2012 Ammunition Hall of Fame Inductee
DR. ROBERT HARRINGTON KENT

Dr. Robert Harrington Kent was born in Meriden, Connecticut on July 1, 1886. He attended Harvard University, obtaining his Bachelor of Arts degree in 1910, his Master of Arts degree in 1916, and, in 1953 his alma mater conferred an honorary doctorate of science. He became an assistant instructor in physics and a part-time instructor in mathematics at Harvard. After successfully completing exams for a doctorate, he left Harvard in 1916 to be an instructor in electrical engineering at the University of Pennsylvania.

In 1917, Dr. Kent entered the U.S. Army and was commissioned as a first lieutenant in the Office of the Chief of Ordnance, Washington, D.C. In June 1918, he was ordered to Tours, France, on the staff of the Chief Ordnance Officer, American Expeditionary Forces. During early involvement in World War I, Lieutenant Kent was one of just three officers (along with Captain A.M. Ayer and Lieutenant S.W. Alexander) in the Ammunition Artillery section of Gun Division the Ordnance Department (OD). His responsibilities included preparing firing tables for use by American artillery and serving as a representative for the Chief Ordnance Officer at numerous tests and demonstrations. Early in 1918, Major Ayer and Lieutenants Kent and Alexander designed conical aluminum windshields to be fitted to projectiles of several calibers to increase both their range and accuracy. Though these modifications were not conclusively tested before the war's ended, their efforts proved useful to the OD in future years.

After the Armistice in 1918, Kent visited the French proving grounds at Gavre where he met the then Captain Ralph Fowler (later professor and Sir). He later saw the work which Professor Fowler was doing in the study of stability and aerodynamics of shells; he also had opportunities to associate with other brilliant young British scientists such as then Captain Alwyn Crow (later Sir Crow). After being offered a permanent Army commission, Kent resigned from the Army in 1919 and entered civilian duties as an ordnance engineer/ballistician in the Office of the Chief of Ordnance, Washington, D.C. In 1922, he transferred to Aberdeen Proving Ground (APG), Maryland, where he continuously worked in the interior, exterior and terminal ballistic fields until his retirement in 1956.

Perhaps the most complex task confronting the Ordnance Department's ballisticians after WWI was the redesign and improvement of ammunition and its components. At that time, artillery experts could specify the performance of characteristics of guns, mounts and carriages. However, for projectiles, explosives, propellants, and fuzes, experts could only describe a desired end item in only the most general terms. Basic research in interior and exterior ballistics was critical to improve projectile design, increase the destructive force of high explosives, develop propellants to produce higher muzzle velocities while staying within the allowable pressure limits, design improved measuring devices, and arrive at sounder mathematical theories and general ballistics procedures. After WWI, the Ballistic Branch of the Office of the Ordnance Department and the Proof Department at Aberdeen worked on these complex problems. Achievements by this group between 1918 - 1938 were remarkable given there were scarcely more than a dozen specially trained individuals available to perform this work. Kent was notably one of the most prominent theoretical researchers and experimentalists who contributed to new theoretical characterizations and measurement advancements during this austerely funded period of peace.

As Kent began his civilian career in 1921, he worked on the 3.3-inch gun program which provided the first scientific basis for the drag functions of artillery shell and for the design of projectiles

of modern shapes. In 1922, limited funding and his impatience with remote testing at APG prompted his permanent relocation to Aberdeen for the remainder of his career. Using the battery of 3.3-inch guns in the early 1920s, he developed resistance laws in flight applicable to projectiles of modern shapes.

In the 1920s, Kent worked with E. A. Eckhart and I. C. Karchter of the National Bureau of Standards to develop the solenoid chronograph. It was considerably more accurate than the Aberdeen chronograph for determining projectile velocities. The perfection of this piezoelectric gauge for laboratory use opened the entire field of pressure phenomenon up to investigation. Its development marked the beginning of a new era for interior ballistics. For the first time, pressure-time curves could be determined from proved data rather than from solely discussed from a theoretical perspective.

In the 1930s, Dr. Kent worked on the theory of the motion of projectiles with H.P. Hitchcock. Their theoretical efforts were experimentally explored using piezoelectric gauges at APG. Previously unobtainable data about the stability of Gerlich-type projectiles and 50 caliber machine gun bullets were taken in Aberdeen's facility and demonstrated the practicality of precision instruments to further the development of weapon improvements. Similar to his work in motion of projectiles, the original blast meter at APG was developed the National Bureau of Standards. Kent improved upon this meter in detail and his developments made possible the first study of experimental blast phenomenon.

The Army's studies of the 240mm howitzer in the 1920s yielded a great deal of information on cannon recoil. To supplement this information, Dr. Kent carried out a number of experiments in the early 1930s to obtain specific information about the dynamics of automatic weapons. In the course of these experiments, he developed an improved method for measuring recoil forces. This method was in general use at the Army's Ballistics Research Laboratory (BRL) by 1940, but used nowhere else, even as late as late as 1975. Kent later evolved a theory of recoil action which served as the basis for the design of a recoil mechanism for automatic guns, known as the soft recoil system which has been widely used.

One of the most significant advances in the theory of exterior ballistics made between World War I and II was the formation of the theory of the spin of projectiles made by Dr. Kent and H.P. Hitchcock. Until after WWI, the movement of a projectile's longitudinal axis relative to its trajectory had not been seriously considered so long as a projectile landed on its nose and its fuze functioned. When the force equation was applied to the problem of accounting for the projectile's range and accuracy, however, this movement of a projectile's long axis was seen to be significant. In England during WWI, British scientists (Fowler, Gallop, Locke and Richmond) developed a theory of the motion of spinning projectile in which its motion was described as being similar to a spinning top. When their findings were studied by Kent and Hitchcock, they conducted similar experiments that confirmed Fowler's theory and produced valuable data for use in the design of projectiles. The analyses of their tests confirmed Fowler's theory and indicated quite clearly the conditions that would have to be met for a projectile to remain stable throughout its flight. They subsequently calculated a numerical index for stability for several types of projectiles. Their carefully designed experiments further revealed the relationship among the stability of a projectile, its air resistance (drag) and the effects of crosswind force.

In 1934, Dr. Kent made terminal ballistic suggestions on how to improve fragmentation investigations by measuring and evaluating the capabilities of fragments to damage targets. During his life time, Dr. Kent was a fellow of the American Association for Advancement of Science and of the American Physical Society. He was decorated with the Presidential Medal for Merit in 1946, the Potts Medal of the Franklin Institute in 1947 and the Levin H. Campbell Jr. Gold Medal of the Ordnance Association in 1955. Dr. Kent passed away in 1961 was inducted into the Ordnance Corps Hall of Fame in 1969.