

## Introduction

Utah Valley University, with the support of federal, state, and local resources, seeks to build upon the lessons learned in JR II by participating in the JR III Program. The team seeks to ensure that the issues and needs related to the National Emergency Preparedness (NEP) mission and emergency response community are integrated and relevant for the JR III program involving catastrophic releases for Toxic Inhalation Hazards (TIH) products. This Federal, State, Local, Tribal, and Territorial (FSLTT) involvement would once again be an opportunity to build upon the successful collaboration between the team and the scientific community experienced during JR II. This will ensure systematic and consistent input and focused objectives promoting the NEP mission and emergency response objectives.

## Background

In 2013, federal, state, local, and tribal technical specialists representing the DHS/FEMA National Preparedness Mission met at the National Fire Academy to review the findings of the JR I Program led by DHS Chemical Security and Analysis Center. This collaboration evolved into a series of meetings and discussions in 2015 and 2016 when UVU supported the JR II Program by coordinating input, guidance, and support from federal stakeholders. UVU facilitated objectives, documented findings and outcomes, and disseminated critical information to the greater preparedness and response community. Key federal agencies have become partners under the UVU umbrella to represent the emergency preparedness community. This federal/educational/local collaboration, working in partnership with UVU and the scientific community, will provide the collaborative efforts to achieve meaningful outcomes from the upcoming JR III Program. Vital stakeholders have included FEMA, U.S. Fire Administration, the National Fire Academy, the InterAgency Board, DOT PHMSA, and several others. JR findings and outcomes have had a direct impact on current hazardous materials training and curriculum at all levels including at the National Fire Academy. (Noll & Byrnes, 2017 & 2019).

The JR II Program, conducted at Dugway (UT) Proving Ground, saw full integration of the UVU Team, representing vital stakeholders, with researchers and test team facilitators for critical experiments and outcomes. Research objectives combined cohesively with the objectives of atmospheric scientists and other research entities achieving unified outcomes. In August of 2017, UVU sponsored a working group of scientists, researchers, and emergency preparedness technical specialists to analyze and find consensus on the JR II emergency response objectives. A national strategy for JR information dissemination was developed along with a conclusive final report detailing the impact of the JR Program on the emergency preparedness mission. (Byrnes, et al., 2017). Also see <https://www.uvu.edu/es/jack-rabbit/>.

## Continuing Contributions

The UVU Team, in concert with other technical specialists, bring considerable knowledge and experience of hazardous materials response and mitigation efforts as they relate to the release of toxic by inhalation (TIH) materials. The UVU Team wishes to build upon the process used for JR II by facilitating these technical specialists' involvement in multiple JR III Working Groups where the team's expertise and resources might be applied to meaningful outcomes. For JR III, the UVU Team desires support to implement objectives and confirm (1) what we know; (2) what we think we know; and (3) what we don't know. Critical objectives of interest include:

- Develop testing protocols to assess the accuracy of the 2020 Emergency Response Guidebook's (ERG) public protective action distances to confirm alignment with upwind and downwind protection distances for catastrophic releases of ammonia.
- Quantify the upwind environment during a release where responders are operating.

- Observe and qualify the chemical and physical properties of anhydrous ammonia related to large scale releases affected by outside forces, wind, humidity, temperature, or terrain.
- Confirm the effectiveness of common emergency mitigation strategies for ammonia.
- Replicate JR II experiments using anhydrous ammonia to confirm that sheltering in place, in both structures and vehicles, is an effective means of public protection when evacuation is not possible and verify recommended public actions during a release.
- Collaborate with stakeholders to quantify peak indoor and outdoor concentrations.
- Determine if response vehicles remain operational when exposed to ultra-high concentrations of anhydrous ammonia and the physical effect on those vehicles.
- Evaluate the operational effectiveness of common detection technologies used by emergency responders including electrochemical cells, LEL sensors (flammability), and Photo Ionization Detectors (PID) with 10.6eV bulbs and related calibration standards.
- Assess predictive plume models, including the ALOHA<sup>®</sup> model, for accuracy and efficacy as an emergency response tool for a catastrophic release of anhydrous ammonia.
- Evaluate the behavior of common urban surfaces, response related communications equipment, and other specific materials when exposed to ultra-high concentrations and liquid exposures of anhydrous ammonia.
- Document plume behavior using an unmanned aerial video platform.

## Conclusion

The UVU Team, representing the nations emergency planners, responders, and federal stakeholder community, is poised and enthusiastic to be involved and contribute to the relevant outcomes of the JR III experiments. While JR I & II findings and outcomes have been impactful on a national level related to emergency preparedness, additional opportunities for research involving TIH materials remain.

Hazmat response organizations use facts, science, and circumstances to develop safe and effective practices for public protection and emergency mitigation. The UVU Team provides decades of knowledge and experience as well as proven and effective dissemination means for a national audience. The capabilities and professionalism of the UVU Team were demonstrated during JR II through its on-the-ground experience and collaboration with stakeholders. The UVU Team seeks to continue to provide effective outcomes for the nation's emergency preparedness community through meaningful and impactful participation in the JR III Program.

## References

- Byrnes, A., Dupont, H., Matthew, D., McCartt, J., Noll, G., Yoder, W. (September 30, 2017). *Final report: The jack rabbit II program's impacts on emergency responders*. Utah Valley University, Provo, Utah.
- Noll, G. & Byrnes, A. (November 2017). *The jack rabbit tests: Catastrophic releases of compressed liquified gases*. Fire Engineering, Penwell Corp. 169(11), p. 61.
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