



DSIAC TECHNICAL INQUIRY (TI) RESPONSE REPORT

Risk of Significant Injury (RSI) Parameters for Non-Lethal Weapons (NLW) Solutions

Report Number:

DSIAC-2018-0953

Completed September 2017

DSIAC is a Department of Defense
Information Analysis Center

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

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1. REPORT DATE (DD-MM-YYYY) 11-09-2017			2. REPORT TYPE Technical Research Report		3. DATES COVERED (From - To)	
4. TITLE AND SUBTITLE Risk of Significant Injury (RSI) Parameters for Non-Lethal Weapons (NLW) Solutions					5a. CONTRACT NUMBER FA8075-14-D-0001	
					5b. GRANT NUMBER	
					5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Nathan Rush					5d. PROJECT NUMBER	
					5e. TASK NUMBER	
					5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Defense Systems Information Analysis Center (DSIAC) SURVICE Engineering Company 4695 Millennium Drive Belcamp, MD 21017-1505					8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Defense Technical Information Center (DTIC) 8725 John J. Kingman Rd. Fort Belvoir, VA 22060-6218					10. SPONSOR/MONITOR'S ACRONYM(S)	
11. SPONSOR/MONITOR'S REPORT NUMBER(S)						
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release: distribution unlimited.						
13. SUPPLEMENTARY NOTES human systems: protection, sustainment, and physical performance; non-lethal weapons						
14. ABSTRACT The Defense Systems Information Analysis Center (DSIAC) received a technical inquiry seeking a better understanding of how to articulate and include risk of significant injury (RSI) parameters in future non-lethal weapons (NLW) effects requirements documents for the U.S. Army and Marine Corps. DSIAC reached out to a NLW subject matter expert from the SURVICE Engineering Company to provide information on the current and future course of RSI parameters for NLW solutions.						
15. SUBJECT TERMS non-lethal weapons, risk of significant injury, parameters						
16. SECURITY CLASSIFICATION OF: U			17. LIMITATION OF ABSTRACT		18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON Ted Welsh, DSIAC Director
a. REPORT U	b. ABSTRACT U	c. THIS PAGE U	UU		10	19b. TELEPHONE NUMBER (include area code) 443-360-4600

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

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A chief service of the DoD IACs is free technical inquiry (TI) research, limited to 4 research hours per inquiry. This TI response report summarizes the research findings of one such inquiry jointly conducted by DSIAC.

ABSTRACT

The Defense Systems Information Analysis Center (DSIAC) received a technical inquiry seeking a better understanding of how to articulate and include risk of significant injury (RSI) parameters in future non-lethal weapons (NLW) effects requirements documents for the U.S. Army and Marine Corps. DSIAC reached out to a NLW subject matter expert from the SURVICE Engineering Company to provide information on the current and future course of RSI parameters for NLW solutions.

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1.0 TI Request

1.1 INQUIRY

How would risk of significant (RSI) parameters best be utilized in future non-lethal weapons (NLW) military solutions?

1.2 DESCRIPTION

The inquirer sought to understand how to best articulate and include RSI parameters in future Joint Non-Lethal Effects (JNLE) requirements documents for the U.S. Army and Marine Corps.

2.0 TI Response

The Defense Systems Information Analysis Center (DSIAC) contacted Nathan Rush, a subject matter expert in NLW from the SURVICE Engineering Company, to respond to the inquiry. Mr. Rush provided the following information on the current and future course of RSI parameters for NLW solutions.

2.1 PRESENT COURSE

The JNLE Initial Capabilities Documents for counter personnel and counter materiel addresses the following military problem [1]:

The Joint Force Commander, operating in complex environments, lacks sufficient capability to immediately neutralize or incapacitate targets without causing permanent injury, death, or gross physical destruction.

Inherent in the process is determining the RSI posed by the identified NLW solution. This process is ongoing and continually being refined. RSI is a metric intended to evaluate the risk of an NLW causing significant or permanent injury. It is also a required element for fielding non-lethal (NL) capabilities, as NLW developers must identify the necessary amount of NL stimuli to achieve the desired effect while remaining within the bounds of acceptable injury risk (reversibility). Reversibility refers to the ability to return the target to its preengagement functionality, usually measured by the time and level of effort required for recovering the target. Permanent injury is defined as physical damage to a person that permanently impairs physiological function and restricts the employment or other activities of that person for the rest of his or her life. RSI is fundamentally a measure of the propensity of an NLW to cause irreversible injury [1].

The U.S. Department of Defense (DoD) Instruction on “Non-Lethal Weapons (NLW) Human Effects Characterization” [2] establishes policy, assigns responsibilities, and provides procedures for a human effects characterization process in support of developing NLW, NL technologies, and NLW systems. It also establishes health care capability indexes as a basis to

determine the RSI from NLW. The characterization of the human effects of NLW is conducted during the materiel development process to assess the likelihood of achieving the desired effects and identify RSI for counterpersonnel systems and the RSI for collateral damage to humans from countermateriel systems. RSI is the probability of causing a permanent injury given limited first responder capability, such as self-aid, buddy-aid, and combat lifesaver skills. It is identified as a key system attribute, usually measured in a percentage.

It is critical that the capability developer, in coordination with the materiel developer, correctly articulates RSI in a requirements document. The RSI for any given weapon is identified by the capability developer, as RSI assists in materiel development and enables force commanders to understand the potential risks associated with the use of specific NLW. However, it is challenging to determine the appropriate percentage of RSI for a particular NLW, as the purpose of NLW is to reduce civilian casualties, determine intent, and capture high-value assets. The capability developer must determine what impact that causing irreversible injury (including death) has on the probability of mission success and what the trade-off is for mission success between the intended effect and the non-intended collateral effects. This trade space has to be quantifiable and testable in estimating the expected rate of causing permanently disabling injuries for an NLW when it is used as intended. In determining RSI for a given system, the capability developer must use it as an estimate of the statistical parameter for reversibility for the (future) population of individuals engaged with the NLW. It estimates a property of the group, not individuals, and should be written such that it clarifies the group to which it is meant to apply. In the absence of definite and precise estimations, the capability developer errs on the side of overestimating RSI.

Once established, the RSI is used by the respective Service test and evaluation agencies to determine if the system meets the identified RSI requirement. To assist the Services in the RSI determination process, the Joint Non-Lethal Weapons Directorate (JNLWD) Human Effects Office leads the RSI Technical Working Group. Its purpose is to provide a forum to establish consistent, systematic, and scientifically rigorous processes to evolve RSI calculation methodologies for NLW. The group works to develop standard methods to characterize RSI and better communicate RSI to the Services. The RSI Technical Working Group's conclusions are reviewed by the Human Effects Review Board (HERB), an independent DoD board established to ensure appropriate scientific processes are used to characterize the human effects of all DoD NLW programs.

2.2 FUTURE COURSE

In the continuing effort to characterize RSI and better communicate RSI to the Services, the JNLWD is preparing a series of NLW human effects handbooks for various systems, such as acoustic, retinal, blunt trauma, flashbang, and active denial technology. The purpose of the handbooks is to provide an end state for NLW human effects characterization, including RSI. The handbooks are intended for capability developers, materiel developers, and the test and evaluation community. They will also be used by the HERB as a reference. The handbooks

should help to improve efficiency in the NLW development and acquisition process when determining and testing RSI.

2.3 DSIAC JOURNAL ARTICLE

Mr. Rush identified the *DSIAC Journal* article “Developing and Fielding Non-Lethal Weapons: The Marine Corps and Army Approach,” which outlines the U.S. Marine Corps and Army approach to developing and fielding NLWs. It also contains information provided by the Joint Non-Lethal Weapons Program support officers of the Marine Corps and the Army [3].

REFERENCES

[1] Joint Capability Board. "Initial Capabilities Document for Counter-Material Joint Non-Lethal Effects," April 2009.

[2] Under Secretary of Defense for Acquisition, Technology, and Logistics. "Non-Lethal Weapons (NLW) Human Effects Characterization." Department of Defense Instruction, no. 3200.19, https://fas.org/irp/doddir/dod/i3200_19.pdf, 12 May 2012.

[3] Rush, N., and R. Miller. "Developing and Fielding Non-Lethal Weapons: The Marine Corps and Army Approach." *DSIAC Journal*, vol. 4, no. 3, <https://www.dsiac.org/resources/journals/dsiac/summer-2017-volume-4-number-3/developing-and-fielding-non-lethal-weapons>, July 2017.

BIOGRAPHY

NATHAN RUSH currently works for the SURVICE Engineering Company, serving as the Marine Corps Joint Non-Lethal Weapons Program Support Officer for the Force Protection Integration Division, Capabilities Development Directorate, Combat Development & Integration. He retired from the Marine Corps in 2016 after 22 years of service and has been working Marine Corps non-lethal weapons initiatives since 2012. Mr. Rush was a career logistics officer with operational and supporting establishment experience, highlighted by three combat tours in support of Operation Iraqi Freedom. He holds a B.A. in economics and business from the Virginia Military Institute and an M.M.S. (master of military studies) from the Marine Corps Command and Staff College.