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Technical Report: NAVTRADEV CEN IH-188

POLYETHYLENE SILHOUETTE TARGET UTILIZATION

(Device 3H23 E-Type)

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NAVTRADEV CEN Task No. 7883-28

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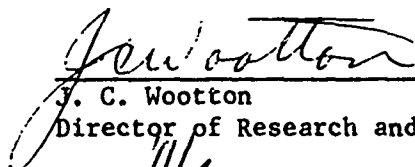
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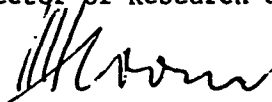
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SECTION I

INTRODUCTION

To determine when the polyethylene silhouette target used with Devices M31A1 and 3C52 becomes unusable is the basis for this report.

Technical Report NAVTRADEVCEM IH-78^{1*} provides some informational depth into this area, but does not answer the question, "when should a target be discarded?"

SECTION II

STATEMENT OF THE PROBLEM

Instances have been encountered where there was reason to believe that polyethylene silhouette targets were being discarded prior to the end of their useful lives.

To affirm or to negate this belief, the Army Participation Group at Orlando, Florida requested that the Naval Training Device Center perform appropriate tests on these targets and analyze the results.

* Superscript numbers indicate references

SECTION III

PROCEDURE

INTRODUCTION

Five targets (figure 1), which had been fired upon by trainees with M-16 rifles and discarded in the field, were provided the Naval Training Device Center for life test and evaluation.

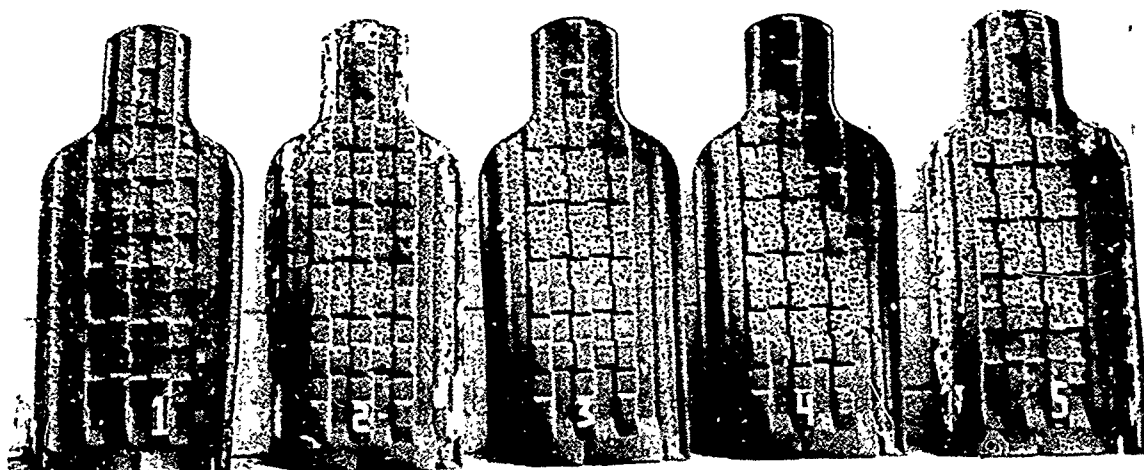


Figure 1. Field Discarded Targets

The test phase of the task was accomplished in three parts. First, the overall areas of each of the five targets were divided into 28 segments; secondly, the average quantity of previous "hits" in each of the segments was determined; and thirdly, segmental test firings in the same proportions as the average of trainee firings were made into one of the five targets.

The evaluation phase consisted of the careful monitoring of the target being fired upon.

TEST PHASE. This phase was conducted as follows:

Target Segmentation. Each of the five targets were divided into 28 numbered segments as indicated in figure 2.

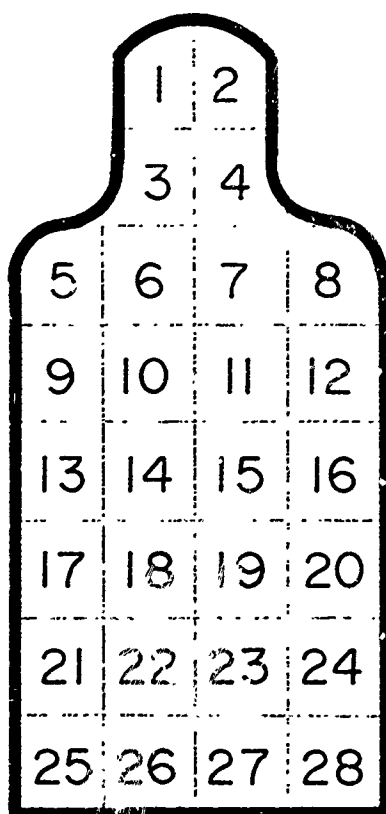


Figure 2. Representation of Target Showing Total Area Segmentation

Determining Average Target Area of Utilization. This determination was made by counting and recording the number of trainee "hits" in each of the 28 segments of the five targets. These "hits" consisted of both direct and ricochette types. Since the holes produced by direct "hits" are round and those of ricochettes are other than round and approximately three times as large as direct-hit holes, it is a simple matter to ascertain the significance of both. Table 1 reflects data compiled from computations of the direct-hit holes in the targets; table 2 reflects the significance of the holes which resulted from ricochettes.

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TABLE 1. DATA COMPILED FROM DIRECT-HIT TARGET HOLES.

(1) S	(2) H_{T1}	(3) H_{T2}	(4) H_{T3}	(5) H_{T4}	(6) H_{T5}	(7) $\Sigma H_{S1, S2, \dots, S28}$	(8) $\text{Col(7)} \div \Sigma H_{TOT}$ (%, rounded)
1	8	10	28	21	10	77	2
2	5	12	28	23	15	83	2
3	26	20	65	43	24	178	4
4	26	29	59	41	32	187	4
5	15	26	36	34	22	133	3
6	40	33	77	77	42	269	6
7	61	37	98	79	43	318	7
8	24	29	53	47	29	182	4
9	44	33	37	42	32	188	4
10	54	60	81	91	57	343	8
11	61	60	81	103	61	366	8
12	52	42	40	55	33	322	5
13	24	40	20	37	26	147	3
14	60	56	32	65	55	268	6
15	67	58	34	84	70	313	7
16	52	41	41	72	56	262	6
17	20	36	0	19	20	95	2
18	40	34	0	51	61	186	4
19	50	48	0	67	59	224	5
20	45	22	0	36	48	151	4
21	3	6	0	1	23	33	1
22	14	7	0	1	37	59	2
23	20	12	0	4	42	78	2
24	14	10	0	0	25	49	1
25	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0
	$\Sigma H_{T1} =$ 825	$\Sigma H_{T2} =$ 761	$\Sigma H_{T3} =$ 810	$\Sigma H_{T4} =$ 1093	$\Sigma H_{T5} =$ 922	$\Sigma H_{TOT} =$ 4411	$\Sigma \text{Col(8)} = 100$

Legend: H - Target Hit
 S1, ..., S28 - Target Segments 1 through 28
 T1, ..., T5 - Targets 1 through 5
 TOT - Total

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TABLE 2. DATA COMPILED FROM RICOCHETTE TARGET HOLES

(1) Σ_{T1}	(2) Σ_{T2}	(3) Σ_{T3}	(4) Σ_{T4}	(5) Σ_{T5}	(6) $\Sigma_{T1, \dots, T5}$	(7) $\text{Col}(6) \div (\Sigma_{TOT} + 96)$ (%, rounded)
31	23	12	10	20	96	2

Obviously, a target would sustain fewer ricochettes than direct-hits before becoming unusable. The ricochettes in these targets reflect an average of only 2% of the total holes in the targets.

Selecting and Preparing the Target for Test. Of the five targets, T4 most nearly fit our model of an "average used target", as depicted by column 8 of table 1. Therefore, target T4 was selected and mounted in a Train-Fire Target Holding Mechanism, M31A1. The next step was to utilize the data in column (8) of table 1, and prepare average areas of target utilization on target T4. These areas are indicated in figure 3.

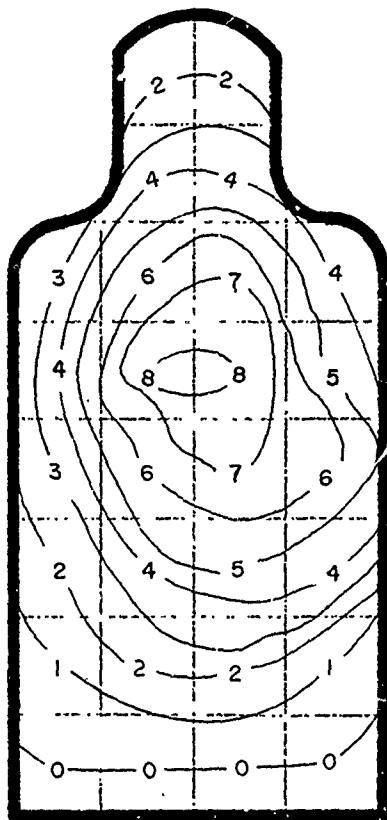


Figure 3. Representation of Target Showing Zones of Average Target Utilization

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Target Test and Evaluation. Using an M-16 rifle at a range of 100 ft, target T4 was fired upon under controlled conditions. The "hits" on the target were restricted to the areas and to the same percentages as is indicated in figure 3. Firing was continued until T4, when viewed head-on, displayed discernible distortion. (The distance between shoulders was reduced from 19-5/16 to 19 inches.) This occurred after 3000 "hits". Figures 4 and 5 show views of T4 after it received 3000 "hits".

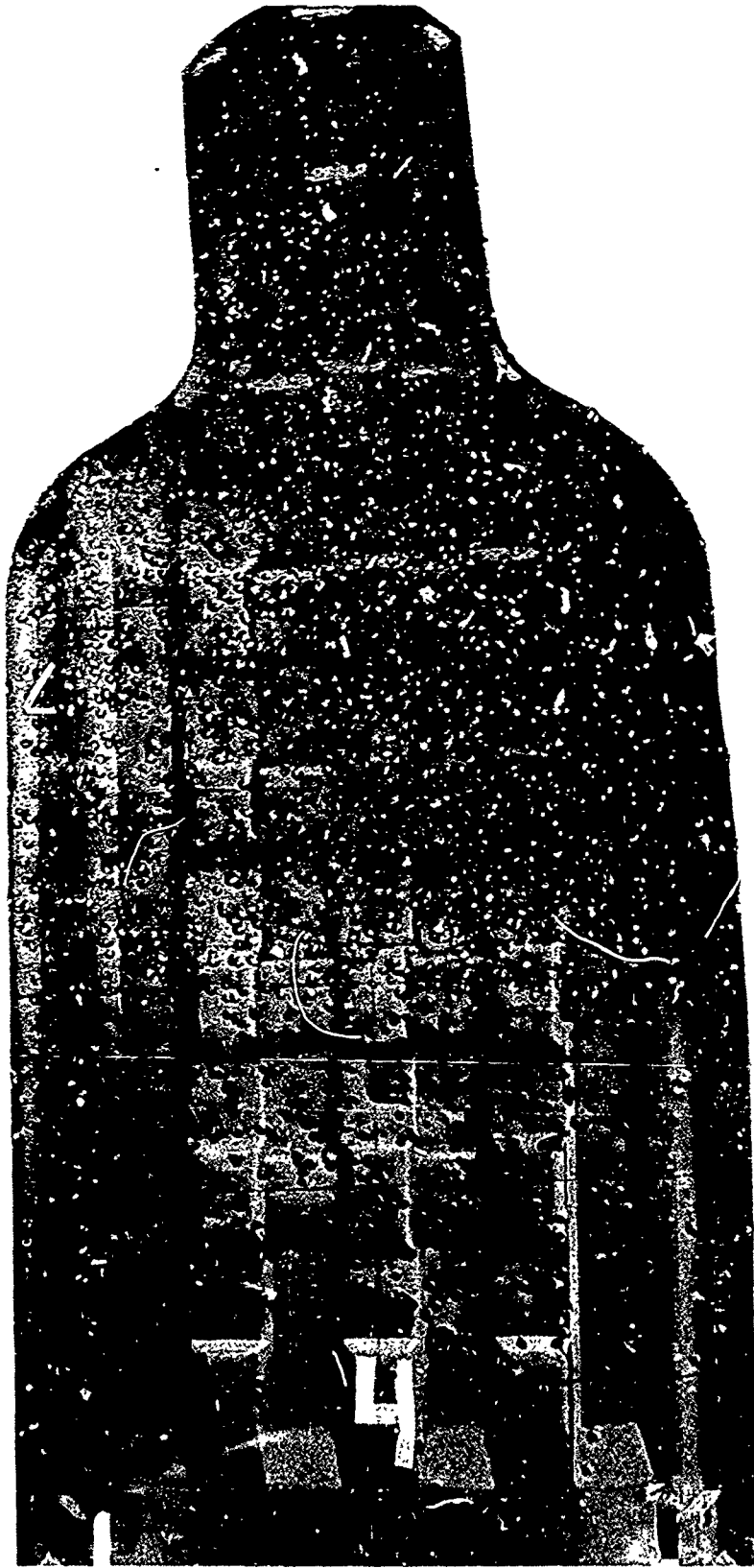


Figure 4. Head-on View of Target After Receiving 3000 "Hits"

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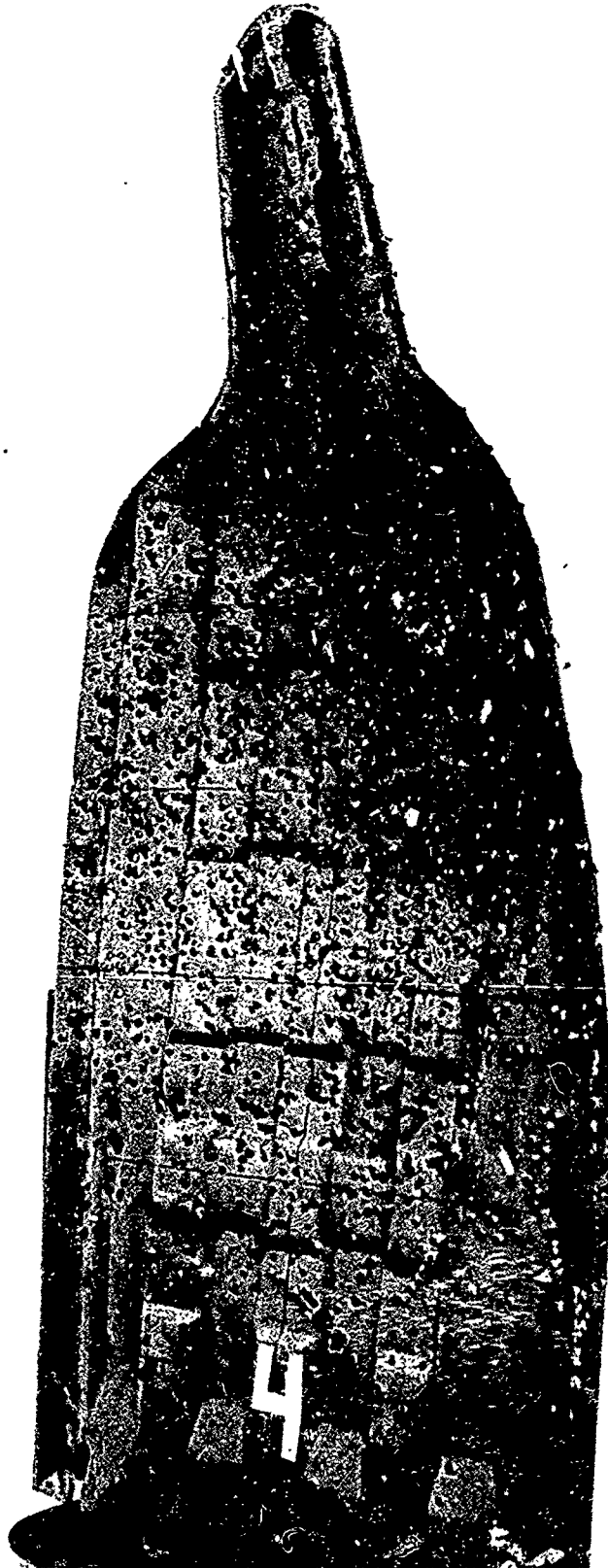


Figure 5. Oblique View of Target After Receiving 3000 "Hits"

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SECTION IV

RESULTS

It is interesting to note that during the test the Train-Fire Target Holding Mechanism, M31A1, responded to the target "hits" 95% of the time. This is significant since it exceeds the acceptable "hit" response of new targets by 5%.

When viewed head-on, target T4 did not display discernible distortion until it had received 3000 "hits" in the target's area of average utilization.

SECTION V

DISCUSSION

The theory used in planning the test was based on the simulation of real life situations. By determining from a fair sampling of the target's area of utilization, the test became completely realistic. Obviously, had its total area been utilized, target T4 would have sustained many hundreds of "hits" in excess of the 3000.

Also, of significance is the fact that the "hit" response of T4 did not deteriorate below the level of acceptability, before head-on discernible distortion occurred.

SECTION VI

CONCLUSIONS

It was concluded that the polyethylene silhouette target usually should not be discarded prior to receiving a total of 3000 "hits". Of this total it is expected that 2% would be ricochettes. This condition may be ascertained by either of two methods: (1) By use of the counter in the Train-Fire Target Holding Mechanism, Device M31A1 or Device 3C52; and (2) By observing that the distance between shoulders has been reduced from 19-5/16 inches to approximately 19 inches.

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SECTION VII

RECOMMENDATION

It is recommended that user activities be advised to retain in service each polyethylene silhouette target until it has received 3000 "hits".

REFERENCES

1. Terry, Robert B. Technical Report: NAVTRADEVGEN IH-78., March 1968, Naval Training Device Center, Orlando, Florida 32813., 46 pages.