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WATERTOWN ARSENAL
LABORATORY

MEMORANDUM REPORT

NO. WAL 710/281

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Resistance of "K Panels" Submitted by
the U. S. Rubber Company to Perforation by
Fragment-Simulating Projectiles

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BY

J. F. SULLIVAN
Asst. Engineer

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DATE 3 January 1945

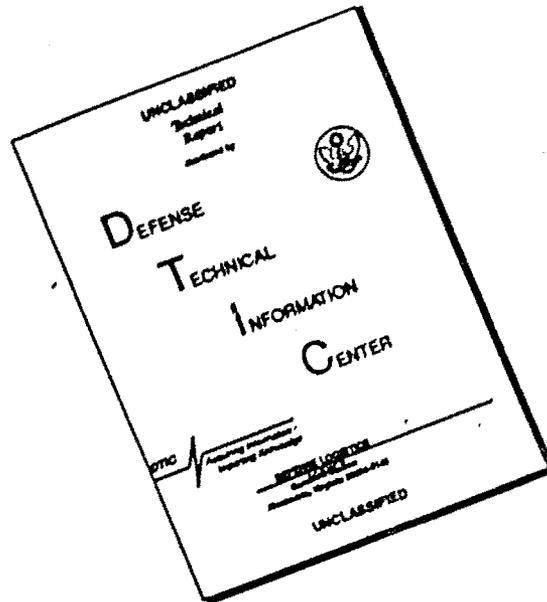
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WATERTOWN ARSENAL LABORATORY

MEMORANDUM REPORT NO. WAL 710/251

First Partial Report on Problem B-8.11

3 January 1945

Resistance of "K Panels" Submitted by
the U. S. Rubber Company to Perforation by
Fragment-Simulating Projectiles

1. In response to a request from the Office, Chief of Ordnance, tests were conducted at this arsenal on several samples of "K Panels" (laminates of R-301-W aluminum alloy with fiberglass) submitted by the U. S. Rubber Company collaborating with the Reynolds Metals Company.
2. The resistance of these samples to perforation by cal. .45 steel-jacketed ball projectiles and by the cal. .22 fragment-simulating projectile, G-2, was so greatly inferior to that of Hadfield manganese steel of equivalent weight-per-unit area that tests with other fragment-simulators were not conducted. It was noticed that when the overall weight was kept constant but the weight of the aluminum component was increased the resistance of a sample decreased.
3. Samples were weighed and measured and the weight-per-square-foot and the equivalent steel gauge determined. Samples were then rigidly clamped to wooden ballistic frames and impacted fairly with cal. .45 steel-jacketed ball projectiles and with cal. .22 fragment-simulating projectiles, G-2. The results of these tests are included in Table I.
4. The resistance of none of these samples to perforation by the test projectiles used compared with that of an equivalent weight of Hadfield manganese steel. As might have been anticipated from earlier tests of the components separately (in which the fiberglass laminate exhibited high resistance and the aluminum alloy exhibited low resistance) samples of equal overall weight increased in resistance to perforation as the weight of aluminum employed decreased.

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1. O.O. 470.1/476 - Wtn 470.1/7254 - 13 July 1944
 2. WAL 762/253

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5. Although the resistance of these samples to perforation by the projectiles used should not be considered a criterion of their resistance to actual service impact of fragments of high-explosive shell, their behavior under impact of these projectiles indicated that the division of the fiberlas component into two sandwiching elements effectually wastes the armoring effect of the face element. The consolidation of these two elements into a single element behind the aluminum component would undoubtedly result in a more efficient perforation resistor.

J. F. Sullivan

J. F. Sullivan
Asst. Engineer

APPROVED:

E. L. Reed

E. L. Reed
Research Metallurgist
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TABLE I

Summary of Ballistic Tests Conducted at Watertown Arsenal
 on Samples of "K Panels" Submitted by the U. S. Rubber Company
 (July Shipment)

Name	Make-Up	Lbs./ Sq. Ft.	Equiv. Steel Gauge	Ballistic Limits Cal. .45	Ballistic Limits Cal. .22
K Panel	.051" -- .062" -- .062"	1.93	.047"	880	--
"	.051" -- .062" -- .062"	1.89	.046"	--	1480
"	.051" -- .062" -- .062"	1.89	.046"	--	1350
"	.051" -- .062" -- .062"	1.89	.046"	824	--
K Panel	.040" -- .062" -- .062"	1.79	.044"	922	--
"	.040" -- .062" -- .062"	1.84	.045"	--	1332
K Panel	.064" -- .051" -- .051"	1.86	.046"	865	--
"	.064" -- .051" -- .051"	2.00	.049"	779	--
"	.064" -- .051" -- .051"	2.00	.049"	--	1287
"	.064" -- .051" -- .051"	2.10	.051"	--	1408
K Panel	.072" -- .051" -- .051"	2.20	.054"	829	--
"	.072" -- .051" -- .051"	2.10	.051"	793	--
"	.072" -- .051" -- .051"	1.85	.045"	--	1327
"	.072" -- .051" -- .051"	2.10	.051"	--	1425
K Panel	.125" -- .051" -- .051"	2.83	.069"	1026	--
"	.125" -- .051" -- .051"	2.83	.069"	--	1620
FOR COMPARISON:					
Hadfield					
Manganese Steel					
1. Cal. .45 steel-jacketed ball projectile - 230 grains					
2. Cal. .22 fragment-simulating projectile - 17 grains					

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