LIFESAVING SYSTEMS CORPORATION

LSC Test Report Number: F-730-740
Revision: B

Submersion and Overpressure Test Report

Osprey Vest and Inflatable Collar P/N: 740-MBT



PROPRIETARY & CONFINDENTIAL

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Document History				
Revision	**Issue Date**	**Description of Revision/Modification**	**Revised by**	**Approved by**
A	10-29-2020	Initial Release	-	RDJ
B	12-15-2020	2.3 and 3.3: Added description of buoyancy test method. 4.3: Added comments about decrease in weight from the initial reading to first trial.	TJB	RDJ

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PURPOSE:

This report documents the results of the submersion and overpressure tests of the Osprey vest and inflatable collar per FAA TSO-C13g. The tests described herein were performed in accordance with the applicable requirements listed in SAE International Aerospace Standard (AS) 1354, Individual Inflatable Life Preserver, dated February 2016, as modified by Appendix 1 of TSO-C13g.

ACRONYMS AND ABBREVIATIONS:

°C- Celsius
°F- Fahrenheit
LSC – Lifesaving Systems Corp.
N/A – Not Applicable
P/N – Part Number
S/N – Serial Number
Lbf – Pound-Force

TEST FACILITY:

Testing and inspection were performed at Lifesaving Systems Corporation's (LSC) manufacturing facility located in Apollo Beach, Florida by LSC personnel.

REFERENCES:

Technical Standard Order TSO-C13g	*Life Preservers*, dated February 3rd, 2017
SAE International Aerospace Standard (AS) 1354	*Individual Inflatable Life Preserver*, dated February 2016

SUMMARY OF TESTS PERFORMED & RESULTS:

Section	Test Description	Results
2	Submersion	The Osprey system stabilizes with 72lbs of buoyant force. This is above the minimum requirement of 35lbs of buoyant force per TSO-C13g.
3	Overpressure	The Osprey system did not burst or deflate when overpressure was applied per TSO-C13g. The Osprey established a minimum of 74.6lbs of buoyant force over an 8-hour test period.

SECTION 1- TEST CONDITIONS & EQUIPMENT:

1.1 Environmental Conditions

The temperature of the fresh water shall be 70°F ± 5°F (21.1°C ± 2.8°C).

1.2 Tolerances

The load readings shall be maintained within all applicable specified tolerances.

- Measured in 5-pound increments with accuracy of ±0.10 pounds.

1.3 Instruments and Equipment

LSC Tool No.	Test Equipment	Description	Cal. Date	Cal. Due
91	Force Gauge	TL-440 Handheld pull tester	7/15/2020	7/15/2021
57	Thermometer	RH/Temp Monitor	2/04/2020	2/04/2022
27	Steel Ruler	Measurement	7/03/2020	7/03/2021

1.4 Calibration

The instruments and equipment are calibrated according to original equipment manufacturer specifications and are traceable to the National Institute of Standards and Technology (NIST). Calibration records are maintained on file at Lifesaving Systems Corporation.

SECTION 2- SUBMERSION TESTING:

2.1 Buoyancy Requirement:

(3.4) The life preserver shall be shown to provide a buoyant force not less than that required in Table 1. The buoyant force of the life preserver is equal to the weight of the volume of the fresh water displaced by the life preserver when totally submerged. Buoyancy shall be demonstrated using only the standard gas reservoirs starting from a vacuum flat unit.

2.2 Buoyancy Test Method:

(5.1.1) Start the test with the life preserver in its stowage package. Remove the life preserver from the package and activate the gas cylinder(s). Submerge the life preserver in 70°F ± 5°F (21.1°C ± 2.8°C) fresh water, so that no part of it is less than 24 inches (60.96 cm) below the surface of the water. Measure the buoyancy to show compliance with the applicable requirement in Table 1. Maintain submersion of the life preserver for at least 8 hours, after which time it shall be shown to meet or exceed the requirement in Table 1.
Alternatively, the test may be discontinued in less than 8 hours if buoyancy measurements taken at four successive 30-minute intervals show that the buoyant force of the life preserver has stabilized at or above the value specified in Table 1.

2.3 Buoyancy Test Setup:

A holding fixture that consists of a stainless-steel frame and multiple 5lb lead weights will be used to submerge the Osprey system. A nylon mesh netting will be attached to the holding fixture to maintain the Osprey system. This setup will be weighed under water for neutral buoyancy calculations. The Osprey system will then be placed in the nylon mesh netting and lowered back under the water. The difference in buoyant force will measured.

TABLE 1.

Category of Life Preserver	Weight of Wearer (lb/kg)	Minimum Buoyant Force in Fresh Water at 70°F ± 5°F (21.1°C ± 2.8°C) (lb/N)
Adult	Above 90/40.82	35/155.69

SECTION 3- OVERPRESSURE TESTING:

3.1 Overpressure Requirement:

(3.6) With the flotation chamber(s) orally inflated, the flotation chamber(s) shall not burst or deflate when the manual inflation means are activated.

3.2 Overpressure Test Method:

(5.1.2) The life preserver shall meet the minimum buoyancy requirements defined in Table 1 when subjected to overpressure. Inflate each flotation chamber via the oral inflation tube to 1-psig (6.89kPa), then manually actuate the discharge of the gas reservoir for each chamber. Submerge the life preserver in 70°F ± 5°F (21.1°C ± 2.8°C) fresh water, so that no part of it is less than 24 inches (60.96 cm) below the surface of the water. Measure the buoyancy to show compliance with the applicable requirement in Table 1. Maintain submersion of the life preserver for at least 8 hours, after which time it shall be shown to meet or exceed the requirement in Table 1.

Alternatively, the test may be discontinued in less than 8 hours if buoyancy measurements taken at four successive 30-minute intervals show that the buoyant force of the life preserver has stabilized at or above the value specified in Table 1.

3.3 Buoyancy Test Setup:

A holding fixture that consists of a stainless-steel frame and multiple 5lb lead weights will be used to submerge the Osprey system. A nylon mesh netting will be attached to the holding fixture to maintain the Osprey system. This setup will be weighed under water for neutral buoyancy calculations. The Osprey system will then be placed in the nylon mesh netting and lowered back under the water. The difference in buoyant force will measured.

SECTION 4- ANALYSIS OF RESULTS

4.1 Submersion:

Examination Table:

Test Criteria	Measurement	Pass/Fail	Time	Notes
Fresh Water: 70°F ± 5°F	72°F	PASS	9:00am	Fresh Water
Submerge the vest not less than 24 inches below the surface of the water.	24-inches	PASS	9:00am	Submerged 24” under surface of water
*Maintain submersion of the life preserver for at least 8 hours. The buoyant force of the life preserver has stabilized at or above 35lb	88.8lb	n/a	9:00am	Weight of lifting harness in water
	77.8lb Buoyant force	PASS	9:00am	Harness w/Vest = 11.0lb 88.8lb - 11.0lb = 77.8lb
	72.4lb Buoyant Force	PASS	9:30am	Harness w/Vest = 16.4lb 88.8lb – 16.4lb = 72.4lb
	72.4lb Buoyant Force	PASS	10:00am	Harness w/Vest = 16.4lb 88.8lb – 16.4lb = 72.4lb
	72.4lb Buoyant Force	PASS	10:30am	Harness w/Vest = 16.4lb 88.8lb – 16.4lb = 72.4lb
	72.4lb Buoyant Force	PASS	11:00am	Harness w/Vest = 16.4lb 88.8lb – 16.4lb = 72.4lb

*Alternatively, the test may be discontinued in less than 8 hours if buoyancy measurements taken at four successive 30-minute intervals show that the buoyant force of the life preserver has stabilized at or above 35lb.

4.2 Overpressure:

Examination Table:

Test Criteria	Measurement	Pass/Fail	Time	Notes
Fresh Water: 70°F ± 5°F	72°F	PASS	8:00am	Fresh Water
With each flotation chamber orally inflated, the flotation chambers shall not burst or deflate when manual inflation means is activated.	1-PSIG	PASS	8:00am	1-PSIG started in chambers. Manual Inflation of two 31g cylinders did not cause chambers to burst or deflate
Submerge the vest not less than 24 inches below the surface of the water.	24-inches	PASS	8:00am	Submerged 24” under surface of water
*Maintain submersion of the life preserver for at least 8 hours. The buoyant force of the life preserver has stabilized at or above 35lb.	102.2lb	n/a	8:00am	Weight of lifting harness in water
	92.2lb Buoyant force	PASS	8:00am	Harness w/Vest = 10.0lb 102.2lb - 10.0lb = 92.2lb
	79.4lb Buoyant force	PASS	8:30am	Harness w/Vest = 22.8lb 102.2lb – 22.8lb = 79.4lb
	79.2lb Buoyant force	PASS	9:00am	Harness w/Vest = 23.0lb 102.2lb – 23.0lb = 79.2lb
	77.8lb Buoyant force	PASS	9:30am	Harness w/Vest = 24.4lb 102.2lb – 24.4lb = 77.8lb
	74.6lb Buoyant force	PASS	4:00pm	Never stabilized, Test ran for 8-hours. Final Reading 102.2lb – 27.6lb = 74.6lb

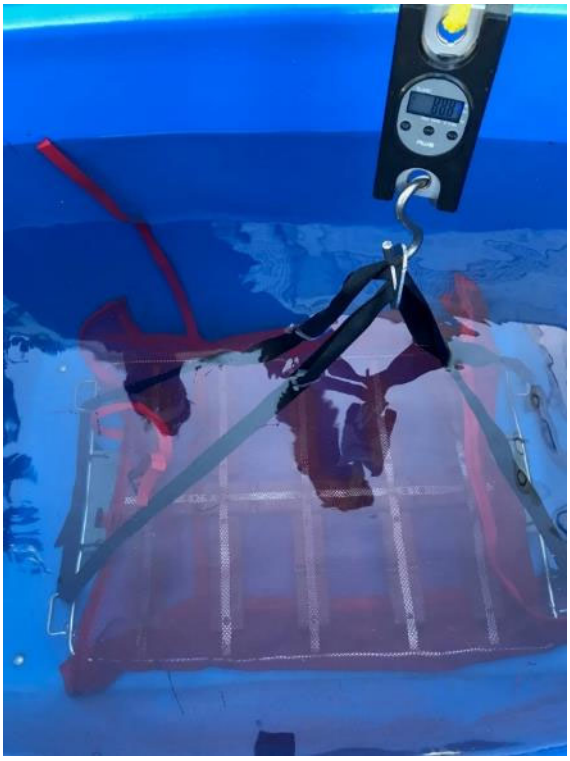
4.3 Comments:

Air was trapped inside the nylon mesh netting and Osprey system when first submerging the holding fixture during both test trials. The air escaped and an accurate buoyancy reading was recorded during the second measurement.

SECTION 5- PHOTOGRAPHS



72°F – Fresh Water

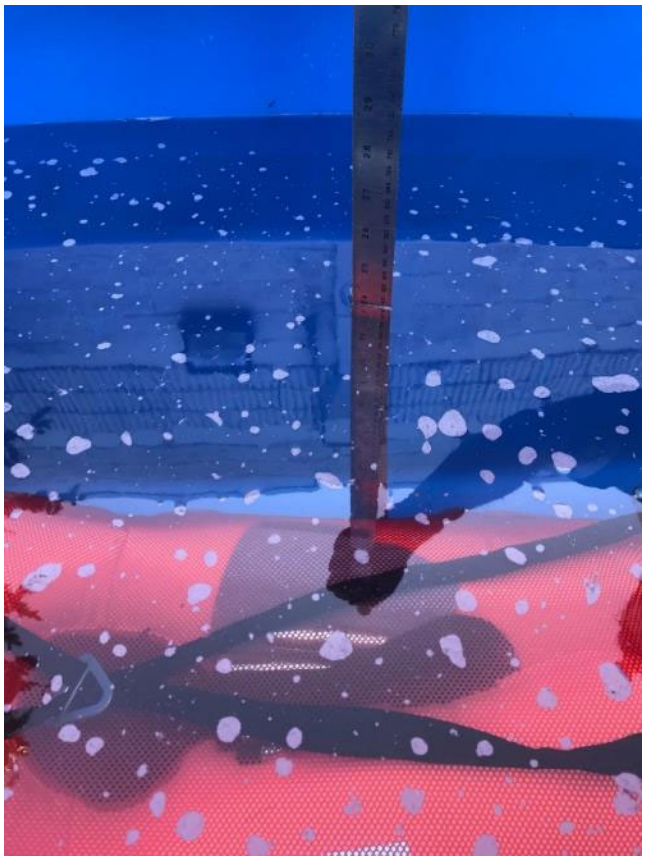


Submersion Test: Lifting harness submerged in test tank.

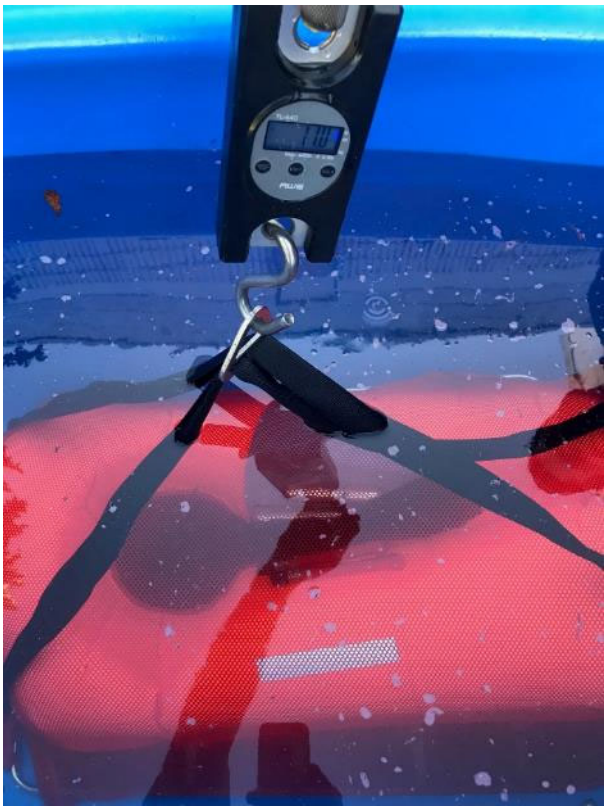
Weight = 88.8lbs



Submersion Test: Osprey system attached to lifting harness



Submersion Test: Osprey system attached to lifting harness 24-inches below surface of water.



Submersion Test: Osprey and lifting harness weight in water = 11lbs (Start)

77.8lbs of Buoyant Force



Submersion Test: Osprey and lifting harness weight in water = 16.4lbs (Stable)

72.4lbs of Buoyant Force

Stable at four successive 30-minute intervals



Overpressure Test: 1-PSIG in chambers prior to manual activation of gas.

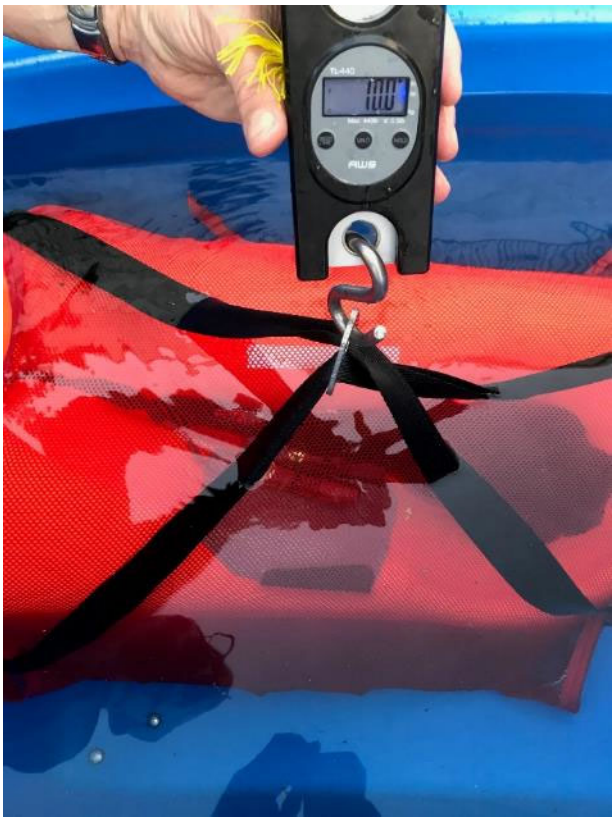


Overpressure Test: Activation of gas did not cause bladder to burst or deflate.



Overpressure Test: Lifting harness submerged in test tank. Weight = 102.2lbs

*Added more weight for buoyant force expectations.



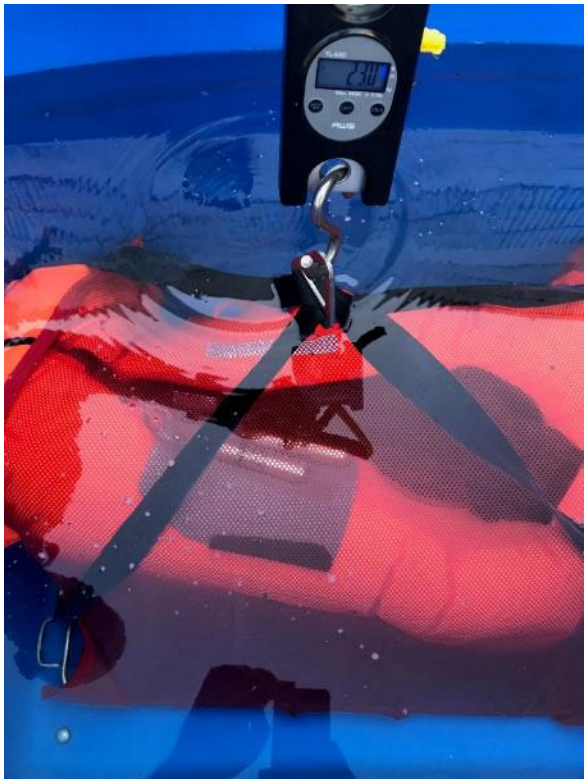
Overpressure Test: Lifting harness and Osprey system in water. Weight = 10.0lbs

92.2lbs of Buoyant Force (8:00am)



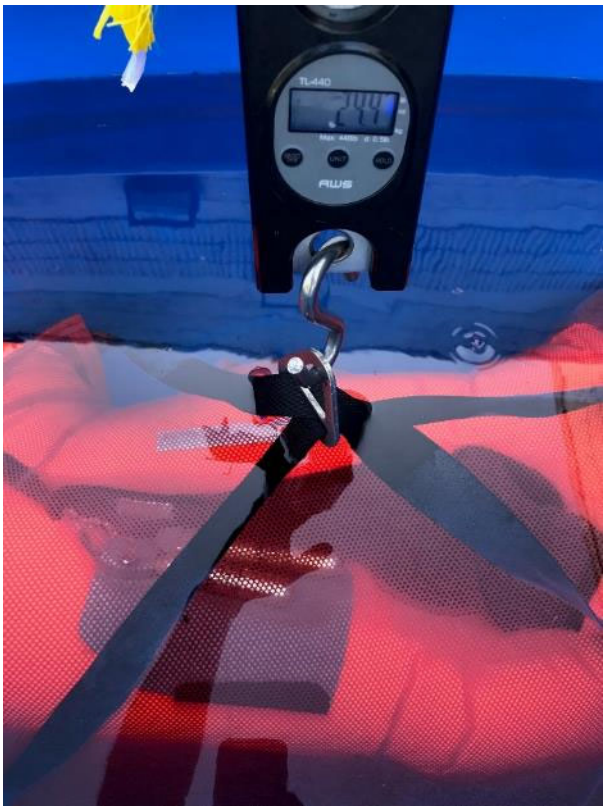
Overpressure Test: Lifting harness and Osprey system in water. Weight = 22.8lbs

79.4lbs of Buoyant Force (8:30am)



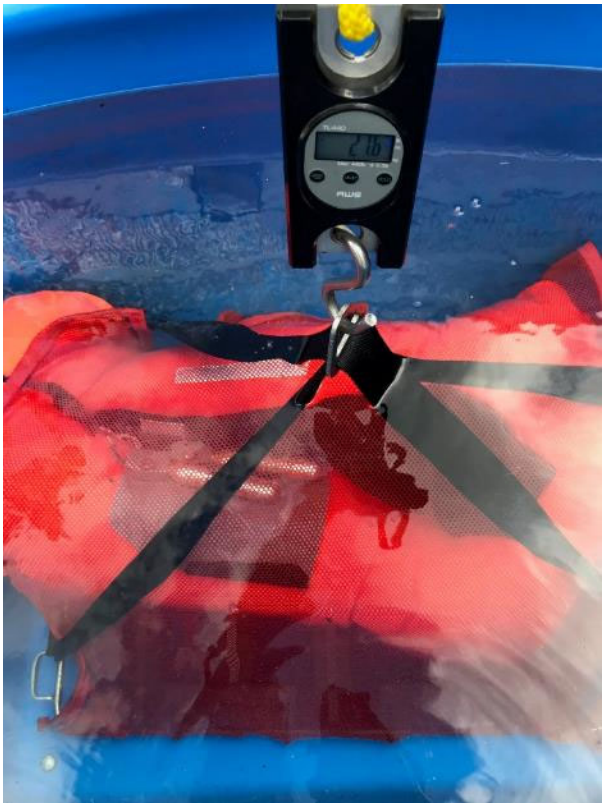
Overpressure Test: Lifting harness and Osprey system in water. Weight = 23.0lbs

79.2lbs of Buoyant Force (9:00am)



Overpressure Test: Lifting harness and Osprey system in water. Weight = 24.4lbs

77.4lbs of Buoyant Force (9:30am)



Overpressure Test: Lifting harness and Osprey system in water. Weight = 27.6lbs

74.6lbs of Buoyant Force (4:00pm)

Pressure never stabilized.

Test ran for 8-hours.