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RDT&E PROJECT NO. 1J643303D54734

USATECOM PROJECT NO. 8-6-6415-01

AD835403

ENGINEERING TEST OF JUNGLE HAT WITH HEADNET

FINAL REPORT

BY

ROBERT C. LAUGHLIN

JUNE 1968

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U S ARMY
GENERAL EQUIPMENT TEST ACTIVITY
FORT LEE, VIRGINIA

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DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY TEST AND EVALUATION COMMAND
ABERDEEN PROVING GROUND, MARYLAND 21005

AMSTE-BC

28 JUN 1968

SUBJECT: Final Report Engineering Test of Jungle Hat with Headnet, RDT&E Project No. 1J643303D54734, USATECOM Project No. 8-6-6415-01

Commanding General
US Army Materiel Command
ATTN: AMCRD-JI
Washington, D. C. 20315

1. Subject report is approved. Copies are provided for information.

2. Tropic Service Test of the Jungle Hat is currently in progress and 75% completed. Final report of that test will be published and distributed in September 1968.

FOR THE COMMANDER:

1 Incl
as (2 cys)

GOODWIN MORROW
Acting Director
Inf Mat Test Dir

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RDT&E PROJECT NO. 1J643303D54734

USATECOM PROJECT NO. 8-6-6415-01

ENGINEERING TEST OF JUNGLE HAT WITH HEADNET

TEST REPORT

BY

ROBERT C. LAUGHLIN
Engineering Test Directorate

JUNE 1968

U. S. ARMY
GENERAL EQUIPMENT TEST ACTIVITY
FORT LEE, VIRGINIA

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U. S. ARMY GENERAL EQUIPMENT TEST ACTIVITY
FORT LEE, VIRGINIA

USATECOM 8-6-6415-01

Final Report of
Engineering Test of
Jungle Hat with Headnet

Conducted at Fort Lee, Virginia

June 1968

Abstract

An Engineering Test of a Jungle Hat with Headnet was conducted from 10 December 1967 through 23 May 1968, to determine the technical performance and safety characteristics of the test item as described in the SDR and as indicated by the particular design and to determine the technical and maintenance suitability of the Jungle Hat with Headnet for Service Testing.

It was concluded that the Jungle Hat with Headnet is suitable for Service Testing.

It was recommended that the hats be marked "for hand laundering only".

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FOREWORD

The U. S. Army General Equipment Test Activity (USAGETA) was responsible for preparing the test plan, executing the test, and preparing the test report.

This test was conducted under the authority of the following: Letter, AMSTE-BC, Headquarters, USATECOM, 20 October 1967, subject: "Test Directive, Engineering and Service Test of Hat and Insect Net, USATECOM Project No. 8-6-6415-01/02."

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TABLE OF CONTENTS

		PAGE
ABSTRACT		i
FOREWORD		iii
SECTION 1. INTRODUCTION		
1.1	BACKGROUND	1
1.2	DESCRIPTION OF MATERIEL	1
1.3	TEST OBJECTIVES	1
1.4	SUMMARY OF RESULTS	2
1.5	CONCLUSIONS	2
1.6	RECOMMENDATIONS	2
SECTION 2. DETAILS OF TEST		
2.1	INTRODUCTION	3
2.2	INSPECTION AND IDENTIFICATION	3
2.3	SIZING AND FITTING	4
2.4	COLORFASTNESS	5
2.5	SHRINKAGE	7
2.6	MAINTENANCE	10
2.7	STRENGTH AND ABRASION RESISTANCE	11
2.8	WATER REPELLENCY	13
2.9	WEIGHT	13
SECTION 3. APPENDICES		
I	FINDINGS	19
II	DEFICIENCIES AND SHORTCOMINGS	23
III	MAINTENANCE EVALUATION	25
IV	REFERENCES	27
V	DISTRIBUTION LIST	29

SECTION 1. INTRODUCTION

1.1 BACKGOUND

Based on evaluations of three (3) hat and headnet designs during 1966, the Army Concept Team in Vietnam recommended that the selected hat design be procured for general issue to U. S. Army Forces in the Republic of Vietnam. DA approved the recommendation and directed that tests be conducted to provide information on the acceptability of the hat for Army wide use as a Tropical Combat Hat. The selected hat with insect net was type classified as Standard A with a limited basis of issue in September 1967. An Engineering Test by USAGETA and a concurrent Service Test by USA Tropic Test Center (USATTC) were directed by USA Test and Evaluation Command (USATECOM) in October 1967.

1.2 DESCRIPTION OF MATERIEL

a. The hat has a low, flat-top crown and a 2 1/2-inch semi-rigid, quilted, full brim. It is made of Quarpel treated 4.8 - 5.8 ounces per yard cotton warp and nylon filling oxford cloth, OG 107. A 3/4-inch nylon webbing is bartacked around the lower outside crown to provide slots for the insertion of camouflage materials. The hat has a nylon lace chin strap with leather slide keeper and four 1/2-inch screened eyelets on the sides of the crown for ventilation. The hat is provided in sizes 6 3/8 to 7 7/8 and is sized to provide a loose fit. It weighs approximately 4 ounces with the net.

b. The headnet is of tubular configuration with an elastic band at each end of the tube and two (2) elastic loops sewn to the bottom end. It is made of 0.5 ounces per yard nylon tricot, dark green shade 323. Since the net is separate from the hat, it may be carried in a pocket or pack or worn rolled on the hat crown when not in use. The net is worn with the top elastic band around the base of the crown of the hat, the net draped over the brim of the hat, and the two (2) elastic loops hooked over breast pocket buttons on the shirt.

1.3 TEST OBJECTIVES

To determine the technical performance and safety characteristics of the Jungle Hat with Headnet as described in the SDR and as indicated by the particular design and to determine the technical and maintenance suitability of the test item for Service Testing.

1.4 SUMMARY OF RESULTS

The jungle hat with headnet met all the requirements of the SDR except:

a. The hat design did not comply with the SDR in the following ways (a shortcoming):

(1) The hat was not provided with a built-in detachable headnet. (The headnet is separate.)

(2) The hat did not have a design concept identified as the "Classic Cavalry -- Indian Wars." (The hat was low with a flat crown.)

(3) The hat was not provided with a rigid crown. (The crown was soft and without a groove.)

(4) The hat did not have three (3) grommets, no larger than 3/8-inch diameter, on each side of the crown. (The hat had two 1/2-inch grommets on each side of crown.)

(5) The chin strap keeper was not black and might not be fungus resistant. (The keeper was brown leather.)

b. Water repellency of the hat was not durable to more than three (3) machine launderings, a shortcoming.

1.5 CONCLUSIONS

It is concluded that the jungle hat with headnet is suitable for Service Testing.

1.6 RECOMMENDATIONS

It is recommended that the hats be marked "for hand laundering only".

SECTION 2. DETAILS OF TEST

2.1 INTRODUCTION

The subtests that follow were designed to provide laboratory evaluations of the pertinent technical characteristics of the jungle hat and headnet to supplement the concurrent service test being conducted by USATTC.

2.2 INSPECTION AND IDENTIFICATION

2.2.1 Objectives

To code mark each individual test item for identification throughout the test, to assure that no defective item was utilized in testing, and to compare the test item with the design characteristics in the SDR.

2.2.2 Criteria

a. Each individual test item that was subjected to testing was to be identified throughout testing.

b. Test items with apparent defects were not subjected to testing.

c. The hat with headnet should be designed as described in the SDR.

2.2.3 Method

Each of the 50 test hats and headnets was inspected for defects in materials and workmanship. The hats were indelibly marked with consecutive numbers for identification. Deviations in design from the SDR were observed and recorded.

2.2.4 Results

Close visual inspection of the 50 hats and nets revealed no defects in materials or workmanship that would invalidate test results; however, a color shade variation in the headnet was noted. The following deviations from the SDR were recorded:

a. The hat is not provided with a build-in detachable headnet. (The headnet is separate.)

b. The hat does not have a design concept identified as the "Classic Cavalry -- Indian Wars." (The hat is low with a flat crown.)

c. The hat is not provided with a rigid crown. (The crown is soft and without a groove.)

d. The hat does not have three (3) grommets, no larger than 3/8-inch diameter, on each side of crown. (The hat has two 1/2-inch grommets on each side of crown.)

2.2.5 Analysis

In spite of five deviations from the SDR, the test hat design was selected by U. S. Army in the Republic of Vietnam. The hat with net is considered to have met the criteria satisfactorily.

2.3 SIZING AND FITTING

2.3.1 Objective

To determine the sizing and fitting characteristics of the new hats.

2.3.2 Criteria

The jungle hat should have a tariff of sizes that will allow a satisfactory fit of all military personnel who have been satisfactorily fitted with the standard utility cap.

2.3.3 Method

Each of the 50 new hats was measured for inside circumference at the band. These measurements were compared with the table of sizes and measurements provided by the developer and with the standard table of sizes and measurements from TM 700-8400-1. Test data and comparative analyses were used as a basis for judgment as to the suitability of the item for sizing and fitting characteristics for the concurrent service test conducted by USATTC, Panama, Canal Zone (C. Z.).

2.3.4 Results

The results of inside circumference measurements are compared in Table I with the table of sizes and measurements provided by the developer for the test item, the table of sizes and measurements indicated

by the developer as applicable to the standard utility cap, and the standard table of sizes and measurements presented in TM 700-8400-1, Fitting of Uniform.

2.3.5 Analysis

The comparisons (Table I) showed that the jungle hat was made approximately one size (3/8-inch) larger in circumference than the standard service cap, to allow for shrinkage and a loose fit. Eight of the nine size comparisons verified this fact. Also, the jungle hat was found comparable in circumference to the standard utility cap to provide approximately the same or a slightly looser fit in the same sizes. Results indicated that the tariff of sizes available should allow a satisfactory fit of all military personnel who have been satisfactorily fitted in the standard utility cap.

2.4 COLORFASTNESS

2.4.1 Objective

To determine the colorfastness properties of the components of the jungle hat.

2.4.2 Criteria

SDR Paragraph 3i, "The hat should have a useful service life of at least one year under tropical conditions - - -."

2.4.3 Method

Utilizing Federal Specification CCC-T-191b, components of the hat and net were tested for colorfastness properties as follows:

a. Crocking: Method 5650

b. Perspiration: Method 5680

c. Laundering: Method 5610.1

2.4.4 Results

Materials in the hats were found "excellent" for colorfastness to perspiration, "good" for dry crocking, "fair" for wet crocking, and "good" for colorfastness to laundering. Because of a laboratory equipment failure, colorfastness to light had not been tested in the engineering test.

TABLE I

COMPARISONS OF HAT SIZES

DIMENSIONS	SIZE PREDICTION CHARTS			FINDINGS		
HEAD CIRCUMFERENCE (INCHES)	STANDARD CAP SIZE (TM 700-8400-1)	UTILITY CAP SIZE (INDICATED BY DEVELOPER)	JUNGLE HAT SIZE (DEVELOPER)	JUNGLE HAT CIRCUM. MEASUREMENTS (AVG. TO NEAREST 1/8" BY SIZES)	COMPARABLE STANDARD SIZE BASED ON MEASUREMENTS	COMPARABLE UTILITY CAP SIZE BASED ON MEASUREMENTS
INSIDE CIRCUMFERENCE (INCHES)						
			7 7/8			
		7 7/8				
24 5/8	7 7/8		7 3/4			
		7 3/4				
24 1/4	7 3/4		7 5/8			
		7 5/8				
				7 1/2	(7 5/8)	(7 1/2)
23 7/8	7 5/8		7 1/2			
		7 1/2				
23 1/2	7 1/2		7 3/8			
		7 3/8		7 3/8	(7 3/8)	(7 3/8)
23 1/8	7 3/8		7 1/4	7 1/4	(7 3/8)	(7 1/4)
		7 1/4		7 1/8	(7 1/4)	(7 1/4)
22 3/4	7 1/4		7 1/8			
		7 1/8				
22 3/8	7 1/8		7	7	(7 1/8)	(7)
		7				
				6 7/8	(7)	(6 7/8)
22	7		6 7/8			
		6 7/8		6 3/4	(6 7/8)	(6 7/8)
21 5/8	6 7/8		6 3/4			
		6 3/4		6 5/8	(6 3/4)	(6 3/4)
21 1/4	6 3/4		6 5/8			
		6 5/8		6 1/2	(6 5/8)	(6 5/8)
20 7/8	6 5/8		6 1/2			
		6 1/2				
20 1/2	6 1/2		6 3/8			
		6 3/8				
20 1/8	6 3/8					

2.4.5 Analysis

Colorfastness results obtained indicated that the color could be expected to last at least one year. Though colorfastness to light had not been tested, an engineering judgment based on the likely assumption that the materials were dyed with light-fast vat dyes, allows the conclusion that the criterion was met to a satisfactory degree.

2.5 SHRINKAGE

2.5.1 Objective

To determine the rates of shrinkage of the jungle hat when it is hand washed and when it is machine washed.

2.5.2 Criteria

SDR paragraph 3i, "---should be capable of being hygienically cleaned---."

2.5.3 Method

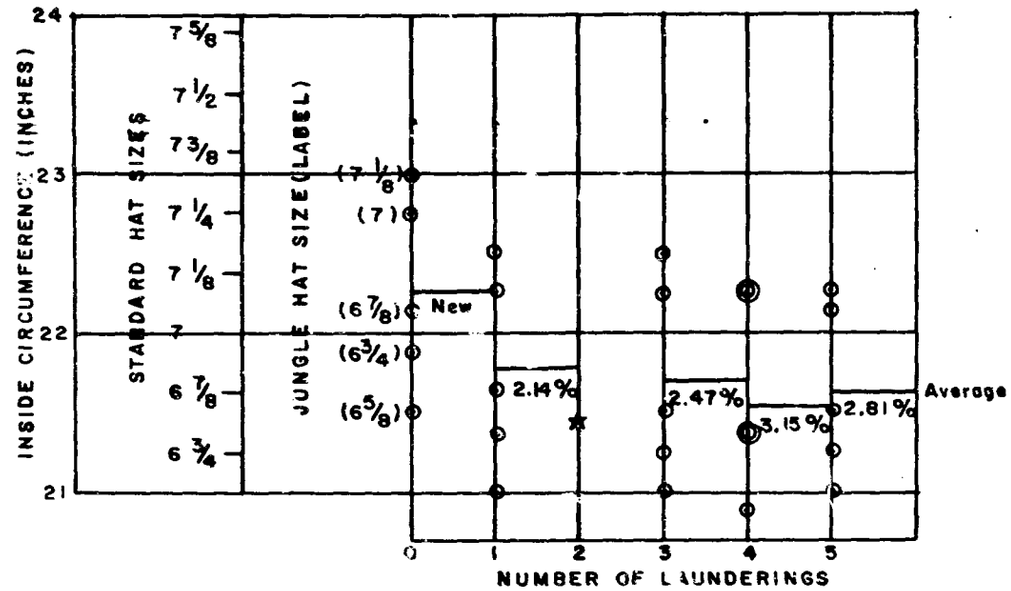
Two separate shrinkage tests were conducted:

a. Five marked and measured hats and headnets were subjected to a series of hand launderings in water with detergent at 120° F. without wear. After each laundering the hats were rinsed, air dried, and measured for inside circumference at the band. Also, the headnets were inspected for damage. Washings were terminated after twelve (12) since the hats showed no further shrinkage.

b. Five marked and measured hats were subjected to a series of machine washings without wear utilizing Formula E, TM 10-354. After each laundering, the hats were tumbled dried at 160° F. and measured for inside circumference at the band. Washings were terminated after five (5) since the hats showed no further shrinkage.

2.5.4 Results

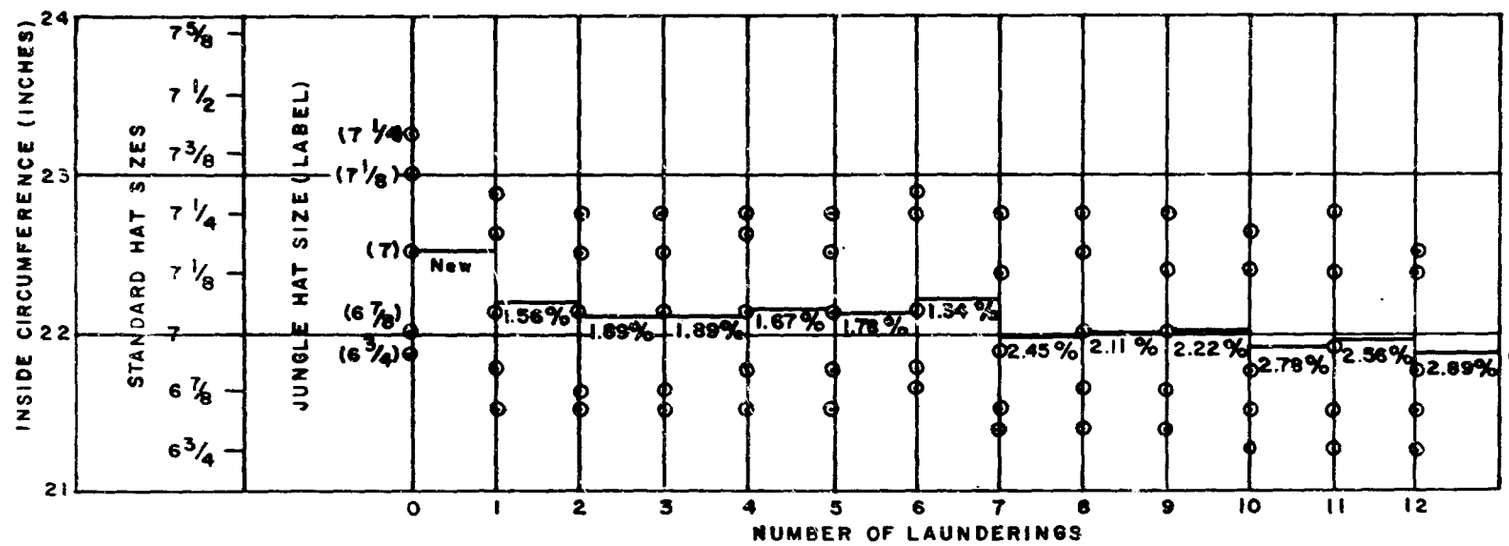
The results of inside circumference measurements are presented graphically in Figure 1 and as percent shrinkage in Figure 2. No defects were found in visual inspections of the headnets after launderings.



★ After second laundering measurements were taken before hats were dry and data were invalidated.

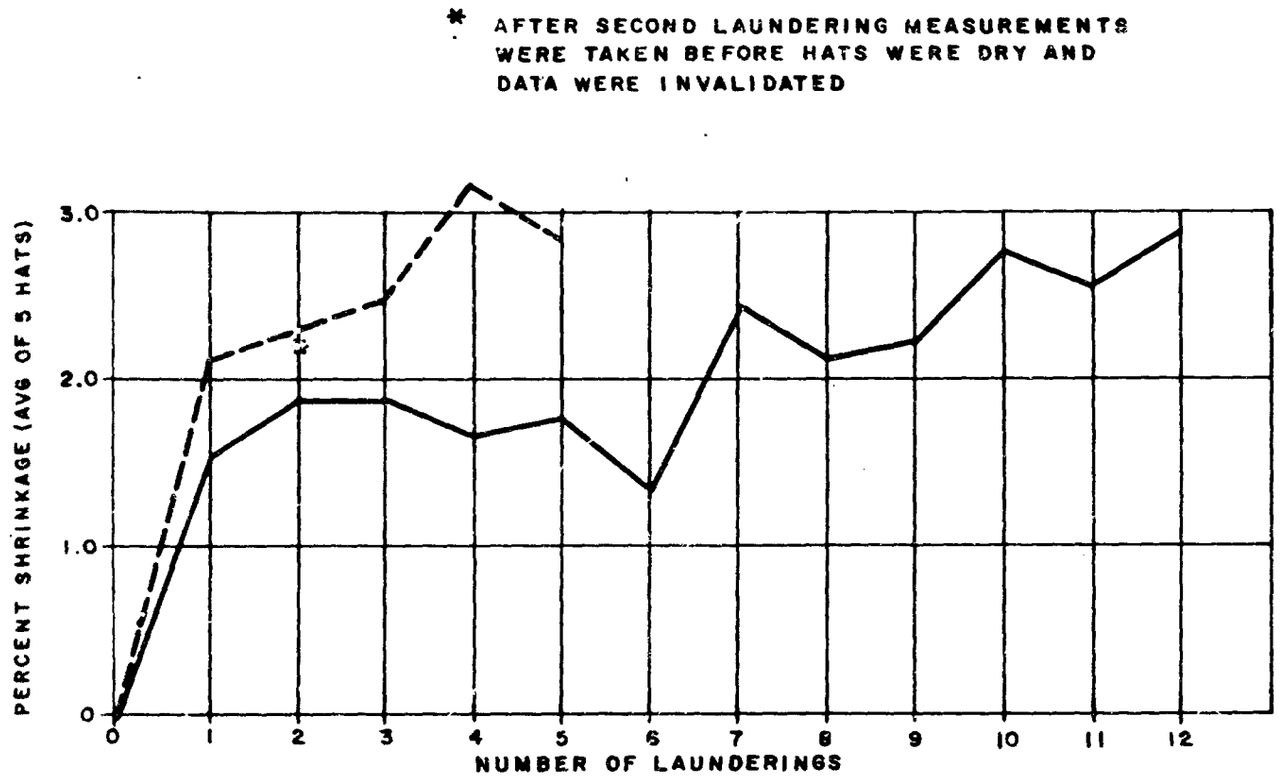
⊙ Data Points

MACHINE LAUNDERING



HAND LAUNDERING

RESULTS OF SHRINKAGE TESTS
(FIVE HATS IN EACH TEST)
Figure 1



RESULTS OF SHRINKAGE TESTS
(FIVE HATS IN EACH TEST)
Figure 2

2.5.5 Analysis

The data and mathematical analyses compiled on Figures 1 and 2 showed that the jungle hats shrank approximately 2%, one full size (3/8-inch), the first time they were laundered by either the hand or machine method. On these unworn hats, shrinkage progressed to a maximum of approximately three (3) percent (2/3-inch). Normally, the stresses of wear would be expected to limit shrinkage during field use, resulting in a practical end-use shrinkage of approximately 2.5% or one and one-half sizes maximum. The preceding paragraph 2.3.5 points out that the hats were fabricated approximately one size larger than standard to allow for shrinkage. It can be concluded that the jungle hats conformed closely to standard cap sizes and measurements once they had been laundered. They can be considered satisfactory for shrinkage characteristics. It should be noted that the shrinkage produced by laundering did not occur as a result of only wetting, as would occur in rainfall, because the hat was made of water repellent treated fabric. The jungle hats and headnets were found satisfactory for cleaning hygienically.

2.6 MAINTENANCE

2.6.1 Objective

To determine the maintenance characteristics of the jungle hat.

2.6.2 Criteria

a. SDR paragraph 3d, "- - - readily returnable to a smart military appearance - - -."

b. SDR paragraph 3i, "- - - should be capable of being hygienically cleaned - - -."

c. SDR paragraph 6, "Maintenance Concept: No maintenance is anticipated other than the normal user care and cleaning, and first echelon repair of minor rips or tears."

2.6.3 Method

During shrinkage tests (Par. 2.5), the hats were purposely smeared with silty soil, clay soil, and dirty lubricating oil to test for removal of these materials during launderings. Also, after each

laundering, each hat was checked for general appearance and shaping characteristics. A minor failure, that occurred during laundering, was repaired with needle and thread to evaluate first echelon maintenance characteristics.

2.6.4 Results

Silty and clay soils were completely removed by laundering. Dirty lubricating oil stains were not completely removed by one laundering. Except for a slight puckering on the quilted brim, and a slightly less stiff "band", the laundered hats were found equal to the new hats in general appearance and shaping characteristics. A one-inch failure in the crown fabric that occurred along a seam of one hat was easily repaired with needle and thread. The repair endured two additional machine launderings.

2.6.5 Analysis

The jungle hats satisfactorily met the SDR requirements relative to maintenance.

2.7 STRENGTH AND ABRASION RESISTANCE

2.7.1 Objective

To determine the strength and abrasion characteristics of the base components and junctures of the jungle hat.

2.7.2 Criteria

SDR paragraph 3i, "The hat should have a useful service life of at least one year under tropical conditions - - -."

2.7.3 Method

Laboratory tests were conducted in accordance with Federal Specification CCC-T-191b on fabric, tape, lace and seams as follows:

a. Strength, breaking: Methods 5100, and 4108 as applicable.

b. Abrasion resistance, Taber: Method 5306 (applicable to fabrics only).

2.7.4 Results

Results of laboratory strength and abrasion tests are presented in Table II.

2.7.5 Analysis

Because samples of component materials were too small to allow compliance with all the standard methods cited for breaking strength tests, modified methodology was used. For example, the sample used in testing of seams consisted of the hat itself rather than samples of fabric cut from the hat. The seam tested was centered between the jaws and the hat remained intact. The results obtained showed that the hat materials and construction were sufficiently sturdy to permit an engineering judgment that the hats should last at least one year in use. Abrasion resistance of 1990 cycles, compared favorably with results previously obtained on 8.5 oz. Cotton Sateen, standard field uniform material, of 1290 cycles. Overall, the hats were judged satisfactory for strength and abrasion resistance.

TABLE II

LABORATORY TEST RESULTS, STRENGTH AND ABRASION

Component	Type Test	Method	No. of Tests	Results		
				Minimum	Maximum	Average
Crown Fabric	Brk Str (wp)	5100	2	85 lb	160 lb	112.8 lb
Crown Fabric	Brk Str (fill)	5100	4	90 lb	150 lb	120.0 lb
Chin Strap	Brk Str (wp)	4108	8	165 lb	195 lb	181.1 lb
Camouflage Tape	Brk Str (wp)	4108	8	470 lb	650 lb	596.9 lb
Back Seam (vertical)	Brk Str	5110.0 (modified)	6	74 lb	123 lb	95.3 lb
Top Seam (crown)	Brk Str	5110.1 (modified)	9	73 lb	155 lb	106.5 lb
Crown Fabric	Abrasion	5306 (¼ in hole)	3	1770 cycles	2370 cycles	1990.0 cycles

2.8 WATER REPELLENCY

2.8.1 Objective

To determine the efficiency and durability of the water repellency of the hat fabric.

2.8.2 Criteria

SDR paragraph 3a, "- - - to develop a new - - - water repellent hat - - -."

2.8.3 Method

Utilizing the funnel and ratings of Federal Specification CCC-T-191b, Method 5526, water resistance of the crown fabric was determined on the five hats new and after each hand and machine laundering conducted in the shrinkage test (Par. 2.5).

2.8.4 Results

The results of spray tests are presented in Figure 3.

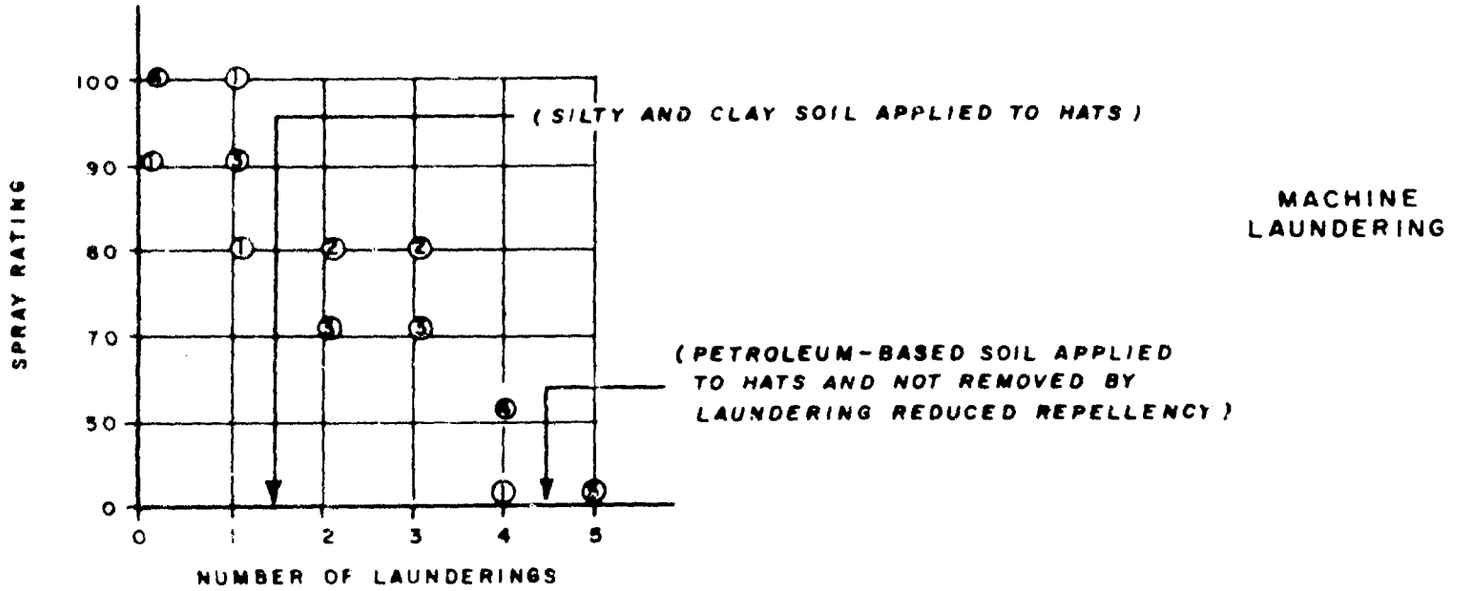
2.8.5 Analysis

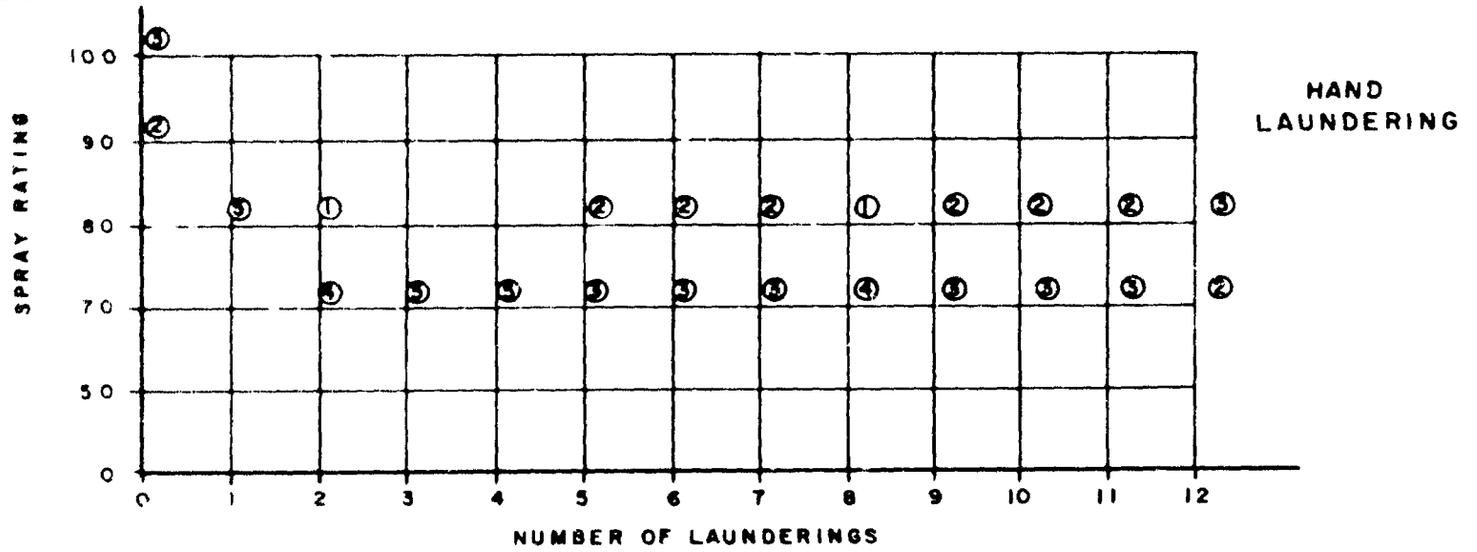
The water repellency of the hats was good before and after the first laundering. Subsequently the repellent finish satisfactorily endured twelve hand launderings but only three machine launderings. During a year of field use the required number and types of launderings would be uncertain, but water repellency characteristics might prove unsuitable if the hats were machine laundered. When the hats were only hand laundered, water repellency would most likely prove entirely satisfactory for a year. Water repellency test results indicated that the hats sould be marked "for hand laundering only".

2.9 WEIGHT

2.9.1 Objective

To determine the weight of the jungle hat with headnet.





WATER REPELLENCY RESULTS

(5 HATS PER TEST)(NUMBER OF HATS RATED AS INDICATED)

Figure 3

2.9.2 Criteria

SDR paragraph 3d: "- - - its total weight should not exceed 12 ounces."

2.9.3 Method

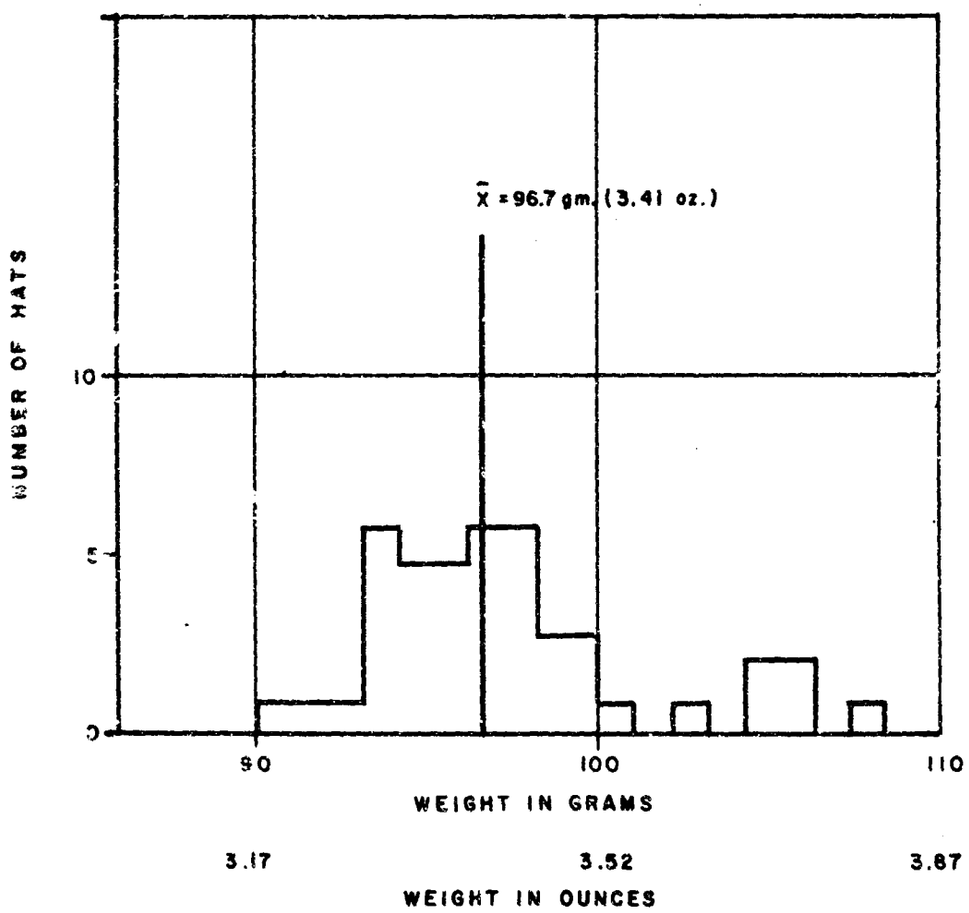
Forty-four (44) of the hats with headnets were weighed on a precision balance to the nearest 0.1 gram.

2.9.4 Results

Weights of hats with nets are presented in Figure 4.

2.9.5 Analysis

The weight of the jungle hat with headnet averaged only 3.4 ounces. Since this is approximately one-fourth of the SDR maximum of 12.0 ounces, the hat met the criterion for weight.



SUMMARY OF WEIGHING RESULTS (44 HATS AND NETS)

Figure 4

SECTION 3. APPENDICES

APPENDIX I - FINDINGS

APPENDIX II - DEFICIENCIES AND SHORTCOMINGS

APPENDIX III - MAINTENANCE EVALUATION

APPENDIX IV - REFERENCES

APPENDIX V - DISTRIBUTION LIST

APPENDIX I. FINDINGS

SDR Requirement	Fully Met	Partially Met	Not Met	Remarks
(Par. 3a) The purpose of this requirement is to develop a new, lightweight, broad brim, water repellent hat, complete with built-in detachable headnet, for use by Special Forces and other selected personnel in tropical and/or jungle areas.		X		The headnet was not built-in but other requirements were met. See par. 1.2, 2.2.4.
(Par. 3b) Latest materials should be used in the construction of the hat, and it should be of such a texture so as to produce minimal noise on contact with vegetation.	X			Hat was nylon-cotton and was of maximum smoothness and minimum stiffness to prevent noise. See par. 1.2.
(Par. 3c) The headnet will be of simple design and inexpensive. When not in use the headnet will be stored in the crown by means of simple straps which do not deform the crown shape and permit retaining the slight groove in the piece of the crown. When the headnet is in use, an elastic band in a heading of the headnet will fit snugly around the base of the crown without deforming the crown. The netting will drape over the brim and descend to the lowest elastic band as in the standard headnet. To preclude the entire hat becoming unserviceable if a tear occurs in the netting, the net, and the attachment thereof must be designed in such a manner so as to permit easy replacement by the user.		X		The headnet was not stored in the crown, the crown did not have a groove, but other requirements were met. See par. 2.2.4.

APPENDIX I

SDR Requirement	Fully Met	Partially Met	Not Met	Remarks
(Par. 3e) The brim should be semi-rigid, of such a design that for normal wear the sides of the brim would have a slight upward curve; for maximum protection during heavy rainfall (or to effectively accomodate the headnet) the user could turn the brim slightly downward.	X			See par. 1.2.
(Par. 3f) The crown will be sufficiently rigid so as to retain its shape after prolonged exposure to precipitation, and should be capable of accepting a military insignia on the front portion in such a manner as to preclude puncturing the hat body. No insignia background will be provided. Ventilation will be provided by three grommets spaced triangularly (upright equilateral) on each side of the crown. Grommets will be noncorrosive, colored black, screened if practical to keep out flying and crawling insects and not exceed 3/8-inch in outside diameter.		X		Two 1/2-inch grommets each side were provided but other requirements were met. See par. 1.2, 2.2.4.
(Par. 3g) The chin strap keeper will be black and be of fungus resistant material.			X	The keeper was brown leather. See par. 1.2, 2.2.4.
(Par. 3h) The hat will have a sweat band of a suitable material that has an equal life expectancy as other portions of the hat.		X		No sweat band was inserted but inside covering at the band was of the same fabric as the hat crown.

APPENDIX I

SDR Requirement	Fully Met	Partially Met	Not Met	Remarks
(Par. 3i) The hat should have a useful life of at least one year under tropical conditions, and should be capable of being hygienically cleaned by the user. No metals subject to corrosion will be used in the construction of the hat.	X			Hand laundering was preferred to preserve water repellency. See par. 2.4.5, 2.5.5, 2.6.5, 2.8.5, and 2.7.5.
(Par. 6) Maintenance Concept: No maintenance is anticipated other than the normal user care and cleaning, and first echelon repair of minor rips or tears.	X			See par. 2.6.5.

APPENDIX II. DEFICIENCIES AND SHORTCOMINGS

1. DEFICIENCIES

Deficiency	Suggested Corrective Action	Remarks
1.1 None	None	None

2. SHORTCOMINGS

Shortcoming	Suggested Corrective Action	Remarks
2.1 Deviations from the SRD design.	None	Design selected by SEA.
2.2 Water repellency was not durable to more than three (3) machine launderings.	None	Hats should be marked "for hand laundering only."

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APPENDIX III. MAINTENANCE EVALUATION

A first echelon repair was performed satisfactorily with sewing kit by hand sewing. Hand laundering was also satisfactorily conducted. It was concluded that the hats with headnet would require minimal maintenance and no special tools or equipment.

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APPENDIX IV. REFERENCES

1. CDOG, 139 (B) d (3) I - Hat, Jungle w/Headnet.

2. SDR, Hat, Jungle with Headnet.

3. Test Directive, Engineering and Service Test of Hat and Insect Net, dated 20 October 1967.

4. AMCTC Item 5597, Meeting 10-67, 7 September 1967, Type Classification of subject item as Standard A with a restricted BOI "1 per indiv assgd to SE Asia."

5. Army Concept Team in Vietnam Final Report of Tropic Combat Hats (ACL 84/67).

6. Letter, AMXRE-COP, Natick Laboratories, 29 August 1967, subject: ET/ST of Hat, Jungle with Headnet.

7. Plans of Test, USATECOM Project No. 8-6-6415-01/02.

AD Accession No

U. S. Army General Equipment Test Activity, Fort Lee, Virginia

ENGINEERING TEST OF JUNGLE HAT WITH HEADNET, by Robert C. Laughlin, June 1968, 30 pages, 4 tables, 1 illus., 5 Appendices p19-30
(TECOM Proj. No. 8-6-6415-01) Unclassified Report

An Engineering Test of a Jungle Hat with Headnet was conducted from 10 December through 23 May 1968, to determine the technical performance and safety characteristics of the test item as described in the SDR and as indicated by the particular design and to determine the technical and maintenance suitability of the Jungle Hat with Headnet for Service Testing.

It was concluded that the Jungle Hat with Headnet is suitable for Service Testing.

It was recommended that the hats be marked "for hand laundering only".

UNCLASSIFIED

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II. Title (Engineering Test of Jungle Hat with Headnet)
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UNCLASSIFIED
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DOCUMENT CONTROL DATA - R&D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1 ORIGINATING ACTIVITY (Corporate author) Department of the Army U. S. Army General Equipment Test Activity Fort Lee, Virginia 23801	2a REPORT SECURITY CLASSIFICATION Unclassified 2b GROUP
3 REPORT TITLE Engineering Test of Jungle Hat With Headnet	
4 DESCRIPTIVE NOTES (Type of report and inclusive dates) Final Report	
5 AUTHOR(S) (Last name, first name, initial) LAUGHLIN, Robert C.	

6 REPORT DATE	7a TOTAL NO OF PAGES	7b NO OF REFS
June 1968	30	7

8a CONTRACT OR GRANT NO b PROJECT NO USATECOM 8-6-6415-01 c d	9a ORIGINATOR'S REPORT NUMBER(S) 9b OTHER REPORT NO(S) (Any other numbers that may be assigned this report)

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13 ABSTRACT

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14. KEY WORDS	LINK A ROLE	LINK A WT	LINK B ROLE	LINK B WT	LINK C ROLE	LINK C WT
Engineering Test						
Test						
Personal Equipment						
Tropical Combat Hat						
Jungle Hat						
Combat Head Gear						
Hats - Military						
Military Combat Hat						
Performance Test						
Headnet						
Insect Net						
Clothing						

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