UNITED STATES MARINE CORPS
Marine Corps Schools
Quantico, Virginia 22134

46/3/vls
51-58-03
4 Oct 1963

From: Coordinator, Marine Corps Landing Force Development Activities, (CMCS) Marine Corps Schools, Quantico, Virginia
To: Commandant of the Marine Corps (Code AX)

Subj: Project No. 51-58-03, Helicopter Cover; Final Report

Encl: (1) Final Report, Project No. 51-58-03

1. Enclosure (1) is forwarded. The Coordinator concurs with the conclusions and recommendations contained in paragraphs 3 and 4 of the report respectively.

L. W. WALT
Deputy Coordinator

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46/3A/FJF:dce
51-58-03

CLASSIFICATION: Unclassified

PROJECT NO: 51-58-03

SUBJECT: Helicopter Cover; final report

REFERENCE: (a) CMC Proj Dir AAJ-1-mjp of 28 Oct 58 to CMCS (CMCLFDA)
(b) Ch, BuWeps Publication NAVWEPS 01-1A-509 "Corrosion Control for Aircraft" of 1 Dec 61

1. INTRODUCTION

a. Purpose - To develop a suitable covering for "ready to fly" type storage of helicopters on carrier flight decks.

b. Description

The covers are manufactured from ten ounce Army Duck treated with a dry type water repellent finish, and are tailored to reduce possible wind damage. Extensive use of zippers and Velcro fasteners were made to reduce the installation time and the number of personnel required to don and doff the cover.

c. Background

(1) The magnesium and aluminum alloy construction of helicopters is susceptible to corrosion and deterioration due to the effects of salt water while operating from LPH's, LST's, and LSD's. This indicates a pressing need for protection of the helicopters.

(2) Marine Aircraft Group 26, Second Aircraft Wing, Fleet Marine Force, Atlantic, utilized polyethylene plastic, and wrapped the aircraft. Test results established that it required ten man hours to cover an HUS type helicopter. This precluded day to day flight maintenance and did not meet the "ready to fly" type storage they require.

(3) Following receipt of the project directive (reference (a)), a prototype cover was designed and constructed by MCLFDC personnel utilizing a 16 ounce neoprene coated nylon (11 ounce neoprene and five ounce nylon). This cover was delivered to MAG-26 for evaluation. Subsequent modifications were effected and seven test covers were constructed at the Marine Corps Air Station, Cherry Point, North Carolina, and delivered to MAG-26 for troop test. The material was aluminum color on the outside and black on the inside. A single cover consisted of 13 separate panels, weighed 205 pounds, and when packaged, occupied nine cubic feet of space. To cover the helicopter, the panels were locked together on the helicopter by means of nylon cords passed through grommets provided on the panels.

(4) Following limited tests aboard an LSD, a test cover was returned to Marine Corps Landing Force Development Center for modification. To reduce the excessive donning time, the lacings were replaced by industrial zippers. Additionally, panels were permanently sewn together in all locations that would not result in assembly problems. After local evaluation and testing, a commercial manufacturer of canvas products was awarded a contract for the manufacture of new covers. This incorporated all modifications developed during previous testing, and those required because of changes to aircraft configuration.

3. DISCUSSION

a. The design criteria established for the development of a suitable helicopter cover contained the following features:

(1) Speedy employment by aircrew personnel without special equipment.

(2) Complete coverage of helicopters, affording protection from normal environmental conditions.

(3) Easy access to inspection and maintenance panels.

(4) Durable and easy to repair without special equipment.

(5) Inexpensive and long shelf life.

b. In the course of the testing conducted so far on this project, a satisfactory means of separately obtaining almost any of the above features has been found. However, it is difficult to obtain all of these desired features in a single item. Some of the features basically conflict with others and the materials required to satisfy certain features adversely affect others. For example, an early prototype was a large, all-encompassing bag simple and rapid to employ. However, it was heavy, difficult to handle and easily punctured by the many small protrusions from the fuselage when buffeted by high winds. Tailoring the cover in an effort to eliminate these problems resulted in a cover consisting of 13 separate panels which required separate handling and subsequent lacing together with a resultant significant time increase in the employment phase. The utilization of a coated fabric to improve the durability and ruggedness of the cover to prevent rough handling damage resulted in an airtight cover that caused the aircraft to sweat. The condensation thus created would also induce corrosion.

c. The approaching introduction of a new family of helicopters has diminished the requirement for these covers. Aluminum alloys, less susceptible than magnesium to corrosion are the principal structural materials. New Methods of insulating unlike metals from each other have been devised to reduce electrochemical action, and new methods of electroplating and

anodizing together with more stringent quality control during manufacture have been implemented by Chief, BuWeps. Additionally, smaller covers have been designed and will be provided for protecting critical exposed areas such as rotor heads and engine inlets during maintenance and storage operations. These covers will require only minutes to don and doff.

d. Additionally, during a recent review of this project, which included a complete re-evaluation to substantiate the requirement for these covers, an informal conference with representatives of the Chief, Bureau of Naval Weapons (Code RRMA) was held. The conclusions of this conference were as follows:

(1) That the following action would have to be taken in each instance of installing the cover for effective prevention of corrosion.

(a) Thoroughly wash the aircraft with unsalted water, then dry thoroughly.

(b) Inspect the aircraft for damage to painted surfaces and retouch unprotected and exposed metal areas.

(c) Use a supplementary soft-film protective coating such as those described in Section XIII to NAVWEPS 15-01-500. In their absence, JP5 fuel will offer some temporary protection.

(d) Install and hermetically seal the cover or in the absence of this procedure, provide dry air ventilation to preclude the condensation of moisture.

(2) In summary, it was concluded that the above action to prevent corrosion action, 2.d.(1)(a) through (c), is already a maintenance requirement as contained in Chief, Bureau of Naval Weapons Publication NAVWEPS 01-1A-509, "Corrosion Control for Aircraft", of 1 December 1961, (reference (b)). These actions have proven to be a satisfactory preventive method, when diligently applied. Accordingly, the manufacture, procurement, and installation of the additional cover is not warranted.

3. CONCLUSIONS

a. The prototype Helicopter Cover is unsuitable for Marine Corps use.

b. The modifications developed during the test program will not make the cover suitable for "ready to fly" type storage.

c. The proper application of recent NAVWEPS instructions, together with engineering advances, have reduced helicopter vulnerability to corrosion.

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4. RECOMMENDATIONS

a. That no further development effort be expended on testing the prototype helicopter cover.

b. That the prototype Helicopter Covers be disposed of in the best interest of the government.

c. That Project No. 51-58-03 be terminated.

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DETAILS OF TEST

1. TEST NO. 1 - PROTECTIVE CAPABILITIES

a. The purpose of this test is to determine to what degree the subject cover performs the designated task of providing protection for the enclosed helicopter.

b. RESULTS

(1) One HUS-1 Helicopter BUNO 145735 was selected for use in evaluating the subject cover. This helicopter was thoroughly inspected for corrosion and/or defects prior to application of the cover.

(2) There were no indications of corrosion, staining, deterioration or wear on the helicopter or its component parts at the time the test commenced. Figures (1) through (4) (Annex B) depict the installation proceedings.

(3) During the test period, sub-divided into two parts and lasting for a total of five days, the average, minimum and maximum weather conditions were noted as follows:

(a) Temperature 72-90 degrees F.

(b) Cloud cover scattered

(c) Humidity 87-93%

(d) Precipitation none

(e) Unusual weather. Thunderstorms in locality but not in the immediate vicinity of aircraft involved in test.

(4) The first test period was for one day; the second a duration of four days. The aircraft conditions on completion of each test were as follows:

(a) First Test (one day) conducted aboard the U.S.S. Thetis Bay in vicinity of Vieques, P.R. The plastic window of the cargo door was warped. Aircraft was covered with sweat beads. Salt air and spray entered around main and tail landing gear and around bottom of aircraft.

Aircraft was washed with fresh water.

(b) Second Test (four days) conducted aboard the U.S.S. Boxer between Guantanamo Bay, Cuba and Onslow Beach, North Carolina. The aircraft was covered with sweat beads. Salt air and spray had again entered around main tail landing gear.

Aircraft was washed with fresh water.

(c) Post Test photos of sweat beads are unavailable due to rapid evaporation when the cover was removed.

2. TEST NO. 2 - MODIFICATIONS REQUIRED

a. The purpose of this test was to determine the modifications required to make the subject cover most suitable for its designed purpose.

b. RESULTS

(1) During the test, it became apparent that a means must be provided to safely move the aircraft about the carrier. To accomplish this it is necessary for the crew chief to be in the aircraft to control the brakes. In order to provide him with external visibility a clear plastic panel must be installed in front of the pilots window. This is an essential modification.

(2) Addition of top vents to prevent pressure loads beneath cover and to relieve heated air or a capability to hermetically seal the cover once installed. This modification is essential.

(3) During these tests it was noted that the Helicopter Cover would not fit on the 14,800 and subsequent bureau number aircraft due to a main landing gear configuration change.

(4) The rapid formulation of condensation, with the resultant necessity to develop additional hardware to prevent or dissipate that moisture, caused the testing and modification to be suspended pending a re-evaluation of the requirements.

Front section emplaced and midsection being attached

ANNEX B

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Positioning rotor blade cradle after covering mid-section of fuselage.

ANNEX B

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Fig 2

Tail pylon cover can be installed with tail folded or extended

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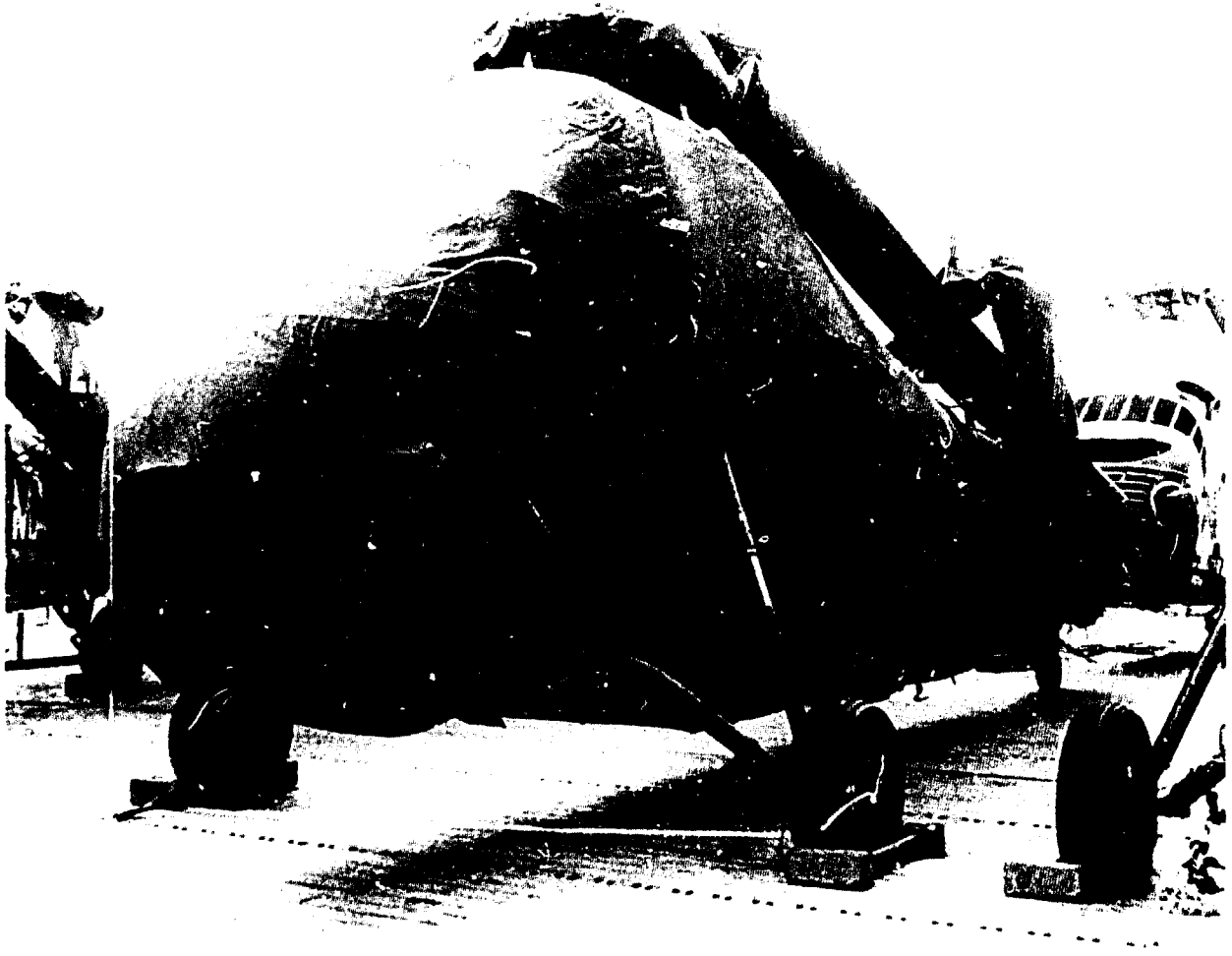
Fig 3



Helicopter Cover employed on HUS aboard LPH

ANNEX B

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Fig 4

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