T E S T R E C O R D N O. 1

SAMPLES:

The manufacturer provided samples of the 730-ROA valves inserted in various lengths, 4-5/16 in. to 6-3/4 in., of the 727-ACU angle connectors. These samples were subjected to the following test program.

CONDITIONING

720 HOUR SALT SPRAY CORROSION TEST:

Five of the samples described were subjected to the following conditioning. The protective caps were left off of the valves to simulate a worst condition. The open end of the angle connector was covered as it would be in actual use.

METHOD

The test specimens were supported vertically and exposed to salt spray (fog) as specified by the test method for Salt Spray (Fog) Testing, ASTM B117-73. -The apparatus used for the salt spray exposure consisted of a fog chamber with the capacity of at least 15 cubic feet and having a salt solution reservoir, a supply of conditioned compressed air, a dispersion tower for producing a salt fog, specimen supports, provision for heating the chamber, and a necessary means of control. The dispersion tower was located in the center of the chamber and supplied with a salt solution and with warm, humidified air at a pressure of 17 to 19 PSIG (0.12-0.13 NPa) so as to disperse the salt solution in the form of a fine fog, throughout the interior of the chamber. The temperature within the chamber was maintained between 33.3 and 36^{0}C. Condensate accumulation on the cover of the chamber was not permitted to drop on the test specimens, and the drops of solution which fall from the specimen were not recirculated, but removed through a drain located in the floor of the chamber.

The salt solution consisted of 5% by weight of common salt (sodium chloride) and de-ionized water. The pH value of the solution as collected after spraying in the test apparatus was between 6.5 and 7.3, and the specific gravity was between 1.0255 and 1.0400 at 25° C. The specimens were subjected to this conditioning for a period of 720 consecutive hours.

RESULTS

There appeared to be no corrosion or excessive salt build up on the internals of the valves when visually examined. No attempt was made to manipulate the valves before the performance tests.

ACCELERATED WEATHERING TEST:

METHOD

The same number and type of samples as subjected to the 720 Hour Salt Spray Corrosion Tests were subjected to the Accelerated Weathering Test.

The samples were exposed to 720 hours of ultra-violet light and water. The ultra-violet light is obtained from two stationary enclosed carbon arc lamps. Each arc is enclosed with a number 9200PX clear pyrex-glass globe. The specimens are mounted vertically on the inside of a revolving cylinder, facing these lamps, and the cylinder continuously revolves around the stationary lamps at a revolution of one revolution per minute. A system of nozzles was provided, so that each specimen was sprayed in turn with water as the cylinder revolved.. During each operating cycle (total of 20 minutes) each specimen was exposed to the light and water spray for 3 minutes and to the light only for 17 minutes. The air temperature within the revolving cylinder of the apparatus during the operation was 63 $\pm$ 5° C.

RESULTS

None of the exposed parts of the valves nor any of the angle connectors showed any discoloring, cracking, crazing, shrinkage, or distortion.

Once again, no attempt was made to manipulate the valves before the performance test.

OPENING PRESSURE TEST:

METHOD

Five samples as received, five samples subjected to the 720 hour salt spray and five samples exposed to the 720 hour UV exposure were tested as follows. Using a manometer to measure the applied pressure and compressed air a pressure of 0.6 PSIG was applied to each sample.

RESULTS

All fifteen samples opened fully with the application of 0.6 PSIG.

VOLUMETRIC FLOW TEST:

METHOD

The samples used in the Opening Pressure Test were also used for this test. The same equipment was also used except a volumetric flow meter monitored the flow, through the sample. One PSIG was applied to the mouthpiece ad the flow rate recorded.

RESULTS

All samples exceeded a flow rate of 48,144 cc/min (1.7 ft ^{3}/min.). For individual results refer to Table I.

TABLE I (cc/min)

Sample Hour Number	As Received	After 720 Hour UV Exposure	After 720 UV Exposure
1	60,000	62,000	60,000
2	62,000	62,000	63,000
3	63,000	62,000	62,000
4	63,000	63,500	61,500
5	63,000	62,000	63,000
Avg.	62,200	62,300	62,300

SOLVENT EXPOSURE:

METHOD

One sample of each color 727-ACU with 730-ROA inserted was submerged in ASTM Reference Oil No. 2 for 8 hours, the samples were then removed and allowed to dry for 1/2 hour before being submerged in ASTM Reference Fuel C. for 2 hours. This procedure was repeated two additional times.

RESULTS

There was no resultant softening, discoloring, shrinkage, distortion or any other physical changes in the angle connector or parts of the exposed valve of either sample.

T E S T R E C O R D N O. 2

SAMPLES:

No tests were deemed necessary to allow dimensional changes to the poppet guide and interior of the valve body so the seating surface area of the valve was increased.

T E S T R E C O R D N O. 3

SAMPLES:

Manufacturers' samples of Models 730ROA (in red and black), 730ROL (in red and black) and 730ROLS (in red and black), were used for the following test program.

Tests were conducted to allow UL Recognition and USCG Acceptance of these products as Oral Inflation Systems for use on USCG Approved Hybrid and Inflatable PFDs.

These samples tested were constructed as shown in the descriptive section of this Report.

CONDITIONING OF SAMPLES:

METHOD

Samples:

The samples indicated in "Sample and Conditioning Summary 1" and "Sample and Conditioning Summary 2" were conditioned as described below:

NUMBER OF SAMPLES AND CONDITIONING

SUMMARY 1

MODEL/CAT. # B	HIGH W	LOW SALT	0.5% OIL REC'D	DESCRIPTION	FUEL TEMP	ACC TEMP	PERC	AS DET		#2
730ROA66B	BLACK	0.35" OD	lg valve		1	1	1	1		1
1	2	1	3							
730ROA56	RED	0.35" OD	lg valve							
		10								
730ROA66	RED	0.35" OD	lg valve		1	1	1	1		1
1	2	1								
730ROL66B	BLACK	0.40" OD	lg valve		1	1	1	1		1
1	2	1	3							
730ROL56	RED	0.40" OD	lg valve		1	1	1	1		1
1	2	1								
730ROL66	RED	0.40" OD	lg valve							
		3								
730ROLS56B	BLACK	0.40" OD	Estane		1	1	1	1	1	1 3
1	3									
730ROLS56	RED	0.40" OD	Estane		1	1	1	1	1	1 3
1	3									

CONDITIONING OF SAMPLES: Continued

NUMBER OF SAMPLES AND CONDITIONING SUMMARY 2

MODEL/CAT. #	DESCRIPTION	TEMP CYCLING	DIESEL OIL
730ROA66B	BLACK 0.35" OD lg valve	2	2
730ROA66	RED 0.35" OD lg valve	2	2
730ROL66B	BLACK 0.40" OD lg valve	2	2
730ROL56	RED 0.40" OD lg valve	2	2
730ROLS56B	BLACK 0.40" OD Estane	2	2
730ROLS56	RED 0.40" OD Estane	2	2

Preparation of Samples for Conditioning:

Caps were not used on any of the samples. For the Salt and Acc W Conditionings the tubes were placed so they would not fill with water. The tubes were allowed to fill with liquid for the remaining liquid exposure conditionings.

Description of Conditionings:

HIGH TEMP - The samples were exposed at 70 ± 2°C for seven days in an air circulating oven.

LOW TEMP - The samples were exposed at -40 ± 2°C for 24 hours.

PERC - The samples were completely submerged for 70 hours in perchloroethylene, removed and then allowed to air dry.

0.5% DET - The samples were completely submerged for 70 hours in 0.5 percent detergent in "0" hardness water, removed and then allowed to air dry.

OIL #2 - The samples were completely submerged for 70 hours in ASTM Reference Oil #2 (per ASTM D471), removed, wiped off, and then allowed to air dry.

FUEL B - The samples were completely submerged for 70 hours in ASTM Reference Fuel B (per ASTM D471), removed and then allowed to air dry.

CONDITIONING OF SAMPLES: Continued

ACC W - The samples were exposed to 300 hours of light and water exposure in accordance with Method 1 (102 minutes of light/18 minutes of light and water) of ASTM G23, using apparatus designated Type E. The lower arcs were No. 15 copper clad carbon. The black panel temperature was 68 ± 5°C. The arcs were replaced and the Corex D glass cleaned every 24 hours. The samples were located perpendicular to the centerline between the upper and lower arcs. After conditioning the samples were removed and allowed to air dry.

SALT - The samples were exposed to 720 hours of salt spray (fog) testing per ASTM B117. After conditioning the samples were removed and allowed to air dry.

AS REC'D - The samples were conditioned at room ambient which was nominally 70°F at 50 percent relative humidity.

TEMP CYCLING - The samples were exposed for 24.0 ± 0.5 hours at a temperature of -30°C, then for 24.0 ± 0.5 hours at a temperature of 60 ± 2°C.

DIESEL OIL - The samples were completely submersed for 8.0 ± 0.1 hours in fresh water and then allowed to dry for 24.0 ± 0.5 hours. The samples were then completely submersed for 8.0 ± 0.1 hours in 5 percent salt water and then allowed to dry for 24.0 ± 0.5 hours. The samples were completely submersed for 8.0 ± 0.1 hours in 5 percent salt water with a 3 ± 1 mm surface layer of No. 2 diesel oil and then allowed to dry for 24.0 ± 0.5 hours. This cycle was repeated a total of five times.

Examination of Samples Following Conditioning:

Following each conditioning (except AS REC'D), the samples were assessed for damage by visual examination. Any deterioration, softening, or cracking of the plastic parts and seals was noted. Any corrosion of metal was noted.

CONDITIONING OF SAMPLES: Continued

RESULTS

There was no apparent degradation of the inflators as a result of any of the conditionings.

The perchloroethylene conditioned samples has some minor cosmetic surface imperfections (bubbles) which were visibly non-structural.

Two samples (one 730ROL66B and one 730ROA66) had some minor salt particles deposited at the opening of the 730-ROA valve. This had some affect on back pressure results as noted in the Operability Test Results. The extent of corrosion from the salt spray did not produce any adverse affect on the performance of the samples on the Operability and Back Pressure Tests.

OPERABILITY TEST and BACK PRESSURE TEST - ORAL INFLATORS:

METHOD

Operability Test:

Except for the diesel oil conditioned samples, all of the conditioned oral inflators shown in SAMPLE AND CONDITIONING SUMMARY 1 and 2 were used for this test. Each sample was tested as a complete unit (i.e. with oral valve and oral tube, but without an inflatable bladder attached).

A gradually increasing air pressure was applied to the inlet side of the valve at a rate of approximately 0.5 psi per minute (3.5 kPa/minute). To be considered acceptable, the pressure at which the valve began to open (the crack pressure) was required to be not more than 0.44 psig (3 kPa).

An air pressure of 1 psig (7 kPa gauge) was then applied to the inlet side of the valve and the flow of air through the system (i.e., valve and tube) was observed.

To be considered acceptable, the air flow through the system (i.e., valve and tube) was required to be not less than 100 lpm (26.1 gpm).

Back Pressure Test:

Each oral inflator from the Operability Test was used for this test.

A gradually increasing air pressure, from 0.0 psig to 10.0 psig, was applied to the outlet side of the oral tube so that the tube and valve experienced a back pressure.

The valve opening was placed below the surface of fresh water to visually observe any leakage.

To be considered acceptable, the inflator was required to not leak when back pressure throughout the range from 0.0 through 10.0 psig was applied.

OPERABILITY TEST and BACK PRESSURE TEST - ORAL INFLATORS: Continued

RESULTS

The crack pressure was not more than 0.44 psig for all of the samples.

All of the samples allowed an air flow of at least 100 lpm at 1 psig inlet pressure.

Except for the one sample of the Model 730ROL66B, no leakage occurred in the Back Pressure Test at pressures of up to 10 psig for any of the samples.

The Model 730ROL66B, that leaked in the Back Pressure Test, leaked initially at approximately 5 psig. However, after rinsing of the valve with water, the valve reseated itself and had no leakage at up to 10 psig. This result is considered acceptable.

PARALLEL STRENGTH OF ATTACHMENT:

METHOD

The inflator, attached to a piece of inflation chamber material that complied with Federal Aviation Administration Technical Standard Order (TSO) C13e, was used for this test.

A force of 75 lbf was applied to the inflator, parallel to the surface of the chamber material at the point of attachment, for at least five minutes.

To secure the joint during application of the load an adaptor, having an inside diameter at least 0.75 inch (19 mm) larger than the outside diameter of the inflator at the point of attachment, was used.

To be considered acceptable, the joint, between the inflator and the inflation chamber material, was required to not fail as a result of this test.

RESULTS

The 730ROA43B BLACK sample tested supported the load without failure. It should be noted this sample had a 0.05 inch thick flange rather than the current 3/32 inch thick flange. The thicker flange is considered acceptable based on the results of similar thickness flange used on the 730ROL samples.

The following samples also supported the load without failure:

73ROA43
730ROL66B
730ROL56
730ROLS56B
730ROLS56

PERPENDICULAR STRENGTH OF ATTACHMENT:

METHOD

The inflator, attached to a piece of inflation chamber material that complied with Federal Aviation Administration Technical Standard Order (TSO) C13e, was used for this test.

A force of 100 lbf was to be applied to the inflator, perpendicular to the surface of the chamber material at the point of attachment, for at least three seconds. This was achieved by rigging the inflator between jaws of a constant-rate-of-extension tensile test machine operated at a rate of jaw separation of 5 ± 1 inch per minute. The machine was operated for three seconds past the first 100 lbf reading. The maximum reading obtained at the end of the three seconds was recorded.

To secure the joint during application of the load an adaptor, having an inside diameter at least 0.75 inch (19 mm) larger than the outside diameter of the inflator at the point of attachment, was used. This adaptor was clamped in the upper jaw of the tensile test machine.

To be considered acceptable, the joint, between the inflator and the inflation chamber material, was required to not fail as a result of this test.

RESULTS

The 730ROA43B BLACK sample tested supported the load without failure. It should be noted this sample had a 0.05 inch thick flange rather than the current 3/32 inch thick flange. The thicker flange is considered acceptable based on the results of similar thickness flange used on the 730ROL samples.

The following samples also supported the load without failure:

73ROA43
730ROL66B
730ROL56
730ROLS56B
730ROLS56

EJK/DPR/aah

T E S T R E C O R D N O 4

Samples:
Manufacturers samples of Model 730ROLS56C4 were used for the UL 1180 Solvent Exposure Test Program. These tests supplement the tests required by UL 1191.

UL 1191 TESTS:
Tests necessary to determine compliance with the requirements of the Second Edition of UL 1191, the Standard for Components for Personal Flotation Devices, and USCG Regulations have been conducted and are reported as follows.

Engineering Considerations for Red and Black "Vythene"
Acceptable test results were obtained with red color (R) and black color (B) samples of the oral inflation system Models 730ROA and 730ROL constructed of Alpha Chemicals and Plastic Corp., "Vythene" #10-78, PVC/Urethane. In addition, samples of the Model 720ROA made of "Vythene" were conditioned and showed no degradation of the tube material. The following table specifies the number of samples of the 730ROA and 730ROL of each color tested. The results are reported under File MQ424, Vol. 1, Sec. 2, Test Record No. 3,
* Issued: 09-21-81, New: 11-04-94.

	OPERABILITY-CRACK PRESSURE AND FLOW; and BACK PRESSURE TESTS	
AS REC'D	BLACK: 9	RED: 16
300H	BLACK: 6	RED: 6
FUEL	BLACK: 3	RED: 3
OIL	BLACK: 3	RED: 3
PERC	BLACK: 3	RED: 3
DET	BLACK: 3	RED: 3
+70°C	BLACK: 3	RED: 3
-30°C	BLACK: 3	RED: 3
SALT	BLACK: 3	RED: 4

In addition 4 black and 4 red samples of the 730ROA and 730ROL had acceptable results after Temperature Cycling Conditioning per IMO A.689(17), and after 5 cycles of the following conditioning: 8h in H_2O, 24h drying time, 8h in 5% NaCl, 24 h drying time, 8h in 5%NaCl with a 3mm head of diesel oil #2, 24 h dry time.

Parallel and Perpendicular Strength of Attachment results were also acceptable.

Engineering Considerations for Red "Esthane"
Acceptable test results directly in accordance with Section 31 of UL 1191 were obtained with red color (R) samples of the over-pressure relief valve / oral inflation system Models V73002U56 constructed of B. F. Goodrich, "Esthane" #58887, red polyurethane. These results are considered completely representative for the
* Model 730ROLSx. The results are reported under File MQ424, 96RT274.

UL 1191 TESTS:
Engineering Considerations for Black "Esthane"
Acceptable test results were obtained with black color samples of the oral inflation system Models 730ROLSxxB constructed of B. F. Goodrich, "Esthane" #58887, red polyurethane. The following table specifies the number of samples tested. The results are reported under File MQ424, Vol. 1, Sec. 2, Test Record No. 3, Issued: 09-21-
* 81, New: 11-04-94.

	OPERABILITY-CRACK PRESSURE AND FLOW; and BACK PRESSURE TESTS
AS REC'D	BLACK: 3
300H	BLACK: 3
FUEL	BLACK: 1
OIL	BLACK: 1
PERC	BLACK: 1
DET	BLACK: 1
+70°C	BLACK: 1
-30°C	BLACK: 1
SALT	BLACK: 1

The limited sample conditioning is deemed acceptable since these samples exhibited no signs of degradation as a result of the conditioning. In addition, the chemical composition of the black "Esthane" is similar to the red "Esthane" except for the addition of carbon black as a colorant, and the elimination of the red colorant. Carbon black is not susceptible to degradation by any of the limited conditionings. Red pigmentation does not improve resistance to degradation for the above conditionngs.

In addition 2 black samples of the 730ROLSxxB had acceptable results after Temperature Cycling Conditioning per IMO A.689(17), and after 5 cycles of the following conditioning: 8h in H_2O, 24h drying time, 8h in 5% NaCl, 24 h drying time, 8h in 5%NaCl with a 3mm head of diesel oil #2, 24 h dry time.

Parallel and Perpendicular Strength of Attachment results were also acceptable.

UL 1180 TESTS:
Engineering Consisderations:
The solvent tests conducted on the Model 730ROLS56C4 are considered fully representative for the other Models described by this Report.

UL 1180 TESTS:

SOLVENT RESISTANCE TEST: per UL 1180, § 7.11

METHOD

The following samples were used for this test:

3 samples of oral tubes with the cap in place and with the outlet openning blocked to prevent fluid from entering the inside of the tube.

The samples were subjected to a series of three separate 5-minute periods of total submergence in ASTM Reference Fuel B (as described in the Standard Test Method for Rubber Property — Effect of Liquids, ASTM D471-79(R1991)), with 30-minute drying periods between submersions. After the last submergence period, the sample was removed from the liquid and the excess liquid allowed to run off for 5 minutes.

A gradually increasing air pressure, from 0.0 psig to 10.0 psig, (0 to 69 kPa) was applied to the outlet side of the oral tube so that the valve experienced a back pressure.

To be considered acceptable, no leakage was permitted from the oral tube.

RESULTS

The results:

__X__ were acceptable. _____ were not acceptable.

For individual results, refer to the Solvent Resistance Test Table.

SOLVENT RESISTANCE TEST TABLES

HALKEY-ROBERTS ORAL TUBE MODEL 730ROLS56C4

SAMPLE	DID VALVE LEAK FROM O TO 10 PSIG?	
	NO	YES
1	X	
2	X	
3	X	

EJK/DPR/ejk

TEST RECORD NO. 5

SAMPLES:

Manufacturers samples of following Models were used for the following test program.

740ROSxC4 (new 747 tube in red "Esthane" with 730ROA valve and C4 dust cap), and
740ROLSxC4 (new 747 tube in red "Esthane" with the new 740ROx valve and C4 dust cap).

GENERAL: Test results relate only to the items tested. UL does not consider the results to be representative of any other products except where specifically detailed in this Report.

Tests were conducted to determine the acceptability of this Oral Inflation System for use in Personal Flotation Devices which are UL Listed and USCG Approved.

These samples were constructed of the parts specified in the descriptive portion of this Report.

UL 1191 TESTS:
Tests necessary to determine compliance with the requirements of the Second Edition of UL 1191, the Standard for Components for Personal Flotation Devices, and USCG Regulations have been conducted and are reported as follows.

Engineering Considerations for Red "Esthane"
Acceptable test results directly in accordance with Section 31 of UL 1191 were obtained with red color (R) samples of the over-pressure relief valve / oral inflation system Models V73002U56 constructed of B. F. Goodrich, "Esthane" #58887, red polyurethane. These results are considered completely representative for the Model 730ROLSx. The results are reported under File MQ424, 96RT274. The limited sample conditioning is deemed acceptable since these samples exhibited no signs of degradation as a result of the conditioning.

UL 1180 TESTS:
Engineering Consisderations:
The solvent tests conducted on the Model 730ROLS56C4 are considered fully representative for the other Models described by this Report.

OPERABILITY TEST - ORAL INFLATOR:

METHOD

Each Oral Inflator was conditioned as a complete unit (i.e. with oral valve and oral tube; without an inflatable bladder attached, and, if provided, with the cap fitted to the tube, but not capped). Each tube was exposed or conditioned in a vertical position with the oral valve at the top and the open end of the tube near the bottom.

Apparatus:
Air supply capable of varying pressure from 0 to 2 psig gradually at a rate of approximately 0.5 psi per minute, and capable of supplying in excess of 100 lpm at 1 psig.

Calibrated air pressure gage(s) for measuring 0.6 psig, or a lower pressure if specified by the manufacturer, and 1 psig.

Calibrated air flow meter for measuring at least 100 lpm at 1 psig.

Samples:
A minimum of three samples, each color and conditioning.

Conditionings:
A. A minimum of 24 hours at 23 ± 2□C, 50 ± 5 percent relative humidity (i.e., AS REC'D).
G. Seven days at +70 ± 2□C (i.e., +70□C).

OPERABILITY TEST - ORAL INFLATOR: (Continued)

Conditionings: (Continued)
After conditioning G, the samples were allowed to rest at room ambient conditions for not less than 30 minutes before testing.

Oral Inflator Procedure:
A flexible hose from a calibrated, metered air supply was attached to the oral valve end. The open end of the tube was placed in water so air flow could be observed.

A gradually increasing air pressure was applied to the inlet side of the valve at a rate of approximately 0.5 psi per minute (3.5 kPa/minute). The pressure at which the valve began to open (the crack pressure) was verified as being not more than the required 0.6 psig (4 kPa), or a lower pressure if specified by the manufacturer.

An air pressure of 1 psig (7 kPa gauge) was then applied to the inlet side of the valve. The air flow through the system (i.e., valve and tube) was verified as being not less than the required 100 lpm (26.1 gpm).

This test was repeated 10 times on each sample.

RESULTS

For each sample tested, the oral inflator:

__X__ had a crack pressure of 0.6 psig or a lower pressure if specified by the manufacturer and allowed an air flow of at least 100 lpm at 1 psig inlet pressure.

_____ did not have a crack pressure of 0.6 psig or a lower pressure if specified by the manufacturer or did not allow an air flow of at least 100 lpm at 1 psig inlet pressure.

For individual results, refer to the OPERABILITY / BACK PRESSURE TEST RESULTS TABLES.

BACK PRESSURE TEST: ORAL INFLATORS

METHOD

The samples from the Operability Test were used for this test.

Apparatus:
Air supply capable of gradually increasing air pressure from 0 to 10 psig (0 to 69 kPa).

Calibrated pressure gage for measuring air pressure from 0 to 10 psig (0 to 69 kPa).

A flexible hose from a calibrated, metered air supply was attached to the open end of the oral inflator. The valve end of the oral inflator was placed in water so leakage could be observed.

A gradually increasing air pressure, from 0.0 psig to 10.0 psig, (0 to 69 kPa) was applied to the outlet side of the oral tube so that the valve experienced a back pressure.

If leakage occurred using samples from the Salt Spray exposure or Detergent exposure, the valve was rinsed from the outside by agitating the sample in fresh water for a period of not more than 15 seconds to dissolve any imbedded particles, and the test was repeated.

The inflator is required to not leak when back pressure throughout the range from 0.0 through 10.0 psig (0 to 69 kPa) is applied.

RESULTS

For each sample tested, the inflator:

__X__ did not leak under a back pressure of 0.0 to 10.0 psig (0 to 69 kPa).

_____ leaked under a back pressure of 0.0 to 10.0 psig (0 to 69 kPa).

For individual results, refer to the OPERABILITY / BACK PRESSURE TEST RESULTS TABLE.

MODEL: 740ROL56C4	COLOR: **RED TUBE WITH RED VALVE**

TEST PRESSURE USED	**PSIG: 0.44 PSIG**

OPERABILITY TEST RESULTS TABLE - ORAL INFLATOR

CONDITION	SAMPLE	IS CRACK PRESSURE □ TEST PRESSURE		IS FLOW □100 LPM @ 1 PSIG?	
		□ YES	□ NO	□ YES	□ NO
AS REC'D	1	□		□	
	2	□		□	
	3	□		□	
+70□C	1	□		□	
	2	□		□	
	3	□		□	

BACK PRESSURE TEST RESULTS TABLE

CONDITION	SAMPLE	DID VALVE LEAK FROM O TO 10 PSIG?	
		□ NO	□ YES
AS REC'D	1	□	
	2	□	
	3	□	
+70□C	1	□	
	2	□	
	3	□	

MODEL: 740ROLS56C4	COLOR: **RED TUBE WITH WHITE VALVE**

TEST PRESSURE USED	**PSIG: 0.44 PSIG**

OPERABILITY TEST RESULTS TABLE - ORAL INFLATOR

CONDITION	SAMPLE	IS CRACK PRESSURE □ TEST PRESSURE		IS FLOW □100 LPM @ 1 PSIG?	
		□ YES	□ NO	□ YES	□ NO
AS REC'D	1	□		□	
	2	□		□	
	3	□		□	
+70□C	1	□		□	
	2	□		□	
	3	□		□	

BACK PRESSURE TEST RESULTS TABLE

CONDITION	SAMPLE	DID VALVE LEAK FROM O TO 10 PSIG?	
		□ NO	□ YES
AS REC'D	1	□	
	2	□	
	3	□	
+70□C	1	□	
	2	□	
	3	□	

PARALLEL STRENGTH OF ATTACHMENT:

METHOD

The inflator, attached to a piece of inflation chamber material was used for this test.

A force of 75 lbf was applied to the inflator parallel to the surface of the chamber material at the point of attachment, for at least 5 minutes.

To secure the joint during application of the load an adaptor having an inside diameter at least 0.75 inch (19 mm) larger than the outside diameter of the inflator at the point of attachment was used.

The inflator and the joint between the inflator and the inflation chamber material is required to not fail as a result of this test.

RESULTS

For each sample tested, the joint between the inflator and the inflation chamber material:

__X__ supported the load without failure.

_____ failed as a result of this test.

For individual results, refer to the PARALLEL STRENGTH OF ATTACHMENT RESULTS TABLES.

PARALLEL STRENGTH OF ATTACHMENT RESULTS TABLE

INFLATION CHAMBER FABRIC USED:

_____ Complied with FAA TSO C13e

__X__ UL Recognized per UL 1191

MODEL: 740ACU56	COLOR: RED TUBE, NO VALVE	
	☐ YES	☐ NO
DID INFLATOR SUPPORT THE LOAD?	☐	

PERPENDICULAR STRENGTH OF ATTACHMENT:

METHOD

The inflator, attached to a piece of inflation chamber material was used for this test.

A force of 100 lbf was applied to the inflator perpendicular to the surface of the chamber material at the point of attachment, for at least 3 seconds. The application of the load was achieved by rigging the inflator between the jaws of a constant-rate-of-extension tensile test machine operated at a rate of jaw separation of 5 ± 1 inch per minute. The machine was operated for 3 seconds past the required load reading. The maximum reading obtained at the end of the 3 seconds was recorded.

To secure the joint during application of the load an adaptor having an inside diameter at least 0.75 inch (19 mm) larger than the outside diameter of the inflator at the point of attachment was used.

The inflator and the joint between the inflator and the inflation chamber material is required to not fail as a result of this test.

RESULTS

For each sample tested, the joint between the inflator and the inflation chamber material:

__X__ supported the load without failure.

_____ failed as a result of this test.

For individual results, refer to the PERPENDICULAR STRENGTH OF ATTACHMENT RESULTS TABLES.

PERPENDICULAR STRENGTH OF ATTACHMENT RESULTS TABLE

INFLATION CHAMBER FABRIC USED:

_____ Complied with FAA TSO C13e
__X__ UL Recognized per UL 1191

MODEL: 740ACU56	COLOR: RED TUBE, NO VALVE	
	☐ YES	☐ NO
DID INFLATOR SUPPORT THE LOAD?	☐	

TEST RECORD NO. 6

SAMPLES:

Manufacturers samples of following Models were used for the following test program.

740ROLSxBKC4 (new 747 tube in black "Esthane" with the 740ROx valve and C4 dust cap).

GENERAL: Test results relate only to the items tested. UL does not consider the results to be representative of any other products except where specifically detailed in this Report.

Tests were conducted to determine the acceptability of this Oral Inflation System for use in Personal Flotation Devices which are UL Listed and USCG Approved.

These samples were constructed of the parts specified in the descriptive portion of this Report.

UL 1191 TESTS:
Tests necessary to determine compliance with the requirements of the Second Edition of UL 1191, the Standard for Components for Personal Flotation Devices, and USCG Regulations have been conducted and are reported as follows.

Engineering Considerations for Black "Esthane"
Acceptable test results directly in accordance with Section 31 of UL 1191 were obtained with black color (BK) samples of the over-pressure relief valve / oral inflation system Models V73002U56 constructed of B. F. Goodrich, "Esthane" #58887, black polyurethane. These results are considered completely representative for the Model 740ROLSxBKC4. The results are reported under File MQ424, 01RT04840. The limited sample conditioning is deemed acceptable since these samples exhibited no signs of degradation as a result of the conditioning.

UL 1180 TESTS:
Engineering Consisderations:
The solvent tests conducted on the Model 740ROLS56BKC4 are considered fully representative for the other Models described by this Report.

OPERABILITY TEST - ORAL INFLATOR:

METHOD

Each Oral Inflator was conditioned as a complete unit (i.e. with oral valve and oral tube; without an inflatable bladder attached, and, if provided, with the cap fitted to the tube, but not capped). Each tube was exposed or conditioned in a vertical position with the oral valve at the top and the open end of the tube near the bottom.

Apparatus:
Air supply capable of varying pressure from 0 to 2 psig gradually at a rate of approximately 0.5 psi per minute, and capable of supplying in excess of 100 lpm at 1 psig.

Calibrated air pressure gage(s) for measuring 0.6 psig, or a lower pressure if specified by the manufacturer, and 1 psig.

Calibrated air flow meter for measuring at least 100 lpm at 1 psig.

Samples:
A minimum of three samples, each color and conditioning.

Conditionings:
A. A minimum of 24 hours at 23 ± 2□C, 50 ± 5 percent relative humidity (i.e., AS REC'D).
G. Seven days at +70 ± 2□C (i.e., +70□C).

OPERABILITY TEST - ORAL INFLATOR: (Continued)

Conditionings: (Continued)
After conditioning G, the samples were allowed to rest at room ambient conditions for not less than 30 minutes before testing.

Oral Inflator Procedure:
A flexible hose from a calibrated, metered air supply was attached to the oral valve end. The open end of the tube was placed in water so air flow could be observed.

A gradually increasing air pressure was applied to the inlet side of the valve at a rate of approximately 0.5 psi per minute (3.5 kPa/minute). The pressure at which the valve began to open (the crack pressure) was verified as being not more than the required 0.6 psig (4 kPa), or a lower pressure if specified by the manufacturer.

An air pressure of 1 psig (7 kPa gauge) was then applied to the inlet side of the valve. The air flow through the system (i.e., valve and tube) was verified as being not less than the required 100 lpm (26.1 gpm).

This test was repeated 10 times on each sample.

RESULTS

For each sample tested, the oral inflator:

__X__ had a crack pressure of 0.6 psig or a lower pressure if specified by the manufacturer and allowed an air flow of at least 100 lpm at 1 psig inlet pressure.

_____ did not have a crack pressure of 0.6 psig or a lower pressure if specified by the manufacturer or did not allow an air flow of at least 100 lpm at 1 psig inlet pressure.

For individual results, refer to the OPERABILITY / BACK PRESSURE TEST RESULTS TABLES.

BACK PRESSURE TEST: ORAL INFLATORS

METHOD

The samples from the Operability Test were used for this test.

Apparatus:
Air supply capable of gradually increasing air pressure from 0 to 10 psig (0 to 69 kPa).

Calibrated pressure gage for measuring air pressure from 0 to 10 psig (0 to 69 kPa).

A flexible hose from a calibrated, metered air supply was attached to the open end of the oral inflator. The valve end of the oral inflator was placed in water so leakage could be observed.

A gradually increasing air pressure, from 0.0 psig to 10.0 psig, (0 to 69 kPa) was applied to the outlet side of the oral tube so that the valve experienced a back pressure.

If leakage occurred using samples from the Salt Spray exposure or Detergent exposure, the valve was rinsed from the outside by agitating the sample in fresh water for a period of not more than 15 seconds to dissolve any imbedded particles, and the test was repeated.

The inflator is required to not leak when back pressure throughout the range from 0.0 through 10.0 psig (0 to 69 kPa) is applied.

RESULTS

For each sample tested, the inflator:

__X__ did not leak under a back pressure of 0.0 to 10.0 psig (0 to 69 kPa).

_____ leaked under a back pressure of 0.0 to 10.0 psig (0 to 69 kPa).

For individual results, refer to the OPERABILITY / BACK PRESSURE TEST RESULTS TABLE.

MODEL: 740ROLS56BKC4	COLOR: **BLACK TUBE WITH BLACK VALVE**

TEST PRESSURE USED	**PSIG: 0.44 PSIG**

OPERABILITY TEST RESULTS TABLE - ORAL INFLATOR

CONDITION	SAMPLE	IS CRACK PRESSURE □ TEST PRESSURE		IS FLOW □100 LPM @ 1 PSIG?	
		□ YES	□ NO	□ YES	□ NO
AS REC'D	1	□		□	
	2	□		□	
	3	□		□	
+70□C	1	□		□	
	2	□		□	
	3	□		□	

BACK PRESSURE TEST RESULTS TABLE

CONDITION	SAMPLE	DID VALVE LEAK FROM O TO 10 PSIG?	
		□ NO	□ YES
AS REC'D	1	□	
	2	□	
	3	□	
+70□C	1	□	
	2	□	
	3	□	

PARALLEL STRENGTH OF ATTACHMENT:

METHOD

The inflator, attached to a piece of inflation chamber material was used for this test.

A force of 75 lbf was applied to the inflator parallel to the surface of the chamber material at the point of attachment, for at least 5 minutes.

To secure the joint during application of the load an adaptor having an inside diameter at least 0.75 inch (19 mm) larger than the outside diameter of the inflator at the point of attachment was used.

The inflator and the joint between the inflator and the inflation chamber material is required to not fail as a result of this test.

RESULTS

For each sample tested, the joint between the inflator and the inflation chamber material:

__X__ supported the load without failure.

_____ failed as a result of this test.

For individual results, refer to the PARALLEL STRENGTH OF ATTACHMENT RESULTS TABLES.

PARALLEL STRENGTH OF ATTACHMENT RESULTS TABLE

INFLATION CHAMBER FABRIC USED:

_____ Complied with FAA TSO C13e

__X__ UL Recognized per UL 1191

MODEL: 747ACU56BK	COLOR: BLACK TUBE, NO VALVE	
	☐ YES	☐ NO
DID INFLATOR SUPPORT THE LOAD?	☐	

PERPENDICULAR STRENGTH OF ATTACHMENT:

METHOD

The inflator, attached to a piece of inflation chamber material was used for this test.

A force of 100 lbf was applied to the inflator perpendicular to the surface of the chamber material at the point of attachment, for at least 3 seconds. The application of the load was achieved by rigging the inflator between the jaws of a constant-rate-of-extension tensile test machine operated at a rate of jaw separation of 5 ± 1 inch per minute. The machine was operated for 3 seconds past the required load reading. The maximum reading obtained at the end of the 3 seconds was recorded.

To secure the joint during application of the load an adaptor having an inside diameter at least 0.75 inch (19 mm) larger than the outside diameter of the inflator at the point of attachment was used.

The inflator and the joint between the inflator and the inflation chamber material is required to not fail as a result of this test.

RESULTS

For each sample tested, the joint between the inflator and the inflation chamber material:

__X__ supported the load without failure.

_____ failed as a result of this test.

For individual results, refer to the PERPENDICULAR STRENGTH OF ATTACHMENT RESULTS TABLES.

PERPENDICULAR STRENGTH OF ATTACHMENT RESULTS TABLE

INFLATION CHAMBER FABRIC USED:

_____ Complied with FAA TSO C13e
__X__ UL Recognized per UL 1191

MODEL: 747ACU56BK	COLOR: BLACK TUBE, NO VALVE	
	☐ YES	☐ NO
DID INFLATOR SUPPORT THE LOAD?	☐	

No testing was deemed necessary to change suffix "B" to "BK" since "BK" indicates Black throughout this file.

Test Record No. 6 Summary:

The results of the investigation indicate that the products evaluated comply with the applicable requirements, and therefore, such products are judged eligible to bear UL's Mark as described on the Conclusion Page of this Report.

Test Record No. 6 by:

ROBERT E. GLOVER
Engineer

Reviewed by:

MICHAEL T. CUNNINGHAM
Engineering Group Leade

TEST RECORD NO. 7

SAMPLES:

Manufacturer samples of following Model were used for the following test program.

740ROLS66C4 ("Esthane" 747ACU red tube with 740ROA valve and C4 dust cap).

GENERAL: Test results relate only to the items tested. UL does not consider the results to be representative of any other products except where specifically detailed in this Report.

Tests were conducted to determine the acceptability of this Oral Inflation System for use in Personal Flotation Devices which are UL Listed and USCG Approved.

These samples were constructed of the parts specified in the descriptive portion of this Report. The only difference is that the 743 Seat was made from molded silicon instead of stamped silicon.

UL 1180 TESTS:
Engineering Consisderations:
The tests conducted on the Model 740ROLS66C4 are considered fully representative for the other Models using Oral Inflation Valve Part No. 740-Rox described by this Report.

OPERABILITY TEST - ORAL INFLATOR:

METHOD

Each Oral Inflator was conditioned as a complete unit (i.e. with oral valve and oral tube; without an inflatable bladder attached, and, if provided, with the cap fitted to the tube, but not capped, unless otherwise specified). Each tube was exposed or conditioned in a vertical position with the oral valve at the top and the open end of the tube near the bottom.

Apparatus:
Air supply capable of varying pressure from 0 to 2 psig gradually at a rate of approximately 0.5 psi per minute, and capable of supplying in excess of 100 lpm at 1 psig.

Calibrated air pressure gage(s) for measuring 0.6 psig, or a lower pressure if specified by the manufacturer, and 1 psig.

If available: Calibrated air flow meter for measuring at least 100 lpm at 1 psig.

Samples:
A minimum of three samples, each color and conditioning.

Conditionings:
1. A minimum of 24 hours at 23 ± 2□C (73 ± 4□F), 50 ± 5 percent relative humidity (i.e., AS REC'D).

Oral Inflator Procedure:
A flexible hose from a calibrated, metered air supply was attached to the oral valve end. The open end and of the tube was placed in water so air flow could be observed.

A gradually increasing air pressure was applied to the inlet side of the valve at a rate of approximately 0.5 psi per minute (3.5 kPa/minute). The pressure at which the valve began to open (the crack pressure) was verified as being not more than the required 0.6 psig (4 kPa), or a lower pressure if specified by the manufacturer.

If available run the following test though it is not required for compliance under this program:
An air pressure of 1 psig (7 kPa gauge) was then applied to the inlet side of the valve. The air flow through the system (i.e., valve and tube) was verified as being not less than the required 100 lpm (26.1 gpm).

This test was repeated 10 times on each sample.

ENG USE ONLYRESULTS

For each sample tested, the oral inflator:

__X__ had a crack pressure of 0.6 psig or a lower pressure if specified by the manufacturer and allowed an air flow of at least 100 lpm at 1 psig inlet pressure.

____ did not have a crack pressure of 0.6 psig or or a lower pressure if specified by the manufacturer or did not allow an air flow of at least 100 lpm at 1 psig inlet pressure.

For individual results, refer to the OPERABILITY TEST TABLES.

OPERABILITY TEST TABLES

MODEL: (specify the exact model of the oral tube and inflator: 740ROLS66C4	COLOR: (Specify color of tube): Red
TEST (CRACK) PRESSURE (specify, shall not exceed 0.44 psig per UL 1191, T32.3)	PSIG: 0.23

CONDITION	SAMPLE	IS CRACK PRESSURE ≤ TEST PRESSURE		IS FLOW ≥100 LPM @ 1 PSIG?	
		YES	NO	YES	NO
AS REC'D	1	X		X	
	2	X		X	
	3	X		X	
	Extra	X		X	
	Extra	X		X	

BACK PRESSURE TEST: ORAL INFLATORS

METHOD

The samples from the Operability Test were used for this test.

Apparatus:
Air supply capable of gradually increasing air pressure from 0 to 10 psig (0 to 69 kPa).

Calibrated pressure gage for measuring air pressure from 0 to 10 psig (0 to 69 kPa).

A flexible hose from a calibrated, metered air supply was attached to the open end of the oral inflator. The valve end of the oral inflator was placed in water so leakage could be observed.

A gradually increasing air pressure, from 0.0 psig to 10.0 psig, (0 to 69 kPa) was applied to the outlet side of the oral tube so that the valve experienced a back pressure.

The inflator is required to not leak when back pressure throughout the range from 0.0 through 10.0 psig (0 to 69 kPa) is applied.

ENG USE ONLYRESULTS

For each sample tested, the inflator:

__X__ did not leak under a back pressure of 0.0 to 10.0 psig (0 to 69 kPa).

_____ leaked under a back pressure of 0.0 to 10.0 psig (0 to 69 kPa).

For individual results, refer to the BACK PRESSURE TEST RESULTS TABLE.

BACK PRESSURE TEST RESULTS TABLE

MODEL: (specify the exact model of the oral tube and inflator:	COLOR: (Specify color of tube):
740ROLS66C4	Red

CONDITION	SAMPLE	DID VALVE LEAK FROM O TO 10 PSIG?	
		NO	YES
AS REC'D	1	X	
	2	X	
	3	X	
	Extra	X	
	Extra	X	

Test Record No. 7 Summary:

The results of the investigation indicate that the products evaluated comply with the applicable requirements, and therefore, such products are judged eligible to bear UL's Mark as described on the Conclusion Page of this Report.

Test Record No. 7 by:

Diane Haithcock
Project Engineer

Reviewed by:

MICHAEL T. CUNNINGHAM
Reviewing Engineer

Reviewed by:

Ernest Kirstein
Staff Chemist

TEST RECORD NO. 8

No additional testing was necessary to make the following revisions and corrections:

1. Page 1 Table- Corrected the part number for the 740 valve. Originally read 740ROA which was incorrect.
2. Page 4- Added an Illustration Index as Item 17.
3. Page 1 New Table of Recognized Component Parts- Added a table to list the oral tubes, valves and cap as Recognized Components so that they can be marked and supplied individually.
4. Added Ill. 16, SOP289, which is the procedure for the removal and replacement of the 730 and 740 valves.

Test Record No. 8 Summary:

The results of the investigation indicate that the products evaluated comply with the applicable requirements, and therefore, such products are judged eligible to bear UL's Mark as described on the Conclusion Page of this Report.

Test Record No. 8 by:

Amanda Dail
Associate Project Engineer

Reviewed by:

MICHAEL T. CUNNINGHAM
Senior Staff Engineer

Reviewed by:

Ernest Kirstein
Staff Chemist

TEST RECORD NO. 9

This test record covers the revision to illustration 6A for the Body Valve, part 731ROA2NW, to include a taper in the 0.460 diameter and a reduction in the 0.395 diameter to aid in the molding and automated assembly of the valve.

No testing was deemed necessary as this minor construction change does not jeopardize nor impact the function of the overall design of the oral inflation system.

Other minor revisions to the illustration include the following:

1.) Consolidation of Note 1 and Note 2 for the material color and composition: Black Acetal
2.) Elimination of extra dimensions that can be noted based on the symmetry of the valve.
3.) Addition of a Revision History chart to indicate revisions made to the drawing.

No testing was deemed necessary for these minor revisions as they do not represent construction changes and serve only as a means to clearly illustrate the components of the Body Valve.

Test Record Summary:

The results of the investigation indicate that the products evaluated comply with the applicable requirements, and therefore, such products are judged eligible to bear UL's Mark as described on the Conclusion Page of this Report. Any information and documentation involving UL Mark services are provided on behalf of Underwriters Laboratories Inc. (UL) or any authorized licensee of UL.

Test Record by:

Denice Young
Engineer
Conformity Assessment Services

Reviewed by:

Michael T. Cunningham
Senior Staff Engineer
Conformity Assessment Services

Any information and documentation involving UL Mark services are provided on behalf of Underwriters Laboratories Inc. (UL) or any authorized licensee of UL.

TEST RECORD NO. 10

Testing deemed necessary to change the dimensions and material used in the poppet guide were conducted as follows.

SAMPLES:

Samples of Model 740ROLSxBKC4 were subjected to the following tests. The poppet guide was constructed with M270 Green Acetal.

Test	Pass	Fail	Results/Comments
Oral Operability – As-Received	X		
Oral Operability – High Temp.	X		
Oral Operability – Low Temp.	X		
Back Pressure – As-Received	X		
Back Pressure– High Temp.	X		
Back Pressure– Low Temp.	X		
Dimensional Spot Check	X		Verification purposes

The results show that the dimension changes and the material change in the poppet guide are acceptable and accurate. Ill. 4 was revised to include the new dimensions of the M270 Green Acetal poppet guide tested as described in the table above.

No additional testing was deemed necessary to allow the following revisions:

1. Add additional parts to the list of Recognized Component parts that may be packaged and shipped separately: 747ACUSx, 747ACUSxBK, 730ROLSx, 730ROLSxBK, 740ROLSx, and 740ROLSxBK. Also removed the C from C727-ACU, as the C is a customer designation not a manufacturing designation.
2. Revision of the following illustrations as described:

   Ill. 1D – Replace the 740 valve with the 730ROA valve as the 740 is being discontinued and the 730ROA is already a tested valve used in other oral tubes currently in this Section.
   Ill. 1E – Added new illustration of 740ROLXXX, which does not depict the dust cap as in Ill. 1D.
   Ill. 2B – Change all fractional dimensions to decimal dimensions. There are no physical changes being made to the tube other than those detailed above in this Test Record. Tolerances added for various dimensions.
   Ill. 2C – Inside diameter of tube changed from 0.482 in to 0.477 in. This minor dimensional change was confirmed acceptable by the testing described above on samples constructed with the 747ACU tube.

2. Revision of the following illustrations as described (cont'd):

Ill. 3 – Revised view of 730ROA valve assembly. Measurements shown on previous revision are already included on other illustrations.
Ill. 5B – No physical changes to part. Changes to tolerance ranges only for ease of manufacture.
Ill. 6A – No changes other than the taper in the body is being replaced with a chamfer to allow the spring to sit flat on the bottom.
Ill. 16 – Replaced obsolete SOP with IFU for T740 valve removal tool.

ENGINEERING CONSIDERATIONS:

The following exposures were waived as these exposures were tested in Test Record No. 3 of the Report Issued 1981-09-21, and these exposures were judged to have no effect on the poppet guide molded of M270 green acetal: Ref. Fuel B, Calumet Oil No. 2, Perchloroethylene, Detergent, and Salt Spray. Exposure CA_{300} was waived as the poppet guide is shielded from the arcs during exposure.

Test Record Summary:

The results of this investigation, including construction review and testing, indicate that the products evaluated comply with the applicable requirements in UL1191 and, therefore, such products are judged eligible to bear UL's Mark as described on the Conclusion Page of this Report.

Standard	Title	Edition or Publication Date	Revision Date
UL1191	Components for Personal Flotation Devices	December 12, 2008	February 27, 2009

Test Record by:

Amanda Dail
Project Engineer
Conformity Assessment Services

Robert Glover
Senior Project Engineer
Conformity Assessment Services

Reviewed by:

Michael Cunningham
Senior Staff Engineer
Conformity Assessment Services

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C O N C L U S I O N

The product as described herein is judged to be eligible for Component Recognition and Follow-Up Service of Underwriters Laboratories, Inc. Under the Service, the manufacturer is authorized to use the Recognized Marking described in the Follow-Up Service Procedure on such products-which comply with said Procedure and any other applicable requirements of Underwriters Laboratories, Inc. Only those products which properly bear the Recognized Marking are considered as Recognized Components by Underwriters Laboratories, Inc. **Any information and documentation involving UL Mark services are provided on behalf of Underwriters Laboratories Inc. (UL) or any authorized licensee of UL.**

Report by:

JAMES D.RUSSELL
Engineering Associate
Marine Department

Reviewed by:

JOHN H. LUCIUS
Engineering Team Leader
Marine Department