

## *2019 Ammunition Hall of Fame Inductee*

### **DR. DAVID DOWNS**



Dr. David S. Downs' federal career spanned 38 years at Picatinny Arsenal. Dr. Downs exhibited exceptional program management and leadership skills during the execution of numerous energetic materials research and development programs which resulted in significant benefits to the DoD and the highest quality state-of-the-art ammunition to the U.S. Warfighter. Dr. Downs gained extensive experience in warheads and gun propulsion research, development, formulation and processing. Specific notable accomplishments directly attributed to Dr. Downs include the following:

**Warheads Development:** Dr. Downs led a team that developed compact multi-purpose shaped charge warhead technology capable of defeating heavy armor. In addition to providing lethality against a full spectrum of targets, this technology successfully demonstrated increased anti-armor capability with reduction in warhead length. These advances have been transitioned to additional systems.

**Explosives Technology:** Dr. Downs played a major role in improving performance, decreasing sensitivity for enhanced soldier safety and survivability, and reduced the overall environmental impact of munitions ingredients. He played a major role in rebuilding the energetic materials workforce at Picatinny Arsenal and establishing world-class facilities for conducting explosives research and development. Dr. Downs was responsible for developing and demonstrating a more cost effective and reliable non-proprietary process for the manufacture of PAX-2 insensitive munitions (IM) explosive. Six Sigma methodologies were used to down-select the target manufacturing process to execute the overall program. The PAX-2A prototype manufacturing process was a cornerstone for strategic change. The production cost of PAX-2A was reduced for current and future ammunition customers. Product yield was also increased. This achievement provided the Army with fielded IM grenade sub-munition and a validated savings of \$17M was realized.

**Propulsion Technology:** Dr. Downs began his career in the Propulsion Branch and was responsible for performing laboratory tests on propellants. His research into laboratory testing of propellants coincided with the early 1970s and the Cold War when propulsion technology was being stressed to increase range and accuracy of artillery and tank systems. Dr. Downs and his team studied laboratory methods to help understand large scale testing. Using small scale closed vessel testing, he furthered the understanding of the analog graph and demonstrated that not only the burn rate can be predicted but also the vivacity. This led to better screening of experimental propellant lots which drastically reduced the frequency of full scale experiment testing, thus resulting in significant savings in program costs and schedule time. Upon demonstrating his leadership and technical abilities in the laboratory, he was called upon many times to investigate failures and problem areas for various munitions. Many of the technologies developed by Dr. Downs are used today. He helped transition the measurement of pressure from the closed

laboratory vessel to the full-scale gun system. During his time analog pressure-time traces were manually studied to observe pressure buildup in the barrel. As a major participant with the Army Ballistic Research Laboratory, the team identified many characteristics to observe in analyzing these pressure-time traces that subsequently led to today's technology of measuring Differential Pressure to evaluate safety of a larger caliber weapon system. This technology has significantly reduced program costs and results in safer and more reliable Warfighter equipment.

Many of his other accomplishments pale in comparison the Differential Pressure technology but are still significant. Among them is his reformulation of the additive (wear reducing) liners used in today's large caliber systems. In the late 1970s, artillery and tank additive liners were leaving significant residue within the chamber and barrel. This residue was a safety concern as the quantity was sufficient in some cases to interfere with chambering of the next round. Given current war scenarios, it was expected that many firings would be performed from a gun heated during prior rapid firings. If a round failed to chamber, the most likely result would be localized ignition and a catastrophic event. His theory of utilizing a synthetic high melting point binder was contrary to the entire propulsion community's belief to pursue a lowing melting binder. Upon testing his analysis proved correct and is utilized internationally today. Dr. Downs also oversaw development and fielding of many systems including the 105mm and 120mm tank HE-AT and KE cartridges, 105mm M200series propelling charges, 120mm mortar cartridges, and 155mm M119A2 and M203A1 propelling charges. These accomplishments were in addition to technically supporting ongoing acquisition of ammunition including medium and small caliber propellants and artillery rocket motor grains. Under his leadership, the development of the XM215 and XM216 modular charges and the XM230 unicharge led the basis for the successful development and standardization of the Modular Artillery Charge System (MACS).

**Extended Range Ordnance Group (EROWG):** Dr. Downs was instrumental in establishing the first technical working group under the Quadrilateral Ballistic Memorandum of Understanding (MOU) (later becoming the Joint Ballistics MOU when France joined). The group was known as the Extended Range Ordnance Working Group (EROWG) and was tasked with identifying and addressing the risks associated with extending the range of 155mm artillery systems beyond the currently fielded 39 caliber systems. Semi-annual meetings were held exchange data and findings with the internationally community and reassess each risk based on progress made in addressing the risk. The EROWG was a major influence on many extended range programs, not only within the JBMOU community but well beyond with other U.S. allies. The EROWG has subsequently become the Joint Ballistics Technical Working Group (JBTWG) and has successfully establish interchangeability and interoperability of numerous 155mm weapon system elements drastically reducing the logistic burden on the Warfighter.

**Partnering:** Dr. Downs was instrumental in development and creation of the Warheads and Energetics Technology Center (WETC), a consortium of industry and academia created to maximize all available resources to focus directly on the technical challenges that face the Army in the science and engineering of warheads and energetics. His vision to create a collaborative environment between Government, Industry, and academia with rapid contracting and joint accountability that was proven successful over the 18-year period since 1999 when it was created. This consortium continues and has significantly grown currently under the name of the

Defense Ordnance Technology Center (DOTC). In the aftermath of 9/11, the DoD requested white papers from Government and industry on how to better protect our homeland from attack. WETC was a major conduit for review of these white papers. Dr. Downs reviewed over 1,300 white papers to determine if the proposed technology was possible. More than 900 white papers were forwarded to the Assistant Secretary of the Army for further review.

Based on his significant achievements in support of ammunition, Dr. David Downs is selected for 2019 induction into the Ammunition Hall of Fame.