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# WATERTOWN ARSENAL LABORATORY

## MEMORANDUM REPORT

NO. WAL 710/649

Resistance of 7-Ply Silk Webbing to

Perforation by Fragment-Simulating Projectiles

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BY
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MEMORANDUM REPORT NO. WAL 710/649

Second Partial Report on Problem B-8.7

3 June 1944

## Resistance of 7-Ply Silk Webbing to Perforation by Fragment-Simulating Projectiles

1. In accordance with a request from the Office, Chief of Ordnance[1] ballistic tests have been conducted at this arsenal and samples of 7-ply silk webbing supplied by the Russell Manufacturing Company.

2. This material afforded the greatest resistance to perforation by steel-jacketed caliber .45 ball projectiles and by caliber .22 fragment simulating projectiles[2] of any of the fabrics tested in webbing form. Its resistance to perforation by both types of projectiles is about equivalent to that of an equal weight of 17½ ounce nylon duck which has shown the greatest resistance to perforation of any fabric tested here.

3. Samples were drawn taut and tacked to wooden ballistic frames which allow an area 8" by the width of the webbing to remain unsupported from the rear. Impacts of caliber .45 ball (steel-jacketed) projectiles and of caliber .22 fragment-simulating projectiles, G-2, fairly spaced, were then directed into this area. The results of these tests appear in Table I.

4. Under impact of caliber .45 (steel-jacketed) ball projectiles the resistance of this material to perforation (724 feet-per-second) is superior, on a weight for weight basis, to that of nylon webbing (537 feet-per-second)[3] and that of glass webbing (786 feet-per-second, but nearly

1. O.O. 423/7881 - Wtn 400.112/3573, dated 19 May 1944.

2. Watertown Arsenal Laboratory Memorandum Report No. WAL 762/253 - Development of a Projectile, to be Used in Testing Body Armor, to Simulate Fragments of a 20 mm. H.E. Projectile - 7 January 1944.

3. Watertown Arsenal Laboratory Memorandum Report No. WAL 710/614 - Resistance of Two Types of Nylon Belting to Perforation by Various Small Arms Projectiles - 21 April 1944.

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twice as heavy)[4] and is equivalent to that of an equal weight of 17½ ounce nylon duck (750 feet-per-second)[5]. It is still considerably inferior, however, to that of an equivalent weight of Hadfield manganese steel (920 feet-per-second).

5. Under impact of the caliber .22 fragment-simulator, G-2, the resistance of this material to perforation (1336 feet-per-second) is superior to that of nylon webbing (1053 feet-per-second) and that of glass webbing (1300 feet-per-second) and again is equivalent to that of an equal weight of 17½ ounce nylon duck (1360 feet-per-second). It is likewise inferior to that of an equivalent weight of Hadfield manganese steel (1630 feet-per-second).

6. Therefore, although it is apparent that no fabric will be equivalent, in resistance to fragment perforation, to Hadfield manganese steel, nevertheless it does appear that, if considerations dictate the use of a fabric as a principal body armor component, this material, as well as 17½ ounce nylon duck deserves serious recommendation.

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4. Watertown Arsenal Laboratory Memorandum Report No. WAL 710/613 - Resistance of 6-Ply Glass Webbing to Perforation by Various Small Arms Projectiles - 21 April 1944.

5. Watertown Arsenal Laboratory Memorandum Report No. WAL 710/616 - Resistance of Various Fabrics of 17½ Ounce Nylon to Several Types of Small Arms Projectiles - 27 April 1944.

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APPROVED:

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Table I

Summary of Ballistic Tests Conducted at Watertown Arsenal

on Samples of 7-Ply Silk Webbing Supplied by

Russell Manufacturing Company

| Sample Tested | Equivalent Steel Thickness | Ballistic Limit (F/S) Cal. .45[1] | Ballistic Limit (F/S) G-2[2] |
|---|---|---|---|
| Silk webbing (7-ply) | .042" | 724 | 1336 |
| Nylon webbing | .041" | 537 | 1053 |
| Nylon duck (12-ply) | .041" | 750 | 1360 |
| Glass webbing (6-ply) | .079" | 780 | 1300 |
| Hadfield Steel (Average) | .042" | 920 | 1630 |

[1]Caliber .45 (steel-jacketed) ball projectile - 230 grains.

[2]Caliber .22 fragment-simulating projectile - 17 grains.

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