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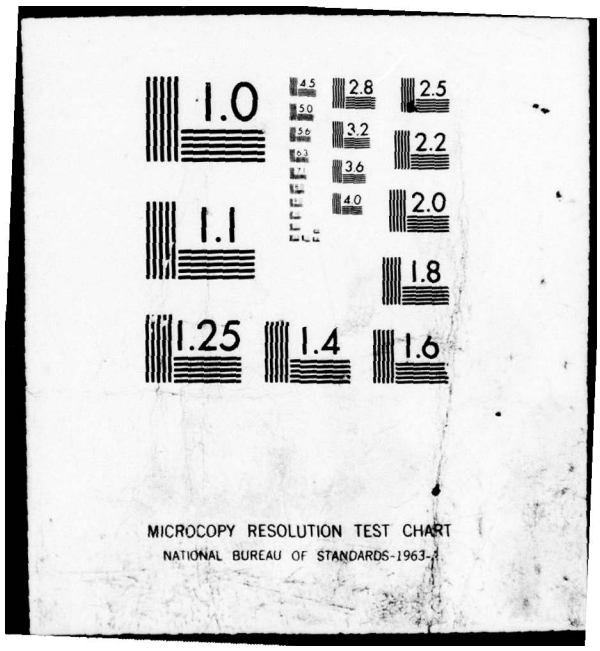
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CEEDO-TR-78-04

Aluminized Firefighters' Crash-Rescue Protective Hood: Facepiece-Visor Redesign Study

NAVY CLOTHING & TEXTILE RESEARCH FACILITY
21 STRATHMORE ROAD
NATICK, MAINE 01760

Francis S Andruk

DECEMBER 1978

FINAL REPORT FOR PERIOD OCTOBER 1976-SEPTEMBER 1977

Approved for public release; distribution unlimited

CEEDO

CIVIL AND ENVIRONMENTAL ENGINEERING DEVELOPMENT OFFICE
(AIR FORCE ENGINEERING AND SERVICES CENTER)
TYNDALL AIR FORCE BASE
FLORIDA 32403

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REPORT DOCUMENTATION PAGE

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1. REPORT NUMBER: CEEDO-TR-78-04	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle): ALUMINIZED FIREFIGHTERS' CRASH-RESCUE PROTECTIVE HOOD: FACEPIECE-VISOR REDESIGN STUDY.	5. TYPE OF REPORT & PERIOD COVERED: Final Report. Oct 1976 to Sep 1977.
	6. PERFORMING ORG. REPORT NUMBER: NCTRF No. 134
7. AUTHOR(s): Francis S. Andruk	8. CONTRACT OR GRANT NUMBER(s): AFCEC Project Order No. 77-002
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Navy Clothing & Textile Research Facility, 21 Strathmore Road, Natick MA 01760	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: JON: 414N-30-06; Program Element: 64714F
11. CONTROLLING OFFICE NAME AND ADDRESS: Detachment 1 (CEEDO), ADTC, Tyndall AFB FL 32403	12. REPORT DATE: December 1978
	13. NUMBER OF PAGES: 15
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)

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17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Aluminized Firefighters' Crash-Rescue Protective Hood
Firefighters Adjustable Facepiece Visor
Protective Clothing Performance Tests
Aluminized Materials
Firefighters' Protective Clothing Redesign Study
Fire-Resistant Materials

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Navy Clothing & Textile Research Facility (NCTRF) conducted a redesign study for the purpose of improving the standard aluminized firefighters' crash-rescue hood. Efforts were directed towards developing an adjustable facepiece visor assembly, which would permit unrestricted visibility, verbal communication, and the exchange of fresh air during standby situations. An adjustable configuration was conceived and initial samples of a comparable commercial type were fabricated and subjected to a limited performance test. Results showed this

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type to be highly functional; however, under fire emergency conditions, several areas proved to be marginal or inadequate. To eliminate these problem areas, NCTRF modified the facepiece design. As the required task approached a resolution, the fiscal year ended and the program terminated. Because the need still exists for an improved hood, appropriation of additional funds and continuance of this redesign study is recommended.

PREFACE

This report was prepared by the Navy Clothing and Textile Research Facility (NCTRF) under Contract AFCEC P.O. 77-02, Job Order Number 414N-30-06, for Detachment 1 (CEEDO) ADTC, Tyndall AFB FL.

This report summarizes work done between October 1976 and September 1977. The principal investigator at NCTRF was Mr Francis S. Andruk. Major Birney Pease and Mr Norman D. Knowles were the project officers at CEEDO. Final technical report preparation was accomplished by Mr Lawrence W. Redman.

This report has been reviewed by the Information Office (IO) and is releasable to the National Technical Information Service (NTIS). At NTIS it will be available to the general public, including foreign nations.

This technical report has been reviewed and is approved for publication.

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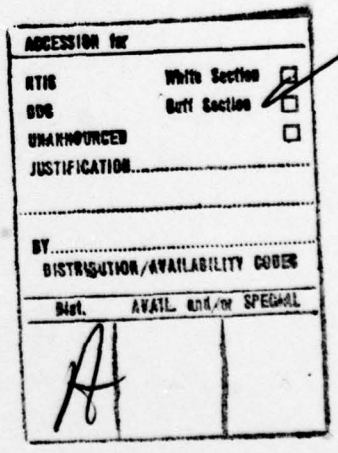

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SECTION I

INTRODUCTION

The Navy Clothing and Textile Research Facility (NCTRF), with resources made available by the Civil and Environmental Engineering Development Office (CEEDO), Detachment 1, ADTC/CNE, Tyndall AFB FL embarked on the task of improving the standard aluminized firefighters' crash-rescue protective hood. In essence, this effort was a continuance of an earlier preliminary redesign study (Reference 1), which eventually had to be curtailed because of the disestablishment of the Aircraft Ground Fire Suppression and Rescue Systems Program Office (AGFSRSPO), the original sponsor of the hood redesign program.

Although the earlier study was of short duration, a sufficient number of performance tests were conducted on commercially available adjustable types to permit the conclusion that the development of a hood with an adjustable facepiece visor assembly was practicable for the protection of personnel operating in hazardous environments, such as those experienced during aircraft fire suppression and rescue operations. In this connection, NCTRF recommended continuance of the redesign effort to develop an adjustable-type hood as a possible replacement for the standard firefighters' crash-rescue hood (Figure 1). The standard hood does not have an adjustable visor system assembly.

The subsequent task, which was performed during the period of October 1976 through September 1977, is briefly described in this report.

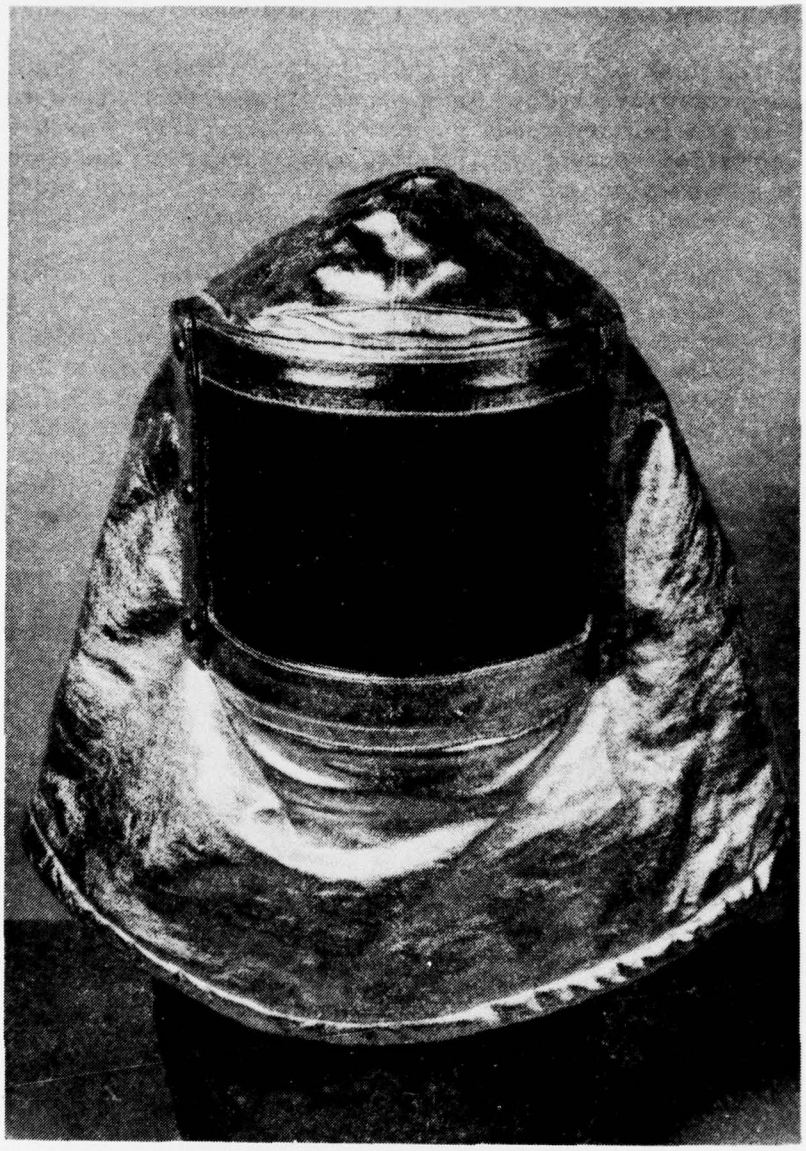

Figure 1. Standard Aluminized Firefighters' Crash-Rescue Protective Hood.

SECTION II

DISCUSSION

The overall effort included a reexamination of earlier investigations, further exploration of adjustable hood design concepts and techniques and acquisition of hoods and hood components, which best serve the primary objectives of permitting unrestricted vision, verbal communication, and the exchange of fresh air, without the aid of a breathing apparatus, during standby situations.

Prior studies had revealed that an adjustable or hinged facepiece visor assembly would lend itself more readily to producing the desired hood. In this connection a small quantity of an adjustable configuration, comparable in design to a model produced by Fyrepel Products, Inc., was fabricated and subjected to a limited performance test under actual-use conditions. This model (Figures 2 and 3) utilized the latest developments in aluminized and fire-resistant materials, and was layered in a manner comparable to the materials used in the standard proximity hood (Reference 2).

Results of a limited performance test showed that this new configuration was favorably received by user personnel and proved to be highly functional in standby situations. The flip-type facepiece visor assembly was easy to operate and served the objective well in standby situations; however, during fire suppression and rescue operations, discrepancies were noted. The seal around the periphery of the window area proved to be marginal, particularly with respect to heat and smoke penetration. In addition the facepiece visor assembly became scratched and marred easily, thus reducing its reflective capabilities. To further understand this discrepancy it should be noted that the facepiece visor assembly is made of a curved 1/8-inch-thick acrylic facepiece support and a 7-mil gold-coated polyester film, which is permanently attached to the frame. The gold film is provided for infrared radiant heat protection, and it is this film that becomes scratched and marred. Since it is permanently attached, it cannot be replaced and thus becomes ineffective with respect to its reflective capabilities. This negative feature requires modification so that the film can be replaced. (Although the standard hood does not have a flip-type facepiece visor, it does allow for the removal of the gold-coated film.) In addition to the foregoing, the new configuration does not provide for a protective cover over the face shield to prevent damage to the gold-coated surface when the hood is carried or stored.

In view of the problems several design modifications were conceived that could improve this hood configuration and render it

Figure 2. Aluminized Firefighters' Hood, Adjustable Facepiece Visor Prototype Model (Front View).

Figure 3. Aluminized Firefighters' Hood, Adjustable Facepiece Visor Prototype Model (Side View).

functional in hazardous environments. The basic design featuring the flip-type visor would be retained; however, a tighter seal around the periphery of the window area should be devised to provide greater protection against smoke and heat. The seal could be of a tubular material, which would essentially be compatible with exposures to high thermal fluxes. Silicone and viton are two suggested candidate materials. The visor or facepiece frame should be made of aluminum and designed to allow for replacement of the gold polyester film. The latching device should be placed in such a manner so that it cannot interfere with removal of the film, and be of such a design that it can be secured by the suited individual.

A preliminary drawing of the planned configuration of the inner components of the adjustable facepiece visor system (Figure 4) was prepared for possible construction by potential suppliers of face shields and safety helmets and caps. An unsolicited proposal was submitted by ILC Industries to develop this configuration and to eliminate other known problems in the current hood. Besides the modifications mentioned, they proposed to explore the problem of fogging in cold weather. They also intend to provide for a means to create greater hood stability during operational use. In certain situations the hood tends to shift and obstruct visibility when the user bends over.

Because of negative responses from potential suppliers, delays were experienced in earlier efforts to develop an acceptable prototype. Consequently, ILC's proposal was received beyond the procurement deadline for FY77, thus negating the possibility of completing the required task of improving the standard aluminized firefighters' crash-rescue hood prior to the end of the fiscal year. Since funds expired September 30, 1977, the task was temporarily terminated.

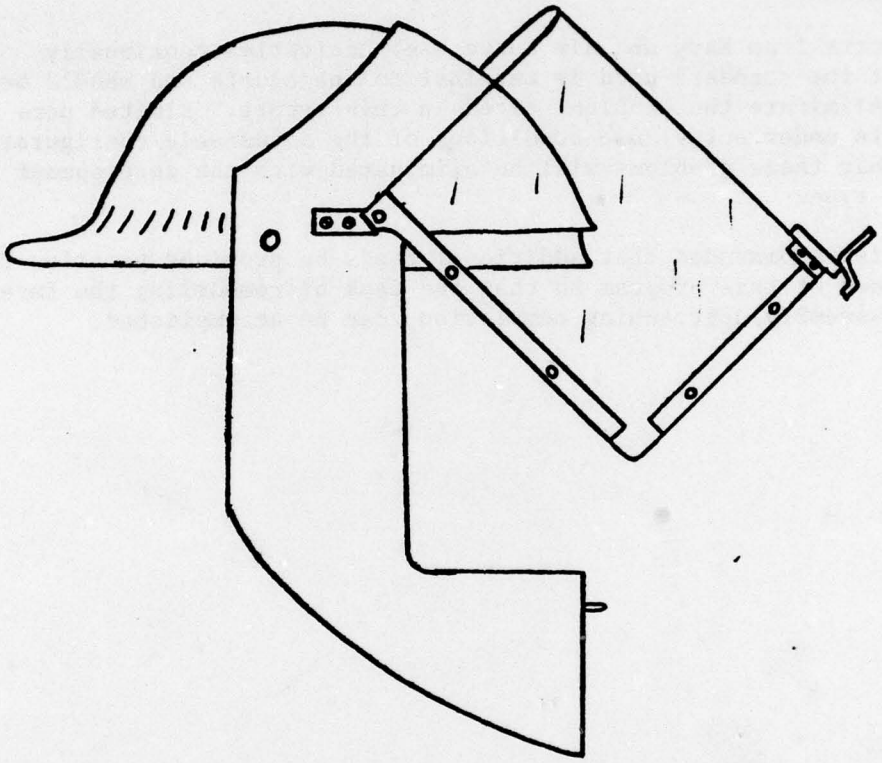

Figure 4. Inner Components of Adjustable Facepiece Visor Assembly.

SECTION III

CONCLUSIONS AND RECOMMENDATIONS

The need still exists for a hood with an adjustable facepiece visor assembly which would provide unrestricted vision, verbal communication and fresh air without the aid of a breathing apparatus during standby situations.

Reports from Navy and Air Force user activities continually indicate that the standard hood is marginal to inadequate and should be improved to eliminate the problems cited in this report. Limited performance tests under actual use conditions of the adjustable configuration have shown that these problems will be eliminated with the development of a hood of this type.

It is recommended that additional funds be provided to allow for the continuance of this program so that the task of remodeling the facepiece-visor assembly, approaching completion, can be accomplished.

REFERENCES

1. Andruk, F. S., Facepiece-Visor Assembly for Aluminized Firefighters' Crash-Rescue Protective Hood (Preliminary Redesign Study) NCTRF Report No. 118, June 1976.

2. Military Specification MIL-H-29144(SA), Hood, Fireman's, Aluminized, Proximity

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