

20030109026

Best Available Copy

②

AD-A144 993

**THE EXPERIMENTAL MOD III
FIREFIGHTERS'
ALUMINIZED, CRASH-RESCUE,
FIRE-PROXIMITY HOOD**



DTIC
ELECTE
AUG 30 1984
S D E

**NAVY CLOTHING AND TEXTILE RESEARCH FACILITY
NATICK, MASSACHUSETTS**

Approved for public release;
distribution unlimited.

TECHNICAL REPORT NO. 154

84 08 29 051

DTIC FILE COPY

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER 154	2. GOVT ACCESSION NO. AD A144993	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) The Experimental MOD III Firefighters' Aluminized, Crash-Rescue, Fire-Proximity Hood		5. TYPE OF REPORT & PERIOD COVERED Final Report
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Harry P. Winer		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Navy Clothing and Textile Research Facility 21 Strathmore Road Natick, MA 01760		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 62758N, 58.523, 62-1-58
11. CONTROLLING OFFICE NAME AND ADDRESS Same as 9.		12. REPORT DATE July 1984
		13. NUMBER OF PAGES 12
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release, distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report) Same as 16.		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Firefighters' Aluminized Crash-Rescue Fire-Proximity Hood; Firefighters' Liftup Facepiece Visor; Protective Clothing Service Test; Aluminized Materials; Fire-Resistant Materials		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The Navy Clothing and Textile Research Facility (NCTRF) has developed the experimental Mod III Firefighters' Aluminized Crash-Rescue Fire-Proximity Hood, which improves upon the standard firefighters' aluminized hood (MIL-H-29144). Reports from the firefighting community have indicated that the standard hood is not compatible with the current self-contained breathing apparatus. To allow for the self-contained breathing apparatus, a new aluminum frame with a greater front radius has been developed, and a liftup visor with an enlarged area for improved vision and voice communications has been incorporated in the experimental hood.		

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

This visor also reduces fogging of the face shield. Also, a bib is attached to the front to serve as a protective flap over the vacuum-deposited gold-coated facepiece when the hood is not being worn. (U)

NCTRF has conducted a service evaluation of the experimental Mod III hood. As a result of this evaluation, NCTRF recommends the adoption of the Mod III hood with a two-piece, adjustable chinstrap. (U)

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

TABLE OF CONTENTS

	<u>Page</u>
List of Illustrations.....	iv
Introduction.....	1
Initial Investigation.....	1
Description of the Standard Fire-Proximity Hood.....	2
Description of Experimental Mod I Hood.....	2
Evaluation of Mod I Hood.....	2
Description of Experimental Mod II and Mod III Hoods.....	4
Field Test Procedure.....	4
Results.....	6
Conclusion and Recommendation.....	6
Appendix A. Information Sheet & Questionnaire for Service Evaluation...	A-1

Accession For	
NTIS GRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By _____	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	



LIST OF ILLUSTRATIONS

<u>Figure</u>		<u>Page</u>
1	Standard Firefighters' Aluminized, Crash-Rescue, Fire-Proximity Hood.....	3
2	Mod III Firefighters' Aluminized, Crash-Rescue, Fire-Proximity Hood with the Visor Raised.....	5

THE EXPERIMENTAL MOD III FIREFIGHTERS' ALUMINIZED, CRASH-RESCUE,
FIRE-PROXIMITY HOOD

INTRODUCTION

The Navy Clothing and Textile Research Facility (NCTRF) has developed the experimental Mod III Firefighters' Aluminized, Crash-Rescue, Fire-Proximity Hood with liftup visor, which is designed to fit comfortably over the standard, self-contained, breathing apparatus. The standard, firefighters', aluminized hood (MIL-H-29144), on the other hand, is not compatible with current breathing devices. If a breathing apparatus were required, the hood would now be discarded, leaving the firefighter's head unprotected from heat. Other reported deficiencies of the standard hood are: poor peripheral vision; severely restricted voice communication while in the standby mode; fogging of the facepiece; easily damaged, vacuum-deposited, gold-coated facepiece.

To allow for the current breathing apparatus, the Mod III hood has been designed with a greater front radius. An enlarged liftup facepiece also is incorporated to increase the peripheral vision, improve upon restricted voice communications while in a standby mode, and decrease fogging of the face shield. The detachable, plastic, protective cover for the vacuum-deposited, gold-coated facepiece has been replaced by a permanent aluminized bib, which protects the facepiece when the hood is not in use. NCTRF service-evaluated the experimental Mod III fire-proximity hood and recommends its adoption. The Mod III hood was highly preferred over the standard, aluminized, fire-proximity hood. This report presents the results of the service test comparing the experimental hood with the standard one.

INITIAL INVESTIGATION

An initial survey of the tri-service firefighting community confirmed that the standard, aluminized, fire-proximity hood was incompatible with the standard, self-contained, breathing apparatus. Also, a number of other deficiencies were reported, such as, poor peripheral vision, fogging of the facepiece, use of an easily damaged vacuum-deposited, gold-coated facepiece, and severely restricted voice communication while in the standby mode. Investigation into commercial, aluminized, firefighters' proximity hoods indicated that there was not a commercial hood that would satisfy NCTRF's requirements. Areas that were deficient in the commercial hoods were:

- a. the front radius, which was not great enough to encompass a breathing apparatus and to permit unrestricted voice communication;
- b. the liftup face shields, which were not airtight (no gasket between face shield and hood); and,
- c. the gold-coated shields on some models, which could be replaced only at the factory.

DESCRIPTION OF THE STANDARD FIRE-PROXIMITY HOOD

The standard fire-proximity hood consists of a one-piece molded frame made of a fibrous-glass-reinforced polyester resin (see Figure 1). A bump-cap-style helmet is attached to the frame by means of a swivel-type, spring-loaded-plunger attachment. The frame-and-helmet assembly is covered by a hood composed of a highly reflective aluminized outer shell. The outer shell is joined to a quilt-lined inner shell, which provides thermal insulation. The hood has a channeled face opening, which permits easy insertion and removal of the facepiece support and the metallized facepiece. The metallized facepiece is a gold-coated, polyester-type, plastic film; the inserts are held securely in position by two flaps, one at each end of the face opening. Also held in place by the flaps is a protective facepiece cover, which is removed when the hood is in use.

DESCRIPTION OF EXPERIMENTAL MOD I HOOD

NCTRF contracted with I.L.C. Dover to design a new fire-proximity hood that would be compatible with the standard, self-contained, breathing apparatus and would eliminate the other deficiencies associated with the standard hood. An experimental Mod I hood was designed with an aluminum frame, which has an increased radius to allow for the self-contained breathing apparatus. A liftup visor was also incorporated into this experimental hood. This visor consisted of: a three-piece aluminum frame; two side pieces, which incorporated the pivot points for rotating the visor assembly open and the visor handles to allow for easy opening without contact with the outer gold surface; and one bottom framepiece, which provides rigidity and acts as the pad for the visor clamp to push against.

Silicone was selected as the seal material because of its resistance to heat and chemicals, both of which are encountered during operations. A "P" configuration seal was chosen, because it is a standard compression-seal configuration available from a number of suppliers, and it presents a wide sealing surface during usage. Two small toggle clamps, which secure the visor in the closed position, provide a positive pressure against the front section of the bottom aluminum frame of the visor.

For protection of the gold-coated facepiece, an attached aluminized b/b was added to the front of the hood. When not in use, the bib can be extended over the visor to prevent the gold surface from becoming marred. A bump cap was secured to the inner visor frame by means of universal mounts to ensure that the bump cap tracks the visor frame. The universal mounts allow for quick removal of the cap, if required. A handle, attached to the top of the hood for ease of carrying and for hanging during storage, helps to eliminate unnecessary damage to the hood's fragile materials.

EVALUATION OF MOD I HOOD

In-house evaluation of the Mod I fire-proximity hood demonstrated that all currently used, self-contained, breathing apparatus could be worn comfortably under the hood. Because of the amount of curvature in the front facepiece, an inadequate seal was found at the bottom corners of the facepiece. NCTRF determined that the clamps would have to be moved to the back corners in order to apply both backward and sideward pressure. The

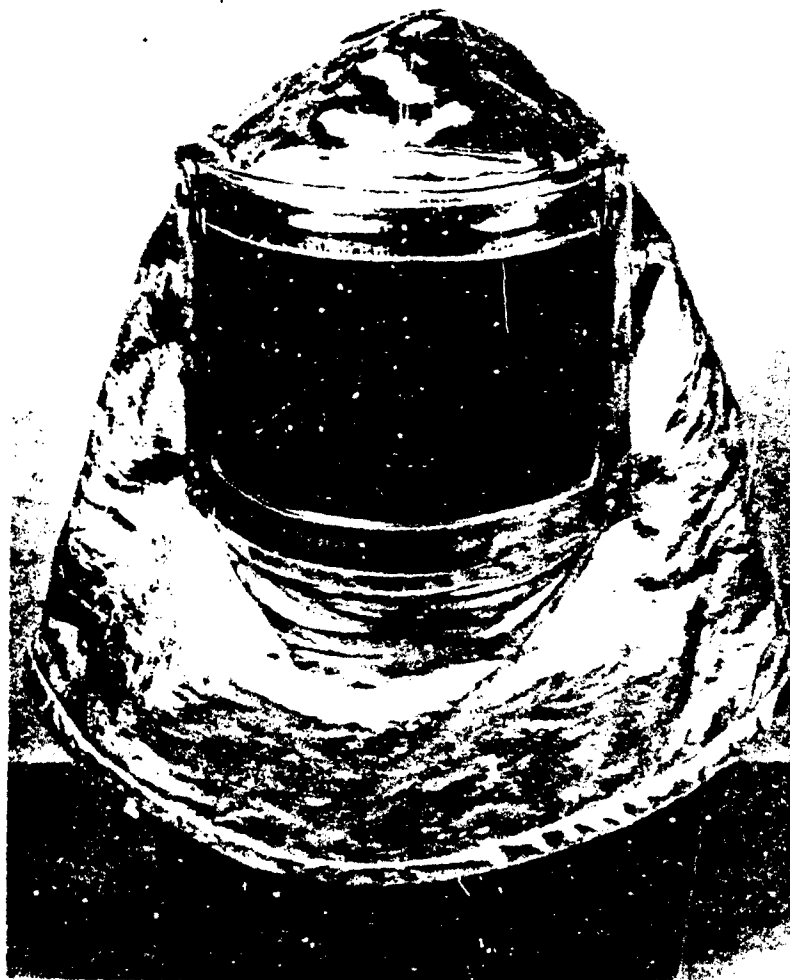


Figure 1. Standard Firefighters' Aluminized, Crash-Rescue, Fire-Proximity Hood.

movement of the clamps then allowed for the removal of the aluminum framepiece at the bottom of the visor. Also, I.L.C. Dover decided that, to reduce cost, the side frame and handles for the visor would be one piece instead of two. Because the handle on the top was determined to be hazardous in an operational mode, it was to be removed. I.L.C. Dover was then awarded a contract to produce 30 additional hoods with these modifications, which became the experimental Mod II hood that has been field-tested against the standard hood.

DESCRIPTION OF EXPERIMENTAL MOD II AND MOD III HOODS

The experimental Mod II and Mod III Firefighters' Aluminized, Crash-Rescue, Fire-Proximity Hood (see Figure 2) consist of an inner and an outer aluminum frame support, which allow the aluminized outer shell fabric and quilted liner to be sandwiched between them (1). This sandwiching effect is secured by rivets in the Mod II and nuts and bolts in the Mod III. The top left and right corners of the frame are pivot points for the liftup visor, which is composed of a facepiece support and metallized facepiece held together by aluminum supporting pieces on the sides. A "P" configured silicone seal is placed on the outer surface of the aluminum frame to prevent smoke from entering between the liftup visor and frame. An aluminized protective bib has been stitched onto the bottom front side of the aluminized hood. When the hood is not in use, the bib extends over the facepiece, preventing it from becoming marred.

The basic cover was enlarged by 3 inches to improve its drape over the wearer's shoulder. The outer shell fabric was also changed from an aluminized asbestos/aramid blend to an aluminized Kevlar fabric. Spring-loaded clamps are attached to the bottom left and right corners of the frame to hold the visor securely to the frame in an operational mode. The Mod II hood has a bump cap attached to the inside of the frame, which is similar to the bump cap in the standard firefighters' hood. The difference between the Mod II and the Mod III was that an improved latch was developed for the Mod III hood. The Mod III latch has an internal spring instead of the external spring, which broke on the Mod II latch.

FIELD TEST PROCEDURE

A total of 29 Mod III hoods were evaluated at the following locations: Tyndall Air Force Base, FL; Chanute Air Force Base, IL; Barksdale Air Force Base, TX; Marine Corps Air Station, Cherry Point, NC; Oceana Naval Air Station, VA; Whidbey Island Naval Air Station, WA; Cecil Field Naval Air Station, FL; and aboard the Carriers KENNEDY, AMERICA and KITTY HAWK. The Mod III hood was service-evaluated for a 3-month period during actual crash rescue and practice sessions. At the end of the test period, the hoods were inspected at Chanute and Oceana, the test subjects were debriefed, and the questionnaires completed at all test sites. (Appendix A contains a sample questionnaire.)

(1) Winer, Harry P., The Experimental Mod II Firefighters' Aluminized, Crash-Rescue, Fire-Proximity Hood: An Interim Report of a Limited Service Test, NCTRF Technical Report No. 143, July 1982.



Figure 2. Mod III Firefighters' Aluminized, Crash-Rescue, Fire-Proximity Hood, with the Visor Raised.

RESULTS

The hoods were worn between 2 and 75 times, and 20 of the test subjects wore breathing apparatus with the hoods. Those personnel using the breathing apparatus determined that the fit was either excellent or good (on a scale of excellent, good, or poor). During a training fire, one of the participants experienced a small amount of smoke entering the hood, and no one experienced excessive heat entering from the edges of the visor. Therefore, the seal created by the silicone gasket and the liftup visor adequately accomplished its purpose.

Ninety-three percent of the personnel preferred the swing-out visor to the nonmoveable visor because of better visibility, easier communication in a standby mode, and less fogging of the face shield. Every test subject (100%) determined that maneuverability and visibility with the Mod III hood were equal to or better than those characteristics with the standard hood.

A number of the test subjects found difficulty using the chinstrap with the breathing apparatus because it was a one-piece chinstrap.

CONCLUSIONS & RECOMMENDATION

In the service evaluation, the experimental Mod III Firefighters' Aluminized, Crash-Rescue, Fire-Proximity Hood was found to be superior overall to the standard-issue hood (MIL-H-29144). During the service evaluation, it was determined that the chinstrap should have a two-piece construction instead of the single hand-pull type in order that it can be maneuvered around the breathing apparatus.

Since this hood is drastically different from the standard hood, a user's operation manual should be prepared. A number of the test subjects were not aware of proper operating techniques, such as, when to use the lift-up visor and how to adjust the latches to tighten the face shield and improve the seal.

NCTR recommends the adoption of the Mod III hood with a two-piece, adjustable chinstrap.

APPENDIX A
Information Sheet & Questionnaire for Service Evaluation

31:HW:jg
62-1-58

General Information for Test Subjects, Concerning Evaluation
of Experimental Hood, Firemen's, Aluminized Proximity

The Navy Clothing and Textile Research Facility (NCTRF), Natick, MA, has completed development of a new style of firemen's aluminized fire-proximity hood and is asking you to "wear test" these hoods under "actual-use" conditions. After results are obtained from this evaluation, modifications will be made to this hood, if required, and then proposed for adoption to replace the current standard headwear.

The main differences between the standard hood and the experimental hood are that the experimental hood enables the wearer to swing out the visor when he is in a standby condition, increases peripheral vision, and permits the ease of use of all type of breathing apparatus under the hood. The thermal qualities of these hoods are comparable to the standard headwear and are suitable for wear under the same conditions as the standard.

In this evaluation you are being asked to wear the hood, as needed, during performance of duties and to record your observations, on a daily basis, until the evaluation is terminated. At the end of the evaluation, you are to complete the attached questionnaire and forward it to NCTRF. Important factors to observe include fit, comfort, ability to perform duties, problems that occur due to the new swing-out visor, the use of breathing apparatus with the new-style hood, and any other factors you may consider to be important. In this connection, the new style should be compared with the standard.

If you have any opinions as to how this headwear can be improved, kindly offer your comments and suggestions.

After 4 months of wear, if the hoods are still usable, it is not necessary to return them; however, if they cannot be used, it is important for us to see the defective hoods.

The information gained from this evaluation will greatly assist this Facility in developing the best possible protective headwear for use by firefighting personnel.

Your cooperation in taking part in this wear test evaluation is greatly appreciated.

QUESTIONNAIRE

EVALUATION OF FIREFIGHTERS' HOOD

NAME AND RATE _____

STATION _____

NUMBER OF TIMES WORN _____

WAS BREATHING APPARATUS WORN? YES _____ NO _____

IF YES, TYPE _____

1. How was the fit and comfort of the experimental hood compared with the standard issue hood?

Better than _____ Equal to _____ Worse than _____

2. a. How would you rate the feature of the "swing out" visor compared with the non-moveable visor?

Better than _____ Equal to _____ Worse than _____

b. If better than or worse than, how or why? _____

3. While fighting fires, did you experience any smoke entering the hood from around the visor? Yes _____ No _____

4. Did you experience flames or excessive heat entering the hood from around the edges of the visor? Yes _____ No _____

5. How was your ability to maneuver with the experimental hood compared with the standard issue hood?

Better than _____ Equal to _____ Worse than _____

6. Compare the vision quality of the experimental visor with the standard-issue visor:

Better than _____ Equal to _____ Worse than _____

7. If breathing apparatus was used, how was the fit?

Excellent _____ Good _____ Poor _____

31:HW:jg
62-1-58

8. In the space below, please list any other comments that you have on the experimental hood:

9. Completed questionnaires should be returned to:

Officer in Charge
Navy Clothing and Textile Research Facility
Attn: H. Winer (Code 30)
21 Strathmore Road
Natick, MA 01760