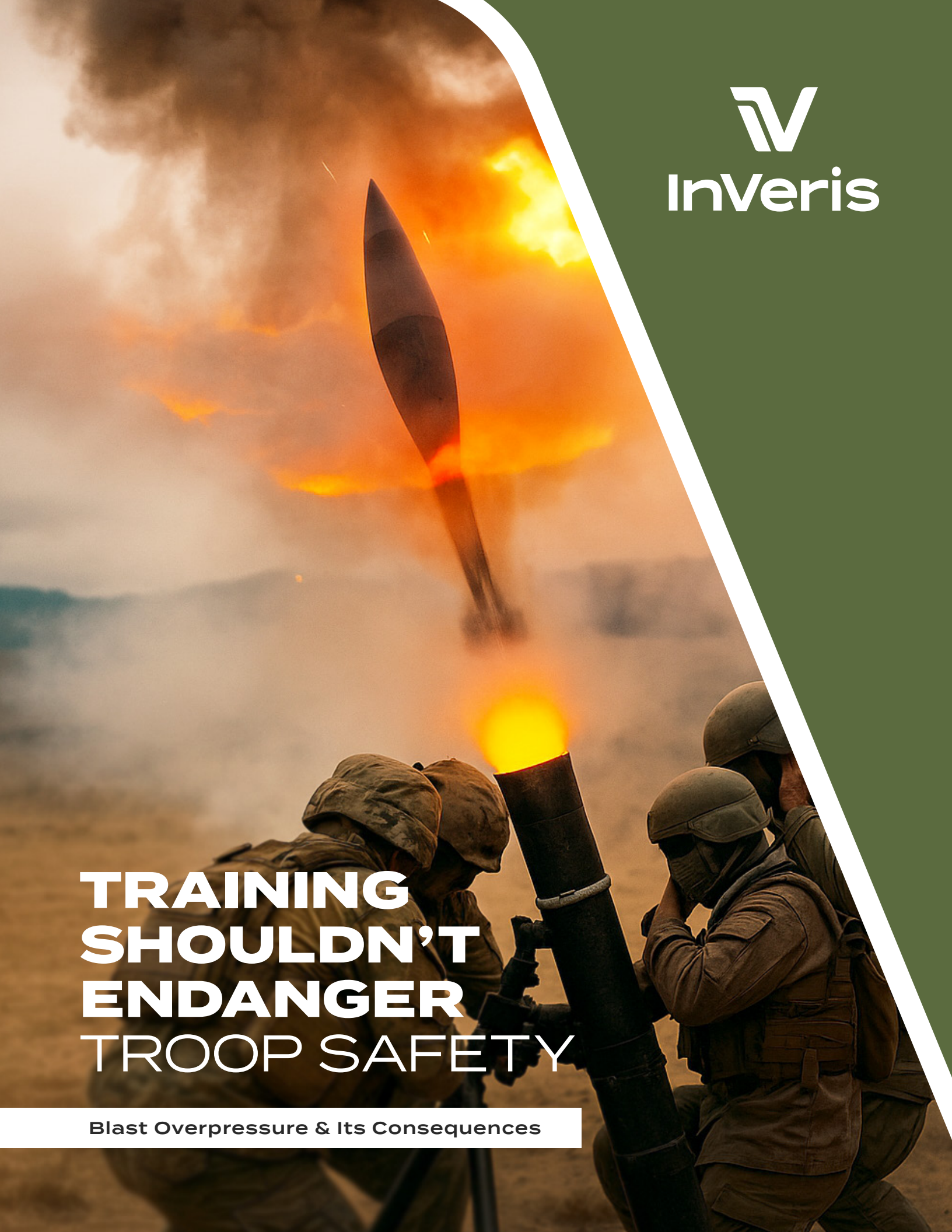

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TRAINING SHOULDN'T ENDANGER TROOP SAFETY

Blast Overpressure & Its Consequences

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Introduction

Blast Overpressure (BOP), is the sudden, sharp increase in air pressure above normal atmospheric pressure caused by an explosion or the firing of weapon systems.

This pressure wave propagates outward from the source of the explosion, and is a silent yet pervasive threat. One that has emerged as a critical concern impacting the long-term health and cognitive well-being of military personnel.

Historically associated with combat injuries, recent research and extensive media coverage have revealed that repetitive low-level blast exposure, particularly during routine training exercises, poses a significant and cumulative risk to Military personnel.

This growing awareness underscores the urgent need for innovative solutions to safeguard the health of service members while maintaining operational combat readiness and performance.

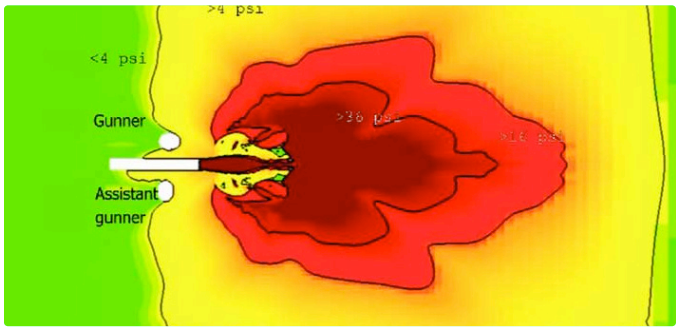
This whitepaper delves into the profound implications of blast overpressure, the increasing efforts to address this issue, and the promising role of leading-edge virtual training systems as a critical mitigation strategy, presenting a path forward for enhancing troop safety and long-term health outcomes.

70%

In one study, **70% of mortarmen exposed to 500 rounds were reported to have experienced headaches, memory issues,** ringing in the ears and slowed thinking from repeated live-fire training, signs consistent with sub-concussive injury.

4 PSI

Alarmingly, these neurocognitive effects occurred even in mortarmen with **average BOP below the 4 psi safety threshold. (1)**



I. The Pervasive Threat:

Understanding Blast Overpressure & Its Consequences

Blast overpressure refers to the sudden and intense pressure wave generated by explosions, whether from explosive devices in combat or the repeated firing of weapons during training.

While the immediate physical injuries from high-level blasts are evident, the long-term, insidious effects of repetitive low-level blast exposure are now gaining critical attention.

> “ Research indicates a disturbing link between such **exposure and severe neurocognitive effects, including Post-Traumatic Stress Disorder (PTSD) symptoms** and an alarming rate of deaths by suicide among military personnel.”

Key research efforts are shedding light on this complex issue:

+ **(1) The NIH National Library of Medicine, in a March 20, 2023, study titled "Repetitive Low-level Blast Exposure and Neurocognitive Effects in Army Ranger Mortarmen,"** highlights the specific vulnerability of certain military occupational specialties.

  This study was led by Julia Woodall from the Wallace H. Coulter Department of Biomedical Engineering at Georgia Institute of Technology, with contributions from Charles R. Hutchinson, DO, USA from the 75th Ranger Regiment at Fort Benning, GA.

+ Further emphasizing the severity, Daniel Johnson, a graduate student and veteran from University of North Carolina at Chapel Hiull and part of the Roy H. Park Fellowship Program at the Hussman School of Journalism and Media, collaborated with Dave Philipps of The New York Times to publish a series of stories examining the alarming ties between recent long-range artillery crews, a high rate of deaths by suicide, and PTSD symptoms.

  This collaboration underscores the critical role of investigative journalism in bringing these issues to the forefront.

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Prominent medical and military experts have also lent their voices and research to this cause, further solidifying the understanding of blast overpressure's impact:

+ **Dr. Daniel P. Perl** of the Uniformed Services University of the Health Sciences is recognized as an expert in this field.
+ **Dr. Brian Edlow**, from Neurology at Massachusetts General Hospital and an Associate Professor of Neurology at Harvard Medical School, has also been referenced for his expertise.
+ **Maj. Allison Brager**, a command research psychologist for the John F. Kennedy Special Warfare Center at Fort Liberty, has contributed her insights, as cited by ABC News.
+ **(Retired) Vice Admiral Tim Szymanski** initiated a study that gathered 30 volunteers to investigate brain injuries.

The urgency of this issue has resonated deeply within the media, bringing widespread public and governmental attention:

+ 60 Minutes dedicated segments to the topic, including **"Larkin's War: A dad's mission to uncover brain injuries after Navy SEAL son's suicide"** and the "Overtime" piece **"A Navy SEAL's invisible wounds,"** both aired on March 20, 2025. A central message from these pieces is that the issue is not limited to single combat blasts but is compounded by repeated exposure in training environments.
+ The New York Times, through the work of Pulitzer Prize-winning journalist Dave Philipps, has extensively covered the subject with articles such as **"Bill in Congress Would Force Action on U.S. Troops' Blast Exposure" (April 9, 2024)** and **"Defense Bill Orders Military to Take New Action on Brain Injury" (December 18, 2024).**
+ Other significant media outlets, including Associated Press **("Pentagon updates guidance for protecting military personnel from 'blast overpressure,'" Aug 14 2024),** NPR All Things Considered ("Blasts from military weapons may injure the brain through its blood vessels," Jan 23, 2025), Military Times ("How the military plans to reduce blast-related injuries in troops," Aug 12, 2024), and ABC News ("Military hunts for answers to mysterious brain injuries among troops," Nov 11, 2024), have all contributed to raising awareness. This extensive media coverage underscores the critical need for a solution.

II. Legislative & Military Action:

A Concerted Effort to Mitigate Risk

The escalating evidence and public awareness regarding blast overpressure have prompted significant legislative and organizational responses aimed at protecting military personnel.

Legislative Initiatives:

Recognizing the severity, legislators in both houses have introduced legislation known as the Blast Overpressure Safety Act in April 2024.

This critical legislation is known as H.R.8025 in the House and S.4109 in the Senate. These bills aim to mandate action on U.S. troops' blast exposure, demonstrating a clear legislative intent to address the problem.

- Key congressional committees involved in this legislative push include the Senate Armed Services Committee (SASC), chaired by Roger F. Wicker (R - Mississippi) with Jack Reed (D - Rhode Island) as Ranking Member, and the House Armed Services Committee, chaired by Mike Rogers (Alabama) with Adam Smith (Washington) as Ranking Member.

- Subcommittees on readiness in both the Senate and House are also critical players, with the House subcommittee on readiness chaired by Jack Bergman (Michigan) and John Garamendi (CA-08) serving as Ranking Member.

  The focus of efforts is to get in front of these specific individuals and committees, recognizing their influence on funding and policy related to military readiness and health.

Department of Defense (DOD) Actions:

The Pentagon has responded with updated guidance and new requirements to counter blast overpressure risks, as reported by the Associated Press and Defense.gov on August 14, 2024. This signifies a top-down commitment from military leadership to address the issue.

- **The US Department of Defense BLAST INJURY RESEARCH COORDINATING OFFICE** plays a central role in this effort. Led by Major General Paula C. Lodi, who serves as the Commanding General of USAMRDC and Executive Agent for Medical Research for Prevention, Mitigation, and Treatment of Blast Injuries, this office is actively involved in coordinating research.
- The Warfighter Brain Health Initiative, launched in 2022 and led by Kathy Lee from the Office of the Assistant Secretary of Defense for Health Affairs, further exemplifies the DOD's commitment to brain health.
- The John F. Kennedy Special Warfare Center at Fort Bragg is another key research organization involved in addressing these injuries.

Forums and Summits:

To foster collaboration and share advancements, the Department of Defense hosts an annual Blast Summit through the Defense Health Agency-Public Health.

The fourth annual event was held from July 16-18, 2024, in Hampton Roads, Virginia. Additionally, the Navy held its own Blast Overpressure Summit on July 15, 2024, indicating a service-specific focus on the problem. These events are crucial for driving collective action and sharing best practices in prevention, mitigation, and treatment.

These concerted legislative and military efforts demonstrate a profound shift in how blast overpressure is perceived, moving from an unavoidable consequence to a preventable injury that requires strategic intervention.

III. The Solution:

Leading-Edge Virtual Training as a Mitigator of Blast Overpressure

While the problem of blast overpressure is complex, advanced simulation and virtual training technologies offer a robust and immediate solution to significantly mitigate exposure risks for military personnel.

The core principle is simple:

By transferring a substantial portion of training from live-fire ranges to controlled, simulated environments, service members can develop critical skills and weapon proficiency without incurring the cumulative neurocognitive impact of repeated blast exposure.

InVeris, a leader in advancing human performance via advanced training solutions, is uniquely positioned to address this challenge:

+ **Technological Capability:** InVeris manufactures training systems for a significant portion of weapons platforms currently in use, harvesting all necessary data to advance soldier safety, accuracy and performance. In fact, citing a relevant DOD report, InVeris produces training solutions for 12 of 15 weapons highlighted.

  This broad portfolio means that InVeris advanced virtual systems can be integrated across a wide array of military training scenarios now, from small arms to artillery and mortars.

+ **Risk Reduction:** Virtual training systems are designed to replicate the operational experience without the physical stressors. For weapons like mortars, which generate significant overpressure during live-fire exercises, virtual systems offer a safe alternative.

+ **Core Messaging and Impact:** Virtual training not only preserves physical health but also contributes to mental health by reducing the neurological strain associated with repetitive blasts, potentially mitigating the incidence of PTSD symptoms and other neurocognitive issues.

The adoption of virtual training systems - including data gathering and guidance and the ability to train remotely from multiple locations once deployed - represents a pragmatic and forward-thinking solution.

It allows the military to maintain and enhance readiness by providing realistic training environments, while simultaneously safeguarding the long-term health of its personnel from the damaging effects of blast overpressure.

Virtual training is a **"perfect solution"** that aligns with broader discussions about the role of technology, such as AI and drones, in modern military applications.

IV. Strategic Engagement & Influence:

Building a Groundswell for Change

Effectively addressing blast overpressure through virtual training requires a multi-tiered strategy that engages lawmakers, military leadership, the media, and the public.

The goal is to build a sustained groundswell of support, driving both policy changes and adoption of technological solutions.

+ **Influencing Lawmakers and Policy:** A key focus is influencing decision-makers on Capitol Hill, particularly those on the Armed Services Committees and their subcommittees on readiness, as well as the Appropriations and Ways and Means committees who control funding.

+ **Media and Public Awareness Campaigns:** A crucial element is shaping public perception and ensuring that lawmakers and their constituents are aware of the risks and available solutions.

+ **Engaging the Military & Stakeholders:** Creating a "groundswell" within the military itself is equally vital. This involves mapping out key stakeholders and influencers within the Pentagon and various military branches, understanding how and where to best influence them.

> “ By carefully mapping stakeholders, leveraging compelling narratives, and engaging strategically with both legislative and military channels, **the widespread adoption of virtual training can be accelerated,** leading to a transformative improvement in military health and readiness.

V: Conclusion

The impact of blast overpressure on military personnel represents a significant and growing challenge, **threatening the long-term health and cognitive function** of those who serve.

However, through dedicated research, proactive legislative measures, and the embrace of advanced technological solutions, this pervasive threat can be effectively mitigated.

> “ Virtual training emerges as a critical and indispensable component of the solution.”

By providing realistic and immersive training environments that significantly reduce exposure to harmful blast waves, these systems offer a dual benefit:

they ensure continued operational readiness through high-fidelity training while simultaneously safeguarding the neurological health and well-being of service members.

Companies with their extensive range of leading-edge virtual training systems for key military weapons, are at the forefront of this necessary evolution.

The path forward requires continued collaboration between researchers, military leadership, lawmakers, and industry innovators.

By relentlessly raising awareness, advocating for supportive legislation, investing in advanced virtual training technologies, and sharing compelling human stories, the military can build a future where the health of its warfighters is as paramount as their readiness.

This commitment to mitigating blast overpressure via virtual training is not merely an operational imperative; it is a moral obligation to those who bravely serve, ensuring their **long-term health** and preserving the strength of our nation’s and allies’defense.