Technical Description, User´s Manual and Packing Instructions for the HOP-330 Main Canopy

No. P – 003 – 05

6 th Issue

In Jevíčko, 03/2015

List of Changes

In case of necessity to change or amend this manual, the holder will be notified by means of approved changes. New (corrected) sheets will be enclosed to such changes. The holder of the manual is obliged to record all obtained changes into the List of Changes and replace out-of-date sheets with valid sheets. Changed or amended texts will be marked with a vertical line along sides, they will be further marked with a number and issue date of the change at the bottom of the page.

Sequence no. of the Change	Chapter	Nos. of Sheets with Referred Changes	Issue Date Of New Sheets	Bulletin No. With Issued Change	Date of Bulletin Approval	Date of Execution Signature

WARNING !

1. **Training and experience are required to reduce and eliminate the risk of serious or fatal injuries.**

   Never use this canopy unless

   A - you have read and understood this warning label and you have not completed a required training for the use of this canopy,

   or

   B - unless you have read and understood all relevant flight manuals for tandem systems and packing instructions and you have performed at least 100 jumps with a tandem parachute,

2. **In order to eliminate the risk of a serious injury, death, destruction or damage of the canopy, it is recommended not to exceed the following limits: load and speed at the parachute opening - see tactical and technical parameters (Chapter I, section 2.1 and 2.2 of this Description)**

MarS a.s.

Okružní II 239

569 43 Jevíčko

CZECH REPUBLIC

CONTENTS

CHAPTER I.

The HOP-330 Canopy Description

1. Specification
2. Tactical and Technical Parameters
3. Functions of the Canopy
4. Parts of the System
5. List of Replaceable Parts
6. Technical Description of Parts

CHAPTER II.

Parachute Packing Instructions

CHAPTER III.

Instructions for the Use of the Parachute

1. Preparation before Exits
2. Opening of the Parachute

CHAPTER IV.

Storage Instructions and Transportation

1. Storage Conditions
2. Transportation

CHAPTER I.

Technical description of the HOP-330Main Canopy

1. Specification

The aim of this Technical description is to provide users with only basic parameters, parts and guidelines for the use of the main canopy of the MarS-T tandem system/hereinafter HOP-330. The Technical description does not deal with training nor the HOP-330 use for jumps in pairs.

The HOP-330 canopy is designed to be used as the main canopy for jumps in pairs (tandem jumps) together with the MarS-T parachute system/ in containers with tandem arrangement and it can be used for jumps with brake parachute opened out of the parachutist´ s hand and then released with a manual release.

2. Tactical and technical parameters

Basic parameters

Brake parachute area BP-01T-1/ BP-04T-1	1,47 (1,33) m^2
Canopy dimensions	10,00 x 3,49 m
Area	30,66 m^2
Number of cells / double chambers	9
Number of suspension lines	20
Maximum canopy weight	6,4 kg
Descent rate at the weight of 180 kg depending on the braking mode	4,0 – 6,5 $m.s^{-1}$
Gliding ratio	1 : 3,5 – 4,5
Turn speed for 360°at the weight of 180 kg	3,0 – 6,0 s
Forward speed at the weight of 180 kg	max. 20 $m.s^{-1}$

The main canopy functional parameters

The parachute secures proper functioning at:

- The pilot and student weight including parachute and gear not exceeding 227 kg;
- Opening parachute speed between 120 and 335 $km.h^{-1}$ (immediate opening);
- The altitudes between 1200 and 4000 mT;
- jumps with an open brake parachute opened out of the parachutist hand and then released with a manual release.

Main canopy operational conditions:

- The parachute can be packed ready for jumps for 180 days in maximum;
- Its proper function is secured at temperatures between - 30 and + 80^o C at the relative air humidity corresponding with these temperatures;
- The connection of the tandem pair or parachutist´ s gear must be done in such a manner that it does not prevent the parachute from proper functioning.

Reliability assuring parameters:

Warranty period

Warranty period lasts 2 years on condition that repairs and replacements of used parts are carried out, storage conditions are maintained and regular inspections connected with the airing of the system are performed. The warranty period begins with the shipment date of the system and is to be recorded in the parachute logbook.

During warranty period the manufacturer will not accept claims in the cases as follows:

- Damage of canopy caused by their catching on gear
- Damage of canopy that occurred during the use
- Violation of conditions of packing, storage and maintenance of the parachute system by user
- Missing parachute logbook or its improper records
- Failure to follow the instructions of this technical description
- Any unskilled handling with the system.

General Overhaul and Inspections

- Canopies are accepted for general overhaul if a user representative evaluates further use of such a system as not suitable.
- General overhaul is performed either directly by the manufacturer or by an organization or person authorized by the manufacturer.

Total Life

The total life is set to 20 years in maximum, however technical condition of the canopy is important. Therefore it is required to keep the following conditions:

- Perform inspections and replace damaged parts in time and without any delay. Any replacement of parts must be recorded in the canopy logbook.
- Repair the canopies in time and without any delay, always according to this technical manual. Each and every repair must be recorded in the parachute logbook.
- After the elapse of 5 years of use carry out overall technical inspections (validity is for 2 years in maximum, result is to be recorded in the parachute logbook) till the end of its total service life (technical life).
- The evaluation of the technical condition of the canopy (technical inspection) is performed directly by the manufacturer or by authorized personnel. This inspection is recorded and must be archived one year longer than the parachute life, in case of any doubt this report must be made available to the manufacturer.
- In Main Risers VK-44/500/TC-1, the Main Risers must be sent to the manufacturer or person authorised by the manufacturer (parachute technician, senior parachute technician with valid authorization) to perform specialist inspection and evaluate the actual condition of Main Risers at the latest upon completing 300 dives or after 5 years of use.
- Canopies that do not comply with conditions for the life prolongation must be put out of operation.

3. Parachute function during jumps with brake parachutes, deployed from the parachutist´ s hand and released with a manual release:

3.1. After the exit out of the aircraft, the tandem pilot/instructor takes the stable belly position and between the 3rd and 5th seconds opens the brake parachute and continues in required time of the freefall.
If the parachute did not deploy within 5 seconds after the exit out of an aircraft, the main canopy cannot be open sooner than after the elapse of 10 seconds from the brake parachute deployment because of reaching the freefall speed, which secures a safe spreading of the main canopy. **The main canopy cannot be open sooner due to its possible serious damage and/or possible injury and health damage of the tandem pilot and student!**

3.2. The pilot pulls the primary brake parachute release at required altitude above the ground, which disconnects the three-ring system of the brake parachute suspension and release the brake parachute webbing. The closing pin, connected to the brake parachute connecting webbing, opens the container and the collapsed brake parachute, with its resistance, pulls the main canopy bag with the packed parachute out of the main canopy container.

3.3. Suspension lines of the parachute are unlaced out of rubber sleeves placed along the sides of the main canopy container. After all the lines are stretched, the main canopy container is opened, and the stowed main canopy is released out of the container and air begins to inflate the main canopy cells step by step. After the canopy´ s cells are inflated, the slider slips down in the direction from the canopy to the harness risers.

3.4. In this stage the tandem pilot checks proper functioning of the canopy of the main parachute. If the parachute is fully functional, then the tandem pilot collapses the slider with sliding lines on the slider. Securing pins on both sliding lines are stuck out and secured on the slider back edge.

3.5. Then the tandem pilot un-brakes the parachute and transfers it into the mode of full gliding. During the successive gliding fall, the pilot prepares the auxiliary steering line handles in such a manner that the pilot could easily grasp them during landing. At the same time the pilot opens the brake system protectors of the steering lines (in order to improve the clearness of the steering line rings). Then the tandem pilot steers the parachute with main steering lines to a set place.

3.6. Before the landing stage begins (at the height of approx. 500mT), the tandem pilot takes a pair of auxiliary steering lines that secure a comfort landing even during windless weather. The tandem pilot performs the landing manoeuvre in such a manner that from the altitude of 100mT no sudden changes of the landing direction are necessary. Due to the canopy´ s functions, it is not required to do any manoeuvres in order to increase the forward speed. **It is strictly forbidden to do any drastic changes in the fall direction at altitudes lower than 50mT!** Violation of this restriction may cause a serious injury of the tandem pilot or student (passenger).

4. Main parachute Parts

The parachute is used together with the following parts:

Main parachute **HOP – 330** 1 piece

Main parachute consists of the following parts:

- the main parachute canopy
- carrying lines
- main steering lines
- auxiliary steering lines
- slider
- fast links.

5. List of Replaceable Parts

With the exception of suspension lines and canopy, all the remaining parts can be replaced.
The replacement of each part is to be recorded into the parachute logbook.

6. Technical Description of Parachute Parts

6.1. The canopy with lines

It is made of polyamide fabric with low permeability and has 9 cells, each of which consists of 2 chambers. The line eye strength is distributed to the canopy thanks to webbings, 13 and 20 mm wide. Remaining stressed canopy parts are strengthened with 13-mm-wide webbings, the trailing edge is strengthened with a15-mm-wide webbing. At risers, the canopy is tied into two groups of lines on the front strap and into one group of line on the back strap. This line divides at the canopy.

6.2. Fast links

Four rapid links, placed at the end of suspension lines, and connect the canopy to the harness. The link minimal strength is guaranteed to 10 kN.

6.3. Slider

The rectangular-shaped slider is made of polyamide fabric and its edge is reinforced with a43-cm-wide webbing. Four stainless steel grommets, with inner diameter of 26 mm, are pressed in all four corners.

CHAPTER II.

Packing Instructions

Periodical checks (are performed at the system assembly and after every 50 jumps or after every 180 days – it depends which situation occurs first). The HOP 330 canopy is to be checked carefully before first jump, then perform inspections periodically in the above mentioned frequency. Such an inspection should be more thorough than the inspection carried out during packing. The canopy inspection is to be made in a clean and well-lightened place where the canopy can be extended. All damaged parts are to be replaced or repaired before the packing begins.

This check is applied only with the HOP main canopy. Instructions for the check of the harness and other parts are described in related documentation.
Be thorough and systematic. Begin with inspection at the top canopy part and continue downwards to the loose ends of the carrying harness.. The canopy is connected to the carrying harness during such a check.

1.**The Brake parachute attachment to the deployment bag.** Check if the connecting webbing with an eye is well connected with the deployment bag. Also check the entireness of the brake parachute canopy fabric, the “kill-line” and reinforced webbings as well as the main deployment bag strengthened webbings and condition of eyes at the place where the brake parachute is attached and at the place where the main canopy is attached.

2. The deployment bag attachment to the main canopy. Check if the eye at the attachment point of the main canopy is intact and not damaged and if the main canopy is not damaged near the deployment bag attachment point. Then check a fast connection between the bag and main canopy.

3. Outside canopy fabric. Stretch the canopy with upper canopy fabric upwards and check the upper fabric. Concentrate on tears, stains and damaged seams. Check the fabric strength in such a way that you hold a part of the fabric in each hand and with not a very strong pull, try to tear the canopy.

4. Inside canopy fabric. Turn the canopy inside out and stretch it in order to check it. Concentrate on tears, stains and damaged seams. Check the fabric strength (see par. 2), then check the line anchoring.

5. Check all the ribs from the leading edge up to the trailing edge while checking each chamber/cell inside. Pay special attention to the attachment point of lines and handles.

6. Put the canopy carefully on one side and straighten all the ribs next to each other. Check if the lines in single groups have a correct length and if the differences in lengths of single groups correspond to required values for specific parachute types. Check the condition of stabilizers and slider stops.

7. Suspension lines Check each line along the whole length if it is not damaged or worn out

Check if the connections at the place of division (an Y-shaped connection of 2 lines) are not frayed and if each line is fastened to a fast link.

8. Slider. Check if the fabric is not used, rings are not damaged with any sharp edges and if they are not pulled out of the slider.

9. Main harness risers

Check if the screw locks of safety snap hooks are fastened and if lin protections are properly placed. Steering loops should be placed and connected properly as shown in the next picture.

The auxiliary equipment steering loops are placed nearer the centre. The placement and connection is shown in the picture.

Check a proper connection of the harness risers to the carrying harness and a proper assembly of the three-ring throw-off system.
The canopy packing is performed by an authorized person (packer), who records such proper packing into the parachute logbook.

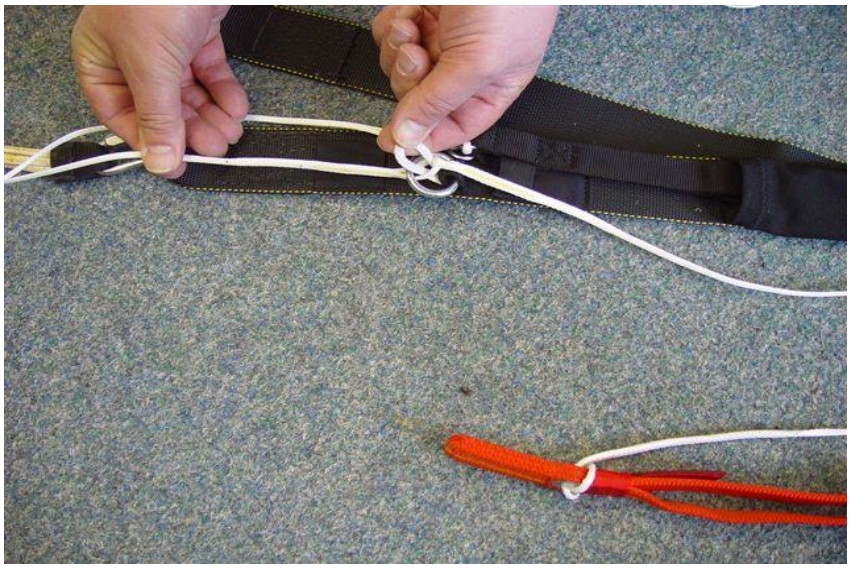
Parachute packing

Fix the parachute set harness to the packing pad edge and spread the canopy on it. If the lines are twisted, untwist them. Pull the slider down to the canopy. Perform an inspection of all the important canopy parts.

Then prepare the harness **and the container for the parachute packing.**

Prepare the canopy for packing. Spread each part of the canopy in such a manner that suspension lines remain extended. Then smooth carefully front and back canopy parts. During the whole packing, single groups of suspension lines must remain stretched. Brake steering lines. The sequence is shown in pictures. Thread the brake loop through the ring in the steering line.

Thread the brake loop through the brake ring.



Interlaced brake loop fix by reinforced part of the main canopy steering loops RP-009 TC-1.

Put the reinforced part of the steering loop into the tape channel on the riser.

Put the securing reinforcement into the steering lloop on the riser.

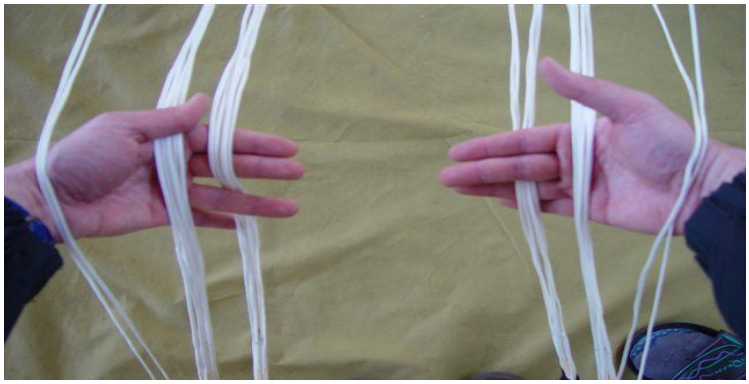
We store the redundant part of the steering line to the loops in the middle part and at the end of the steering loop.

We insert the end of the steering loop to the elastic fabric channel on the riser.

Connection of the auxiliary equipment steering loops of the additional steering RP- 011 TC -1 to the Main riser.

Connection of the auxiliary equipment steering loops of the additional steering is obvious from the following pictures.

We carry out a check of suspension lines of the main parachute from the harness straps up to the attachment of the suspension lines to the canopy. Insert your left hand fingers among individual left straps and between the left steering line and straps. Repeat the same step with your right hand in such a manner that each line group and each steering line remains in the empty space between two fingers. Stand yourself between the groups of right and left risers as shown in the picture. Make sure that the straps are not twisted. Start lifting the lines while they slide between your fingers until you reach the bottom canopy edge.



As soon as you reach the canopy edge, stretch out your arms to the sides as much as the slider allows. Shake the canopy several times in order to align single canopy cells. If the canopy is aligned, there will be four clearly differentiated line groups (A, B, C, D) leading up to the stabilizers, where no lines cross one another nor remain twisted. The aim is to get suspension lines aligned with single suspension rib trims.

After the lines are checked, connect suspension lines into one joint bundle. Now, place the parachute lines on a random shoulder in such a manner that the stops on the main parachute canopy are at the same height. Use one hand to list individual canopy cells leading parachute edge in an order form A-1 to A-10.

Cells will be listed correctly. During the whole process of packing, individual groups of lines have to be stretched out at all times, while the leading edge should still be leading towards the harness. Following pictures describe packing procedure. The parachute should look like the one in the picture. Slider should be touching appropriate stabilizer stops, which have to be at the same height for the whole time of packing.

We find the A group of lines on one side of the canopy. We should hold the canopy in front of ourselves, as we have it now, A lines form front part of line groups going through the front passages of the slider (part, which is the closest to us).

We insert our left hand between A and B lines attachment (there are lower edges of canopy ribs). The right hand holds A lines and we stretch arms away from each other. The fabric between the A and B lines is pulled away from the parachute centre and create the first fold.

We repeat the same procedure for B and C groups of lines and pull the folds away from the center of the parachute towards its outer perimeter.

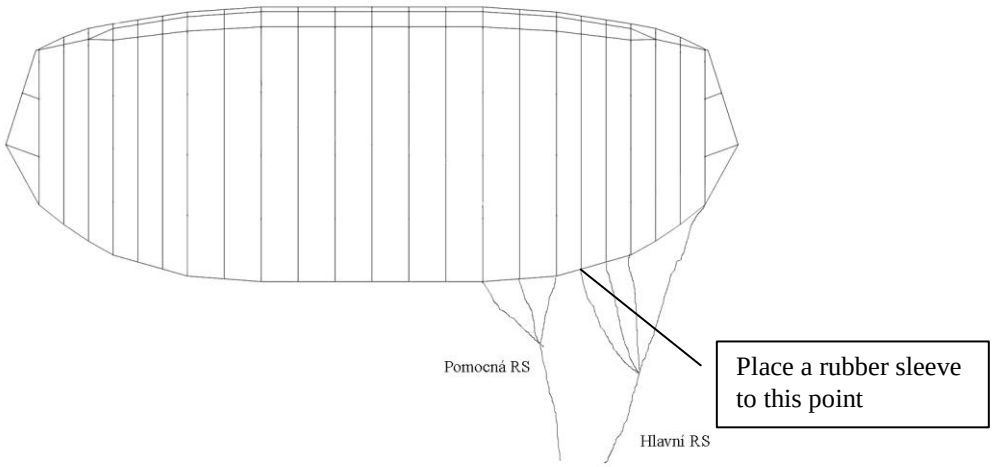
Now, when we have pulled the canopy between the B and C lines, we do the same between C and D lines. Folds of the fabric should after listing look like those in the following picture.

The D group of lines is found the closest to trailing edge and on the contrary to steering lines is not connected to trailing edge of the canopy

Left steering lines will be pulled towards left in such a way that they would not get tangled into packing. We continue in the direction of down along the stabilizer towards D lines. Get hold of the D lines and separate them form steering lines. We take the whole D group of lines and pull it carefully. We fold D group with one movement of hand in such a way that between C and D lines is created another fold of material. We continue in the same manner, but in a mirror-like fashion on the opposite part of canopy. Fold between A and B lines, fold between B and C lines and fold between C and D.

Before folding the trailing edge, carry out a check of rubber sleeve on the fourth steering loop in the direction from the parachute beginning to the parachute center. (see Ground plan of canopy and a scheme of steering lines tie-up). In case that we find our some wear or damage of rubber ring, carry out its replacement even on the opposite side of the canopy.

The canopy plan and the scheme of steering line connections



Fold the trailing edge into S-folds in a similar way to stabilizers. Stretch the steering lines and auxiliary steering lines and turn the excess auxiliary steering lines twice around the forefinger and middle finger of left or right hand, and put the resulting twist into a rubber sleeve.

The next step is to check if the stabilizers and their slider stops are in the proper position outside the suspension lines. If the stabilizer (or its slider stop) lies under the line, the canopy could possibly become damaged. The canopy stowed in this way should look like in the following picture.

Folds created between individual rows of lines and on the trailing edge should be placed alternately towards the canopy centre, therefore consequent possible shift of some of the suspension lines over the leading canopy side. Folds between suspension lines A and B should on the other hand be folded together with leading canopy edge into its central part. Then we straighten the slider.

Than we have to hold the trailing edge exactly in the middle, in a place where identification mark is sewn on. Lift the trailing edge and lay it to slider stops and hold it on the place with the same hand that holds the lines.

Roll the canopy trailing edge evenly around the stowed canopy and align the left and right sides in such a manner that the seams and trailing edge trims are placed against each other.

Connect both parts and roll them as shown in the picture.

Insert the rolled-up trailing edge part into the parachute centre (see the picture).

Put your free hand under the canopy carefully. Swing slightly the canopy so that the lines remain stretched and place it slowly on the pad in such a way that the canopy remains evenly divided into halves.

Move to the canopy side and place your hand under the canopy edge, where the slider is placed. Put your second hand on top a little bit further and create an S-fold. Be careful so that the slider remains on top touching stabilizers and do not let its move down along the lines.

Kneel on the canopy fold astride so that the warning label is placed between your knees. Fold the canopy rest over your knees towards your belly and span it all around with your left or right hand in such a manner that you hold it together. Start pulling the container over the canopy, first one side, then the other one. Keep the stowed canopy corner on top during the container pulling-over, then place in such a way that you fill the container corners with it therefore the packed canopy will look neater.

Hold the canopy with your free hand at the place where the main canopy container is connected and fold it back over the enfolding arm towards the packing pad. Smooth the container and insert a left or right part of the first canopy fold into the container as shown in the picture. Then repeat this step on the opposite side.

Only when the whole canopy is placed inside the container, release the pressure of your knees. The above described procedure helps to fill the container completely and evenly. After the main canopy is stowed into the bag, smooth it inside. Pay attention to the canopy trailing edge central seam and the warning label that must be placed symmetrically in the centre. Their even placement influences a symmetrical canopy opening.

Close the deployment bag with a suspension line bundle. Put the remaining suspension line length into rubber sleeves so that the length of single loop is between 5 and 7 cm.

After the suspension lines are put into rubber sleeves on the main canopy deployment bag, smooth the protruding fabric of the canopy into the container together with the remaining suspension lines with harness risers.

Prepare the parachute cover for the container storage with suspension lines and harness risers.

As described in harness manufacturer instructions, stow the closed bag into the main canopy container.
Remaining steps of the main canopy packing is described in the P-005-05 container/harness technical description.

CHAPTER III.

Instructions for the Parachute Use

1. Parachute preparation before exit

The parachute system can be packed for a freefall jump with the use of a brake parachute. **The preparation for the exit itself depends on the used type of the tandem parachute set.**

CHAPTER IV.

Storage and Transportation Instructions

1. Storage Conditions

The parachutes are stored in shelves in a dry, dark and well-aired room.
The distance between the bottom shelf and the floor must be 0.1m in minimum, the distance between the shelf and walls must be 0.5m in minimum and the distance to heating radiators 1m in minimum. If a parachute is stored for a longer period, it must be aired for 24 hours in minimum every 6 months.
The parachute is aired in the shade and cannot be exposed to sunlight.
It is forbidden to store any metal objects that do not belong to parachutes, nor any oils, acids, solvents or any other aggressive substances in premises where parachutes are stored.

The following climatic conditions must be fulfilled in storage premises:

- Temperature between +14 and +25 ^{o}C
- Relative air humidity between 35 and 73 %
- Average annual relative humidity between 45 and 55 %.

Parachutes are stored unpacked. If packed, they cannot be stored longer than 120 days after their packing.

2. Parachute Transportation

On operational conditions, parachutes are transported in portable bags.

2015

MarS a.s., Okružní II 239, 569 43 Jevíčko, THE CZECH REPUBLIC

phone: +420 461 353 841; fax: +420 461 353 861

http:\\www.marsjev.com, e-mail: mars@marsjev.cz