TEST PLAN & REPORT

Qualification Testing of Lifesaving Systems Corp. #513 Talon II Safety Hook with Swivel for NAVAIR CMARS Integration

Prepared by: Jason Glazer, Engineer
Lifesaving Systems Corp.
220 Elsberry Road
Apollo Beach, FL 33572

10/31/08
DATE

May 21, 2008

Reviewed by: Desirée Smith
NAVAIR
CMARS Project Engineer

23/oct/08
DATE

Reviewed by: Roger Podob
NAVAIR
CMARS Project Engineer

10/23/08
DATE

Purpose

The purpose of this test plan is to define the procedures & reporting requirements for qualification testing of Lifesaving Systems Corp. p/n #513 Talon II Safety Hook w/ Swivel for integration within NAVAIR CMARS program. With the exception of minor deviations the qualification testing will be performed in accordance with the requirements of Sections 4.3.1.1.1, 4.3.1.1.2, and 4.3.1.1.3 of ANSI Standard Z359. Detailed test methods are provided for each section and the noted deviations are listed.

Qualification Testing

All tests will be performed at Lifesaving Systems Corporation's (LSC) manufacturing facility located in Apollo Beach, Florida by LSC personnel. A NAVAIR representative will be present to observe and verify the test results. Testing will be performed in accordance with the procedures outlined in ANSI Standard Z359 with fixtures applicable to LSC's in-house test equipment. A total of three (3) tests will be performed as follows:

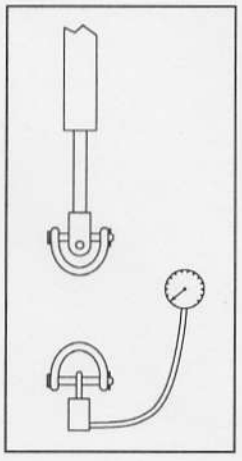
Qualification Test #1 -	Eight (8) samples in accordance with ANSI Z359, section 4.3.1.1.2 .
Qualification Test #2 -	Seven (7) samples in accordance with ANSI Z359, section 4.3.1.1.3 .
Qualification Test #3 -	Seven (7) samples in accordance with ANSI Z359, section 4.3.1.1.1 .

The successful completions of these tests will verify that Lifesaving Systems Corp. p/n #513 Talon II Safety Hook with integrated Swivel meets these ANSI standard however it will not render Lifesaving Systems Corp as a whole or the Talon II Safety Hook ANSI certified.

Test Equipment

The primary testing equipment consists of the following items:

1. Load Cell Universal Testing Machine.
    a. Force Application - Hydraulic cylinder, manual control valve.
    b. Force Measurement - Hydraulic load cell with analog gauges.
    c. Fixtures - Shackles, pins, and custom fixtures as required.
2. Ruler/Calipers - Linear measurements.

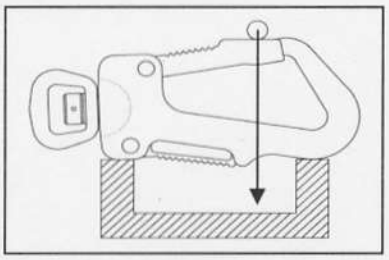


Photographic Documentation

Pictures will be taken as needed before, after and during tests.

Qualification Test #1

ANSI Z359 4.3.1.1.2 *Gate Face Testing of Snaphook and Carabiner* - Position the snaphook or carabiner in the clamping fixture such that the outside face of the gate is generally parallel to the test bed and the gate's motion is perpendicular to the test bed. Using a rigid bar as shown in Appendix B, apply a load perpendicular to the face of the gate at a point as close to the nose of the hook body as possible. The load shall be applied increasingly until the required test load of 220 pounds (1 kN) is reached. The rigid bar travel rate shall not exceed 3 inches/minute. Maintain the test load for a minimum period of 1 minute. While the load is applied, measure the distance of gate separation from the hook or carabiner nose at the point of minimum clearance.



Deviation Notes:

1. The indicated rigid bar may be replaced with 3/8" diameter steel bar.
2. LSC test apparatus does not provide for travel rate control. Rate of increase for the test force will be manually controlled in a slow and practical method.

Success Criteria According to ANSI Z359, Section 3.2.1.4:

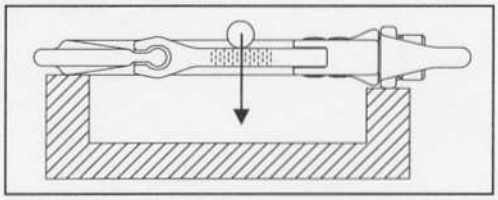
- The gate cannot separate more then 0.125 inches (3 mm) from the nose of the snaphook

Qualification Test #1 (Section 4.3.1.1.2) Results

Sample	Pass / Fail	Measured Clearance / Notes
1	Pass	No gap seen between gate and nose of hook
2	Pass	No gap
3	Pass	No gap
4	Pass	No gap
5	Pass	No gap
6	Pass	No gap
7	Pass	No gap. Additional weight was added post-test. At 250 lbs, gate was even with nose of hook. At 300 lbs, gap was 0.050". At 350 lbs, gap was 0.135". At 400 lbs, gap was sufficient to allow 3/16" steel ring in test fixture to slide past gate.

Qualification Test #2

ANSI Z359 4.3.1.1.3 *Side Load Testing of Snaphook and Carabiner Gates* - Position the snaphook or carabiner in the clamping fixture such that the opening motion of the gate is generally parallel to the test bed and the snaphook or carabiner is supported above the test bed from each end. Measure the height from the test bed as shown in Appendix B Figure 23. Apply the test load at an increasing rate (speed of 3 inches/minute) until the required test load of 350 pounds (1.55 kN) is reached. Maintain the test load for a minimum period of 1 minute. While the load is applied, measure the distance of gate separation from the hook or carabiner nose at the point of minimum clearance. Remove the load and measure the gate height from the test bed. Calculate the permanent deformation of the gate. Compare the test results to the requirements set forth in 3.2.1.4.



Deviation Notes:

1. LSC test apparatus does not provide for travel rate control. Rate of increase for the test force will be manually controlled in a slow and practical method.

Success Criteria According to ANSI Z359, Section 3.2.1.4:

- Permanente deformation greater then 0.125 inches (3.1 mm) cannot occur
- The nose cannot separate from the nose of the snap hook by more then 0.125 inches (3 mm).

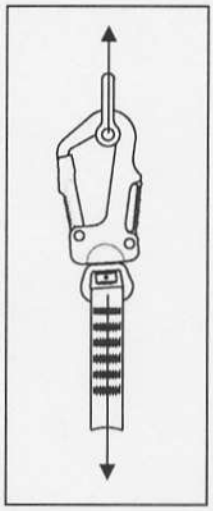
Qualification Test #2 (Section 4.3.1.1.2) Results

Sample	**Pass / Fail**	**Measurements**		
		Pre-Test Height	**Separation w/Load**	**Post-Test Height**
1	Pass		No significant deflection seen	
2	Pass		No deflection seen	
3	Pass		No deflection seen	
4	Pass		No deflection seen	
5	Pass		No deflection seen	
6	Pass		No deflection seen	
7	Pass		No deflection seen. Weight increased post-test to 650 lbs; no	

			significant deflection seen.	

Qualification Test #3

ANSI Z359 4.3.1.1.1 *Tensile testing of Snaphook and Carabiner Bodies* - Submit the snaphook or carabiner body to a test load of 5000 pounds (22.2 kN) between its two bearing points. The time to reach the force shall be greater than 1 minute in order to avoid dynamic effects. Maintain the test force for a minimum period of 1 minute and evaluate the condition of the connector in accordance with 3.2.1.4. Test fixture pins used in loading of snap hooks and carabiners shall have a round cross section and be no greater in diameter than the throat opening of the snaphook or carabiner being tested.



Deviation Notes:

1. Rate of force application for LSC's test apparatus is manually controlled. The rate of force application will be performed incrementally in steps of 500 lbs every 6-10 seconds until the maximum test force of 5000 lbs is achieved.
2. The text fixture pin used to secure the swivel eye may be replaced by a sewn webbing loop.
3. After maintaining the applied force of 5000 pounds for 1 minute the hook will be taken to failure.

Note: Deviation Note 3 will be completed in order to determine the failure load and the tolerance of the failure load. This is not part of the ANSI requirements.

Success Criteria According to ANSI Z359, Section 3.2.1.4:

-the hook cannot break

-the hook cannot distort enough to release the gate

Qualification Test #3 (Section 4.3.1.1.1) Results

Sample	Pass / Fail	Failure Load	Notes
1	Pass	9,500 lbs	Threads on swivel nut failed
2	Pass	8,500	Threads on swivel nut failed (nut split in half)
3	Pass	10,000	No failure
4	Pass	8,000	Nut split in half
5	Pass	9,800	Threads on swivel nut failed

6	Pass	9,500	Nut split in half
7	Pass	8,400	Nut split in half
9	Pass	8,600	Threads on swivel nut failed
8	N/A (additional test)	9,600	Nut split in half
10	N/A	8,700	Threads on swivel nut failed
11	N/A	6,400	Threads on swivel nut failed
12	N/A	9,300	Nut split in half
13	N/A	8,900	Nut not found
14	N/A	5,900	Threads on swivel nut failed
15	N/A	9,200	

Results

Based on the results of the test represented by this test plan Lifesaving Systems Corp. p/n #513 Talon II Safety Hook with integrated Swivel requires additional testing before being qualified for use within NAVAIR CMARS AIRSAVE Interface (AI). The results of Test #3 above (tensile testing) show a very wide range of hook strength. The failure mode was the swivel nut. It is believed that the tighter quality control of the threads during mass production will ensure better static load strength. Results of testing production-representative hooks are listed below and verify hook strength and manufacturing procedures.

Repeat of Qualification Test #3 (Section 4.3.1.1.1) Results

Sample	Pass / Fail	Failure Load	Notes
56	Pass	8,800 lbs	Swivel pulled apart
54	Pass	9,000	Swivel pulled apart
50	Pass	7,000	Swivel pulled apart. Cable pulling on the swivel might have been off-center

58	Pass	9,000	No breakage
59	Pass	8,700	Swivel pulled apart
55	Pass	10,000	No breakage
57	Pass	9,000	No breakage
53	Pass	9,000	No breakage
51	Pass	9,000	Swivel pulled apart
52	Pass	9,300	Swivel cracked