MUSTANG SURVIVAL IMMERSION COVERALL, CONSTANT WEAR MODEL MSF750 NSN 8475–21–907–9901

DESCRIPTION AND MAINTENANCE INSTRUCTIONS 24 SEPTEMBER 2012, REV: --

Mustang Survival Canada
7525 Lowland Drive
Burnaby, BC, V5J 5L1
Tel: (604) 270-8631 Fax: (604) 270-0489
E-mail: mustang@mustangsurvival.com
WEB: www.mustangsurvival.com

Mustang Survival-USA
1215 Old Fairhaven Parkway
Bellingham, WA
USA 98225
Tel: (360) 676-1782 Fax: (360) 676-5014
E-mail: mustangusa@mustangsurvival.com

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 GENERAL 1
1.2 CONTACT 1
1.3 RESPONSIBILITIES 1
1.4 DESCRIPTION 2
2.0 IMMERSION AND ANTI-EXPOSURE CLOTHING 4
2.1 HAZARDS 4
2.2 WET SUITS 4
2.3 DRY SUITS 4
3.0 FEATURES 5
3.1 GENERAL 5
3.2 HYPOTHERMIA PROTECTION 5
3.3 TESTING 6
3.4 WEIGHT AND DIMENSIONS 7
3.5 NECK AND WRIST SEALS 7
3.6 MAIN ENTRY ZIPPER 8
3.7 RELIEF SLIDE FASTENER 9
3.8 STORAGE POCKETS 9
4.0 FITTING 12
4.1 DONNING INSTRUCTIONS ILLUSTRATED 12
4.2 ATTACHING PARTS 14
4.3 WATERPROOF IMMERSION SOCKS 15
4.4 FITTING OF IMMERSION SOCKS 15
4.5 TAPING THE JOINTS 16
4.6 EXPOSED ADHESIVE SOLUTION 17
5.0 MAINTENANCE 18
5.1 GENERAL 18
5.2 CLEANING 18
5.3 ACID STAINS 19
5.4 OIL STAINS 19
5.5 OTHER DAMAGE 19
5.6 TREATMENT AFTER IMMERSION 19
5.7 ZIPPER CARE 20
5.8 INSPECTION 20
5.9 REPAIRS 26
5.10 REPLACEMENT OF COMPONENTS 30
6.0 FOLDING AND PACKING PROCEDURES 34
7.0 SUMMARY 37
8.0 PARTS LIST 38

TABLE OF FIGURES

Figure 1. MSF750 Size Chart 3
Figure 2. Clo Insulation Graph 6
Figure 3. Gently Stretching the Wrist Seal Opening 8
Figure 4. Gently Stretching the Neck Seal Opening 8
Figure 5. Main Entry Zipper 9
Figure 6. Writing Pad Window Pocket 10
Figure 7. Pencil Pocket 10
Figure 8. Plain Pocket 11
Figure 9. Inner Thigh Pocket 11
Figure 10. Step a. (Donning Instructions) 12
Figure 11. Step b. (Donning Instructions) 12
Figure 12. Step c. (Donning Instructions) 13
Figure 13. Step d. (Donning Instructions) 13
Figure 14. Step e. (Donning Instructions) 14
Figure 15. Steps a. and b. (Fitting of Immersion Socks) 15
Figure 16. Steps c and d. (Fitting of Immersion Socks) 16
Figure 17. Step e. (Fitting of Immersion Socks) 16
Figure 18. Recommended Zipper Cleaning Fluids and Waxes 20
Figure 19. Step a. (Suit Leakage Test) 21
Figure 20. Step b. (Suit Leakage Test) 22
Figure 21. Step c. (Suit Leakage Test) 22
Figure 22. Step d. (Suit Leakage Test) 23
Figure 23. Step e. (Suit Leakage Test) 23
Figure 24. Step f. (Suit Leakage Test) 24
Figure 25. Step g. (Suit Leakage Test) 24
Figure 26. Step h. (Suit Leakage Test) 25
Figure 27. Step i. (Suit Leakage Test) 25
Figure 28. Step j. (Suit Leakage Test) 26
Figure 29. Simulated Tears and Suggested Patch Configurations (Not to Scale) 29
Figure 30. Steps a. and c. (Folding and Packing) 34
Figure 31. Steps d. and e. (Folding and Packing) 35
Figure 32. Step f. (Folding and Packing) 35
Figure 33. Step g. (Folding and Packing) 36
Figure 34. Step h. (Folding and Packing) 36
Figure 35. Immersion Coverall Model MSF750 and Index Numbers 38
Figure 36. Parts List for the Immersion Coverall, Constant Wear Model MSF750 39
Figure 37. Expendables List for the MSF750 39

1.0 INTRODUCTION

1.1 GENERAL

1.1.1 This manual provides information on the hazards of cold-water immersion; the function and features of the Mustang Survival Constant Wear Immersion Coverall Model MSF750. This manual also includes test, maintenance and repair instructions to assist qualified Aviation Life Support Equipment Technicians.

1.1.2 Read this manual thoroughly to become familiar with the operation of the zippers, pockets and seals. The lives of aircrew may depend on the condition of the MSF750. Keep the manual in a convenient location for easy reference in the event that the suit requires inspection, repair or cleaning.

1.1.3 This manual consists of eight sections, each organised into a number of subsections (see the Table of Contents).

1.2 CONTACT

1.2.1 For further information concerning this manual or the suit, contact:

Technical Support Department

Mustang Survival Corp.

7525 Lowland Drive

Burnaby, BC

V5J 5L1

Tel. (604) 270-8631

Fax (604) 270-0489

E-mail: mustang@mustangsurvival.com

WEB: www.mustangsurvival.com

1.2.2 Velcro™ is a trademark of American Velcro™ Inc.

1.2.3 GORE™ is a registered trademark of W. L. Gore and Associates.

1.2.4 Nomex® is a registered trademark of DuPont.

1.3 RESPONSIBILITIES

1.3.1 Responsibility is assumed, following training, by the individual to whom the suit is issued or assigned for pre and post flight inspections and for returning the suit to the Aviation Life Support Equipment shop for periodic inspection and testing on required dates.

1.3.2 Each operational organization is responsible for the instruction and survival training of all aircrew and aircraft passengers in the following:

a. Fitting of the immersion suit

b. Purpose, use and operation of all accessories

c. Importance and method of visual pre and post flight inspections

1.3.3 The Aviation Life Support Equipment shop is responsible for:

a. Inspection upon first issue from the supply depot or contractor

b. Ensuring the suit is complete and serviceable prior to issue

c. Periodic inspection and testing of the suit (see section 5.8.3)

d. Maintenance, cleaning and repair when required

e. Requisitioning and maintaining stocks of spare parts

f. Maintenance of inspection records for all Mustang MSF750 units

1.4 DESCRIPTION

1.4.1 Purpose

1.4.1.1 The constant wear immersion coverall Mustang model MSF750 is a blend of ergonomic design and hazard protection. The suit, specifically engineered for aircrew use in over-water operations, provides fire protection and anti-exposure protection in the event of cold-water immersion.

1.4.2 Design

1.4.2.1 The MSF750 is a one-piece design constructed from a three-layered GORE™ material comprised of fire resistant aramid cloths and the waterproof material polytetrafluoroethylene (PTFE), which is impermeable to liquid water, and yet moisture vapour permeable. The breathable quality of the fabric makes the MSF750 a constant wear garment.

1.4.2.2 The moisture vapour permeable characteristics reduce heat stress, meaning relative thermal comfort for the wearer. In a 68° F (20° C), 50% relative humidity environment, the suit will permit transmission of approximately 175 grams of moisture vapour per hour. This equates to a heat dissipation of approximately 150 watts per hour during periods of high activity.

1.4.2.3 The fitting of high stretch soft latex rubber seals at the neck and wrists and immersion facilitates the watertight design, keeping a wearer dry when immersed in water.

NOTE: Wearers must wear appropriate thermal undergarments (including liner) or the protection afforded by the MSF750 is substantially reduced.

1.4.3 **Fit**

1.4.3.1 This suit is available in eleven sizes. Contact Mustang Survival for information regarding custom sizing.

Figure 1. MSF750 Size Chart

SIZE	HEIGHT		CHEST CIRCUMFERENCE		NSN
	Cm	Inches	Cm	Inches	
1	165 - 173	65 - 68	84 - 91	33 - 36	8475-21-907-9902
2	165 - 173	65 - 68	91 - 99	36 - 39	8475-21-907-9903
3	165 - 173	65 - 68	99 - 107	39 - 42	8475-21-907-9904
4	173 - 180	68 - 71	84 - 91	33 - 36	8475-21-907-9905
5	173 - 180	68 - 71	91 - 99	36 - 39	8475-21-907-9906
6	173 - 180	68 - 71	99 -107	39 - 42	8475-21-907-9907
7	180 - 188	71 - 74	91 - 99	36 - 39	8475-21-907-9908
8	180 - 188	71 - 74	99 - 107	39 - 42	8475-21-907-9909
9	180 - 188	71 - 74	107 - 114	42 - 45	8475-21-907-9910
9XT	188 - 196	77	107 - 114	42 - 45	8475-21-907-9912
10	188 - 196	77	114 - 122	45 - 48	8475-21-907-9911

2.0 IMMERSION AND ANTI-EXPOSURE CLOTHING

2.1 HAZARDS

2.1.1 Cold-water immersion is a life-threatening situation, and your survival depends on the clothing you wear. Cold, shock, hypothermia, loss of dexterity and mental sharpness and drowning are your primary concerns. Many strong swimmers drown within metres of safety in cold water. This suggests that many drown because of the rapid shock of immersion, causing immediate hyperventilation, water ingestion, and often heart failure, which may occur in water below 59° F (15° C).

2.1.2 Without adequate buoyancy and insulation, individuals rely on swimming ability and endurance for survival. Your strength and endurance are seriously diminished in colder water, reducing your ability to overcome waves, currents, spray, etc.

2.1.3 Hypothermia results when your body loses heat faster than it can be replaced, and can occur in any environment below 98.6^{o} F (37° C), our normal body core temperature. Water conducts heat away from our body 25-30 times faster than air, presenting a high risk.

2.1.4 Shivering is the body's way of generating heat to replace the heat that is lost. The smallest blood vessels constrict close to the skin, reducing the blood circulation to your hands and feet. Circulation to the body core is restricted, where it is needed most, resulting in a loss of dexterity. As the effect of cold increases, muscles weaken and stiffen, leading to the loss of feeling and reduced co-ordination. Your decision-making and thinking processes slow down.

2.1.5 Proper clothing reduces many of these hazards, improving your chances of survival. Clothing should provide insulation from the cold and should not hinder mobility. Ensure buoyancy is provided either inherently in your outfit or with an additional life preserver, preferably both.

2.1.6 Generally there are two types of immersion protective clothing:

a. Wet suits

b. Dry suits

2.2 WET SUITS

2.2.1 Wet suits allow some water in, but restrict water movement into and out of the suit. Your body heats up the water that becomes, more or less, trapped in the suit. If the openings of the suit become restricted, the warmed water stays inside the suit longer, reducing heat loss. If a wet suit is damaged or torn, the level of protection is reduced.

2.3 DRY SUITS

2.3.1 Dry suits protect you during cold-water immersion by using, in conjunction with garments worn under the suit, the trapped air as an insulation layer from the cold water. Most dry suits utilise seals at the wrists, neck and ankles, unless incorporating gloves and boots. These seals are made from waterproof materials, insulated or non-insulated.

3.0 FEATURES

3.1 GENERAL

3.1.1 Familiarize yourself with all the features of the suit to maximize its effectiveness. Illustrations are provided as an additional reference.

3.1.2 The suit is made of fire retardant, watertight fabric and has soft latex neck and wrist seals, a main entry slide fastener and urination slide fastener. When properly fitted with anti-exposure socks (Mustang P/N MGS510), the suit is watertight and is intended to keep the wearer dry in the event of immersion. Multiple pockets are included for convenient storage.

3.1.3 The aramid cloth lamination provides some tear resistance, and allows for a smoother external surface, providing increased comfort and ease in donning and doffing.

3.1.4 Two lower leg pockets are included with the suit for optional addition after fitting.

3.1.5 Spare watertight fabric patches are also included.

3.2 HYPOTHERMIA PROTECTION

3.2.1 Immersion in cold water is a danger for anyone working on or near the water. The length of time a person can survive in cold water largely depends on both the water's temperature and the thermal protection of their protective clothing.

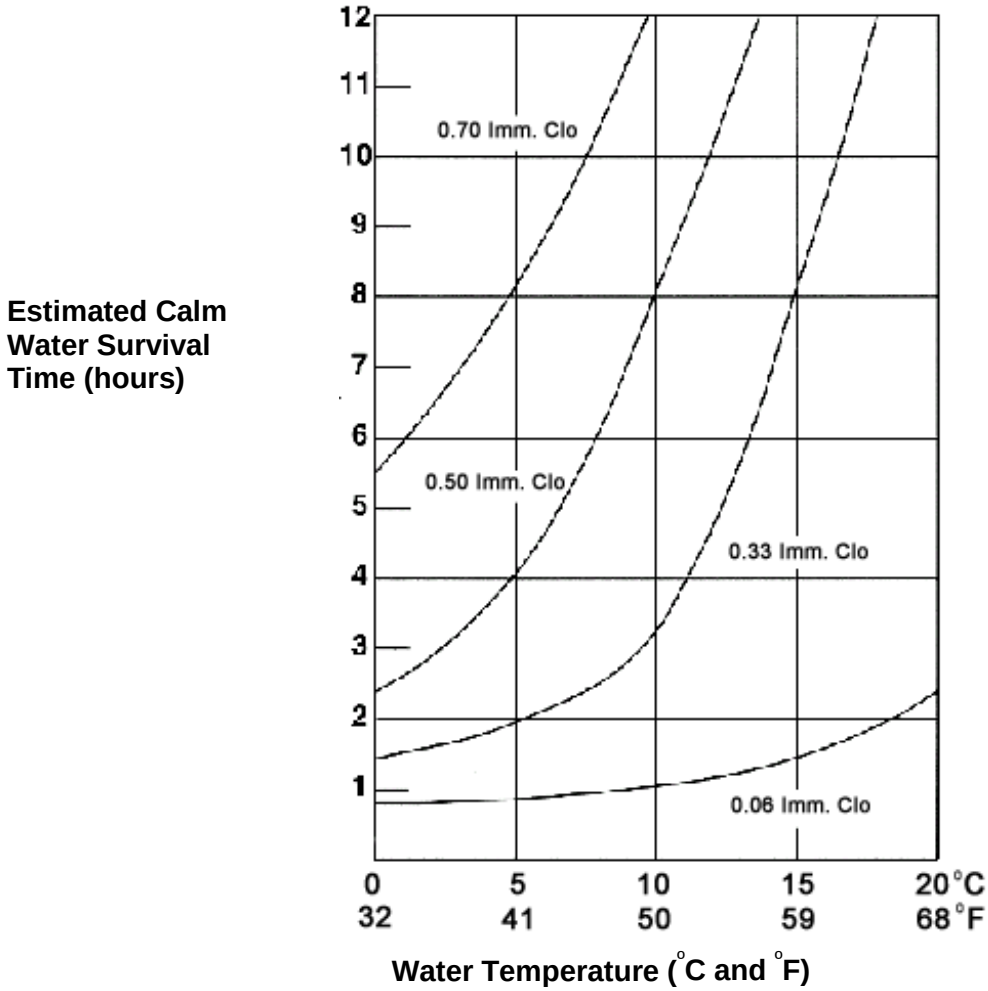
3.2.2 To create the most effective protection against hypothermia, Mustang Survival begins by evaluating the clothing's immersed Clo value, which depicts the level of thermal insulation a garment provides. Clo is a measurement of insulation, much like the 'R' values assigned to fibreglass house insulation. We determine the rate at which heat is lost from the body, as well as the difference in temperature between the skin and the water.

3.2.3 Simply speaking, we determine the rate at which heat is lost from the body, as well as the difference in temperature between the skin and the water. Predictions can be made, from the Immersed Clo values, of the rate at which a person's body temperature will drop in cold water. These values are included in figure 2.

3.2.4 Figure 2 indicates random samples of Immersed Clo values and the corresponding estimation of survival time in cold water (assuming a thin person with a 5.5° F (3° C) drop in body core temperature).

3.2.5 The Mustang model MSF750 Immersion Coverall has been rated at 0.847 immersed Clo (calm water).

Figure 2. Clo Insulation Graph



NOTE: When using figure 2, keep in mind that the chart was derived empirically by mathematical modeling and conservatively applied to the tenth percentile (thin) individual.

With the complexity of factors involved, there is no guarantee as to the accuracy of the predicted survival time on an individual case basis.

3.3 **TESTING**

3.3.1 All MSF750 suits are 100% tested to ensure the highest level of reliability of performance. Superior quality is guaranteed by Mustang Survival's qualification under rigid ISO-9001 standards.

3.4 WEIGHT AND DIMENSIONS

3.4.1 The weight of the dry MSF750 immersion coverall is approximately 1.8 kg (4 lbs).

3.5 NECK AND WRIST SEALS

3.5.1 The neck and wrist seals are latex rubber, allowing the user to stretch each seal over their head or hand providing watertight seals. The neck seal is attached to the suit at the collar and the wrist seals at the end of the sleeves.

3.5.2 When the wearer has been fitted with the correct size suit, the seals should be trimmed to a comfortable but watertight fit. The seals incorporate small equally spaced ribs around the circumference of the opening, providing added strength and tear resistance. The seals require careful usage to avoid rips, which would result in the loss of their waterproof seal.

3.5.3 The circumference of the fitted wrist seals varies from approximately five to seven inches in six equal steps, denoted by the equally spaced rings.

3.5.4 The neck seal provided has a series of equally spaced rings, each half-inch. The untrimmed seal will fit a wearer with a 33.0 – 34.3 cm (13-13 $^{1}/_{2}$ inch) neck circumference.

3.5.5 These ribs may be used as a guide in trimming the seal opening to fit different individual sized necks and wrists. To trim the seals for a proper fit, the spaced rings should be carefully removed one at a time using a pair of scissors. The suit should be worn for a reasonable amount of time before trimming.

3.5.6 Individuals with large necks (43.0 cm or 17 inches or greater) should have a minimum of two rings removed before fitting.

NOTE: When fitting, the wearer should remove the suit if they experience significant discomfort.

3.5.7 Latex rubber deteriorates with age, causing the seals to lose their elasticity, and eventually crack when stretched. It is important that the seals are inspected, with the rest of the suit, at regular intervals to ensure they will seal properly when required. The seals are replaceable by qualified technicians at the unit level (see section 5.10).

3.5.8 To quickly check the seals:

a. Grasp the seal opening with two fingers.

b. Gently stretch the opening.

c. Watch for cracks, nicks, or tears near the opening of the seal.

Figure 3. Gently Stretching the Wrist Seal Opening

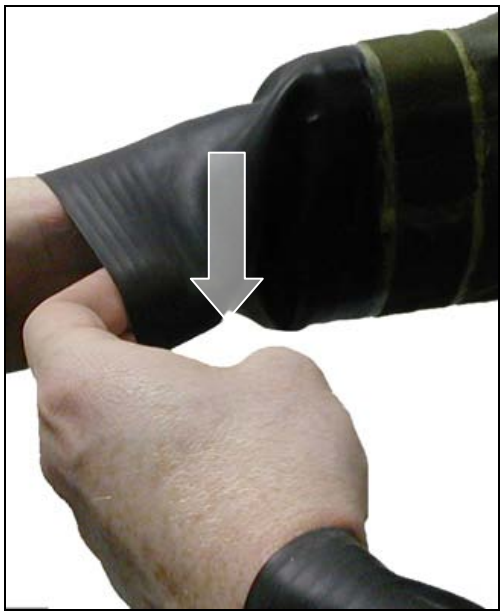


Figure 4. Gently Stretching the Neck Seal Opening

3.5.9 Return the suit immediately to a qualified technician, or Mustang Survival, for replacement upon detection of any of these types of damages.

3.6 **MAIN ENTRY ZIPPER**

3.6.1 The main entry zipper (see figure 5) is a heavy-duty zipper with nickel-silver teeth that provides a watertight seal when closed.

3.6.2 The main entry zipper starts on the front of the suit and extends vertically up the side of the chest, around the back of the neck and down the other side of the chest. A 0.83 cm ($^5/_8$ inch) wide black ribbon nylon thong is attached to the zipper slider, assisting the wearer in opening and closing the zipper.

Figure 5. Main Entry Zipper

CAUTION: Avoid snagging your clothing in the zipper, as this can break the zipper's seal.

3.6.3 The zippers should always be left in the closed position while the suit is packed in a container. See section 5.7 for zipper care procedures and for recommended zipper cleaners and lubricants.

3.7 RELIEF SLIDE FASTENER

3.7.1 The relief slide fastener (see figure 5) is a black, zipper with metal teeth that provides a watertight seal when fully closed. The slide fastener is located on the front of the MSF750 Immersion Coverall and extends horizontally across the groin area.

3.7.2 The zipper closes left to right, from the wearer's point of view. A nylon thong is attached to the zipper slider, assisting the wearer in opening and closing the zipper.

3.8 STORAGE POCKETS

3.8.1 The pockets are constructed of three-layered GORE™ fabric, in several different configurations, and are located at various places on the suit. The sewn seams are heat sealed with tape on the inner side of the suit to ensure the suit is watertight.

3.8.2 The writing pad window pocket (see figure 5) is constructed of three-layered GORE™ fabric, and consists of a slide fastener, four drainage eyelets, and two snap fasteners. It contains one piece of clear plastic and two pieces of white polystyrene sheets. The

pocket is sewn to the suit on the front of the upper thigh just beneath the relief slide fastener.

Figure 6. Writing Pad Window Pocket

3.8.3 The pencil pockets (see figure 7) are constructed of the three-layered GORE™ fabric. One pencil pocket is sewn to each upper sleeve.

Figure 7. Pencil Pocket

3.8.4 The plain pocket (see figure 8) is constructed of the three-layered GORE™ fabric, a snap fastener and two drainage eyelets. These pockets are not sewn on the suit, but are included for application after fitting (see section 4.0).

Figure 8. Plain Pocket

3.8.5 The inner thigh pocket (see figure 9) is constructed of the three-layered GORE™ fabric and a metal slide fastener. The pocket is glued on the left inside thigh beside the writing pad window pocket.

Figure 9. Inner Thigh Pocket

4.0 FITTING

4.1 DONNING INSTRUCTIONS ILLUSTRATED

CAUTION: All watches and jewellery should be removed prior to donning the suit, as they may snag on the seals, tearing the openings.

a. Insert your feet into the suit, and pull it up to your waist.

Figure 10. Step a. (Donning Instructions)

b. Insert your arms into the sleeves.

Figure 11. Step b. (Donning Instructions)

c. Pull the neck seal over your head.

Figure 12. Step c. (Donning Instructions)

d. Grasp the base of the zipper with your left hand; and pull the zipper thong up your torso, and around your head.

Figure 13. Step d. (Donning Instructions)

e. Grasp the zipper with your right hand and pull the zipper thong down your torso, securely closing the zipper. Ensure the relief slide fastener is completely closed.

Figure 14. Step e. (Donning Instructions)

4.2 ATTACHING PARTS

4.2.1 When attaching parts to the suit, the following general practices should be followed:

a. Markings must be made carefully only with tailor's chalk.

b. The rubber items area to be glued should be abraded with grade-three emery paper. Degrease the abraded areas using coal tar naphtha or toluene. When the solvent has been removed, seal immediately with the first coat of adhesive.

c. Round the corners of the tape and other cut parts corners to prevent peeling.

d. Place the part to be attached into position, and mark the edge of the attachment area.

e. Apply the specified number of coats of adhesive allowing an over-smear of approximately 6 mm ($^1/_4$ inch).

f. Apply any subsequent coats only after the previous coat has become tacky.

g. Fit the two parts together when the final coat is tacky, taking care to prevent rucks, bubbles or creases.

h. Use a roller to ensure an even contact seal between the surfaces and to remove small air pockets and creases. If the coat has become too dry for adhesion, apply a further thin coat of adhesive solution before joining.

i. Exposed adhesive solution should be carefully removed with a stiff brush (not a wire brush). If the accessible adhesive solution cannot be brushed, dust with French chalk or Talcum powder.

j. Allow at least twenty-four hours for the adhesive to cure prior to further handling.

4.3 WATERPROOF IMMERSION SOCKS

4.3.1 The following instructions must be followed when attaching the socks to the MSF750 Immersion Coverall.

4.4 FITTING OF IMMERSION SOCKS

4.4.1 Fit the socks, constructed of watertight vapour permeable fabric, to the MSF750 Immersion Coverall as follows:

a. Select a sock of the correct size and turn the legs of the MSF750 Immersion Coverall inside out.

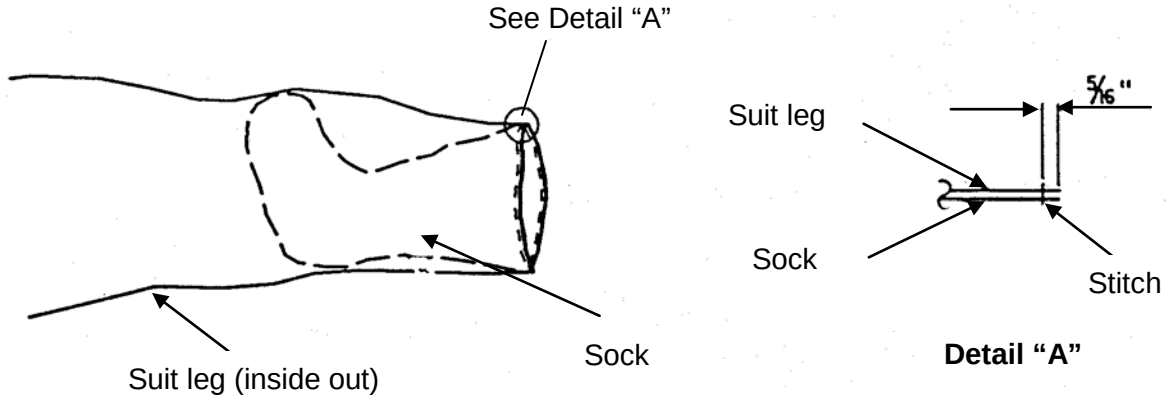
NOTE: Due to slight differences in circumference of suit leg and sock opening, it is recommended that alignment marks be added to both items before sewing.

Make marks at the front, back, and both sides, equally spaced around the circumference of both openings.

It may be necessary to manually induce an uneven feeding of materials into the sewing machine in order to compensate for differences in sock and suit leg circumferences, minimizing pleats or puckers.

b. Ensure the suit is positioned with its back portion laying on the working surface. Insert the sock into the leg opening with the toe section pointing upwards (see figure 15).

Figure 15. Steps a. and b. (Fitting of Immersion Socks)

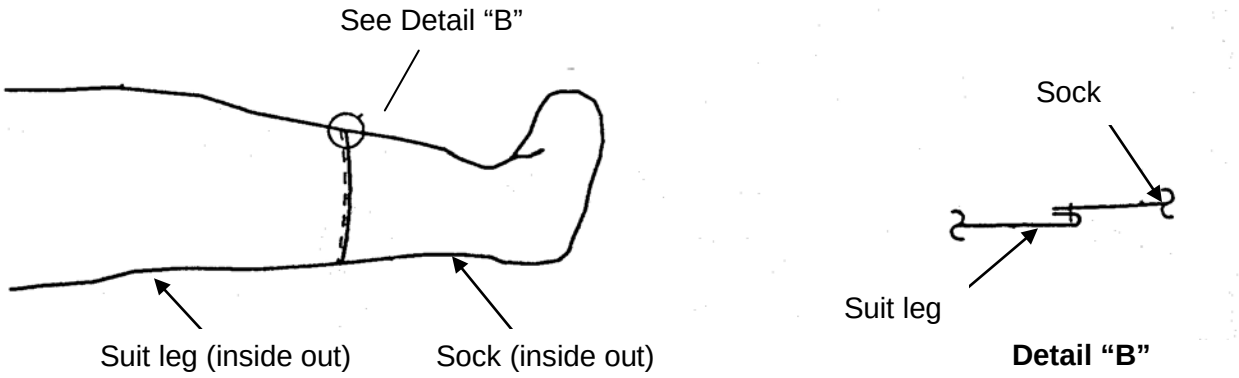


c. With the leg and sock alignment marks matched and the edges of the opening aligned, attach the sock with one row of stitches $^{5}/_{16}$ inch (8 mm) from the edges using a single needle lockstitch, eight to ten stitches per inch. Securely backstitch the end of the stitching not less than $^{1}/_{2}$ inch (12 mm).

NOTE: The thread used should conform to the Commercial Item Description A-A-50195. Match the thread colour to the suit colour.

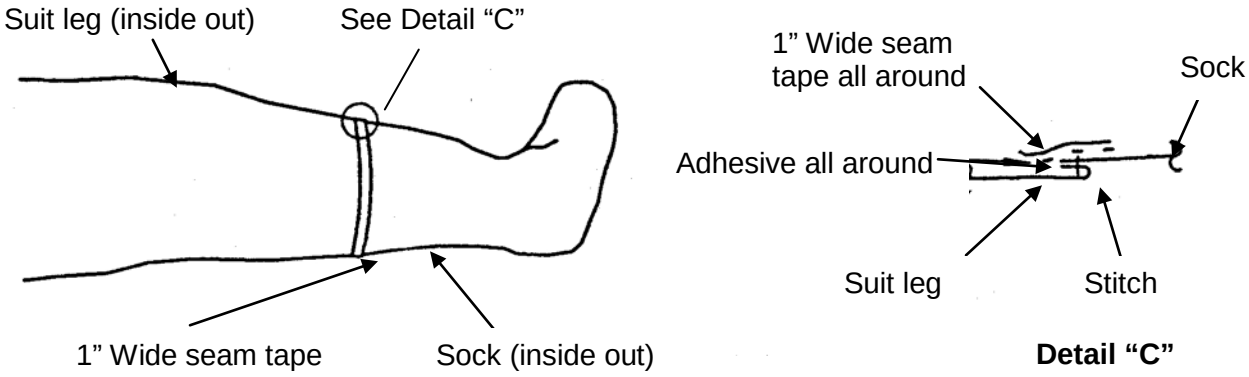
d. Pull the sock inside out (see figure 16) and ensure the sock and leg cut edges are pointing towards the upper part of the suit (see detail “B” of figure 16).

Figure 16. Steps c and d. (Fitting of Immersion Socks)



e. Tape the joint (see section 4.5).

Figure 17. Step e. (Fitting of Immersion Socks)



4.5 TAPING THE JOINTS

4.5.1 Tape over the joint as follows:

a. Cut a length of one-inch wide seam tape (see section 8.0) sufficient to surround the sock or boot and suit joint allowing for a one-inch overlap. Use scissors to round the corners at each end to prevent peeling.

b. Apply three coats of adhesive solution to the tape attachment area of the joint (see figure 16) and the one-inch overlap on the fabric side of the tape. Allow the adhesive to become tacky between the applications of each coat.

c. When the final coat is tacky, peel off the backing of the seam tape and attach the tape to cover the sock and suit joint. Push down the overlap at the end of the tape until it adheres.

d. Roll the joint repeatedly with a hand roller to secure even adhesion and remove the gluing jig, if used.

e. Allow the joint to stand for a minimum of 24 hours before handling.

f. Where applicable, turn the suit right side out.

NOTE: Tape the inside and outside joints of each sock.

g. Repeat steps (a) to (e) on the outside joint.

4.6 EXPOSED ADHESIVE SOLUTION

4.6.1 Exposed adhesive solution on the inside and outside of the MSF750 Immersion Coverall must be either removed with a stiff brush (not wire) or lightly dusted with French chalk or Talcum powder.

5.0 MAINTENANCE

5.1 GENERAL

5.1.1 Proper care of this garment is extremely important for best results and extended service. Failure to follow the procedures outlined in this document for usage, maintenance, repair and general care may void any warranties for this product.

5.1.2 Storage

5.1.2.1 It is important that the dry suit is stored in:

a. A cool dry area, where an even temperature may be maintained.

b. An area without excessive sunlight, and ultra violet rays, and is free of petroleum products, acids and other damaging contaminants.

CAUTION: Never store the suit wet. Never hang the suit from the neck seal; doing so may result in suit damage.

5.1.3 Service Life

5.1.3.1 The suit's service life is determined on condition rather than age. Suits may remain in service for extended periods if properly maintained and they pass all tests and inspections. Neck and wrist seal replacement may be required in the event of long-term usage.

NOTE: The suit's glue deteriorates over time and should be visually inspected more often, from approximately five years after manufacturing.

5.1.4 Work Area

5.1.5 The work area where maintenance of the suit is performed should be smooth and flat, where the suit will not snag, tear or otherwise be punctured or damaged and should also be clear of all non-essential equipment and materials. The working surface should be free of harmful contaminants such as oil, grease, acids or solvents. Work areas, which are subjected to wide temperature variations, should be avoided.

5.2 CLEANING

5.2.1 Mud and soil stains should be removed from the suit. Mud stains must be either allowed to dry and then removed with a cloth brush, or sponged clean with cold fresh water. Other stains should be sponged with cold fresh water. After cleaning, the suit should be thoroughly air-dried.

WARNING: Do not dry clean the suit.

Do not use bleaches or similar additives before cleaning.

Do not use commercial laundry facilities.

5.2.2 Machine Wash

5.2.2.1 The suit can be machine washed only as follows:

a. Ensure that only cold water is used with mild low sudsing powdered detergent.

CAUTION: Liquid detergents are not recommended.

b. The wash cycle should not exceed three minutes.

c. Rinse the suit three times, using clean, fresh water for each rinse.

d. Each rinse cycle should be a minimum of one minute.

NOTE: Proper rinsing is essential to removing the entire soap residue. Any residue could inhibit the vapour permeability of the fabric.

e. Hang the suit over a bar or chair to air-dry approximately 4-6 hours. The suit may require flipping and additional drying time to ensure both sides are completely dry.

5.3 ACID STAINS

5.3.1 A suspected acid stain and any other part of the suit, which has been in contact with the suspected area, should be tested with litmus paper. If the result is positive, the affected area must be cut out. The areas immediately surrounding the affected area should be swabbed with a **50%** solution of ammonia (specific gravity 0.88) and distilled water. When the fabric is dry, the hole must be patched. See section 5.9.9 for patching procedure and limits of repair.

5.4 OIL STAINS

5.4.1 Oil stains can sometimes be removed by gently scrubbing in warm water with a soft brush and household detergent. After cleaning, the suit should be thoroughly air-dried.

5.4.2 A suit with slight oil stains should be tested to be waterproof. If the area has lost its waterproof qualities, the affected area should be cut away and patched. Severe oil stains will cause leakage of water and should be cut away and patched. See section 5.9.9 for patching procedure and limits of repair.

5.5 OTHER DAMAGE

5.5.1 Singed, burnt or worn areas should be cut away and patched. See section 5.9.9 for patching procedure and limits of repair.

NOTE: Cut away material no more than 2 inches (50.8 mm) in diameter.

5.6 TREATMENT AFTER IMMERSION

5.6.1 Whenever a suit has been immersed in water, it must be treated as specified below and then inspected in accordance with the current authorized servicing schedule.

5.6.2 Fresh Water Immersion

5.6.2.1 Allow the suit to dry naturally, preferably in the open air. If the insides of the socks are waterlogged, drying may be hastened by blowing with oil-free compressed air at room temperature.

5.6.3 Salt Water Immersion

5.6.3.1 Soak the suit in fresh water for 30 minutes and rinse thoroughly. Soak the suit for an additional thirty minutes and rinse again. Allow the suit to dry naturally, preferably in the open air.

5.6.4 **Chlorinated Water Immersion**

5.6.4.1 Immersion of the suit in chlorinated water is not recommended. If the suit is immersed in chlorinated water, use the same procedure as for salt water immediately following immersion.

5.7 **ZIPPER CARE**

5.7.1 Zipper cleaning is the first step to zipper longevity. Clean the zipper of any mud, sand, salt or foreign elements. First, use warm soapy water to remove any heavy deposits and then use one the zipper manufacturers recommended cleaning fluids listed in Figure 18. After cleaning, use a recommended wax for easy zipper movement.

Figure 18. Recommended Zipper Cleaning Fluids and Waxes

CARE PRODUCT	PRODUCT NAME	SUPPLIER
Cleaning Fluid	Zippy Cool	YKK USA
	Zip Care	McNett
	BDM Fluid	BDM UK
Lubricating Wax	Zippy Cool	YKK USA
	Zip Wax	McNett
	BDM Wax	BDM UK

5.8 **INSPECTION**

5.8.1 **Inspection Intervals**

5.8.1.1 The suit should be inspected:

a. On receipt from the supply depot or contractor.

b. Periodic inspections; depending on the environmental conditions of usage, not to exceed 90 days unless in storage.

NOTE: The MSF750 should be stored in dry areas in moderate temperatures, away from direct sunlight.

c. Before and after use by the individual issued the suit.

d. Whenever the integrity of the suit is in doubt.

5.8.2 **Visual and Pre-flight Inspection**

5.8.2.1 A close visual inspection should be performed prior to issue, by the issuer and the suit user.

5.8.2.2 To perform a close visual inspection, ensure:

a. There is no excessive wear or damage to the material, particularly stiffness, discoloration, burns, tears and frayed edges.

b. There is no separation of the seams, broken or missing stitches.

c. All metal components are intact and free from damage or corrosion.

d. The zipper is intact and operating smoothly.

e. All adjustment straps are adjusting freely and smoothly.

f. All pockets and pocket closures are intact.

g. Neck and wrist seals and socks have not deteriorated: cuts, tears and the attachment to the suit.

5.8.3 **Periodic Inspection**

5.8.3.1 The suit manufacturer, or a qualified technician with the appropriate equipment, should carry out the in-depth periodic inspection (every 90 days). This inspection includes:

a. Visual inspection

b. Leak Testing every second periodic inspection (unless damage is suspected)

c. Zipper, or slide fastener inspection

5.8.4 **Suit Leakage Test**

5.8.4.1 Have a qualified Aircrew Life Support Equipment (ALSE) technician test for leaks on periodic inspection, prior to issue and every six months thereafter, and when a visual inspection raises any doubt about the integrity of the suit's waterproofing.

5.8.4.2 The following suit leakage test uses Mustang Survival Corp. equipment. Your equipment may differ and, if so, the test should be adjusted accordingly. Mustang Survival Corp. offers an opportunity to purchase the MA8836 leak test kit.

5.8.4.3 The suit displayed in this test is **not** the MSF750 Immersion Coverall, however the procedure is the same.

5.8.4.4 To perform the suit leakage test:

a. Remove the suit from the container and turn it inside out, with the entry zipper and relief slide fastener fully closed.

Figure 19. Step a. (Suit Leakage Test)

b. Carefully seal the wrists of the suit with suitable clamps.

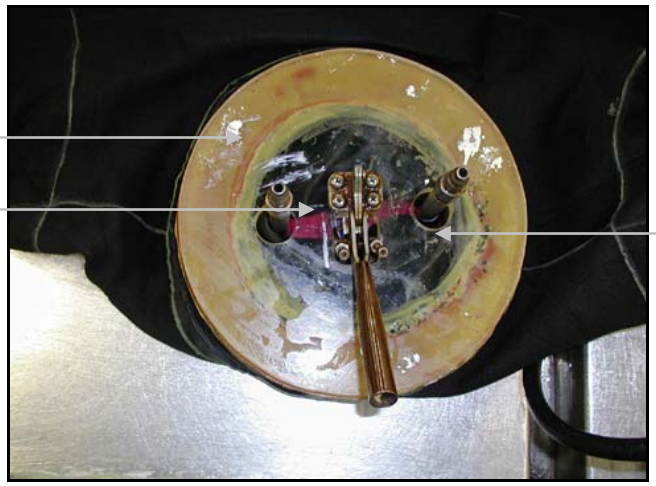
Figure 20. Step b. (Suit Leakage Test)

c. Insert the neck seal plate through the neck seal opening from underneath the neck opening.

Figure 21. Step c. (Suit Leakage Test)

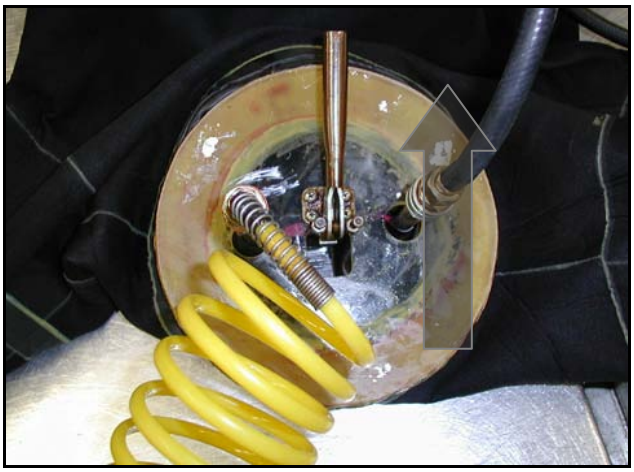
d. Insert a neck clamp plate on top of the neck seal plate, making sure that the pneumatic couplings are lined up with the holes.

Figure 22. Step d. (Suit Leakage Test)



e. Carefully seal the neck by clamping the plates together, and attach the air hose and gauge hose to the appropriate pneumatic couplings.

Figure 23. Step e. (Suit Leakage Test)



f. Inflate the suit with air that is free of any oil or water.

CAUTION: Do not exceed a pressure of twelve inches of water column. Exceeding this pressure may overstress the suit, resulting in damage.

You may need to adjust one of the wrist clamps to allow enough escaping air to attain an appropriate level of continuous pressure.

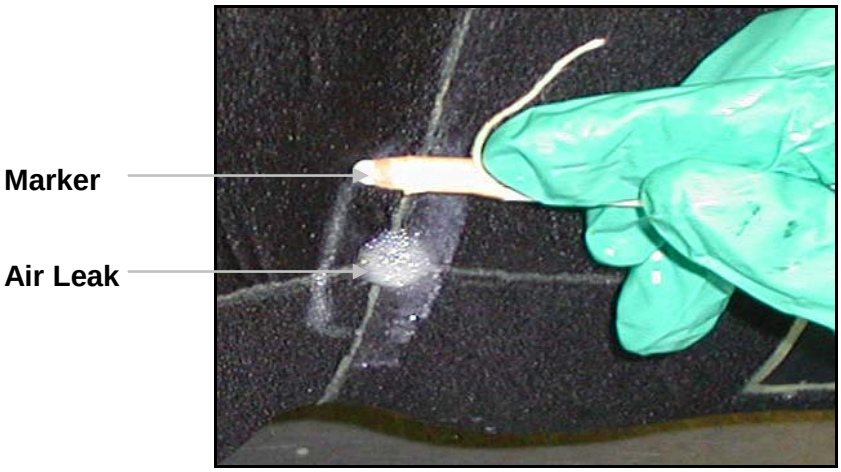
Figure 24. Step f. (Suit Leakage Test)

g. While inflated, spray the suit section by section, with soapy water (alternatively, immerse it in water) and look for any signs of leakage (bubbles).

Figure 25. Step g. (Suit Leakage Test)

h. Mark the general area of any leaks, if required, with a non-damaging marker. Ensure any detected damage is repaired before the suit is put back into service.

Figure 26. Step h. (Suit Leakage Test)



i. Rinse off all soapy residues with water. Do **not** use chlorinated water.

Figure 27. Step i. (Suit Leakage Test)

j. Hang the suit over a bar or chair to air dry, and turn the suit right side out after drying, approximately four to six hours. The suit may require flipping and additional drying time to ensure both sides are completely dry.

Figure 28. Step j. (Suit Leakage Test)

5.9 **REPAIRS**

5.9.1 **General**

5.9.1.1 The protection provided by this dry suit relies very much on its watertight characteristics. It is extremely important that damaged suits are handled in accordance with the following repair requirements.

5.9.1.2 Qualified repair personnel can normally perform minor repairs, with adequate facilities. The manufacturer should do all major repairs. This section provides some information to assist with minor or emergency repairs to the suit and related components.

NOTE: Stitching shall not be used for repair of tears or holes.

5.9.1.3 The proper work area is identified in section 5.1.4 of this document.

5.9.1.4 Before any items are glued to the suit, the attachment areas must be thoroughly cleaned. Fabric surfaces may be cleaned with a stiff brush (not wire). Brushing must be done lightly or the properties of the fabric will be destroyed.

5.9.2 **Inspection Failures**

5.9.2.1 These are the recommended repairs for any suit failing inspection:

a. Missing, damaged or corroded parts of components shall be replaced

b. Heavily soiled areas shall be cleaned using only mild soap and water with a soft, non-abrasive nylon or synthetic bristle brush. Other cleaning agents or solvents must not be used.

c. Worn, broken or missing stitching should be repaired

d. Any additional parts or components found to be defective should be repaired or replaced

5.9.3 **Stitching**

5.9.3.1 All repairs involving sewing shall be done with thread that corresponds to the colour of the material being sewn. The thread should conform to Commercial Item Description A-A-50195 Size E.

5.9.3.2 Seam repairs, stitching, and joining shall be done using a single needle lockstitch, eight to ten stitches per inch. Securely backstitch all ends of stitching not less than $^1/_2$ inch (12.5 mm). The seam allowance to be used is $^3/_8$ inch (9 mm) $\pm^1/_{16}$ inch (2mm). Securely backstitch breaks in thread not less than 1 inch (25 mm).

5.9.4 All stitching should be done with Nomex® aramid thread and be a single needle lockstitch. Stitching density should be eight to ten stitches per inch and all broken threads, seam ends and ends of stitching should be backstitched not less than $^1/_2$ inch (12.5 mm). Most of the seam allowances are $^1/_2$ inch (12.5 mm).

5.9.5 **Leak Repairs**

5.9.5.1 Locate the leak (see section 5.8.4), and assess the reparability of the leak. Use the following Limits of Repair section to make the assessment. In cases of significant damage, the manufacturer should repair the damage.

5.9.6 **Limits of Repair**

5.9.6.1 It is recommended that the following guidelines be used in determining potential for repair. A qualified technician should make all repairs.

a. All slits or tears in the suit shall fit within the dimensions of a single repair patch (1.75-inch (44 mm) X 3.25-inch (83 mm)). At least 0.75-inch (19 mm) of the patch should extend past either end of the slit or tear. Using Patch kit MA 7025-2 Orange or Patch kit MA 7025-27 Green.

b. If the damage does not fit within the confines of a patch, the suit shall be considered not repairable.

c. Do not place patches beside each other to make a “longer patch”.

d. The suit may not have any more than 2 patches per panel to a max of ten per suit.

e. Do not repair slits or tears that are closer than 1 inch (25 mm) to any seam.

f. Do not patch the neck or wrist seals or socks.

5.9.6.2 All minor repairs should be performed using the following sections.

5.9.7 Repair Materials

5.9.7.1 The full description and part numbers of the materials required for repairs are detailed in section 8.0 of this manual. Additionally, some small repair materials are included with the suit.

5.9.8 Gluing

5.9.8.1 Gluing should only be performed in a clean, dry, well-ventilated area. Repair personnel should wear protective rubber gloves and follow the adhesive supplier's guidelines for use and preparation. All surfaces must be clean and dry prior to gluing. Mustang PN GL1027 adhesive glue, with curative GL1028, is recommended for repairs.

5.9.8.2 To glue a section of the suit:

a. Apply three coats of the adhesive over the full contact area using a small brush, ensuring that the glue does not adhere to the inner face of the fabric.

b. Apply the first coat and allow drying until tacky.

c. Apply the second coat and allow drying until tacky again.

d. Apply the third coat of adhesive and allow drying until tacky.

e. Join the surfaces carefully by pressing together with the gloved fingers of both hands.

f. Always leak test the suit after completion of repairs, after a minimum of twenty-four hours of drying, to ensure the repairs are watertight (see section 5.8.4). Do not use the suit if the repairs are not successful.

g. The repair area must be allowed to dry for a minimum of 24 hours prior to wearing or re-issuing the suit.

5.9.9 Patching

5.9.9.1 All patching of **minor** tears and holes should conform to the following heat application method:

a. All slits or tears in the suit shall fit within the dimensions of a single repair patch (1.75-inch (44 mm) X 3.25-inch (83 mm)). At least 0.75-inch (19 mm) of the patch should extend past either end of the slit or tear. Using Patch kit MA 7025-2 Orange or Patch kit MA 7025-27 Green.

b. Patches may be cut to fit the repair area.

c. Patches shall be circular or rectangular with rounded corners.

d. Repair close grouped small holes or tears with one large patch rather than several small ones.

e. If the damage does not fit within the confines of a patch, the suit shall be considered not repairable.

f. Do not place patches beside each other to make a "longer patch".

g. The suit may not have any more than 2 patches per panel to a max of ten per suit.

h. Do not repair slits or tears that are closer than 1 inch (25 mm) to any seam.

i. Preheat a hand iron to approximately 320 ºF (160 ºC).

j. Turn the Immersion suit inside out.

k. Locate the area to be patched.

l. Lay the Immersion suit on a flat surface so that the inside surface of the suit is facing upward.

m. Ensure the Immersion suit material is flat and wrinkle free around the area to be patched.

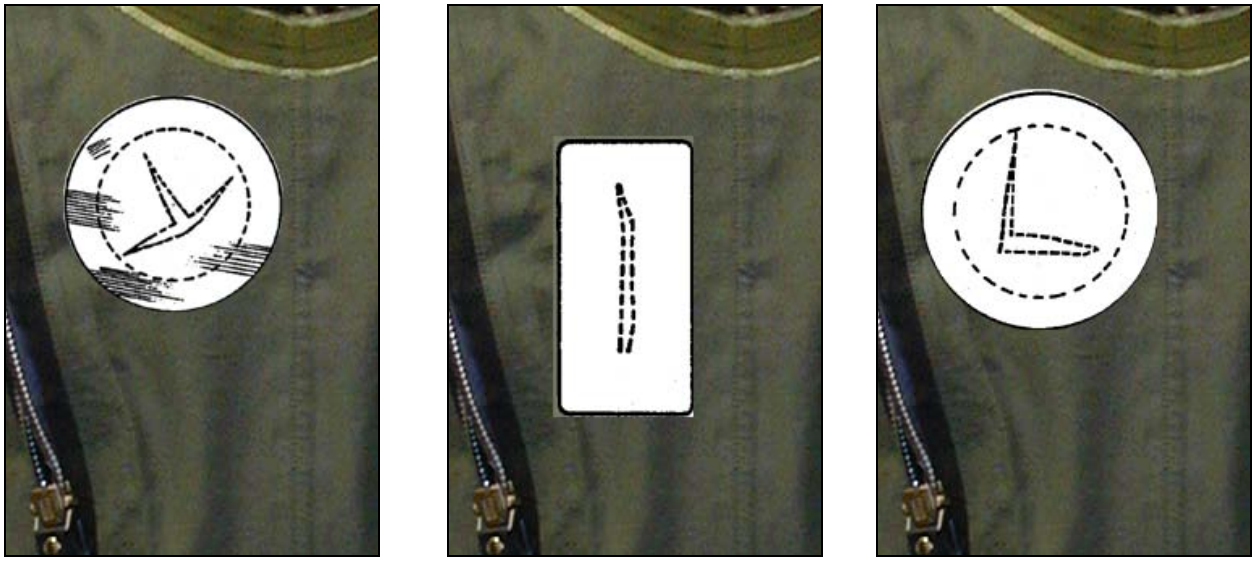
n. Ensure the area around the damage is both clean and dry.

o. Peal the backing off of a repair patch and place the shiny side of the patch downwards so that it is in contact with the inside surface of the suit.

p. Ensure the patch is centered over the damage. At least 0.75-inch (19 mm) of the patch should extend past either end of the damage.

Figure 29. Simulated Tears and Suggested Patch Configurations (Not to Scale)

Jagged Tear Patch **Straight Tear Patch** **L-Shaped Tear Patch**



q. Place the hot iron on the patch and apply pressure perpendicular to the flat surface for approximately 120 seconds. The iron should cover the entire patch.

r. Remove the iron and allow the patch and suit to cool for approximately 10 minutes or until cool to the touch.

s. Turn the suit right side out.

t. Repeat the above steps to apply a patch on the outside of the suit over the same area of damage.

u. A 1-inch roller can be used to smooth out the patch, and assist in bonding.

v. Allow the suit to cool for approximately 10 minutes or until cool to the touch.

w. Always leak test the suit after completion of repairs, to ensure the repairs are watertight (see section 5.8.4).

5.9.10 Taping

5.9.10.1 If a portion of a suit seam requires re-taping, then follow the procedures outlined below. Refer to section 8.0 for details of the adhesive and seam tape required for these repairs. To re-tape a seam:

a. Cut the seam tape to the required length, allowing a one-inch (25 mm) overlap on the fabric side of the tape.

b. Round the corners of the new tape to prevent peeling.

c. Remove the existing seam tape to the best of your ability.

d. Create a smooth surface with toluene.

e. Apply three coats of adhesive to the suit (see section 5.9.8).

NOTE: The surfaces of the tape don't need to be prepared with adhesive when the suit's surface has already been properly prepared.

f. Peel off the backing from the seam tape before applying to the surface of the joint.

g. Apply the seam tape to the repair area when the final coat is tacky.

h. Firmly roll the glued areas with a suitable roller to remove entrapped air, channels, and wrinkles.

i. Always leak test the suit after completion of repairs, and after a minimum of twenty-four hours of drying, to ensure the repairs are watertight (see section 5.8.4).

5.10 REPLACEMENT OF COMPONENTS

5.10.1 Wrist Seals

5.10.1.1 Replace the wrist seals as follows:

a. Carefully remove the old seam tape

i. Remove the seam tape on the outside and inside of the seal using a pair of needle nose pliers to grip the end of the seam tape.

ii. Pull the seam tape away from the glue, checking to ensure that no damage is occurring to the suit.

iii. A hot air gun can be used to assist in loosening the seam tape. Be careful not to damage the suit shell.

b. Carefully remove the old seal

i. Remove the old seal by gripping it with a pair of needle nose pliers.

ii. Pull the old seal away from the glue, checking to ensure that no damage is occurring to the suit.

iii. A hot air gun can be used to assist in loosening the old seal. Be careful not to damage the suit shell.

c. Prepare the suit for the new seal

i. There will be remaining glue residue on the suit from the previous seal and seam tape. This must be cleaned from the suit as best as possible. It will not be possible to completely clean all of the remaining glue from the suit.

ii. Use a light piece of sand paper or a brush to clean the remaining glue from the suit.

iii. Do not use a solvent to clean the glue as this may damage the suit.

d. Buff the inside of the new seal, Mustang part number MI-6023M (see section 8.0), to a width of $^{3}/_{4}$ inch (19 mm).

e. Apply three coats of adhesive solution to the areas referred to in (b) and to the outside of the sleeve to a width of 1 $^{1}/_{4}$ inches (32 mm) along the edge. When the final coat is tacky, apply the seal to the outside of the sleeve to a width of $^{3}/_{4}$ inch (19 mm). Then roll it down well to remove any wrinkles or entrapped air.

f. Apply three coats of adhesive solution to a width 1 $^{1}/_{4}$ inches (32 mm) on the outside of the seal and sleeve joint.

g. Apply tape (see Taping section 5.9.11).

h. Repeat (d) and (e) for the inside joints of the seal and sleeve.

5.10.2 **Neck Seals**

5.10.2.1 Replace the neck seal as follows:

a. Carefully remove the old seam tape

i. Remove the seam tape on the outside and inside of the seal using a pair of needle nose pliers to grip the end of the seam tape.

ii. Pull the seam tape away from the glue, checking to ensure that no damage is occurring to the suit.

iii. A hot air gun can be used to assist in loosening the seam tape. Be careful not to damage the suit shell.

b. Carefully remove the old seal

i. Remove the old seal by gripping it with a pair of needle nose pliers.

ii. Pull the old seal away from the glue, checking to ensure that no damage is occurring to the suit.

iii. A hot air gun can be used to assist in loosening the old seal. Be careful not to damage the suit shell.

c. Prepare the suit for the new seal

i. There will be remaining glue residue on the suit from the previous seal and seam tape. This must be cleaned from the suit as best as possible. It will not be possible to completely clean all of the remaining glue from the suit.

ii. Use a light piece of sand paper or a brush to clean the remaining glue from the suit.

iii. Do not use a solvent to clean the glue as this may damage the suit.

d. Buff lightly around the inside and outside of the base of the new neck seal, Mustang part number MI-6022L (see section 8.0), to a width of $^{3}/_{4}$ inch (19 mm).

e. Apply three coats of adhesive to the areas referred to in (b).

f. When the final coat is tacky, apply the neck seal to the outside of the neck of the suit for a width of $^{1}/_{2}$ inch (12.5 mm), eliminating all rucks. Then roll it down well to remove any entrapped air.

g. Apply three coats of adhesive solution to a width of 1 $^{1}/_{4}$ inches (32 mm) to the outside joint

h. Apply tape (see Taping section 5.9.11).

i. Repeat steps (d) and (e) for the inside joint of the seal and neck.

5.10.3 **Immersion Socks**

5.10.3.1 Replace the socks as follows:

a. Carefully remove the old seam tape

i. Remove the seam tape on the outside and inside of the sock using a pair of needle nose pliers to grip the end of the seam tape.

ii. Pull the seam tape away from the glue, checking to ensure that no damage is occurring to the suit.

iii. A hot air gun can be used to assist in loosening the seam tape. Be careful not to damage the suit shell.

b. Remove the old socks using a stitch remover.

c. Prepare the suit for the new sock

iv. There will be remaining glue residue on the suit from the previous sock and seam tape. This must be cleaned from the suit as best as possible. It will not be possible to completely clean all of the remaining glue from the suit.

v. Use a light piece of sand paper or a brush to clean the remaining glue from the suit.

vi. Do not use a solvent to clean the glue as this may damage the suit.

d. Replace the socks (section 4.4).

6.0 FOLDING AND PACKING PROCEDURES

6.1 Fold and pack the dry suit using the following steps.

6.2 The points of reference used here are from the perspective of the individual folding and packing the suit (at the foot of the suit). Ensure that the suit is thoroughly clean and dry before folding and packing. To fold and pack the suit:

a. Ensure that the main entry zipper is in the closed position. Rub a recommended lubricant on the zippers for a smoother action (see section 5.7). Put Talcum powder on the inside of the wrist and neck seals to reduce sticking.

b. Empty the contents from all of the other pockets.

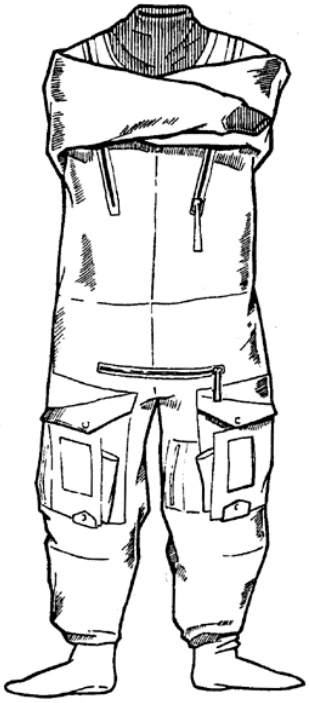
c. Lay the suit flat on its back on a horizontal; clean surface, allowing the suit to be fully extended with none of the parts overlapping.

Figure 30. Steps a. and c. (Folding and Packing)

d. Fold the left sleeve, from the shoulder, straight across the body of the suit.

e. Fold the right sleeve, from the shoulder, straight across the body of the suit on top of the folded left arm.

Figure 31. Steps d. and e. (Folding and Packing)

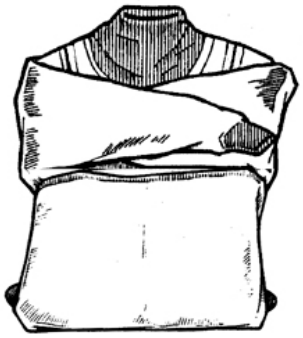


f. Fold the socks over top of the legs until they reach crotch level.

Figure 32. Step f. (Folding and Packing)

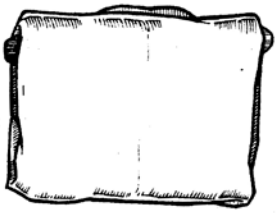
g. Fold the legs, from the crotch, up to the shoulders being careful not to damage the plastic sheets of the writing pad pockets.

Figure 33. Step g. (Folding and Packing)



h. Fold the suit in half.

Figure 34. Step h. (Folding and Packing)



7.0 SUMMARY

The Mustang Survival Immersion Coverall Model MSF750 is a constant wear dry-suit that protects aircrew in harsh marine environments with cold-water immersion features. The suit is easily donned, maintained and stored. Qualified technicians, with proper equipment, or Mustang Survival Corp. may make suit repairs. A well-maintained suit means survival in emergency situations for which normal cloths were not designed.

8.0 PARTS LIST

This section identifies the materials used in the construction of the Mustang Survival MSF750. These materials are highly recommended for repairs and replacements. Item order quantity is based on their availability. The actual product may not be as shown below.

Figure 35. Immersion Coverall Model MSF750 and Index Numbers

Figure 36. Parts List for the Immersion Coverall, Constant Wear Model MSF750

INDEX NUMBER	PART NUMBER	NOMENCLATURE	MIN ORDER QUANTITY
1	TA3003	SEAM TAPE, 1 IN, USED FOR NECK SEAL, WRIST SEAL AND SOCKS	1 ROLL (275 yds per roll)
2	MI6023M	RUBBER LATEX WRIST SEALS	20 EA
3	MI6022L	RUBBER LATEX NECK SEALS	20 EA
4	TH886027	BONDED NOMEX® THREAD SAGE GREEN	1 EA
5	MA702527	HEAT REPAIR PATCHES SAGE GREEN, 1 PR	1 EA
6	MA70252	HEAT REPAIR PATCHES ORANGE, 1 PR	1 EA
7	MA8836	DRY SUIT TEST KIT	1 EA

Figure 37. Expendables List for the MSF750

INDEX NUMBE	PART NUMBER	NOMENCLATURE	MIN ORDER QUANTITY
1	GL1027	RAINBOW RH 110 ADHESIVE	1 Pail (18.6 L)
2	GL1028	RAINBOW C506 CATALYST (For GL1027 RH110 Glue)	1 Bottle (1 KG)
3	MI5008	AQUASEAL FORMULA ZIPCARE	20 EA