INTERMODAL MATERIÉL
AND
NAUTICAL/NUCLEAR ANALYSIS
IMANNA
LABORATORY INC.

515 Gus Hipp Blvd.
Rockledge, Florida 32955
Telephone (321) 632-2008
http://www.imanna.com

Post Office Box 560933
Rockledge, Florida 32956-0933
FAX (321) 690-3360
e-mail: info@imanna.com

CERTIFICATION TEST REPORT

Rev. 09/16

CERTIFICATION TEST REPORT
20595-1A
LUMINOUS INTENSITY COMPARISONS
FOR
STANDARD FUSEE, ORION FLARE DIV. HHRF
AND
WEEMS & PLATH ELECTRIC DISTRESS LIGHT LED

CUSTOMER:

STANDARD FUSEE CORPORATION
ORION FLARE DIVISION
3157 NORTH 500 WEST
PERU, IN 46970

MANUFACTURER OF TEST ARTICLE: STANDARD FUSEE CORP.
Weems & Plath

DATE: April 28, 2017

REPORT NO.: 20595-1A
IMANNA JOB NO.: 20595
CUSTOMER P.O. NO.: Verbal
CONTRACT: N/A
PAGES IN REPORT: 11

STATE OF FLORIDA
COUNTY OF BREVARD

ROBERT L. WHITE, being duly sworn, deposes and says: The information contained in this report is the result of complete and carefully conducted tests and is to the best of his knowledge true and correct in all respects.

Robert L White

SUBSCRIBED and sworn to before me this 28th day of April, 2017

CHRISTINA A. MORALES
Commission # FF 168597
Expires October 21, 2018
Bonded Thru Troy Fain Insurance 800-3857019

IMANNA shall have no liability for damages of any kind to person or property, including special or consequential damages resulting from IMANNA's providing the service covered by the report.

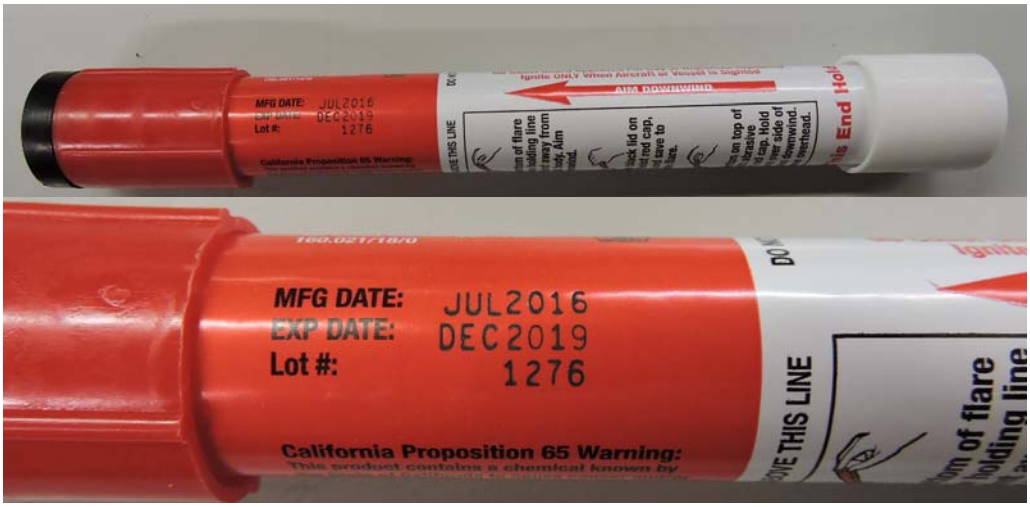
IMANNA LABORATORY, Inc.
TEST BY
Robert White
PROJ. MANAGER

1. TEST ARTICLE

Two Weems & Plath Electronic Flares and four ORION pyrotechnic Hand Held Red Flares were obtained from the open market. The flares are commercially available as distress signals.

2. PART NUMBER

ORION Marine Hand Held Red Flare (Intended to meet the requirements for a Day/Night Visual Distress Signal as required in 46 CFR 160.021) Item # 865, Lot No. 1276, Expiration date: Dec 2019. The flares were purchased from West Marine on 9/2/2016.




ORION
Locate - 4
RED Handheld Flares
U.S. Coast Guard Approved Day or Nighttime Signal
• Burn Time: Up to 3 Minutes Each
• Brightness: Up to 700 Candela
• Approved as Day or Nighttime Signals
STORAGE BAG
Reusable, Water Resistant, Floats,
Quick-Easy Access To Signals In An Emergency
MADE IN USA


ORION
Locate - 4 RED Handheld Flares
U.S. Coast Guard Approved Day or Nighttime Signal
• Burn Time: Up to 3 Minutes Each • Brightness: Up to 700 Candela
Item #
DO NOT IGNITE UNTIL RESCUE VESSEL IS IN SIGHT
Expiration Dates Here
IMPORTANT!! PLEASE READ!
EMERGENCY USE ONLY! IT IS ILLEGAL TO IGNITE FIRE DISTRESS SIGNALS IN A NON-DISTRESS SITUATION. CAUTION: EXTREMELY FLAMMABLE. KEEP OUT OF REACH OF CHILDREN.
ORION SAFETY PRODUCTS

Weems & Plath #C-1001 Electronic Flare (Intended to meet the requirements for an Electric Distress Light for boats as required in 46 CFR 161.013) Battery date: DEC 2025 (date printed on 3 Size “C”, 1.5VDC batteries, purchased separately, since the unit does not come with batteries included in the blister pack). The Electronic flare was purchased from West Marine on 9/3/2016. The fresh batteries were purchased from Lowe’s Hardware on 9/2/2016.

3. REQUIREMENTS

To perform luminous intensity measurements on the flares and compare the results.

The ORION Marine Hand Held Flare is intended to meet the luminous intensity as stated below (46 CFR 160.021)

Luminous intensity.
The luminous intensity of each specimen tested shall be measured by a visual photometer or equivalent photometric device, while the specimen is supported in a horizontal position and the photometer is at right angles to the axis of the specimen. Visual luminous intensity readings shall be observed and recorded at approximately 20 second intervals during the burning of the specimen. The minimum photometric distance shall be 3 m (10 ft.). Recording photometers shall have a chart speed of at least 25 mm (1 in.) per minute. The luminous intensity of specimen shall be computed as the arithmetical average of the readings recorded. The average luminous intensity of a test specimen shall be not less than 500 candela. The burning time of a specimen shall be obtained by stop watch measurements from the time distinct, sustained flame is emitted until it ceases. Test specimens shall burn in air not less than 2 minutes.

The Weems & Plath Electronic Flare is intended to meet the luminous intensity as stated below (46 CFR 161.013)

§ 161.013–5 Intensity requirements.
(a) If an electric light emits light over an arc of the horizon of 360 degrees, the light must:
(1) When level, have a peak intensity within 0.1 degrees of the horizontal plane;
(2) Have a peak Equivalent Fixed Intensity of at least 75 cd; and,
(3) Have a minimum Equivalent Fixed Intensity within a vertical divergence of ±3 degrees of at least 15 cd.
(b) If an electric light emits a directional beam of light, the light must:
(1) Have an Equivalent Fixed Intensity of no less than 25 cd within ± 4 degrees vertical and ± 4 degrees horizontal divergence centered about the peak intensity; and,
(2) Have a minimum peak Equivalent Fixed Intensity of 2,500 cd.
(c) The Equivalent Fixed Intensity (EFI) is the intensity of the light corrected for the length of the flash and is determined by the formula:
$EFI = I \times (t_c ¥ t) / 0.2 + (t_c ¥ t_i)$

Where:
I is the measured intensity of the fixed t_c is the contact closure time in seconds,
(0.33 for this S-O-S signal), and t_i is the incandescence time of the lamp in seconds.

(d) An electric light which meets the requirements of either paragraph (a) or (b) of this section need not, if capable of operating in both manners, meet the requirements of the other paragraph. § 161.013–7 Signal requirements.
(a) An electric light must have a flash characteristic of the International Morse Code for S-O-S and, under design conditions,
(1) Each short flash must have a duration of ⅓ second;
(2) Each long flash must have a duration of 1 second;
(3) The dark period between each short flash must have a duration of ⅓ second;
(4) The dark period between each long flash must have a duration of ⅓ second;
(5) The dark period between each letter must have a duration of 2 seconds;
(6) The dark period between each S-O-S signal must have a duration of 3 seconds.

(b) The flash characteristics described in paragraph (a) must be produced automatically when the signal is activated.

4. PROCEDURE

The test for the luminous intensity is taken at a distance such that the signal is a point source for the measurement. The luminous intensity of a flashing light is typically measured using the energy and math calculation for effective Intensity, and the Continuous burning HHRF is measured using the flux measurement. The luminous intensity measurements are equivalent in the statement of candela or lumens, even though the sampling technique is different.

5. RESULTS / PROCEDURE

The luminous intensity of the two designs is presented in the chart below:

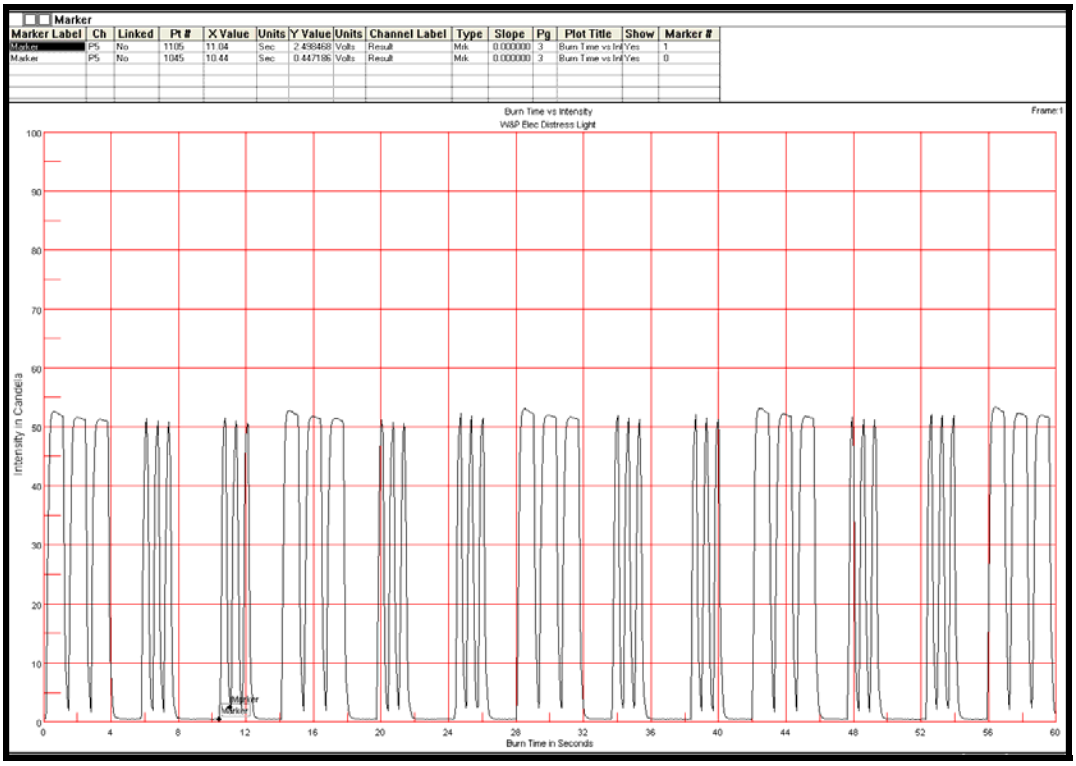
Average luminosity in Candela for LED Electric Distress Signal	Average luminosity in Candela forHand Held Flare Distress Signal
62.5 ± 27.6 Candela	647 ± 150 Candela
675 Lumens	6965 Lumens

The average luminosity of the Hand Red Flare Distress signal measured 647 Candela, which is 10.35 times the 62.5 Candela average of the Electric Distress Signal. The Light from the Electric Distress is visible over an arc of 270 degrees. The light from the ORION HHRF is visible over an arc of 320 degrees. The luminous intensity of the Electric Distress signal and the Hand Held Red Flare was taken at an elevation where the light output appeared to be the bright to the naked eye (the elevation was at the horizon for both the Hand Held Red Flare and the Electric Distress Signal).

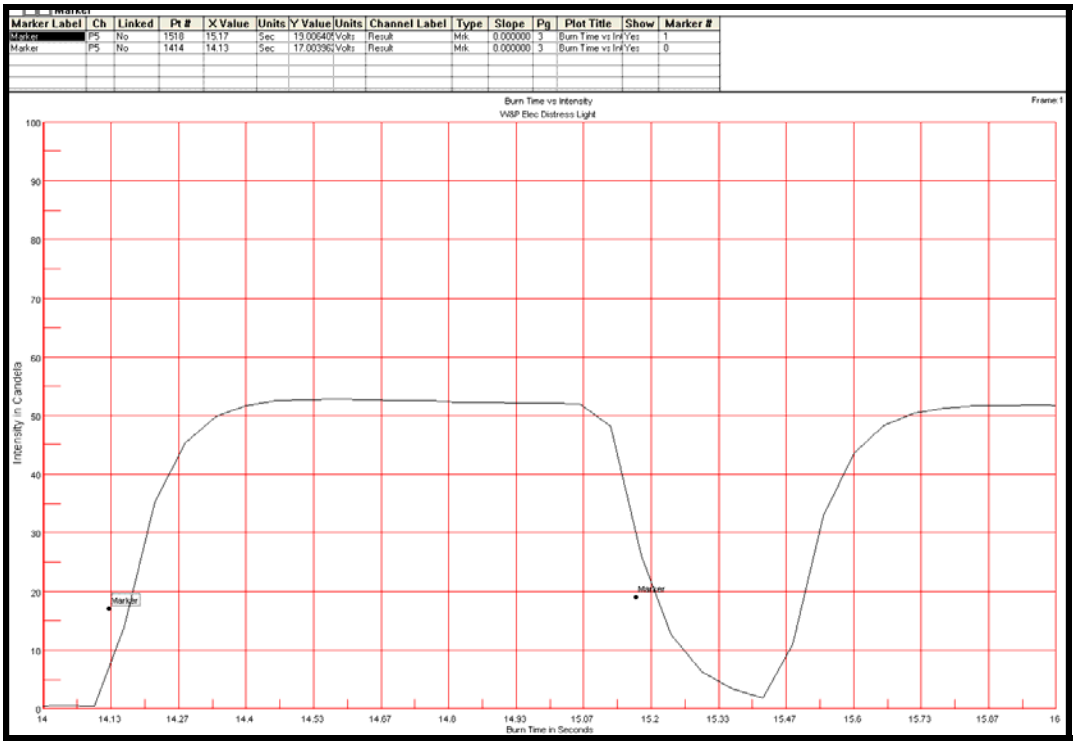
6. OBSERVATIONS AND COMMENTS

The Electric Distress Signal is a S.O.S. flashing light. The luminous intensity of a flashing light is measured by integration of the energy under the light curve, using the Blondel-Rey equation for the effective intensity of a flashing light. The average intensity of the Electric Distress Signal would be considered as the average intensity of one of the 9 flashes in the S.O.S. pattern, without differentiating between the durations of the flashes. The Blondel-Rey equation works well for flashes that are less than 0.200 milliseconds in duration, but is less effective for longer flashes. The 0.200 millisecond flash takes into account the human

eye response time for light recognition, particularly at darkness. The marine light measurements procedures have recognized that flashes longer than 300 milliseconds can be adequately measured using the flux measuring technique for determining the candela magnitude of nights intended for night recognition. The flashes of the Electric Distress Light are each longer than 300 milliseconds; therefore, the peak light during a single flash is adequate for determining the luminous intensity of the light output.



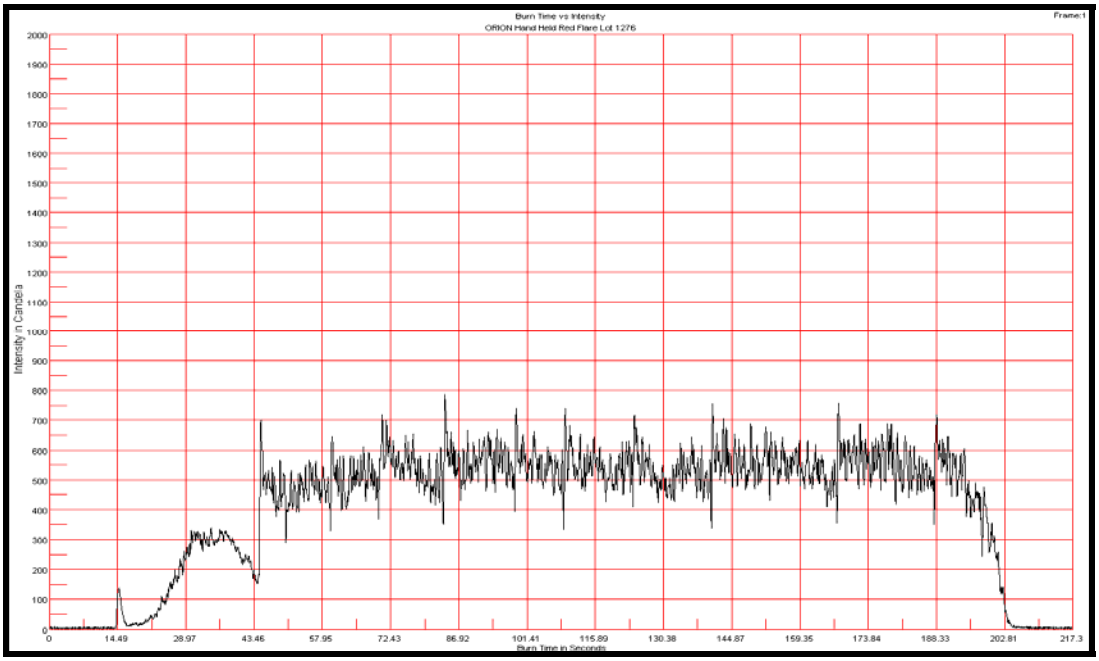
Plots of the W&P Electric Distress Signal flash pattern at bright light ring.



Marker Label	Ch	Linked	Pt #	X Value	Units	Y Value	Units	Channel Label	Type	Slope	Pg	Plot Title	Show	Marker #
Marker	P5	No	1518	15.17	Sec	19.00640	Volts	Result	Mrk	0.000000	3	Burn Time vs Int	Yes	1
Marker	P5	No	1414	14.13	Sec	17.00396	Volts	Result	Mrk	0.000000	3	Burn Time vs Int	Yes	0

Plots of the W&P Electric Distress Signal Luminous Intensity

The Hand Red Flare Distress signal is a fluxuating, constant emission source. The luminous intensity of a continuous emission source is measured by recording the flux of the continuous source, and averaging the magnitude of the fluxuating source over time.



Plot of Luminous Intensity of the ORION HHRF at the horizon position.

It is noted that the lights are intended to meet different requirements, and are not identical replacements for each other.

All equipment used in the performance of these tests was calibrated to standards traceable to the N.I.S.T and/or verified at the time of the test using internationally recognized methods to validate the accuracy and repeatability of the values recorded or collected during the tests.

The results of the tests presented herein apply only to the test specimen as prepared and as tested.

INSTRUMENTATION EQUIPMENT SHEET

DATE: Sept. 2016

JOB NUMBER: 20595

CUSTOMER: Standard Fusee, ORION Signal Products

TECHNICIAN: Lowe

TEST AREA: Environmental Lab

TEST ITEM DESCRIPTION: Pyrotechnic Flares, LED SOS Electric Distress Signal Light

INSTRUMENT	MFG.	MODEL	RANGE	ACCURACY	CAL/DATE	CAL/DUE
Data Acquisition System	IO Tech	Daqbook 100	Multi	Mfg.	Self-Cal Each operation	
Photometer	EG&G GAMMA SCIENTIFIC	DR2000	0 to 2000 Candela	±0.5% FS	3-21-16	3-21-17
Pentium IV Computer	John Key Corp.	AMD-K6	Multi	Mfg.	Not Required	Not Required

Instrumentation Information Verified by: R White

Purchase Receipts for Flare and Batteries

West Marine

320 W Merritt Island Cswy
MERRITT ISLAND, FL 32952-4808
321-452-4661

Customer: BOB WHITE
Company:

****
Your West Advantage Information
****

BOB WHITE

West Adv #: 4827079	
Points Earned Today:	25
Your Total Points:	25

****
****
***REPRINT - REPRINT - REPRINT - REPRINT**
****
****

Qty	Price	Total
Flares-Locate HH Rd (4) 8665770		
1	24.99	24.99

Subtotal	24.99
Sales Tax	1.62
Total	26.61

Store #: 1209 Date: 9/2/16
Register #: 2 Time: 2:53 PM
Trx #: 487
Cashier: CHRISTOPHER

911209020487162468

LOWE'S

LOWE'S HOME CENTERS, LLC
3790 S FISKE BLVD
ROCKLEDGE, FL 32955 (321) 631-0696

- SALE -

SALES#: S1506GP1 1771052 TRANS#: 74839650 09-02-16

98795 DURACELL C 4-PACK	7.47
SUBTOTAL:	7.47
TAX:	0.49
INVOICE 13829 TOTAL:	7.96
AMEX:	7.96

MYLOWE'S CARD NUMBER: 461000500972050

West Marine

320 W Merritt Island Cswy
MERRITT ISLAND, FL 32952-4808
321-452-4661

Customer: BOB WHITE
Company:

****
Your West Advantage Information
****

BOB WHITE

West Adv #: 4827079	
Points Earned Today:	100
Your Total Points:	100

Qty	Price	Total
Flare-Electronic SOS Lite 17466988		
1	99.99	99.99

Subtotal	99.99
Sales Tax	6.50
Total	106.49

Store #: 1209 Date: 9/3/16
Register #: 1 Time: 5:59 PM
Trx #: 7944
Cashier: CHARLES

ERATTA SHEET FOR CHANGES TO TEST REPORT 20595-1

During a post publication review, a reviewer noticed an incorrect reference on the Instrumentation sheet that indicated the test item was a Pocket Rocket Pyrotechnic flare instead of a LED Electric Distress Signal Flare.

An investigation revealed that the reference was a word publishing mistake initiated by using a template for the form which already had the item specified and the template was not changed in that cell during the initial publishing of the document. A verification of the data and content of the instrumentation log was conducted and it was determined that the reference to the Pocket Rocket Flare was a typographic error.

The item reference was revised as follows:

WAS:

TEST ITEM DESCRIPTION: Flares, Pocket Rocket Red Aerial

IS NOW:

TEST ITEM DESCRIPTION: Pyrotechnic Flares, LED SOS Electric Distress Signal Light

The report number was changed from 20595-1 to 20595-1A and republished.