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U.S. NAVAL MEDICAL RESEARCH LABORATORY



Submarine Base, New London, Conn.

MEMORANDUM REPORT NO. 58-1

EVALUATION FOR SERVICE USE OF A PROTO-
TYPE SWIMMER'S RESCUE SUIT

NM 21 01 20.01.01

10 March 1958

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U. S. NAVAL MEDICAL RESEARCH LABORATORY
U. S. Naval Submarine Base
New London, Connecticut

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TYPE SWIMMER'S RESCUE SUIT

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10 March 1958

Supervisory Investigator:

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SUMMARY PAGE

THE PROBLEM

To test and evaluate a prototype Rescue (Swim) Suit under service operating conditions and to determine the suitability of this ~~item~~ for adoption for use in ships and submarines.

FINDINGS

The suits tested were found to be relatively waterproof for periods of one-half to one hour; comfortably warm for up to one hour's exposure; they added materially to the buoyancy of the subject, and were highly resistant to damage. However, they were difficult to put on, the process requiring some assistance and so much time that their effectiveness in emergency situations would be impaired. The chin segment was poorly placed and uncomfortable and the flutter valve not effectively located. It was found that the material of the suit caused some discomfort due to limited stretchability.

APPLICATIONS

Results of these tests will enable the Clothing Supply Office to construct a more effective and satisfactory Rescue (Swim) Suit.

ADMINISTRATIVE INFORMATION

This investigation was conducted as a part of NM 21 00 00 - Evaluation of Clothing, Equipment and Devices for Submarine and Ship-board Use, under Study No. 1, 21 01 20. This is Report Number One on Subtask 21 01 20 and was approved for publication on 10 March 1958.

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ABSTRACT

The present investigation is one of a series of tests and evaluations of prototype Rescue (Swim) Suits conducted by NAMRL in cooperation with the Research Section of the Naval Clothing Supply Office, Brooklyn. The latest version of this type of suit was tried out under service operating conditions during exercises aboard two submarine rescue and salvage vessels (ASR's 15 and 16) during June and July 1957 and January 1958. The scope of the evaluations included swimming, surface diving, floating, simulated rescuing of personnel, and use with an aqua lung for such purposes as examining the bottom of ships, checking anchor chains for fouling, and for taking underwater pictures. A number of favorable features were noted--waterproofness, buoyancy, warmth, and a number of unfavorable features were tabulated for use in modification of these suits, such as poor locations of the flutter valve and the chin segment of the face opening, the face that it was difficult to get into the suit and took too long a time, the face that the material was so limited in elasticity as to cause discomfort.

EVALUATION FOR SERVICE USE OF A PROTOTYPE SWIMMER'S RESCUE SUIT

INTRODUCTION

The Naval Medical Research Laboratory has for a number of years been investigating the matter of special protective clothing for use by watch standers on the submarine bridge, and for men escaping from a disabled submarine, and for the protection of personnel adrift in the sea after such escape has been accomplished. This has been a cooperative project with the Bureau of Supplies and Accounts, specifically with its Clothing Research Division in Brooklyn. Some of the suits have been designed at NMRL, constructed at the Clothing Supply Office and then tested by NMRL both in the Escape Training Tank and at sea; others have been designed by CSO and forwarded to NMRL for testing. Several reports have been published by NMRL (1, 2); and test results have been reported by BuSandA (3,4).

The most recent series of tests concerned the evaluation of prototype swimmer's rescue suits manufactured by the Hodgeman Rubber Company of Framingham, Mass. The description of the suit, the type of testing conducted, and the results obtained follow:

PROJECT DETAILS

<u>Authorization for the Tests</u>	Chief BuSandA ltr to CNO (OP 373), SS1. All/1 of 19 Mar 57 CNO ltr Op-373B/mw Ser 114P37 of 15 Apr 57 to ComInChLant ComInChLant ltr FF1-2/A1, Ser 1801/31 of 29 Apr 57 to ComSubLant ComSubLant ltr FF4-12A1, Ser 9202 of 7 Jun 57 to ComSubRon TWO
<u>Purpose and Scope of the Tests</u>	Purpose: To test and evaluate a prototype Rescue (Swim) Suit under service operating conditions and to determine the suitability of this item for

this item for adoption as a swimmers rescue suit. This suit is not to be confused with the standard Underwater Demolition Team suit (BuShips item). The Rescue (Swim) Suit is not intended to replace the suit which is currently used by Underwater Demolition Team personnel. It will be a separate unit of issue to ships and submarines for use by expert swimmers in performing rescue work.

Scope of Test: The item to be tested was designed and developed specifically for rescue personnel who go over the side in cold water, to rescue others who have been accidentally immersed. The suit's main function is to facilitate the rescuer's mobility and to provide short time protection against cold water shock by keeping the wearer dry and retaining the insulating qualities of the under-clothing. The Operational Evaluation Request from BuSanda states that tests to be performed include swimming, surface diving, floating, rescuing personnel and any other tests which may be required to simulate rescue operations. The factors to be observed and the data to be collected in determining the suitability of this item should include the following:

(a) Waterproofness of the suit, including material, seams, and the roll closure. It is anticipated that a small amount of water will penetrate at the face opening; however, special notation should be made relative to the amount of leakage and its effect on the wearer.

(b) A gasket (diaphragm) has been provided at the neckline (inside the suit) to prevent any water that does enter at the face opening from going further down into the body. The effectiveness of

this gasket should be noted.

(c) Flutter valves were provided for expelling entrapped air. The functional utility of these valves should be noted.

(d) Length of exposure time and temperature of water should be noted.

(e) Oral temperature of subjects should be taken, if possible, before and after immersion to determine effects of exposure. Subjects should remain in water as long as possible without causing any ill effects.

(f) Ease of donning, maneuverability, fit, comfort, and ability to use hands should be noted.

(g) Comments and/or possible recommendations for the further improvement of this item should also be noted. "

Description of
the Suit:

The suit to be tested was developed by the Clothing Supply Office under Bureau of Supplies and Accounts Research and Development Project NT0001-045. Samples were manufactured by Hodgeman Rubber Company, Framingham, Massachusetts. Mass production cost is estimated at \$45.00 each. The suit consists of a form fitting jumper having attached gloves and hood, and a pair of high waisted trousers having attached foot coverings. Swim trunks are also provided for wear over the trousers after the roll closure has been formed at the waist. The roll closure is formed by turning down the high waist of the trousers and overlapping it with the bottom extension of the jumper. Both plies are then rolled together upwards until a tight roll is formed at the waist. The trunks are then donned over the roll to hold it in place and to prevent the trousers from sagging at the crotch.

The suit is fabricated of a rubberized, laminated two way stretch material (two plies of knitted cotton with a rubber sheet in between) which has been dyed an International Orange color for good visibility at sea. The entire suit is waterproof with the exception of the face opening. Adjustment straps are provided on the back of the hood for individual fitting of the hood to obtain a secure face closure. The neck diaphragm helps to prevent any water that may enter through the face opening from going further down into the body of the suit. Flutter valves are provided on the back of the head and on the chest area below the diaphragm to allow for the expulsion of entrapped air. Knee and elbow patches have also been incorporated for extra reinforcement at these points.

This suit is worn over a set of waffle weave underwear, a pair of woolen gloves and two pairs of wool-cotton cushion sole socks. These items provide insulation to the wearer against the cold water.

Evaluation and
Tests
Conducted

Evaluations of prototype swimmer's rescue suits were conducted on board ASR 15 and ASR 16 during June and July of 1957 and aboard ASR 16 during February 1958. A total of 5 large and 2 medium sized suits were used with the accompanying underclothing. The suits were worn by four submarine and diving medical officers: Doctors George F. Bond, J. E. Stark, H. Moses, and S. B. Rentsch, (medical officer Submarine Squadron TWO), and three enlisted divers.

The scope of the evaluations included swimming, surface diving, floating, simulated rescuing of personnel, and use with an aqua lung for such pur-

poses as examining the bottom of ships, checking anchor chains for fouling, and for taking underwater pictures.

Results:

Favorable features noted:

- (1) All of the subjects found the suits relatively waterproof for periods of one-half to one hour. However, some of the seams of the suits and the body rolls became quite damp at the end of one hour's exposure. The face seal was completely unsatisfactory both as to the comfort of the wearer and the effectiveness of the seal. The neck gasket did prevent the water which entered the hood through the face seal from penetrating into the body of the suit. However, this same gasket materially interfered with the donning of the suit.
- (2) All the subjects found the suits, with or without underwear, comfortably warm for up to one hour's exposure in water temperatures of 58-60° F.
- (3) The suits materially added to the buoyancy of the subject.
- (4) There was excellent resistance of the suit material to damage of any sort. The reinforcement patches on the elbows and the knees were quite valuable and the inherent elasticity of the suit material prevented tearing when the subject snagged the suit on some projection.

Unfavorable features noted:

- (1) Three of the subjects had extreme difficulty in donning and doffing the suits. Especially troublesome was the jumper, which together with the neck gasket made for uncomfortably tight entry and exit from the headpiece.

(2) Donning and doffing time was found to be excessively long for the possible emergency use of subject suits.

(3) It was felt that the material itself, while durable, has limited stretch properties and causes some chest and abdominal squeeze in some subjects. However, this limited stretchability is due to a faulty manufacturing technique and was not present in the suits used for a prior evaluation.

(4) The flutter valves were not strategically placed. This again was an error in manufacture, and when relocated, the flutter valves proved quite effective. The relocation consisted of removing the flutter valve from the chest of the suit and replacing it in the area on the back between the shoulder blades.

(5) It was considered that the chin segment of the face opening is very poorly designed and extremely uncomfortable and

(6) that the neck gasket is not a necessity and while it limits the drainage of water from the headpiece down into the lower portions of the suit, this is not enough of an advantage to offset the difficulty in donning and doffing.

(7) The hood was considered a desirable feature by some of the evaluators and a completely useless and undesirable feature by others.

Recom-
mendations for
Modifications

(1) Other than color and slightly greater durability, the swimmer rescue suit offers no great advantages over the standard Navy two-piece exposure suit ("Pirelli-type") presently used by the UDT swimmers and aboard submarines.

(2) The above mentioned unfavorable features should be remedied prior to acceptance of subject suits.

(3) Because of the prolonged donning time, the suits will have to be used on a standby basis and have little usefulness for an emergency of unexpected or unforeseen nature.

(4) It was felt that the waffle-weave underclothing is a distinct advantage over previous standard woolen Navy underclothing. This underclothing itself, if necessary, can be used as an exposure suit for short periods in waters of temperatures down to 50°F.

(5) In most cases the swim trunks served no useful purpose and merely prolonged the donning time.

(6) The face seal and body roll should be improved; quite possibly it should be made of neoprene or a similar suitable substitute.

(7) The hood should be constructed so it can be utilized or discarded as desired.

(8) The manufacturing of the suit should be supervised so that the cloth does not lose the stretchability which is the most desirable quality of this fabric.

REFERENCES

1. Field Evaluation of Submarine Rescue and Escape Suits, NAMRL, New London, Memo Report No. 55-3, 6 June 1955
2. Field Evaluation of Modified Submarine Rescue and Escape Suits, NAMRL, New London, Memo Report No. 56-3, 9 Feb 1956
3. Development and Evaluation of a Two-Piece Rescue (Swim) Suit with Roll Closure, BUSANDA, CLOSUPO, Bklyn, Report No. 1, 1 Feb 1955.
4. Evaluation of Experiment Two Piece Rescue (Swim) Suits with Roll Closure, BUSANDA, CLOSUPO, Bklyn, Report No. 13, 17 May 1956

ACKNOWLEDGMENT

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