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NAVY EXPERIMENTAL DIVING UNIT
WASHINGTON NAVY YARD
WASHINGTON, D.C. 20390

NEDU - EVALUATION [redacted]-14-57

EVALUATION OF INTERNATIONAL LATEX CORP. SWIM SUIT HELMET AND FACEPIECE: PHASE 1.

PROJECT NS185-005 ~~SUBTASK 4 TEST 43~~

C. M. PRICKETT
15 MAR [redacted]57

CONDUCTED
AND
PREPARED

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GM1(DV) USN

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ABSTRACT

This evaluation was made to determine limitation of visual field perimeter and distortion within that perimeter for SPD-2 facepiece (Standard) and SPD-2 facepiece (Modified). This report describes use of the perimeter detector and measurements of the visual field and distortion while wearing the two SPD-2 facepieces.

The results are discussed and recommendations are made for the SPD-2 facepiece with the least restricted visual field and distortion.

SUMMARY

PROBLEM

To determine the limitation of the visual field and the presence of distortion in the visual field of SPD-2 facepieces (Standard and Modified).

FINDINGS

SPD-2 facepiece showing the least restriction of visual field, and distortion is the SPD-2 facepiece (Modified). Distortion was present in the SPD-2 facepiece (Standard) and too severe to obtain any distortion readings.

RECOMMENDATIONS

It is recommended that the SPD-2 facepiece (Modified) be used in further development of the contract.

ADMINISTRATIVE INFORMATION

Ref: (a) BuShips contract NOBs 72125.
(b) Phone conversation Lt. Searle, E.D.U to Mr. Foran, BuShips Code 538, 27 February 1957.

BuShips has, by reference (a) contracted the International Latex Corporation of Dover, Delaware for the development of subject equipment. Reference (a) is quoted in part as follows:

Phase 1. Design, develop and furnish a facepiece for a swim suit.

Phase 2. Design, develop and furnish a hard head-shell, compatible with the facepiece developed under phase 1.

Conferences were held at E.D.U on 21 November 1956 and 17 January 1957 with representatives of E.D.U., BuShips and International Latex- wherein preliminary models of a facepiece were presented. Two facepieces presented at a third conference of 27 February 1957 were considered sufficiently satisfactory to warrant evaluation before proceeding further

By reference (b) the project number was assigned.

C. M. Prickett, GM1(DV), USN was designated project engineer. Work commenced 4 March 1957. The following breakdown indicates the manhours expended for this evaluation.

DESCRIPTION	MANHOURS
Preliminary set up	6
Peripheral vision tests (dry)	20
Peripheral vision tests (wet)	36
Photography	4
Report preparation	36
Drafting	16
Report typing and duplication	20
Total	138

CONTENTS

LIST OF ILLUSTRATIONS

1. INTRODUCTION

1.1 Introduction

1.1.1 The Bureau of Ships has been interested in basic development work towards the long range development of a better swimmer's helmet and facepiece to be used with either a rubber suit or a blast suit. The recent and current developments in headgear for pilots of high-altitude air craft appear to contain features readily adaptable to diving headgear. Many of the problems existing in high altitude breathing are parallel to those experienced in diving. The International Latex Corporation has conducted a great deal of the developmental work for the aviation helmets, both for the Navy and the Air Force.

1.1.2 The contract for the subject equipment was let for development of head gear as quoted in "Administrative Information" with the stipulation that no work would be done on Phase 2 until the facepiece (phase 1) was accepted.

1.2 Objectives

1.2.1 The object of the first phase of the project is the evaluation of the facepiece (phase 1) portion of the overall project to determine if the facepiece is sufficiently acceptable to warrant proceeding with phase 2 or if additional work is required on phase 1.

1.2.2 This evaluation has two objectives:

(1) To determine the amount of limitation of the visual field in the SPD-2 facepiece (Standard) and the SPD-2 facepiece (Modified).

(2) To determine the presence, and amount of distortion throughout the visual field of the SPD-2 facepiece (Standard) and the SPD-2 facepiece (Modified).

1.3 Scope

1.3.1 The scope of this project will be limited essentially to subjective visual perimeter measurements following the pattern for such measurements established in E.D.U. Evaluation Report 4-57, "Visual Field Perimeters and Distortion in Diving Masks".

2. DESCRIPTION

2.1 General

2.1.1 The facepieces evaluated in the project were essentially the same facepiece used in the aviators helmet. The outer dimensions and means of sealing into the helemt were not modified.

2.2.2 The lower part of each facepiece is fitted with a flexible rubber transition piece through the optical plexi-glass. A Northill mouth-bit is installed inside and a Northill mouthpiece valve is outside. The flexible transition piece permits the diver to remove or insert the mouth piece from outside.

2.1.3 The SPD-2 facepiece (Standard) is exactly as used by the aviators (except for the insertion of the mouthpiece which is below the field of vision). No attempt has been made to compensate underwater optical aberration. This facepiece is as shown in Figures 5 and 6.

2.1.4 The SPD-2 Facepiece (modified) is a standard aviators facepiece but with the radius of that portion in the visual field increased to approximately 6 inches. The inserted portions of optical plexiglass are bonded to the original facepiece with sharp discontinuities in the prototype model. The Northill mouthpiece is installed as above. This facepiece is as shown in Figures 7 and 8.

3. PROCEDURE

3.1 Method

3.1.1 The method used for all tests in water and on the surface is described in E.D.U. Evaluation Report 4-57, "Visual Field Perimeters and Distortion in Diving Masks".

4. RESULTS

4.1 Presentation

4.1.1 The results are presented in graphical form, each graph showing the following information for each facepiece.

(1) Perimetry results (average of three subjects for air) with both facepieces.

(2) Perimetry results (average of three subjects for water) with both facepieces.

(3) Distortion results (average of three subjects for air) with both facepieces.

(4) Distortion results (average of three subjects for water) with both facepieces.

(5) Perimetry and distortion results (average of three subjects in air) with no facepiece, or mask.

4.1.2 Visual field perimeters, and areas of distortion within these perimeters are presented for the SPD-2 facepieces in Figures 1 through 4.

4.1.3 The distortion in the SPD-2 facepiece (Standard) in water was so severe and general that no distortion readings could be obtained.

4.1.4 While swimming the SPD-2 facepiece (Standard) in the pool, all subjects reported unusual subjective feelings.

4.1.5 The SPD-2 facepiece (Modified) has leakage and blurring where the modified facepiece is bonded to the standard facepiece.

5. DISCUSSION

5.1 General

5.1.1 Visual field perimeters and distortion measurements were made both in air and water to determine if significant differences existed.

5.1.2 The Standard Evaluation Procedure Outline for Visual Field Perimeter and Distortion in facepieces and face masks was used. There was significant difference found between the two SPD-2 facepieces. The SPD-2 facepiece (Modified) was found to be the best facepiece to use in the development of a hard head-shell in Phase 2.

5.2 SPD-2 Facepieces

5.2.1 The SPD-2 facepiece (Standard) did not prove to be useful in this evaluation. The reason is that the SPD-2 facepiece (Standard) had complete, and severe distortion in water and the subjects used in this evaluation reported blurring of vision and slight headaches.

5.2.2 The SPD-2 facepiece (Modified) showed the least amount of distortion, and is considered the best facepiece to be used for Phase 2. The SPD-2 facepiece (Modified) has leakage, and blurring where the modified facepiece is bonded to the standard facepiece.

5.2.3 The visual field perimeter and distortion characteristics of the SPD-2 Facepiece (Modified) compare favorably with the facepieces evaluated in E.D.U. Evaluation Report 4-57 which were considered acceptable for use by underwater swimmers.

5.2.4 Although not an objective of this evaluation, it was found that the seal on both facepieces leaked on all runs. The leakage was not severe and was not thoroughly investigated. Such should be done before this sealing method is adopted or further developed.

6. CONCLUSIONS

6.1 Conclusions

6.1.1 It is concluded that the SPD-2 (Modified) facepiece has visual field and distortion characteristics sufficiently promising to warrant its further development, Phase 2 of the basic developmental project.

6.1.2 The SPD-2 (Standard) is not acceptable for use as a divers facepiece.

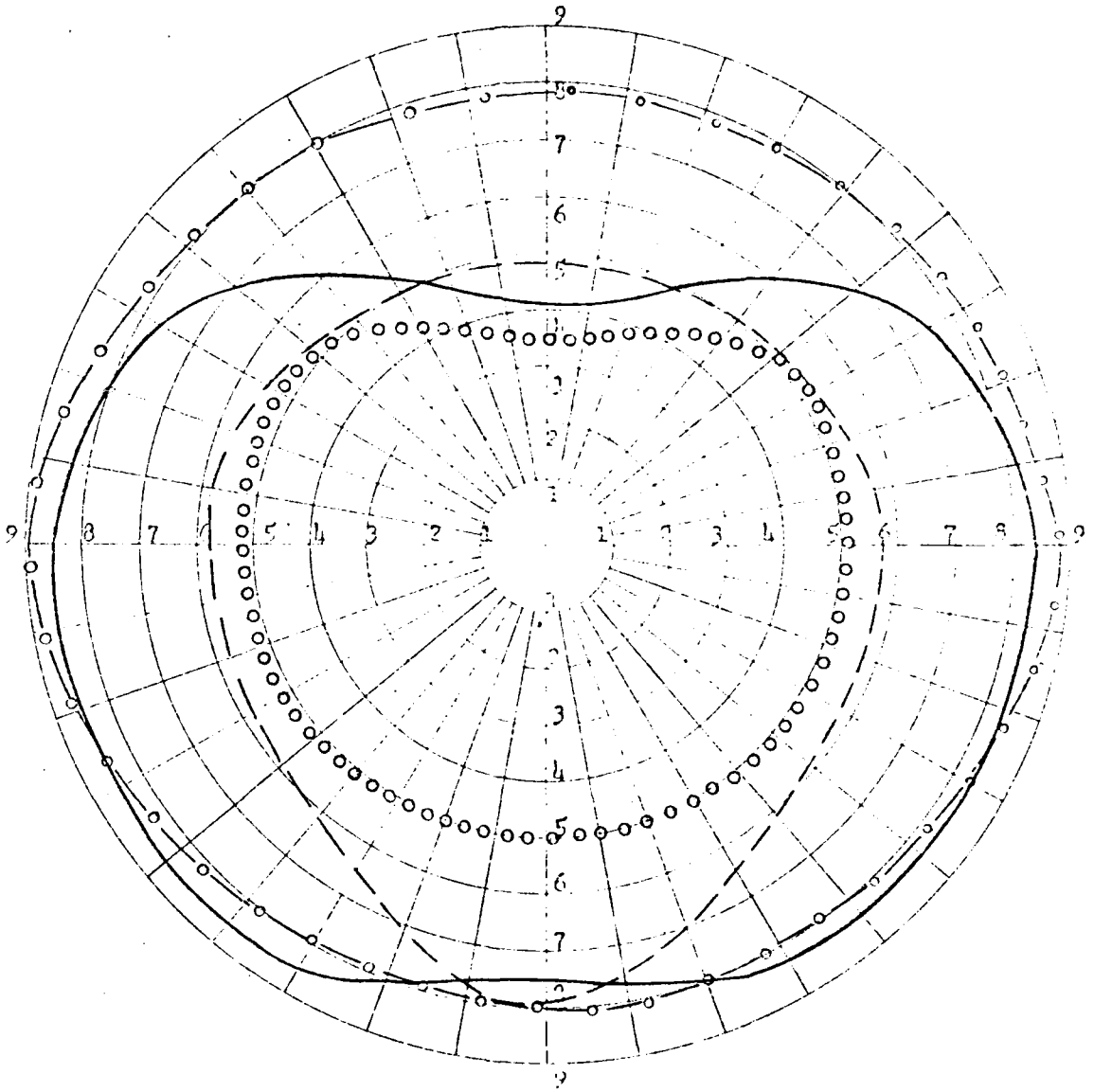
6.2 Recommendations

6.2.1 It is recommended that the SPD-2 facepiece (Modified) be used in the further developmental work and that the SPD-2 facepiece (Standard) be discarded.

6.2.2 It is recommended that the SPD-2 facepiece (Modified) be improved in the areas where the large radius piece joins the basic facepiece to ensure against leakage and improve blurring.

6.2.3 It is recommended that the method of sealing be tested with increased differential of pressure in both directions. Such tests should be conducted in water.

OPTICAL CHARACTERISTICS
INTERNATIONAL LAREX
SPD-2 FACEPIECE (STANDARD)
AVERAGE OF THREE SUBJECTS IN AIR



PERIMETER-NO FACEPIECE
PERIMETER-WITH FACEPIECE
DISTORTION-NO FACEPIECE
DISTORTION-WITH FACEPIECE

FIG. 1

OPTICAL CHARACTERISTICS
INTERNATIONAL LATEX
SPD-2 FACEPIECE (MODIFIED)
AVERAGE OF THREE SUBJECTS IN AIR

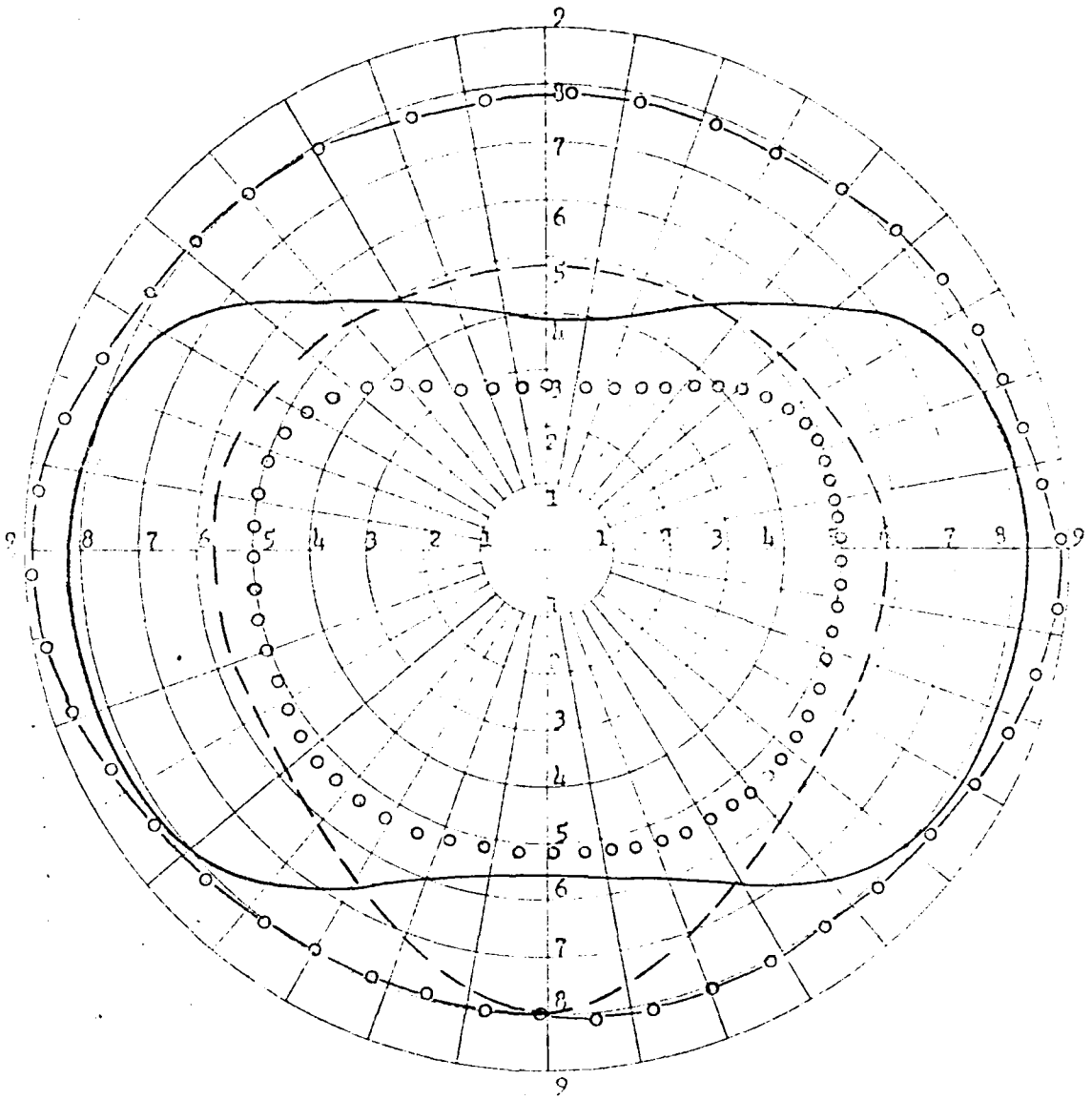
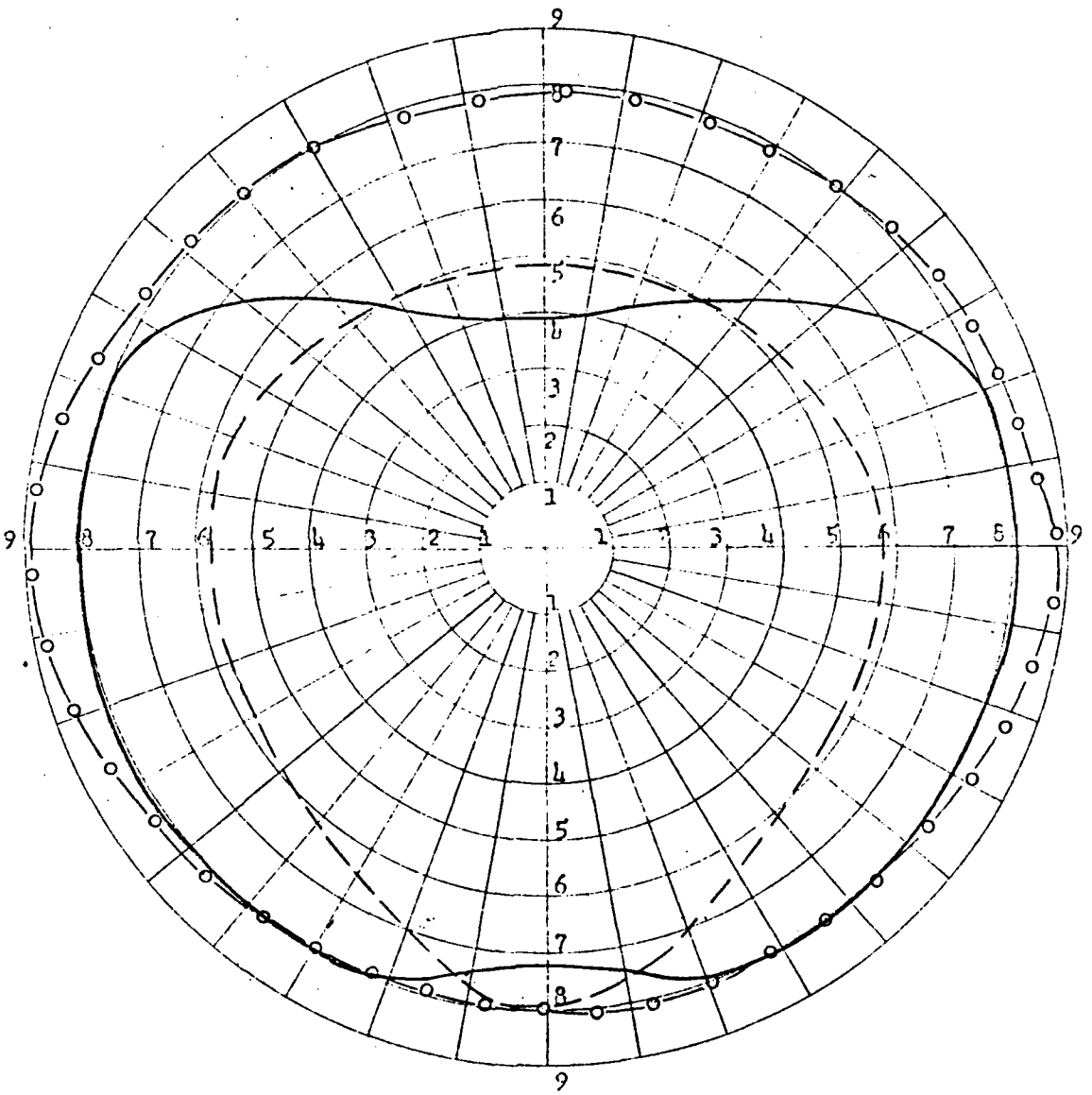


FIG. 2

OPTICAL CHARACTERISTICS
INTERNATIONAL LATEX
SPD-2 FACEPIECE (STANDARD
AVERAGE OF THREE SUBJECTS IN WATER

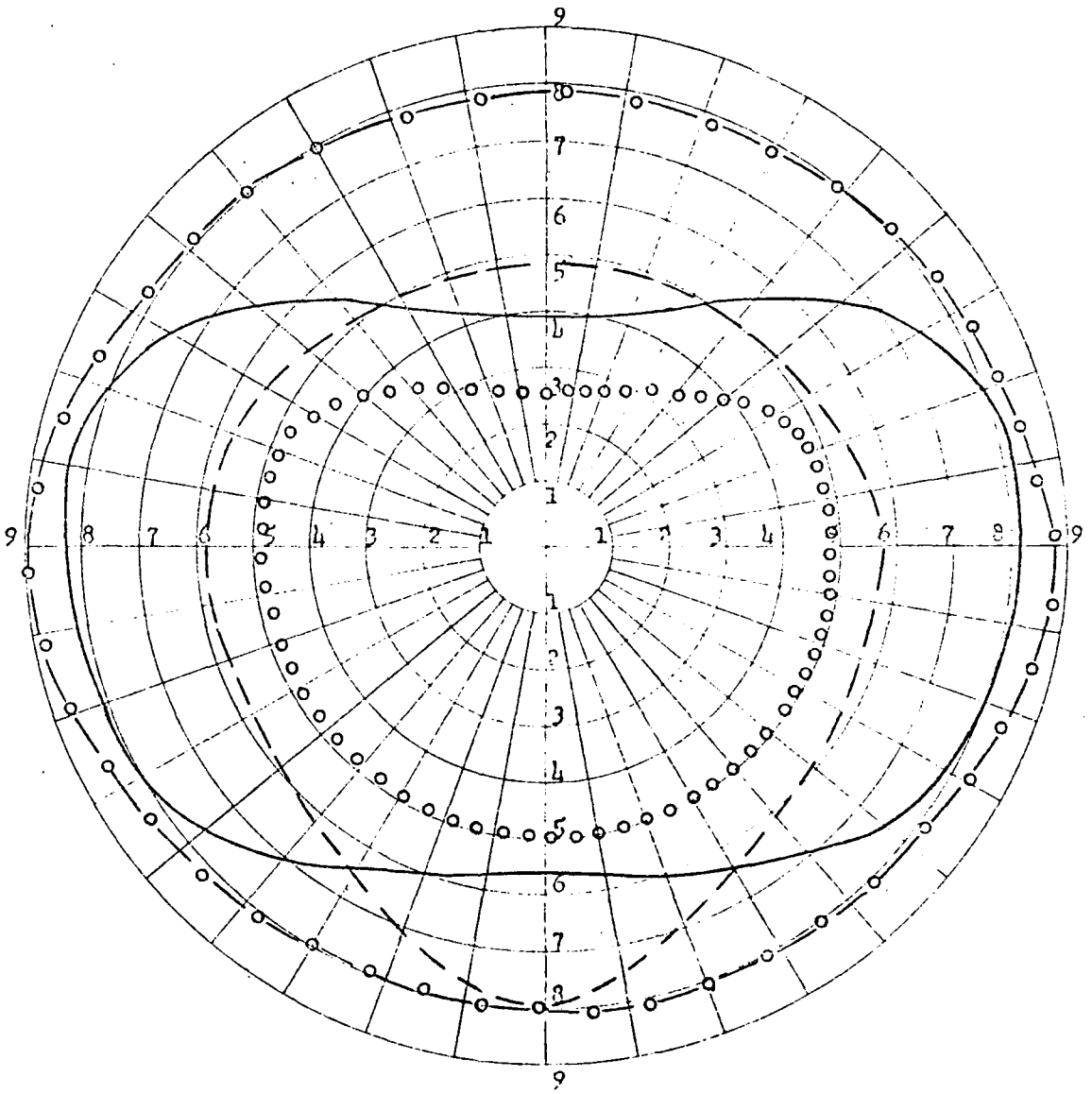


NOTE:
DISTROTION IN WATER WAS TOO SEVERE AND GENERAL TO OBTAIN ANY READINGS

PERIMETER-NO FACEPIECE
PERIMETER-WITH FACEPIECE
DISTORTION-NO FACEPIECE

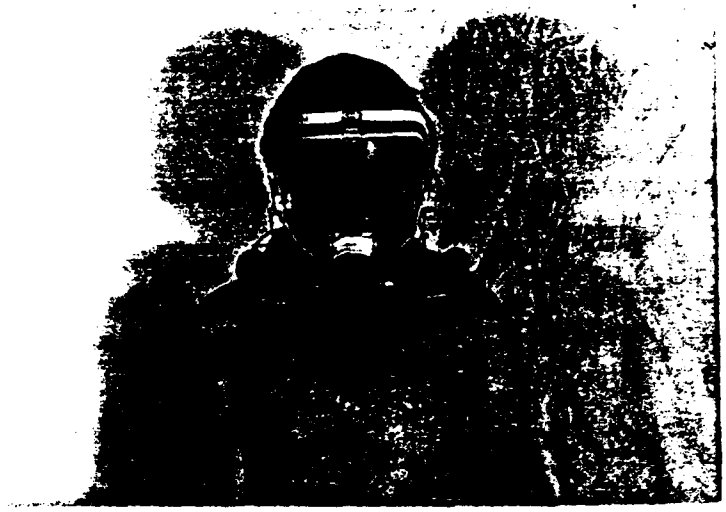
FIG. 3

OPTICAL CHARACTERISTICS
INTERNATIONAL LATEX
SPD-2 FACEPIECE (MODIFIED)
AVERAGE OF THREE SUBJECTS IN WATER



PERIMETER-NO FACEPIECE
PERIMETER-WITH FACEPIECE
DISTORTION-NO FACEPIECE
DISTORTION-WITH FACEPIECE

FIG.4



FRONT

SIDE

(STANDARD)

FRONT

SIDE

FRONT

SIDE

[illegible]
[illegible]
[illegible] 7
[illegible] FACEPIECE (MODIFIED)

FRONT

SIDE

[illegible]

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13. ABSTRACT

This evaluation was made to determine limitation of visual field perimeter and distortion within that perimeter for SPD-2 facepiece (Standard) and SPD-2 facepiece (Modified). This report describes use of distortion while wearing the two SPD-2 facepieces.

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