2017 Ammunition Hall of Fame Inductee

JAMES RUTKOWSKI

Mr. Rutkowski has made significant, lasting, positive contributions to the development, production, and fielding of mortar and cannon ammunition. He is an internationally-recognized expert in propelling charge technology and his mark on the fire support community extends to virtually every 155mm mission fired today.

Mr. Rutkowski began his career in 1970 as a mechanical engineer in the Quality Engineering Directorate, Picatinny Arsenal, New Jersey, with his initial work focused on redesign of the M829 4.2-inch mortar cartridge. In 1972, his focus shifted to artillery ammunition. The propelling charges of that period were inadequate to meet the Army's future requirements and Mr. Rutkowski designed the laboratory and ballistic tests, analyzed results, and developed the system specifications for the experimental 155mm propelling charges that would replace the antiquated systems of the time. These included the XM164 Green Bag, XM201 series White Bag, as well as the XM123 series and XM203 super charges. The success of Mr. Rutkowski's efforts was highlighted through development testing of the M198 Towed Howitzer, M549A1 Rocket Assisted projectile, and M203 propelling charge. By the time these systems were type classified, a quantity of top zone charges were fired and they proved too far surpass their legacy propellant systems.

Concurrent with the 155mm developments, the eight-inch M110 howitzer was upgraded with the M201 cannon. A new, extended-range charge was developed to complement the existing green-bag and white-bag charges. The M188 propelling charge increased the system's range with the M650 Rocket Assisted Projectile. Following type-classification, the M188 charge was improved, increasing system range and doubled tube wear life. Mr. Rutkowski contributed significantly to ensuring quality was designed into this product.

During the Vietnam War, there were frequent catastrophic gun failures caused by the propelling charge developing excessive pressures beyond acceptable limits of the gun system and projectile. There was no method of evaluating the propensity of a propelling charge to develop excessive pressure levels other than shooting an unaffordable amount of propelling charges. Mr. Rutkowski was a member of the team that developed the measurement of pressure waves to evaluate propelling charge safety. The team analyzed numerous firings and theories on how excessive pressures are created. They developed a method of measuring pressures in the breech and at the projectile base ends of the gun chamber. Extensive analysis and collaboration with interior ballistic experts established a strong correlation between these measurements and the propensity to create excessive gun pressures. The technology is known as Differential Pressure and is used worldwide to assess the safety of a large-caliber weapon system. The technology has eliminated these excessive pressure failures in operations since the 1990s and has saved hundreds of lives based on the frequency observed during the Vietnam War.

Performing safety evaluations measuring pressure waves developed by propelling charges with known defects, his work demonstrated that the M119A1 propelling charge could easily be redesigned to eliminate the center-core ignition system. Subsequently, a Product Improvement Program (PIP) was executed that resulted in moer than $35M a year production savings in FY79 and significantly improved weapon system accuracy and precision (because of improved muzzle velocity uniformity).

In 1979, Mr. Rutkowski was given responsibility for quality assurance for all mortar, tank, and artillery propellant and propelling charges. Production rates were significant, examples are: M6 propellant for the M119A2 propelling charge; M30A1 propellant for the M203 propelling charge; and M31A1 propellant for the M188A1 propelling charge. At that time, there were unacceptably large performance differences between propellant and propelling charge production lots. Mr. Rutkowski developed calibration systems on the production line and at the proving grounds that measurably improved system accuracy by reducing the deviation of muzzle velocity within and between propellant lots. He also established Test Operating Procedures that have become the international standard for propelling charge safety certification and he was instrumental in developing a proof charge system – the "PXR" designation – that allows acceptance testing of cannons and projectiles at increased pressures with significantly less risk and cost than previous methods.

In 1984, he moved to the Ammunition Engineering Directorate as Project Leader for the M203E2 propelling charge Product Improvement Program (PIP). The goal was to increase the cannon wear life. This success reduced the requirement for 155mm cannons and likewise the logistic burden during operations. His efforts ultimately led to successful type classification of the M203A1 propelling charge that set the world standard for performance, safety, and reliability in the 155mm cannon system. During production scale-up, the blending system developed and utilized at Radford AAP was found to be labor intensive and ineffective as production lots were being rejected for unacceptable muzzle velocity uniformity. Working closely with quality organizations at both the Picatinny and Rock Island sites, Mr. Rutkowski developed an efficient and effective blending system that resulted in significant savings and the elimination of propellant and propelling charge lot rejections due to uniformity. For this effort, he received the William Mosley Award for Value Engineering in 1993.

With the international focus on extending the range of artillery, Mr. Rutkowski led the effort to extend the range of the current 155mm systems with the development of the XM282 58-caliber cannon and the XM224 propelling charge. The effort was later transferred to a 52-caliber cannon to be internationally compatible with our Allies, but not before a demonstration with the M549A1 projectile. The technology is now being utilized by the Extended Range Cannon Artillery (ERCA) program.

Promoted to Supervisory Team Leader in 1987, Mr. Rutkowski's responsibilities expanded to encompass life-cycle technical efforts on all artillery, mortar, and eventually, tank ammunition propulsion systems. Advances in artillery propulsion technology that were born within his team included the XM215 and XM216 propelling charges, and the XM230 Uni-Charge – all precursors to the Modular Artillery Charge System (MACS). Together with

Crusader's XM297 cannon, MACS would have permitted unparalleled capability on the battlefields of the 21st century.

As the Cold War ended, more focus was placed on environmental effects of ammunition. Proving ground and training test sites for high performance ammunition were found contaminated with lead, an additive to the propulsion system that reduced copper deposits in the gun barrel. During the same period, studies showed that burning of excessive propelling charges left toxic residue. As Development Project Officer for MACS, Mr. Rutkowski designed the M231 propelling charge with the Army's first green (environmentally compliant) propellant (PAP-7993) which is also currently undergoing qualification testing for application to the 105mm M67 propelling charge. The M231 propelling charge, along with replacing lead with a non-toxic material in the M232 propelling charge, have greatly minimized the Warfighter's exposure to toxic elements, both in 155mm training and operations.

When problems arose, management often turned to Mr. Rutkowski to investigate the cause and help identify solutions. These investigations included: 105mm Gun Malfunction (blown breech,1986); XM24 Artillery and Main Tank Gun Simulator (explosion during vibration, 1987); Premature Ignitions of the M82 Primer (1990) and the Crusader Liquid Propellant Storage Tank Explosion (1995). The M82 Primer initiation suspended all training worldwide, for approximately a week. The effort resulted in a primer modification and ammunition plants operating outside normal hours, while delivering new primers worldwide to maintain readiness. The other investigations identified causes and remedies that allowed further development and type classification of the item. Mr. Rutkowsi's reputation for thorough and successful investigations became known throughout the Services to the extent that he was selected as a member of the U.S. Navy investigation team on the U.S.S. Iowa Battleship Explosion (1989).

In 1995, Mr. Rutkowski was co-located to the Project Manager for Crusader as the Deputy Product Manager for Munitions. During that time, the M231 and M232 MACS propelling charges, along with the MOFA fuze, were type classified. With the cancellation of the Crusader program, Mr. Rutkowski transferred to the Project Manager for Combat Ammunition Systems as Chief of the Energetics and Components Branch, and was responsible for all propellants and explosives efforts. The M232 propelling charge had been designed for the Crusader 52-caliber cannon but delivered poor performance in the existing 39-caliber Howitzer fleet. He executed a product improvement program which optimized the M232 propelling charge for the existing 39-caliber howitzer fleet. This program improved the accuracy by meeting the objective muzzle velocity precision, eliminated the charge residue at low zones, and increased the cannon wear life. The program was successfully completed with type classification of the M232A1 propelling charge in 2005.

In 2005, Mr. Rutkowski received the Army's RDT&E award for development of the 105mm XM350 propelling charge. This charge combines the performance of the M67 propelling charge and the M200 propelling charge into one charge system, thus cutting the number of needed 105mm cartridges. Currently, four different 105mm cartridges, each containing one of two propelling charges, are needed to engage the various targets. By

incorporating the XM350 into the M1130 cartridge, the resulting M1130E1 cartridge replaces all four of those cartridges, while increasing the range.

Until 1970, most U.S. allies either bought U.S. 155mm weapons and ammunition or negotiated rights to manufacture using U.S. drawing and specifications. Post 1970, many nations began designing ammunition to their national standards and the ammunition in many cases was not compatible with other allies' ammunition and weapon systems. To establish standards to achieve 155mm interchangeability, the Joint Ballistics Group was established. Mr. Rutkowski has served for 25 years as Chairman of the Joint Ballistic Technical Working Group effectively representing U.S. interests in the international fire support arena. He was a key member of the negotiating staff that approved the new Joint Ballistics Memorandum of Understanding (JBMoU) with Italy, Germany, France and the United Kingdom in 2009. The new JBMoU allows cost-sharing testing, making interchangeability easier and less costly. During his tenure, his technical team achieved approval of eight technical annexes covering 155mm 39-cal cannon systems, Extended Range Ordnance (52-cal) systems, projectiles, propelling charges, primers, fuzes, fuze setters and guided munitions. Besides dimension and performance requirements, the annexes also covered other topics as ballistic match, ballistic similitude of projectiles along with safety and environment requirements and test procedures for all 155mm elements. These annexes together form a standardized requirements and testing procedures protocol that allows interchangeability and interoperability between the nations with minimal or no additional testing. The technical annexes are available to and utilized by most NATO Nations and Partners-in Peace. As a result of his efforts, Mr. Rutkowski was awarded the 2006 Defense Standardization Program Achievement Award.

With increasing emphasis on producing insensitive munitions, Mr. Rutkowski initiated a program known as Common Low-cost Insensitive Munitions Explosive (CLIMEX) to develop replacement explosives. In 2010, the CLIMEX project completed the development of the IMX-101 explosive (named one of the year's greatest inventions by Time magazine) and the qualification of the M795IM projectile. Two IM goals originally thought to be unattainable on a large munition were achieved. The first was to pass sympathetic detonation in the standard packaging without any addition of barriers. The second was passing the new Shaped Charge Jet Test based on the RPG-7, a threat currently being faced by soldiers in theatre. Qualification of the explosive and the explosive-filled projectile design is a major achievement in providing safer, yet effective, ammunition to the Warfighter. The IMX explosives also drastically reduces the logistics burden by allowing more ammunition stockpiled or transported together and reductions in quantity distance requirements, as the threats of mass detonation/explosion to unplanned stimuli have been eliminated. The IMX-104, developed under the CLIMEX program has since been standardized in mortar systems and is being considered for several other applications.

Propellants, propelling charges, projectiles, and explosives are a common denominator in every mission the Warfighter executes. We demand performance, reliability, and safety from every ammunition item we fire. For almost half a century, Mr. Rutkowski had been decisively engaged in ensuring just such performance, reliability, and safety. Throughout his career he remained at the cutting edge of propellant, propelling charge, projectile and explosive technology, guiding the energetics programs through development, production and fielding. Mr. Rutkowski is inducted into the 2017 Ammunition Hall of Fame.