



ENVIRONMENTAL
TEST REPORT
ON
NIGHTSTAR FLASHLIGHT
FOR
APPLIED INNOVATION TECHNOLOGIES, INC.
FORT LUPTON, COLORADO

| | | | |
|----------------|-------------------------|---------------|--------|
| WRITTEN BY | <i>Salim Khabieh</i> | REPORT | 3-4494 |
| CHECKED BY | <i>Denese Pootan</i> | AERO NAV S.O. | 4494 |
| APPROVED BY | <i>Gyanchand Pooles</i> | CUSTOMER P.O. | 400 |
| DATE | September 18, 2003 | CONTRACT NO.: | |
| GOVERNMENT QAR | NO INSPECTION REQUIRED | | |

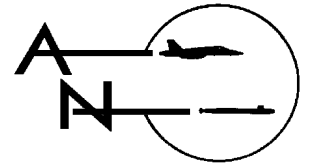
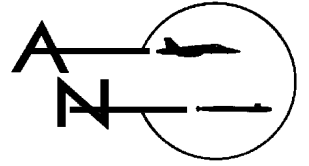


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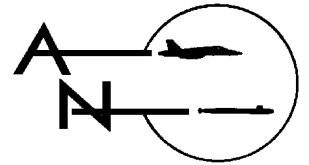
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REVISION HISTORY

Paragraphs/Sections Affected

Change



ADMINISTRATIVE DATA

PURPOSE OF TEST: To determine the effects of Environmental Conditions on the physical and operational characteristics of the NightStar Flashlight.

MANUFACTURER: Applied Innovative Technologies, Inc.
1310 Factory Circle
FT. Lupton CO, 80621

MANUFACTURER'S NOMENCLATURE: As specified on Purchase Order, the following nomenclature applies:
NightStar Flashlight.

DRAWING (S) AND / OR SPECIFICATIONS: Tested in accordance with ASTM F 1014-02, Aero Nav Labs Test Procedure 4494 dated March 6, 2003 and detailed instructions of client.

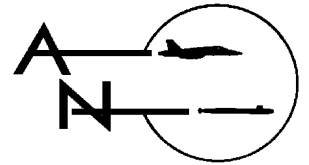
QUANTITY OF ITEMS TESTED: (7) Seven

DATE TEST COMPLETED: August 18, 2003.

TEST CONDUCTED BY: AERO NAV LABORATORIES, INC.
14-29 112th Street
COLLEGE POINT, NEW YORK 11356

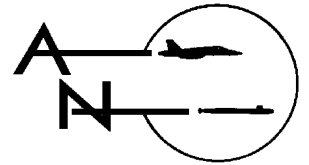
DISPOSITION OF SPECIMEN: Returned to client.

ABSTRACT: It is the function of Aero Nav Laboratories, Inc., as an impartial testing agency in performing tests, to subject the equipment to environmental conditions as specified in the detailed specifications.



1.0 DESCRIPTION OF TEST APPARATUS:

- 1.1** Salt Spray Chamber, Model 411-1-ACD, S/N S-4887
Manufactured By Industrial Pump and Filter Co.
Calibration Due: July 11, 2004.
- 1.2** Thermocouple Meter, Model 650-T-X-DSS, S/N AN054
Manufactured By Omega Engineering.
Calibration Due: December 26, 2003.
- 1.3** PH Meter, Model PH Tester 3+, S/N AN200
Manufactured By Oakton Ins.
Calibration Due: Before Each Used.
- 1.4** Humidity Test Chamber, Model S064-73177CH, S/N SW0
Manufactured By American Research.
Calibration Due: September 24, 2003.

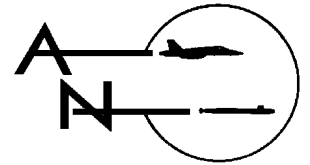


2.0 NAMEPLATE DATA:

NONE

3.0 TEST SEQUENCE AND COMPLETION DATES:

| | | |
|-----|---|------------------|
| 3.1 | Operation Test: | May 28, 2003. |
| 3.2 | Watertightness Test: | May 29, 2003. |
| 3.3 | End Cap Ring Test: | May 28, 2003. |
| 3.4 | Light Projection Test: | May 28, 2003. |
| 3.5 | Impact Test: | May 29, 2003. |
| 3.6 | Rough Use Test: | May 29, 2003. |
| 3.7 | Corrosion Test: | June 11, 2003. |
| 3.8 | Heat and Humidity Test: | August 15, 2003. |
| 3.9 | Switch Endurance Test (After the Rough Use Test): | August 18, 2003. |



4.0 METHOD OF TESTS:

4.1 Operation Test:

The NightStar Flashlight S/N 1 switch was operated five times. The test specimen was shaken vigorously in the "ON" switch position and monitored for continues operation.

The Nightstar flashlight was checked for physical damage that could prevent the NightStar Flashlight from performing its intended function.

4.2 Watertightness Test:

The NightStar Flashlight S/N 1 was submerged in a salt-water solution (1.04 sp gr) under a head of 1 ft (0.3m) for a period of 24 hrs at a water temperature of 65°F (18°C).

Upon the completion of the 24 hour exposure the unit was checked for water penetration.

4.3 End Cap Ring Test:

The end cap ring was subjected to a 25 LBS load for one (1) minute in the vertical direction and for one (1) minute in the horizontal direction.

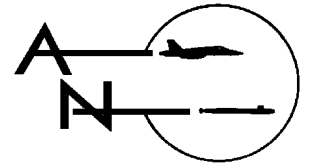
Upon the completion of this test, the unit was checked for distortion.

4.4 Light Projection Test:

The NightStar Flashlights S/N 1 & 2 where checked for a projected a concentrated beam of light not less than 5in (127mm) nor more than 11in (279mm) in diameter when located 5ft from a screen.

The plane of the screen was perpendicular to the optical axis of the flashlight.

The diameter of the concentrated beam was determined.



METHOD OF TESTS (continued):

4.5 Impact Test:

4.5.1 Test Conditions:

The NightStar Flashlight, S/N 2, was placed into a cold chamber at $-40^{\circ}\text{F} \pm 5^{\circ}\text{F}$ ($-40^{\circ}\text{C} \pm 3^{\circ}\text{C}$) for 2 hrs. Immediately following the two (2) hour exposure, The Nightstar Flashlight was subjected to the low and high impact tests specified in 4.4.1.1 and 4.4.1.2.

Impact Area:

- a) The outside of the test specimen case at a point midway between the ends of the case on a side 90° from the switch.
- b) The switch in the "ON" position.
- c) The switch in the OFF" position.
- d) The lens cap.
- e) The end cap.

4.5.1.1 Low Impact Test:

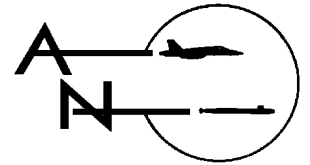
The NightStar Flashlight was subjected to a 12-lbf.in (1.4N.m) impact using a steel ball at each of the points specified 4.4.1.

The Nightstar flashlight was checked for evidence of breakage from the impact or moisture in the case, and for evidence of damage to the case or lens.

4.5.1.2 High Impact Test:

After the low impact test the NightStar Flashlight was placed into a cold chamber at $-40^{\circ}\text{F} \pm 5^{\circ}\text{F}$ ($-40 \pm 3^{\circ}\text{C}$) for 2 hrs. Immediately following the two (2) hour exposure, The Nightstar Flashlight was subjected to a 20lbf.in (2.3N.m) impact using a 1-lb (0.4-kg) steel ball at each of the points of impact indicated above in 4.4.1.

The Nightstar flashlight was checked for evidence of breakage from the impact or moisture in the case, and for evidence of damage to the case or lens.



METHOD OF TESTS (continued):

4.6 Rough Use Test:

The NightStar Flashlights S/N 4 & 6 and Enhanced Nightstar S/N 1M were allowed to free fall from a height of 5 ft (1.5m) onto a vinyl-asbestos tiled concrete floor.

The NightStar Flashlights were dropped twice in a horizontal position onto the switch, with the switch in the "ON" position, and twice with the switch in the "OFF" position, twice in a vertical position upon the head of the flashlight, and twice upon the base of the flashlight.

The NightStar Flashlights switches were operated 25,000 cycles. A cycle consisted of movement from "OFF" position through the full "ON" position and back to the "OFF" position.

Failure of the switch to complete 25,000 cycles constituted a failure. Failure of the LED or any other components of the NightStar Flashlights did not constitute a failure.

4.7 Corrosion Test:

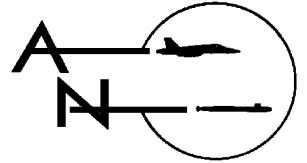
The NightStar Flashlight S/N 1 was subjected to salt spray exposure for 200 hrs in a 5% salt solution.

Prior to the start of the salt spray test, a sufficient amount in 5% salt solution was prepared for the test.

With the NightStar Flashlight in the preheated (35°C (95°F)) salt spray chamber, the salt spray test was performed for a period of two hundred (200) hours. The spray was circulated freely about the NightStar Flashlight in such a manner that there was no direct impingement of the spray or dripping of condensate on the NightStar Flashlight. No liquid that had entered the exposure chamber and had come in contact with the NightStar Flashlight was permitted to return to the salt solution reservoir. The temperature within the test chamber was maintained at 35°C (95°F). The PH of the salt solution was maintained between 6.5 and 7.2.

The NightStar Flashlight was then washed with fresh water and allowed to dry.

The NightStar Flashlight was operated in accordance with 4.1.



METHOD OF TESTS (continued):

4.8 Environmental Testing:

4.8.1 Heat and Humidity Test:

The NightStar Flashlights S/N 5 & 6 were placed on a horizontal surface in test chamber and subjected to dry heat at $150 \pm 1.5^{\circ}\text{F}$ ($65.6 \pm 3^{\circ}\text{C}$) for 16 hrs, followed by 6 hrs at 85 \pm 5% relative humidity and $100 \pm 2^{\circ}\text{F}$ ($38 \pm 1^{\circ}\text{C}$).

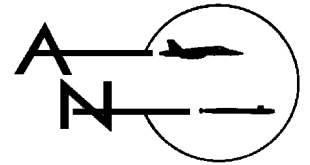
After performing the Heat and Humidity Test the NightStar Flashlight was compared with an untested NightStar Flashlight for dimensional stability and crazing of surface.

The NightStar Flashlight was operated in accordance with 4.1.

4.9 Switch Endurance Test:

The NightStar Flashlight S/N 3 switch was operated 25,000 cycles. A cycle consisted of movements from "OFF" position through the full "ON" position and back to the "OFF" position.

Failure of the switch to complete 25,000 cycles constituted a failure. Failure of the LED or any other components of the NightStar Flashlight did not constitute a failure.



5.0 RESULTS OF TESTS:

5.1 Operation Test (Nightstar Flashlight S/N 1):

There was no apparent physical damage or electrical malfunction a result of this test.

5.2 Watertightness Test (Nightstar Flashlight S/N 2):

There was no apparent physical damage or water penetration as a result of this test.

5.3 End Cap Ring Test:

There was no distortion noted as a result of this test.

5.4 Light Projection Test (Nightstar Flashlights S/N 2 & 3):

The following measurements were recorded during the test:

Flashlight S/N 2 16" DIAMETER

Flashlight S/N 3 16" DIAMETER

5.5 Impact Test (Nightstar Flashlight S/N 2):

5.5.1 Low Impact Test:

There was no apparent physical damage or electrical malfunction as a result of this test.

5.5.2 High Impact Test:

There was no apparent physical damage or electrical malfunction as a result of this test.

5.6 Rough Use Test (Nightstar Flashlight S/N 4):

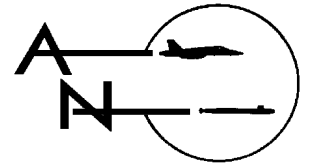
On the last drop unit Stayed "ON" with the switch in the "OFF" position.

At this point testing was discontinued.

5.7 Rough Use Test (Repeated With Nightstar Flashlight S/N 6):

After the first drop the unit Stayed "ON" with the switch in the "OFF" position.

At this point testing was discontinued.



RESULTS OF TESTS (continued):

5.8 Rough Use Test (Repeated with one (1) Enhanced Nightstar Flashlight S/N 1M):

There was no apparent physical damage or electrical malfunction as a result of this test.

5.9 Corrosion Test (Nightstar Flashlight S/N 1):

There was no apparent physical damage as a result of this test.

5.10 Environmental Testing (Nightstar Flashlights S/N 5 & 6):

5.10.1 Heat and Humidity Test:

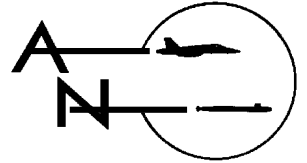
There was no apparent physical damage or electrical malfunction as a result of this test.

5.11 Switch Endurance Test (Nightstar Flashlight S/N 3):

There was no apparent physical damage or electrical malfunction as a result of this test.

5.12 Switch Endurance Test (post the Rough Use Test) Repeated with one (1) Enhanced Nightstar Flashlight S/N 1M:

There was no apparent physical damage or electrical malfunction as a result of this test.



6.0 VISUAL POST TEST EXAMINATION:

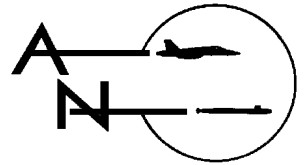
Visual post test examination revealed no further evidence of physical damage or electrical malfunction as a result of the stress of the testing herein.

7.0 RECOMMENDATIONS:

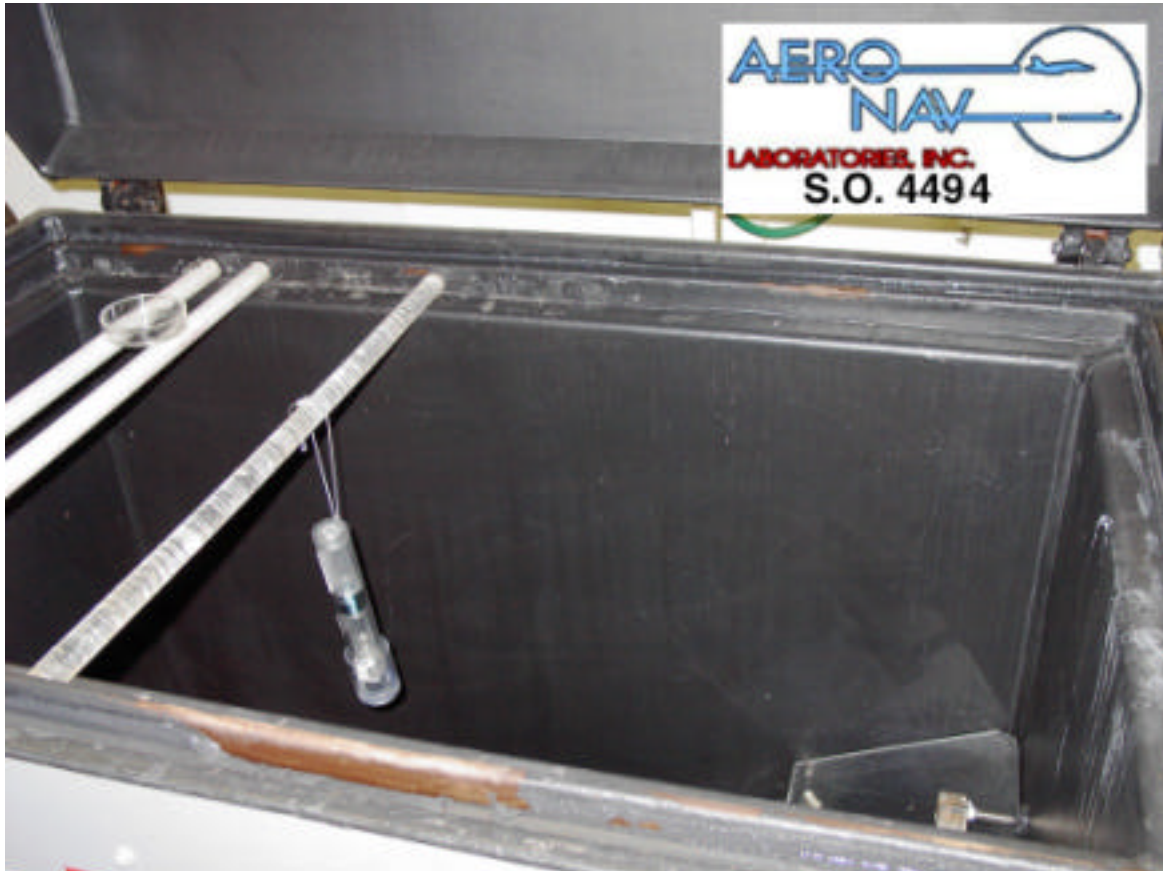
None, data merely submitted.

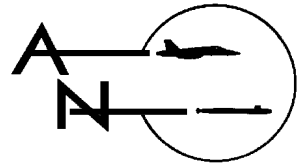
8.0 CONCLUSIONS:

Final evaluation of the submitted NIGHTSTAR FLASHLIGHT for conformance to the requirements of the detailed specifications will be accomplished by APPLIED INNOVATION TECHNOLOGIES, INC. and the cognizant government agency upon review of results reported herein and further examination as required.



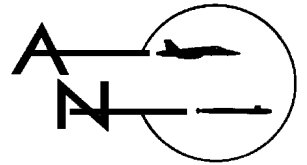
APPLIED INNOVATION TECHNOLOGIES, INC.
FORT LUPTON, COLORADO
NightStar Flashlight
Photograph Of Salt Spray Test Setup



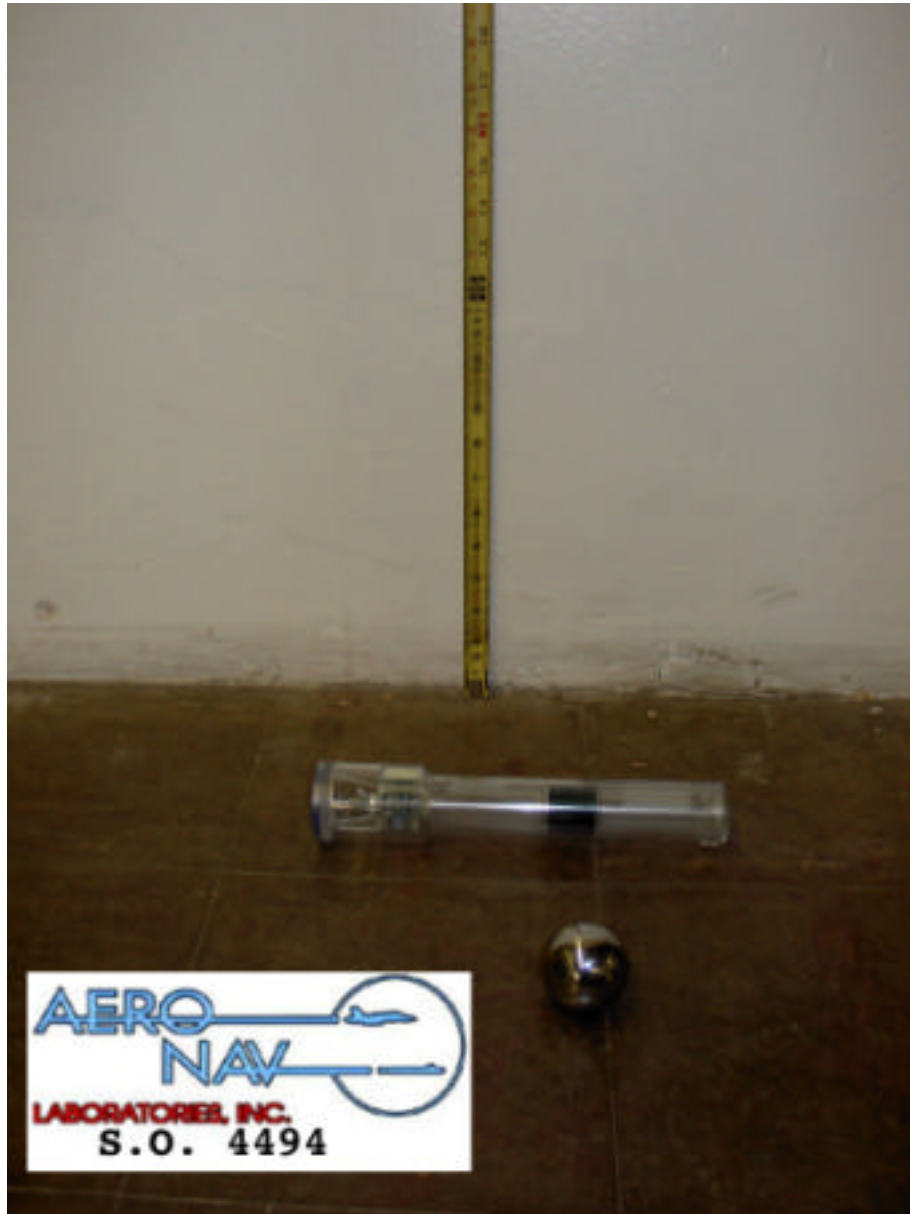


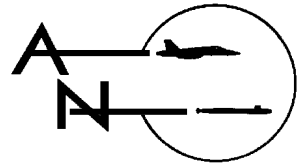
APPLIED INNOVATION TECHNOLOGIES, INC.
FORT LUPTON, COLORADO
NightStar Flashlight
Photograph Of Heat Test Setup





APPLIED INNOVATION TECHNOLOGIES, INC.
FORT LUPTON, COLORADO
NightStar Flashlight
Photograph Of Impact Test Setup





APPLIED INNOVATION TECHNOLOGIES, INC.
FORT LUPTON, COLORADO
NightStar Flashlight
Photograph Of Humidity Test Setup

