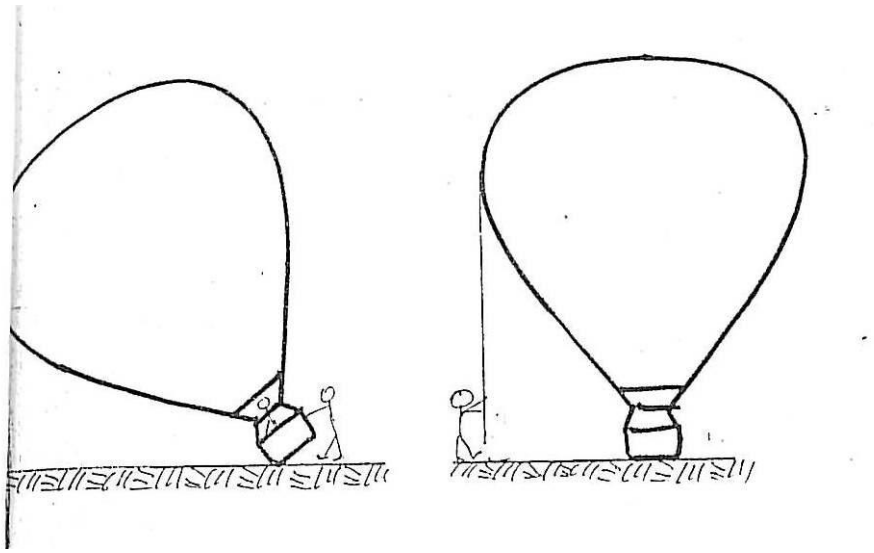


Fig.2.5.

Crew memeber take up positions holding open the mouth by the top load wires.

A third member may take up position inside the balloon to hold up the envelope fabric and to keep the floor from rising into the flame.

On windy days it is advisable to have further helpers stationed on the outside of the balloon at the first and second load tapes. Their job is to hold out the sides of the balloon by the load tapes.

As the balloon inflates, the man inside steps out and the mouth crew release the load wires, taking hold of the next down, one by one, until the balloon is upright.

Note:

All members of the mouth crew should wear and protect their arms. On windy days it may be necessary to hold th mouth down from underneath to procedure a large enough opening for the flame.

2.6. Preparation for flight

When preparing the balloon consider that the procedure should be designed to test the balloon's equipment.
Do not forget that envelope fabrcs will deteriorate with exposure to ultra-violet light whether the balloon is flying or simply layed out on the ground.
Therefore the less time the balloon remains out of its bag the more flying hours the envelope will give. Having chosen the launching site set the basket in an upright position on the ground, facing the downwind side of the balloon envelope.

Place and secure the required number of flight fuel cylinders as in Fig. 2.6.

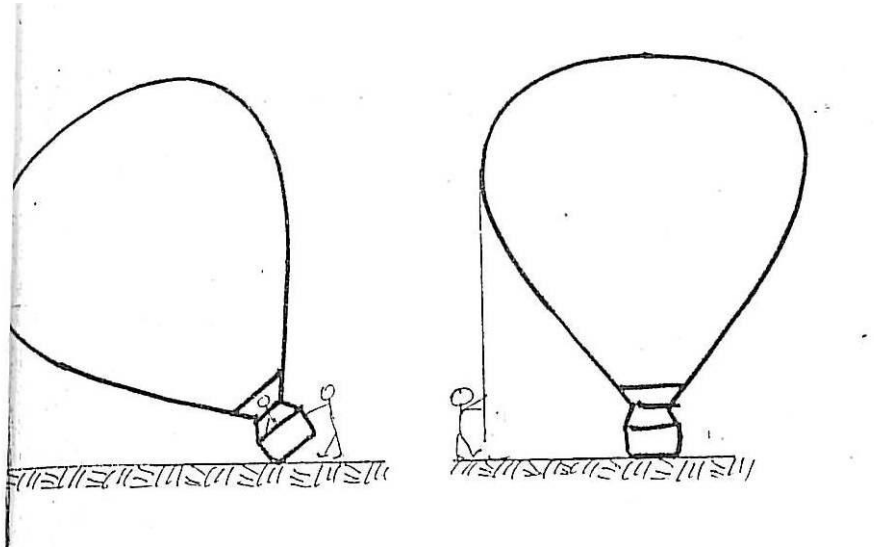


Fig. 2.6.

1. Basket with 2 fuel cylinders
2. Basket with 3 fuel cylinders
3. Basket with 4 fuel cylinders

Assemble /fit together/ the burner, the basket and the fuel system /in compliance with Part II. 2.1.2./ in flight /upright/ position.

The pilot or co-pilot should carry out the check of the complete fuel system, including allinstalled flight cylinders. /In a clothing prescribed for flights/.

Having tested the burner check that all cylinder valves are fully closed and the hoses are ventilated through.

Reminder notes for the preparation of the flight

During pre-flight preparations the assigned pilot-in-command should carry out /or get carried out/ the following checks and operations:

1./ Obtaining meteorological data and informations /Is the weather suitable for flights or for carrying out the planned fight-task/;

2./ Is the fuel enough for the planned flight /20-22 kgs gas is needed on the average for a 40 minute-flight/.

3./ Calculating load taking into consideration special weather conditions /inversion, wind shear/, ground conditions /obstacles to be cleared/;

4./ Briefing of balloon and ground crew;

5./ Asembling the basket-burner system, preparing the ground equipment, securing and checking of accessories, parts.

6./ Check perfect condition, leak-proofness and functioning of the burner and the fuel system /check pilot flame stability and quality, operate every burner and cylinder for 10-30 seconds, check perfect condition of the cylinder dip tube, the pressure and free flow of gas, the correct functioning of the valves/;

7./ Decide on starting inflation.

3. Inflation

Counting clockwise as you face the envelope grip a group of load wires. Standing behind the burner attach these wires to the bottom left-hand corner of the frame.

Repeat this on the next group of wires, counting anti-clockwise from the mark, and attach to bottom right corner of load frame.
Repeat this with the following wires and attach these to top right corner.

Repeat on last froup of wires and attach to top left corner. Check that the rip line is not twisted around the load wires from the envelope.

After this unroll and spread out the balloon envelope in a line down wind of the basket. Always handle the balloon by the load tapes, and not by the fabric /Fig.2.7./.

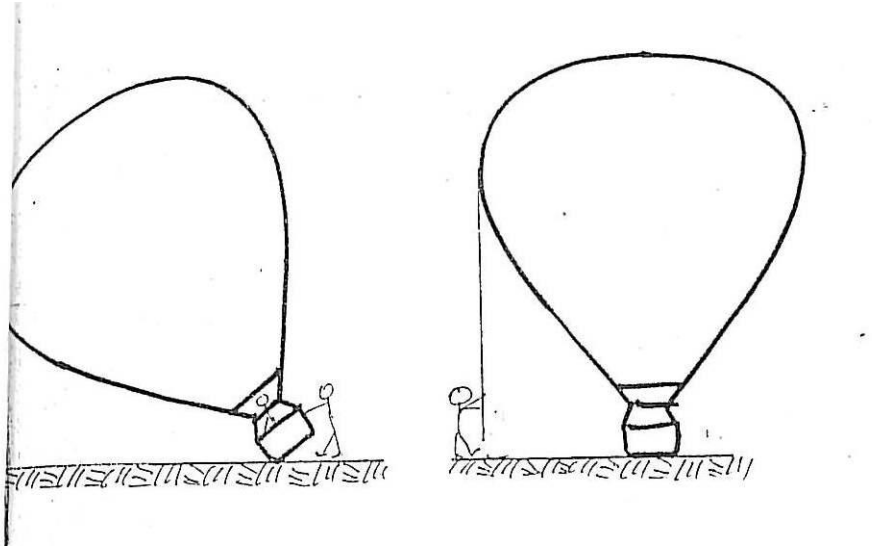


Fig. 2.7.

Lay out the crown rope down wind of the envelope. Check that it is securely fastened and not twisted or knotted. Check the envelope controls and inspect the fabric for damage.

To be checked

Whether control line of the vent /rip/ panel and the pulleys are un-snagged, and the line is operating satisfactorily;

The balloon crew members wear their prescribed outfit;
Ground crew members have their leather gloves;
Prescribed balloon equipment are complete and in the proper place;
Cylinder control valves and burner control taps are fully closed;
It is advisable to use a four-stroke engine or an electric motor for inflating the balloon with cold air, since blown-in oily combustion products of a two-stroke engine have damaging effects on the fabric.

It is advisable to close the rip panel after the beginning of inflation with cold air. Then the pilot should carry out the inner check:

- rip line is undamaged, pulleys and line are un-snagged and secured;

- Thermistor /crown temperature gauge/ and fusible ling are undamaged and fit for use;

- general condition of the envelope.

Whwn the envelope is inflated with cold air to three quarters, inflation can be started with hot air.
It is recommended to continue operating the cold air-fan during inflation with hot air.

Doing so the mouth of balloon will not beeing sucked in behind, the flame will be girded by cold air and the risk of burn damage will be less.

As the envelope rises off the ground, pilot has to step into the basket and direct inflation from it. The mouth crew and finally the crown crew must be instructed to take up positions on the basket. Pilot shall instruct crew members to get aboard. He shall check again that he has a supply of matches and check on maps and instrument settings /spare lighter device/.

Note: do not light the main burner's flame, do not open the cylinder tape until everybody left the envelope, or there is somebody in front of the burner.

Continue to heat of the balloon, and carry out a 'hands off/hands on' procedure.

Crew shall be briefed on this procedure. /Note temperature/.

Pre-inflation check summary

1. Weather conditions are convenient for the flight.

2. The balloon and every part of it is fit to fly.

3. Intsruments are operational.

4. All prescribed equipment are on board.

5. Crew members are on the right places, everybody knows his task.

6. Instruments and all loose equipment in the basket are secured.

7. all handling ropes are free and are hold only by trained crew members.

8. Hovering temperature is known and it is appropriate for flight regime.

9. Deciding on taking off and on its method.

4. Taking off

Give command ’hands off’, and if the balloon does not rise, instruct ’hands on’ and continue heating. Repeat this until the balloon rises from the ground on the command ’hands off’.

If the wind is fairly strong /more than 4 m/s/, it is advisable to produce an amount of positive buoyancy to enable a controlled lift off. To do this, give command to the crew ’hands on’ even though the balloon is light, and heat for a few more seconds before giving the ground crew the final instruction ’hand off, stand clear’, and watch the thermometer. /It is advisable to produce +5-+15 °C surplus in heating/.

Be carefull however not to produce excessive lift which will result in climb rates exceeding normal limitation /Fig.2.8./, which can cause an unintended opening of the vent panel.

At an unsheltered site, the wind will tend to deflate the balloon on the upwind sied. To overcome this it may be necessary to run with the balloon with the wind to obtain enough buoyancy for take off.

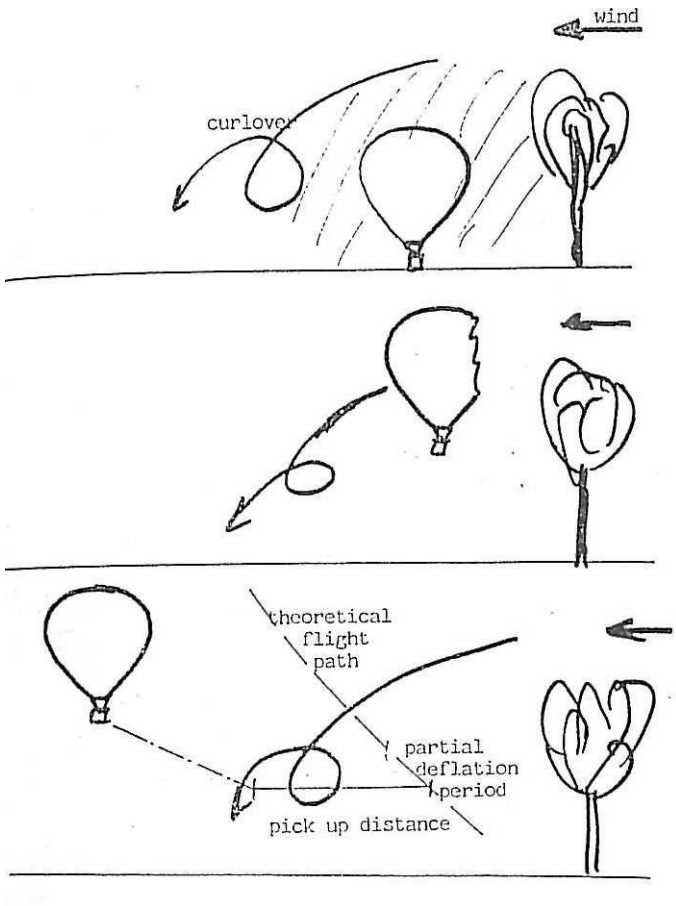


Fig. 2.8.

It is important therefore that the balloon and the ground crew have a long down-wind stretch free of obstacles for this.

Furthermore remember that in this situation it is advisable to fly with fewer passengers /Fig.2.9./

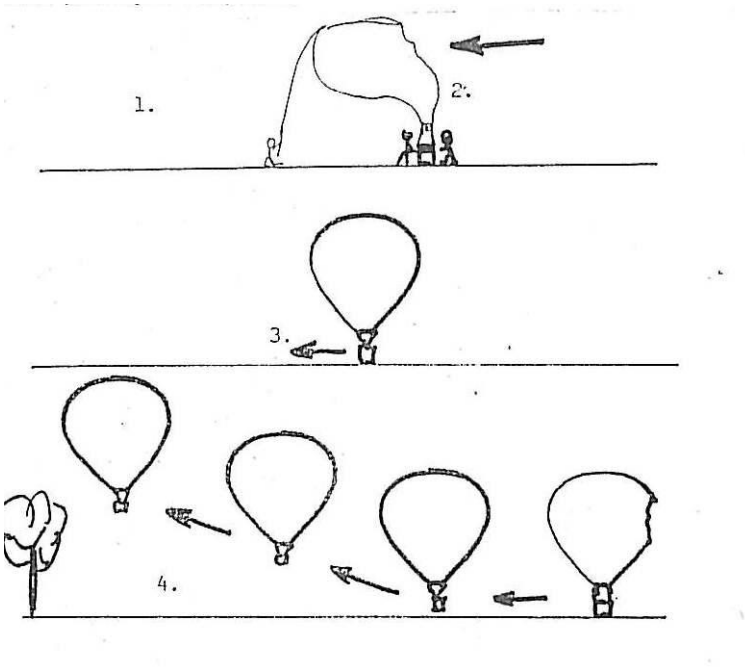


Fig. 2.9.

1. Launch procedure at a wind less than 4 ,/s.
2. Deflation by wind
3. Run at wind speed
4. Balloon gradually picks up windspeed and lift.

The ground crew take hold of the basket /outer/ handles and lift and run with the balloon. At the same time the pilot continues to burn until the balloon lifts off.

Note:

It is very important that the ground crew do not give the balloon false lift by throwing the basket into the air. The entire procedure is extremely exhausting for the ground crew and is not recommended as a launch method.

All ground crews should be instructed never to hang onto the basket or any part of the balloon as it leaves the ground. Doing so would only endanger their safety, whereas if they let go the pilot would at worst only have to abort the take off.

Reminder notes for take off

1. Everything is secured.
2. Lift-off temperature is appropriate and safe.
3. Take-off temperature and rate of climb are within the allowed limits and their changes can be controlled.

5. Flight

As soon the balloon is airborne, check:

/I/ Correct time of lift-of
/II/ lift-off temperature, rgime of flight
/III/ position of take off on map, and establish direction of flight.
/IV/ ask passengers to maintain a lookout for obstacles such as power wires, masts, or other aircraft.
/V/ brief passengers on landing and emergency duties.

Balloon control

Theoretical instructions on the control of the balloon do not subtitute for practical experience, but the following comments may be useful:

Vertical control

Firstly is should be remembered that there will be a time-lag between the operation of the controls and that action taking visible effect. This obviosly os different for each balloon, but after a short time in the air the pilot will becom familiar with the balloon own responsiveness.

Vertical control of the balloon can be effected by:

A/ The burner,
B/ The dump valve,
C/ In emergency by making use of avaible ballast /e.g. trail rope if carried/.

A/ Burner operation

The balloon is most efficiently controlled by short burts of flame. Numerous short burts allow a greater degree of control than one longer burts at irregular intervals.

5.1. B/ Dump valve operation

The dump valve can be used to increase the balloon’s heat loss. Opening the panel will induce a greater rate of descent or reduce the rate of climb by venting a larger amount of hot air.
When learning to fly, it is recommended that the student pilot should count the number of seconds during which he holds the dump open. This allows an immediate comparison of dump effects and will make judgement easier. To maintain level flight the burner should be operated just before the cooling of the balloon produces a downward motion.

5.1. C/ Directional control

Directional control of the balloon is about which can be said the least because it is the less possible.

An approximate estime on wind direction at various altitude can be obtained from the meteorological service before take off and more accurate assesment can be made once in flight.

By altering his altitude the pilot may find himself able to ’steer’ the balloon on a desired course or toward a chosen point. Wind speed usually changes with height, and the pilot may also use this knowledge to determinate his destination or time of arrival. Aside from the prevailing wind, local wind effects can also be used to ’steer’ the balloon. A common effect is the valley wind which can run counter to the prevailing direction of wind. This and other local effects may be identified by observing smoke from chimneys or bonfires etc.

5.2. Fuel use

During the flight always keep a check on the cylinder contents. Always leave t least 50 % of fuel in the ultimate cylinder. This gives a safety margin should finding a landing site prove difficult, or you must proceed on your flight for some reasons.
When changing cylinders /an empty for a full one/, use them in the sequence shown in Fig. 2.6.

To change a cylinder in flight observe the following sequence:

1/ Turn off empty cylinder tap,
2/ Burn fuel out of hose and close burner tap,
3/ Disconnect hose and attach to the new /full/ cylinder,
4/ Open cylinder valve on the new /full/ cylinder and check it. This changeover will not affect the other side of the dual burner, so whilst changeover os in progress if it is necessary to burn, the other half of the system may be used.

It is recommended that both taps on the dual burner be connected t 'active' cylinders-one cylinder in use and one full 'back-up' cylinder. This goes specially for landing approach.

5.3. Low-level avoidance procedure

Always the pilot must make the decision to climb or descend. If you want to climb, assess the situation quickly and if possible, burn quickly and intensively to climb out. To gain additional lift immediately, offload ballast such as trailrope.

Notes: If you are going to hit a tree, ensure that the dump line do not snag on branches. Brief crew to hold on tight and at al costs stay in the basket. Having cleared the obstacle, it may be necessary to dump to reduce excessive lift.

6/ Landing

6.1. Passenger briefing

Prior to slecting the landing site, brief crew members, passengers. They should forward of the pilot in the basket, facing forwards and holding firmly onto the interior handles. On impact flex knees, in order to damp the shock effect with ’springy’ legs and crouch down inside the basket if necessary.

Everybody must remain inside the basket until told otherwise by the pilot.

It is advisable to turn to one side, not to bump with the knees against the side of the basket.

6.2. Checks prior to landing

Ensure that there is sufficient gas in the operational and the reserve cylinders to complete the approach of the landing site. If there is not, change to a new full cylinder. Check that dump line is free and unsnagged.

6.3. Select a landing field

Selecta landing field in the line of flight. As a general rule, the faster the flight, the larger the field required.

The field should be free of livestock, wires or crops, and if possible close to an access road.

An approach into a field over trees will afford some protection from the wind upon landing.

6.4. Approach and landing

A/ In calm conditions:

Alow tha balloon to cool and begin a descent path. Use short burns to control the descent rate. Cease descent, level out 6-15 ms above the selected landing site. When flight path is clear /there are no obstacles before us/, reduce height, turn off the pilot flame, close off the oprational cylinder valves and rip progressively to touching down.

As the basket touched the ground, rip fully. As the basket stops and the cannopy folds down close off cylinder valves possibly left open and vent off the fuel remaining in the lines. /Check first that the pilot flame is extinguished./ When the envelope has deflated sufficiently, tell the passengers and crew they may step out of the basket.

B/ In fast wind conditions:

The approach is basically the same, but it is usually necessary to handle more precisely the controls. The dump valve can be used to speed the rate of descent. In certain circumstances the rip panel can be progressively opened at up to 25-50 m to bring the balloon down quickly – bur be always prepared for a heavy landing in such cases.

The trail rope – if carried – may be dropped to drag on the ground and solw the forward speed, but take care to ensure that it will not cause excessive damage, and be ready for its snag and stop the balloon suddenly. Generaly in windy conditons it is advisable to land the balloon as you took off, behind shelter and with a steeper angle of descent.

6.5. Preparation for a hard landing

Brief the crew /passengers/ as for a normal landing, stressing the importance of holding on tight and remaining inside the basket until they are told otherwise. They should try to strain muscles on impact.

6.6. The pilot’s duties at hard landing

The pilot should:

- Shut off the main cylinder valve after the last burn.
- Shut off the pilot ligth.
- Vent off the line.
- Drop the ballast, e.g. trail rope if carried.

1/ Prior to dropping ballast of any type the balloon crew must ensure that in doing so they will not endanger personnel or property on the groung below.
2/ The crew should be aware that the basket could turn upside down, and that if it does so they should hold on until the balloon stops.

Reminder notes for preparation of landing

1./ Equipment secured – O.K.
2./ Put on gloves and helmet.
3./ Wind direction, course of approach are known.
4./ Cylinders secured, - O.K.
5./ Ground escort is visible and informed.
6./ Glide path – O.K.
7./ There are no obstacles on approach and at the landing site.
8./ Cylinder valves are shut off.
9./ Rip line strained.

7/ Packing up

Remembering that the damage caused by the landing of the balloon can be aggravated, do not take your retrieve vehicle to landing site unless you have obtained permission from the lendowner, or you do not cause more damage.

If there are problems of that kind, the balloon should be carried out to the vehicle.

CHECK:

1./ Cylinder valves are shut off, fuel lines are vented off the fuel.
2./ Fuel hoses are disconnected and protected against dirt.
3./ Cylinder pressure reduced.
4./ Canopy checked and packed up.
5./ Instruments dismantled, turned off and packed.
6./ Basket checked, O.K. for transporting.
7./ Basket cooled, O.K., it can be transported.
8./ Landing time fixed.
9./ Flight data recorded in the logbook.

8./ Emergency situations

8.1. Pilot flame failure

In the event of pilot light failure adopt the following course of action:

- attempt to relight the pilot flame,

- if unsuccessful:
  shut off main fuel supply at cylinder valve. Open burner knock-on tap to that cylinder fully. Crack open cylinder valve to allow a little fuel to reach the main jet.
- light burner at main jet,
- open cylinder valve to fractional setting to maintain pilot light. Carry on heating so.

Notes: The fractional settings to maintain the pilot light will cause refrigeration in the burner valve. To avoid or stop this, burn frequently in short bursts to clear the system, making sure not to turn out the supply completely.

For the above reason it is not possible on a dual supply system to operate one supply as the burner supply and the other as the pilot feed.

A landing should be made as soon as possible.

8.2. Fire on the ground

Turn off fuel supply at the cylinder valve and put out fire by using the fire extinguisher. If this action proves unsuccessful within 20 second i.e. the fire can not be put out, evacuate crew to safety because fuel tank or tanks overheated from outside can explode.

In the air

Turn off fuel supply at cylinder valve. Put out fire with extinguisher. If safe to relight pilot flame, proceed as normal, and make an immediate landing. If unsafe to relight pilot flame, prepare basket and crew to make a “hard” landing.

8.3. Curlover

Curlover is commonly experienced close to the ground and it has an effect which pushes the balloon downwards. It usually occurs on the downwind side of hills, wood or other large obstacles.

It can occur also above the middle of wood, or above other indented terrain.
The strength of the downward effect is proportional to the wind speed and object height, and the pilot should anticipate this effect and burn early to keep the balloon not enough to counteract the effect.

8.4. Valleywind/gusting.

They are basically a confrontation between the prevailing wind a local effect.
This tends to deflate the balloon by pushing a part of the envelope in and spilling hot air out at the base, thus causing a loss of lift.
The flame may also be blown sideways, so the pilot should make full use of the directional burner control in order to fill the balloon with hot air in a short time.

As these gusts are noticed look up to see what is happening to the flame and envelope as you must counteract the effect.

Defect, failure, repaired by....	Pilot-in command	Name of the pilot in training or the pilot checked or the passenger.

N°	20....		Take off		Landing		Flying time		Total time		Failure reporting
	month	day	hour	min.	hour	min.	hour	min.	hour	min.	on page...

PART III.

THE LOGBOOK

The Logbook consists of numbered pages from page 3-1 up to page 3-30.

Rules of keeping the Logbook

1./ The pilot-in-command of the balloon has the duty to keep the Logbook on the basis of the flight plan, on accomplishing the flight.

2./ The serial numbers should be kept with continous numeration.

3./ Time of departure and landing must be entered in local time.

4./ Observed by the pilot-in-command failures, troubles must be entered in Part IV of the Flight Manual "Repair and maintenance records" and the page number of the note under the heading "failure reporting on page…".

The Logbook is an inseparable part of the Flight Manual and it is a document of the balloon approved by the Civil Aviation Authority. For this reason its exact keeping is essential.

Part IV

Maintenance, repair and inspection

Table of contents

1/ Interchangeable parts of the balloon

Interchangeable parts of the balloon may be replaced only with approval /information/ of the manufacturer in accordance with the description of the aircraft:

Rigging /load wires/
Handling /control/ lines
Basket
Fuel cylinders
Burners
Instruments
Fuel system

Replacements of parts of the aircraft are to be entered in Part 7.

2/ Storage conditions

The envelope of the aircraft should be stored only in a store-room between two flights for more then 72 hours /in justified cases not more than 140 hours - 5days/ in serviced condition /after performed maintenance - form 'A'/.

Storage conditions:

4.1/ Temperature: between +5 and +30 Celsius.

4.2/ Degree of air humidity: between 30-80%

4.3/ Not direct damaging radiation /sunlight, light with ultra-violet component/ should effect upon the envelope fabric

4.4/ The storage room should be free from damps of chemicals and oil-products. Therefore no chemicals are allowed to be stored together with the envelope

4.5/ The store-room should be free from rodents and insects

4.6/ There should be a clearance of not less than 0,2 m between the envelope and the wall, ceiling or floor

4.7/ The space between the envelope and a heating body /radiator e.g./ should not be less than 1m /without special screening against heat/

4.8/ Store-room – where smoking and free flame are forbidden – should be closed from unauthorized individuals

4.9/ Temperature, air humidity should be recorded once a day

3/ Condition of the aircraft /accessories/

Category I

Condition of the aircraft comes under the Category I, when:

- life is not expired
- it has not been used, it is undamaged
- no accessories are missing.

Category II

Condition of the aircraft comes under the Category II, when:

-it has been operated only within its prescribed and approved life, it is undamaged

-no accessories are missing

-it has no defect to be repaired.

Category III

Condition of the aircraft comes under Category III, when:

-it has been operated only within its prescribed and approved life

-it has no more than the following defects:

A/ Envelope and load tapes

-there are fabric damages /tears, burns/ within the limits of one gore, but those do not extend on more load tapes,

-there are separated damages on load tapes

-strands are damaged in different seam-rows

-there are stains of different origin causing no damage to the envelope fabric

-there are significant abrasive wears, burning discolorations on handling /control/ lines.

B/ Load wires:

- There are well marked heat – discolorations on load wires

C/ Basket:

- Outer surface damaged, damage did not penetrate
- Outside handles are damaged
- Distorted.

D/ Burner and fuel system:

- One of the units is leaking, valve can not be shut off, it has got jammed
- Afterburning is not up to description
- Consumption /heat output/ not as specified in the description
- There are mechanical defects, damages on burner frame mountings
- Hoses have surface damages.

Category IV

Condition of the aircraft comes under the Category IV when:

- It has reached 100 flying hours since the last airworthiness certification, or its Certificate of Airworthiness expired
- The allowed temperature maximum has been exceeded
- It has such defects /failures/ which are beyond the scope defined for Category III

- It must be made up-to date /renewed/ under operating conditions.

Category V

Condition of the aircraft comes under the Category V, when:

a/ Envelope and load tapes have:

- fabric damages /burns, tears, discolorations, weakenings, increased air permeability/ on more then

  -15% of the total surface area /length/, if remaining life /TBO/ is one year or 100 hours
  -35% of the total surface area /length/ if remaining life /TBO/ is two years or 200 hours

- fabric strength is reduced beyond 60% of the employed construction fabric.

b/ Load wires

- eyelets /ferrules/ damaged, displaced
- snagging, damaged, torn wire strands and staples
- rust, which cannot be fully removed even ribbing it with oiled dud

c/ Basket

- there are holes, opening on sidewalls caused by damages
- broken mounting – supporting elements
- underside /bottom/ disjoined from the sidewalls
- accessories, fitting cannot be secured undisplaceable

- the inside surface of the basket is in such condition that injuries can occur
- broken floor plate, or damaged up to 50% of its thickness

d/ Burner and fuel system

- damaged fuel cylinder,
- damaged hose junctions, fittings. They can be jointed anomalously /too tightly, with difficulty/
- fuel hoses are damaged on their surface
- battered, damaged, deformed burner piping.

4/ Defects not allowable for flights

4.1 Defects not to be allowed in the heating and fuel system:

- local cooling at valve, fuel line /in the case of cooling after the preheating coil valve burner output must be checked at a gas pressure appertaining to +15 Celsius/
- pulsing /noise, hose-, or flame movements, changing of pressure/, at lasting continous, not less then 1 min. functioning
- under conditions of steady, or operative functioning gas flowing out of the jets undercools /forming solid grains of gas/

- difficult functioning of joining elements
- leaks, bleeds
- unstable functioning of the burner valve /uncertain closing/
- burner can be moved to free, so that it may swing away accidentally at any landing.

4.2/ Defects of the envelope and its systems not to be allowed:

- any damage of the rip line /burning, discolorations caused by heat, abrasive wear, tear/ and unsecured fixing

- any snagging on the moving part of the rip line /except on the pulling down strand near to the crown of the envelope, if it does not reach the neighbouring guiding elements during functioning/

- a heat-shielded setting of the sensing element of the thermometer and the fusible link, placed not at the highest point on the symmetry axis of the envelope

- stiching, patches causing stress

- discoloration stain caused by heat

- changes in air permeability which can be perceived by perflation

4.3/ In the balloon system as a whole it is not allowed:

- to use such elements which can be cause injuries /wounds, bruise/
- any inoperative, anomalously functioning instrument, or accessory

5/ Maintenance, repair, inspection Form 'A'

a.1/ Drying the envelope as necessary /by inflation with cold air, hanging, or flight with reduced load/

a.2/ Removing contaminations, dirt

a.3/ Folding up and visual check of the envelope for storage

a.4/ Visual check, cleaning of every part of the balloon

Form 'B'

b.0/ Perform maintenance Form 'A'

b.1/ Envelope

b1.1/ Fabric of the envelope: The fabric must be checked with tensile test or on elastic limit if the temperature gauge indicated a higher than allowed operating temperature /or such an excess heating has been recorded in the Flight Log/. In such cases a 300 hour maintenance check must be carried out.

B.1.2./ Condition of the fabric: Fabric damages may be accepted above base of nomex /'leading edge'/ up to the first horizontal load tape. Abrasive damages and tears, ruptures on other places must be repaired.

B.1.3./Air permeability: If the fabric of the part of the envelope above the largest diameter can be blown through, the envelope must be checked during the flight and porosity must be eliminated by coating.

B.2./ Load tapes

B.2.1./ All horizontal and vertical load tapes must be undamaged. This applies especially to the vertical tapes.

B.2.2./ Joints of load wires and load tapes must be checked by lifting the protective cover.

B.2.3./Sound condition of extensions /overlappings/ must be checked at the base /'leading edge'/ of the balloon.

B.2.4./ Where the load tapes come apart from the envelope fabric /as normal/, the reinforcing seam-fields must be sound.

B.2.5./ Seams of overlapped load tapes at the crown must be sound.

B.2.6./ Seam-fields of extensions on every vertical load tape must be sound.

B.2.7./ Overlappings of the horizontal load tapes must be undamaged.

B.2.8./ The tape of the balloon base must be undamaged.

B.3/ Load wires

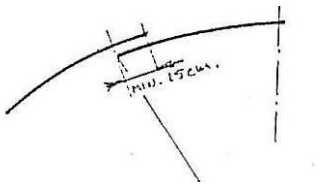
B.3.1./ Load wires should not be frayed, no strands are allowed to be torn

B.3.2./ Ferrules /chucks/ on wire ands must be undamaged.

B.3.3./ Extreme burns on wires cannot be accepted.

B.4/ Parachute

B.4.1./ Overlap of the parachute along the vertical load tape must be not less than 15cm.



B.4.2./ Securing of placing tapes of the parachute to the vertical load tapes must be sound.

B.4.3./ There should not be any damage along securing of parachute placing tapes on reinforcing /load bearing/ tapes.

B.4.4./ Every parachute pull cord /central tape/ must be attached securely to the pulley.

B.5./ Rip line

B.5.1./ Guiding pulleys and rope-tape connection should be undamaged.

B.5.2./ Rope guiding pulleys must turn free.

B.5.3./ Rip rope is not allowed to be tight in inflated condition of the balloon.

B.5.4./ Rip rope /tape/ should not be fire-fanged.

B.6/ Burner frame

B.6.1./ The burner frame should not be distorted.

B.6.2./ Connecting karabiners must be secured. Karabiners must be properly lubrified because of the smooth functioning.

B.6.3./ Bolted connections must be locked.

B.7/ Burner

B.7.1./ The burner system must be free from damage and distortion.

B.7.2./ The burner /jets/ should be cleaned by washing thoroughly in petroleum.

B.7.3./ Not less then 50N force is necessary to wing the shackles of the burner.

B.7.4./ Output /consumption/ of the burner is according to the data in 1.2.

B.8./ Basket

B.8.1./ Car line roped /basket ropes/ should not be frayed no strands are allowed to be torn.

B.8.2./ Ferrules /chucks/ of rope ends must be undamaged, they must be on their places.

B.8.3./ Underside /bottom/ of the basket should not be broken, cracked, too much distorted.

B.8.4./ Hardwood runners should be strongly fixed, fixing screws tight. Damaged runners must be replaced.

B.8.5./ Sidewalls of the basket should be free from extreme damage-marks. The wicker-work of the basket should be free from mildew.

B.8.6./ Webbing straps securing the cylinders should be undamaged, clasps should lock tightly.

B.8.7./ Stay rods are undamaged.

B.9./ Classifying the balloon

Form 'C'

C.0/ Perform maintenance Form 'B', and

C.1./ Strength test: Cut out at least two testing sample from the upper part of the envelope, and send them to strength test.

Be careful to take the samples from the original envelope fabric and not from a repaired part of it.

C.2./ Heating system

C.2.1./ Heating system must be checked with 2,45 MPA /25 bar/ pressure included fuel lines.

C.2.2./ Functioning of the burners are to be checked from every fuel cylinder. Check pressure by opening and closing burner control taps. Check pressure with functioning connections and cylinder control valves.

C.2.3./ Dismantle the jets of the burner and clean them from contamination.

C.2.4./ Dismantle the jet of the pilot light and clean it from encrustation.

C.2.5./ Check that there is no encrustation in the pilot flame chimney.

C.2.6./ Fuel hoses must be free from damages, attrition. Check carefully hose junctions, fittings.

C.2.7./ Pilot light connection should be free from encrustation and operative.

C.3./ Cylinders

C.3.1./ Check that all control valves can be closed separately.

C.3.2./ Check that ventilating valve is operative.

C.3.3./ Every cylinder should be checked /after removing the level-indicator/ on internal corrosion. /If there is doubt about inner corrosion the cylinder must be submitted to a pressure test/.

C.3.4./ In the case of cylinder damages, indentations the cylinder must be submitted to a pressure test.

5.2./ Repairs

Fabric used to repairs should be original balloon fabric or equivalent to it. Repairs are to be accomplished according to Instruction no 008-62 for repairing parachute outfits.

6. Performing maintenance, inspection

6.1 The aircraft must be submitted to maintenance form ‘A’ in every 30 days if the time between two flights reached 72 hours.

6.2 The aircraft must be submitted to maintenance form ‘A’ in every 30 days if it is stored continuously in a store-room.

6.3 After 25 hours flying time the aircraft must be submitted to maintenance form ‘A’ and this is to be completed with B.4.1. and B.7.2. maintenance record: “25 hour maintenance fulfilled.”

6.4 After 50 flying hours it is recommend to accomplish maintenance form ‘B’ instead of 25 hour maintenance.

6.5 Subsequent to 100 flying hours – or at expiration of the Certificate of Airworthiness – maintenance form ‘B’ must be performed. Maintenance record: “Maintenance form ‘B’ fulfilled, category of the aircraft….”

6.6 Maintenance form ‘C’ must be performed with classifying of the balloon when:

- the balloon has been operated for more than 3 years as of the date of manufacturing
- the flying time reached 300 hours
- the envelope has been operated beyond the temperature limit.

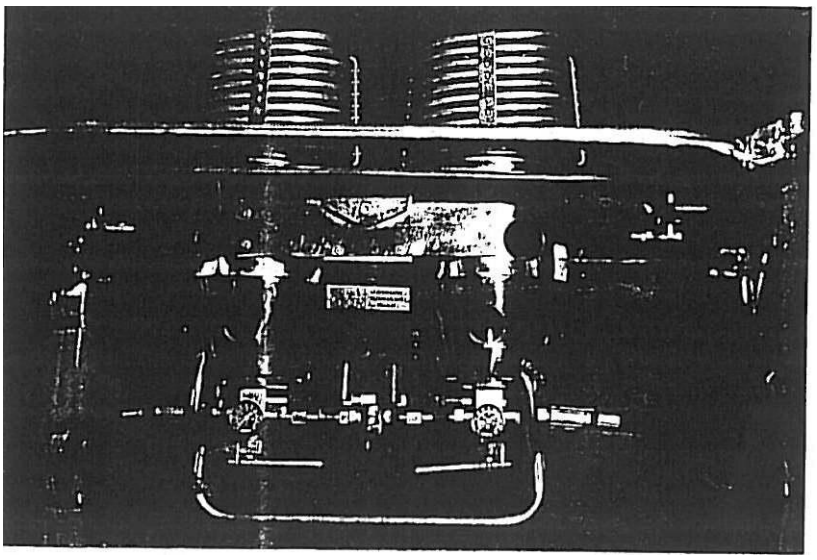
Record of defects, repairs, maintenance and inspections

TECHNICAL DESCRIPTION

INSTRUCTION AND MAINTENANCE MANUAL

FOR KÖGÁZ-II. TYPE HOT AIR BALLOON BURNER

AUSGABE:1987



TECHNICAL DATA OF THE BURNER

Type:KÖGÁZ-II
Calculated operating pressure bottle pressure: 7,2 bar (main burner)
Calculated nozzle diameter (main burner): 3,2 mm
Gas consumption with calculated nozzle and pressure: 2,6 kg/min
Capacity (with gas of calorific value of 46057 kJ/kg): 1995 kW
Gas consumption with duplicated main burners, one heating valve opened: 3 kg/min
Capacity (H1= 46057 kJ/kg)with duplicated main burners, one heating valve opened: 2302 kW
Allowed max. operating pressure: 8 bar
Allowed min. operating pressure: 5 bar
Test pressure: 30 bar
Recommended size of dome for the burner: AX-7; AX-8,AX-9 category
Material of burner: K0-35; K0-38 steel
Weight: 22kg

DESRCIPTION OF THE BURNER

The KÖGÁZ-II type burner – on the basis of previous experience was developed by KÖGÁZ.
It has an aesthetic design,it can be used easily and safely. The typical KÖGÁZ type solution of the handgrip ensures that the operator should not have use both hands for operating the burner, directing the flame and for climbing. Since one hand is free it can be used for further manoeuvring.
The burner has a turbular flame, the transverse-joint support makes it possible to direct the flame in two steps in a +-30 degree direction. There are heat insulating shields provided to the nozzles which protect travelers from radiating heat and back-firing as well.
Preheating, atomization and burning within the liquid phase of the gas is ensured by two nozzle systems that can be operated independently from each other. One system consist of the following:

1 connecting head for the gas pressure bottle
1 high pressure hose
1 heating valve
1 duplicated preheating spiral
4 replaceable nozzles

The gas leaves the nozzles of the burning head in atomized fluid phase. The flame of the two burning heads is adjusted so that not to give a long and sharp jet flame but a relatively short and spreaded flame. This feature allows the burner to be used at smaller AX-7 type hor air balloons as well.
Behind the heating valve of the two main burner we find a commoned system that can be activated with the No…..ball pivot.

This means if you open the ball pivot No……then (in. e.g. system One) after opening the heating valve both heads receive gas from the pressure bottle of system One. Gas flow is of course determined by the pressure anf flow diameters of system One as well. The aim of this system is that in emergency, in case of breakdown of a gas system of a burner the capacity of the other burner can be increased up to 15 percent. (see below the usage of the emergency system and safety measures.)
The heating valves of the main burners are sealed with double 0-rings (see diagram enclosed.) The compression ring ensures the automatic cutoff of the valve after releasing the handle. In case of breaking the spring the design of the valve closing leaves the closed due to gas pressure with a strength of 2 dan.
The ignition of the gas coming out of the main burner is ensured by the pilot flame. This system consists of the following:
connecting head for the gas pressure bottle
high pressure hose
junction towards the two main burners
2 throttles
3 BUNSEN-type burners
A it can be seen in the diagram, the ignition flame is basically one system, it is not duplicated like the main system. In order to have right ignition an ignition burner is placed within the spiral of both burners so that they burn continuously during operation. In case of proper adjustment the ignition burner keeps n burning if gust speed reaches 15 m/S.

The ignition of the two BUNSEN-type burner can be made by the piezo-burners No……. Burners can be of course ignited by other ways of ignition, too.

The KÖGÁZ-II. type hot air balloon burner in total fulfills the requirements concerned.

OPERATING INSTRUCTIONS

-Before putting the burner into working order check the fill and pressure of the gas pressure bottles!
Set up the operating pressure if needed with help of nitrogen cushion!
Before pressurizing woth nitrogen cushioncheck mechanical damages on the pressure bottles!
-Make a visual check on the burner concerning mechanical damages (cracking on the spiral, damages on the valve body, undamaged hoses and seals on the Hollanders etc.)
-free and easy motion of the heating valves
-correct ignition place of the burners.

-Connect ripping locks of the support rods to the frame then put burner into place!
If everything was found correct after the visual check then connect hoses to the right pressure bottles!
WARNING! For the sake of right sealing please use rubber sealings manufactured by KÖGÁZ for these quick-connecting Hollanders! (use of pentan-proof rubber is compulsory!)
-Open the valves of bottles of the main burner and check leakage at the bottle connection, at the heating valve or elsewhere!
-Open the bottle valve of the ignition burner system by pushing once or twice the No…..pushbuttons!
(take into account the time needed for the hose to be filled with gas – the BUNSEN-burner will burn only after this!)
If the pilot flame is burning, check the flame shape then adjust flame if needed with the help of the throttles!
WARNING! Prevent the ignition burning system from liquid-phase gas because this may cause freezing or generating of an ice-cork!

-If both ignition flame is burning and both bottle valves are fully open you can activate the main burners.
WARNING! After a couple of minutes of operation check the heating valves whether leakage of freezing occur.

-When opearating the burner take care of the fully opened position of the heating valve in order to keep the maximum efficiency and to avoid freezing as well!
-The burner is designed for intermittent running.
This does not exclude continous heating. In case of more than 10 minutes of continous running take care of the high thermal load that may cause deformation of the structure!
In case of intermittent running of the heating valve there is no limit for a continous burner operation.
-How to use the commoned system:
If there is a breakdown in one of the main burner systems (blockage, hose damage, pressure bottle valve breakdown, breakage of the dip tube etc.)and the captain decides to use the system, then open the commoned valve No……!
What happens now is that by disconnecting the heating valve of the defective system and opening the heating valve the working system liquid phase gas is flowing to spirals and nozzles of both burner head, i.e. both burners are operated by one heating valve.
This does not mean ofcourse a 100percent capacity increase, because at a consumption rate like the actual flow diameterworks as a throttle in this case. Capacity increase is therefore about 15 percent. WARNING! This is a frved kind of operation for one burner. Steady opearation would cause damages to the operating burner system and freezing of the heating valve as well.
This kind of operation can only be used in emergency and for a short period. The use of this system needs careful operation.

If the heating valve of the defective system has malfunction and bypasses then the gas flowing jerky may return to the hose of the defective system.

Therefore (except in case of hose damage) the hose should always be connected to the pressure bottle or leaking of the gas.

In total: the defective system have to be closed at a certain point somewhere.

-If the burner operation is about to be finished close the bottle valves of the main burners first and let the gas burn out from the hose.

After it close bottle of the pilot flame system and let the gas burn out from the hose again.

If there is only air in the hose then disconnect them from the bottles.

WARNING! Avoid sudden heat impact (like snow, cols water etc.) on the preheating spiral of the burner since it may cause cracking!

When storing or during transportation the burner should be fixed with a spiral dióown and hoses winded.

When transporting by hand it is forbidden to grip ti close to the supporting joints. The two frames moving within each other may break your hand! Akways clamp the two frames together concurrently so that they cannot shift on each other.

-The burner should be stored indoor.Avoid direct sun damages.

Warining! Hose life is 7 years calculated from date of manufacture. Date of manufacture can be found on the name-plate of the burner.

MAINTENANCE OF THE BURNER

Regular maintenance is needed for safe operation. The supporting structure of the burner is designed so that load generated during operation is picked up without deformation. In spite of this after fulfilling the task always make a visual check of the load-bearing structure of the burner! The burner is made of corrosion-proof material, no further treatment is needed. Always clean it with soft clothes! Do not wash it with petrol or gasonline because non-evaporating liquid may cause fire or burn onto the surface.

Before each flight

-always use a silicon spray for the 0-rings of the valve bod by drawing the heating valves, replace if needed.
-check and clean the throttling valves and nozzles of the ignition flame system and piezo ignition. After each dismantling and assembly check system leakage using soap foam test! We suggest the general checking, pressure testing and qualifying to be made by our factory after 2 years of operation.