



# Owner's Manual

01.01.20 V02

*[www.icarusworld.net](http://www.icarusworld.net)*



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1. LETTER FROM ICARUS WORLD

Dear Customer,

*Welcome to the ICARUS WORLD!*

We would like to thank you for trusting ICARUS WORLD and its products. By purchasing an ICARUS WORLD NANO RESERVE canopy, you have made a choice for TECHNOLOGY, QUALITY & RELIABILITY.

Your ICARUS WORLD NANO RESERVE has been designed, built, tested and approved to today's highest industry standards established on the ETSO C-23d and TSO-C23d for your safety.

Whether your ICARUS WORLD NANO RESERVE canopy is brand new or used, we strongly recommend that you and your rigger inspect with detail your ICARUS NANO RESERVE canopy and get familiar with its characteristics and workmanship quality.

With proper care and maintenance, your ICARUS WORLD NANO RESERVE canopy should provide you many years of use and service.

Once again, we would like to thank you for choosing ICARUS WORLD and its products.

Sincerely,

ICARUS WORLD

## 2. PRODUCT DATA RECORD

*CONGRATULATIONS on selecting your new ICARUS WORLD canopy!*

*Experience the true REALITY OF FLIGHT.*

*Blue Skies!*

**CAUTION!**  
CHECK LINE ROUTING  
AND CONTINUITY AFTER  
ASSEMBLING ON RISERS.

Important:  
Keep S/N and DOM (Date of Manufacture)  
for record purposes and maintenance of  
your canopy



Canopy Model	ICARUS NANO Reserve
Canopy Size	
Serial Number (SN)	
Date of Manufacture (DOM)	
Line material	SPECTRA

### 3. WARNING



# WARNING

READ THIS MANUAL CAREFULLY PRIOR ASSEMBLING, PACKING AND/OR USING YOUR ICARUS WORLD NANO RESERVE PARACHUTE.

THE ICARUS WORLD NANO RESERVE MUST BE INSPECTED AND ASSEMBLED BY A QUALIFIED AND PROPERLY RATED RIGGER.

## W A R N I N G

Each time you use this parachute you risk bodily injury and death.

You may reduce this risk by:

A - Assuring every component of the complete parachute system has been assembled and packed in strict accordance with the manufacturer's instructions.

B - Obtaining proper instruction in the use of this parachute and the rest of the equipment, and

C - Operating each individual component of the system in strict compliance with the owner's manual and safe parachuting practices.

Anyway, sometimes parachute systems fail to operate properly, even when properly assembled, packed and operated – so YOU DO RISK SERIOUS INJURY AND DEATH EACH TIME YOU USE THE SYSTEM.

### 4. STATEMENT OF COMPLIANCE

The policies contained herein comply with the Federal Aviation Regulations, Part 21.

### 5. REVISION LIST

This manual may be revised at any time by ICARUS WORLD. The only way to ensure that this manual is current for your canopy is to check periodically with ICARUS WORLD or check [www.icarusworld.net](http://www.icarusworld.net).

We always welcome suggestions how to improve this publication. If you feel parts are incomplete or hard to understand, please let us know by writing or emailing us. ([info@icarusworld.net](mailto:info@icarusworld.net))

## **6. DISCLAIMER NO WARRANTY**

Because of the unavoidable danger associated with the use of this parachute, the manufacturer makes no warranty, either expressed or implied. It is sold with all faults and without any warranty of fitness for any purpose.

The manufacturer also disclaims any liability in tort for damages, direct or consequential, including personal injuries resulting from a defect in design, material, workmanship or manufacturing whether caused by negligence on the part of the manufacturer or otherwise.

By using this parachute assembly, or allowing it to be used by others, the user waives any liability of the manufacturer for personal injuries or other damages arising from such use.

If the buyer declines to waive liability on the part of the manufacturer, buyer may obtain a full refund of the purchase price by returning the parachute before it is used to the manufacturer within 30 days from the date of the original purchase with a letter stating why it is returned.

## **7. GENERAL INFORMATION ABOUT THIS MANUAL**

To reduce the unavoidable risk of serious injury or death, you must obtain instruction in the use of this parachute from a competent and appropriately rated instructor before using this parachute for the first time.

It is beyond the scope of this manual to teach you how to deploy, fly, land or maintain this parachute. This manual is meant to be a general guide only. It does not replace or substitute for proper training and instruction.

Parachute associations around the world, including the United States Parachute Association, publish recommended procedures on learning to skydive and on using parachuting equipment. We highly urge you to learn and follow these procedures.

Using this parachute without first receiving thorough and personal instruction increases the risk of serious injury or death.

Parachuting technology and procedures continue to advance rapidly. ICARUS WORLD cautions that this manual may contain information that may not be correct or behind the current state of the art of parachute use.

For these reasons, you must use qualified experts, properly rated riggers and instructors to help you inspect, assemble, pack, use and maintain this parachute.

## 8. READ BEFORE ASSEMBLY OR USE

Since parachutes are manufactured and inspected by people there is always a possibility that this parachute contains defects as a result of human error. Therefore, each individual component of the complete parachute system must be thoroughly inspected before their first use and before each use thereafter.

For a number of reasons, parachutes suffer degradation through time and the damage may or may not be obvious. Therefore, parachute and aviation associations around the world have laws regarding repack and inspection cycles for parachutes. Make sure that you are aware of the laws pertaining to you.

Repack Cycles Currently, up to one-year repack cycles are authorized for ICARUS WORLD reserve canopies when cared for properly. Proper care includes keeping the entire system clean, dry, limited exposure to UV light, not overheating, and no exposure to degrading elements. ICARUS WORLD reserves the right to extend or reduce repack intervals based on continued research and field experience. You must use the shortest repack **cycle of your country's applicable legal requirements, harness/container manufacturer's requirements, and AAD manufacturer's requirements.** Your new ICARUS WORLD reserve canopy must be assembled, inspected and packed into your parachute system by a certificated rigger. Even if you live in a country where it is legal for you to assemble and maintain your reserve, you should let an experienced and appropriately rated person that is familiar with this reserve, your harness/container and all other components of the parachute system perform the assembly and repack. If your reserve parachute is improperly assembled or packed, you risk serious injury or death!

This parachute should be immediately inspected if at any time it was exposed to any environmental factor that could cause damage.

Inspections must be performed by a qualified and properly certificated rigger who has previous experience with this type of parachute.

Be aware that some chemicals will continue to degrade the materials this parachute is made of long after initial exposure.

If the ICARUS WORLD NANO RESERVE canopy has been exposed to or stored in extreme humidity **or became wet during a water jump or so called "water swoop" landing, the ICARUS WORLD NANO RESERVE canopy must be unpacked, aired and dried, inspected and repacked before the next use!**



Regular and thorough inspections are necessary to maintain the structural integrity, reliability, and, last but not least, the flight characteristics of this reserve parachute.

Ensure that you know the entire life history of every single part of your parachute system.



## 9. WARNING LABEL

Warning label on ICARUS WORLD NANO RESERVE canopy can be found on the center top surface by the tail.

 <b>WARNING</b>					
<p>THIS IS A HIGH PERFORMANCE PARACHUTE; EVEN NORMAL USE MAY RESULT IN SERIOUS INJURY OR DEATH. TRAINING PROFICIENCY AND SKILL ARE REQUIRED TO LOWER THE RISK. READ AND COMPLY WITH ALL MANUFACTURER'S MANUALS, RECOMMENDATIONS, PROCEDURES, PLACARDS AND LIMITATIONS. PARACHUTE SYSTEMS SOMETIMES FAIL TO OPERATE CORRECTLY, EVEN WHEN PROPERLY MANUFACTURED, ASSEMBLED, PACKED AND OPERATED. YOU RISK SERIOUS INJURY AND DEATH EACH TIME YOU USE THIS SYSTEM.</p>					
CANOPY HISTORY LOG					
<p>EACH TIME THIS CANOPY IS PACKED BUT HAS NOT BEEN JUMPED, MARK A DIAGONAL BAR IN THE NEXT EMPTY BOX. <input type="checkbox"/></p> <p>EACH TIME THIS CANOPY IS PACKED AFTER IT HAS BEEN JUMPED, MARK A "X" IN THE NEXT EMPTY BOX. <input checked="" type="checkbox"/></p> <p>THIS CANOPY MUST RECEIVE A FABRIC PERMEABILITY TEST WITHIN EACH 25 JUMPS AND 40 PACKS. DO NOT REPACK UNLESS THESE REQUIREMENTS ARE MET.</p>					
<b>MODEL</b>		<b>NANO</b>		<b>SIZE</b>	
<b>P/N</b>		<b>317523-1</b>		<b>INSPECTOR</b>	
<b>S/N</b>					
<b>MFR DATE</b>					
<b>MAX. OPERATING WEIGHT</b>			<b>LBS</b>	<b>MAX. OPERATING SPEED</b>	
			<b>KG</b>	<b>150</b>	
				<b>278</b>	
				<b>KNOTS</b>	
				<b>KM/H</b>	
<p>• THIS PARACHUTE IS APPROVED UNDER EASA ETSO-C23d AND FAA TSO- C23d.          • AS8015 Rev B 4.3.4 AVERAGE PEAK FORCE 12 KN.          • APPROVED FOR USE WITH SINGLE HARNESS RESERVE PARACHUTE ASSEMBLIES EQUIPPED WITH OR WITHOUT A MAIN PARACHUTE RELEASE ONLY.</p>					
<p>REMOVAL OF THIS LABEL VOIDS THE ETSO, TSO AND ALL WARRANTIES</p>					
			<p><b>ICARUS WORLD</b> www.icarusworld.net</p>		

P/N 040385 R02

PANTONE 100% Process Black CV  
PANTONE Orange 021 CV

## 10. PRODUCT INFORMATION

The *ICARUS WORLD NANO RESERVE* is an incredible addition to the wide array of products found in the ICARUS WORLD product line. The SFIRE, XFIRE, SAFIRE 2, CROSSFIRE 2, EQUINOX, OMNI, *Om-7* and NEOS are able to be combined with the *ICARUS WORLD NANO RESERVE* to offer a complete canopy package for every modern skydiver/canopy pilot that provides security and dependability with an incredible low volume technology.



The *ICARUS WORLD NANO RESERVE* is engineered and produced using the highest construction standards and impressive performance that will satisfy the current demands of this generation of skydivers. ICARUS WORLD has successfully completed the ETSO-C23d by EASA (European Aviation Safety Agency) and TSO-C23d (FAA) testing and certification process, complying with the latest and highest requirements for safety and performance in the industry.

The outstanding strength and reliability of the *ICARUS WORLD RESERVE* has been maintained; however, through innovation and enhancing the weaving process we are able to offer an important bulk reduction within *ICARUS WORLD NANO RESERVE*. The trust and effectiveness of the traditional *ICARUS WORLD RESERVE* canopy has been complemented with high resistance low bulk materials to assure the same high caliber of safety with an increased ability to install the *ICARUS WORLD NANO RESERVE* into smaller containers.

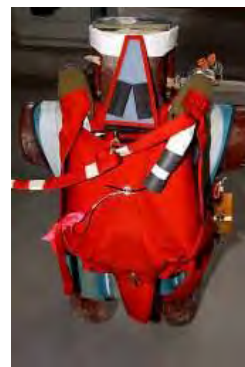
ICARUS WORLD has gone again *ONE STEP AHEAD* and has designed a state-of-the-art wing that provides swift, accurate and reliable opening as well as incredible flight characteristics for a reserve canopy. Aside from the amazing opening and flight characteristics- the landing performance is unparalleled making the *ICARUS WORLD NANO RESERVE* the complete package from deployment to touch down. The *ICARUS WORLD NANO RESERVE* is the canopy you want to have your back in an emergency.

### 10.1. *The Evolution from the ICARUS WORLD Reserve to the NANO*

In 1999, ICARUS Canopies began the *ICARUS Reserve* project, in order to fulfill the market demand for a high-quality Reserve canopy.

In May 2002, *ICARUS Reserve* certification testing began in France at the independent test center CEVAP (Centre d'Essais en Vol Aérotransport, Parachutage in Toulouse) - D.G.A. (Délégation Générale pour l'Armement) – Ministère de la Défense.

From July to September 2003, CEVAP successfully completed all the test drops according to ETSO-C23d certification requirements (refer to EASA regulations for further detail).





In November 2003, CEVAP issued the final test report, concluding with the satisfactory completion of all ETSO-C23d certification requirements, stating that "The reserve canopy PN 317523-1 (Part Number for the *ICARUS Reserve*) has a good flight behavior, particularly during the landing phase".

In October 2005, with the completion of the certification process, the EASA (European Aviation Safety Agency) issued the ETSO certificate for the *ICARUS Reserve*.

In January 2006, the FAA issued TSO approval for the *ICARUS Reserve*.

In July 2006, ICARUS Canopies began delivering *ICARUS Reserve* canopies to the market.

In February 2010, ICARUS Canopies began the process of developing a new weaving technique that would allow the use of 30 denier fabric, therefore falling under the same TSO as its predecessor, and still the same resistance and reliability of the *ICARUS Reserve* while significantly lower volume.

In February of 2012 ICARUS Canopies concluded the search as a result of finding the manner in which to weave 30 denier fabric that packs 30% significantly smaller than the previous *ICARUS Reserve*.

In September 2013, ICARUS Canopies releases the *ICARUS NANO RESERVE*.

## 10.2. Product Specifications

The *ICARUS WORLD NANO RESERVE* is a 7-cell canopy made of low porosity fabric and Spectra lines for reduced pack volume. Sizes are available from 99 to 253 sq. ft (no custom sizes). The *ICARUS WORLD NANO RESERVE* is only available in WHITE.

The *ICARUS WORLD NANO RESERVE* is designed and constructed as a low aspect ratio, 7-cell parachute with a square planform for stability during opening, flight and landing, exhibiting predictable behavior throughout its entire flight.

The *ICARUS WORLD NANO RESERVE* exceeds the requirements of the Aerospace Standard AS8015B, the FAA TSO-C23d and the EASA ETSO-C23d. The rugged construction uses additional reinforcement chordwise, spanwise, throughout the nose, and at all line attachment points.



The *ICARUS WORLD NANO RESERVE* canopy features an extra low pack volume as compared to other regular reserve parachutes. Even better results than the traditional ICARUS WORLD Reserve canopy are obtained when talking about packing volume, thanks to the use of 0-3 CFM low permeability, high quality ripstop fabric (SASPA T-34, PIA C-44378C Type IV), together with its unique reinforced construction. However, exact pack volume can be affected by many things including environmental factors, packing technique, and even the number of pack jobs on the canopy.

The suspension lines are 725 lb Spectra, with the lower steering lines made of 1000 lb Spectra. Line attachment points are secured with double bartacks for higher strength. *ICARUS WORLD NANO RESERVE* Spectra lines are coated to assure better protection during packing, opening and after landing, better resisting damage from bushes, sand, Velcro hook, etc....

The *ICARUS WORLD NANO RESERVE* slider includes an opening in the center and extra reinforcement to ensure fast and reliable openings.

The *ICARUS WORLD NANO RESERVE* is manufactured under the highest Quality Control standards. All materials and processes are thoroughly inspected and tested according to military standards (MIL SPECS). The manufacturing process is strictly controlled under ISO 9001:2000, NATO AQAP 2120, and EN9100:2003 for Aerospace Quality Standard, EASA Part 21A.G.

### 10.3. *Selecting the appropriate ICARUS WORLD NANO RESERVE canopy*

To select the appropriate ICARUS WORLD NANO RESERVE size for a jumper, several factors must be taken into consideration. Some of these factors are legal limits and must be respected.

To select the appropriate ICARUS WORLD NANO RESERVE size, first and foremost, consider the jumper's MAXIMUM EXIT WEIGHT. Make sure that the jumper's MAXIMUM EXIT WEIGHT complies with the certified one for each ICARUS WORLD NANO RESERVE canopy size, in accordance with FAA TSO C23(d) and EASA ETSO C23d requirements.

The MAXIMUM EXIT WEIGHT for a reserve canopy size is a legal limit. This parachute was tested under US FAA TSO C23d and EASA ETSO C23d to maximum exit weights of 255 lb(116 kg). It is forbidden to use any ICARUS WORLD NANO RESERVE parachute with an exit weight exceeding the MAXIMUM EXIT WEIGHT for which each canopy is certified.

The MAXIMUM EXIT WEIGHT is detailed on the warning label sewn on each ICARUS WORLD NANO RESERVE, in the ICARUS WORLD NANO RESERVE manual and in all product documentation that can be found in the ICARUS WORLD web site [www.icarusworld.net](http://www.icarusworld.net)

Other important factors to consider include the jumper's level of experience. Level of experience may vary from person to person and depends also on number of jumps, type of jumps, basic and additional training and jumper's skills.

Drop Zone physical placement (elevation, winds, weather, ground conditions, etc...) should also be considered. All these factors influence the performance of any given main and reserve canopy.

We recommend selecting the ICARUS WORLD NANO RESERVE canopy size as similar as possible to the main canopy for safety considerations.

### 10.4. *Operational Limitations*

Deployment speed is limited on all sizes to 150 KTAS at mean sea level.

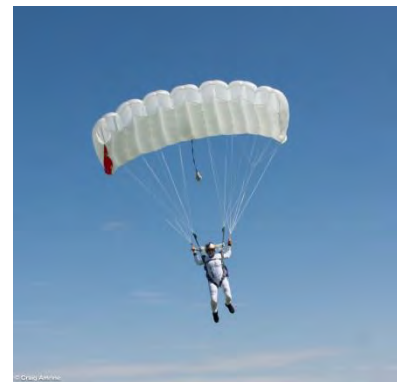
The ICARUS WORLD NANO RESERVE was designed to operate and function within these specific weight and speed parameters, while oriented in a "belly to earth" body position

Some body positions during freefall (i.e. head down, stand up, long dives etc.) may enable the user of this parachute to reach speeds beyond those for which the equipment has been designed and tested.

In the event of a premature or unintentional deployment while in these body positions you risk any /all of the following:

- Extremely hard openings
- Equipment failure
- Light to severe injuries
- Death

Never exceed the operational speed or weight limits of the parachute system. You should avoid deploying in an attitude that the equipment was not designed for.





### 10.5. Permitted Wing Loadings

Wing loading can be calculated as follows:

The jumper's total exit weight is the total weight, in pounds, of the jumper's body plus the weight of all the jumper's equipment, including the parachute system itself (normally 20 – 30 pounds) and any additional equipment such as helmets, cameras, etc.



Wing loading is then determined by dividing the jumper's total exit weight (in pounds) by the surface area of the parachute (in square feet).

Example:

- A jumper who weighs 170 lbs wearing his jumpsuit, helmet and altimeter; using a packed rig that weighs 25 pounds

The jumper will have an exit weight of 195 pounds.

If this jumper jumps a 169 sq. ft. canopy, he would have a wing loading of 1.15 pounds / square foot:  $195 \text{ lb} / 169 \text{ ft}^2 = 1.15 \text{ lb/ft}^2$

A wing loading lower than 0.5 lbs/ft<sup>2</sup> is unsafe. In unstable atmospheric conditions such as turbulence, such a wing loading may not allow for sufficient pressurization of the parachute. Additionally, forward speed is reduced to the point that penetration into even light winds may not be possible. Therefore, the wing loading range below 0.5 lb/ft<sup>2</sup> is NOT allowed.

A wing loading between 0.5 and 0.7 lb/ft<sup>2</sup> is considered a light wing loading. It is especially recommended for low experienced jumpers. This wing loading may allow you to make small mistakes, such as an early or late flare, without severe consequences. The parachute is still a little bit sensitive to unstable atmospheric conditions, such as turbulence. In consideration of this, even though other people might be jumping, this wing loading should not be considered safe in unstable atmospheric conditions.

A wing loading in the range from 0.7 to 1.1 lb/ft<sup>2</sup> is recommended for most jumpers. The parachute will have the best overall performance within this range. This wing loading establishes the best balance between properties like speed, flare power, reactivity, and resistance to adverse atmospheric conditions.

A wing loading between 1.1 and 1.325 lb/ft<sup>2</sup> is ONLY allowed for very experienced jumpers who are aware of the dangers associated with flying a highly loaded reserve parachute. Landing a parachute with this wing loading requires a high skill level, especially in small landing areas, at high density altitudes, or in congested traffic areas. At this wing loading, even with a fully deployed parachute, being unconscious or making an error of judgment during landing can still result in serious injury or even death.

A wing loading higher than 1.325 lb/ft<sup>2</sup> is unsafe because of the high descent rate even with a fully deployed canopy. At this wing loading, the parachute cannot be expected to save your life if you are unconscious. Therefore, it is NOT allowed to fly in the wing loading range above 1.325 lb/ft<sup>2</sup>.

According to the US FAA certification limits, it is forbidden to jump with this parachute with an exit weight exceeding 255 lb (116 kg).

### 10.6. Certification

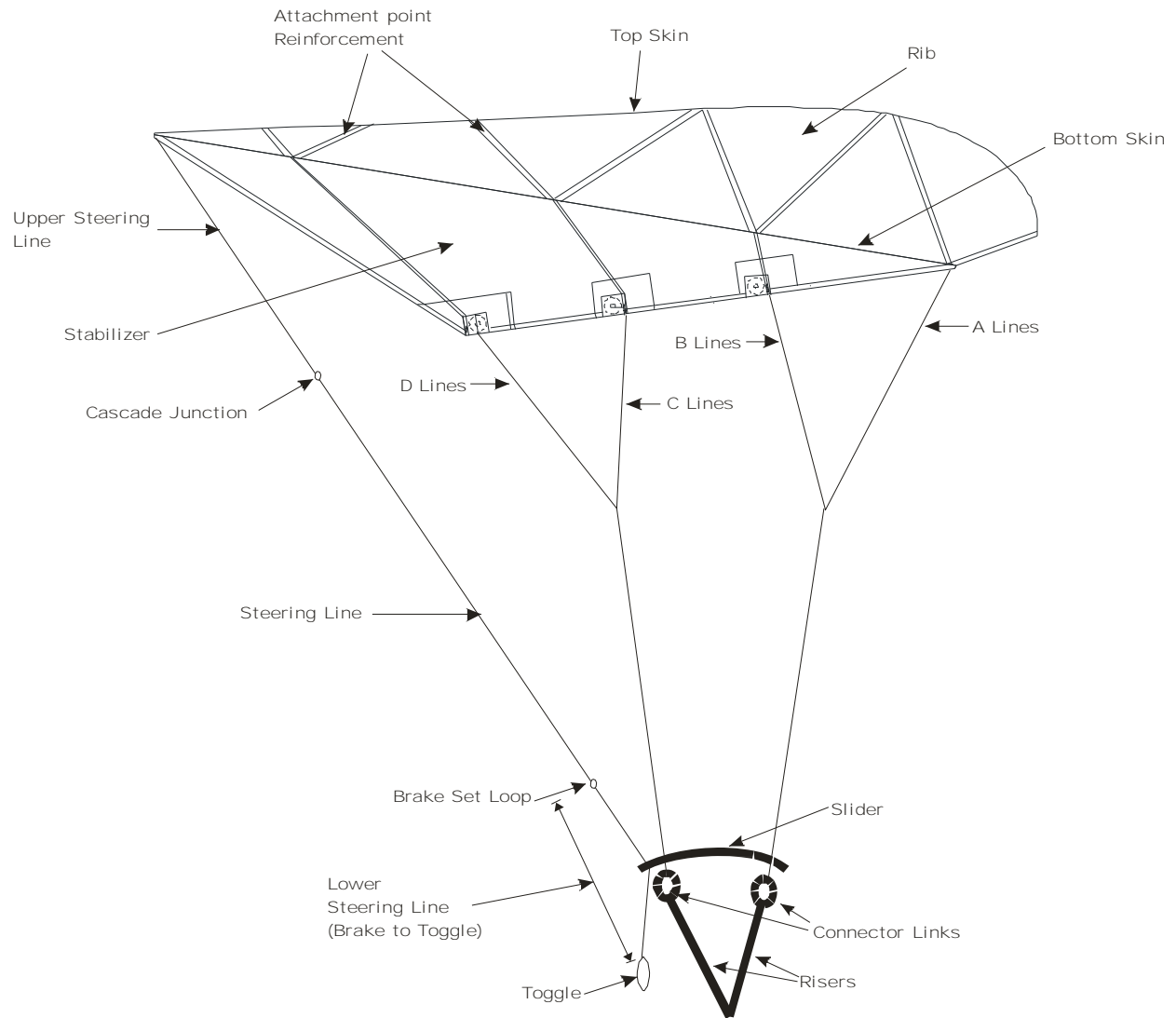
This reserve canopy has been tested and certified, meeting the requirements described in the Aerospace Standard AS8015 Rev. B.

It complies with all the requirements of the EASA ETSO-C23d and the US FAA TSO-C23d.

### 10.7. Technical Specifications

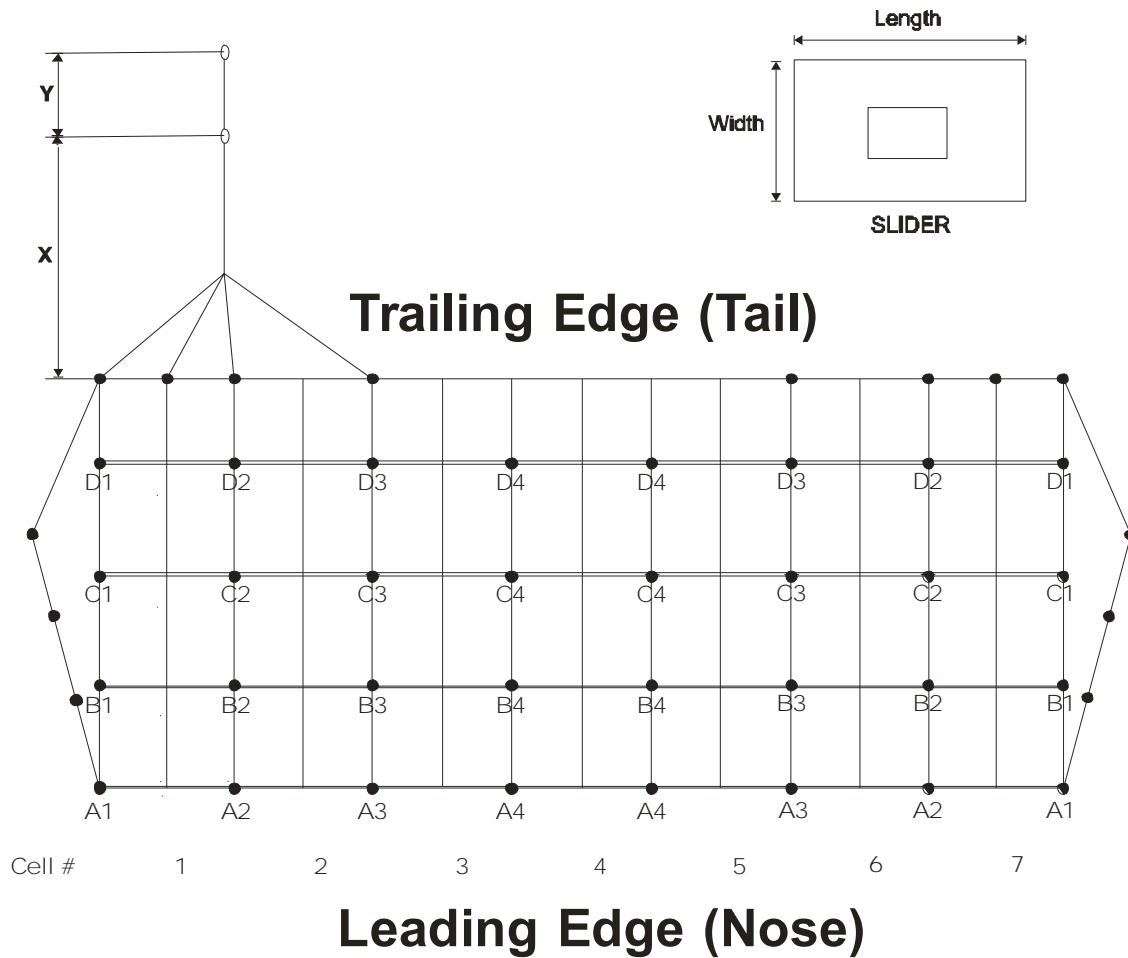
NANO - Model	Area (ft <sup>2</sup> )	Max Exit Weight		Span		Chord		Aspect Ratio
		(kg)	(lb)	(m)	(ft)	(m)	(ft)	
NANO 99	99	59	131	4.4	14.3	2.1	6.8	2.1
NANO 106	106	64	140	4.6	14.8	2.2	7.1	2.1
NANO 113	113	68	150	4.7	15.3	2.3	7.3	2.1
NANO 126	126	76	167	5.0	16.2	2.4	7.7	2.1
NANO 143	143	86	189	5.3	17.2	2.5	8.2	2.1
NANO 160	160	96	212	5.6	18.2	2.7	8.7	2.1
NANO 176	176	106	233	5.9	19.1	2.8	9.1	2.1
NANO 193	193	116	255	6.1	20.0	2.9	9.5	2.1
NANO 218	218	116	255	6.5	21.3	3.1	10.1	2.1
NANO 235	235	116	255	6.8	22.1	3.2	10.5	2.1
NANO 253	253	116	255	7.0	22.9	3.4	10.9	2.1

## 10.8. Canopy Parts





### 10.9. Line Trim Measurements



Size	A Lines (cm)	B Lines (cm)	C Lines (cm)	D Lines (cm)	X (cm)	Y (cm)	Slider	
							Length	Width
99	226.0	232.0	247.4	264.7	255.2	52.2	66.6	44.0
106	235.7	241.9	257.8	275.7	265.5	53.6	68.9	45.5
113	245.0	251.4	267.9	286.3	275.5	54.9	71.1	47.0
126	261.6	268.4	285.8	305.2	293.2	57.1	75.1	49.6
143	282.1	289.3	307.9	328.6	315.0	60.0	80.0	52.9
160	301.4	309.0	328.7	350.6	335.6	62.6	84.6	55.9
176	318.7	326.6	347.2	370.2	353.9	65.0	88.8	58.7
193	336.1	344.5	366.1	390.1	372.6	67.4	92.9	61.4
218	360.5	369.4	392.3	417.9	398.5	70.8	98.8	65.3
235	376.3	385.5	409.3	435.9	415.4	72.9	102.6	67.8
253	392.4	402.0	426.7	454.2	432.5	75.1	106.4	70.3

## 11. INSTALLATION

### 11.1. *Installation Requirements*

Before a certified FAA Rigger or foreign equivalent begins installation, be sure the risers, toggles, freebag, pilot chute, harness, container and other items are compatible with this reserve canopy. All components must fit and work properly. The use of incompatible components makes it illegal to assemble the system and voids the manufacturer's responsibility.

### 11.2. *Installation Procedure*

The connections between the canopy and the container system consist of four links and 2 steering lines.



At the factory, the links are assembled onto a card identifying each link and steering line. This is to be used as a guide only. It is the responsibility of the assembling/inspecting rigger to verify that each link is connected to the proper riser and each steering line is connected to the proper steering toggle. Before securing the links fully, check line continuity. Ensure that each line group passes through the correct slider grommet and there are no twists, tangles, or knots in the lines.

To lock the metal connector links, tighten the barrels completely by hand, until the thread is fully covered. Then tighten them with an additional  $\frac{1}{4}$  turn using an adjustable wrench or similar tool. Mark the position of the barrel. This mark can be used in future inspections to ensure that the barrel has not loosened.

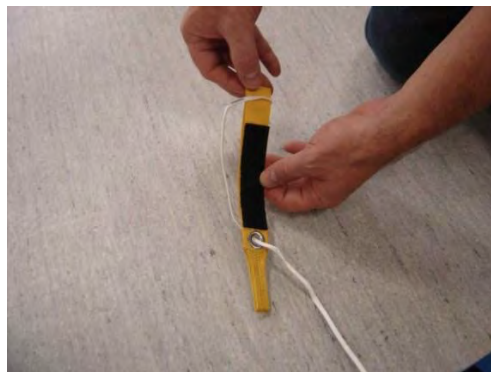
It is permissible to substitute connector links as long as they are compatible with the container, all four connectors links are of the same type, and they are all certified for use under TSO C23d to operational limits exceeding the operational limits of the reserve parachute. If substitute links are used, they need to be installed in accordance with the instructions of the manufacturer of the links.

Always follow harness/container manufacturer's instructions detailed on their manuals. Following we provide a general example of how to connect the steering toggles, for referential purposes only:

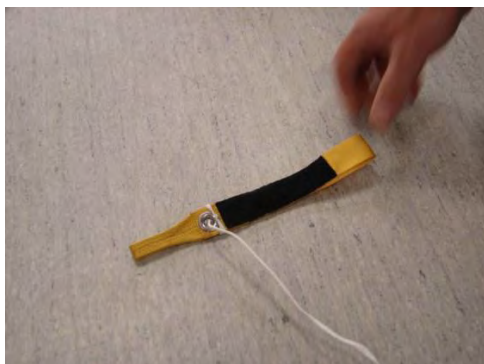
1. Inspect the entire length of the control lines, checking that they are not tangled with any of the suspension lines.
2. Insure that the control lines pass through the corresponding rear grommet on the slider.
3. Pass the control line through the corresponding guide ring on the rear riser.
4. Pass the end of the control line through the grommet of the steering toggle from the rear to the front.



5. Pass the lower part of the toggle through the loop at the end of the control line.



6. Pull all excess line through the toggle until the loop is taut.



## 12. INSPECTION

### 12.1. *Compatibility Check*

Before you begin, be sure the risers, toggles, freebag, pilot chute, harness, container and other items are compatible with the reserve canopy and each other. All components must fit and work properly. If any of the components do not fit or function properly, they are not compatible, making it illegal to pack the system.

### 12.2. *Connection to the Harness*

Check for proper assembly of all the suspension lines onto each corresponding connector link.

- If it is a metal link, check that the match marks on the barrel and link are aligned. Inspect the condition of the links for any damage or any sharp edges. Any damaged link must be replaced by an identical certified link.
- If it is a soft link, check that it is installed correctly as [OTEC870029 \(Soft Link Installation Instructions\)](#)

### 12.3. *Slider bumpers*

Check the slider bumpers for any signs of damage or wear.

### 12.4. *Suspension Lines*

Check each line for any signs of damage or wear. Give extra attention to the cascade points and the attachment loops to the canopy and the connector links. Check that the bartacks at each of these points are complete and free of any loose or broken stitches.

### 12.5. *Control Lines*

Check the control lines for signs of damage or wear. Give extra attention to the brake setting loop. Again, check that all bartacks at each of these points are complete and free of any loose or broken stitches.

### 12.6. *Slider*

Check the fabric for tears or other damage. Make sure the grommets are undamaged, have smooth edges, and are firmly attached to the reinforcement tape.

### 12.7. *Slider bumpers*

Check the slider bumpers for any signs of damage or wear.

## 12.8. Canopy

### 12.8.1. Slider Stops

The slider stops should be in good condition and are not allowed to show any sign of wear.

### 12.8.2. Fabric

Methodically inspect all pieces of fabric, including the top and bottom surfaces, as well as the ribs, for holes, rips, stains, and broken stitches along all of the seams.

### 12.8.3. Tapes and reinforcement

Check the tapes for any signs of wear or damage. Check the stitching of every tape to ensure that it is securely attached to the fabric along its entire length.

### 12.8.4. Crossports

Check the crossports for any signs of wear or damage.

### 13. NANO RESERVE CANOPY PACKING

THIS NANO RESERVE CANOPY  
MUST BE INSPECTED AND PACKED  
BY AN AUTHORIZED AND CERTIFIED RIGGER ONLY

#### 13.1. *Setting deployment brakes*

1. Remove any and all twists from the steering lines from the canopy down to the toggles.
2. Pull the toggle until the brake setting loop passes through the guide ring on the rear riser.
3. Insert the upper part of the toggle in the brake setting loop. Insure that the brake is set below the guide ring as shown. Pull the steering line through the guide ring.

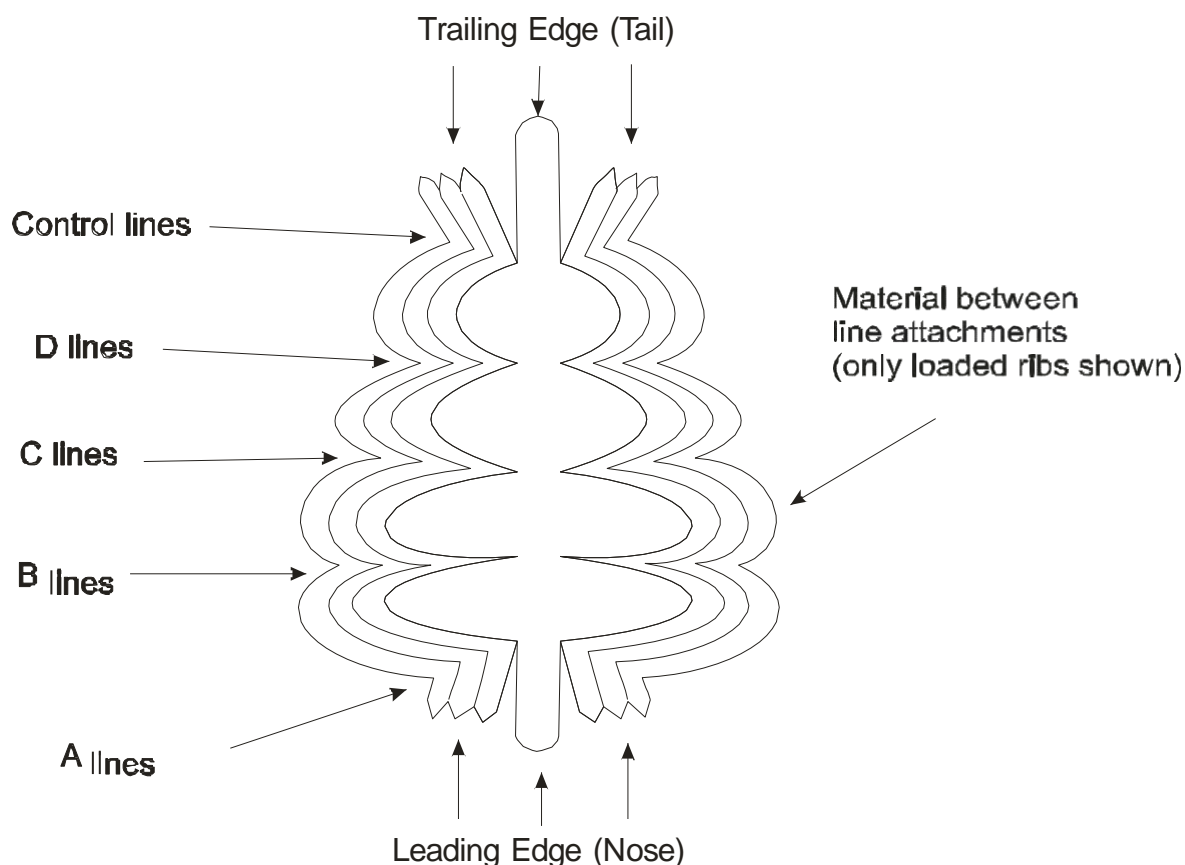


4. S fold the excess control line. Secure the toggle and excess control line according to the instructions of the harness manufacturer.



### 13.2. Packing

This reserve canopy is designed to be packed using a PRO pack method. PRO is an acronym for Proper Ram air Orientation. That simply means that the canopy is distributed in the container so that the left side of the canopy is packed into the left side of the container, and similarly, the right side is packed into the right side of the container. The center of the canopy should be centered in the container. All the lines should be arranged up the middle of the pack job, with the fabric neatly and precisely folded to each corresponding side. This method allows for a wide variation in sizes and shapes of container systems and allows for container systems employing a through loop or molar deployment bag.

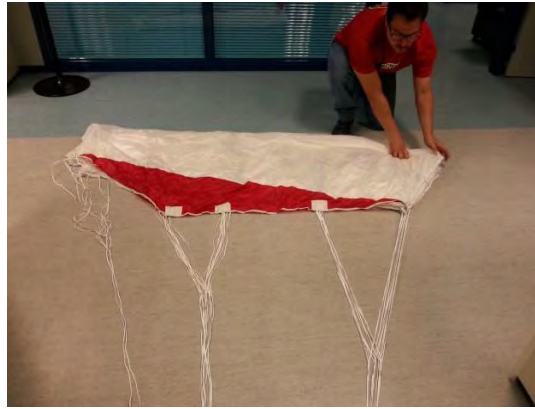


Riggers may employ a number of methods to achieve the results shown in this illustration. As an example of this variation, some riggers initially organize the canopy over their shoulder and others do the same organization on the floor. Either method is permissible since this manual is not intended to show an exact method. The end result is the important part of the packing procedure. The packing should be neat, orderly, and precise as shown in the illustrations.

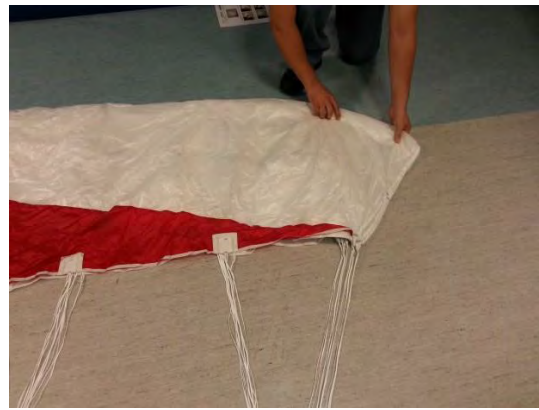
Riggers often use a number of tools to accomplish the packing of reserves. The use of tools introduces the risk that a tool could be accidentally left in a pack job. For this reason, all tools used in the packing procedure need to be completely inventoried before packing. At the end of the packing, all tools need to again be counted to eliminate the possibility that a tool is left in the reserve pack job.



Again, verify line continuity from the risers through the slider grommets to the canopy. The following illustration distinctly shows the A, B, C, and D line groups as well as the steering lines.



The nose of the canopy should be split so that 3 cells are arranged to each side and the middle cell is spread open. When arranging the canopy over the shoulder, the nose should face the rigger. When the canopy is on the floor, the nose should face the floor.



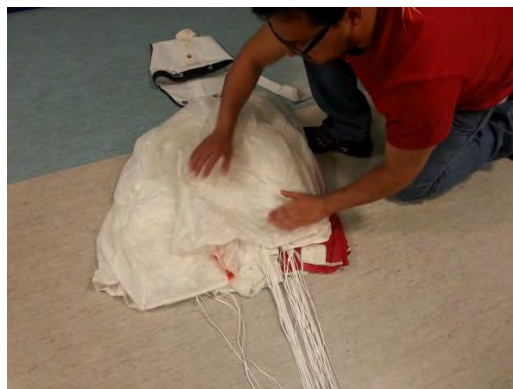
Continue flaking the material between the line groups to achieve the PRO distribution. Carefully group each line group in the middle, ensuring that the center cell remains centered and the folds of fabric passing between the line groups are distributed evenly and neatly to each side. As shown in the diagram, there should be three major folds of fabric. First is the A-B fold, which is the material between the A and B lines, followed by the B-C fold, and the C-D fold.



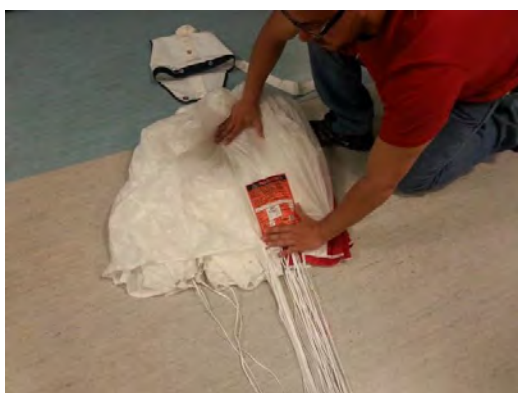
If it is not already there, the canopy should now be neatly laid on the floor, nose facing the floor, with the tail on top.



Now, precisely neaten the folds of the canopy. For each grouping of lines, count and verify that all lines are neatly grouped in middle and the A-B, B-C, and C-D folds are neatly and precisely folded to each side.



Neatly flake the tail of the canopy, grouping the steering lines in the middle and making folds of material to each side, maintaining a constant width for each fold. Stop flaking when you reach the middle of the center cell, and repeat the procedure for the other side of the canopy.



Upon finishing the flaking of the canopy, verify that the tail is evenly split so that the label is centered on the top of the pack job.  
Once the fabric is neatly flaked and folded, again verify that all the line groups are neatly up the center of the pack job.



Packing weights or clamps may be used to keep the organization of the pack job. All tools used in the packing need to be counted before and after the pack job to ensure that no tools are left in the canopy. From this point, take care to ensure that the organization is maintained until the canopy is in the freebag.





Now, pull the slider all the way up to the canopy, placing it symmetrically against all four slider stops. Flake the slider to each side between the line groups and neatly organize the fabric.



The following section gives general guidelines for folding the canopy to fit into a freebag. Because of the variation in size and shape of container systems, freebags from different container manufacturers will, of necessity, vary in shape and size. The exact amount of material in each fold of the canopy will then have to vary so that the material is distributed to fit in the freebag and container being used.

First, reduce the width of the reserve pack job to approximately the width of the freebag. Fold under all the fabric above the A lines to achieve the desired width. Take care to not disturb the neat distribution of the lines up the middle of the pack job. Repeat the folds symmetrically on the other side. If the slider is disturbed during this process, ensure that it is again pushed up against the slider stops and distributed symmetrically.





At this point, three cells of the nose should extend from each side of the pack job. Count the cells at the nose and verify that the previous step did not pass any fabric around any portion of the nose of the canopy.

S fold the nose under the canopy as shown to the width of the remainder of the canopy. Repeat for the other side.

Now, the width of the canopy should be approximately the same as the width of the freebag being used.



The remaining folds will form the canopy into a molar shape to fit into a typical freebag. Again, the size of these folds should be determined by the rigger to distribute the bulk of the canopy appropriately for the container system being used.

Make the first S fold as shown, taking care to keep equal tension on the lines.



Many riggers use their knees in order to help maintain control of the initial fold, and move into the position as shown.



From this position, it is possible to carefully lift the pack job and verify that the center cell is centered and spread to the width of the pack job.





Then carefully make a second S fold as necessary to form the canopy into the proper shape to fit in the freebag.

At this point, a molar strap may be installed to assist in the neat and orderly placement of the canopy in the freebag. It is extremely important that the molar strap is removed once the canopy is in the freebag. A forgotten molar strap can result in failure of the NANO reserve canopy to inflate. Again, all tools need to be counted before and after the pack job to ensure that no tools are left in the canopy.



The ears of the molar pack job may need to be reduced in length to fit in the freebag. This can be accomplished by folding or compressing the ears to achieve a uniform distribution of fabric in the freebag. The end result is a canopy, neatly folded, distributed evenly, and formed into a shape that can be placed into a freebag according to the container manufacturer's instructions.



At the completion of each step of the packing process, count all tools and check against the original tool inventory. This must be done to ensure that no tool is left in the canopy.



The exact method of bagging the canopy and stowing the lines will vary to some degree according to the freebag design and construction. The container manufacturer's instructions will provide details pertaining to the freebag and line stowage method. Take care when stowing the lines. Many freebag designs use Velcro to secure lines within a pouch. All Velcro hook should be covered with a piece of Velcro pile prior to stowing the lines. These Velcro covers should be considered tools and counted before and after packing just like any other tool. Take care to avoid any contact between the lines of the canopy and any Velcro hook used in the freebag. Contact with Velcro hook can damage the lines, and care must be taken to avoid this sort of damage. Once the lines are stowed, be sure to remove any Velcro covers and securely mate any Velcro used on the freebag.

## 14. MAINTENANCE

If during storage, transport, or normal use of the equipment, the humidity index is over the usual limits (see Chapter 14.5 – *Storage*), or if the parachute, either packed or unpacked, has been exposed to extreme climatic conditions, the equipment must be aired properly to avoid any damage to any of its components.

### 14.1. *Cleaning*

In the event of contact with any substance that could contain acid or any other corrosive substance, the equipment must be removed from service until the exact nature of the substance can be identified. If the substance could not be identified, or if the normal repair procedures could not eliminate all the rest of the chemical or acid substance, the equipment must be removed from service.

If the parachute or any of its components has been submerged in salt water during a period of more than 24 hours, it must be removed from service.

If the parachute or any of its components has been submerged in salt water during a period less than 24 hours, upon removal from the salt water, it must be immediately rinsed in fresh water. In this circumstance, if the parachute is not immediately rinsed in fresh water, it must be removed from service.

The entire parachute should only be washed when necessary to remove contamination. If only a small area of the parachute is affected by contamination, it is preferable to spot clean only the affected area. Always use fresh water, and never twist, rub, or otherwise manipulate the fabric or lines in the cleaning or drying process.

When drying a parachute, never use any source of heat. Dry the parachute in a well-ventilated area, away from sunlight. If the parachute is suspended for drying, it must be suspended symmetrically by the tail by each of the load bearing ribs.

Never expose the parachute or its components to any source of ultraviolet light, especially direct sunlight.

### 14.2. *Repairs*

In addition to any required certifications, persons performing repairs to this NANO reserve canopy must possess authentic factory replacement components, and the necessary skills and equipment to return the canopy to service in a condition equal to its original

### 14.3. *Spares*

Reserves may only be repaired using certified materials. All replacement materials must come from the manufacturer. Inferior strength thread and fabric is frequently found in the field. The only way to be sure that materials meet original standards is to purchase them from the factory.

#### 14.4. Damage

Damage may be classified into four categories:

- 1) Not Significant – Damage that may be left unrepaired.

Small snags and holes smaller than 3 mm<sup>2</sup> (one ripstop box) located further than 25.40 centimeters from the closest line attachment may be left unrepaired as long as there are no more than one snag or hole in any 25.40 centimeters circle. A maximum of three such snags or holes per cell are allowed. Ripstop tape is not authorized for use on this reserve.

- 2) Minor Repairs – These may be performed by a FAA senior rigger, FAA master rigger, or foreign equivalent.

Any hole or tear up to 25.40 centimeters in length may be repaired by as long as the closest area of the completed repair is at least 2.54 centimeters from the nearest seam and at least 12.70 centimeters from the nearest tape or line attachment. A maximum of 3 such repairs per panel or 15 per canopy are allowed.

- 3) Major Repairs – These may be performed by a FAA master rigger or foreign equivalent.

Any repair to line, tape or webbing damage is considered a major repair. FAA Master riggers or their foreign equivalent may perform repairs that do not involve taking apart any bartacks on the canopy. Special bartack patterns and thread types are used. Any other type of bartack will affect the strength of the parachute. In addition, removal and replacement of these stitch patterns usually weakens the fabric to the point that it is necessary to replace portions of panels.

- 4) Factory Repairs – These repairs may only be performed by the manufacturer.

Factory repairs include all repairs that are not specifically listed as minor or major repairs.

If there is any doubt that a canopy can be returned to service in a condition equal to its original construction standards, it must be returned to the factory for repair.

#### 14.5. Storage

Textile and other materials used in the construction of this parachute can be affected or damaged by natural elements. During periods while the parachute is not used, the parachute must be stored in a place where the temperature is kept between 15°C and 22°C (59°F and 72°F). Relative humidity must be kept between 15% and 72%. Furthermore, the parachute must be protected from:

- ◆ Ultra-violet radiation (sunlight, ...)
- ◆ Acid and corrosive chemicals (car or golf cart batteries, ...)
- ◆ Gnawing animals or insects (mice, grasshoppers, ...)

During the periods of regular use (when packed), it is acceptable to store the parachute assembly inside a bag in a place free of humidity and gnawing animals or insects.