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WATERTOWN ARSENAL LABORATORY

MEMORANDUM REPORT

NO. WAL 710/613

AF1-126225

Resistance of 6-Fly Glass Webbing to
Perforation by Various Small Arms Projectiles



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BY
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Watertown Arsenal Laboratory

Memorandum Report No. WAL 710/613

First Partial Report on Problem B-3.7

20 April 1944

Resistance of 6-Ply Glass Webbing to
Perforation by Various Small Arms Projectiles

1. In accordance with a request of the Office, Chief of Ordnance, ballistic tests have been conducted at this arsenal on samples of 6-ply glass webbing received from Russell Manufacturing Company.

2. On the basis of resistance to perforation per unit weight this material, which is equivalent in weight per unit surface area to .079ⁱⁿ of steel, is considerably inferior to steel and other substitute materials tested here.

3. This material was supplied to this arsenal in a strip 6 $\frac{1}{2}$ feet long, 3-5/8" wide and 7/16" thick. From this strip sections 12 inches long were cut and tested, stretched tautly (back unsupported) across a wooden ballistic frame, with 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 In addition, similar sections, strapped to a sawdust-filled canvas dummy, were tested with G-1-S and G-2 projectiles. These results are summarized in Table I.

4. The ballistic limit of this material, rigidly mounted, under impact of projectile G-1-S (1121 feet-per-second) is substantially the same as that of 12 plies of 17 $\frac{1}{2}$ oz. nylon duck (1105 feet-per-second) which is only 56% as heavy per unit surface area. (Twelve plies of the nylon material are equivalent in weight to .044" of steel). Its ballistic

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1. O.O. 423/7544(r) - Wtn. 400.112/3053(r) dated March 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. 1944.
WAL Memorandum Rpt. No. 762/253(c) - "Development of a Projectile to Be Used in Testing Body Armor to Simulate Fragments of a 20 mm. HE Projectile", 7 Jan. 1944.

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limit with projectile G-2 (1300 feet-per-second) is somewhat less than that of the lighter assembly of nylon duck (1360 feet-per-second). With projectile G-1-A and with standard cal. .45 ball ammunition its ballistic limits (691 feet-per-second and 786 feet-per-second, respectively) are not so superior to those of the nylon duck (566 feet-per-second and 750 feet-per-second, respectively) as its greater weight (ratio 79 to 44) would imply. As strapped to a sawdust-filled canvas dummy the ballistic limit of the subject material with projectile G-1-S (1175 feet-per-second) is somewhat greater than that of 11-ply nylon duck (1090 feet-per-second) which is equivalent in weight per unit surface area to .040" of steel, whereas under impact of projectile G-2, the ballistic limits of those two materials are identical (1360 feet-per-second). The ballistic limit of steel of a thickness (.079") equivalent in weight per unit area to the glass webbing is so much greater that no comparison is attempted.

5. Thus, the results of these tests indicate that further consideration, as a body armor component, of glass webbing in the form submitted, should be discouraged.

J. F. Sullivan

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Jr. Engineer

APPROVED:

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TABLE I

Summary of Ballistic Tests Conducted at Watertown Arsenal on
6-Ply Glass Webbing Submitted by Russell Manufacturing Company

<u>Sample Tested</u>	<u>Equivalent Steel Thickness</u>	<u>Ballistic Limit</u>	
		<u>G-1-S¹</u>	<u>G-1-A²</u>
<u>Faultly stretched on rigid wooden frame - back unsupported:</u>			
Glass webbing (6-ply)	.079"	1121	691
Nylon Duck (12-ply)	.044"	1105	566
Hadfield Steel (Average)	.044"	1050	475
			1650
			925

Strapped on sawdust-filled canvas dummy:

Glass webbing (6-ply)	.079"	1175	-	1360	-
Nylon Duck (11-ply)	.040"	1090	-	1360	-

1. Cal. .30 (34 grain)
2. Cal. .30 (150 grain)
3. Cal. .22 (17 grain)
4. Standard cal. .45 ball ammunition. (steel jacketed 230 grains)

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