

**PREPRODUCTION INITIATIVE-NELP  
ARRESTING GEAR CABLE AUTOMATIC LUBRICATION  
TEST PLAN (SHIPBOARD TEST DIRECTIVE)**

**SITE: USS HARRY S TRUMAN**

<b><u>TEST DIRECTIVE</u></b> NAWCAD LAKEHURST (REVISED 10-97) THIS DIRECTIVE IS CANCELED UPON COMPLETION.	<b>TD NUMBER:</b> <b>12-GP-9800xx</b>
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Action addressees shall advise the test engineer immediately if any completion dates cannot be met. As soon as the work is accomplished, the action addressee shall mark “*Completed*” and the date on a copy of this directive and return it to the test engineer.

<b>From:</b> Code 4.8.12	<b>Effort:</b> Normal	<b>Date:</b>
<b>To:</b> COMNAVIARPAC COMNAVIARLANT	<b>Subject:</b>  Shipboard Test and Evaluation of the Automatic Cable Lubricator	

Revision Letter	Page Numbers	Date of Revision	Test Engineer	Test Team Leader	Performance Engineer (if reqd)	Systems Engineer (if reqd)	Test Branch Head	Program Manager
A								
B								

**References:**

(a) NAWCADLKE-PVTP-97-L025, Preliminary Evaluation of Automatic Cable Lubricator

**Copies to:**

4.8.12.1 (AR), 4.8.10.2 (LW), 4.8.1.4 (DP) (2), 4.8 A, 1.1.X.7.1

<b>Test Engineer: Code 4.8.12.1</b>  A. Rivera (x4974)	<b>Test Team Leader: Code 4.8.12.1</b>  R. O’Connor (x4968)
<b>Performance Engineer:</b>  D. Piatkowski (x2716)	<b>Systems Engineer: Code 4.8.10.2</b>  L. White (x4260)
<b>Branch Head: Code 4.8.12.1</b>  F. Valeri (x7728)	<b>Program Manager: Code 1.1.X.7.1</b>  J. MacIntyre (x1936)

1. General: The Navy Environmental Leadership Program (NELP) is currently providing equipment for the fleet to assist in performing its mission in a more environmentally sound and economical manner. An automatic cable lubricator has been designated to be within this category. Preliminary testing of this equipment was conducted at NAWCADLKE, NJ (reference (a)).

2. Objective: To evaluate the performance of the Core-Lube System 900 Series (Automatic Cable Lubricator) in an operational environment. The Core-Lube System's primary objective is to penetrate, clean, and coat the wire rope purchase cable with lubricant as the rope passes through the Core-Lube Housing.

3. Test Plan: The Automatic Cable Lubricator unit will be tested and evaluated aboard a designated USS aircraft carrier. The lubricator will be used to perform all maintenance lubrication on the purchase cable of each of the arresting engines. Two identical, complete lubricator systems will be provided.

A summary of key items for the evaluation is provided below:

- a. The automatic lubricator shall be used whenever cable maintenance lubrication is needed or required. The minimum schedule for use of the automatic lubricator shall be governed by the MRC.
- b. Data reporting is required to aid in determining the cost-effectiveness of the cable lubricator.
- c. The cable lubricator shall be used with the present lubricant, Prelube 6. Lubricant is circulated from the container assembly, through the lubricator, and back to the container assembly. Samples of this recirculated lubricant are needed to determine the quality of the lubricant remaining in the container. Bottles will be provided to sample the lubricant.

4. Action:

- a. COMNAVAIRPAC & COMNAVAIRLANT
  - (1) Specify host carrier to complete test directive. Please send copy of test directive to host carrier. Please notify NAWCADLKE when carrier has been tasked to conduct the test.
  - (2) Act as a liaison between host carrier and NAWCADLKE.
- b. NAWCADLKE, Code 4.8.1.4
  - (1) Provide two Automatic Cable Lubricator units to be tested and evaluated.
  - (2) Provide spare liners and an additional set of scraper bushings per unit.
  - (3) Provide or arrange for technical assistance should unforeseen difficulties be encountered.
  - (4) Tycom will be advised of all post-CV/CVN service test results and analyses.

c. NAWCADLKE, Code 4.8.12.1

- (1) Provide and execute shipboard Test Directive for component evaluation.
- (2) Report all progress during evaluation period.
- (3) Prepare Task Phase Report upon completion of Test Directive. All recommendations, if necessary, for any improvements to the design or durability of unit will be reported within this document.

d. Host Carrier

- (1) Provide personnel to operate test units under guidance of NAWCADLKE personnel.
- (2) Provide necessary equipment to function cable lubricator during evaluation period.
- (3) Provide suitable amount of Prelube 6.
- (4) Provide low-pressure air and an air hose long enough to reach the vicinity of the retractable sheave of each arresting engine (where the automatic lubricator will be used). The air hose shall be fitted with an appropriate quick-disconnect fitting to connect with a 1/2-inch male fitting on the lubricator air pump.
- (5) Complete the "Arresting Gear Cable Automatic Lubricator Environmental Payback Data Requirements" forms included with the Test Directive (information may be provided free-form if sent electronically). Provide samples of the Prelube 6 removed from the container assembly at required intervals.

5. Operating Instructions for the Automatic Cable Lubricator:

- a. The two lubricators that will be tested are identical and consist of three major components. The major components are the air pump assembly, the lubricator housing assembly, and the lubricant container assembly. All components will be delivered ready assembled for use on an aluminum cart for easy movement of the lubricator and for storage. The lubricator is operated totally by low-pressure air. Each assembly is described and defined as follows:

**Air Pump Assembly** - The purpose of the air pump assembly is to pump lubricant from the container assembly to the housing assembly, where the purchase cable is located, and to return excess lubricant to the container. The air pump is operated by low-pressure air. Lubricant pressure through the pump is manually regulated at the air supply valve and read via a pressure gauge. Air enters the air pump through a 1/2-inch quick-disconnect male fitting. The air inlet contains a needle valve to direct air to "air seals" within the

body of the housing. The air seals prevent lubricant from leaking from the housing and remove excess lubricant from the purchase cable. The air pump is shown on Figure (1).

**Housing Assembly** - The housing assembly is constructed of bright blue-colored polyurethane and contains the inner liners and scraper bushings. The housing is pictured on Figure (2). The liners and bushings maintain direct contact with the wire rope and are sized for proper fit to the 1 <sup>7</sup>/<sub>16</sub>-inch diameter purchase cable. The liners are stamped with the wire rope dimension, expressed decimally as 1.4375 inches. The liners and bushings are pictured on Figure (3). The housing assembly is fitted with a manifold of hoses for air and lubricant distribution through ports in the liners. The housing also contains shackle links that allow the housing to be secured to pad eye tie-down fittings.

**Container Assembly** - Consists of a six-gallon, open-lid plastic container and breather cover. The breather cover accommodates the suction strainer (filter), suction tube, and manifold coupling. The air pump assembly draws lubricant from this container, and this container receives the returned excess lubricant. The container assembly is pictured on Figure (4).

b. Core-Lube Data

Weight:

Housing:	8 lbs.
Pump:	17 lbs.
Total system:	45 lbs.
Cart:	### lbs.

Air Requirements:

Minimum air capacity:	15 cfm @ 100 psi
Minimum supply air pressure:	70 psi
Maximum supply air pressure:	175 psi

c. Operating Instructions

- (1) Install liner halves into lubricator housing. Ensure liners are stamped with cable diameter 1-7/16 expressed as 1.4375. The liner halves fit onto dowel pins. Press a bushing into each slot on each end of the housing.
- (2) Pull purchase cable out fully. Position the lubricator under the cable approximately 2 feet from the retractable sheave housing. Position it with return hoses toward the sheave. Close lubricator body. Ensure halves mate properly (liner and bushing installed correctly.) Close and secure clamps on bottom of housing. Ensure clamps are tight.
- (3) Attach nylon lanyards to quick links on housing. Hook other end to pad eyes. Snug lanyards tight, but do not overtighten—allow for some side-to-side movement of lubricator as cable runs through. For best results, ensure lanyards have even tension on both sides of the housing.

Figure 1: Air Pump Assembly

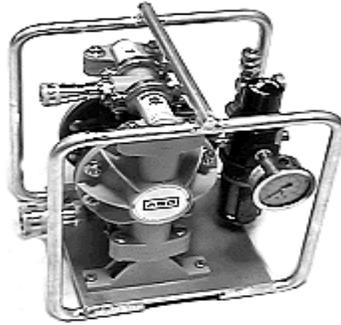


Figure 2: Housing Assembly

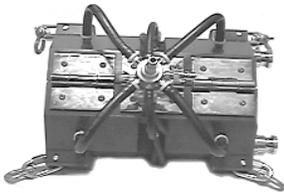


Figure 3: Bushings and Liners

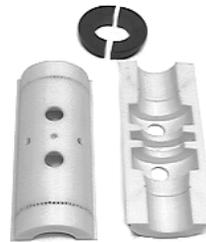


Figure 4: Container Assembly



- d. Ensure that two or three gallons of Prelube 6 lubricant are in the six-gallon plastic pail; fill as necessary. (Note: Do not overfill. Leave room for the suction tube and strainer basket.) Place suction tube with strainer basket installed into pail and fit lid to pail.
- e. (Please note that if lubricator is supplied with a storage cart, all hoses will already be connected.) Before attaching hoses, check to ensure the pump is off. The pump is off when the air regulator pressure gauge reads 0 PSI and the needle valve to activate the pump is in the horizontal position.
- f. Connect air hoses. Each of the lines on the lubricator system is equipped with a distinct quick-disconnect fitting to facilitate setup—each fitting is sized differently; hoses cannot be connected incorrectly. Hoses may be attached in any order.

**Air hose:** Provides pressurized air from the pump to the lubricator. Attach the 1/2-inch diameter hose to the fitting at the pressure regulator on the pump to the vertical fitting on the top of the lubricator hose manifold.

**Air supply line:** Make sure the air regulator and air needle valve are off (horizontal position) before connecting the air supply line. The air supply line is the source of low-pressure air to the system.

- g. Connect lubricant hoses.

**Lubricant return hoses:** Returns spent lubricant to supply pail. Attach two 1-1/4-inch flex return hoses to lubricator housing and manifold on pail lid. Securely clip cam coupling in place onto fittings.

**Oil suction hose:** Draws lubricant from supply pail to pump inlet. Attach 1/2-inch oil supply hose to quick-disconnect fitting onto fitting of suction strainer and to lower fitting on pump.

**Oil delivery hose:** Delivers lubricant from pump to lubricator. Attach 1/4-inch oil hose to the upper quick-disconnect fitting on pump outlet and the other to the horizontal check valve fitting on the manifold assembly on top of the lubricator.

- h. Set regulator pressure. Slowly turn the knob on the air regulator until the pressure gauge registers 40 to 60 psi.
- i. Lubrication. Open the needle valve to activate the pump (turn the needle valve 90 degrees to the vertical position).

Note: Do not run the cable through the housing without turning on the air valve. Air seals prevent the lubricant from leaking outside the housing.

- j. Observe the return lines for the initial flow of lubricant. Once lubricant is observed, begin to retract the cable. Retract the cable in a slow, controlled manner.

Caution: Do not allow the cable terminal to impact housing. Stop retracting when the terminal approaches the lubricator.

- k. Purge lubricant upon completion of the lubrication process and before dismounting the equipment from the wire rope. Turn the air regulator knob to the left until the air regulator pressure gauge reads 0 PSI—indicating no lubricant flow through the pump. Allow airflow to continue (needle valve in the vertical position), thus removing excess lubricant from the housing and hoses.

Once lubricant flow has ceased in the return lines, close the needle valve (horizontal position). Dismount the lubricator from the wire rope. The lubricant can be left in the supply container for the next lubrication job. Remove or scrape any accumulations of debris and cable preservative from the air seal ports, lubricant distribution ports, and the lubricant return ports in liners. Replace the aluminum cleaning bar in the lubricator housing before storage. No other cleaning is required.

#### 6. Lubricant Sampling Requirements:

The automatic lubricator system recirculates the lubricating oil through the housing back to the container. An inlet filter element and an outlet strainer basket are fitted in the container to remove large debris, but small particles and other materials that may be present or dissolved on the cable may contaminate the lubricant. The quality of the lubricant will be determined by analyzing samples of the lubricant removed from the container assembly. The oil in both the port and starboard containers will be sampled.

A sample bottle of oil shall be obtained from the container on the following schedule, on the basis of whichever is sooner:

- After the lubrication of four purchase cables.
- Before pouring additional lubricant into the container.

The sample shall be labeled to indicate port or starboard and the date and time the sample was taken. Ensure that the sample label is created and protected in such a way that it will not be obliterated by residual oil from the sample bottles. The samples shall be forwarded on a monthly basis to the Naval Air Warfare Center as follows:

Naval Air Warfare Center  
Aircraft Division  
Code 4.8.1.4, Bldg. 562-2  
Highway 547  
Lakehurst, NJ 08733-5033

## ARRESTING GEAR CABLE AUTOMATIC LUBRICATOR ENVIRONMENTAL PAYBACK DATA REQUIREMENTS

### 1. Objective

This section describes the data collection procedure for determining the environmental and financial investment returns for the arresting gear cable automatic lubricator. The data will be reviewed to establish return on investment via indicators such as cost/benefit analysis, payback period, internal rate of return (IRR), and net present value (NPV).

The lubricator will then be tested aboard the USS Harry S Truman in an operational environment, where data will be collected regarding environmental and financial returns. Specifically, the unit will be evaluated on its ability to:

- reduce wasted lubricant caused by spills and inefficient application techniques
- reduce the amount of hazardous waste requiring disposal
- reduce the time and costs associated with lubricating the purchase cable.

### 2. Description

The wire rope is traditionally lubricated by pouring lubricant over the cable and wiping it with rags, or by running the cable through a trough of lubricant. The process is messy—resulting in lubricant spills on deck and lubricant-laden rags being disposed of as hazardous waste. The arresting gear cable automatic lubricator will eliminate spills by applying lubricant to the wire rope in a closed-loop system.

### 3. Data Collection

Data will be collected to evaluate the unit's effectiveness in saving time and money and reducing waste volume.

#### 3.1 Approach

Quantitative and qualitative data will be acquired by completion of Tables 1 and 2.

##### 3.1.1 Instructions for Completing Tables

The following data will be collected to evaluate the performance of the automatic lubricator.

##### *Table 1: Usage Report*

**Date:** Indicate dates the unit was used and the arrestment number on the engine.

**Cable Number:** Indicate which cable was lubricated by arresting gear engine number, and port or starboard.

**Time/Task:** Record the length of time required to lubricate each cable. Also, indicate the time required to set up the lubricator onto the cable.

**Waste Volume:** Indicate the volume of lubricant, if any, requiring disposal.

**Quality:** A sample of lubricant shall be removed from the lubricator container assembly in the collection bottle provided. The sample shall be removed after the lubrication of four purchase cables or before pouring additional lubricant into the container, whichever event is sooner. These samples will be analyzed to determine the quality of lubricant being returned to the container assembly.

## *Table 2*

### **Consumables**

**Item:** Record the name of any item required as part of the process of using or maintaining the lubricator, especially lubricant, rags, and liners (if necessary). Also indicate any other consumables or items determined by the ship's force to be necessary, i.e., cleaners, tools, etc.

**Quantity/Volume:** Indicate the quantity or volume of any consumables used, i.e., gallons of lubricant, number of rags.

**Cost:** Indicate the cost of the consumables ordered (where available).

### **Downtime/Month**

**Time Period:** Record dates when the unit could not be used to lubricate the cable.

**Reason:** Explain whether downtime was due to repairs, maintenance, workload, or other factors.

### **Repairs**

**Time:** Indicate the time required to repair the system.

**Parts:** List the repair parts required.

**Cost:** Record the cost of the parts and the labor required for repair.

**Qualitative Assessment:** Provide a narrative evaluation of the capabilities of the cable lubricator. Briefly discuss:

- Efficiency of use compared to present methods
- Ease-of-use compared to previous methods
- Apparent durability and ruggedness.
- Suggestions to improve the design, operation, storage, or maintenance of the cable lubricator system.

#### **4. REPORTING**

Simple forms have been generated to collect the above-required data. These data will be collected during the time the lubricator is under evaluation, a period not to exceed six months. During the evaluation period, submit periodic status reports on the testing to NAWCADLKE. Please fax the forms as they are completed (or on a monthly basis at a minimum) to Marty Casey at 609-667-7586 and David Piatkowski at 732-323-1988. Alternatively, the data can be e-mailed to the following address: [piatkods@lakehurst.navy.mil](mailto:piatkods@lakehurst.navy.mil).

At any time, include results and detailed observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with fleet operations.



**Table 2**

**Consumables**

Date	Item		Quantity/Volume	Cost
	Number	Description		

**Downtime**

Time Period	Reason

**Repairs**

Time	Parts	Cost	
		Parts	Labor

**Qualitative Assessment:**

Please comment on the effectiveness and efficiency of the unit. Use additional space as necessary.

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