Award Number: W81XWH-22-2-0060

TITLE: Creation of an Anesthesia Resuscitation Kit (ARK) for Prolonged Field Care of Military Casualties with Traumatic Brain Injury

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Fort Detrick, Maryland 21702-5012

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4. TITLE AND SUBTITLE : **Creation of an Anesthesia Resuscitation Kit (ARK) for Prolonged Field Care of Military Casualties with Traumatic Brain Injury**		**5a. CONTRACT NUMBER** W81XWH-22-2-0060 **5b. GRANT NUMBER** **5c. PROGRAM ELEMENT NUMBER**
6. AUTHOR(S); Hasan B Alam, MD; Zaiba Shafik Dawood, MBBS; Toby Phillip Keeney-Bonthrone, MD, Jessie Ho, MD E-Mail:hasan.alam@nm.org		**5d. LOG NUMBER** **5e. AWARD NUMBER** **5f. WORK UNIT NUMBER**
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Northwestern University, 676 North St. Clair Street, Suite 2320, Chicago, IL 60611**		**8. PERFORMING ORGANIZATION**
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13. SUPPLEMENTARYNOTES

14. ABSTRACT

Prolonged Field Care (PFC) is a military adaptation aimed at providing pre-hospital care in delayed extrication from austere settings. Providing PFC is challenging due to a lack of standardized medical equipment and size/weight restrictions of military packs during dismounted operations. In this study, we sought to design a standardized, practical, and effective Anesthesia Resuscitation Kit (ARK) with the goal of improving implementation of PFC.

Objectives: Our long-term objective is to develop effective PCC guidelines and equipment for battlefield medics and physicians.

b. Specific aims:

1. Create a tri-service consensus handbook for the provision of Prolonged Casualty Care (PCC) with a particular focus on traumatic brain injury (TBI) outcomes in collaboration with key stakeholder units that drive military medical practices.

2. Develop a novel prototype of a field Anesthesia Resuscitation Kit (ARK) optimized for PCC in polytrauma patients to maximize TBI and hemorrhagic shock survival while minimizing progression of TBI (TBIPHRP IDA Focus Areas 2.b and 3.a).

Sub-Aim 2a. Determine contents of ARK based on complete weight-, volume- and cost-based evaluation of components, and develop Long-Range Medical Backpack to carry ARK in the field.

Sub-Aim 2b. Test ARK effectiveness in a swine model of hemorrhagic shock and TBI to evaluate brain lesion size and survival rate compared to care at a simulated Role-2 MTF.

Sub-Aim 2c. Following product delivery, conduct survey to determine whether stakeholder units believe the finalized handbook and ARK will significantly enhance their ability to deliver PCC.

15. SUBJECT TERMS NONE LISTED

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON** USAMRDC
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			**19b. TELEPHONE NUMBER *(include area code)***
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1. **INTRODUCTION:** *Narrative that briefly (one paragraph) describes the subject, purpose and scope of the research.*

Future wars are not expected to have the advantage of rapid evacuation. This will increase the need to deliver more effective Prolonged Casualty Care (PCC) under austere circumstances. There are significant logistical obstacles to implementing such a strategy. A crucial gap in implementation is that no standardized PCC equipment loadouts have been designed as benchmarks for widespread use. Our goal is to address this limitation with the development of the first-ever Prolonged Field cAre Kit – The Anesthesia Resuscitation Kit (ARK)

2. **KEYWORDS:**

Prolonged Casualty Care; Prolonged Field Care Kit

3. **ACCOMPLISHMENTS:** *The PI is reminded that the recipient organization is required to obtain prior written approval from the awarding agency grants official whenever there are significant changes in the project or its direction.*

What were the major goals of the project?
List the major goals of the project as stated in the approved SOW. If the application listed milestones/target dates for important activities or phases of the project, identify these dates and show actual completion dates or the percentage of completion.

	Task 1: Complete the organizational, contractual and regulatory work to start and continue the project			
Milestone Number	**Significant Events/Accomplishments**	**Month Due**	**% Completed this Reporting Period**	**Cumulative % Complete**
1	Submit protocol for IRB approval	1	100%	100%
2	Task 1.1: Complete kickoff meeting with DoD and funding agency		100%	100%
3	Finalize IRB approval	3	100%	100%
4	Task 1.2: Submit y1q1 quarterly report	3	100%	100%
5	Task 1.3: Submit IRB approval to funding agency	4		
6	Task 1.4: Submit y1q2 quarterly report	6	100%	100%
7	Task 1.5: Submit y1q3 quarterly report	9	100%	100%

8	Task 1.6: Submit y1 annual report	12	100%	100%
9	Task 1.7: Submit y2q1 quarterly report	15	Not Started	Not Started
10	Submit revised protocol to IRB based on final ARK contents	17	Not Started	Not Started
11	Task 1.8: Submit y2q2 quarterly report	18	Not Started	Not Started
12	Receive revised protocol approval from IRB	18-19	Not Started	Not Started
13	Task 1.9: Submit revised IRB protocol approval to funding agency	19	Not Started	Not Started
14	Task 1.10: Submit y1q1 quarterly report		Not Started	Not Started
15	Task 1.11: Submit y2 annual report	24	Not Started	Not Started
Specific Aim 2: Develop a novel prototype of a field Anesthesia Resuscitation Kit (ARK) optimized for PCC in polytrauma patients to maximize TBI and hemorrhagic shock survival while minimizing progression of TBI.				
Sub-Aim 2a. Determine contents of ARK based on complete weight-, volume- and cost-based evaluation of components, and develop Long Range Medical Backpack to carry ARK in the field				
	Task 2: Finalize ARK and Backpack Parameters			
Milestone Number	**Significant Events/Accomplishments**	**Month Due**	**% Completed this Reporting Period**	**Cumulative % Complete**
16	Initial Grant Payment to Northwestern University	5	100%	100%
17	Task 2.1: Develop initial stakeholder unit surveys (Delphi Round 1 + backpack survey)	5-6	100%	100%
18	Distribute Delphi survey Round 1 and analyze results	6-8	100%	100%
19	Distribute backpack survey and analyze results	6-8	100%	100%
20	Determine ARK medication contents with Northwestern University Investigational Pharmacy	7-8	100%	100%
21	Define initial ARK contents based on Round 1 results	8	100%	100%

22	Define initial backpack parameters based on backpack survey	8-9	100%	100%
23	First draft of ARK manual based on initial ARK contents	8-11	50%	50%
24	**Task 2.2: Sign contract with manufacturer for procurement of Long-Range Medical Backpack**	8-9	100%	100%
25	Transmit initial backpack parameters to backpack manufacturer	9	100%	100%
26	Develop, distribute and analyze Delphi survey Round 2	9-12	100%	100%
27	Refine ARK contents based on Round 2 results	12	100%	100%
28	Receive and evaluate long-range medical backpack prototype	12-13	100%	100%
29	Refine ARK manual based on ARK Round 2	13-15	50%	50%
30	Develop, distribute and analyze Delphi survey Round 3	14-16	100% (Expert Panel survey distributed)	100% (Expert Panel survey distributed)
31	Refine ARK medication contents with Northwestern University Investigational Pharmacy	16	70%	70%
32	Define final ARK contents	16	50%	50%
33	Either finalize backpack design or adjust backpack parameters with manufacturer	17	Not Started	Not Started
34	**Deliverable 1 for Task 2:** Complete ARK manual	23	50%	50%
35	Deadline for any backpack adjustments	25	Not Started	Not Started
36	**Deliverable 2 for Task 2:** Deliver complete prototypes (backpack + ARK + ARK manual) to stakeholder units, DoD and funding agency	28	Not Started	Not Started

Sub-Aim 2b. Test ARK effectiveness in a swine model of hemorrhagic shock and TBI to evaluate brain lesion size and survival rate compared to care at a simulated Role-2 MTF				
	Task 3: Animal Experiments			
Milestone Number	**Significant Events/Accomplishments**	**Month Due**	`	**Cumulative % Complete**
37	Translate ARK contents into animal model with NU veterinary staff	9-16	20% (No animal work started)	20% (No animal work started)
38	**Task 3.1:** Obtain regulatory approvals		Not Started	Not Started
39	**Subtask 3.1a:** Submit protocol for IACUC approval	16	Not Started	Not Started
40	**Subtask 3.1b:** Submit protocol for USAMRDC Animal Care and Review Office (ACURO) approval	16	Not Started	Not Started
41	**Subtask 3.1c:** Finalize IACUC approval	19	Not Started	Not Started
42	**Subtask 3.1d:** Finalize ACURO approval	19	Not Started	Not Started
43	**Task 3.2:** Submit IACUC and ACURO approvals to funding agency	20	Not Started	Not Started
44	**Task 3.3:** Conduct initial porcine ARK outcome experiment	20-21	Not Started	Not Started
45	**Task 3.4:** Complete ~50% of ARK outcome experiments (n = 2-4)	21-23	Not Started	Not Started
46	**Task 3.5:** Complete 100% of ARK outcome experiments (n = 4-8)	24-26	Not Started	Not Started
47	**Task 3.6:** Revise final ARK contents based on outcome of experiments completed in Milestone 38, if necessary	27-28	Not Started	Not Started
	Major Task 4: Data Analysis			
48	Obtain control group data from parallel DoD grant (experiments in this group have already been completed)	25-26	Not Started	Not Started
49	Final Analysis of all Physiological Data	26-28	Not Started	Not Started

50	**Task 4.1:** perform post-ARK-delivery survey of stakeholder units	27-28	Not Started	Not Started
51	**Task 4.2:** analyze survey results	27-28	Not Started	Not Started
	Major Task 5: Final Project Deliverables			
52	**Task 5.1:** Present project design and initial findings at a scientific or technical meeting	17	50%	50%
53	**Task 5.2:** Submit findings of ARK experimental outcomes to Peer-Reviewed Journal(s)	29	Not Started	Not Started
54	**Task 5.3:** Present final project findings at a scientific or technical meeting	29	Not Started	Not Started
55	**Task 5.4:** Present final project findings at DoD-sponsored meeting	29	Not Started	Not Started
56	**Task 5.5:** Distribute Final Report to stakeholders, DoD and funding agency	29	Not Started	Not Started
57	**Task 5.6:** Distribute Award Expiration Transition Plan to DoD and funding agency	29	Not Started	Not Started

What was accomplished under these goals?

For this reporting period describe: 1) major activities; 2) specific objectives; 3) significant results or key outcomes, including major findings, developments, or conclusions (both positive and negative); and/or 4) other achievements. Include a discussion of stated goals not met. Description shall include pertinent data and graphs in sufficient detail to explain any significant results achieved. A succinct description of the methodology used shall be provided. As the project progresses to completion, the emphasis in reporting in this section should shift from reporting activities to reporting accomplishments.

Overview

We have completed designing the first and second prototypes of the ARK cell and Long-Range Medical Backpack (LRMB). Additionally, we have completed the creation, distribution, and analysis of the first and second rounds of Delphi Surveys. Since most of the medications for each indication had been identified after the first two rounds of the Delphi

survey, we decided not to proceed with the third round of surveys. We instead conducted an expert panel survey to finalize medications where a consensus had not been reached.

Summary of Results

The medications that ranked highest for inclusion in ARK based on Delphi Round 1, Round 2 and Expert Panel surveys are as follows:

Indication	**Medication**
IV Pain Medication	Fentanyl
Sedation	Ketamine
Sepsis	*Oral antibiotic:* Moxifloxacin *IV antibiotic:* Ertapenem
Seizure	*Initial Seizure Management:* Midazolam *Seizure Prophylaxis:* Levetiracetam
Antiemetic	Ondansetron
Choice of Anticoagulation	Enoxaparin
Inclusion of Antiparasitic	No
Oral Pain Medication	Meloxicam
Resuscitation	*IV fluids:* Lactated ringers Plasmalyte*
Management of high Intracranial Pressure	23.4% saline
Vasopressors	Norepinephrine
Inclusion of Antifungals	No

The figures below show the first and second prototypes of the ARK cell:

Figure 1. a- First prototype of the ARK cell; b- First prototype of the Long-Range Medical Backpack

Figure 2: Second prototype of the ARK Cell.

The second of the ARK cell was finalized based on feedback obtained for the first prototype. Both cells were then packed with preliminary medications to look at suitability and identify any flaws in the process.

What opportunities for training and professional development has the project provided?
If the project was not intended to provide training and professional development opportunities or there is nothing significant to report during this reporting period, state "Nothing to Report."

Describe opportunities for training and professional development provided to anyone who worked on the project or anyone who was involved in the activities supported by the project. "Training" activities are those in which individuals with advanced professional skills and experience assist others in attaining greater proficiency. Training activities may include, for example, courses or one-on-one work with a mentor. "Professional development" activities result in increased knowledge or skill in one's area of expertise and may include workshops, conferences, seminars, study groups, and individual study. Include participation in conferences, workshops, and seminars not listed under major activities.

Nothing to Report

project activities, for the purpose of enhancing public understanding and increasing interest in learning and careers in science, technology, and the humanities.

Nothing to Report

What do you plan to do during the next reporting period to accomplish the goals?
If this is the final report, state "Nothing to Report."

Describe briefly what you plan to do during the next reporting period to accomplish the goals and objectives.

This coming year our plans are to finalize the design of the LRMB in an ergonomic efficient manner. This will be achieved by trialing some prototypes of the LRMB with the finalized items of the ARK. Moreover, we plan on holding further discussions with the Northwestern University Investigational Pharmacy to finalize the ARK contents.
Additionally, we aim to assess the translational applicability of ARK by testing the medications in the ARK on an animal model of TBI + hemorrhagic shock. We Plan on finalizing an animal model and conducting various discussions with the Northwestern University Veterinary staff to derive medication doses and translational applicability. We will then obtain the various regulatory approvals and then conduct initial porcine ARK outcome experiment.

4. **IMPACT:** D*escribe distinctive contributions, major accomplishments, innovations, successes, or any change in practice or behavior that has come about as a result of the project relative to:*

What was the impact on the development of the principal discipline(s) of the project?
If there is nothing significant to report during this reporting period, state "Nothing to Report."

Describe how findings, results, techniques that were developed or extended, or other products from the project made an impact or are likely to make an impact on the base of knowledge, theory, and research in the principal disciplinary field(s) of the project. Summarize using language that an intelligent lay audience can understand (Scientific American style).

The Anesthesia Resuscitation Kit (ARK) would enable efficient provision of prolonged field care. The various field tests conducted to develop the LRMB and ARK Cell helped not only educate the medics on the importance of PCC but also enabled them to understand the scarcity in resources for PCC
Additionally, the field tests help medics and other participants gain an insight on our project.
Moreover, the Delphi survey enabled the PCC medications to be picked by the final users themselves enhancing its potential applicability.

What was the impact on other disciplines?
If there is nothing significant to report during this reporting period, state "Nothing to Report."

Describe how the findings, results, or techniques that were developed or improved, or other products from the project made an impact or are likely to make an impact on other disciplines.

Nothing to report.

What was the impact on technology transfer?
If there is nothing significant to report during this reporting period, state "Nothing to Report."

Describe ways in which the project made an impact, or is likely to make an impact, on commercial technology or public use, including:

- *transfer of results to entities in government or industry;*
- *instances where the research has led to the initiation of a start-up company; or*
- *adoption of new practices.*

Nothing to report.

What was the impact on society beyond science and technology?
If there is nothing significant to report during this reporting period, state "Nothing to Report."

Describe how results from the project made an impact, or are likely to make an impact, beyond the bounds of science, engineering, and the academic world on areas such as:

- *improving public knowledge, attitudes, skills, and abilities;*
- *changing behavior, practices, decision making, policies (including regulatory policies), or social actions; or*
- *improving social, economic, civic, or environmental conditions.*

Nothing to report.

5. CHANGES/PROBLEMS: *The PD/PI is reminded that the recipient organization is required to obtain prior written approval from the awarding agency grants official whenever there are significant changes in the project or its direction. If not previously reported in writing, provide the following additional information or state, "Nothing to Report," if applicable:*

Changes in approach and reasons for change
Describe any changes in approach during the reporting period and reasons for these changes. Remember that significant changes in objectives and scope require prior approval of the agency.

Nothing to report.

Actual or anticipated problems or delays and actions or plans to resolve them
Describe problems or delays encountered during the reporting period and actions or plans to resolve them.

Nothing to report.

Changes that had a significant impact on expenditures
Describe changes during the reporting period that may have had a significant impact on expenditures, for example, delays in hiring staff or favorable developments that enable meeting objectives at less cost than anticipated.

Nothing to report.

Significant changes in use or care of human subjects, vertebrate animals, biohazards, and/or select agents
Describe significant deviations, unexpected outcomes, or changes in approved protocols for the use or care of human subjects, vertebrate animals, biohazards, and/or select agents during the reporting period. If required, were these changes approved by the applicable institution committee (or equivalent) and reported to the agency? Also specify the applicable Institutional Review Board/Institutional Animal Care and Use Committee approval dates.

Significant changes in use or care of human subjects

Nothing to report.

Significant changes in use of biohazards and/or select agents

Nothing to Report

6. PRODUCTS: *List any products resulting from the project during the reporting period. If there is nothing to report under a particular item, state "Nothing to Report."*

- **Publications, conference papers, and presentations**
  Report only the major publication(s) resulting from the work under this award.

  Journal publications. *List peer-reviewed articles or papers appearing in scientific, technical, or professional journals. Identify for each publication: Author(s); title; journal; volume: year; page numbers; status of publication (published; accepted, awaiting publication; submitted, under review; other); acknowledgement of federal support (yes/no).*

  1. Zaiba Shafik Dawood, Toby P Keeney-Bonthrone, Rachel M Russo, Jessie W. Ho, Marjorie Liggett, Jennifer Gurney, Allyson Greenberg, Joshua M. Tobin, Walter Clark, Aleezeh Shaikh, Hasan B. Alam. Designing the Prolonged Field cAre Kit (PFAK) to Address the Logistical Challenges of Future Combat Casualty Care. Military Medicine. (Submitted Under Review)

  Books or other non-periodical, one-time publications. *Report any book, monograph, dissertation, abstract, or the like published as or in a separate publication, rather than a periodical or series. Include any significant publication in the proceedings of a one-time*

conference or in the report of a one-time study, commission, or the like. Identify for each one-time publication: author(s); title; editor; title of collection, if applicable; bibliographic information; year; type of publication (e.g., book, thesis or dissertation); status of publication (published; accepted, awaiting publication; submitted, under review; other); acknowledgement of federal support (yes/no).

Other publications, conference papers and presentations. *Identify any other publications, conference papers and/or presentations not reported above. Specify the status of the publication as noted above. List presentations made during the last year (international, national, local societies, military meetings, etc.). Use an asterisk (*) if presentation produced a manuscript.*

1. Accepted for presentation at 2023 Military Health System Research Symposium.
    a. Submitted for presentation February 2023; Accepted for presentation August 2023

2. Accepted for presentation at the Edelston-Bendix Day poster presentation at Northwestern University held on June 9, 2023
3. Other Presentations:
    a. Military Health System Strategic Partnership with the American College of Surgeons First Quarter Business Meeting 23 Jan 2023. Virtual.
    b. American College of Surgeons Committee on Trauma 2023 Annual Meeting. 10 March 2023. Chicago, IL
    c. Joint Trauma System Committee on Surgical Combat Casualty Care. 22 March 2023. San Antonio, TX Military Health System Strategic Partnership with the American College of Surgeons Second Quarter Business Meeting. 3 April 2023.

- **Website(s) or other Internet site(s)**

List the URL for any Internet site(s) that disseminates the results of the research activities. A short description of each site should be provided. It is not necessary to include the publications already specified above in this section.

Nothing to Report

- **Technologies or techniques**
  Identify technologies or techniques that resulted from the research activities. Describe the technologies or techniques were shared.

Nothing to Report

- **Inventions, patent applications, and/or licenses**
  Identify inventions, patent applications with date, and/or licenses that have resulted from the research. Submission of this information as part of an interim research performance progress report is not a substitute for any other invention reporting required under the terms and conditions of an award.

Nothing to Report

- **Other Products**
  Identify any other reportable outcomes that were developed under this project. Reportable outcomes are defined as a research result that is or relates to a product, scientific advance, or research tool that makes a meaningful contribution toward the understanding, prevention, diagnosis, prognosis, treatment and /or rehabilitation of a disease, injury or condition, or to improve the quality of life. Examples include:
  - *data or databases;*
  - *physical collections;*
  - *audio or video products;*
  - *software;*
  - *models;*
  - *educational aids or curricula;*
  - *instruments or equipment;*
  - *research material (e.g., Germplasm; cell lines, DNA probes, animal models);*
  - *clinical interventions;*
  - *new business creation; and*
  - *other.*

Nothing to report.

7. PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS

What individuals have worked on the project?

Provide the following information for: (1) PDs/PIs; and (2) each person who has worked at least one person month per year on the project during the reporting period, regardless of the source of compensation (a person month equals approximately 160 hours of effort). If information is unchanged from a previous submission, provide the name only and indicate "no change".

Example:

Name:	*Mary Smith*
Project Role:	*Graduate Student*
Researcher Identifier (e.g. ORCID ID):	*1234567*
Nearest person month worked:	*5*
Contribution to Project:	*Ms. Smith has performed work in the area of combined error-control and constrained coding.*
Funding Support:	*The Ford Foundation (Complete only if the funding support is provided from other than this award.)*

Name:	Hasan B. Alam
Project Role:	Project Leader
Nearest person month worked:	0.24
Contribution to Project:	Dr. Alam is a trauma and acute care surgeon and a seasoned researcher in the field of trauma research. He has many years of federal funding from the DoD (>20 years) and the National Institutes of Health and has published around 350 peer-reviewed papers, and numerous book chapters. He provides valuable mentorship to the team and assesses progress of the project.

Name:	Rachel Russo
Project Role:	Co-investigator

Nearest person month worked:	1.2
Contribution to Project:	Dr. Russo is a Trauma and Acute Care Surgeon and Surgical Intensivist Her clinical and research experiences span multiple disciplines including the clinical care of injured patients in shock, the development of intensive care translational research in large animal models, and military training in combat casualty care. She has has previously worked with the lab as a research fellow and is well connected with the team. She helps provide the team with mentorship to enable smooth running of the project.
Name:	Toby Phillip Keeney-Bonthrone
Project Role:	Co-investigator
Nearest person month worked:	1.2
Contribution to Project:	Dr. Keeney-Bonthrone is an Emergency Medicine resident whose role has been to conduct stakeholder visits and formulating PCC best practices for the handbook, liaising with stakeholders, consultants and manufacturers about ARK contents. He additionally assists with data collection and analysis.
Name:	Jessie Ho
Project Role:	Co-investigator
Nearest person month worked:	1.2
Contribution to Project:	Dr. Ho is a General Surgery resident whose role has been to conduct stakeholder visits and formulating PCC best practices for the handbook, liaising with stakeholders, consultants and manufacturers about ARK contents. She additionally assists with data collection, analysis and manuscript writing.
Name:	Zaiba Shafik Dawood
Project Role:	Co-investigator
Nearest person month worked:	12
Contribution to Project:	Dr. Dawood is a recent medical graduate. She is responsible for the day-to-day running and progress of the project. She assists with conducting project surveys, analyzing data, reporting outcomes, and writing manuscripts.

Has there been a change in the active other support of the PD/PI(s) or senior/key personnel since the last reporting period?
If there is nothing significant to report during this reporting period, state "Nothing to Report."

If the active support has changed for the PD/PI(s) or senior/key personnel, then describe what the change has been. Changes may occur, for example, if a previously active grant has closed and/or if a previously pending grant is now active. Annotate this information so it is clear what has changed from the previous submission. Submission of other support information is not necessary for pending changes or for changes in the level of effort for active support reported previously. The awarding agency may require prior written approval if a change in active other support significantly impacts the effort on the project that is the subject of the project report.

DM160428: Testing of Novel Pro-Survival Strategies in the Setting of Prolonged Damage Control Resuscitation ended on 9/29/23.

What other organizations were involved as partners?
If there is nothing significant to report during this reporting period, state "Nothing to Report."

Describe partner organizations – academic institutions, other nonprofits, industrial or commercial firms, state or local governments, schools or school systems, or other organizations (foreign or domestic) – that were involved with the project. Partner organizations may have provided financial or in-kind support, supplied facilities or equipment, collaborated in the research, exchanged personnel, or otherwise contributed.

Provide the following information for each partnership:
Organization Name:
Location of Organization: (if foreign location list country)
Partner's contribution to the project (identify one or more)

- *Financial support;*
- *In-kind support (e.g., partner makes software, computers, equipment, etc., available to project staff);*
- *Facilities (e.g., project staff use the partner's facilities for project activities);*
- *Collaboration (e.g., partner's staff work with project staff on the project);*
- *Personnel exchanges (e.g., project staff and/or partner's staff use each other's facilities, work at each other's site); and*
- *Other.*

Organization Name: Mystery Ranch
Location: Bozeman, Montana
Partner Contributions: Designing the Long-Range Medical Backpack.

8. SPECIAL REPORTING REQUIREMENTS

COLLABORATIVE AWARDS: *N/A*

QUAD CHARTS: *N/A*

9. APPENDICES: *N/A*