INFORMATION PAPER

SUBJECT: Insights from 2015 Mad Scientist Conferences

1. **Purpose.** To provide an overview and identify insights from the 2015 Mad Scientist series of conferences.

2. **Facts.**

   a. The Mad Scientist series of events is designed to examine the impacts of science and technology on future armed conflict. Mad Scientist events are part of the G-2's continuous study of the future Operational Environment and the Army Capabilities Integration Center (ARCIC) Campaign of Learning. Mad Scientist facilitates dialogue between Joint military, international partners, academia, industry – key partners in defining the future operational environment.

   b. During 2015, TRADOC G-2 conducted two Mad Scientist conferences in April and October. The April conference, co-sponsored with Georgetown University and ARCIC's Science and Technology Division, focused on how the U.S. could maintain its relative technological advantage over increasingly capable adversaries. The October conference, conducted with Army University, Army Recruiting Command, and the Army Center for Initial Military training studied the Human Dimension of warfare to look at steps the Army must take today to ensure highly capable Soldiers tomorrow. Insights from these conferences are used to provide input into concepts and capabilities documents, including the Commanding General's annual requirement to recommend science and technology investment priorities to the Army Staff and the Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA/ALT). They also provide technology based assessments to support Army Capability Development activities. A list of key insights is provided in paragraphs c and d below.

   c. Maintaining Relative Technological Advantage Conference Key Insights:

      (1) Continued increases in computing power and speed is a necessary enabler: Virtually all technological capabilities rely on large amounts of computing power. System design, modeling and simulation, gaming, and general processing can benefit from increased computing power. The Army can gain strategic advantages over adversaries through investing in quantum computing technologies, developing a tactical Internet of Things (IoT), and leveraging machine to machine learning—key to getting relevant information down to the point of need.

      (2) Human performance enhancement is a potential game changer: S&T enhancements to human cognitive and physical performance, combined with the development and nurturing of adaptive leadership, provide an opportunity for sustained overmatch (i.e., a position of Army advantage in the OE). The advantages the Army can gain from enhanced human performance will have a significant effect on the cognitive, endurance and physical capabilities of future soldiers.

      (3) U.S. technological supremacy is fleeting and costly: The competition among states and non-state entities for power and influence will perpetuate S&T research and development

(R&D) efforts to mitigate any perceived advantage their competitors may have. Similarly, competition among international corporations and industry for S&T supremacy and profits will drive R&D. Further, cyber vulnerabilities, network exploitation and the increasing proliferation of data, technology, and computing power will characterize the competition. Near-peer competitors are expected to rapidly close the gap with a perceived U.S. technological advantage. This proliferation of technology may provide an adversary with advanced capabilities where the U.S. may be surprised during conflict.

     (4) Combined technology produces synergy: There are advantages of combining multiple technologies in innovative ways to develop new systems, system-of-systems and superior capabilities. Examples include devices designed to operate within an IoT architecture requiring multiple networked capabilities as well as a cyber-protection component. In most cases, any single technology is dependent upon others in order to be effectively employed.

    d. Human Dimension in 2025 and Beyond Conference Key Insights:

     (1) The optimization of the individual soldier will be crucial for sustained Army cognitive and physical supremacy: Potentially, the soldier of 2025 and Beyond could be recruited like a world class athlete. In this time period, soldiers may reach their full physical and cognitive potential through the use of tailored diets, smart drugs, and specialized gaming. They will likely have greater situational awareness enabled through a tactical IoT consisting of integrated soft sensors, processors, and robotics. Commercial and governmental S&T prioritization and investments can affect the realizations of these future soldiers.

     (2) The Army will have to develop cohesive teams through tailored training: Army teams of 2025 and Beyond will train for a wide spectrum of complex environments with tailored training scenarios that support unique organizational and echelon requirements. Requiring cohesive teams, the Army will need to tailor training to enhance specialties, at the same time enabling individual contributions to a team. By developing base line individual and team requirements, including degrees of cohesion and performance measures, a soldier could exercise collective cognitive skills in "Brain Gymnasiums" (i.e., individualized training to improve cognitive abilities). These enabling S&T efforts will rely heavily on virtual and game based training environments.

     (3) The Army will have to develop institutional capabilities through an established culture of innovation: The Institution of 2025 and Beyond will require an agile and adaptive culture that sets conditions for plausible S&T evolutions and potential revolutions in military capabilities. An Army, enabled by big data and advanced algorithms can more accurately recruit for skills required and train at the point of demand. As the Army orients on the future and adapts to meet the needs of future conflict it must be cognizant that "that culture eats strategy for breakfast" and as such must be cautious of institutional biases.

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