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Use of Mathematics in World War 1

World War 1 was a war fought between two trenches. What you might not realize is that these trenches were built to protect soldiers from shelling from artillery. Even though the war seemed like it was fought with little strategy, the mathematics and physics required to properly aim mortar and other artillery was new.

Unlike other wars, math was not created to serve the purpose of military, the military served the purpose of math in World War 1. Scientists had created all of the necessary formulas and laws to serve the needs of the military, however, all of the constants for making artillery hit targets accurately. Books like *The Mathematics of Warfare* and *Elementary Mathematics for Field Artillery* came out as guides to help artillery operators more accurately hit the enemy trenches.

When the US entered the Great War, the Military started to employ mathematicians and physicist to find how to describe the motion of a projectile in the air at different elevations, and in different weather conditions.

The first person who was offered to do this was Dr. Oswald Veblen, a math professor at Princeton University. He traveled to Aberdeen, an army proving grounds in Maryland, to map out the range and firing pattern of these guns. Starting with a shell that was 2.95 inches in diameter, Veblen and his team took samples of every mortar leaving for the western front, in doing this they were able to create tables to be used by operators who were serving on the front lines of the western front. Doing these calculations was difficult during this period in time. There were no computers to find the muzzle velocity of the round, so it was difficult to derive other parts of the

equation. Instead, the researchers had to lay the gun barely off the ground, so the muzzle velocity could be easily calculated.

Veblen created a ballistics coefficient, something that making determining the drag coefficient and the shape that the projectile would make in the air, this was found by using factors such as shape, size, and mass of the shell. The only issue is that measuring this coefficient took longer than expected, and it took months for other colleagues of his to calculate them. After this arbitrary C value was found, it was basic Newtonian physics to calculate distance, firing angle, etc.

For the first time in history, aerial imagery was be able to be used to generate important maps. “These guys would risk their lives in these ‘flying coffins,’ as they were called, flying at 12,000 feet above the enemy with a guy leaning out the back with a camera” (Miller). These soldiers risking their lives, may have saved the life of many of their fellow soldiers lives. These photographers took photos of enemy lines and photos of town.

The equations that Veblen, and the tables that he was able to generate from his tables were made possible to be used in the field only by cartographers who mapped out the battlefield to the meter, noting all possible elevation changes. The Allies had a superior mapping method, using the Lambert method, they were able to make maps that correctly project the curvature of the earth, while the Axis Powers used the Belgian Bonne mapping method, that converted the curvature of the earth to a flat surface. This Belgian Bonne ended up being very inaccurate when dealing with long range artillery strikes because it negated the curvature of the earth.

These new mapping and mathematical methods and mapping methods attributed to the Allied winning the stalemate on the western front in World War 1.