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**OCP TECD TARDEC Blast Mitigation Program (BMP) and
NDIA-MI CRADA Summary Report**

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26 September 2017

U.S. Army Tank Automotive Research,
Development, and Engineering Center
Detroit Arsenal
Warren, Michigan 48397-5000

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14. ABSTRACT The cooperative research and development agreement (CRADA) between the U.S. Army Tank Automotive Research Development and Engineering Center (TARDEC) Blast Mitigation Program and the Michigan Chapter of the National Defense Industrial Association (NDIA) was created based on the desire of both parties to collaborate to develop a practical and useable set of Blast Mitigation Program (BMP) design guidelines and standards. The effort focused on the following topics: occupant-centric design philosophy and terms, test procedures, Military performance specifications, and Military standard. The objective of this report is to document the BMP NDIA-MI CRADA activities and accomplishments from October 2014 through July 2017. During the three year period, the working group held 11 information exchange meetings where 20 briefs were presented and discussed. The NDIA-MI provided industry feedback on meeting topics. This work enabled the publications of 6 Military performance specification and 1 Military Standard, MIL-STD-3058, Occupant-Centric Protection for Military Ground Vehicles.					
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**TANK-AUTOMOTIVE RESEARCH
DEVELOPMENT ENGINEERING CENTER**

Warren, MI 48397-5000

Occupant-Centric Platform (OCP) Technology-Enabled Capability Demonstration (TECD)

26 September 2017

**TARDEC Blast Mitigation Program (BMP) and National
Defense Industrial Association (NDIA) Michigan (MI)
Chapter Cooperative Research and Development
Agreement (CRADA) Summary Report**

By

Christine M. Wodzinski



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List of Symbols, Abbreviations, Acronyms

BMP	Blast Mitigation Program
CAMEL	Concept for Advanced Military Explosion-mitigating Land demonstrator
CRADA	Cooperative Research and Development Agreement
CVP	Combat Vehicle Prototype
DCS	Defense Collaboration System
DoD	Department of Defense
GDLS	General Dynamics Land Systems
NDIA	National Defense Industrial Association
OC	Occupant-Centric
OCP	Occupant-Centric Protection
OCP TECD	Occupant-Centric Protection Technology-Enabled Capability Demonstration
OPSEC	Operations Security
PME	Pratt & Miller Engineering
TARDEC	Tank Automotive Research, Development, and Engineering Center
UBB	Underbody Blast
WIAMan	Warrior Injury Assessment Manikin

1. Executive Summary

The cooperative research and development agreement (CRADA) between the U.S. Army Tank Automotive Research Development and Engineering Center (TARDEC) Blast Mitigation Program and the Michigan Chapter of the National Defense Industrial Association (NDIA) was created based on the desire of both parties to collaborate to develop a practical and useable set of Blast Mitigation Program (BMP) design guidelines and standards. The intent of this effort is to allow industry, in a non-competitive environment, an opportunity to exchange information and collaborate with TARDEC as a practical and usable set of Occupant-Centric design guidelines and standards for accommodation, operability, and underbody blast force protection to achieve a reduction in Soldier injuries are being developed. The overall purpose of the working group was to provide a forum to exchange information between the TARDEC Blast Mitigation team and its industry partners. The effort focused on the following topics: Occupant-Centric Design Philosophy and Terms, Test Procedures, Performance Specifications, and Military Standard.

The objective of this report is to document the Blast Mitigation Program and the National Defense Industrial Association (NDIA) Michigan (MI) Cooperative Research and Development Agreement (CRADA) activities and accomplishments from October 2014 through July 2017.

Prior to and during the project kickoff meeting on 22-October-2014 TARDEC G2, Security, was consulted regarding information sharing with the NDIA-MI through the CRADA agreement (Appendix A). At that time, the decision was to share all information in this forum at the “for Public Release” level.

During the three year period, the working group held 11 information exchange meetings where 2 briefs were presented and discussed. The NDIA-MI provided industry feedback on meeting topics. This work enabled the publications in ASSIST of 6 Military performance specification and 1 Military Standard.

- MIL-PRF-32518, Interior Head Impact Protection for Use in U.S. Army Military Vehicle Interiors [1]
- MIL-PRF-32548, Occupant Seat Belt Restraints for Use in U.S. Military Ground Vehicles [2]
- MIL-PRF-32558, Blast Sensing and Blast Data Recording Systems for Use in U.S. Military Ground Vehicles [3]
- MIL-PRF-32563, Energy-Attenuating (EA) Seat Systems for Use in U.S. Military Ground Vehicles [4]
- MIL-PRF-32564, U.S. Army Ground Vehicle Energy Attenuation (EA) Steering Subsystems [5]
- MIL-PRF-32566, Energy-Attenuating Floor Mats for Use in U.S. Military Ground Vehicles [6]
- MIL-STD-3058, Occupant-Centric Protection for Military Ground Vehicles [7]

ASSIST is a web site used by standardization management activities to develop, coordinate, distribute, and manage defense and federal specifications and standards.

2. Introduction

2.1 Background

The cooperative research and development agreement (CRADA) between the U.S. Army Tank Automotive Research Development and Engineering Center (TARDEC) Blast Mitigation Program and the Michigan Chapter of the National Defense Industrial Association (NDIA) was created based on the desire of both parties to collaborate to develop a practical and useable set of Blast Mitigation Program (BMP) design guidelines and standards.

The Michigan Chapter of the NDIA charter is to provide a legal and ethical forum for the interchange of ideas between the government and industry to resolve industrial problems of joint concern. Currently the Michigan Chapter has more than 3,000 members representing government, military, and industry. The majority of large businesses that support the Michigan defense community are Corporate Members of NDIA. The Michigan Chapter is involved in a myriad of different activities that support all branches of the armed forces, local, state, and federal government, as well as the corporate entities that support our Warfighters, first responders, and patriotic Americans. The intent of the NDIA working group is to be an open forum for participation and sharing of information regarding the Blast Mitigation Program. NDIA, through its industry interactions, forums and website, will communicate the opportunity and procedures to participate in the working group regarding the BM Program.

TARDEC'S focus on the overarching blast mitigation program was to design, develop, demonstrate, and document an occupant-centric ground vehicle design philosophy that improves vehicle survivability as well as occupant protection by mitigating Soldier injuries due to underbody blast, crash, and rollover events as well as design to accommodate the central Soldier population. Currently, there is not a DoD standard to aid acquisition program managers and defense military vehicle manufacturers in the design and development of a survivable occupant-centric ground vehicle. The TARDEC Blast Mitigation Program developed standardized documents that identify requirements to design a military vehicle that is Occupant-Centric and considers mounted force protection, operational safety, and Soldier accommodation during design phases. During this effort, the blast mitigation team was primarily focusing on protecting the occupant during an underbody blast event and accommodating the entire soldier population.

The CRADA occurred over a period of three years, beginning in October of 2014, and concluding in June of 2017. The signed agreement is shown in Appendix A.

2.2 Scope

The intent of this effort is to allow industry, in a non-competitive environment, an opportunity to exchange information and collaborate with TARDEC as a practical and usable set of Occupant-Centric design guidelines and standards for accommodation, operability, and underbody blast force protection to achieve a reduction in Soldier injuries are being developed. The overall purpose of the working group was to provide a forum to exchange information between the TARDEC Blast Mitigation team and its industry partners. TARDEC provided documents, draft standards, draft specifications, and related

artifacts for which review by the NDIA-MI working group was requested to review and provide feedback. As necessary, TARDEC was to provide a response to the NDIA-MI. The effort focused on the following topics: occupant-centric design philosophy and terms, test procedures, performance specifications, and Military standard.

2.3 Objective

The objective of this report is to document the Blast Mitigation Program and the National Defense Industrial Association (NDIA) Michigan (MI) Cooperative Research and Development Agreement (CRADA) activities and accomplishments from October 2014 through July 2017.

2.4 Limitations

Prior to and during the project kickoff meeting on 22-October-2014 TARDEC G2, Security, was consulted regarding information sharing with the NDIA-MI through the CRADA agreement (Appendix A). At that time, the decision was to share all information in this forum at the “for Public Release” level.

3. Activities and Accomplishments

This section presents the Blast Mitigation Program and the National Defense Industrial Association (NDIA) Michigan (MI) Cooperative Research and Development Agreement (CRADA) activities and accomplishments from October 2014 through July 2017. During the three year period, the working group held 11 information exchange meetings where 20 briefs were presented and discussed.

The initial kick-off meeting was held at TARDEC in Warren Michigan on October 22, 2014. The NDIA-MI presented an overview of their organization. TARDEC Ground System Survivability presented a TARDEC overview, the 30-year strategy, a GSS overview, the Combat Vehicle Prototype (CVP) program, a CRADA overview, and the first CRADA information exchange topic “Occupant-Centric Design: Boundary Manikins and Accommodation Models.” Representation from NDIA-MI included the president, CRADA Point of Contact (POC)/Facilitator, and Board Member as well as industry representation from Oshkosh Defense, GDLS, BAE Systems, Navistar Defense, and AM General,

The 10 meetings that followed were coordinated by TARDEC and the NDIA-MI working group. The meeting topic as well as date and location follow.

- Occupant-Centric Definitions and Philosophy on 10-December-2014 at TARDEC – Warren, MI
- Quantifying Disaccommodation on 11-March-2015 at TARDEC – Warren, MI
- Restraint Systems on 19-August-2015 at TARDEC – Warren, MI
- Seat Systems and Head Impact Protection on 28-October-2015 at TARDEC – Warren, MI
- Seat Analysis Data Review and Laboratory Overview and Tour on 20-January-2016 at TARDEC Occupant Protection Laboratory – Selfridge Air National Guard Base, Harrison Township, MI
- Occupant-Centric Platform Technology-Enabled Capability Demonstration (OCP TECD) Concept for Advanced Military Explosion-mitigating Land demonstrator (CAMEL) Overview on 30-March-2016 at Pratt and Miller Engineering (PME) Facilities – New Hudson, MI
- Performance Specifications (Blast Sensing and Blast Data Recording Systems & Occupant Restraints) on 12-October-2016 at BAE Systems – Sterling Heights, MI
- Performance Specifications (Floor Mats, Seat Systems, and Steering Systems) on 7-December-2016 at Navistar Defense – Madison Heights, MI
- Military Standard, MIL-STD-3058, Occupant Centric Protection for Military Ground Vehicles on 22-March-2017 at General Dynamics Land Systems (GDLS) – Sterling Heights, MI
- CRADA Accomplishments and Closing Meeting on 29-June-2017 – Virtual via telecom and Defense Collaboration System (DCS)

The list of 20 briefs by title and presenter are found below.

- 1) NDIA-MI and TARDEC BMP CRADA Overview – Wodzinski, OPSEC #25849
- 2) TARDEC Overview and 30 Year Strategy – Germundson, OPSEC #25848

- 3) GSS, OCP and CVP Program Overview – Kott, OPSEC #25851
- 4) OC Design – Boundary Manikins and Accommodation Models – Zielinski, OPSEC #25850
- 5) Occupant-Centric Definitions and Philosophy – Wodzinski, OPSEC #26056
- 6) Quantifying Disaccommodation – Reed, OPSEC #26407
- 7) The Effects of Soldier Gear Encumbrance on restraints in a Frontal Crash Environment – Karwaczynski, OPSEC #27096
- 8) Optimal Restraints System Routing Procedures for Restraint System Development – Karwaczynski, OPSEC #26832
- 9) The Seated Soldier Study-Posture and Body Shape in Vehicle Seats – Reed, OPSEC #24403
- 10) Utilizing Shape Modeling Techniques for Automotive and Military Seats – Litrichin, OPSEC #26899
- 11) Interior Head Impact Protective Components and Materials for use in US Army Vehicles – Klima, et al. OPSEC #26831
- 12) Blast Mitigation Seat Analysis-Drop Tower Data Review – Bosch, et al., GVSETS
- 13) CAMEL Overview – Korson, OPSEC #27697
- 14) Overview of MIL-PRF-32558, Vehicle Blast Data Recorder – Pakenas, OPSEC #28545
- 15) Overview of MIL-PRF-32548, Restraints – Staniak, OPSEC #28490
- 16) Overview of MIL-PRF-32566, Floor Mats – Halstead, OPSEC #28691
- 17) Overview of MIL-PRF-32563, Seats – Litrichin, OPSEC #28690
- 18) Overview of MIL-PRF-32564, Steering – Bolton, OPSEC #28687
- 19) MIL-STD-3058, Occupant Centric Protection for Military Ground Vehicles – Wodzinski, et al., OPSEC #28773
- 20) TARDEC BMP NDIA-MI CRADA Closing Meeting – Wodzinski, OPSEC #29294

The NDIA-MI provided industry feedback on 11 topics: Boundary Manikins and Accommodation Models Feedback (8-December-2014), Occupant-Centric Design and Philosophy (6-March-2015), CRADA Agreement (6-March-2015), Occupant Restraints Testing (26-October-2015), Performance Specification Interpretation (12-October-2016), MIL-PRF-32548 and MIL-PRF-32558 (2-December-2016), and MIL-PRF-32563, MIL-PRF-32564 and MIL-PRF-32566 (3-March-2017).

The efforts of the working group led to the publication of six performance specifications and one Military Standard on ASSIST.

- Interior Head Impact Protection for Use in U.S. Army Military Vehicle Interiors, MIL-PRF-32518, 24-August-2015 [1]
- Occupant Seat Belt Restraints for Use in U.S. Military Ground Vehicles, MIL-PRF-32548, 13-June-2016 [2]
- Blast Sensing and Blast Data Recording Systems for Use in U.S. Military Ground Vehicles, MIL-PRF-32558, 6-September-2016 [3]
- Energy-Attenuating (EA) Seat Systems for Use in U.S. Military Ground Vehicles, MIL-PRF-32563, 7-October-2016 [4]
- U.S. Army Ground Vehicle Energy Attenuation (EA) Steering Subsystems, MIL-PRF-32564, 7-October-2016 [5]
- Energy-Attenuating Floor Mats for Use in U.S. Military Ground Vehicles, MIL-PRF-32566, 22-November-2016 [6]
- Occupant-Centric Protection for Military Ground Vehicles, MIL-STD-3058, 4-May-2017 [7]

ASSIST is a web site used by standardization management activities to develop, coordinate, distribute, and manage defense and federal specifications and standards. ASSIST Link: <http://quicksearch.dla>

4. Conclusions

The objective of this report was to document the Blast Mitigation Program and the National Defense Industrial Association (NDIA) Michigan (MI) Cooperative Research and Development Agreement (CRADA) activities and accomplishments from October 2014 through July 2017. During the three year period, the working group held 11 information exchange meetings where 20 briefs were presented and discussed. The NDIA-MI provided industry feedback on meeting topics. This work enabled the publications of 6 Military performance specification and 1 Military Standard.

The closing meeting was held virtually on 29-June-2017 where the TARDEC BMP and NDIA-MI CRADA activities and accomplishments were briefed. A TARDEC CRADA Close-Out Form was prepared and submitted to the TARDEC Defense Industry Liaison.

5. Acknowledgements

The TARDEC Blast Mitigation Program and NDIA-MI CRADA would like to acknowledge those who contributed to this 3-year effort.

Participation from the defense industry included representation of the following organizations:

- AM General
- BAE Systems
- General Dynamics Land Systems (GDLS)
- Great Lakes Systems and Technology
- Hodges Transportation/Nevada Test Center
- Lockheed Martin
- M3 Defense Consulting
- Navistar Defense
- Oshkosh Defense

Underbody blast mitigation and occupant-centric design related briefs were created and presented by:

Mr. Robert K. Bolton (Steering Systems)
Ms. Kelly Bosch (Seat Systems)
Mr. David W. Clark Blast Mitigation Interior Technologies)
Mr. Mark Germundson (Deputy Associate Director, Blast Mitigation)
Mr. Steven L. Halstead (Floor Mats)
Ms. Chantelle M. Korson (OCP TECD CAMEL Demonstrator Lead)
Mr. Norbert J. Kott (OCP TECD/Combat Vehicle Prototype Team Leader)
Dr. Sebastian K. Karawczynski (Occupant Seat Belt Restraints)
Ms. Julie K. Klima (Protective Trim)
Ms. Gale M. Litrichin (Seat Systems)
Ms. Hollie A. Pietsch (WIAMan)
Steve Pakenas (Blast Sensing and Blast Data Recording Systems)
Ms. Risa D. Scherer (TARDEC Occupant Protection Laboratory)
Ms. Celia M. Staniak (Occupant Restraints)
Ms. Gale L. Zielinski (Boundary Manikins and Accommodation Models)
Ms. Christine M. Wodzinski (CRADA Overview, Occupant-Centric Philosophy, CRADA Accomplishments)

Meeting logistics was provided by Scott J. Merritts. The brief compilation and technical editing of this report was provided by Dave Woomer.

Leadership of the TARDEC Blast Mitigation Program and NDIA-MI CRADA was provided by the following Points of Contact (PoCs):

Mr. Samuel C. Homsy
Navistar Defense, LLC Director - Army Programs
NDIA-MI and TARDEC CRADA POC

Ms. Christine M. Wodzinski
OCP TECD System and Standards Lead
TARDEC and NDIA-MI CRADA POC

6. Definitions

Occupant-Centric: Designing Military vehicles around the occupant requirements for accommodation, operability, and underbody blast force protection to achieve a reduction in Soldier injuries.

7. Bibliography

- [1] Department of Defense, "MIL-PRF-32518 Performance Specification for Interior Head Impact Protection for Use in U.S. Military Ground Vehicles," TARDEC (Available in Assist), Warren, 2016.
- [2] Department of Defense, "MIL-PRF-32548 Performance Specification for Occupant Seat Belt Restraints for Use in Military Ground Vehicles," TARDEC, (Available in ASSIST), Warren, 2016.
- [3] Department of Defense, "MIL-PRF-32558 Performance Specification for Blast Sensing and Blast Data Recording Systems," TARDEC (Available in Assist), Warren, 2016.
- [4] Department of Defense, "MIL-PRF-32563, Performance Specification for Energy Attenuating Seat Systems for Use in US Military Ground Vehicles," TARDEC (Available in Assist), Warren, 2016.
- [5] Department of Defense, "MIL-PRF-32564 Performance Specification for Energy-Attenuating Steering Systems," TARDEC (Available in Assist), Warren, 2016.
- [6] Department of Defense, "MIL-PRF-32566 Performance Specification for Energy-Attenuating Floor Mats," TARDEC (Available in Assist), Warren, 2016.
- [7] Department of Defense, "MIL-STD-3058 Occupant-Centric Protection for Military Ground Vehicles," U.S. DoD (Available from Assist), Washington D.C., 2017.

8. Appendix A: TARDEC Blast Mitigation Program and NDIA-MI CRADA

This CRADA was signed and placed into effect on July 11, 2014.

COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENT
BETWEEN
NDIA MICHIGAN CHAPTER
AND
THE TANK AUTOMOTIVE
RESEARCH, DEVELOPMENT AND ENGINEERING CENTER

This is a Cooperative Research and Development Agreement (CRADA) pursuant to the Federal Technology Transfer Act of 1986 between the Michigan Chapter of the National Defense Industrial Association, a non-partisan, non-profit, educational association (NDIA MICHIGAN CHAPTER) and the U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC), a laboratory of the United States Army.

TARDEC possesses information and skills, related to vehicle construction, maintenance and testing.

NDIA MICHIGAN CHAPTER possesses institutional defense industrial base expertise in vehicle design, integration, testing and volume production.

The intent of this collaborative effort is to allow industry, in a "non-competitive" environment, an opportunity to participate with TARDEC in military ground vehicle Science and Technology initiatives.

The parties agree as follows:

ARTICLE 1. DEFINITIONS

"Cooperative Research and Development Agreement" (CRADA) identifies this agreement.

"Governmental License" means a nonexclusive, nontransferable, irrevocable, paid-up license to practice a Subject Invention or have a Subject Invention practiced, throughout the world by, or on behalf of the U.S. Government.

"Invention" means any invention or discovery which is or may be patentable under Title 35 of the United States Code.

"Made" in relation to any Invention means the conception or first actual reduction to practice of such Invention.

"Proprietary Information" means information which embodies trade secrets developed at private expense or which is confidential business or financial information provided that such information:

- (i) Is not generally known or available from other sources without obligations concerning its confidentiality;
- (ii) Has not been made available by the owners to others without obligation

concerning its confidentiality; or

- (iii) Is not already available to the Government without obligation concerning its confidentiality.

"Reasonable Time" means less than six months.

"Software" means computer programs, source code, source code listings, object code listings, design details, algorithms, processes, flow charts, formulae and related material that would enable the Software to be reproduced, recreated or recompiled.

"Subject Data" means all recorded information first produced in the performance of this CRADA. It does not include Proprietary Information.

"Subject Invention" means any Invention Made in the performance of work under this CRADA.

ARTICLE 2. COOPERATIVE RESEARCH

STATEMENT OF WORK. The cooperative research will be performed in accordance with an individually-negotiated Statement Of Work (SOW) for each initiative under this agreement, and each individual SOW will be attached as an Appendix A-x (e.g., A-1, A-2, etc.). The work will be performed on a best efforts basis using the resources each party considers necessary. Researchers acting under this CRADA remain employed and controlled by their employer.

ARTICLE 3. REPORTS

REPORTS. The parties shall prepare submissions, feedback and reports as delineated in the SOW.

ARTICLE 4. PATENTS AND SOFTWARE

REPORTING. Each Subject Invention Made by a party's employees /members and reported to the party shall be promptly reported to the other party.

NDIA MICHIGAN CHAPTER EMPLOYEE INVENTIONS. NDIA MICHIGAN CHAPTER retains title to any Subject Invention Made solely by NDIA MICHIGAN CHAPTER members under the SOW. NDIA MICHIGAN CHAPTER agrees to grant the U.S. Government a Governmental License on NDIA MICHIGAN CHAPTER employee Subject Inventions under the SOW. NDIA MICHIGAN CHAPTER may release its rights in any Invention provided for by this paragraph to its employee inventors subject to a Governmental License. NDIA MICHIGAN CHAPTER retains all intellectual property rights on Inventions Made solely by NDIA MICHIGAN CHAPTER members outside the SOW.

JOINT INVENTION. When a Subject Invention is Made jointly by a NDIA MICHIGAN CHAPTER inventor and a Government employee, NDIA MICHIGAN CHAPTER may retain title and TARDEC will assign its rights in the Subject Invention to NDIA MICHIGAN CHAPTER subject to a Governmental License and a right to share in royalties collected from third parties.

TARDEC EMPLOYEE INVENTIONS. TARDEC on behalf of the U.S. Government shall retain title to each Subject Invention Made solely by its employees.

FILING OF PATENT APPLICATIONS. The party having the right to retain title to a Subject Invention has the first right to file patent applications. On joint Subject Inventions, if NDIA MICHIGAN CHAPTER elects not to file, they will advise TARDEC of their decision in a timely manner so TARDEC may elect to file patent applications prior to any statutory bar. In the event neither party elects to file a patent application on a Subject Invention, the party having the right to retain title may release the right to file to the inventor(s).

EXPENSES. The party filing a patent application is responsible for all expenses associated with obtaining and maintaining protection on a Subject Invention. If the party which files a patent application decides to abandon either obtaining or maintaining protection on a Subject Invention, they will notify the other party of the intent to discontinue protection within a reasonable time. The other party shall have the option to take over protection of the Subject Invention, and the party abandoning the effort to protect shall assign the patent or application to the party assuming protection. The assignment will be subject to a nonexclusive, nontransferable, irrevocable, paid-up license to practice the Subject Invention or have the Subject Invention practiced throughout the world.

LICENSES. TARDEC on behalf of the Government, agrees to grant to NDIA MICHIGAN CHAPTER an exclusive license in each U.S. patent application and patent covering a Subject Invention to which TARDEC has title. The license shall bear a reasonable royalty rate. The specific royalty rate and a term of exclusivity, not to exceed three years, shall be negotiated within a Reasonable Time after a patent application covering the Subject Invention is filed in the U.S. Patent and Trademark Office and will be subject to a Governmental License and a right to share in royalties collected from third parties. The party having title may license such Invention to a third party subject to the restrictions herein.

UNITED STATES MANUFACTURING. When granting licenses to third parties under patents covering Subject Inventions, the party having the right to grant the license will require that products made, used or sold under the license be manufactured substantially in the United States.

COPIES. Each party shall provide the other party with copies of the patent applications it files on any Subject Invention along with the power to inspect and make copies of all documents retained in the official patent application file by the Patent Office.

GOVERNMENTAL LICENSE. The U.S. Government has a Governmental License on all Subject Inventions Made under this CRADA. The Governmental License shall be evidenced by a confirmatory license agreement in the form shown in Appendix B.

NDIA MICHIGAN CHAPTER EMPLOYEE SOFTWARE. NDIA MICHIGAN CHAPTER retains title to any Software Made solely by NDIA MICHIGAN CHAPTER members under the SOW and NDIA MICHIGAN CHAPTER may file for copyright protection. NDIA MICHIGAN CHAPTER grants the U.S. Government a Governmental License on Software developed by NDIA MICHIGAN CHAPTER under the SOW whether copyrighted or uncopyrighted. NDIA MICHIGAN CHAPTER retains all intellectual property rights to Software developed solely by NDIA MICHIGAN CHAPTER members outside the scope of the SOW.

JOINT EMPLOYEE SOFTWARE. NDIA MICHIGAN CHAPTER retains title to any Software Made jointly by NDIA MICHIGAN CHAPTER members and TARDEC employees under the SOW and NDIA MICHIGAN CHAPTER may file for copyright protection. NDIA MICHIGAN CHAPTER grants the U.S. Government a Governmental License on jointly developed Software whether copyrighted or uncopyrighted. NDIA MICHIGAN CHAPTER agrees to pay TARDEC a fee for the contributions of TARDEC employees to the jointly developed Software. The fee shall be based on the sales or license fees received from use of the jointly developed Software and any license fees received from sublicenses.

ARTICLE 5. DATA AND PUBLICATION

PROPRIETARY INFORMATION. NDIA MICHIGAN CHAPTER shall place an appropriate notice on all Proprietary Information it delivers to TARDEC. TARDEC agrees that any Proprietary Information furnished by NDIA MICHIGAN CHAPTER to TARDEC shall be used only for carrying out work under this CRADA. TARDEC agrees to use its best efforts to protect information designated as Proprietary Information from unauthorized disclosure. Proprietary Information shall be returned at the conclusion of work on the SOW at the owner's expense. One copy may be retained, if desired, for records purposes only.

SUBJECT DATA. TARDEC shall provide appropriate protection for Subject Data which would be trade secret, confidential or financial information if it had been obtained from NDIA MICHIGAN CHAPTER. The protection is for a period of five years from the date the Subject Data is developed and includes protection from dissemination under 15 U.S.C. §3710a (c)(7)(B) if permitted. The parties shall have the right to use Subject Data protected under this paragraph for any Government or NDIA MICHIGAN CHAPTER purpose.

DISCLOSURE OF PROPRIETARY INFORMATION. NDIA MICHIGAN CHAPTER agrees that TARDEC is not liable for the disclosure of information designated as proprietary which, after notice to and consultation with NDIA MICHIGAN CHAPTER, it is determined may not lawfully be withheld or which a court of competent jurisdiction requires disclosed.

ARTICLE 6. PUBLICATION

PUBLICATION APPROVAL. The parties agree to secure written pre-publication approval from each other prior to publication of information, test results or reports related to work under this CRADA. Such approval shall not be unreasonably withheld and all objections shall be made to the requesting party within 90 days of a party's request to publish.

USE OF THE OTHER PARTY'S NAME. Use of the other party's name or its employees/members' names in any promotional activity which refers to work under this CRADA requires prior written consent of the party and any person named. By entering into this CRADA, neither party directly or indirectly endorses any product or service provided, or to be provided by the other party.

PATENT APPLICATIONS. Any party having the right to file patent applications shall be offered an ample opportunity to file patent applications on Subject Inventions prior to publication of research results from this CRADA.

ARTICLE 7. REPRESENTATIONS

TARDEC REPRESENTATIONS. TARDEC represents to NDIA MICHIGAN CHAPTER that: it is a federal laboratory of the Department of Defense; this CRADA is consistent with TARDEC's mission; the TARDEC official executing this CRADA has the requisite authority; and prior to executing this CRADA, TARDEC's Laboratory Director has considered the statutory requirements relating to special consideration for CRADAs with small business firms.

NDIA MICHIGAN CHAPTER REPRESENTATIONS. NDIA MICHIGAN CHAPTER represents: it is a non-profit entity with individual and corporate members whose interests lie in furthering the technology base in both the US Government and Defense Industrial Base; it has the requisite authority to execute this CRADA and perform according to the terms; and that the NDIA MICHIGAN CHAPTER official executing this CRADA has the requisite authority.

ARTICLE 8. TERMINATION

MUTUAL CONSENT. TARDEC and NDIA MICHIGAN CHAPTER may terminate this CRADA at any time by mutual consent. The parties shall specify the disposition of all property, patents and other results of work upon termination.

UNILATERAL TERMINATION. Either party may unilaterally terminate this entire CRADA by giving the other party 90 days written notice. If NDIA MICHIGAN CHAPTER unilaterally terminates this CRADA, TARDEC's obligation to grant exclusive licenses is simultaneously terminated.

ARTICLE 9. DISCLAIMER

THE PARTIES MAKE NO EXPRESS OR IMPLIED WARRANTY AS TO ANY MATTER, INCLUDING THE CONDITIONS OF THE RESEARCH OR ANY INVENTION OR PRODUCT,

WHETHER TANGIBLE OR INTANGIBLE, MADE, OR DEVELOPED UNDER THIS CRADA, OR THE OWNERSHIP, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE OF THE RESEARCH OR ANY INVENTION OR PRODUCT.

ARTICLE 10. PROPERTY

All tangible personal property shall remain the property of the party which purchased it. Disposal will be at the expense and direction of the owner.

ARTICLE 11. PERSONNEL

A party to this CRADA may assign personnel to the other party's facility. Any personnel so assigned remain the employee of the assigning party and under the assigning party's control except for routine supervisory and administrative control.

ARTICLE 12. MISCELLANEOUS

OFFICIALS NOT TO BENEFIT. No member of, or delegate to the United States Congress, or resident commissioner, shall be admitted to any share or part of this CRADA, nor to any benefit that may arise therefrom; but this provision shall not be construed to extend to this CRADA if made with a corporation for its general benefit.

GOVERNING LAW. The construction, validity, performance and effect of this CRADA for all purposes shall be governed by the laws applicable to the Government of the United States.

ENTIRE CRADA. This CRADA, with its Appendices, constitutes the entire agreement between the parties and supersedes any prior understanding or written or oral agreement relative to this research.

WAIVERS. No provision of this CRADA shall be considered waived by any party hereto unless such waiver is given in writing. The failure of a party to insist upon strict performance of any term and condition, or delay in exercising any right is not a waiver of the right.

SEVERABILITY. The illegality or invalidity of any provision of this CRADA shall not impair, affect or invalidate the other provisions of this CRADA.

AMENDMENTS. If either party desires a modification in this CRADA, the parties shall meet in good faith to determine the desirability of a proposed modification. No such modification is effective until a written amendment is executed by the parties.

ASSIGNMENT. Neither this CRADA nor any rights or obligations of any party under this CRADA shall be assigned or otherwise transferred by a party without the prior written consent of the other party.

NOTICES. All notices pertaining to or required by this CRADA shall be in writing, sent first class mail and signed by an authorized representative of the party.

The addresses are:

TARDEC:

Director, TARDEC
TARDEC (MS 204)
6501 E. Eleven Mile Road
Warren, MI 48397-5000
(586) 282-6144

NDIA MICHIGAN CHAPTER:

NDIA MICHIGAN CHAPTER
ATTN: Samuel Homsy
1675 E. Whitcomb Ave
Madison Heights, MI 48071
(248) 680-7507

Any party may change their address by giving notice to the other party in the manner set forth above.

ARTICLE 13. RELATIONSHIP

RELATIONSHIP OF THE PARTIES. The parties to this CRADA remain independent contractors. They are not agents of each other, joint venturers or partners.

ARTICLE 14. HOLD HARMLESS

PROPERTY. Neither party shall be responsible for damage to the other party's property provided pursuant to this CRADA.

NDIA MICHIGAN CHAPTER agrees to indemnify and hold harmless the U.S. Government for all losses and claims arising from a personal injury or property damage occurring from making, using or selling a product derived from work under this CRADA by NDIA MICHIGAN CHAPTER, its licensees and assigns, except to the extent that such loss or claim arises from the negligence of TARDEC or its employees.

GOVERNMENT. Government responsibility shall be determined solely under the provisions of the Federal Tort Claims Act.

ARTICLE 15. DISPUTES

Any dispute arising under this CRADA which is not disposed of by agreement of the parties shall be submitted jointly to the signatories of this CRADA. A joint decision of the signatories or their designees shall be the disposition of such dispute.

ARTICLE 16. DURATION OF CRADA AND EFFECTIVE DATE

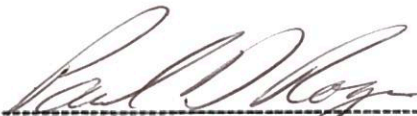
DURATION. This CRADA will continue in force for a period of three years from date of final signature. The parties understand research and development programs cannot be rigidly defined in advance, and that any contemplated completion period is a good faith projection. The provisions of Article 4 shall survive the termination of this CRADA.

EFFECTIVE DATE. This CRADA is effective on the date the Assistant Secretary of the Army concurs with the CRADA as written. If modification is required, the effective date is the date the modification is accepted by NDIA MICHIGAN CHAPTER.

RATIFICATION. If the Assistant Secretary of the Army (Research, Development and Acquisition) exercises his retained authority to require modification, which must be exercised within thirty days of this CRADA being submitted for review, NDIA MICHIGAN CHAPTER shall have 30 days from notification of any required modifications to ratify the modifications or terminate the CRADA.

IN WITNESS WHEREOF, the parties have caused this CRADA to be executed by their duly authorized representatives as follows:

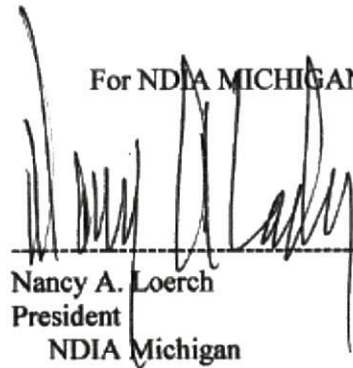
For TARDEC:



Paul D. Rogers, Ph.D., SES
Director, Tank Automotive Research,
Development and Engineering Center

Date 11 Jul 14

For NDIA MICHIGAN CHAPTER:


Nancy A. Loerch
President
NDIA Michigan

Date: April 16, 2014

APPENDIX A-1

(CRADA #14-12)

STATEMENT OF WORK

Blast Mitigation (BM) Program

ABSTRACT. The parties desire to collaborate to develop a practical and useable set of Blast Mitigation (BM) design guidelines and standards. NDIA Michigan Chapter working group will provide advisory assistance and an industry perspective to the TARDEC BM Program. This initial effort will focus on 1) providing feedback and comment on the form, format and content of the BM design handbook and 2) work with the TARDEC BM Team to develop and agree upon a common BM Design philosophy, BM Design Terms, and BM areas of concentration.

BACKGROUND. The Michigan Chapter of the National Defense Industrial Association (NDIA) charter is to provide a legal and ethical forum for the interchange of ideas between the government and industry to resolve industrial problems of joint concern. Currently the Michigan Chapter has more than 3,000 members representing government, military, and industry. The majority of large businesses that support the Michigan defense community are Corporate Members of NDIA. The Michigan Chapter is involved in a myriad of different activities that support all branches of the armed forces, local, state, and federal government, as well as the corporate entities that support our warfighters, first responders, and patriotic Americans. The intent of the NDIA working group is to be an open forum for participation and sharing of information regarding the BM Program. NDIA, through its industry interactions, forums and website, will communicate the opportunity and procedures to participate in the working group regarding the BM Program.

ARMY TECHNOLOGY. The focus of the overarching BM Program is to design, develop, demonstrate, and document an occupant-centric ground vehicle design philosophy that improves vehicle survivability as well as occupant protection by mitigating soldier injuries due to underbody blast, crash, and rollover events as well as design to accommodate the central soldier population. Currently, there is not a DoD standard to aid acquisition program managers and defense military vehicle manufacturers in the design and development of a survivable occupant-centric ground vehicle. The TARDEC BM Program is developing standardized documents that identify requirements to design a military vehicle that is Occupant Centric and considers mounted force protection, operational safety, and Soldier accommodation during design phases. During this effort, BM team will be primarily focusing on protecting the occupant during an underbody blast event and accommodating the entire soldier population.

TECHNOLOGY TRANSFER. TARDEC will provide information regarding current efforts in regards to application and standardization of Army BM R&D.

POTENTIAL BENEFIT. Development of a comprehensive BM MIL-STD and design handbook is expected to provide significant improvements to vehicle force protection for our Soldiers, as well as provide accommodation for the center 90% of the Soldier user population. The BM Design Standard and

Handbook will provide a consistent set of requirements for BM design engineering and a reliable means to validate system requirements and performance. The BM Handbook will provide essential best practices and lessons learned to assist PEO's, PM's, and industry partners in meeting those requirements. By having a stable set of requirements and a consistent way to assess those requirements, the Army will have more reliable and useful data from which to make decisions that affect the force protection levels of vehicle platforms. Securing feedback and comment from the NDIA working group on OC design issues is critical, as it will provide the government BM Team with industry's perspective. It will also provide a foreshadowing of the requirements and test procedures that will ultimately need to be achieved.

PRIMARY INVESTIGATORS:

Party	TARDEC	NDIA MICHIGAN CHAPTER
Person	N. Joseph Kott	Sam Homsy
Street address	TAR-RTI-GSS-OCF	
	6501 E. 11 Mile Road	
City state zip	Warren, MI 48397-5000	
phone	586-282-7604	
e-mail	norbert.j.kott.civ@mail.mil	sam.homsy@navistar.com

NDIA MICHIGAN CHAPTER TASKS:

- 1) NDIA MICHIGAN CHAPTER will engage the NDIA working group to support the BM Project.
- 2) NDIA MICHIGAN CHAPTER will provide funding as needed and agreed to by the parties.
- 3) NDIA MICHIGAN CHAPTER will set up a data warehouse for the BM Project, to be available to NDIA working group membership.
- 4) NDIA MICHIGAN CHAPTER will facilitate exchange of documents and communication between NDIA working group and TARDEC. NDIA working group will provide feedback to TARDEC. Feedback will consist of (but not limited to) input to design philosophy, high level chapter content, type of document to publish (design guidebook, MIL- STD, design handbook, etc.)
- 5) NDIA MICHIGAN CHAPTER will coordinate document review with NDIA working group.
- 6) NDIA MICHIGAN CHAPTER will convene NDIA working group meetings as necessary to complete the BM project.
- 7) NDIA MICHIGAN CHAPTER will provide input to BM Program Office on:
 - a. BM Philosophy
 - b. BM MIL-STD/Handbook Format

- c. BM MIL-STD /Handbook development process
 - d. BM MIL-STD/Handbook Chapter Content
 - e. Metrics
 - f. Key Assumptions concerning BM.
 - g. Modeling and Simulation Techniques used by Government
 - h. Interpretation of Theater Threat and Casualty data from an BM perspective
 - i. Test Operating Procedures
 - j. Manufacturing Procedures
 - k. Logistics Impacts
 - l. Applicability of FMVSS and other standards
- 8) NDIA MICHIGAN CHAPTER will consolidate input from the NDIA Working Group and, where appropriate, come to a consensus on the feedback, and will provide that information to TARDEC.
- 9) NDIA MICHIGAN CHAPTER will receive periodic feedback from NDIA working group on the BM Project.

TARDEC TASKS:

- 1) TARDEC will host a kick off meeting upon signature of this CRADA.
- 2) TARDEC will provide to NDIA working group the framework for the development of the BM Publications. TARDEC will provide the NDIA working group a draft document outlining the form, format and content of the BM design guidebook. The details for the final MIL-STD publication will follow at a later date.
- 3) TARDEC will provide NDIA working group with specific TARDEC needs with respect to NDIA working group feedback to the BM program.
- 4) TARDEC will provide documents, artifacts, draft standards, draft specifications etc., for which NDIA working group review is requested.
- 5) TARDEC will provide periodic technical “knowledge drops” to the NDIA working group as the program matures. These knowledge drops will comply with any required USG protocols before release.
- 6) TARDEC will provide NDIA working group feedback on submitted documents as necessary
- 7) TARDEC will include NDIA working group in appropriate Government-led meetings, Soldier feedback forums etc., concerning the OCP program.
- 8) TARDEC will prepare a TARDEC CRADA Close-Out Form upon termination of this Statement of Work (SOW), or the expiration of the CRADA work period (whichever occurs first), including an accurate summary of the objectives and results of the SOW.

APPENDIX B

CONFIRMATORY LICENSE AGREEMENT

Application Identification

The Invention described in the application (patent) identified above is a Subject Invention as defined in a Cooperative Research and Development Agreement between the U.S. Army Tank Automotive Research, Development and Engineering Center and (assignor).

This document is confirmatory of the Government's right of a nonexclusive, nontransferable, irrevocable, paid-up license to practice the Subject Invention or have the Subject Invention practiced, throughout the world by, or on behalf of the U.S. Government granted under the terms of this Cooperative Research and Development Agreement.

The Government is granted an irrevocable power to inspect and make copies of the above-identified application.

Signed this _____ day of _____ 20__

(CORPORATE SEAL)

NDIA MICHIGAN CHAPTER

BY: _____

TITLE: _____