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WATERTOWN ARSENAL LABORATORY

MEMORANDUM REPORT

NO. WAL 710/614

A-1-38803

Resistance of Two Types of Nylon Belting to Perforation
by Various Small Arms Projectiles

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BY

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Jr. Engineer

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~~RESTRICTED~~ DATE 21 April 1944

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Memorandum Report No. WAL 710/614

Second Partial Report on Problem B-8.4

21 April 1944

Resistance of Two Types of Nylon Belting to Perforation
by Various Small Arms Projectiles

1. At the request of the Office, Chief of Ordnance,¹ ballistic tests have been conducted at this arsenal on two types of nylon webbing designated as 68-2831 and 68-2831A.

2. On the basis of resistance to perforation per unit weight neither type compared well with multi-layered samples of 17 $\frac{1}{2}$ ounce nylon duck previously tested here and both types were considerably inferior to an equivalent weight of Hadfield manganese steel. As between these two types the one which apparently was more compactly woven (63-2831) offered no significantly better resistance per unit weight than the one which apparently was less compactly woven (63-2831A).

3. Samples 63-2831 and 63-2831A were received in strips 8' by 3-1/8"x 7/16" and 9' by 3-1/8"x1/2" respectively. From these strips sections, 12 inches long have been cut and tested, stretched tautly across a wooden ballistic frame so that the back of the sample was unsupported, with standard cal. .45 ball ammunition and with projectiles G-1-A (cal. .30, 150 grains), G-1-S (cal. .30, 34 grains) and G-2 (cal. .22, 17 grains) developed at this arsenal.² Similar sections were also tested, strapped to a sawdust-filled canvas dummy with projectiles G-1-S and G-2. The results of these tests appear in Table I.

¹ O.O. 423/121(c) - Wtn 423/169(c) dated 14 February 1944.

² WAL Memorandum Rpt. No. 762/247(c) - "Development of Projectiles to Be Used in Testing Body Armor to Simulate Flak and 20 mm. HE Fragment", 17 Dec. 1943.

WAL Memorandum Rpt. No. 762/253(c) - "Development of Projectiles to Be Used in Testing Body Armor to Simulate Flak and 20 mm. HE Fragment", 7 Jan. 1944.

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4. Under impact of projectiles G-1-A and G-2 and standard cal. .45 ball ammunition the resistance of the two types is substantially identical, with the slight superiority of G3-2831A over G3-2831 attributable to its slightly heavier weight. Under impact of projectile G-1-S, however, the lighter, but apparently more closely woven, G3-2831 affords greater resistance under both conditions of testing. This is due, it is felt, to the tendency for the sabot of this projectile to engage the more closely woven fabric during perforation and thus dissipate a portion of the energy of the projectile in work superfluous to the main task of penetration.

5. Under impact of all projectiles the resistance of both types of nylon webbing is appreciably inferior to that of multi-layered samples of 17½ nylon duck of equivalent weight per unit surface area. Their inferiority to equivalent weights of Hadfield manganese steel is even more pronounced.

6. It is, therefore, suggested that consideration, as body armor components, of nylon webbing, in forms similar to the subject samples, be henceforth discouraged.

J. F. Sullivan
Jr. Engineer

APPROVED:

N. A. MATTHEWS
Major, Ord. Dept.
Chief, Armor Section

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TABLE I

Summary of Ballistic Tests Conducted at Watertown Arsenal on
Two Types of Nylon Belting Designated 63-2831 and 63-2831A

<u>Sample</u>	<u>Equivalent Steel Gauge</u>	<u>G-1-A1</u>	<u>G-1-S2</u>	<u>G-23</u>	<u>154</u>
Stretched tautly across a wooden ballistic frame - back unsupported:					
63-2831	.040"	484	840	973	517
63-2831A	.041"	496	791	1055	557
11 plies nylon duck (17 1/2 oz.)	.040"	567	1058	1310	704
Radfield Steel (Average)	.040"	-	900	1600	960
Strapped to sand-filled canvas dummy:					
63-2831	.040"	500	896	1075	-
63-2831A	.041"	-	806	1085	-
11 plies nylon duck (17 1/2 oz.)	.040"	-	1090	1360	-

1. Cal. .30 (150 grains)
2. Cal. .30 (34 grains)
3. Cal. .22 (17 grains)
4. Standard cal. .45 ball ammunition

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