Materials Technology Ltd - CO_2 cylinder report

Materials Technology Ltd.
5 Rushington Court, Rushington Business Park, Chapel Lane, Southampton SO40 9NA
Tel: +44 (0) 2380 580240
e-mail: info@mtechltd.co.uk
Web: www.mtechltd.co.uk

Examination of a Life Raft Gas Cylinder

Client: [redacted] MAIB Mountbatten House Grosvenor Square Southampton SO15 2JU	**Date:** 4th July 2016	**Mat Tech Job No:** G6624

Request Details:

Materials Technology were supplied with a CO_2/N_2 cylinder which was installed as an emergency inflation device on a life raft. When the raft was deployed it failed to inflate resulting in a loss of life and it is suspected that the cylinder was empty at the time of the incident.

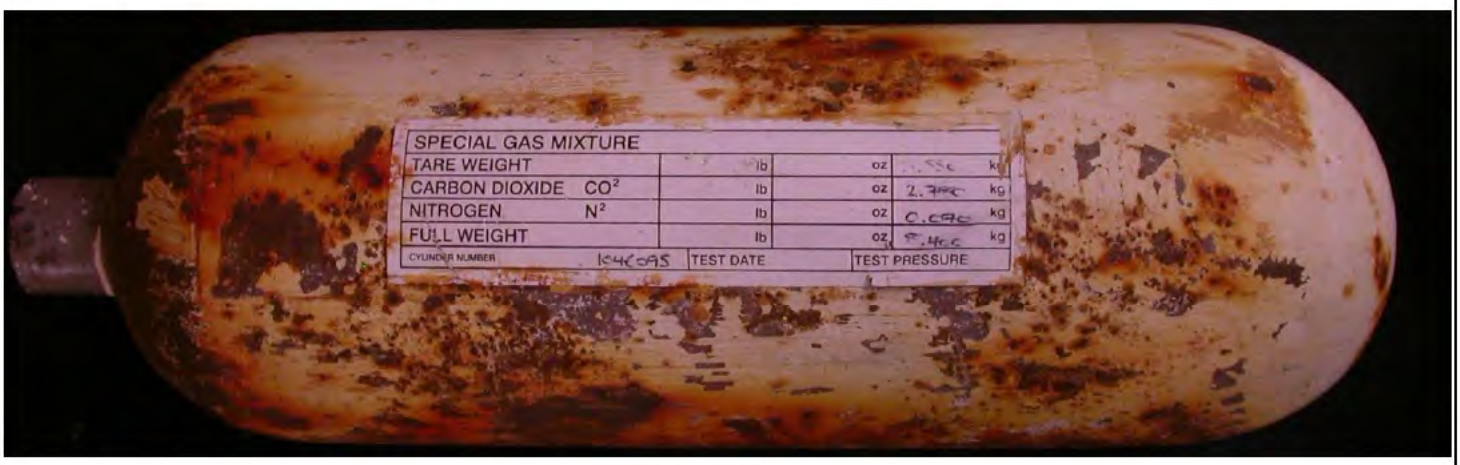
The cylinder was retrieved from the sea bed and was found to contain 1.7L of water which may have entered through a suspected crack in the threaded neck of the cylinder. Materials Technology were asked to perform a non-destructive examination of this crack as detailed in the brief below:

Brief:

1. Visual & microscopic examination of the neck of the cylinder looking for cracks including:
    a. Establishing if the cracks are through wall utilising non-destructive dye penetration tests.
    b. Identifying if the cracks are in the threaded area only or if they extend into the cylinder wall.
    c. Photographing the cracks.
2. Provide a report, with photographs suitable for publication in an annex of a publically available report if required.

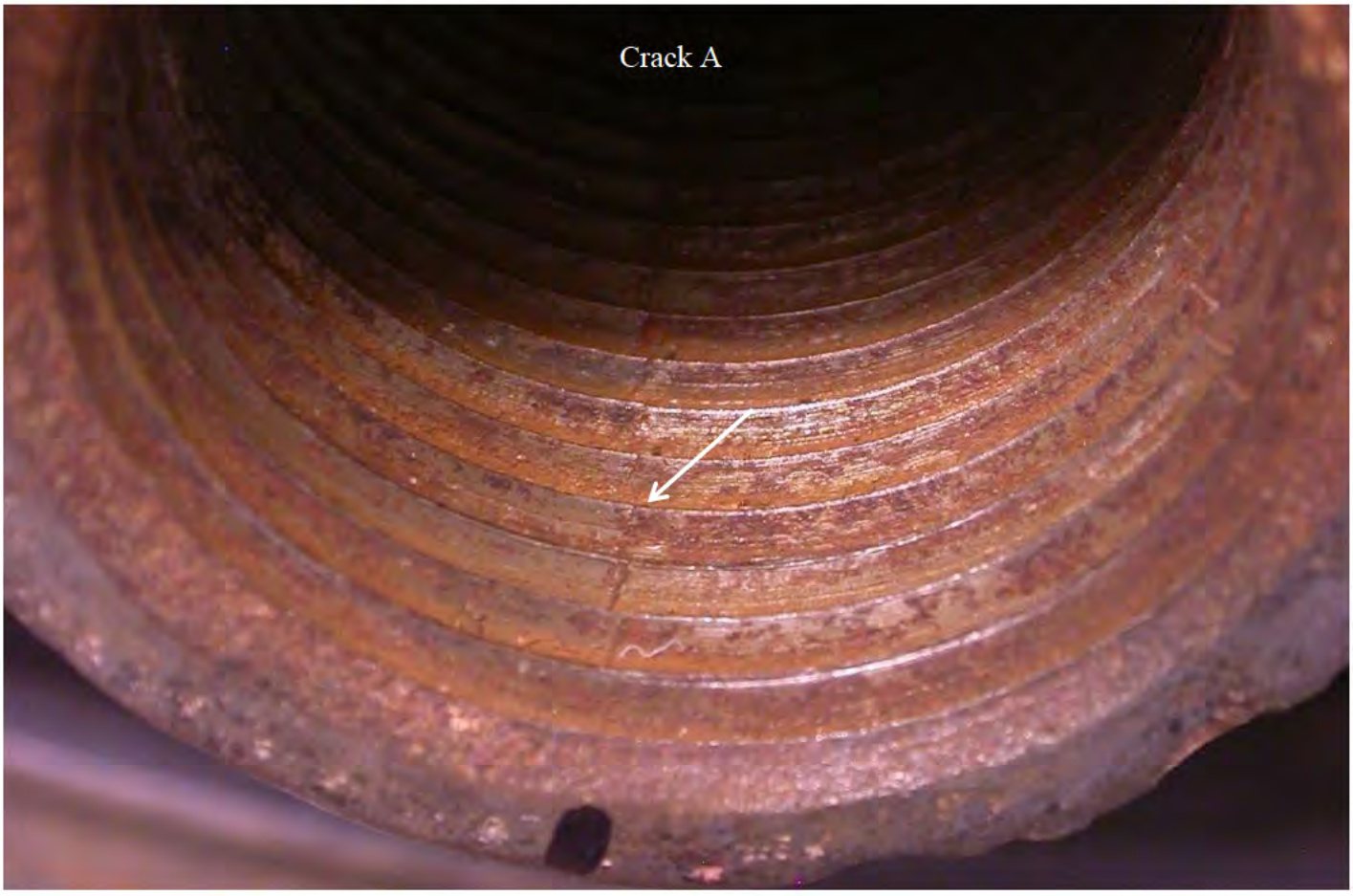
It was requested that all examination was non-destructive.

Visual Examination:
A general view of the cylinder is shown below:



Prior to examination of the neck the threads were cleaned using non-woven solvent impregnated wipes and a wire brush. Residual paint from round the neck was removed with a scalpel & acetone soaked rags.

The internal regions of the neck were then examined initially using a low powered stereo microscope and then with a borescope to extend the region of examination beyond the threads into the body of the cylinder. Two regions with crack like defects were found running longitudinally down the inside of the neck approximately 90° apart. Views of the cracks are shown below and overleaf: For the purposes of the report these were denoted A & B.



Visual Examination (cont.):

Examination with the borescope did not reveal any evidence of the cracks extending beyond the threads into the body of the cylinder.

The external faces of the neck were then examined, however no evidence of the cracks having progressed through the wall were found. As an example view of the external face of the neck is shown below in the region of crack A.

Dye Penetrant Testing:
Dye penetrant testing was performed on the neck region of the cylinder as a further confirmation of the absence of through wall cracks. A view of the neck in the region of the 2 longitudinal cracks is shown below. As can be seen, there is again no evidence of the cracks having penetrated through the wall in either the threaded region, or beyond in the main body of the cylinder.

Discussion:
Examination of an emergency inflation gas cylinder has shown the presence of two cracks running longitudinally down the neck approximately 90° apart. Borescope examination has not revealed any evidence of the cracks having propagated beyond the end of the threaded region into the main body of the cylinder, however it should be stressed that it is not possible to clean the cylinder in this region and it is possible that cracks could be concealed by corrosion deposits etc.

Visual & dye penetrant examination has not shown any evidence of the cracks having penetrated through to the outside of the neck or the main body of the cylinder beyond.

Author:
[redacted]

[redacted]

Annex B

Marchwood Scientific Services - water analysis report

MARCHWOOD SCIENTIFIC SERVICES
Unit 1A.2(a) North Road
Marchwood Ind. Park
Marchwood
Southampton
SO40 4BL

TEST REPORT

Marine Accident Investigation Branch
First Floor, Spring Place
105 Commercial Road
Southampton
SO15 1GH

Certificate No.	116/5659rev Page 1 of 1
Date received	14/06/2016
Ref.	SJ/116/5659

28th June 2016

Re. Analysis of a Water Sample for Range of Determinants

Please find below the tabulated results for the sample received.

Compounds	Units	Results
Water Soluble Chloride	mg/litre	19117
Iron (Soluble)	mg/Kg	7.0
Iron (Total)	mg/Kg	627
Sodium	mg/Kg	10417

The water is likely to have been seawater

*Supplement to test certificate 116/5659

Reported by: [redacted]
Position: [redacted]
For/on behalf of Marchwood Scientific Services Ltd.

Extract from A.689(17) and MSC.81(70) - Recommended lifejacket water performance tests

2.9 Water performance tests

2.9.1 This portion of the test is intended to determine the ability of the lifejacket to assist a helpless person or one in an exhausted or unconscious state and to show that the lifejacket does not unduly restrict movement. All tests should be carried out in fresh water under still conditions.

Test subjects
2.9.2 These tests should be carried out with at least six persons as described in **2.8.2**. Only good swimmers should be used, since the ability to relax in the water is rarely otherwise obtained.

Clothing
2.9.3 Subjects should wear only swimming costumes.

Preparation for water performance tests
2.9.4 The test subjects should be made familiar with each of the tests set out below, particularly the requirement regarding relaxing and exhaling in the face-down position. The test subject should don the lifejacket, unassisted, using only the instructions provided by the manufacturer. The observer should note the points prescribed in **2.8.5**.

Righting tests
2.9.5 The test subject should swim at least three gentle strokes (breast stroke) and then with minimum headway relax, with the head down and the lungs partially filled, simulating a state of utter exhaustion. The period of time should be recorded starting from the completion of the last stroke until the mouth of the test subject comes clear of the water. The above test should be repeated after the test subject has exhaled. The time should again be ascertained as above. The freeboard from the water surface to the mouth should be recorded with the test subject at rest.

Drop test
2.9.6 Without readjusting the lifejacket, the test subject should jump vertically into the water, feet first, from a height of at least 4.5m. When jumping into the water, the test subject should be allowed to hold on to the lifejacket during water entry to avoid possible injury. The freeboard to the mouth should be recorded after the test subject comes to rest.

Assessment
2.9.7 After each of the water tests described above, the test subject should come to rest with the mouth clear of the water by at least 120mm. The average of all subjects' trunk angles should be at least 30 degrees back of vertical, and each individual subject's angle should be at least 20 degrees back of vertical. The average of all subjects' faceplane (head) angles should be at least 40 degrees above horizontal, and each individual subject's angle should be at least 30 degrees above horizontal. In the righting test, the mouth should be clear of the water in not more than 5s. The lifejacket should not become dislodged or cause harm to the test subject.

2.9.8 When evaluating the results of a test in accordance with **2.9.5**, **2.9.7** and **2.9.8**, the Administration may, in exceptional circumstances, disregard the results of a test on a subject if the results show a very slight deviation from the specified criteria, provided the Administration is satisfied that the deviation can be attributed to the unusual size and stature characteristics of the test subject and the results of tests on other subjects, chosen in accordance with **2.9.2**, show the satisfactory performance of the lifejacket.

Swimming and water emergence test

2.9.9 All test subjects, without wearing the lifejacket, should attempt to swim 25m and board a liferaft or a rigid platform with its surface 300 mm above the water surface. All test subjects who successfully complete this task should perform it again wearing the lifejacket. At least two thirds of the test subjects who can accomplish the task without the lifejacket should also be able to perform it with the lifejacket.

Extracts from MSC.200(80) - Amended recommended lifejacket water performance tests

Test subjects

2.7.2 These tests should be carried out with at least 12 able-bodied persons who are completely unfamiliar with the lifejacket and selected according to the heights and weights in table 2.1 and the following:

.1 small test subjects need not be adults;

.2 at least 1/3, but not more than 1/2 of test subjects should be females, including at least 1 per height category but excluding the tallest height;

.3 at least one male and one female should be from the lowest and highest weight group;

.4 at least one subject should be selected from each cell containing a "1"; and

.5 enough additional subjects should be selected from cells containing a "X" to total the required number of test subjects, with no more than one subject per cell. A uniform distribution across weight ranges should be maintained.

Table 2.1 – Test subject selection for adult lifejackets

	Weight range – kg							
Height range (m)	40 - 43	43 - 60	60 - 70	70 - 80	80 - 100	100 - 110	110 - 120	>120
< 1.5	1	X	X	X				
1.5 - 1.6	X	1	1	X	X			
1.6 - 1.7		X	X	1	X	X		
1.7 - 1.8			X	X	1	X	X	X
1.8 - 1.9			X	X	X	1	1	X
> 1.9					X	X	X	1

2.8 Water performance tests

2.8.1 This portion of the test is intended to determine the ability of the lifejacket to assist a helpless person or one in an exhausted or unconscious state and to show that the lifejacket does not unduly restrict movement. The in-water performance of a lifejacket is evaluated by comparison to the performance of a suitable size standard reference lifejacket, i.e. Reference Test Device (RTD) as specified in appendices 1 to 3. All tests should be carried out in fresh water under still conditions.

Test subjects

2.8.2 These tests should be carried out with at least 12 persons as described in 2.7.2. Only good swimmers should be used, since the ability to relax in the water is rarely otherwise obtained.

Clothing

2.8.3 Subjects should wear only swimming costumes.

Preparation for water performance tests

2.8.4 The test subjects should be made familiar with each of the tests set out below, particularly the requirement regarding relaxing and exhaling in the face-down position. The test subject should don the lifejacket, unassisted, using only the instructions provided by the manufacturer. After entering the water, care should be taken to ensure that there is no significant amount of air unintentionally trapped in the lifejacket or swimming costume.

Righting tests

2.8.5 Each test subject should assume a prone, face down position in the water, but with the head lifted up so the mouth is out of the water. The subject's feet should be supported, shoulder width apart, with the heels just below the surface of the water. After assuming a starting position with the legs straight and arms along the sides, the subject should then be instructed in the following sequence to allow the body to gradually and completely relax into a natural floating posture: allow the arms and shoulders to relax; allow the legs to relax; and then the spine and neck, letting the head fall into the water while breathing out normally. During the relaxation phase, the subject should be maintained in a stable face down position. Immediately after the subject has relaxed with the face in the water, simulating a state of utter exhaustion, the subject's feet should be released. The period of time until the mouth of the test subject comes clear of the water should be recorded to the nearest 1/10 of a second, starting from when the subject's feet are released. The above test should be conducted for a total of six times, and the highest and lowest times discarded. The test should then be conducted for a total of six times in the RTD and the highest and lowest times discarded.

Static balance measurements

2.8.6 At the conclusion of the righting tests without making any adjustments in body or lifejacket position, measurements should be made with the subject floating in the relaxed face-up position of static balance resulting from the preceding tests. The following measurements should be made (see figure 4):

.1 freeboard – the distance measured perpendicularly from the surface of the water to the lowest point of the subject's mouth where respiration may be impeded, if the mouth were not held shut. The lowest side of the mouth should be measured if the left and right sides are not level;

.2 faceplane angle – the angle, relative to the surface of the water, of the plane formed between the most forward part of the forehead and the chin;

.3 torso angle – the angle, relative to vertical, of the line formed by the forward points of the shoulder and hipbone (ilium portion of the pelvis); and

.4 list angle – the angle relative to the surface of the water and a line between the left and right shoulder or a line through the ears if only the head is tilted.

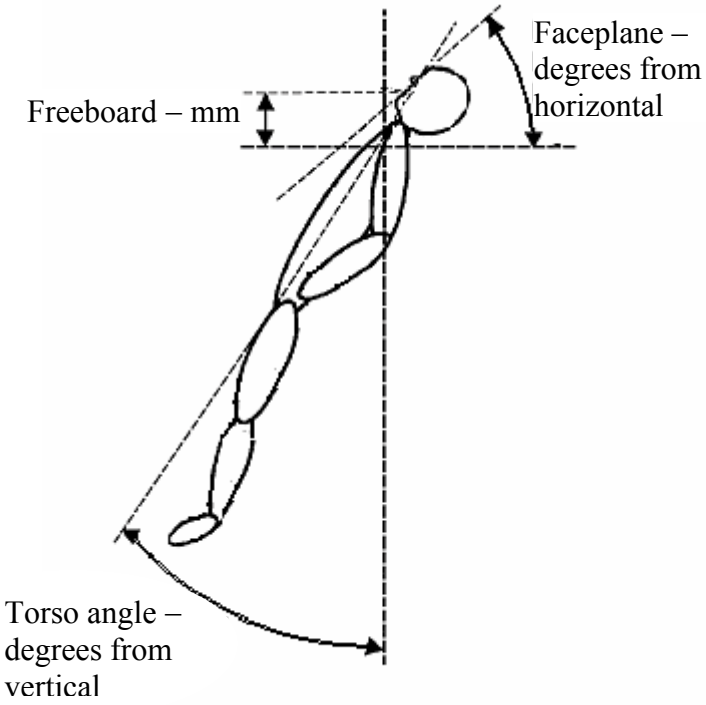


Figure 4 – Static balance measurements

Assessment

2.8.7 After the water tests described in 2.8.5 and .6 above:

.1 *Turning time:* The average turn time for all subjects in the candidate lifejacket should not exceed the average time in the RTD, and the number of "no-turns", if any, should not exceed the number in the RTD;

.2 *Freeboard:* The average freeboard of all the subjects should not be less than the average for the RTD;

.3 *Torso angles:* The average of all subjects' torso angles should be not less than the average for the RTD minus 5°;

.4 *Faceplane (head) angles:* The average of all subjects' faceplane angles should be not less than the average for the RTD minus 5°;

.5 *Lifejacket light location:* The position of the lifejacket light should permit it to be visible over as great a segment of the upper hemisphere as is practicable.

Jump and drop tests

2.8.8 Without readjusting the lifejacket, the test subject should jump vertically into the water, feet first, from a height of at least 1 m while holding the arms over the head. Upon entering the water, the test subject should relax to simulate a state of utter exhaustion. The freeboard to the mouth should be recorded after the test subject comes to rest. The test should be repeated from a height of at least 4.5 m but, when jumping into

the water, the test subject should hold on to the lifejacket during water entry to avoid possible injury. Upon entering the water, the test subject should relax to simulate a state of utter exhaustion. The freeboard to the mouth should be recorded after the test subject comes to rest. The lifejacket and its attachments should be examined for any damage. If injury is believed likely from any jump or drop test the lifejacket should be rejected or the test delayed until tests from a lower height or with additional precautions demonstrate that the risk from the required test is acceptable.

Assessment

2.8.9 Following the drop test, the lifejacket should:

.1 surface the test subject in a face up position with an average freeboard for all the subjects of not less than the average for the RTD determined in accordance with 2.8.6;

.2 not be dislodged or cause harm to the test subject;

.3 have no damage that would affect its in-water performance or buoyancy; and

.4 have no damage to its attachments.

Stability test

2.8.10 The test subject should attain a relaxed face-up position of static balance in the water. The subject should be instructed to assume a foetal position as follows: "place your elbows against your sides, your hands on your stomach, under the lifejacket if possible, and bring your knees up as close to your chest as possible." The subject should be rotated clockwise around the longitudinal axis of the torso by grasping the subject's shoulders or upper areas of the lifejacket so that the subject attains a 55 ± 5 degree list. The subject should then be released. The subject should return to a stable face-up position. The test should then be conducted with the subject rotated counter-clockwise. The entire test should then be repeated with the test subject wearing the RTD. The candidate lifejacket should not roll any subject face down in the water. The number of subjects who are returned to the stable face-up foetal position in the candidate lifejacket should be at least equal to the number who are returned to the stable face-up foetal position in the RTD.

Swimming and water emergence test

2.8.11 All test subjects, without wearing the lifejacket, should attempt to swim 25 m and board a liferaft or a rigid platform with its surface 300 mm above the water surface. All test subjects who successfully complete this task should perform it again wearing the lifejacket. At least two thirds of the test subjects who can accomplish the task without the lifejacket should also be able to perform it with the lifejacket.

Annex E

Extract from MSC.378(93) - Further amendments to recommended lifejacket water performance tests

2 Paragraph 2.7.2.3 is amended to read as follows:

".3 at least one male should be from the lowest and highest weight group and one female should be from the lowest weight group and one female should be more than 80 kg and 1.8 m;"

3 The following sentence is added at the end of paragraph 2.8.1:

"Each test for a candidate lifejacket and the relevant RTD should be conducted on the same day."

4 In paragraph 2.8.4, the following sentence is added after the second sentence:

"Prior to taking the measurements in 2.8 and 2.9, the proper fit, donning, and fastening of the RTD on the subject should be checked and corrected as necessary."

5 In paragraph 2.8.7.1, the words "plus 1 s" are added after the words "the average time in the RTD".

6 In paragraph 2.8.7.2, the words "minus 10 mm" are added at the end.

7 In paragraph 2.8.7.3, the words "minus 5°" are replaced with the words "minus 10°".

8 In paragraph 2.8.7.4, the word "(head)" is deleted and the words "minus 5°" are replaced with the words "minus 10°".

9 Paragraph 2.8.9.1 is amended to read as follows:

".1 surface the test subject in a face up position with an average freeboard for all the subjects of not less than the average determined for the RTD after the turning test in accordance with 2.8.6 minus 15 mm;"

Extract from MSC.378(93) - Amended design and construction requirements for an RTD

1 GENERAL

The RTD is intended for use only as a test reference standard to represent the desired level of in-water performance of a lifejacket required by the Convention, and is not considered representative of any other required lifejacket performance. The adult RTD is designed to fit persons from a chest size of 700 mm to 1350 mm and to be comfortable to wear as a non-reversible device such that it would be obvious to the wearer as to which is the inside and outside of the device, even under reduced lighting conditions. The adult RTD is made with two types of buoyant foam in a vest style using a heavy nylon cover fabric shell secured to the body with 25 mm webbing, closures and adjustments. The shell is made with slide fasteners (zippers) in place of closing seams to hold the foam within, in order that the foam inserts can be easily removed to check their buoyancy and renew or supplement them if they are out of tolerance. Hook and loop fasteners are used on the interior foam retainers to position and prevent shifting of the foam panels.

2 MATERIALS

All materials used should comply with ISO 12402-7:2006.

2.1 Foam requirements

The performance of the RTD is dependent on using plastic foam of the proper stiffness, shape and buoyancy.

2.1.1 *Stiffness*

Two different stiffness foams are used: one is a soft foam and the other is a stiff foam. A bridge deflection test is provided to determine acceptability for the intended application. Figure A.20 provides the setup details and table A.1 provides the specific measured values. For selecting the type of foam for the specific insert, see tables A.2 and A.3. To measure the centre deflection of a foam panel of the specified cross-section ($a \times b$) and 110 mm wide, place the foam panel centred across the two equal height, parallel horizontal surfaces separated by the specified distance (c), and then load with a mass of the specified width. Note the length of the load should be at least 110 mm, such that when placed on the foam panel it will extend the full width of the foam panel. It is acceptable for the load to extend beyond the width of the foam panel provided that it is centred over the panel with equal amounts extending over the sides of the foam panel. Measure the deflection at the bottom centre location of the foam panel 30 s after placing the load on the panel.

2.1.2 *Shape*

The shape of each foam insert is specified in figures A.27 to A.30. For dimensions see tables A.2 and A.4.

2.1.3 *Buoyancy*

The total design buoyancy of the foam inserts is 149 N. Table A.3 specifies the foam characteristics, the buoyancy for each insert and its tolerances and the overall buoyancy distribution to be verified with using the RTD for certification testing.

2.2 Other component requirements

See table A.2.

3 CONSTRUCTION

The construction and assembly of the device should be in accordance with tables A.2 to A.5, figures A.1 to A.19 and figures A.21 to A.36. A tolerance of $\pm$ 6 mm is used throughout for fabric cutting and stitching assembly. A tolerance of $\pm$ 6 mm is also used for foam cutting, however, the buoyancy requirements of table A.3 should be met.

3.1 Seams

3.1.1 The seam allowances are 13 mm, unless otherwise specified. All structural seams use a lock type stitch so that the seam will not unravel when a force is applied in the direction of the seam on any of the threads forming the stitch. Stitching should have a density of 7 to 12 stitches per 25 mm of stitch length. The box-X stitching on the webbing is 15 mm $\times$ 18 mm, unless otherwise specified. The bar-tack stitching on the webbing is 15 mm $\times$ 2 mm.

3.1.2 On the closing seam of the back section of the outer and inside cover, the cut ends of the fabric are turned under and stitched so that the fabric will not ravel. The cut ends of webbing should be heat-sealed.

3.1.3 Tabs on the ends of the waist belt are formed by turning under 40 mm of material twice and stitching 19 mm from the end of the folds with box-X or bar tack stitching.

3.1.4 The zippers are set to the fabric by turning under the raw edge of the fabric 13 mm, aligning the fold with the centre of the closed zipper, and topstitching through both layers of fabric and the zipper tape. The stitch line should be far enough from the zipper teeth or coil so as not to interfere with the operation of the zipper.

3.2 Assembling the fabric cover

The fabric cover is assembled as described below, with the dimensions described in figures A.31 through A.33 and table A.4.

3.2.1 *Assembling the inside cover*

3.2.1.1 Attach the interior fabric retainers for foam inserts 1 (component 1.7) to the "wrong" (interior) side on each lobe of the inside cover fabric (component 1.3).

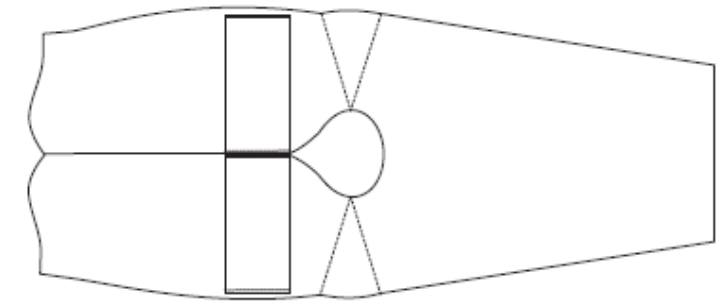


Figure A.1 – Location of Interior fabric retainers

3.2.1.2 Sew the hook and loop fasteners (component 4) to opposing sides of the interior fabric retainers for foam inserts 2 (component 1.8) as shown in figure A.2.

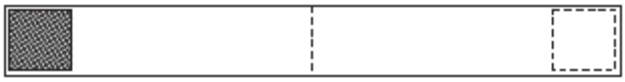


Figure A.2 – Orientation of hook and loop fasteners

3.2.1.3 Fold the interior fabric retainers for foam inserts 2 (component 1.8) in half and sew to the inside edge seam allowance of the "wrong" (interior) side of the inside cover fabric (component 1.3). Sew one fabric retainer to each lobe of the front cover fabric with the hook and loop fasteners (component 4) facing upward and oriented toward the outer edge of the inside cover fabric. Turn the bottom edge of the back cover up 13 mm and topstitch.

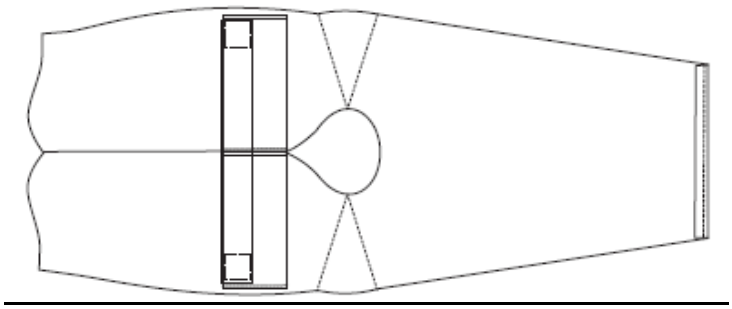


Figure A.3 – Location of fabric retainers

3.2.1.4 Attach one 89 mm black belt-loop webbing (component 3.5) to each lobe of the "right" (exterior) side of the inside cover fabric. Join the shoulder darts.

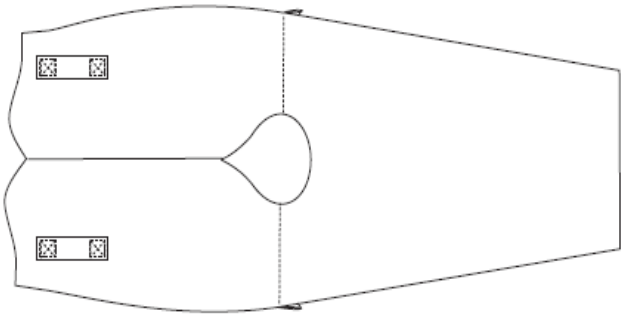


Figure A.4 – Completed inside cover

3.2.2 *Assembling the collar cover*

3.2.2.1 Attach the yellow collar attachment webbing (component 3.6) to the inside collar cover (component 1.5), placing one reinforcement patch (component 1.6) under the fabric, with a tack on each side, as in figure A.5. The webbing should be centred on the fabric, creating a 254 mm loop measured from the edge of one tack to the edge of the other.

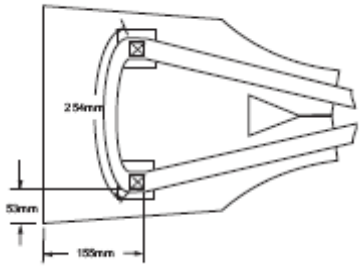


Figure A.5 – Collar attachment on collar cover

3.2.2.2 Sew the 280 mm zipper (component 6.5) to the inside and outer collar cover fabric (component 1.5) as in figure A.6.

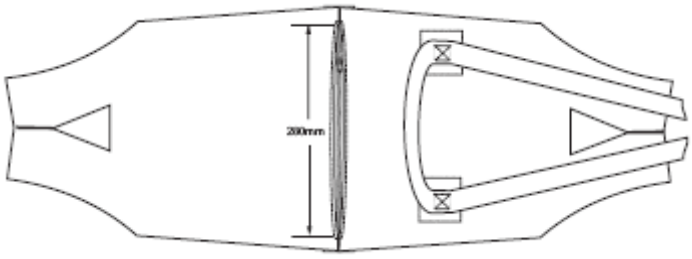


Figure A.6 – Joining the inside and outer collar cover

3.2.2.3 With the "right" (exterior) sides of the fabric together, join the sides of the inside and outer collar cover fabric (component 1.5) at the sides and around the neck opening. To allow access to the collar foam insert, do not join the fabric at the ends of the zipper. Turn the collar cover right side out.

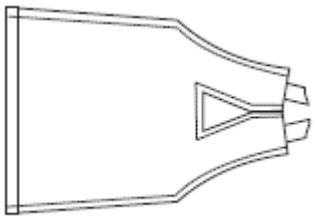


Figure A.7 – Completed collar cover

3.2.3 *Assembling the outer cover*

3.2.3.1 Attach one 76 mm black belt-loop webbing (component 3.4) to each shoulder on the "right" (exterior) side of the front outer cover fabric (component 1.1) using double bar tack stitches on each end, creating a 40 mm loop opening.

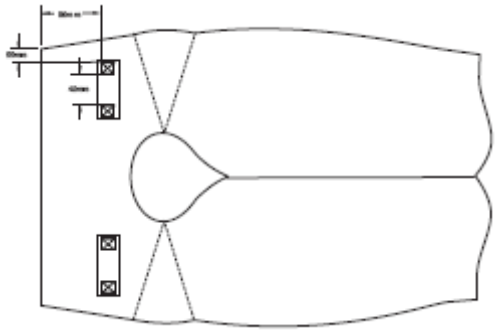


Figure A.8 – Attaching the shoulder loops

3.2.3.2 Sew the 370 mm zipper (component 6.6) to the back outer cover (component 1.2) and front outer cover (component 1.1) as shown in figure A.9. Turn the bottom edge of the back cover up 13 mm and topstitch.

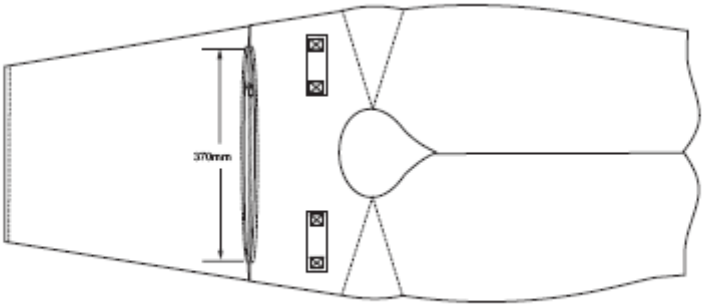


Figure A.9 – Completed outer cover

3.2.4 *Joining the collar to the front outer cover*

Join the shoulder darts on the front outer cover (component 1.1). Lace the yellow collar attachment webbing (component 3.6) through the black shoulder straps (component 3.4) with the collar loop facing toward the cover fabric. Stitch the collar cover fabric tabs to the neck seam.

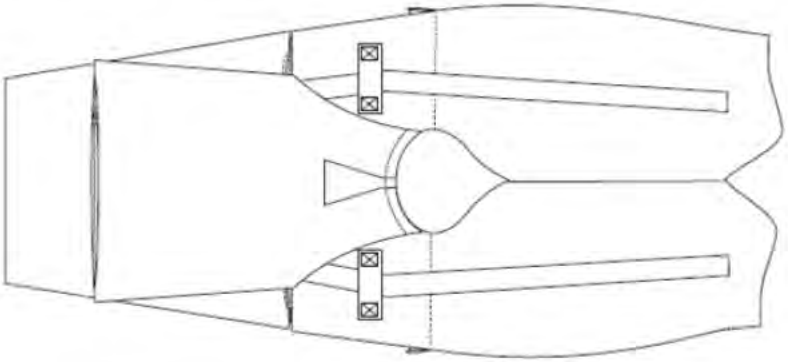
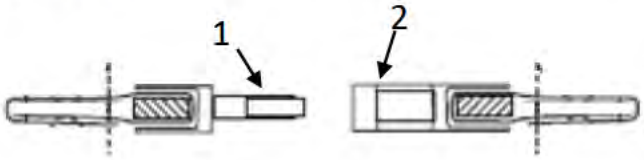


Figure A.10 – Joining the collar to the front outer cover

3.2.5 *Assembling and attaching the hardware assemblies*

3.2.5.1 Construct the chest strap buckle assemblies by lacing the 127 mm black chest strap webbing (component 3.1) through the male and female buckles (component 6.1) and stitching, as shown in figure A.11.



Key
1 Male buckle
2 Female buckle

Figure A.11 – Chest strap buckle assembly

3.2.5.2 Construct the waist belt assemblies by lacing the 203 mm black waist belt webbing (component 3.3) through the slide adjusters (component 6.2), snap hook (component 6.3), and D-ring (component 6.4), and stitching as shown in figure A.12.

Key
1 D-Ring
2 Snap hook
3 Slide adjuster

Figure A.12 – Waist belt assembly

3.2.5.3 Lace the left side yellow collar attachment webbing (component 3.6) through the male chest strap buckle assembly. With one fabric reinforcement (component 1.6) positioned on the "wrong" (interior) side of the front outer cover fabric (component 1.1), attach the chest strap buckle assembly to the yellow collar attachment webbing and cover fabric with a box-X stitch. Repeat on the right side with the female chest strap buckle assembly.

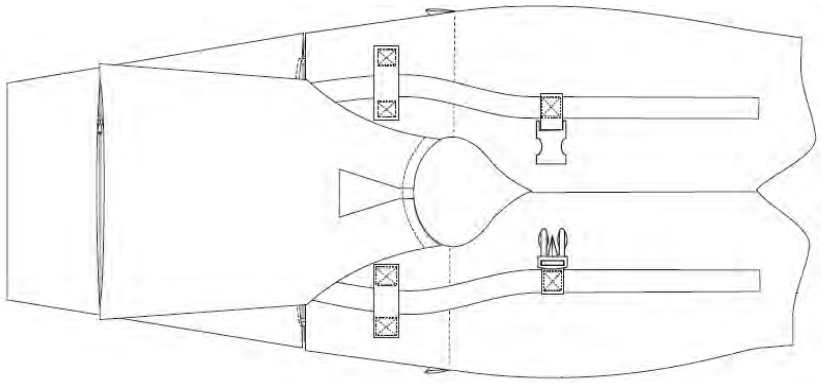


Figure A.13 – Attachment of chest strap buckle assembly

3.2.5.4 Lace the left side yellow collar attachment webbing (component 3.6) through the snap hook waist belt assembly. Attach the waist belt assembly to the yellow collar attachment webbing and the front outer cover fabric (component 1.1) with a box-X stitch. Repeat on the right side with the D-ring waist belt assembly.

3.2.5.5 Stitch the yellow collar attachment webbing to cover front, between the two buckle assemblies on each front forming a rectangle.

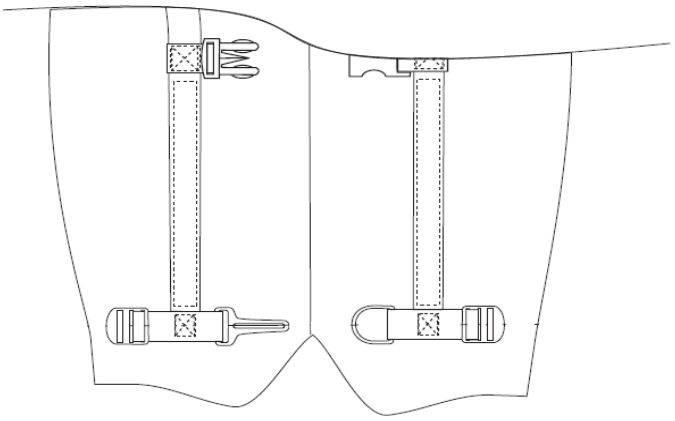


Figure A.14 – Chest and waist belt attachments

3.2.6 *Joining the inside and outer covers*

3.2.6.1 Join the inside cover fabric (component 1.3) to the front and back outer cover fabric (components 1.1 and 1.2) at the sides by sewing a 440 mm zipper (component 6.7) on the outside edge of each front.

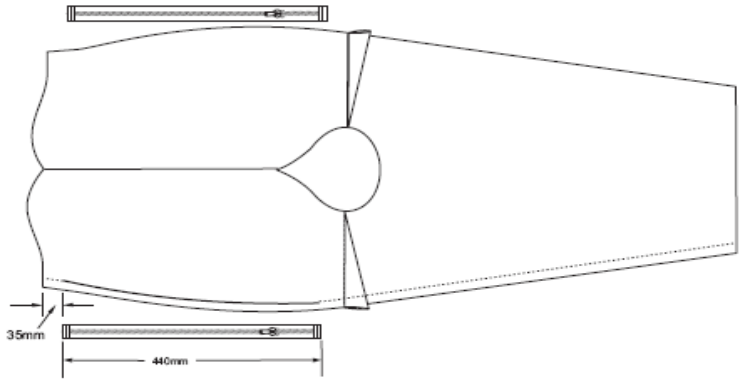


Figure A.15 – Joining the inside and outer cover fabric

3.2.6.2 Join a centre gusset (component 1.4) to the left and right lobes of the outer cover fabric, then join to the inside cover. The seam created by joining the outside edges should be centred on the end of the gusset with the taper of the gusset forming a point as it approaches the neck curve, as shown in figure A.16.

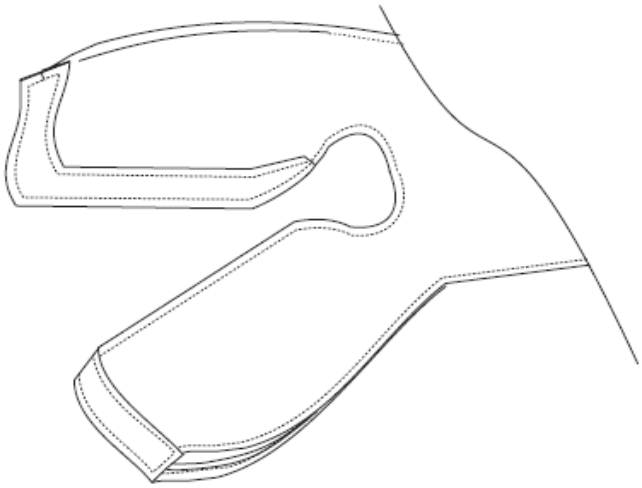


Figure A.16 – Joining the inside and outer over with the centre gusset

3.2.7 *Finishing*

3.2.7.1 Turn the cover right-side out. Attach the 1867 mm black waist belt webbing (component 3.3) to the back cover with three tacks, one centred on the fabric and one on each corner of the fabric. Tack the free ends of the webbing with a box-X with ends double folded. Top stitch through the inside and back outer covers, 80 mm from the foam access zipper (component 6.6).

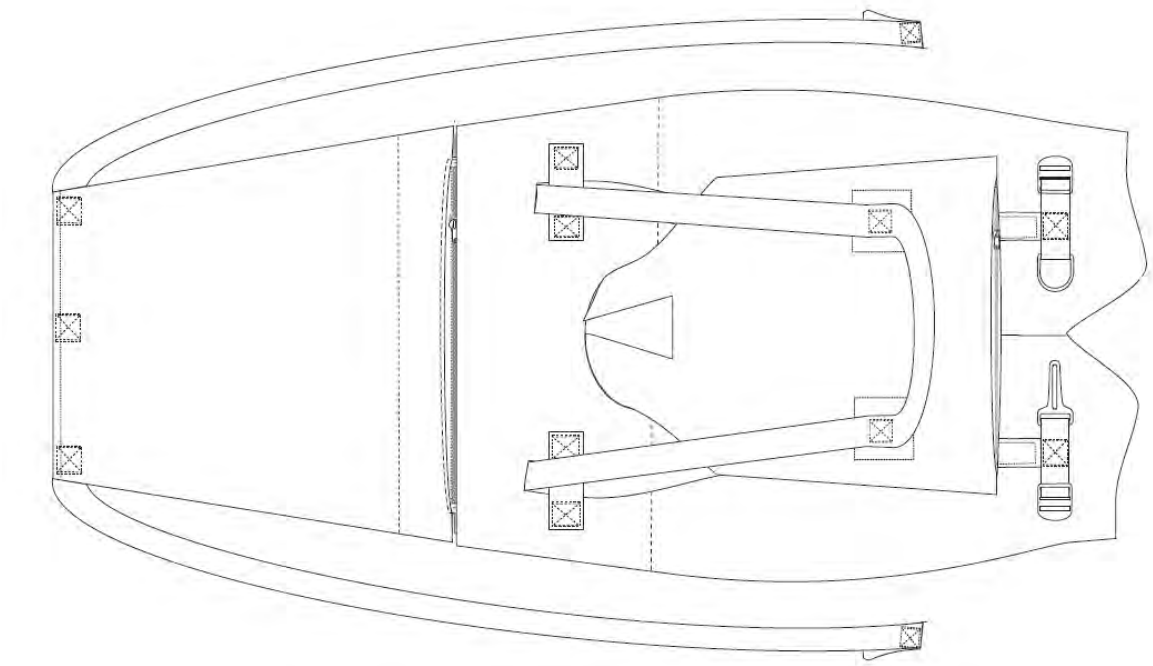


Figure A.17 – Attaching the waist belt

3.2.7.2 Lace the 1867 mm black waist belt webbing (component 3.3) through the slide adjusters (component 6.2) on each waist belt assembly.

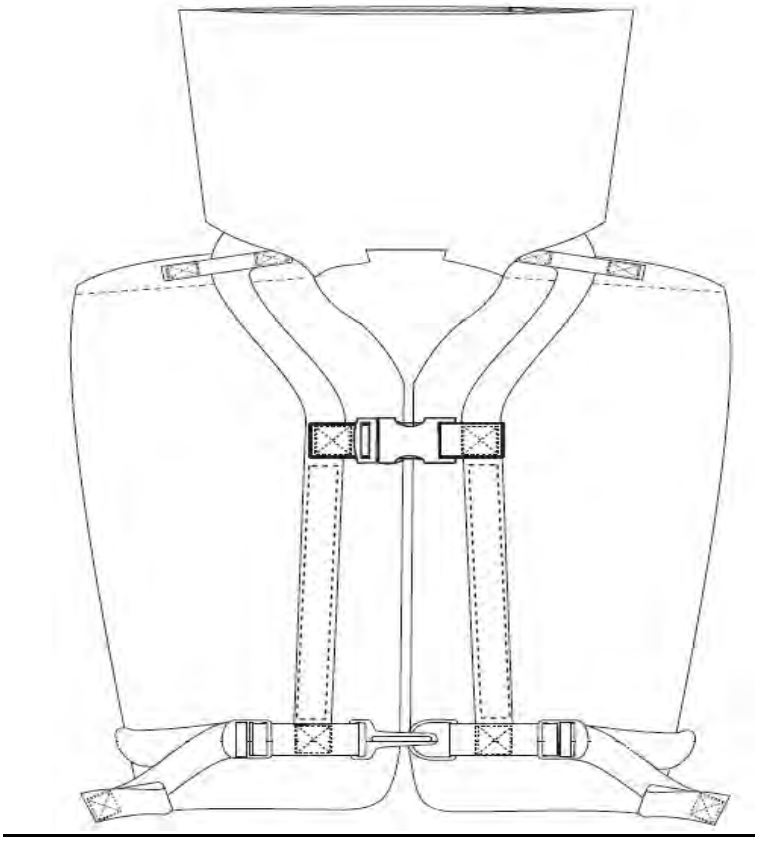
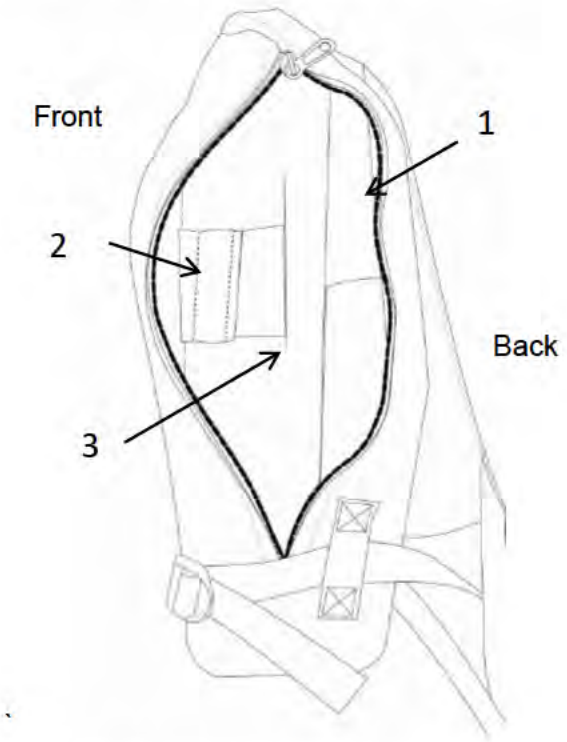


Figure A.18 – Completed RTD cover and hardware

3.3 Inserting the front foam

Slide the front foam inserts (components 2.2.1 and 2.2.2) under the interior fabric retainers for foam inserts 1 (component 1.7). Slide the interior fabric retainers for foam inserts 2 (component 1.8) through the slot in the front foam inserts (components 2.1.1 and 2.1.2). Wrap the interior fabric retainer for foam inserts around the foam insert so that the retainer passes around the front of the RTD as shown in figure A.19. Close the hook and loop fastener. Close the zipper (component 6.7).



Key

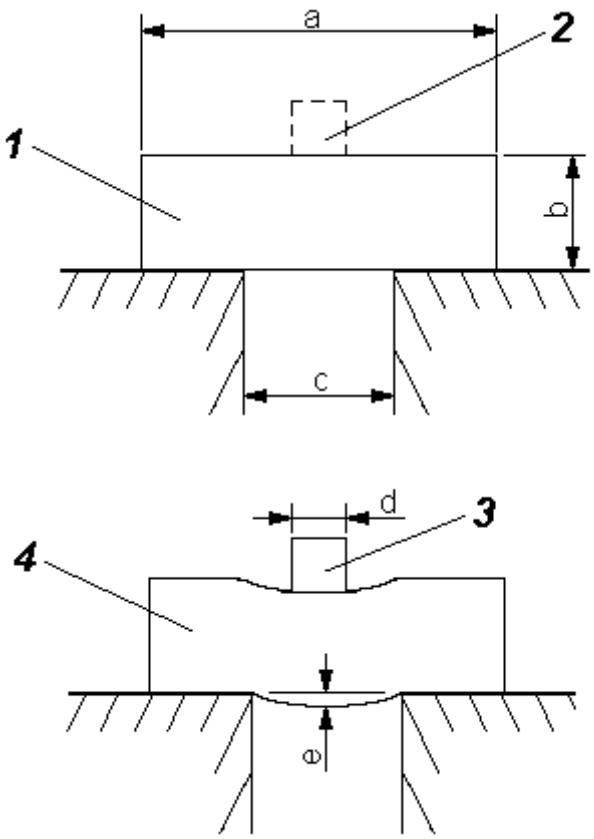
1	Interior fabric retainers for foam inserts 1 (component 1.7)
2	Interior fabric retainers for foam inserts 2 (component 1.8)
3	Slot (cut through foam)

Figure A.19 – Inserting the front foam

3.4 Validation

The proper assembly of the RTD should be verified according to the Guidelines developed by the Organization*.

* Refer to the *Guidelines for validating the construction of a completed adult lifejacket reference test devices (RTDs)* (MSC.1/Circ.1470).



Key:

	1	Foam at initial setup
	2	Centre load
	3	Load
	4	Foam bridge deflection after 30 s

Figure A.20 – Foam bridge deflection test

Table A.1 – Specifications for the foam bridge deflection test

	Dimension shown in figure A.20						Load mass
Foam type	a (Length) mm	(Not shown) (Width) mm	b (Thickness) mm	c (Span) mm	d (Load width) mm	e (Deflection) mm	kg
Stiff	394	110	83	300	120	< 20	8.6
Soft	394	110	45	150	30	≥ 25	0.75

Table A.2 – Parts, quantity and assembly

Component		Description	Quantity	See Figure	Construction notes
1	**Cover fabric**	420 denier nylon, with ravel resistant coating, orange			
1.1	Front outer cover		1	A.21	
1.2	Back outer cover		1	A.21	
1.3	Inside cover		1	A.22	
1.4	Centre gusset		2	A.23	
1.5	Collar, outer and inside cover		2	A.24	
1.6	Fabric reinforcement		4	A.25 A.33	Attach to inside of collar cover, as attachment 1, for reinforcement at webbing attachment (see figure A.33).
1.7	Interior fabric retainers for foam inserts 1		2	A.26 A.1	Attach to inside of front cover, as attachment 3, stitch to cover at each side to form a foam retainer for inside front foam insert components 2.2.1 and 2.2.2 (see figure A.1).
1.8	Interior fabric retainers for foam inserts 2		2	A.26 A.3	Attach hoop and loop fasteners to the ends and stitch at centre to the inside of front cover, as attachment 4, to form a foam retainer for front foam insert components 2.1.1 and 2.1.2 (see figure A.3).
2	**Foam**				
2.1	Stiff	See tables A.1 and A.3			
2.1.1	Front foam insert, right side	81 mm thick	1	A.27	
2.1.2	Front foam insert, left side	81 mm thick	1	A.27	
2.1.3	Collar foam insert	56 mm thick	1	A.29	
2.2	Soft	See tables A.1 and A.3			
2.2.1	Inside front foam insert, right side	46 mm thick	1	A.28	
2.2.2	Inside front foam insert, left side	46 mm thick	1	A.28	
2.2.3	Back foam insert	25 mm thick	1	A.30	

Table A.2 *(continued)*

Component		Description	Quantity	See Figure	Construction notes
3	**Webbing**	25 mm, polypropylene, with easy adjustment and no significant slippage when used with the specified hardware.			
3.1	Chest strap	127 mm, black	2	A.11 A.31	On left side of front cover, attach webbing with male buckle. On right side of front cover attach webbing with female buckle. The free ends of the chest strap are folded under the yellow webbing (collar attachment webbing), with reinforcing fabric (see figure A.25) on inside of cover fabric. A box-x stitch is used to attach the chest strap to the front cover.
3.2	Waist belt	203 mm, black	2	A.12 A.31	On left side attach waist belt with slide and buckle clip waist belt. On right side attach bottom belt with D-ring and slide.
3.3	Waist belt	1,867 mm, black	1	A.31 A.32 A.17	Form 40 mm tab on each end. Attach to back cover using three box-x stitches (after front and back covers are assembled).
3.4	Belt-loop on front cover	76 mm, black	2	A.31 A.8	Attach webbing to front outer cover and form a belt-loop (one on each side) by two sets of double bar tack stitches.
3.5	Belt-loop on inside cover	89 mm, black	2	A.32 A.4	Attach webbing to inside cover and form a belt-loop (one on each side) by two box-x stitches.
3.6	Collar attachment	1,384 mm, yellow	1	A.14 A.6 A.31 A.33	Attach webbing to collar and reinforcing fabric, in two places using box-x stitch.
4	**Hook and loop fastener**	50 mm × 70 mm, black generic	2	A.2 A.26	Hook and loop fasteners are attached to the ends of interior fabric retainer for foam insert.
5	**Thread**	Generic synthetic	AR		
6	**Hardware**				
6.1	Buckle	Male and female 25 mm, plastic	1		Chest strap
6.2	Slide	Adjuster 25 mm, plastic	2		Waist belt
6.3	Snap hook	25 mm, SS, 1,600 N single-end strength	1		Waist belt
6.4	D-ring	25 mm, SS, 1,600 N single-end strength	2		Waist belt
6.5	Zipper	280 mm, open-ended, plastic (zipper chain and pulls)	1	A.6 A.33	Foam access for collar cover
6.6	Zipper	370 mm, plastic (zipper chain and pulls)	1	A.9 A.31	Foam access for back cover
6.7	Zipper	440 mm, plastic (zipper chain and pulls)	2	A.15 A.31 A.32	Foam access for front cover

Table A.2 – Foam insert specifications

Values in Newton (N)

	Front right	Front left	Inside front right	Inside front left	Back	Collar
Foam type[a]	Stiff	Stiff	Soft	Soft	Soft	Stiff
Buoyancy[b]	34 ± 1,1	34 ± 1,1	17,75 ± 0,65	17,75 ± 0,65	18,5 ± 0,7	28 ± 0,8

[a] The buoyancy of most foams will change over time with the greatest change occurring in the first several months after manufacture. The exact kind of foam selected will need to be evaluated to determine the amount of additional buoyancy needed at the time of manufacture to maintain the values specified.

[b] Buoyancy distribution: 69% front ± 1.5 percentage points.

Table A.3 – List of dimensions shown in figures A.21 to A.33

Dimensions in millimetres

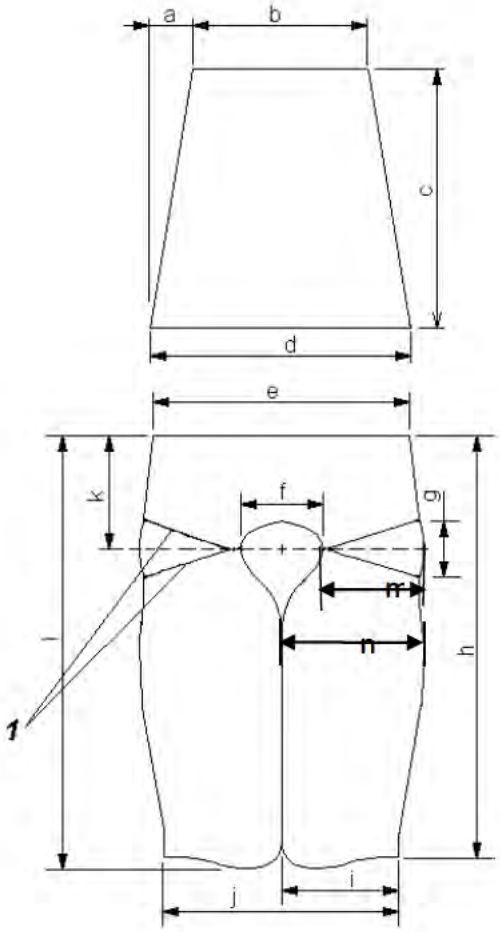
Letter	Figure											
	A.21	A.22	A.23	A.24	A.25 A.26	A.27	A.28	A.29	A.30	A.31	A.32	A.33
a	66	298	23	308	73	198	76	20	188	120	138	19
b	298	100	497	75	73	46	46	56	274	18	18	155
c	427	1106	586	10	130	76	394	51	414	35	35	53
d	430	199	102	288	205	84	38	216	343	55	295	25
e	423	398		342	72	76	51	229	147	95	55	45
f	141	597		396	470	157	165	259	223	320		
g	100	1124		65		394		45		90		
R							51	70				
h	705	141				46				40		
i	199					8				55		
j	398					20				225		
k	197					20				80		
l	723					76						
m	176					46						
n	245					38						
o						165						
p						25						

Table A.5 – List of dimensions shown in figures A.35 and A.36

Dimensions in millimetres

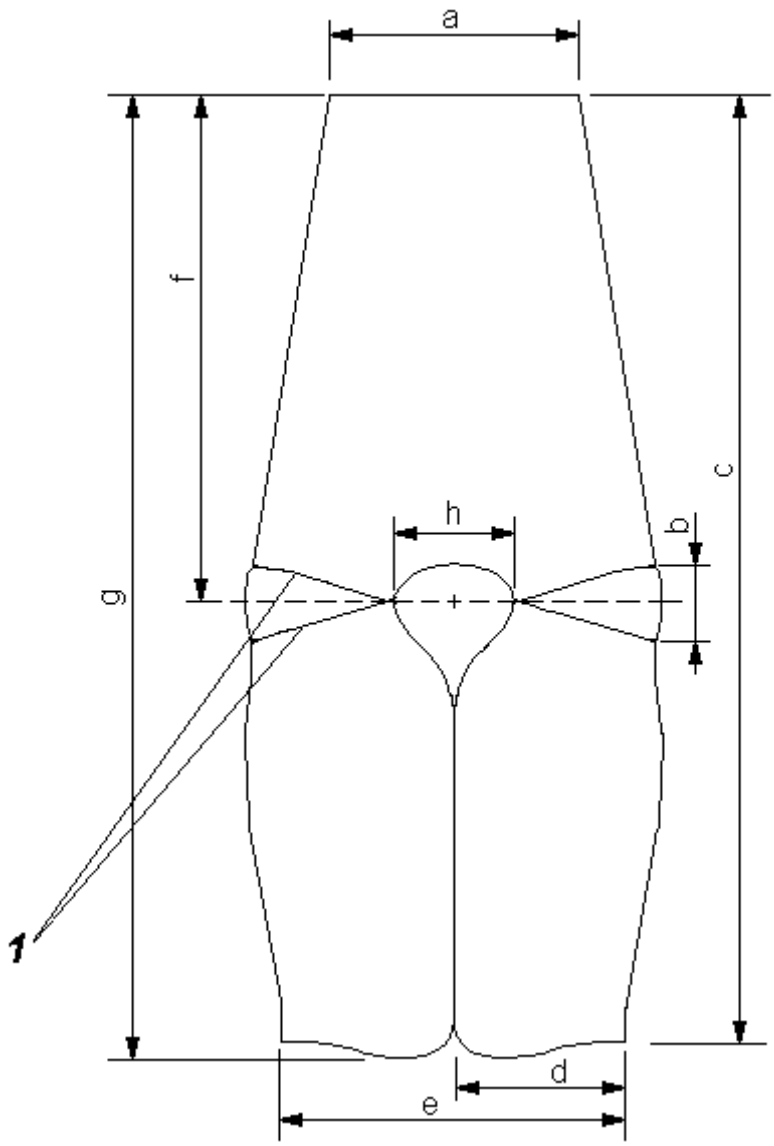
Figure	Dimension											
	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*
A.35	450	530	980[a]	90	60	340	20	310	70	50	60	260
A.36	260	340	230	120	215	210	60	290				
	m	*n*	*o*	*p*	*q*	*r*						
A.35	240	270	130	80	70	30						
A.36												

[a] Dimension *c* in figure A.35 = dimensions *a* + *b* (i.e. dart closed).



Key:
1 Dart

Figure A.11 – Outer cover, front and back sections



Key:
1 Dart

Figure A.22 – Inside cover

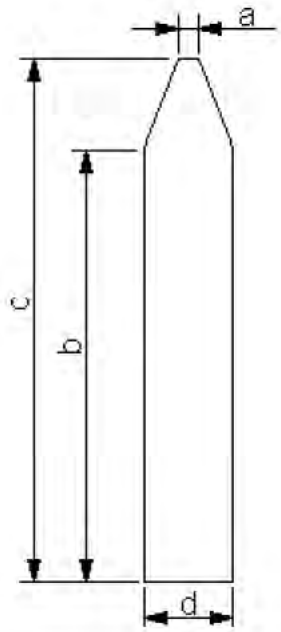


Figure A.23 – Centre gusset

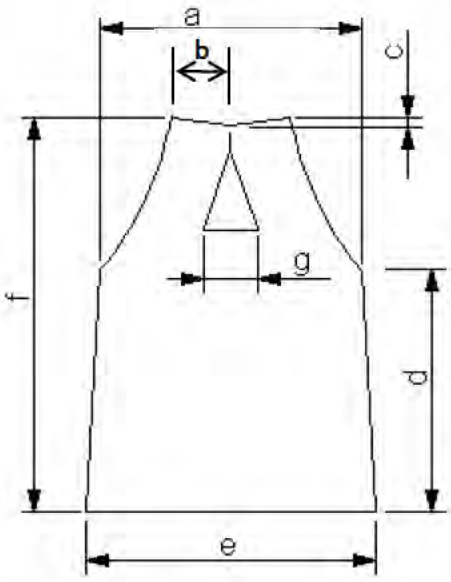


Figure A.24 – Outer and inside cover, collar

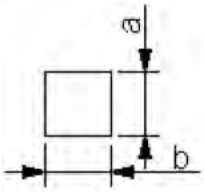
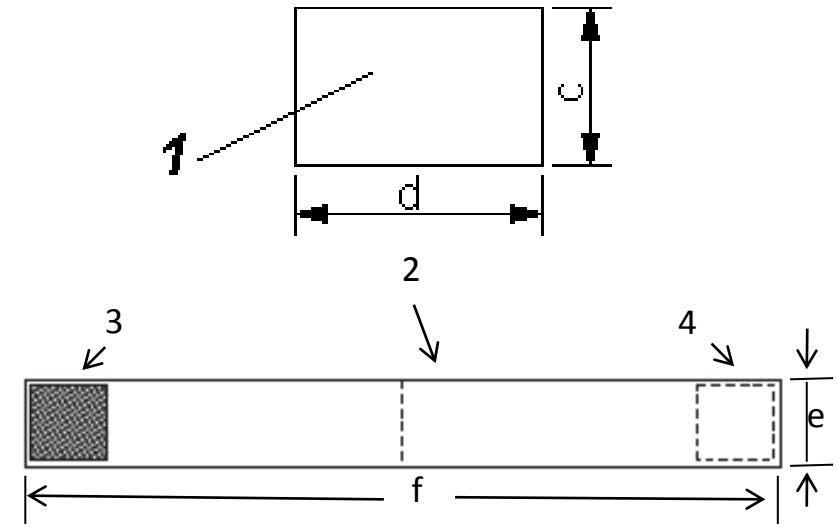
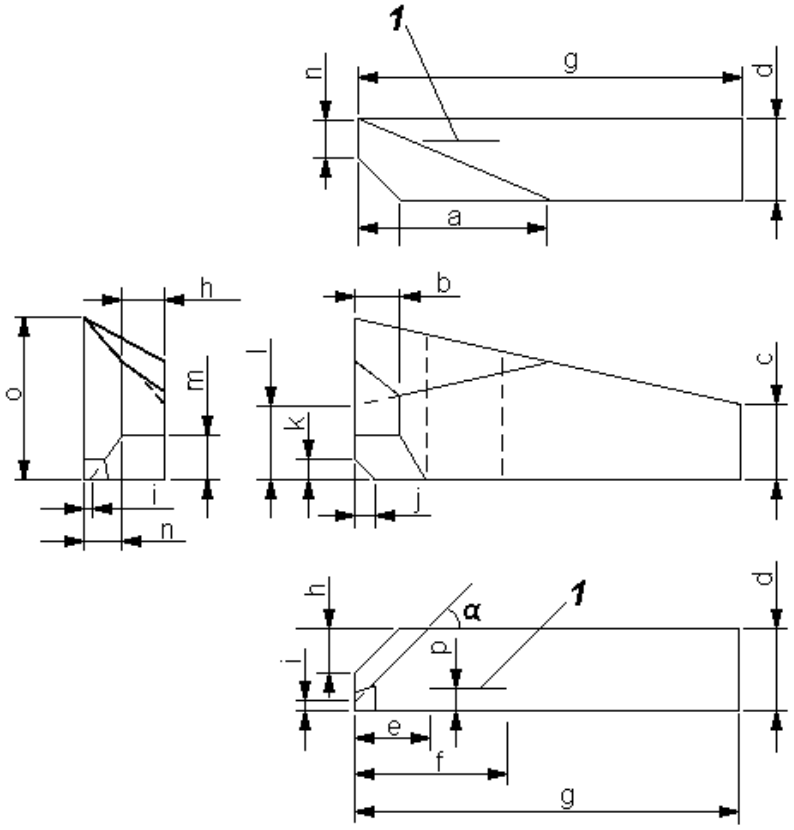


Figure A.25 – Fabric reinforcement



Key:
1 Fabric retainer for the front soft foam insert
2 Fabric retainer for the soft and stiff foam inserts
3 Hook and loop fastener (hook portion)
4 Hook and loop fastener (loop portion)

Figure A.26 – Interior foam retainer



Key:
1 Slot (cut through foam insert)
α 45°

Figure A.27 – Front foam insert

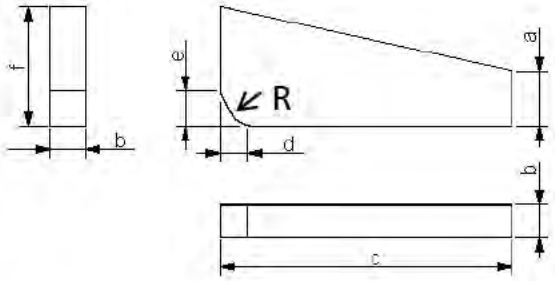
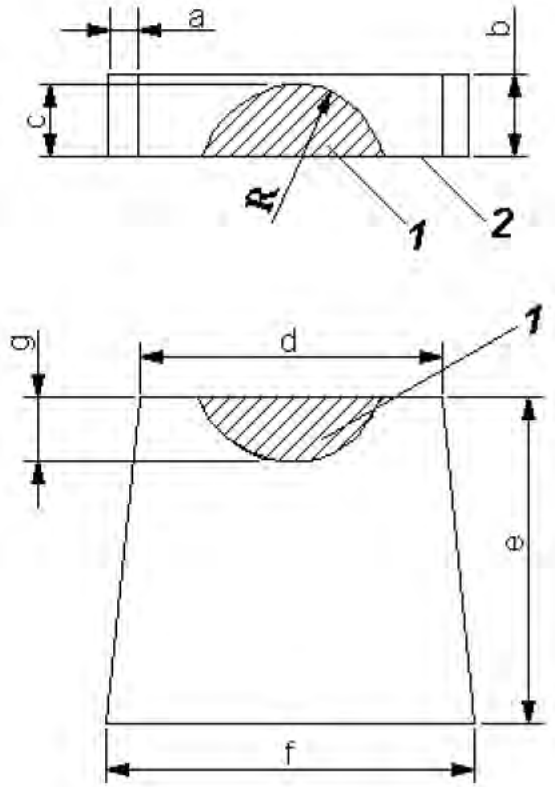


Figure A.28 – Inside front foam insert



Key:

1	Skive
2	Side towards body

Figure A.29 – Collar foam insert

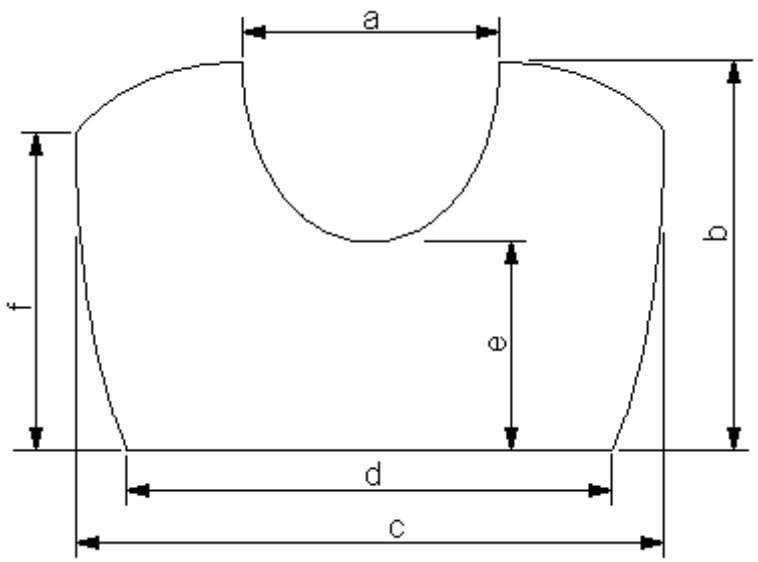
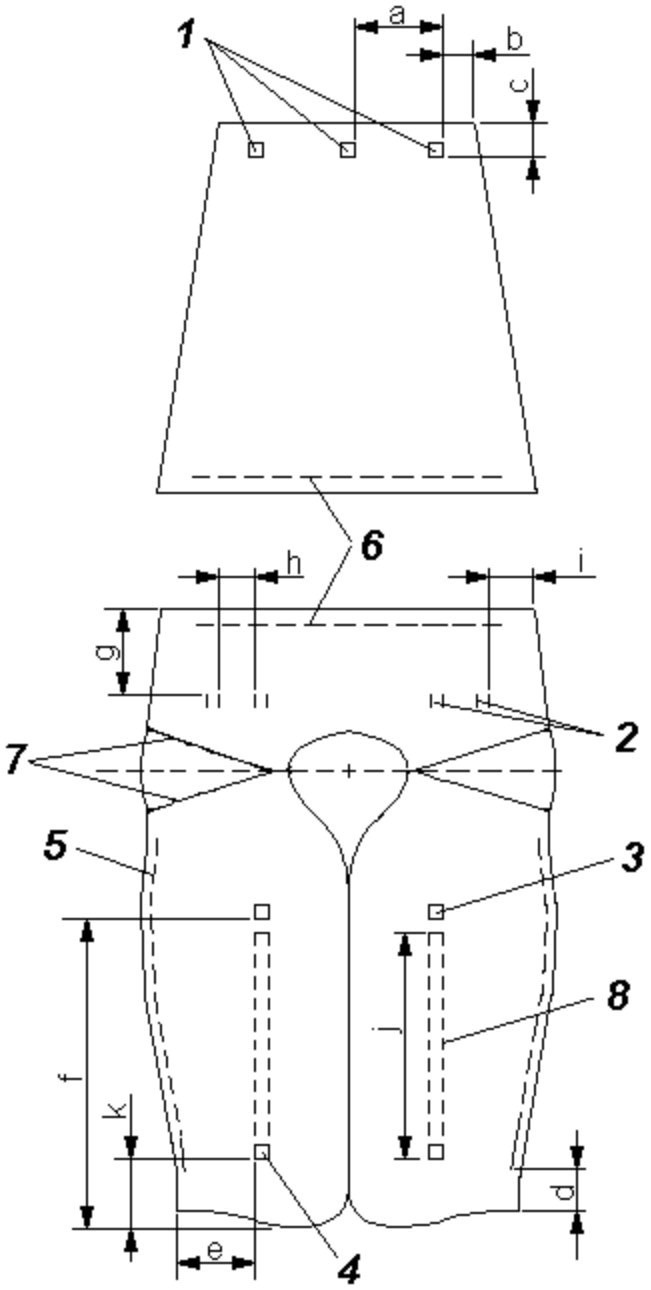


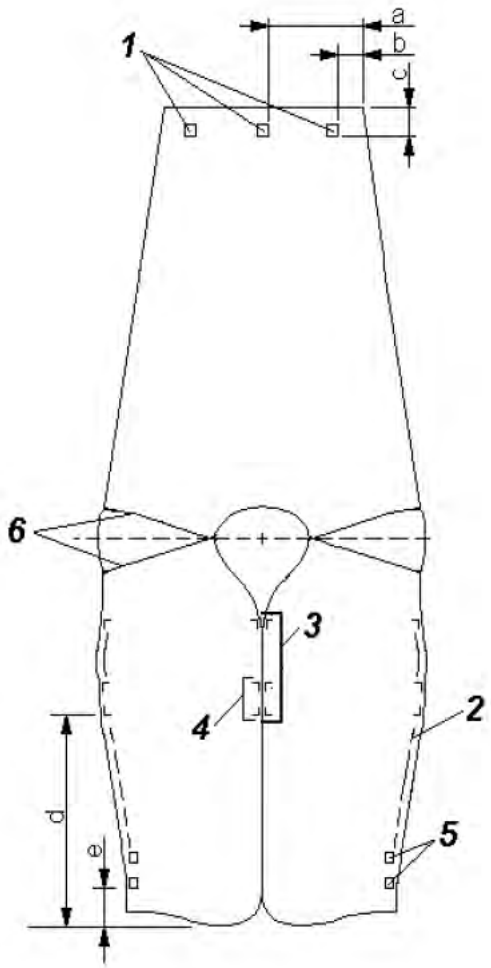
Figure A.30 – Back foam insert



Key:

1 Waist belt (1,867 mm) attachment to outside of back cover
2 Belt loop webbing (76 mm) attachment to outside of front cover
3 Chest strap (webbing (127 mm)) attachment to outside of front cover
4 Waist belt (203 mm) attachment to outside of front cover
5 Zipper (440 mm) attachment to front
6 Zipper (370 mm) attachment to the front and back covers
7 Dart
8 Collar webbing (1,384 mm) attachment to outside of front cover

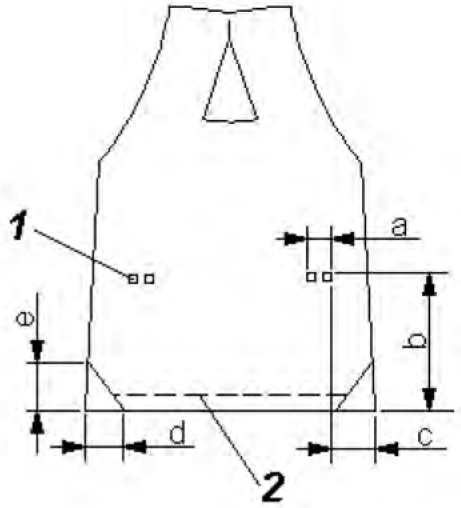
Figure A.31 – Attachments to front and back cover (dimensions on pattern, before sewing)



Key:

1 Waist belt (1,867 mm) attachment to outside of back cover and inside cover (see figure A.31)
2 Zipper (440 mm) attachment
3 Interior fabric retainer attachment to inside front cover
4 Interior fabric retainer attachment to centre of inside front cover
5 Belt loop webbing (89 mm) attachment to outside of cover
6 Dart

Figure A.32 – Attachments to inside cover (dimensions on pattern, before sewing)



Key:

1 Collar webbing (1,384 mm) attachment on the outside of the inner cover with reinforcement fabric inside

2 Zipper (280 mm) attachment to the outer and inner covers

Figure A.33 – Attachments to outer and inside collar cover (dimensions on pattern, before sewing)

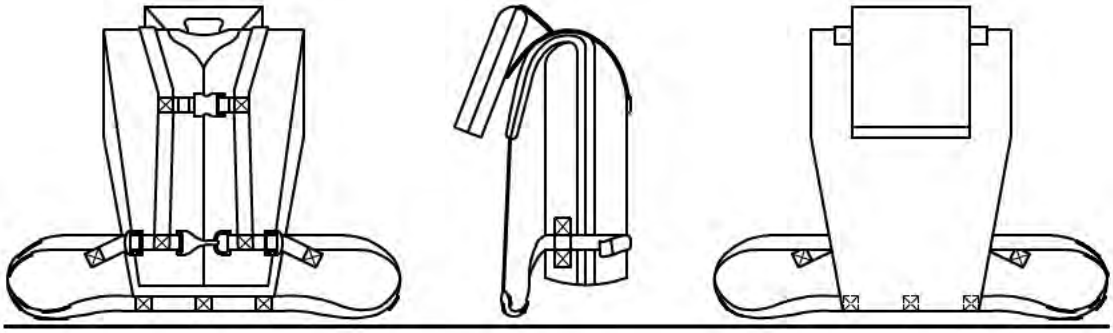
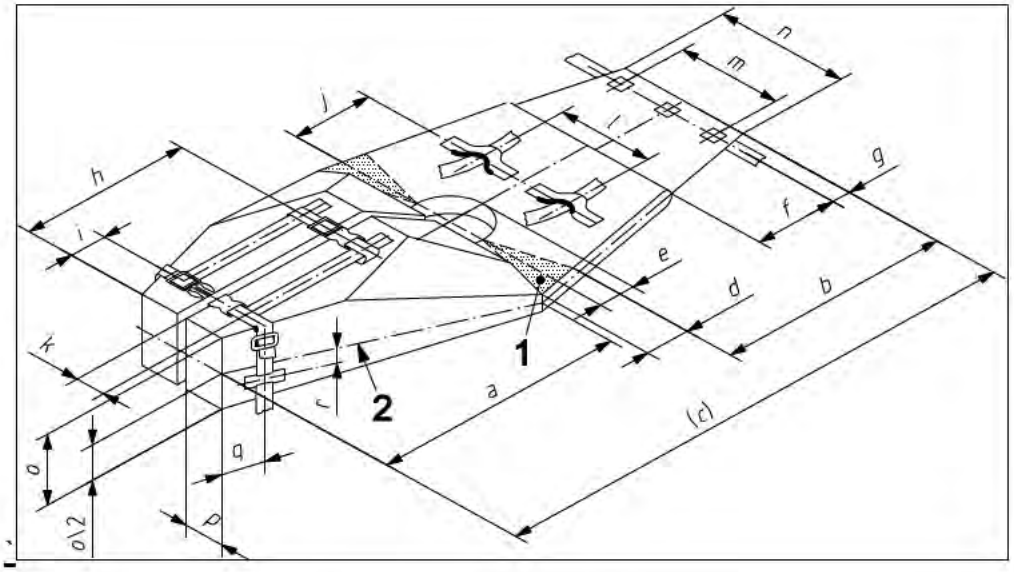
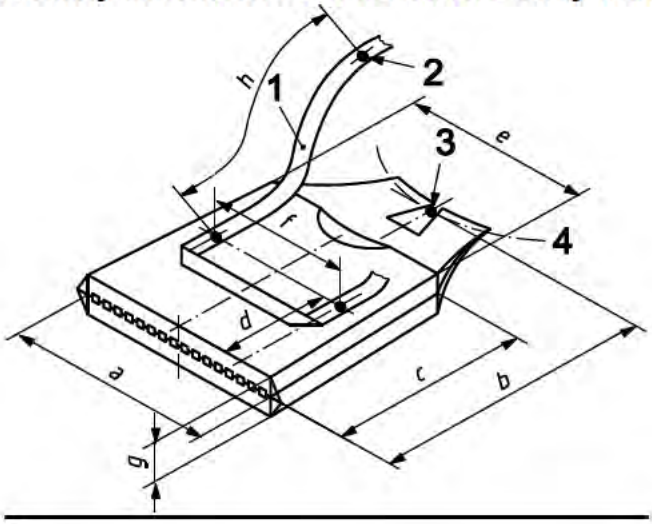


Figure A.34 – Assembly views of finished RTD



Key:
1 Dart at shoulder seam; shown spread out
2 Seam line and side zipper location

Figure A.35 – Assembly dimensions of finished RTD body with collar removed



Key:
1 Collar attachment webbing
2 Nearest point of attachment to chest of vest
3 Centre of neck seam on vest
4 Assembly seam in neck of vest

Note: h is measured along the webbing to the nearest point of attachment.

Figure A.36 – Assembly dimensions of finished RTD collar"

***

HMCG’s standard operating procedure for satellite distress beacon alerts

Satellite Distress Beacon Alerts (GMDSS)

406 MHz Distress Beacons working in the COSPAS/SARSAT system consist of three main types: EPIRB (Emergency Position Indicating Radio Beacon - maritime), ELT (Emergency Locator Transmitter - aviation) and PLB (Personal Locator Beacon - mainly used on land and by the offshore industry). Ops Centres may be alerted to any one of these beacon types being used in the maritime environment to indicate a distress situation

An EPIRB activation is always a DISTRESS ALERT

Dealing with **RNLI MOB Guardian** alerts

Related Links

GMDSS - 406 Beacons
COSPAS/SARSAT Handbook
RNLI MOB Guardian

Initial Actions

Information Gathering

Where - Position

- The position-confidence (A and B positions for unmerged LEOSAR alerts)
- Number of detections received during the satellite pass

Who

- Vessel name/Call-sign or aircraft identity
- MMSI
- EPIRB serial number decode from Falmouth database

How many persons at risk?

When

- Satellite pass detection time

What

- Nature of Distress

Actions

Try to contact the vessel

Respond to active beacons as people may still be in danger

Homing

SRUs must monitor 121.5MHz D/F for homing signals

If CG SAR helicopter airborne, give them the beacon's exact 406 frequency (e.g. 406.025), if known, to aid homing

Plot - position on chart and/or AIS, and add error factor (LEOSAR: 2.7NM radius, GEOSAR: 0.6NM)

Broadcast - DSC Distress Relay alert and MAYDAY Relay - use NAVTEX and EGC if necessary

Check - AIS / LRIT picture (Via CGOC Falmouth) for vessel and/or other vessels in the vicinity (divert vessels to assist)

Consider launching SRUs, or bring to readiness

Declare Phase

An EPIRB activation is always a DISTRESS ALERT

Mission Conduct

Considerations

Information

Vessel Type

- The type of vessel may provide an idea of the number POB (crew and passengers) and the type of equipment carried (Survival and communications)

Merged Solutions

- Carefully monitor/wait for position updates: 'merged solution' is confirmed beacon position

Datapoints

- More than 7 Data Points in a detection message provides a good position

Beacon ID confusion

- If a craft is found and reported safe but the beacon still transmitting, consider that the beacon ID may have been confused

Country of Registration

- PLB/ELTs may only be registered in the country of origin of the vessel/aircraft/person

Who may have information on intended voyage

406 Detect Only Alerts

In the event of a detect only (no position) 406 alert, CGOG Falmouth will assume coordination until the position is confirmed

If information is gained that the vessel is registered to a UK port or uses a certain area, then Falmouth will contact the relevant Ops Centre and may ask them to undertake local information gathering

Falmouth remains the coordinating station and the other Ops Centre becomes an action station until such time as the position is confirmed

406 Unresolved Alerts

If an unresolved alert is received with one position in the UKSRR and the other outside the UKSRR, CGOG Falmouth will assume initial coordination. Falmouth will discuss the alert with the other RCC and agree the action to be taken

If the alert subsequently resolves to the UKSRR then Falmouth will formally pass coordination to the appropriate Ops Centre, with Falmouth acting as a supporting station thereafter

If both positions are in the UKSRR, Falmouth will assume initial coordination until such time as the position resolves or information is gathered proving the actual position. At this point, coordination will be formally handed to the appropriate Ops Centre

Coordinating Actions

Ask UKMCC for advice and guidance on beacon behaviour, signal information, next satellite pass, etc.

Tasking Facilities
Lifeboats
Aircraft
Additional
Coast Rescue
Other Services

Phases
DISTRESS
ALERT
UNCERTAINTY

Mission Conduct
1 Planning
2 Statement
3 Records
4 Reports
5 Review

Welfare
Welfare
Blood Borne Viruses

Conclusion
Termination, Suspension & Closure
Post Mission Review Form

Ask responding vessels fitted with Guard Receivers to use them to monitor and report detections

Military Beacons

Contact ARCC and let them advise/decide on action required of Ops Centre/SRUs/Vessels

- 9GHz radar and AIS SART - Ask vessels to monitor for transmissions as casualty may have AIS and/or Radar SART
- Ask ATC/ARCC to ask high flying aircraft to monitor 121.5MHz and report any homing signals (Swept tone) that are heard, and aircraft position, route and height at that time
- Check ITU website for vessel information if beacon MMSI is available
- Ask CGOC Falmouth to investigate beacon details on your behalf

Search Planning

- Datum Line
- Datum Point - most appropriate for beacons
- Backtrack

If SAR helicopter tasked, give them the beacon's exact 406 frequency (e.g. 406.025) - they can home in on this

Conclusion

You cannot terminate an EPIRB incident unless:

- The alert is confirmed as a false alarm by conversation directly with the activating vessel
- Persons at risk are rescued or
- It is confirmed that the situation that caused the alert no longer exists

The MC must verify beyond doubt the origin of a GMDSS satellite distress beacon alert. Only when this is established beyond reasonable doubt may the incident be terminated

Who May Need to Know

- Duty Controller
- Duty Commander

Revision: 6 - Published: 07/03/2016

Revisions:
Revision: 0 - Published: 20/10/2010
Revision: 1 - Published: 06/04/2011
Revision: 2 - Published: 01/11/2011
Revision: 3 - Published: 04/05/2012
Revision: 4 - Published: 05/09/2013
Revision: 5 - Published: 14/01/2014
Revision: 6 - Published: 07/03/2016
Revision: 7 - Published: 24/05/2016
Revision: 8 - Published: 28/06/2016

MAIB Flyer to the Fishing Industry

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

SAFETY FLYER TO THE FISHING INDUSTRY

Fishing vessel *Louisa* (SY30), foundering with three fatalities, 9 April 2016

Figure 1: Fishing vessel *Louisa*

Narrative

Louisa, a creel vessel fitted with a vivier system for maintaining the catch alive, foundered with the loss of three lives while anchored close to the shore in Mingulay Bay in the Outer Hebrides.

The skipper and his three crew had been working long hours, and had anchored the vessel at approximately 2230 to enable them to rest. Having all gone to bed, they were woken suddenly in the early hours of the following morning, 9 April, with the vessel significantly down by the head and apparently sinking. They were able to escape to the aft deck, don lifejackets and activate an EPIRB before abandoning the vessel, but were unable to inflate the liferaft.

One crewman managed to swim ashore and survive. However, the rescue services found the skipper and the two remaining crew unresponsive and face down in the water. The skipper was lost during recovery and remains missing. The two crew were later declared deceased caused by drowning.

Safety Lessons

1. The skipper and crew had all gone to bed, leaving the wheelhouse unmanned despite the engine running apparently at slow speed with the propeller engaged astern, and the vivier system pump driven from the main engine power take off. All machinery and accommodation doors were left open and the hold hatch cover was secured in the open position. The deck wash pump had probably been left running, and it is concluded that flooding of the hold from the deck wash hose through the open hold hatch was the probable cause of the foundering.

   The condition in which *Louisa* was left while all on board went to bed was inconsistent with best practice and demonstrated an underestimation of the risks associated with flooding and foundering.

2. *Louisa* had been fitted with bilge pumps and bilge level alarms as required by The Code of Practice for the Safety of Small Fishing Vessels. However, the hold bilge alarm had previously been disabled, which prevented early notification of hold flooding to the skipper and crew.

3. The debilitating effect of fatigue should not be underestimated. Fatigue affects both physical and mental abilities and can significantly reduce risk perception and awareness. Instead of managing work routines to prevent fatigue and so ensure adequate levels of safety were maintained, the skipper drove the crew and himself to a state of tiredness such that the safety of the vessel and its crew were compromised.

4. *Louisa* was not transmitting an AIS signal, and the skipper and crew were not equipped with personal locator beacons. The rescue services were therefore reliant on gathering local information while awaiting a confirmed position from the vessel's EPIRB. An historical record of *Louisa*'s movements would have proved particularly valuable to those involved in initiating and conducting the search and rescue operation.

This flyer and the MAIB's investigation report are posted on our website: www.gov.uk/maib

For all enquiries:
Marine Accident Investigation Branch
First Floor, Spring Place
105 Commercial Road
Southampton, SO15 1GH

Email: maib@dft.gsi.gov.uk

Tel: 023 8039 5500

Cosalt Premier (32kg or more) lifejacket - testing and type approval certificates

LIFE JACKETS

WATER PERFORMANCE AND DONNING TESTS
IN ACCORDANCE WITH RESOLUTION A689(17)

TYPE COSALT "PREMIER" (Over 32 Kgs) DATE 21 APRIL 1992

SURVEYOR [redacted] LOCATION DERBY TCE, SOUTH SHIELDS

2.8.2. SELECTED PERSONS

2.8.2.	SEX	WEIGHT Kgs	HEIGHT M
A	MALE	82	1.82
B	MALE	93	1.77
C	MALE	75	1.79
D	MALE	74	1.70
E	MALE	64	1.66
F	FEMALE	45	1.64
G	FEMALE	55	1.55
H	FEMALE	65	1.58

2.8.3 DONNING PERFORMANCE 5 MALE 3 FEMALE

i. NORMAL INDOOR CLOTHING

ii. HEAVY WEATHER CLOTHING

2.8.4	(i)SECONDS	(ii)SECONDS
A	28	24
B	16	14
C	13	11.5
D	22	18.5
E	19	17
F	18	20
G	17.5	27
H	19	20

2.8.4
Following demonstration out of sight of other person
Don without assistance within 1 minute.

2.8.5 NOTE: Ease and speed of donning, proper fit and adjustment.

2.9.4 DON LIFEJACKET,

NOTE: EASE AND SPEED OF DONNING
PROPER FIT AND ADJUSTMENT

2.9.5 THREE GENTLE STROKES
SIMULATE STATE OF UTTER EXHAUSTION
HEAD DOWN, LUNGS PARTIALLY FILLED.

TIME FROM COMPLETION OF LAST STROKE
UNTIL MOUTH BECOMES CLEAR
(TIME NOT TO EXCEED 5 SECONDS)

2.9.5	TIME (1)	TIME (2)
A	5.1	
B	4.5	
C	5.1	
D	4.0	
E	5.5	
F	5.5	
G	3.8	
H	4.5	

REPEAT AFTER EXHALED
(TIME NOT TO EXCEED 5 SECONDS)

2.9.5	TIME (1)	TIME (2)
A	5.5	
B	5.0	
C	3.5	
D	3.8	
E	5.0	
F	4.2	
G	4.0	
H	5.8	

2.9.5 WHEN FACE UP, FREEBOARD MEASUREMENT ON EACH SIDE OF MOUTH (MEAN READING AT LEAST 120MM)

2.9.5.	LEFT		RIGHT		MEAN	
	1	2	1	2	1	2
A	188	188	150	150	174	174
B	75	125	175	137	125	131
C	150	175	188	175	169	175
D	137	162	175	137	156	149
E	144	144	150	144	147	144
F	137	125	150	175	143	150
G	150	112	125	162	137	137
H	144	131	137	150	140	140

2.9.7 INCLINATION OF TRUNK FLOATING BACKWARDS (NOT LESS THAN 20° FROM VERTICAL, AVERAGE AT LEAST 30° FROM VERTICAL. INCLINATION OF THE FACE PLANE NOT LESS THAN 30° FROM HORIZONTAL, AVERAGE AT LEAST 40° FROM HORIZONTAL.

2.9.7	TRUNK ANGLE FROM VERTICAL		HEAD ANGLE FROM HORIZONTAL	
	1	2	1	2
A	45°	45°	20°	20°
B	40°	40°	30°	40°
C	20°	20°	25°	30°
D	45°	35°	30°	35°
E	45°	40°	35°	35°
F	70°	70°	25°	20°
G	70°	75°	30°	30°
H	70°	80°	30°	30°
AVERAGE	50°	50°	30°	30°

CHECK RETRO - REFLECTIVE MATERIAL 400 SQ CM (8 PIECES OF 10CMS X 5CMS)

2 PIECES FRONT
2 PIECES SHOULDERS
2 PIECES BACK
2 PIECES FRONT SHOULDERS

IF LIFEJACKET REVERSIBLE, 8 PIECES ON OTHER SIDE (50MM X 100MM)

WITHOUT RE-ADJUSTING LIFEJACKET
DROP FEET FIRST 3.0 METRES CHECK MOUTH FREEBOARD AND INCLINATION (MEAN 120MM, TRUNK NO LESS THAN 20° FROM VERTICAL) FACE PLANE NOT LESS THAN 30° FROM HORIZONTAL See 2.9.7

	FREEBOARD (MM)			INCLINATION DEGREES	
2.9.6	LEFT	RIGHT	MEAN	BODY FROM VERT'L	FACE PLANE FROM HORIZ'L
A	188	150	169	45°	25°
B	162	125	143	40°	10°
C	175	175	175	20°	10°
D	162	137	150	35°	30°
E	144	144	144	40°	35°
F	125	175	150	70°	10°
G	112	162	137	75°	25°
H	137	150	143	80°	35°
AVERAGE	-	-	-	50.5	22.5°

JACKET MUST NOT DISLODGE OR CAUSE HARM TO SUBJECT.

2.9.7	DISLODGE/CAUSE HARM
A	NONE
B	NONE
C	McMURDO LI1 LIGHT DISLODGED
D	NONE
E	NONE
F	NONE
G	NONE
H	-

2.9.9 SWIMMING AND WATER EMERGENCY

i. SWIM 25 METRES UNAIDED BOARD LIFERAFT OR PLATFORM, SURFACE 300MM ABOVE WATER

ii. REPEAT WITH LIFEJACKET
(TWO THIRDS WITHOUT LIFEJACKET MUST COMPLETE WITH AT LEAST THREE PERSONS COMPLETING.

2.9.9.	UNAIDED	WITH JACKET
A	COMPLETED	COMPLETED
B	COMPLETED	NOT COMPLETED
C	COMPLETED	COMPLETED
D	COMPLETED	COMPLETED
E	COMPLETED	COMPLETED
F	COMPLETED	NOT COMPLETED
G	COMPLETED	NOT COMPLETED
H	COMPLETED	NOT COMPLETED

(9)

LIFE JACKETS

WATER PERFORMANCE AND DONNING TESTS IN ACCORDANCE WITH RESOLUTION A689(17)

TYPE COSALT "PREMIER" (OVER 32 Kgs) DATE 5 MAY 1992

SURVEYORS [redacted] LOCATION DERBY TCE, SOUTH SHIELDS

2.8.2. SELECTED PERSONS

2.8.2.	SEX	WEIGHT Kgs	HEIGHT M
A	MALE	82	1.82
B	MALE	93	1.77
C	MALE	75	1.79
D	MALE	74	1.70
E	MALE	64	1.66
F	FEMALE	45	1.64
G	FEMALE	55	1.55
H	FEMALE	65	1.58

2.8.3 DONNING PERFORMANCE MALE FEMALE

i. NORMAL INDOOR CLOTHING

ii. HEAVY WEATHER CLOTHING

TESTS SATISFACTORILY CARRIED OUT AS PER REPORT DATED 21 APRIL 1992.

2.8.4	(i)SECONDS	(ii)SECONDS
A		
B		
C		
D		
E		
F		
H		

2.8.4
Following demonstration out of sight of other person
Don without assistance within 1 minute.

2.8.5 NOTE: Ease and speed of donning, proper fit and adjustment.

2.9.3 BATHING COSTUMES

2.9.4 DON LIFEJACKET,

NOTE: EASE AND SPEED OF DONNING
PROPER FIT AND ADJUSTMENT

2.9.5 THREE GENTLE STROKES
SIMULATE STATE OF UTTER EXHAUSTION
HEAD DOWN, LUNGS PARTIALLY FILLED.

TIME FROM COMPLETION OF LAST STROKE
UNTIL MOUTH BECOMES CLEAR
(TIME NOT TO EXCEED 5 SECONDS)

2.9.5	TIME (1) secs.	TIME (2)
A	4.0	
B	3.8	
C	3.8	
D	5.0	
E	3.0	
F	3.0	
G	2.5	
H	3.5	

REPEAT AFTER EXHALED
(TIME NOT TO EXCEED 5 SECONDS)

2.9.5	TIME (1) secs.	TIME (2)
A	4.0	
B	3.8	
C	3.5	
D	5.0	
E	3.5	
F	3.0	
G	3.8	
H	3.5	

2.9.5 WHEN FACE UP, FREEBOARD MEASUREMENT ON EACH SIDE OF MOUTH (MEAN READING AT LEAST 120MM)

2.9.5.	LEFT mm		RIGHT mm		MEAN mm	
	1	2	1	2	1	2
A	213	–	137	–	175	–
B	88	–	112	–	100	–
C	137	–	150	–	143	–
D	137	–	137	112	137	131
XX						
XX						
E	162	162	162	162	162	162
F	112	112	138	138	125	125
G	125	150	125	175	125	162
H	125	118	118	125	121	121

2.9.7 INCLINATION OF TRUNK FLOATING BACKWARDS (NOT LESS THAN 20° FROM VERTICAL, AVERAGE AT LEAST 30° FROM VERTICAL. INCLINATION OF THE FACE PLANE NOT LESS THAN 30° FROM HORIZONTAL, AVERAGE AT LEAST 40° FROM HORIZONTAL.

2.9.7	TRUNK ANGLE 1 FROM VERTICAL	2	HEAD ANGLE 1 FROM HORIZONTAL	2
A	40		40	
B	70		55	
C	75		50	
D	70		40	
E	80		60	
F	75		45	
G	70		45	
H	65		45	
AVERAGE	68		47.5	

CHECK RETRO - REFLECTIVE MATERIAL 400 SQ CM (8 PIECES OF 10CMS X 5CMS)

2 PIECES FRONT
2 PIECES SHOULDERS
2 PIECES BACK
2 PIECES FRONT SHOULDERS

IF LIFEJACKET REVERSIBLE, 8 PIECES ON OTHER SIDE (50MM X 100MM)

WITHOUT RE-ADJUSTING LIFEJACKET
DROP FEET FIRST AT LEAST ~~XXX~~ 3.0 METRES CHECK MOUTH FREEBOARD AND INCLINATION (MEAN 120MM, TRUNK NO LESS THAN 20° FROM VERTICAL) FACE PLANE NOT LESS THAN 30° FROM HORIZONTAL See 2.9.7

	FREEBOARD			INCLINATION DEGREES	
2.9.6	LEFT mm	RIGHT mm	MEAN mm	BODY FROM VERT'L	FACE PLANE FROM HORIZ'L
A	200	137	168	40	40
B	100	125	112	75	50
C	150	137	143	75	50
D	137	137	137	70	40
E	150	175	162	55	45
F	112	138	125	75	45
G	125	125	125	70	40
H	-	-	-	-	-
AVERAGE	-	-	-	66	44

JACKET MUST NOT DISLODGE OR CAUSE HARM TO SUBJECT.

2.9.7	DISLODGE/CAUSE HARM
A	NONE
B	NONE
C	Small amount of movement of front pads inside cover.
D	do.
E	do.
F	NONE
G	Small amount of movement of front pads inside cover.
H	=

2.9.9 SWIMMING AND WATER EMERGENCY

i. SWIM 25 METRES UNAIDED BOARD LIFERAFT OR PLATFORM, SURFACE 300MM ABOVE WATER

ii. REPEAT WITH LIFEJACKET
(TWO THIRDS WITHOUT LIFEJACKET MUST COMPLETE WITH AT LEAST THREE PERSONS COMPLETING.

2.9.9.	UNAIDED	WITH JACKET
A	Completed satisfactorily.	Completed satisfactorily.
B	do.	do.
C	do.	do.
D	do.	do.
E	do.	do.
F	do.	do.
G	do.	do.

Lloyd's Register

CERTIFIED COPY

CERTIFICATE OF TYPE APPROVAL

This is to certify that

The product detailed below will be accepted for compliance with the applicable Lloyd's Register Rules and Regulations and with the International Convention for the Safety of Life at Sea, (SOLAS), 1974, as amended, for use on ships and offshore installations classed with Lloyd's Register, and for use on ships and offshore installations when authorised by contracting governments to issue the relevant certificates, licences, permits etc.

Manufacturer	Cosalt International Ltd
Address	Fish Dock Road Grimsby N.E. Lincolnshire, DN31 3NW United Kingdom (UK)
Product Type	**LIFEJACKETS**
Product Description	Inherently buoyant adult lifejacket – Type: "Cosalt Premier 'C'"
Specified Standard	SOLAS 74, as amended, Regulations III/4, 34 and X/3. IMO Resolution MSC.48(66), LSA Code, Regulations I/1.2 and II/2.2. IMO Resolution MSC.97(73), 2000 HSC Code, Regulations 8.1. IMO Resolution MSC.81(70) Part 1.

The attached Design Appraisal Document forms part of this certificate.
This certificate remains valid unless cancelled or revoked, provided the conditions in the attached Design Appraisal Document are complied with and the equipment remains satisfactory in service.

Date of issue 06 May 2004

Expiry date 05 May 2009

Certificate No. SAS S040057

Signed [redacted]

Lloyd's Register

Sheet No 1 of 3

Name [redacted]

Surveyor to Lloyd's Register EMEA
A Member of the Lloyd's Register Group

Note:

This certificate is not valid for equipment, the design or manufacture of which has been varied or modified from the specimen tested. The manufacturer should notify Lloyd's Register of any modification or changes to the equipment in order to obtain a valid certificate.

Lloyd's Register EMEA
71 Fenchurch Street, London, EC3M 4BS
Telephone 020 7423 2940 Fax 020 7397 4246
Email dcg-stat@lr.org

Document number
SAS S040057

Issue number
1

DESIGN APPRAISAL DOCUMENT

Date	Quote this reference on all future communications
6 May 2004	MSG/STAT/TA/LSA/SCM

ATTACHMENT TO CERTIFICATE OF TYPE APPROVAL No. SAS S040057

The undernoted documents have been appraised for compliance with the relevant requirements of International Conventions, and this Design Appraisal Document forms part of the Certificate.

APPROVAL DOCUMENTATION

Cosalt/Young drawing number 10050 dated 17 December 1994, Rev. A (June 1998)

TEST REPORTS

Fleetwood Testing Laboratory Report No. DAR/FTL/422 dated 9 March 1999.
Fleetwood Testing Laboratory Report No. AER/FTL/348 dated 8 September 1998.
AMTAC Laboratories Report No. ALCT.7606.0598 dated 1 June 1998.

CONDITIONS OF CERTIFICATION

1. The lifejacket is approved only for use by adults of more than 32kg in weight.
2. Each lifejacket shall be marked with the information required by LSA Code, Regulation 1.2.2.9.
3. An approved lifejacket light and whistle meeting the requirements of LSA Code Regulations II/2.2.3 and II/2.2.1.8 respectively, are to be fitted.
4. If the specified standards are amended during the validity of this certificate, the product is to be re-approved prior to it being supplied to vessels to which the amended standards apply.
5. Production items are to be manufactured in accordance with a quality control system which shall be maintained to ensure compliance with SOLAS Regulation III/5.
6. Production tests are to be conducted in accordance with the applicable requirements of IMO Resolution MSC.81(70), Part 2 and each item, batch, or lot be delivered with an LR Certificate of SOLAS Production Testing issued by the attending LR Surveyors following their witness of the tests. This does not preclude any further testing to additional requirements of the Marine Administration of the country where the ship is registered (i.e. the flag state) or those acting on behalf of that Administration.

Lloyd's Register EMEA
71 Fenchurch Street, London, EC3M 4BS
Telephone 020 7423 2940 Fax 020 7397 4246
Email dcg-stat@lr.org

Document number
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1

DESIGN APPRAISAL DOCUMENT

Date	Quote this reference on all future communications
6 May 2004	MSG/STAT/TA/LSA/SCM

ATTACHMENT TO CERTIFICATE OF TYPE APPROVAL No. SAS S040057

PLACE OF PRODUCTION

Winning Industrial Co. Ltd.
Chuan Tan Industrial Zone
Liaobu
Dongguanh]Guandong
People's Republic of China

[redacted]
Senior Surveyor
Dry Cargo Ship Section
Statutory Department
Marine Support Group
Lloyd's Register EMEA

Supplementary Type Approval Terms and Conditions

This certificate and Design Appraisal Document relates to type approval, it certifies that the prototype(s) of the product(s) referred to herein has/have been found to meet the applicable design criteria for the use specified herein, it does not mean or imply approval for any other use, nor approval of any products designed or manufactured otherwise than in strict conformity with the said prototype(s).

Lloyd's Register

mca
Maritime and Coastguard Agency
An Executive Agency of the Department of Transport, Local Government and the Regions

CERTIFIED COPY

EC TYPE EXAMINATION (MODULE B) CERTIFICATE

This is to certify that :

LLOYD'S REGISTER VERIFICATION LIMITED (LRV), specified as a "notified body" under the terms of The Merchant Shipping (Marine Equipment) Regulations S.I. 1999 No. 1957, did undertake the relevant type approval procedures for the equipment identified below which was found to be in compliance with the essential Life Saving Appliance requirements of Marine Equipment Directive (MED) 96/98/EC as modified by Commission Directives 98/85/EC, 2001/53/EC, 2002/75/EC and 2002/84/EC subject to any conditions in the Design Appraisal Document attached hereto.

Manufacturer	Cosalt International Ltd
Address	Fish Dock Road Grimsby N.E. Lincolnshire, DN31 3NW United Kingdom (UK)
Annex A1 Item	**A.1/1.4**
Product Type	**LIFE JACKETS**
Product Description	Inherently buoyant adult lifejacket – Type: "Cosalt Premier 'C'"
Specified Standard	SOLAS 74, as amended, Regulations III/4, 34 and X/3. IMO Resolution MSC.48(66), LSA Code, Regulations I/1.2 and II/2.2. IMO Resolution MSC.97(73), 2000 HSC Code, Regulations 8.1. IMO Resolution MSC.81(70) Part 1.

The attached Design Appraisal Document (schedule) forms part of this certificate.
This certificate remains valid unless cancelled or revoked, provided the conditions in the attached schedule are complied with and the equipment remains satisfactory in service.

Date of issue	6 May 2004	Expiry date	5 May 2009
Certificate No.	MED 0450172	Signed	Lloyd's Register Verification [redacted] Lloyd's Register
Sheet No	1 of 3	Name	[redacted]

For and on behalf of Lloyd's Register Verification
LRV EC Distinguishing No. 0038

Note:
This certificate is not valid for equipment; the design or manufacture of which has been varied or modified from the specimen tested. The manufacturer should notify the notified body named on this certificate of any modification or changes to the equipment in order to obtain a valid Certificate.

Subject to compliance with the conditions in the attached Design Appraisal Document (schedule), which forms part of this certificate, and those of Articles 10.1(i) and 11 of the Directive, the Manufacturer is allowed to affix the "Mark of Conformity" to the Product described herein.
yy Last two digits of year mark affixed.
This certificate is issued under the authority of the MCA.

0038/yy

Lloyd's Register Verification Limited
71 Fenchurch Street, London, EC3M 4BS
Telephone 020 7423 2940 Fax 020 7397 4246
Email dcg-stat@lr.org

Document number
MED 0450172

Issue number
1

DESIGN APPRAISAL DOCUMENT

Date	Quote this reference on all future communications
6 May 2004	MSG/STAT/TA/LSA/SCM

ATTACHMENT TO EC TYPE EXAMINATION (MODULE B) CERTIFICATE No. MED 0450172

The undernoted documents have been appraised for compliance with the relevant requirements of International Conventions and European Union legislation for the EC Type Examination of Marine Equipment for use on Merchant Ships Registered in the European Economic Area.

This Design Appraisal Document (schedule) forms part of the Certificate.

APPROVAL DOCUMENTATION

Cosalt/Young drawing number 10050 dated 17 December 1994, Rev. A (June 1998)

TEST REPORTS

Fleetwood Testing Laboratory Report No. DAR/FTL/422 dated 9 March 1999.
Fleetwood Testing Laboratory Report No. AER/FTL/348 dated 8 September 1998.
AMTAC Laboratories Report No. ALCT.7606.0598 dated 1 June 1998.

CONDITIONS OF CERTIFICATION

1. The lifejacket is approved only for use by adults of more than 32kg in weight.
2. Each lifejacket shall be marked with the information required by LSA Code, Regulation 1.2.2.9.
3. An approved lifejacket light and whistle meeting the requirements of LSA Code Regulations II/2.2.3 and II/2.2.1.8 respectively, are to be fitted.
4. If the specified standards are amended during the validity of this certificate, the product is to be re-approved prior to it being supplied to vessels to which the amended standards apply.
5. Production items are to be manufactured in accordance with either an approved Production Quality Assurance system (Module D) or Product Quality Assurance (Module E) or Product Verification (Module F) of the Marine Equipment Directive.
6. Production tests are to be conducted in accordance with the applicable requirements of IMO Resolution MSC.81(70), Part 2 and be recorded by the manufacturer in accordance with either the approved Production Quality Assurance system (Module D) or Product Quality Assurance (Module E) or witnessed by the Notified Body (LR) as required by the Product Verification (Module F) of the Marine Equipment Directive. This does not preclude any further testing to additional requirements of the Marine Administration of the country where the ship is registered (i.e. the flag state) or those acting on behalf of that Administration.
7. Each item, batch or lot of the equipment is to have the "Mark of Conformity" affixed and be issued with a "Declaration of Conformity"

Lloyd's Register

Lloyd's Register Verification Limited
71 Fenchurch Street, London, EC3M 4BS
Telephone 020 7423 2940 Fax 020 7397 4246
Email dcg-stat@lr.org

Document number
MED 0450172

Issue number
1

DESIGN APPRAISAL DOCUMENT

Date	Quote this reference on all future communications
6 May 2004	MSG/STAT/TA/LSA/SCM

ATTACHMENT TO EC TYPE EXAMINATION (MODULE B) CERTIFICATE No. MED 0450172

PLACE OF PRODUCTION

Winning Industrial Co. Ltd.
Chuan Tan Industrial Zone
Liaobu
Dongguanh]Guandong
People's Republic of China

[redacted]

[redacted]
Senior Surveyor
For and on behalf of Lloyd' Register Verification
LRV EC Distinguishing No. 0038