

MS-360-M2

MILITARY SILHOUETTE MAIN PARACHUTE

BY PERFORMANCE DESIGNS, INC.



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SECTION 1:
INTRODUCTION

WARNING AND DISCLAIMER

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

Parachute systems sometimes fail to open properly, even when properly assembled, packed, and operated. There is a risk of equipment damage, serious injury, or death each time this system is used.

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

You can substantially reduce this risk by: **(1)** assuring every component of the parachute system has been assembled and packed in strict accordance with the manufacturer's instructions. **(2)** by obtaining proper instruction on the use of this parachute and the rest of the equipment, and **(3)** by operating each component of the system in strict compliance with the owner's manual and safe parachuting practices.

REVISION LIST

Performance Designs, Inc (PD) may revise this manual at any time. The only way to be sure this manual is current for your parachute is to check periodically with PD or check www.performancedesigns.com. PD welcomes suggestions of ways to improve this publication. If you feel parts are incomplete or hard to understand, please let us know by writing or emailing PD. Copyright 2005, Performance Designs, Inc.

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.



SECTION 2:
PERFORMANCE SPECIFICATIONS

INTRODUCTION

Unlike reserve parachutes, main parachutes are not required by the federal government to meet TSO requirements. Performance Designs has established its own rigorous test requirements. While reviewing the test results, adequate safety margins must be added to these figures to derive operational limitations.

All test results are from jumps that have been made with new equipment. Experienced test jumpers perform all test jumps.

SUMMARY OF TEST CRITERIA AND RESULTS

The MS-360 is designed to have soft, reliable openings over a wide range of both weight and speed. The MS-360 has been deployed at weights up to 550 pounds (249.5kg), which is well in excess of the recommended maximum. The parachute is relatively forgiving to errors in body position during deployment.

The MS-360 can reach a descent rate of zero with a flared landing from a normal stabilized approach. The parachute still maintains its landing flare performance even at wing loadings well above the maximum. Our test jumps involved good landings at weights up to 550 pounds. Test jumps were conducted with the MS-360 at field elevations from sea level up to approximately 10000 feet (3048m), with exit weights above the 425 pounds (193 kg) maximum. Both full flare and deep brakes landing techniques were used successfully.

Another item successfully tested was the parachute's performance of flat turns while in brakes. Flat turns decrease the descent rate while in the turn. The parachute also exhibits good stability and responsiveness in poor weather conditions when loaded reasonably for those weather conditions.

The MS-360 is easy for the novice to pack in freefall configuration. It is also relatively forgiving to common packing errors.

Multiple static line test jumps at full operational weights were conducted with the MS-360-M2, at 170 knots indicated at 5000 feet, resulting in low opening forces. Jumps at normal C-130 jump run speeds have been conducted at altitudes up to 33000 feet, resulting in low openings forces as well.

Stability and responsiveness were tested for and observed at wing loadings below 0.45lbs/sq ft. The weather conditions ranged from fair to lightly turbulent.

All the tests were completed satisfactorily, and all parameters were met.

TESTING AND EVALUATION

Based upon the results of our live testing as well as dummy testing, the PD Military Silhouette (M1) is capable of being deployed at speeds up to 150 KIAS at an altitude of 25000 feet.

The static line/freefall (M2) version of the Military Silhouette is a modification to the basic M1 version for use in a high speed and/or high altitude static line environment. Modifications permit the installation of a pilot chute controlled reefing system, for use with a dual-bag static line system. Parachute modifications include:

- Large buffer pads on the center cell top and bottom skins.
- Buffer Channel through these patches, from top to bottom.
- The buffer pads are made with either cotton or Nomex® to prevent friction burns.
- Stainless steel grommets at the ends of the channel, for installation and use of the pilot chute controlled slider.
- Modification of the slider to allow for a removable 4 into 1 bridle system that is to be attached to the pilot chute for static line operations.

When used with a properly designed and constructed dual bag static line deployment system, the Military Silhouette (M2 version) has been found to offer lower opening shock than any other type of static line ram air parachute (from any manufacturer) that we have tested. We have made repeated deployments from C-130 and C-160 aircraft at altitudes from 33000 feet and airspeeds of 110-130kts with excellent results. Reports of superior deployments have been confirmed by more than one foreign military organization in their own independent evaluations.

FINAL TESTING AND EVALUATION

The final testing and evaluation of the MS-360 parachute involved many specific proprietary tests and numerous test jumps on this parachute. The test jumpers weighed between 98 pounds and 215 pounds, and the heavier jumpers carried ballast to reach an exit weight of up to 550 pounds. Test jumps for the MS-360 included live static line test jumps at speeds up to 170 knots. Test drops (both live and dummy drops) of the MS-360-M2 specifically have been made with 550 pounds suspended weight on dual bag static line drops from as high as 33000 feet at 130 knots indicated, which equaled a true airspeed of up to 220 knots. Dummy drops of the MS-360-M1 were made with a payload of 600 pounds at a deployment altitude of 25000 feet with no damage. All tests were completed satisfactorily, and all parameters were met.

PD MILITARY SILHOUETTE (MS) PARACHUTE SPECIFICATIONS

SIZE	SPAN	CHORD CENTER/END	MAX. DEPLOYMENT. WT./AIRSPEED	MAX. LANDING WT.
MS- 360	25.6 ft. (7.8m)	12.4 ft. / 11.0 ft. (3.8m / 3.4m)	425 lbs. / 150 kts. (193 kg) / 150 kts	425 lbs. (193 kg)



FLIGHT PERFORMANCE

The following specifications are at maximum exit weight for the MS-360 at sea level, which is 425 lbs (192.7 kg). Performance will vary due to the varying drag of payload and jumper. These values are from actual measurements, and should not be compared to inflated marketing values claimed for systems from other manufacturers.

CONFIGURATION	EXIT WEIGHT	DESCENT	FORWARD SPEED
MS-360, brakes set	425 lbs	11.5 fps	20 mph
MS-360, brakes released	425 lbs	15.0 fps	28 mph

INFORMATION ON MINIMUM WING LOADING

The minimum weight for the MS-360 is dependent upon weather conditions, as is true for any ram air parachute. As a parachute is loaded more lightly, it becomes more susceptible to turbulence, which can alter the flight path or, in severe cases, actually collapse the parachute.

It is also true, however, that a knowledgeable person making an intentional jump will evaluate the weather before that jump, and will be more critical of the weather if they are lightly loading the parachute.

Keeping the above statements in mind, the recommended minimum wing loading for the MS series nine cells (in all available sizes) is 0.45 pounds per square foot, assuming ideal weather conditions.

Ideal weather conditions could be considered smooth light winds, no turbulence due to large objects upwind of the landing area, and no turbulence due to convective lifting action (dust devils, strong thermals, etc.) The recommended minimum must be adjusted up as the weather conditions worsen, eventually to the point that no jump can be safely made, regardless of the wing loading.

CONCLUSION

Based on the results of our testing, we certify the MS-360-M2 Main Parachute by Performance Designs, Inc. as being fit for service when used within its operating limitations as placarded on the data panel located on the top skin of the center cell near the trailing edge.

SECTION 3:
PARACHUTE MAINTENANCE AND REPAIR

PARACHUTE INSPECTION

OVERVIEW

The Performance Designs parachute should be inspected thoroughly before its first use and periodically with use. This inspection should be done in a clean, well-lit area with enough room to spread out the parachute.

The following is the Performance Designs recommendation for main parachute inspection. Consult the harness and container owner's manual for instructions regarding inspection of non-parachute components.

VISUAL INSPECTION

TOP SURFACE

Spread the parachute out on its bottom surface and inspect the top surface starting at the front of the left end cell. Check half of the cell from nose to tail. Then check the other half from tail to nose. Repeat this pattern until each cell's top surface has been inspected. Look for rips, stains, snags, burns, abrasions or failed seams.

BOTTOM SURFACE

Turn the parachute over and spread it out to inspect the bottom surface. Again use the procedure of inspecting half-cells as on the top surface. Check for rips, stains and failed seams. Look very closely at the line attachments. Even slight damage is cause for rejection in these areas. Line attachments must be completely free of any damage or defects. Check under the ends of the line tabs.

RIBS

Inspect each rib from leading edge to the trailing edge by looking inside each cell. Pay extra attention to the line attachment points. Check for items such as burns, tears, seam integrity and pulled threads. Also check the cross ports.

STABILIZERS AND LINE CONNECTIONS

Lay the parachute neatly on one side, stacking each loaded rib on top of the others. Check that all lines in each line group are the same length and that the trim differential between each line group is correct for this parachute. Check the condition of the stabilizers and slider stops on the stabilizer.

SUSPENSION LINES

Check the full length of each line for damage and wear. Look for fraying at all cascades and where each line attaches to the connector link. Check that all lines are sewn and that the stitching is good. Check the continuity and routing of each line.

SLIDER

Ensure the fabric is not torn, the grommets are undamaged with no sharp edges, and that they are securely attached to the slider. Be sure every suspension line and both steering lines pass through the proper grommet on the slider. Inspect integrity of bridle attachment points on MS-360-M2 sliders.

RISER AREA

Visually check the link and its condition. If the link is not bent, cracked or damaged, the link is ok for continued service.

PROTECTIVE LINK COVERS

Insure that the protective link covers located on the connector links are the correct ones, are positioned correctly, are in good condition and are properly secured with tacking cord.

TOGGLES

The toggles must be installed correctly and must match the guide ring and the hook and loop fastener on the risers. Performance Designs canopies come with brake settings and toggle tie on marks set for PIA standard riser/brake dimensions. This standard calls for 4 inches (10.2 cm) from the top of the riser to the top of the brake-setting ring. If the risers are more than 1 inch or (2.5 cm) different from this standard the parachute must be modified. This modification may only be done by a master rigger and must be reported to Performance Designs, Inc. In addition, any changes must be marked on the parachute's data panel.

FABRIC TESTING**STRENGTH**

If doubt exists about the strength of the canopy fabric due to being exposed to a degrading element, the fabric strength should be tested according to the following procedure:

Use commercially available 1-inch (2.5 cm) wide fabric testing clamps with rubber-faced jaws and appropriate scale. The scale should be calibrated at least once per year and be accurate within 1.0 lb (0.45 kg). The clamps should be free of any burrs or rough edges that could snag the fabric.

Three fabric strength tests should be performed on each of the following locations on the parachute:

- left end cell, top surface
- right end cell, top surface
- center top surface near trailing edge

The test should never be done where any part of the fabric involved in the test is within 3 inches (7.6 cm) of any seam or the data panel. The test should be done chord-wise. An additional test must be performed on any stained or discolored areas.

Attach the locking fabric clamps to the ripstop fabric. The distance between the clamps should be 3 inches (7.6 cm) and the clamps should be aligned so that the ripstop pattern is parallel to the edge of the jaw.

Lock the clamps securely to avoid slippage. Pass a short length of cord through the eye of one clamp and secure to the packing table or other object that will allow a 30 lbs (13.6 kg) load without movement.

Pass the hook from the spring scale through the other eye and apply a 30 lbs (13.6 kg) load for 3 seconds.



PERMEABILITY

The permeability of the fabric is very important. As the permeability increases, the parachute will open more slowly and flight performance will deteriorate. The rate of descent will increase and the forward speed will decrease. The ability of the parachute to flare to a soft landing will decrease.

To ensure the parachute is safe to use, Performance Designs has established an average permeability level of 2.0 cfm for the top surface and 13.0 cfm for the bottom surface maximum, for all MS series parachutes.

Fabric permeability does not change while the parachute is packed; it changes because of use, packing and handling.

Fabric permeability should be tested if any of the following events occur:

- Flight performance appears to be substandard.
- There are other reasons to believe the fabric permeability may exceed specifications.

The Performance Designs factory is equipped to perform permeability testing. It is recommended that any parachute needing such testing be returned to the factory.

MAINTENANCE AND REPAIRS

Repairs should only be performed by appropriately rated riggers with training and experience specific to PD parachutes.

ATTACHING THE PARACHUTE TO THE RISERS

ATTACHING THE PARACHUTE TO THE RISERS

OVERVIEW

When assembling a Performance Designs canopy onto risers it is important that the directions are followed precisely. The first time you perform an installation, it should be under supervision. If these directions are followed correctly, and only parts supplied by Performance Designs are used, these links will provide excellent service.

CONNECTOR LINKS

Remove all grease and dirt from links, using a solvent that will leave no residue. Trichloroethylene or electrical contact cleaner is recommended.

Inspect the links carefully. Check for nicks, burrs and any sign of bending or stress. Check to be sure the barrel will screw down at least 2-3/4 turns from first engagement with no resistance.

If the bumpers are not already installed, slide them over the links and onto the lines. You can use a pull up cord to assist you in doing this.

Attach the connector links onto the risers and tighten the links - finger tight.

Perform a thorough line continuity check at this point, making sure that the canopy is rigged correctly.

Tighten the link finger tight and torque to 20-30 in lbs-force (2.26 – 3.39 Nm). To accurately gauge this, place a 5 lb. (2.27 kg) weight on a wrench, 5 inches (12.7 cm) from the link. When the wrench is horizontal and the barrel no longer turns, the link is fully tightened. Do not tighten more than 30 in lbs-force (3.39 Nm).

ATTACHING DACRON STEERING LINES TO TOGGLES

ATTACHING DACRON STEERING LINES TO TOGGLES

OVERVIEW

The following contains instructions on toggle attachment. A mark is provided on the parachute steering line that is the best location for the toggle. If the toggles are above the mark, the parachute will not have the forward speed it should and may not land well.

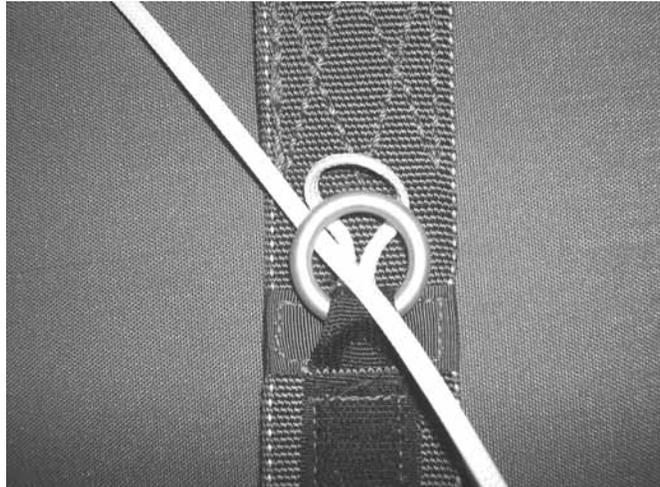
Attach the steering toggles according to the rig manufacturer's instructions if they are compatible with the type of steering line used. Be sure the knot cannot get caught on the riser guide ring.

If the rig manufacturer gives no conflicting instructions, then Performance Designs recommends either of the following methods. The methods shown will work well for most toggles.

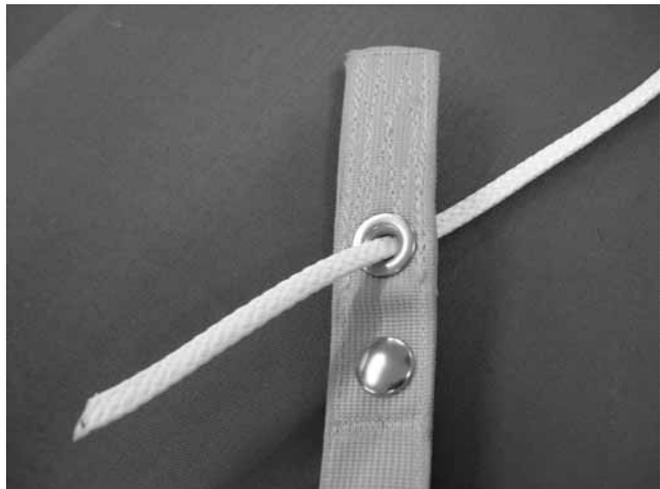
PROCEDURE

NOTE: Prior to hooking up the steering toggles, make sure the steering line passes through the grommet on the slider.

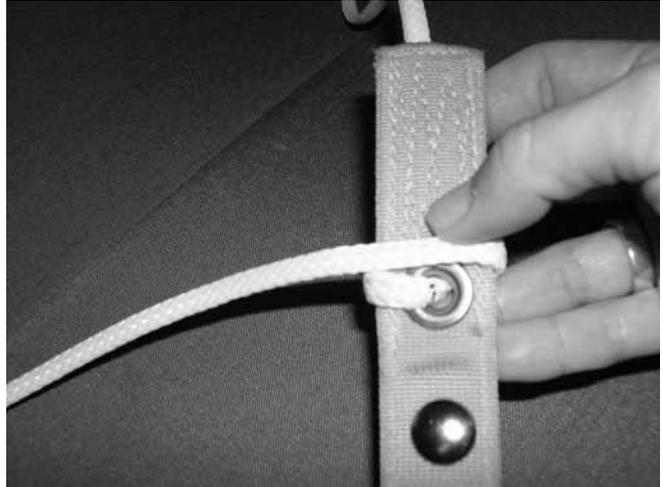
Route the steering line through the guide ring located on the riser.



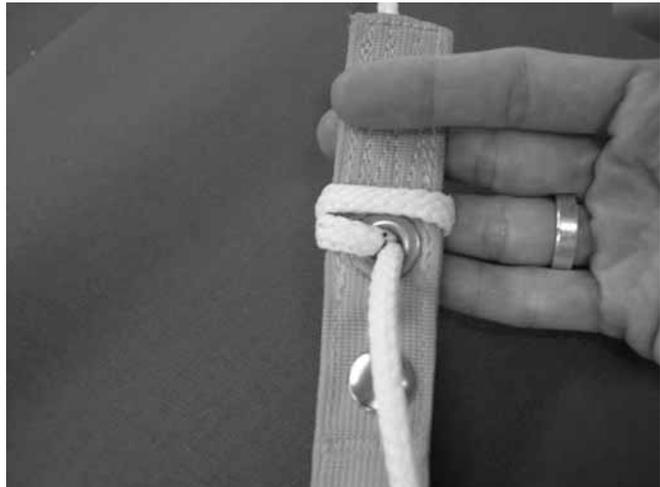
Continue to route it through the grommet in the toggle, starting from the hook and loop fastener side.



While holding the toggle mark in place, wrap the cut side of the steering line around the toggle 1 ½ times.



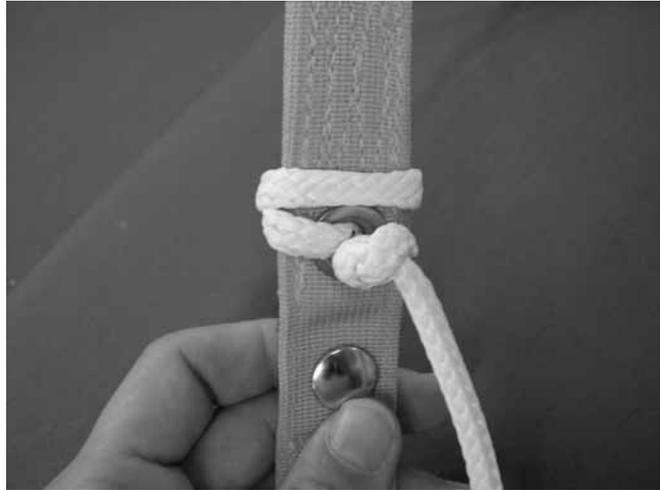
Insert the steering line thru the grommet again from the backside of the toggle.



Tie a half-knot in the steering line...



Cinch it against the toggle.



Tie another half-knot wrapping the line between the existing knot and the grommet.

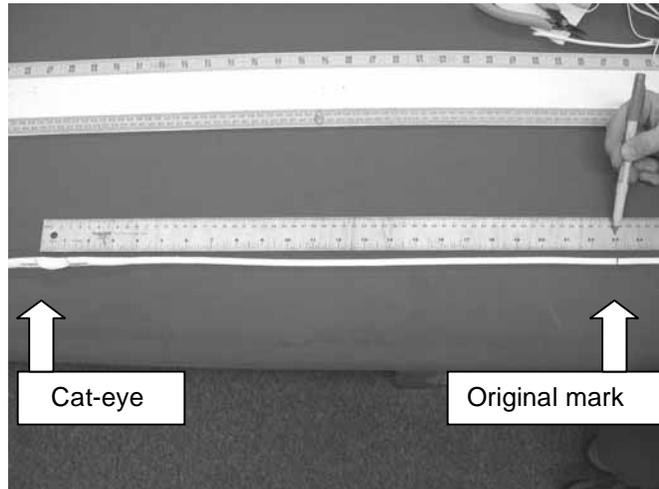


Cinch it down tightly against the toggle.



ALTERNATE METHOD

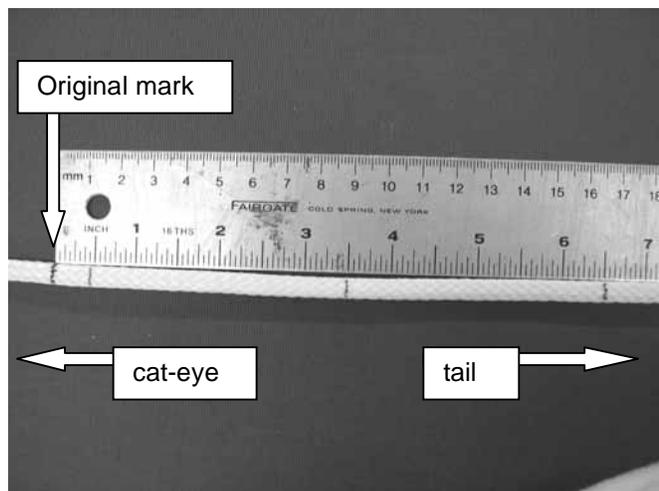
The factory toggle mark is located 23 inches from the top of the cat-eye.



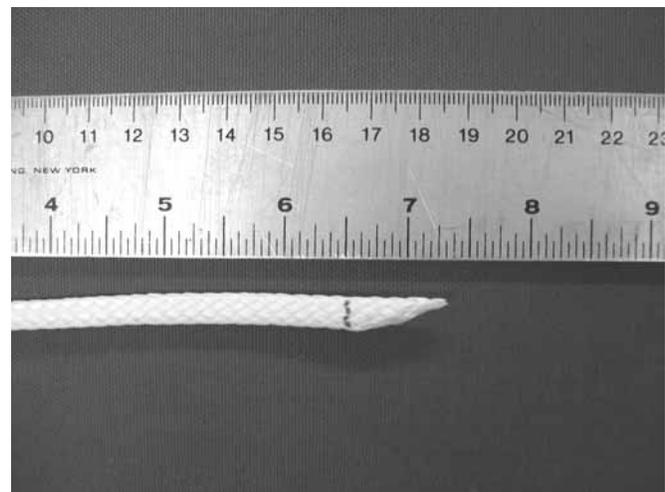
Working towards the cut tail, place a mark at each of the following locations:

- $\frac{1}{2}$ " from the original mark towards the tail
- $3\frac{1}{2}$ " from the original mark towards the tail
- $6\frac{1}{2}$ " from the original mark towards the tail. This is the cut mark.

Use different color ink than the factory placed mark to help distinguish between the original and the newly placed marks.

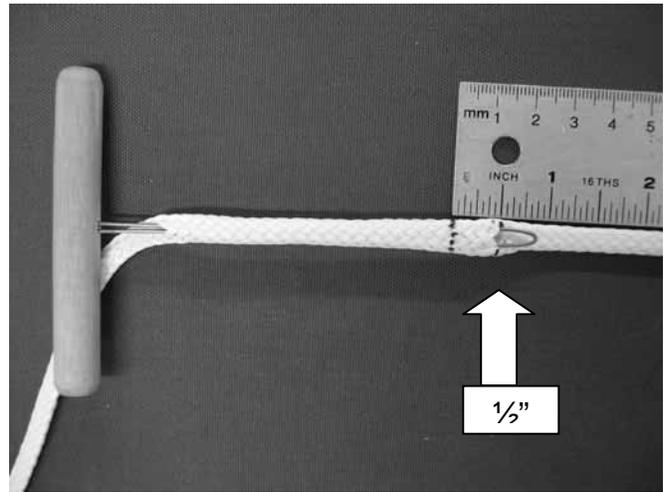


At the $6\frac{1}{2}$ " mark, cut the line at an angle using scissors. Do not use a hot knife.

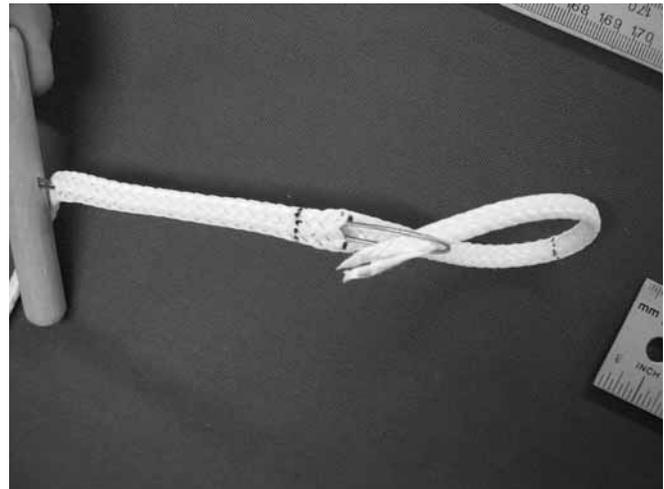


Insert the finger-trapping tool into the line at a distance greater than the amount of line being finger-trapped. The finger trap tool shall emerge at the $\frac{1}{2}$ " mark drawn in step 2.

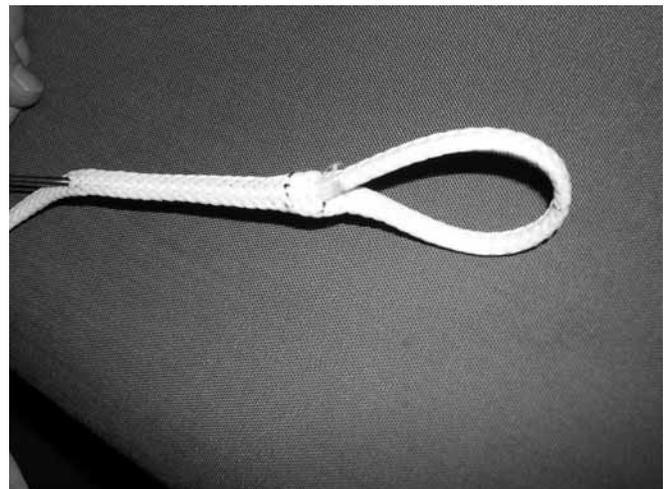
The line between the $3\frac{1}{2}$ " mark and the $6\frac{1}{2}$ " mark is the portion to be finger-trapped.



Insert the tail of the line thru the eyelet of the finger-trapping tool.

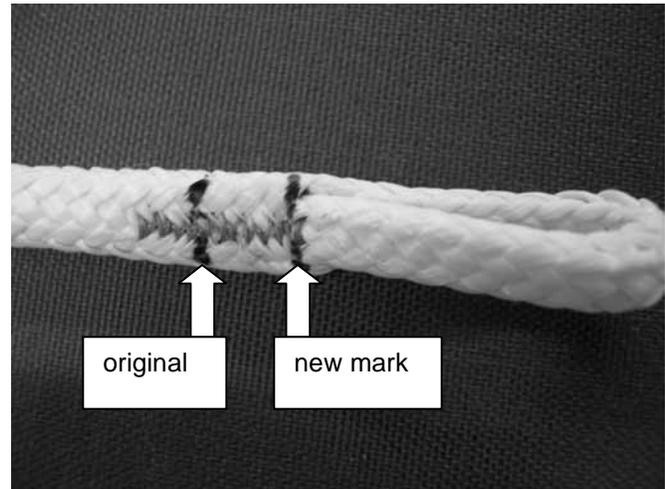


Pull the line thru until the $3\frac{1}{2}$ " mark and the $\frac{1}{2}$ " mark are in alignment.

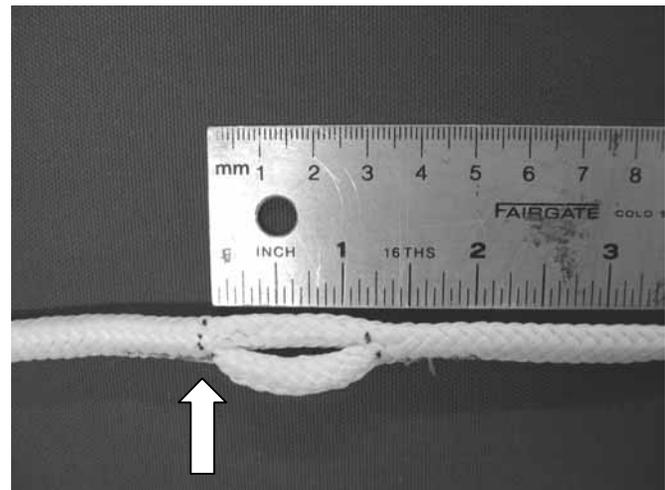


Remove the fingertrap tool. Ensure the tail remains completely inside the line.

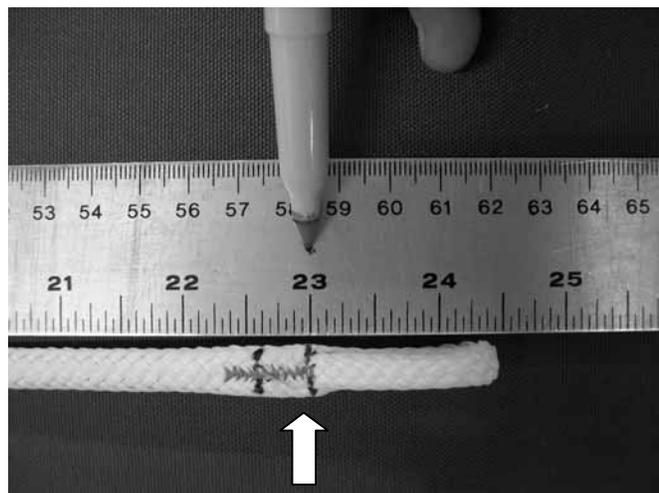
Place a bartack (or its equivalent) at the fingertrap insertion point to secure the fingertrap.



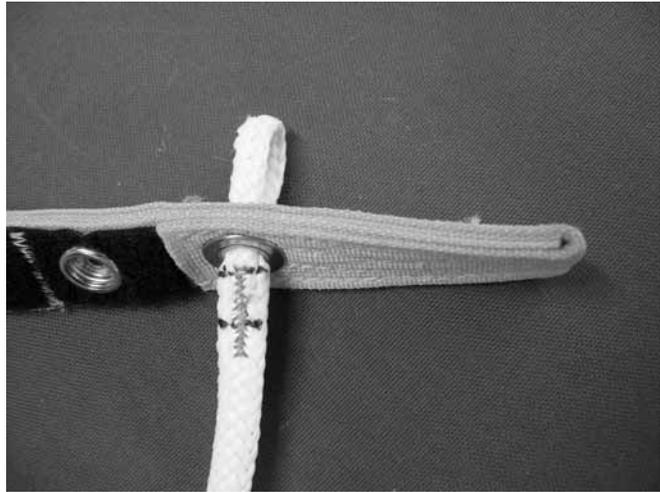
Double-check your measurements against the tape. The distance between the top of the cat-eye...



...and the start of the finished loop should be 23 inches.



Push the finished loop through the back of the toggle.



Thread the handle end of the toggle through the finished loop creating a lark's head knot. Do not thread the upper end of the toggle through the loop because this is not a secure method and may come off.



Pull the toggle completely through and tighten the knot around the toggle.



CLEANING THE PARACHUTE ASSEMBLY

CLEANING THE PARACHUTE ASSEMBLY

OVERVIEW

Washing a parachute is not recommended unless deemed absolutely necessary. Washing a parachute can weaken and/or increase the permeability of the fabric. Washing can also cause shrinkage in the nylon fabric, tapes and the cotton/Nomex® components (i.e., bridle attachment area). Do not dry clean parachutes. Parachute components may be spot cleaned or cleaned as a unit and care must be taken that the cleaning process does not do more damage than the original soiling.

This chapter also covers identification and removal of some types of contamination. Items such as acid, salt water, and petroleum products are covered.

HANDWASHING (IF ABSOLUTELY NECESSARY)

1. A mild soap or soap solution, and a water softener may be used.
2. Immerse the parachute into clean, fresh water contained in a smooth vessel, such as a bathtub.
3. Do NOT wring the parachute fabric. Damage will result.
4. Gently move items by hand until all air pockets are removed. Agitate as little as possible.
5. Empty the vessel of dirty water and refill with fresh warm, clear water.
6. Rinse the parachute several times in warm, fresh water until rinse water is clear.

DRYING A PARACHUTE

The procedure for drying a parachute is as critical as the procedure for washing it. Asymmetric shrinkage may occur if the parachute is dried unevenly

1. Remove pilot chute assembly and/or drogue/slider control line when at all possible.
2. Hang parachute full-length or the seams may experience uneven shrinkage. This can create a turn in the parachute.
3. Hang parachute assembly by all four connector links for the same time.

ACID CONTAMINATION

Nylon that has been contaminated by acid may have irregular shaped spots of gray or dead white color. The acid-contaminated fabric may also become powdery when scraped lightly.

Parachute components suspected of acid contamination may be tested with blue litmus paper. Dampen the suspect area with distilled water. Then lay the litmus paper on the area in question. If the paper turns pink, acid is present. Be careful not to touch the litmus paper. Touching the paper can cause an erroneous response.

If an area tests positive for acid and the effected area is known to be localized, that area should be neutralized with a solution of distilled water and ammonia. Household ammonia will work. Ammonia will not damage nylon or hardware. The damaged area should be removed and the resulting hole should be



patched. If the extent of contamination cannot be determined or if it effects large portions of the parachute, the parachute should be first destroyed then disposed of.

REMOVAL OF SALT WATER CONTAMINATION

Crystals of dry salt and the presence of pale brown, circular stains often evidence salt-water exposure. If the parachute is allowed to dry after salt-water immersion without being rinsed in fresh water, salt crystals will form causing damage to the fabric and suspension lines.

1. Parachutes exposed to salt water should be rinsed out several times in warm, fresh water in a smooth tub. Use of a water softener is recommended. Hang assembly in drying tower in accordance with the section above entitled "Drying a Parachute."

The maximum complete salt-water immersion limits for the parachute are listed below. The parachute assembly should be cleaned within 8 hours of immersion.

Remove from service any parachute assembly or sub-assembly for any of the following conditions:

1. Immersion in salt water for more than 6 hours if the parachute contains cadmium-plated parts (i.e., slider stops).
2. Immersion in salt water for more than 24 hours if the parachute contains stainless steel parts (i.e., slider stops).
3. Immersion in salt water and cannot be cleaned for 36 hours.

REMOVAL OF PERSPIRATION

Perspiration causes damage to the parachute much like salt water does. Small amounts are not significant and may be ignored. For larger areas heavily contaminated, clean the parachute in accordance with the "Removal of Salt Water Contamination" section above.

REMOVAL OF FRESH WATER

Dry parachute assembly in accordance with the section above entitled "Drying a Parachute."

REMOVAL OF MILDEW

1. Wash affected area with mild soap and water solution.
2. Rinse affected area thoroughly with fresh, clear water.
3. Hang assembly in drying tower in accordance with the section above entitled "Drying a Parachute."

REMOVAL OF FIREFIGHTING AGENTS

Parachute fabric and webbing exposed to light water, protein foam, PKP, and any combination of such shall be thoroughly washed within 30 hours after exposure. Hang assembly in drying tower in accordance with the section above entitled "Drying a Parachute."

Metallic parts or components so exposed shall be disassembled as far as practical, washed, dried, and examined. Metallic components treated in this manner may be returned to service if undamaged.

Remove from service any parachute assembly or sub-assembly for any of the following conditions:



1. Contamination by soda-acid firefighting agent. Hardware items may be returned to service after cleaning.
2. Contamination by firefighting agents such as light water, protein foam, PKP or any combination of such, if not decontaminated within 30 hours. Hardware items may be returned to service after cleaning.

REMOVAL OF PETROLEUM PRODUCTS

Hydrocarbons usually do not harm nylon. Petroleum products such as oil or grease have a greenish or brownish appearance. Wash affected area by repeated applications of mild soap and water solution. Each application shall be followed by a rinse in clean, fresh water.

1. Continue washing and rinsing affected area until clean.
2. Hang assembly in drying tower in accordance with the section above entitled "Drying a Parachute."

REMOVAL OF BLOODSTAINS

1. Soak the stained area in cold water.
2. Hand wash affected area with mild soap and water solution.
3. Rinse affected area thoroughly with fresh clean water.
4. Hang assembly in drying tower in accordance with the section above entitled "Drying a Parachute."

REMOVAL OF SOIL

1. Hang the parachute and shake to remove most of the dirt and sand.
2. Brush lightly with a soft-bristled brush.
3. If the assembly is extremely contaminated, perform the following:
 - a. Wash only the soiled areas in warm water with a mild soap.
 - b. Rinse affected area thoroughly with fresh clean water.
 - c. Hang assembly in drying tower in accordance with the section above entitled "Drying a Parachute."



BASIC PATCH PROCEDURE

BASIC PATCH PROCEDURE

OVERVIEW

The Raghanti Basic Patch is recognized as the preferred patching method throughout the industry. The patching method does not require pins nor does it require a measuring square.

LIMITATIONS

A senior rigger (or country's equivalent) is qualified to repair any damage up to 10 inches (25.4 cm) in length as long as the closest area of the completed repair will be:

- At least 1 inch (2.54 cm) from the nearest seam, and
- At least 5 inches (12.7 cm) from the nearest tape or line attachment.

Small snags and holes smaller than 1/8-inch square (one ripstop box) located further than 10 inches (25.4 cm) from the closest line attachment may remain unrepaired as long as there are no more than one in any 10-inch (25.4 cm) diameter circle. A maximum of three such snags per cell are allowed.

Ripstop tape is not authorized for use on Performance Designs parachutes. If the damage is enough to warrant a repair, a sewn repair must be performed.

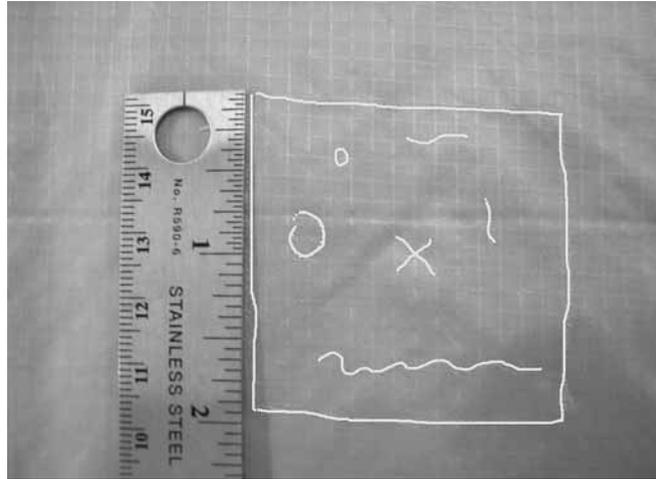
EQUIPMENT AND SUPPLIES NEEDED

- Marking pencil
- Single needle sewing machine with "E" thread
- Ruler
- 7-inch (17.8cm) square piece of fabric for the patch
- 13-inch (33 cm) fabric piece (on which to sew the practice patch)
- Hemostat
- Scissors
- Nippers

PROCEDURE

Locate the damage on the fabric (ex. circles and lines in the photograph). Once the damage has been identified, draw a box around it to define the damage area. The boundary for this particular area of damage is approximately a 2-inch square.

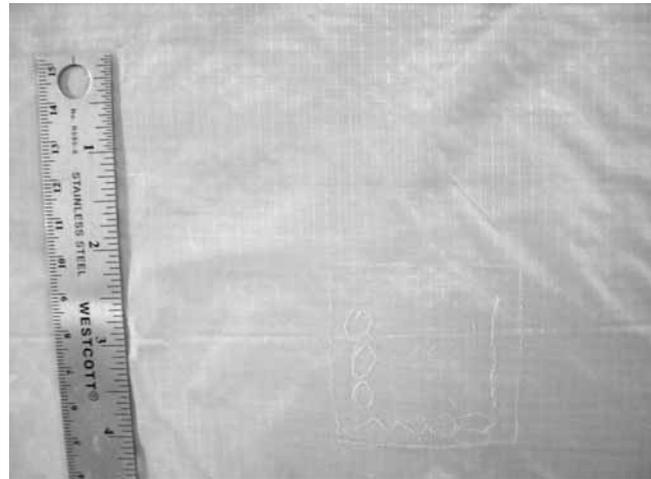
Find the center of the damage and mark it with an "X".



Allow approximately 2 inches from each boundary side for repair work. This includes a 1-inch seam allowance.

Measure half the patch size (in this case, 3 inches) to the left of the damage center. Follow one rip stop line in the fabric as a guide.

At 3 inches out make a center and left border mark (resembling a "T" turned 90° counterclockwise). The center mark will be on the ripstop line (which was followed out 3 inches) and the left border mark will be perpendicular to the center mark. Go 3 inches up from the left center mark and place a top left corner mark.



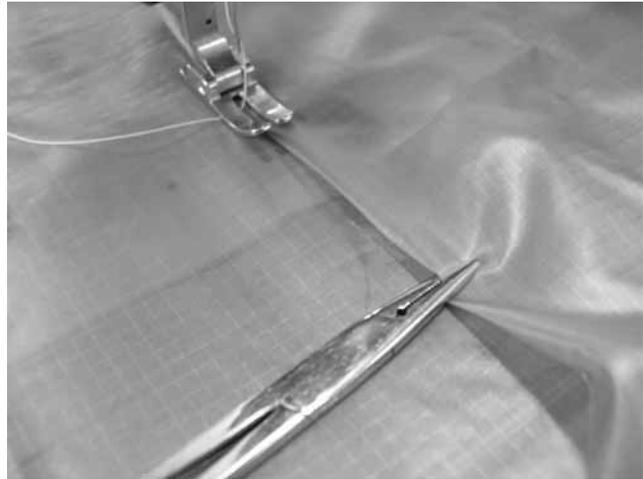
Count down 10 ripstop boxes from the top border and make a mark. This is the starting point.

Count 14 ripstop boxes down on the 7-inch fabric (patch) piece and make a mark. This is the starting point.

Align the starting marks on both pieces of fabric.



Fold the patch material under 4 ripstop boxes. Hold this 4-block seam allowance with the hemostats.



Disengage the puller if one exists on the sewing machine. This gives the person sewing more control over the fabric to prevent slippage and bunching.

Lower the foot and needle into the fabric. While using one hand to hold the two pieces of fabric taut in front, use your other hand to help feed the fabric thru the machine.



Sew to approximately 2 inches from the corner. Fold the 4-block seam allowance under for the second side creating a corner. Hold with the hemostats.



Make sure to set the hook in the stitch loop before lifting the foot to turn a corner. Sew to 1 block from the edge and turn the corner.



Sew the second side to 2 inches from the corner. Fold the 4-block seam allowance under for the third side creating a corner. Hold with the hemostats.

At this point make sure that the third and fourth sides will align properly before sewing.

Sew the third side, then the fourth side as shown.



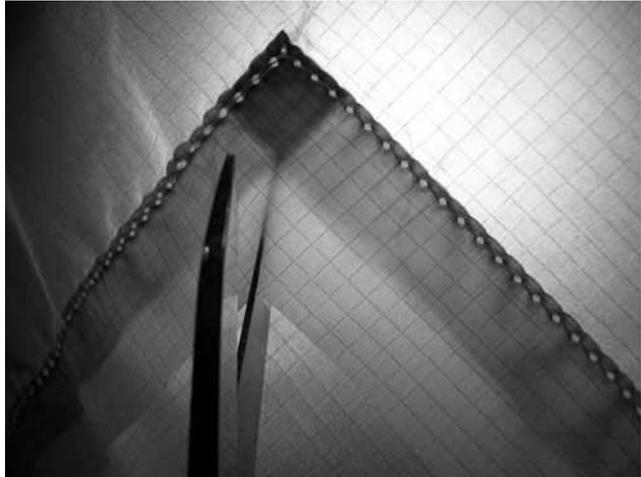
Perform a 4-6 inch oversew.



Using scissors cut the damage out along the ripstop lines 7 boxes in from the stitching holding the patch on. Placing the hand between the patch and parachute while trimming (like wearing a mitten) will prevent damaging the patch with the scissors.



Make a diagonal cut in each corner to 3 ripstop boxes from the corner.



Place the work under the sewing machine. Using the hemostats clamp 1 ripstop box in from the cut edge.



Place the parachute fabric behind the fold back of the patch forming a French fell seam. Do this in two places and seat the 1 box fold back against the patch stitch row with the tip of the hemostat. Sew around the parachute patch repeating this process on each side.



Take care that each corner is fully seated and square.

Use the side of the presser foot as a guide for stitching.



Inspect the work thoroughly.

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COMPLEX PATCH

COMPLEX PATCH

OVERVIEW

This chapter gives guidance on how to perform a complex parachute repair involving a top seam, the top skin, and loaded ribs with V-tapes on a cell.

LIMITATIONS

A master rigger familiar with repairing PD parachutes or a rigger that has received training from Performance Designs on complex repairs may perform these repairs.

EQUIPMENT AND SUPPLIES NEEDED

- Marking pencil
- Single needle sewing machine with “E” thread
- Ruler
- Repair fabric (darker fabric used in the example to show contrast only)
- Hemostat
- Scissors
- Nipper

PROCEDURE

Remove the second pass stitch row of the top seam six inches beyond the location of the completed patch repair.

1. Lift the V-tapes two inches beyond the location of the finished patch repair.
2. Mark the boundaries of the damage on both the top skin and rib.
3. Determine the appropriate size repair patch needed to cover all damage.
4. Cut out the repair patches using the ripstop lines as guides.
5. Make sure the ripstop grain of the repair fabric is square (warp and fill fibers meet at right angles).



6. Sew the patches on the top skin and rib around three sides leaving excess fabric on the fourth or shaped edge of the top skin and rib (always sew repair patches on the inside of the parachute).



7. Use the damaged skin and rib to mark and cut the shape into the fourth side of the repair patch and mark the tape locations on the repair rib.

8. Remove the damaged fabric cutting seven rip-stop boxes away from the repair patch stitch row. Cut the corner diagonals to within three ripstop boxes of the repair patch stitch row corners.



9. Finish the proper parachute patches taking care to be sure that the skin and rib parts go behind the repair patch parts forming a French fell seam. Seat the one box fold back against the patch stitch row with the hemostat. Make the corners square and the stitching straight and even.



10. Re-sew the tapes down to the repaired rib.
11. Re-sew the top seam being careful to sink the needle in the same holes as before.



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LINE REPLACEMENT

LINE REPLACEMENT

OVERVIEW

Damaged suspension lines shall not be repaired. A Master Rigger or his equivalent should replace the lines. Also, lines shall be replaced in pairs to minimize any asymmetrical line trim issues that may result from a single line replacement. Any line, tape, or webbing damage is classified as a major repair and therefore can only be performed by a Master Rigger or his equivalent.

REQUIRED EQUIPMENT AND MATERIALS

- Replacement lines from manufacturer
- V-T-295 size E nylon thread of the same color as used on the rest of the lines
- Bar tack or zig-zag machine
- Scissors
- Seam ripper
- Finger trapping needle

COMPLETE STEERING LINE REPLACEMENT

PROCEDURE

1. Remove the damaged steering line.
2. Starting with the outboard side, attach the new line to the parachute using the same knot as used on the other lines.
3. Bartack the fingertrap. Ensure the bartack originates at the fingertrap entry and extends toward the live side of the fingertrap.
4. Repeat steps 1 through 3 to attach all upper steering lines to the parachute.
5. Thread the lower steering line through the slider and steering line guide ring on the riser and tie to the steering toggle or loop.
6. Apply even tension and adjust all knots. Recheck all measurements.
7. Inspect the work thoroughly. Double check line lengths.
8. Perform a line continuity check.



LOWER STEERING LINE (LST) REPLACEMENT

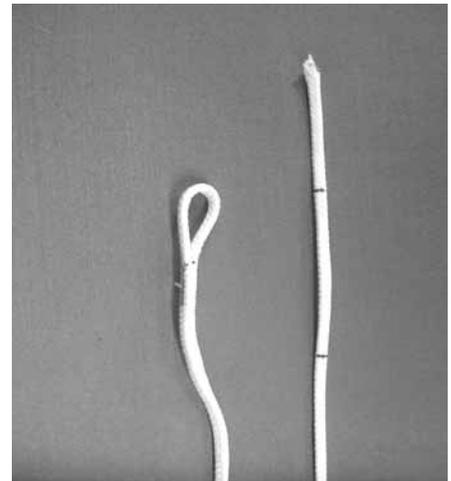
PROCEDURE

1. Remove the damaged lower steering line.
2. Place the new lower steering line through the lower loops of the upper steering lines.
3. Fingertrap the line back into itself, ensuring the marks on the line match up.
4. Bartack the fingertrap ensuring it originates at the fingertrap entry and extends toward the live side of the fingertrap.
5. Attach bottom end of the lower steering line to the connector link in the same location as the damaged lower line.
6. Perform a continuity check.

SUSPENSION LINE REPLACEMENT

The line being replaced will either be an A/B line or a C/D line. These lines come from the factory as follows:

- The “A” portion of the A/B line and the “C” portion of the C/D line will have a prefabricated loop for parachute attachment. (see picture)
- The “B” portion of the A/B line and the “D” portion of the C/D line come straight line (without a loop) and cut at an angle for finger trapping.



PROCEDURE

1. Remove the damaged line.
2. Attach either the A or the C line (depending on which line is being replaced) to the parachute using a lark's head knot.
3. Attach either the B or the D line (depending on which line is being replaced) to the parachute by wrapping the line around the parachute attachment loop to resemble a lark's head knot.
4. Verify the finger-trap match marks are aligned. This ensures the line is at its proper length.
5. Fingertrap the line back into itself, ensuring the marks on the line match up.
6. Bartack the fingertrap. Ensuring it originates at the fingertrap entry and extends toward the live side of the fingertrap.
7. Perform a line continuity check.
8. Repeat steps 1 through 7 for the line opposite the damaged line to ensure symmetry and trim.

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SECTION 4:
PACKING INFORMATION

FLAT PACKING INSTRUCTIONS FOR MS-360-M2 MAIN PARACHUTE

OVERVIEW

If the rig manufacturer specifies a packing method other than the ones shown, and the rig manufacturer authorizes its use for this specific parachute, you may decide which instructions to follow. Otherwise you must follow the Performance Designs instructions. It is recommended that you follow the instructions for the packing method with which you are most familiar.

Inspect the parachute thoroughly before starting to pack it, following the inspection instructions described in Maintenance and Repair section of this manual. Check the line continuity, and ensure the parachute has been assembled on the rig correctly.

PACKING INSTRUCTIONS

Separate the rear and front suspension lines above the slider as shown. When facing the parachute, the control lines and all lines attached to the rear risers should be placed on the left. All lines attached to the front risers should be placed on the right.



Walk the lines up to the parachute and lay it down on the ground.

Flake out the parachute until all T-seams (where non-loaded ribs meet the top skin) are straight from leading edge to trailing edge.

Be sure the parachute is flaked and straight.



Divide the nose (leading edge) in half, folding the top four cells back toward the tail. Leave the bottom four cells lying against the floor. Spread the center cell out evenly between the two halves of the nose. Be sure the A-lines stay grouped together.



Fold the bottom half of the nose in toward the middle of the center cell.



Fold the bottom half of the nose in again towards the center.



Repeat for the other half of the nose.



The folded nose should be in alignment with the A lines as shown.



Hold down the parachute at the A-line path. Grasp the T-seams directly above the B-line path. While holding tension on the lines, fold to the left placing the B lines on top of the A lines.

The material between the A and B lines should now create the fold to the right of the A and B lines.



Hold down the parachute at the B-line path. Grasp the T-seams directly above the C-line path. While holding tension on the lines, fold to the left placing the C lines on top of the B lines.



Hold down the parachute at the C-line path. Grasp the T seams directly above the D-line path. Lay the D-lines on top of the C lines.



Set the deployment brakes according to the harness and container manufacturer's instructions.

Split the tail, leaving the center cell of tail (with label) on top.



Stack the control lines of one side on top of the D lines. Ensure tension is applied to the lines to keep them taut.



Flake this side of the parachute evenly until the center cell (label) is showing.



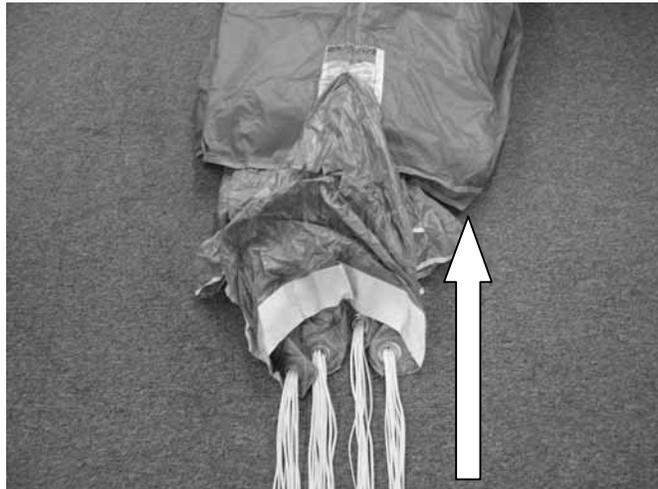
Repeat for the other side.



Clear the stabilizers A to B, B to C, and C to D so that they are on each side of the line path and do not cross the center. Look up the lines to all the line attachment points. All lines should go up to the attachment points with no parachute fabric between them.



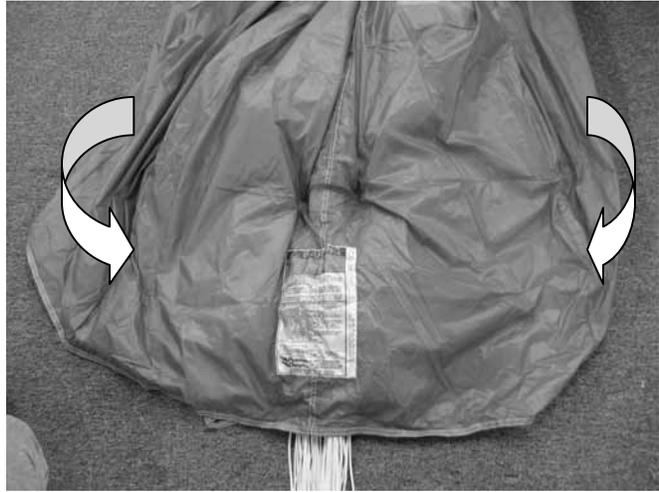
Pull up the slider by grabbing the tapes around its center and walking from the connector links to the base of the folded parachute.



Ensure the slider grommets rest firmly against the slider stops.



Dress the center of the tail by spreading out the top center panel to the width of the rest of the parachute underneath.



Tuck the center tail panel around the parachute, working from bottom to top and making sure not to cover the leading edge.



Fold the parachute as shown.



S-fold the parachute again.



Place the parachute in the deployment bag following the harness and container manufacturer instructions.



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**PRO PACKING THE MS-SERIES MAIN
PARACHUTE**

PRO PACKING THE MS-SERIES MAIN PARACHUTE

OVERVIEW

If the rig manufacturer specifies a packing method other than the ones shown, and the rig manufacturer authorizes its use for this specific parachute, you may decide which instructions to follow. Otherwise you must follow the Performance Designs instructions. It is recommended that you follow the instructions for the packing method with which you are most familiar.

Inspect the parachute thoroughly before starting to pack it, following the inspection instructions described in Maintenance and Repair Section of this manual. Check the line continuity, and ensure the parachute has been assembled on the rig correctly.

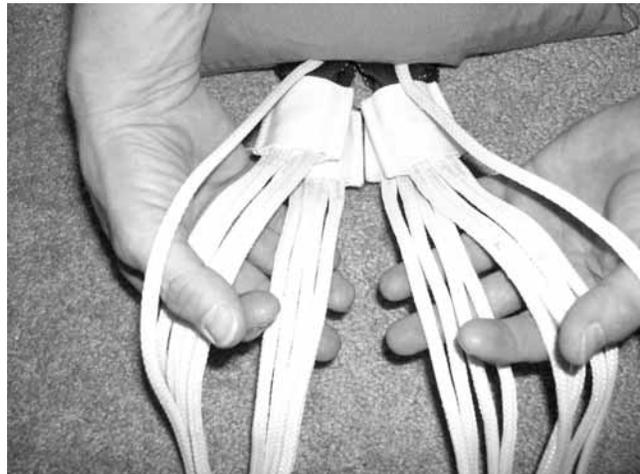
PROCEDURE

Stretch your parachute system out on the ground.

Set the brakes according to instructions provided by the harness container owner's manual.



Place the fingers of the left hand between each left-hand riser and between the left-hand steering line and the risers. Do the same with the right hand. Be sure there are no twists in the risers. Walk up to the parachute pushing the slider along as you go.



When you reach your parachute, pull both hands apart as far as the slider will allow. Shake the parachute a couple of times to settle everything.



Flake the entire nose with one hand as shown.



Once you have the entire nose flaked, tuck it between your knees and hold it there.



Clear the stabilizers. Clear the fabric between the line groups by pulling it out to each side. Do this for all the line groups.



When you look down in between the stabilizer folds after you've done your flaking, the folds should look neat.



Fold the d-line group in with one motion to put a real fold in the fabric between the C and D lines. Do the same thing on the other side.



Grasp the steering lines where they attach to the tail. Pull the entire tail out and drop it straight down.

Now organize the steering lines and tail to look like the photograph (right).



Ensure the stabilizers and their slider stops are correctly located outside the suspension lines as described previously. Parachute damage is likely if a stabilizer or its slider stop lies under a line.

Quarter the slider and ensure the slider grommets are against the slider stops.



Reach down and pick up the very middle point of the trailing edge. Raise the tail a couple inches above the slider and hold it in place with the same hand that is holding the lines.



Release your knee grip on the nose and tail.

Take both sides of the tail in one hand and roll them together into the middle so they completely encase the rest of the parachute.



Place your free hand carefully under the bundle. Swing it out slightly so that the lines stay taut and gently lay it on the floor.

Remove the air from the parachute.



S-fold the parachute as shown. Ensure the parachute is dressed to approximately the width of the d-bag.



S-fold the parachute again.



Place the parachute in the deployment bag following the harness and container manufacturer instructions.



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SECTION 5:
DRAWINGS

MS-360-M2 WARNING LABEL



WARNING

MODEL SIZE
SI-360-M2

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.

TRAINING AND PROFICIENCY REQUIREMENTS:

DO NOT USE THIS PARACHUTE SYSTEM UNLESS YOU HAVE:

- A. RECEIVED INSTRUCTION IN THE USE OF THIS SPECIFIC PARACHUTE SYSTEM AND OPERATE IT WITHIN THE STUDENT OR NOVICE LIMITATIONS LISTED BELOW:
- OR-
- B. PERFORMED AT LEAST 50 RAM AIR PARACHUTE JUMPS AND AT LEAST 10 SOFT STAND UP LANDINGS, WITHIN THE TARGET AREA, USING A CANOPY NO MORE THAN 15% LARGER THAN THIS SIZE.
- OR-
- C. EXPERIENCE WITH THIS EQUIPMENT AND ARE HIGHLY FAMILIAR AND PROFICIENT WITH THE OPERATION, FLIGHT AND LANDING CHARACTERISTICS OF THIS MODEL/SIZE PARACHUTE AND SYSTEM.

SKILL AND OPERATING LIMITS (STD. DAY TEMP. AT SEA LEVEL):

WEIGHTS LISTED ARE (JUMPER + CLOTHING + EQUIPMENT) LBS (KG).

MIN. WT.	STUDENT*	NOVICE*	INT.*	ADV.*	EXPERT*	MAX. WT.
160 (73)	325 (148)	325 (148)	350 (159)	375 (170)	425 (193)	425 (193)

MAXIMUM DEPLOYMENT SPEED: 150 KTS KTS EAS @ SEA LEVEL

* MAXIMUM WEIGHT, TO REDUCE RISKS STAY WELL BELOW THIS WEIGHT.
 -WEIGHT ADJUSTMENTS FOR LANDING CONDITIONS:
 REDUCE ALL WEIGHTS BY 2 % PER 1000 FT (300M) LANDING ELEVATION.
 REDUCE ALL WEIGHTS BY AN ADDITIONAL 1% FOR EVERY 3° C (5° F) ABOVE STD. DAY TEMP., WHICH IS 15°C (59°F) AT SEA LEVEL.
 STD DAY TEMP. DECREASES 2°C (3.5°F) PER 1000 FT (300M).
 FOR EACH 1000 FT ABOVE SEA LEVEL.
 -OPENING FORCES INCREASE WITH ALTITUDE, REDUCE MAXIMUM WEIGHT AND/OR MAXIMUM AIRSPEED (EAS) FOR DEPLOYMENT ALTITUDE.
 **VARIES WITH WEATHER/LANDING CONDITIONS
 -NOT APPROVED FOR TANDEM USE
 -MAX WT. = MAXIMUM DEPLOYMENT WEIGHT
 -MAXIMUM LANDING WEIGHT = 425 LBS (193 KG)

MILITARY SILHOUETTE 360-M2
 M2 = FREEFALL/STATICLINE

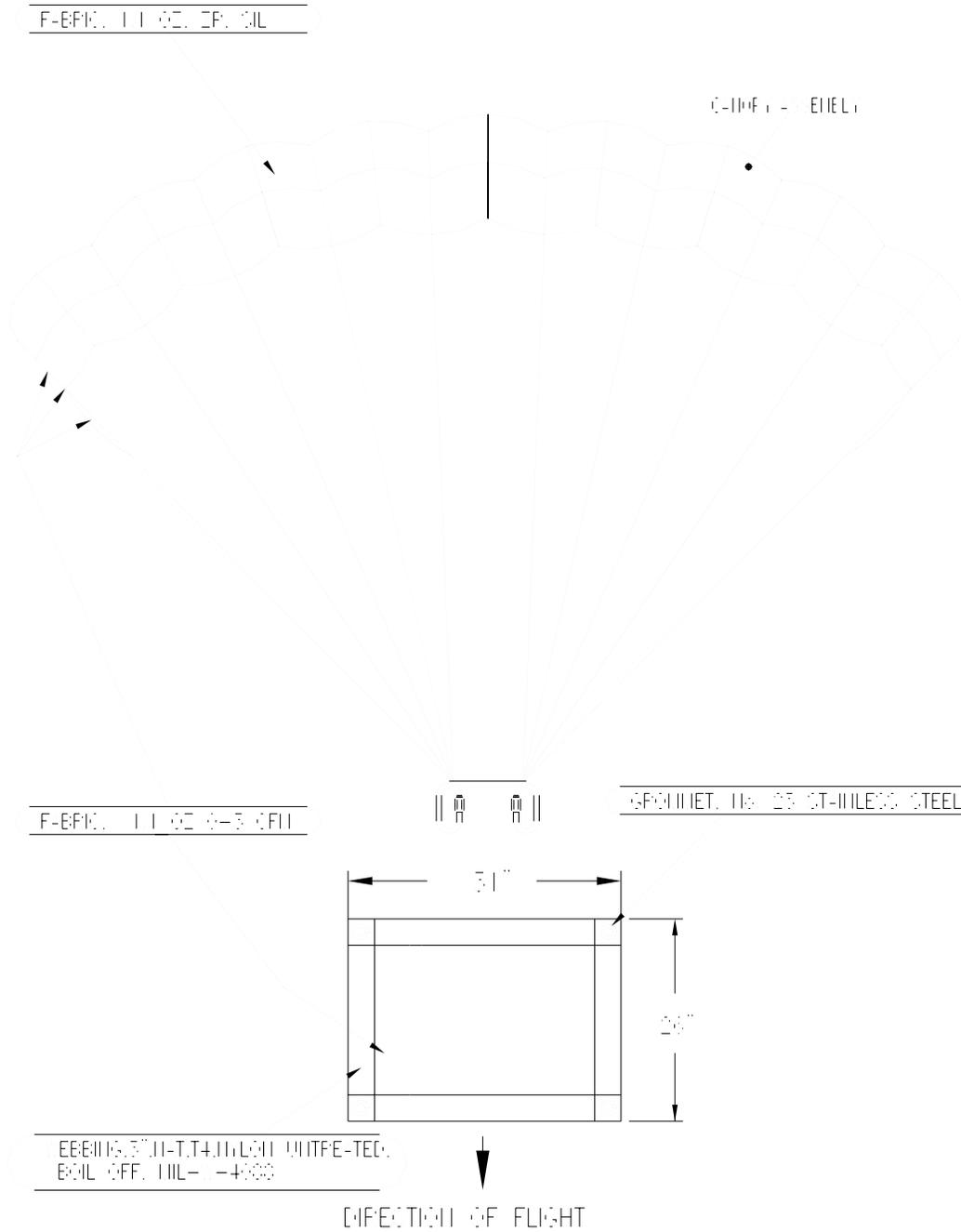
DATE OF MANUFACTURE: CUT DATE	
PN: MS0360P06	INSP:

SN: MS360-000000

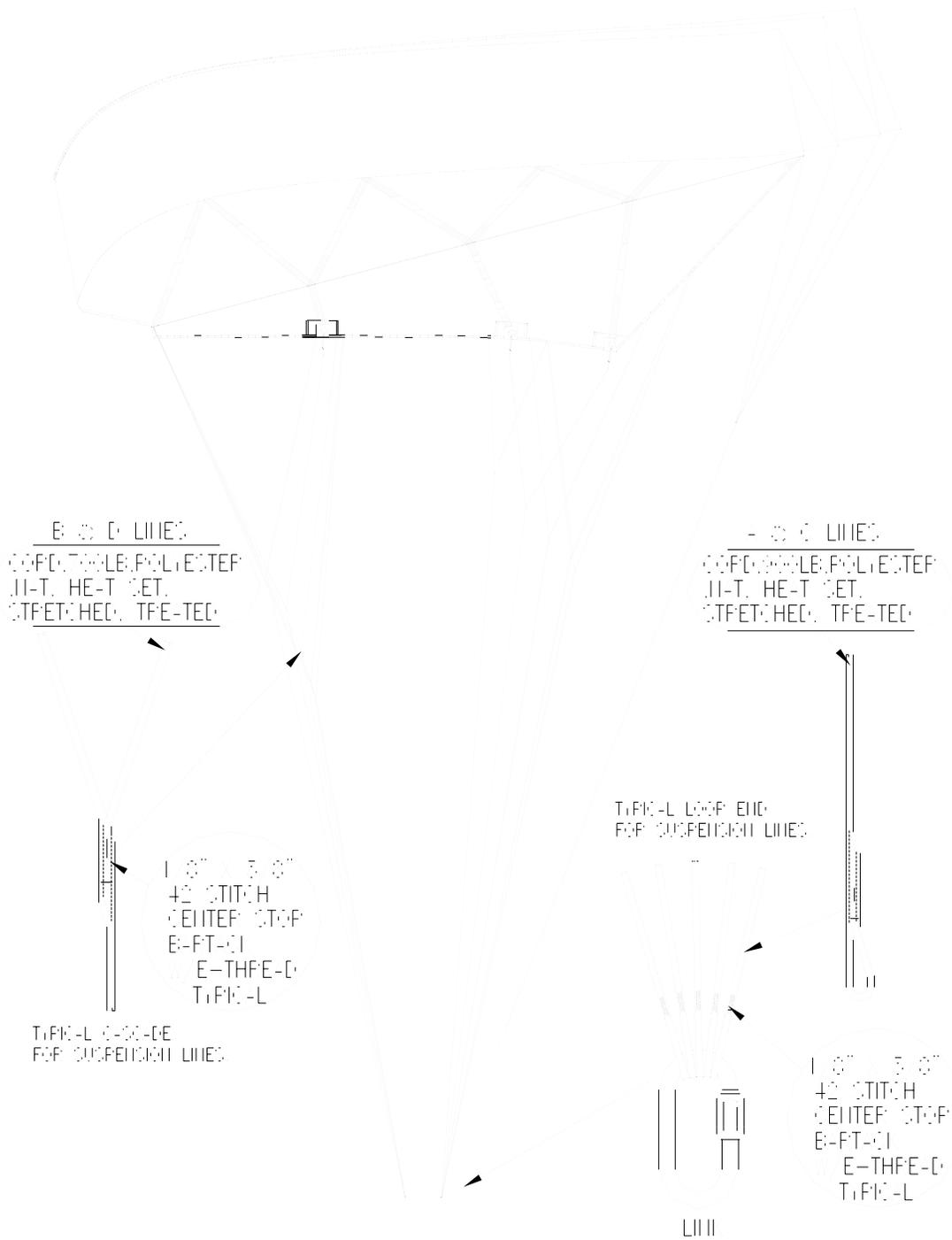
SI-360-M2	MODEL #
MS0360+CUT REVISION FROM PRODUCTION ORDER	PART #
MS360-NUMBER FROM PRODUCTION ORDER	SERIAL #



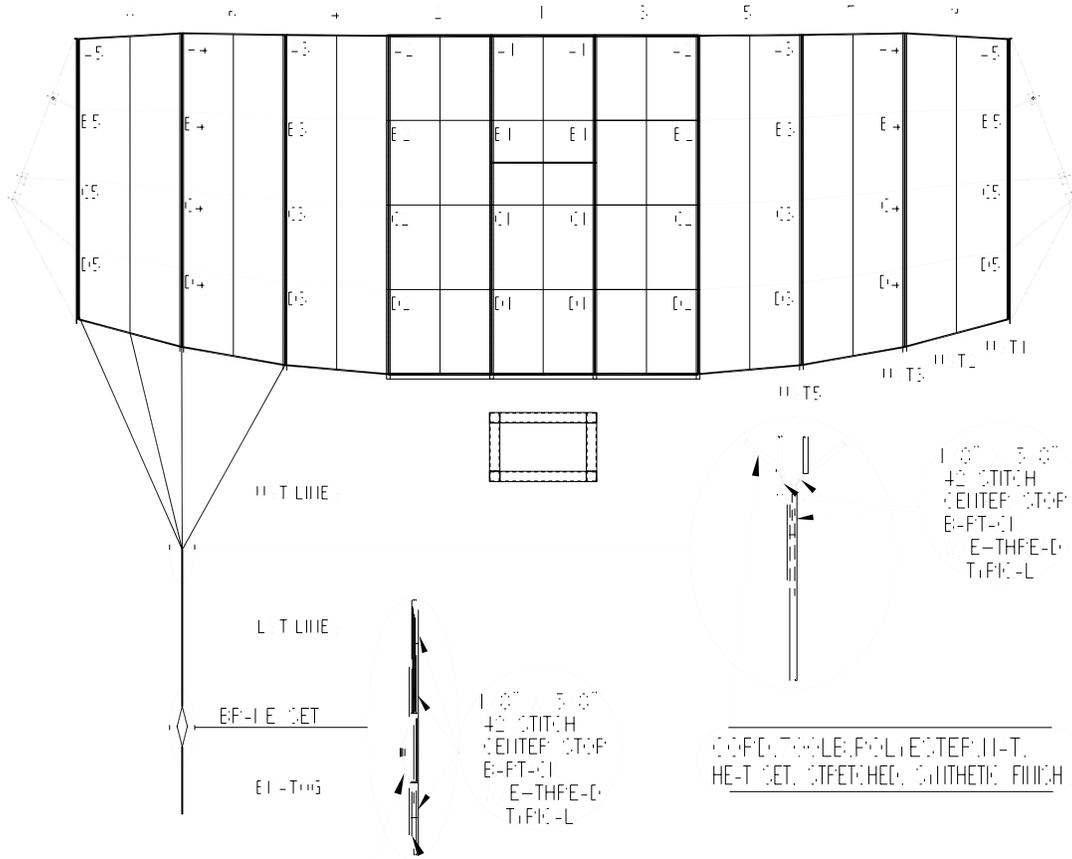
MS-360-M2 FLYING FRONT VIEW



MS-360-M2 FLYING SIDE VIEW



MS-360-M2 PLANFORM



COPOLYESTER/POLYESTER/NET,
STRETCHED, UNIFORMLY STRETCHED

COPOLYESTER/POLYESTER/NET,
HEAT SET, STRETCHED, SYNTHETIC FINISH

LINE LENGTHS FOR EQUIPMENT INSPECTION

E-5 LINE	166.14	± .1	E-5 TO E-5	33.4	± .1	E-2 TO E-2	33.4	± .1
E-4 LINE	166.3	± .1	E-5 TO C-5	11.1	± .1	E-2 TO C-2	16.1	± .1
E-3 LINE	166.14	± .1	E-5 TO D-5	21.1	± .1	E-2 TO D-2	26.1	± .1
E-2 LINE	166.5	± .1	E-4 TO E-4	33.4	± .1	E-1 TO E-1	33.4	± .1
E-1 LINE	166.5	± .1	E-4 TO C-4	11.1	± .1	E-1 TO C-1	16.1	± .1
E-F-I-E TO TROG	25	± .1	E-4 TO D-4	21.1	± .1	E-1 TO D-1	26.1	± .1
E-11 TO E-11 TOP (100#)	33.14 TO 33.14		E-3 TO E-3	33.4	± .1	E-5 TO H-T	19.1	± .1
E-1 TO C-1	33.14 TO 33.5		E-3 TO C-3	11	± .1			
			E-3 TO D-3	21	± .1			



MS-360-M2 DAMAGE CHART

Serial # _____ MILITARY SILHOUETTE M2 Tracking # _____

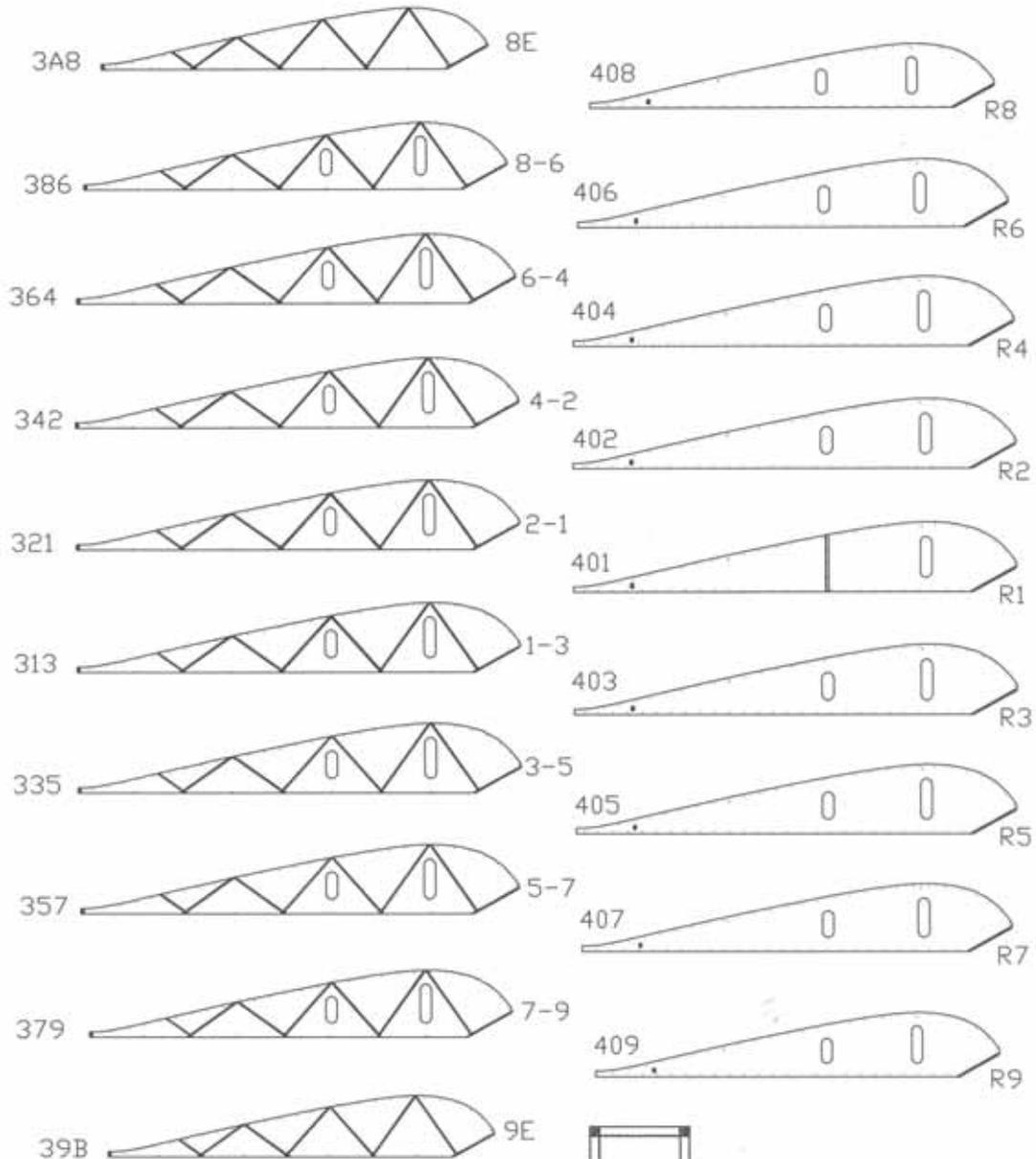
TE 502	LE 8E	TE	LE
208	B8	109	T9
206	B6	107	T7
204	B4	105	T5
202	B2	103	T3
201	B1	101	T1
203	B3	102	T2
205	B5	104	T4
207	B7	106	T6
209	B9	108	T8
501	9E		

Date # _____ DCH-012_REV0 10F2 Insp # _____



MS-360-M2 DAMAGE CHART

Serial # _____ MILITARY SILHOUETTE M2 Tracking # _____



Date # _____ DCH-012_REV0 20F2

Insp # _____

