## THREAT AGENT DEFEAT MODELING AND TESTING USING WMD SIMULANTS

# Jack Rabbit III: Environmental Factors Affecting Ammonia Airborne Plume Transport & Dispersion

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The anticipated surge in global demand for anhydrous ammonia driven by climate crisis response initiatives poses heightened risks in its distribution via railways, highways, oceangoing vessels, cargo shipping and pipelines. This surge amplifies the likelihood of incidents and the potential consequences of incidents at multi-ton scales. Knowledge gaps exist in understanding the environmental factors affecting ammonia plume dynamics. To address this, the Jack Rabbit (JR) III project was initiated to experimentally address critical data and knowledge gaps associated with the release of anhydrous ammonia through laboratory, chamber, and field trial studies. The Chemical Security Analysis Center at the Department of Homeland Security's Science and Technology Directorate has partnered with the Defense Threat Reduction Agency and Transport Canada to conduct multi-phase JR III Chamber studies to meet objectives defined by several JR Working Group teams. From this cooperative research, atmospheric dispersion modeling gaps have been identified, historical incidents were studied, and experiments were conducted in a laboratory setting.

The most recent chamber experiment presented here focuses on advancing hazard assessment and predictive atmospheric dispersion modeling accounting for prevailing wind speed, atmospheric stability humidity, and temperature. This multi-phased chamber experiment simulates scenarios with varying temperatures, humidity, saturated water vapor conditions, rainfall, and carbon dioxide. This presentation will provide results and findings of the experiment to date. The final experimental phase is pending completion of environmental studies. Additionally, this presentation will outline the broader JR planning and efforts to understand the effect of environmental factors on ammonia airborne plume spread, emphasizing integration into real-world scenarios for informed emergency response. This project underscores the benefits of interdisciplinary collaboration and highlights the pivotal role of partnership with JR Working Groups multiplying the impact of the research. It focuses on integrating the development of effective, science-driven analytical plume modeling tools with the pragmatic solutions for emergency responders when responding to real-world application in the field.