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AWARD NUMBER: W81XWH-15-9-0001

MTEC BASE AGREEMENT NUMBER: 2018-649

TITLE: Prototype of Joint Evacuation and Transport Simulation (JETS) System

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RECIPIENT: U.S. Army Medical Research and Material Command
Fort Detrick, Maryland 21702-5012

REPORT DATE: August 31, 2018, Revised February 25, 2019 (Version 4.0)

TYPE OF REPORT: Phase I: Final

PREPARED FOR: U.S. Army Medical Research and Materiel Command
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REPORT DOCUMENTATION PAGE			*Form Approved OMB No. 0704-0188*
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. **PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.**			
1. REPORT DATE 08-31-2018 (revised 02-25-2019)	**2. REPORT TYPE** Phase I: Final		**3. DATES COVERED** 01-23-2018 to 08-22-2018
4. TITLE AND SUBTITLE Prototype of Joint Evacuation and Transport Simulation (JETS) System			**5a. CONTRACT NUMBER** – – – – – – – – **5b. GRANT NUMBER** W81XWH-15-9-0001 **5c. PROGRAM ELEMENT NUMBER** – – – – – – –
6. AUTHOR(S) Strayhorn, Catherine, BS. – PI; Lewandowski, William, MS. – Educational Engineer; Dee Kuenzig, MS – Program Manager; Honold, Erin, BS – Biomedical/Software Engineer; Shuford, Ray, BS. – Sr. Researcher Mouch, Jenine, RN, BSN – Sr. Researcher; Shuford, Charles, BS – Sr. Researcher			**5d. PROJECT NUMBER** – – – – – – – **5e. TASK NUMBER** – – – – – – – – **5f. WORK UNIT NUMBER** – – – – – – – –
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Information Visualization and Innovative Research, Inc. (IVIR Inc.) **AND ADDRESS(ES)** 1680 Fruitville Road, Suite 215 Sarasota FL 34236			**8. PERFORMING ORGANIZATION REPORT NUMBER** – – – – – – – –
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Medical Research and Materiel Command Fort Detrick, Maryland 21702-5012			**10. SPONSOR/MONITOR'S ACRONYM(S)** USAMRMC **11. SPONSOR/MONITOR'S REPORT NUMBER(S)** – – – – – – – –
12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution authorized to U.S. Government agencies only. Other requests for this document shall be referred to U.S. Army Medical Research and Materiel Command, 504 Scott Street, Fort Detrick, Maryland 21702-5012			
13. SUPPLEMENTARY NOTES Prepared in cooperation with subawardees Vcom3D, Discovery Machine, Think-A-Move, Pitch Technologies, Education Management Solutions and program Subject Matter Experts (SMEs)			

14.ABSTRACT
Proper medical training is critical to ensure that Service component members are prepared for wartime deployment, with a particular emphasis to support the en route care of patients from initial point of injury through several echelons to continental U.S. (CONUS)-based military hospitals. Currently, medical training is generally conducted within each Service component "independently" (i.e., Army, Navy, Air Force, etc.) and our NATO/Coalition allies, with only occasional combined training. In addition, there is a wide repertoire of tools, devices, and approaches used to provide deployable training to Service members, ranging from devices (e.g., manikins) to computerized simulations to formal didactic training through internet-based, video, or classroom style instruction. This study and design effort systematically gathered and transformed requirements for JETS into an architecture description that provides a basis for understanding the current state of the potential component parts, the work required to achieve the Medical Simulation Enterprise (MSE) vision, and the staging of further development to successfully bring the full family of systems online.

15. SUBJECT TERMS
Medical simulation, casualty care, high-level architecture, federation object model, capability development document, training

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON** USAMRMC
a. REPORT U	**b. ABSTRACT** U	**c. THIS PAGE** U	UU	35 Plus Annexes	**19b. TELEPHONE NUMBER** *(include area code)* --------

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

PROTOTYPE OF JOINT EVACUATION AND TRANSPORT SIMULATION (JETS) SYSTEM

MTEC-17-07-JETS-03

PHASE I: Final Technical Report

Version 4.0
Date: 25 February 2019

IVIR MTEC BASE AGREEMENT NUMBER: 2018-649

IVIR MTEC RESEARCH PROJECT AWARD NUMBER: 001

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Revision History

Version	Date	Author	Description
2.0	12-8-18	Charles Shuford	Updated IVIR address, added revision table, changed JPM to JPM/GPM/JTPE, added NATO/Coalition as necessary, added references to Annexes B(1), B(2), J(1) and J(2)
3.0	2-4-19	Charles Shuford	Updated per comments received
4.0	2-25-19	Charles Shuford	Restructured report, updated Acronym List (Appendix A), changed “student” to “learner”, added reference to Annex K: LVCG Simulation Matrix

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1. INTRODUCTION

Within the military Medical Simulation Enterprise (MSE) arena there exists a variety of independent subsystems that are used for Service and organizational specific missions. The mission of the JETS research project was to develop an overarching architecture that ties together these disparate medical training subsystems. The proposed JETS architecture includes a common, objective, engineering-oriented lexicon, a governance strategy, a definition of shared services and application program interfaces (API) for interoperability. It is expected that creating a Department of Defense wide, interconnecting training and simulation system will have a synergistic effect resulting in an adaptive system that is more effective, efficient and cost effective.

In June 2015, a High-Performance Team (HPT) representing the Military Health System (MHS) stakeholders, convened to establish Joint Evacuation and Transport Simulation (JETS) functional requirements, which resulted in an approved requirements matrix. Required capabilities for the JETS System include providing modular training sites, integrated with a global Point of Demand (PoD) distributed training capability, through a medical Synthetic Training Environment (STE), across the DoD. It enables skills and high-level learning of individual, team and unit training of patient movement tasks covering the complete chain of evacuation throughout the full Continuum of Care.

Information Visualization and Innovative Research, Inc. (IVIR Inc.) was funded through the Medical Technology Enterprise Corporation (MTEC) Base Agreement No. 2018-649 in support of U.S. Army Medical Research Materiel Command (USAMRMC) Other Transaction Agreement (OTA), W81XWH-15-9-0001, to conduct a 6-month Phase I and a 12-month Phase II research study and design effort to develop architectural requirements for the System of Systems (SoS) which is comprised of JETS and Point of Injury Trauma Simulation (POINTS).

By following Department of Defense Architecture Framework (DoDAF) guidelines and Systems Engineering processes, this study and design effort systematically gathered and transformed requirements for JETS into an architecture description that provides a basis for understanding the current state of the potential component parts, the work required to achieve the MSE vision, and the staging of further development to bring the full family of systems online, resulting in a positive result.

The specific aims of this Joint Program Committee-1 (JPC-1) led effort was to identify design requirements for an interoperable architectural framework for a training system SoS that can track individual and team performance and develop the prototype knowledge products that will interoperate and integrate with future programs making up the MSE.

The scope of this program was to develop architectural models that will be used to guide the construction of integrated simulations and training modules for the JETS system, which will be utilized throughout the Department of Defense's (DOD) medical departments. The study aimed to add to the current body of knowledge by identifying and addressing gaps in joint en route care training and constructing a top-level, interoperable architectural framework for a training system of systems that can track individual, team and unit performance.

Phase 1 focused on creating prototype knowledge products that will interoperate and integrate with future programs within the MSE. Designs for an overarching architecture, including a common, objective, and engineering-oriented lexicon, along with a governance strategy, a definition of shared services, and application programming interfaces (APIs) for interoperability were produced. A collection of architecture views was developed and presented for possible integration into the JETS Capabilities Development Document (CDD).

2. KEY WORDS

Roles of care, patient handoffs/transfers, en route care, MEDEVAC, CASEVAC, aeromedical evacuation, patient movement, medical treatment facilities, high level architecture.

3. ACCOMPLISHMENTS

3.1 PROGRAM OBJECTIVES

The objectives of the study effort and research outcomes are as follows:

3.1.1 OBJECTIVE #1: Conduct Front-End Domain Analysis

"Evidenced-based and combined-arms-lessons-learned literature research to identify critical variables and determinants of patient evacuation and transport will be conducted as well as to identify system requirements".

"Current curriculums, protocols and programs of instruction across the DoD Service components, currently in use for training and skills sustainment of joint patient evacuation and transport will be reviewed to identify educational elements for the acquisition and assessment of cognitive, psychomotor, and decision-making skill sets".

A literature search was conducted to collect information surrounding the roles of care, CASEVAC/MEDEVAC, en route care, aeromedical evacuation, patient handoffs and transfers, and existing communication tools that are used to facilitate global patient movement along the care continuum while simultaneously maintaining the progression of patient care. Pubmed, Google Scholar, CINAHL, Cochrane, and Medline were queried for articles, reports and resources pertaining to these topics, and the resulting 139 citations were selected (from among hundreds) as applicable to the *Prototype of Joint Evacuation and Transport Simulation Project* effort. These were collated into an extensive matrix using Microsoft Excel for ease of sorting and use during the remainder of the project. The matrix served as a working database to which material was added as new research was published during the project timeline.

The collected citations include 139 scholarly articles from peer reviewed medical journals (both military and civilian), medical texts, documents, presentations, reports professional institutions (Joint Commission, American College of Surgeons, etc.), Government institutions (Agency for Healthcare Research and Quality), and international publications (World Health Organization – WHO, etc.). The oldest citation is an Army reference from 1999, which was included as a measure of progress and evolution in communication technology. Furthermore, 64 doctrinal documents from individual, Joint Service components and NATO were included.

Table 1. Citations By Source Area

SOURCE AREA	NUMBER OF CITATIONS
Peer Reviewed Articles	139
U.S Army Doctrine	19
U.S Air Force Doctrine	16
U.S. Navy/Marine Doctrine	4
Joint Service Doctrine	6
NATO	19

3.1.1.1 SUBJECT MATTER EXPERT (SME) INTERVIEWS

As part of the research effort to gain knowledge of current curricula, protocols, Programs of Instruction (POI) and training methods/concerns, the IVIR Inc. and SimQuest team empaneled a cohort of Subject Matter Experts (SME) to be interviewed in order to ascertain their expertise and knowledge base of the training and actual joint evacuation and transport efforts currently being conducted across Service components.

The first step of this research task was to establish a set of questions to be used as a guide during the conduct of each interview. The following describes the types of the questions that were used:

- Demographics – name, Service component, rank or rating, position or job title, unit/organization
- Experience in Joint Patient Movement/Global Patient Movement/Joint Theater Patient Evacuation (JPM/GPM/JTPE) During Combat – area of operation (AO), tasks and responsibilities, joint Service components efforts/communications and mission success and/or shortfalls
- Current Training Being Provided – courses, method of delivery, use of computer and simulation-based training and task training vs. transfer/handoff training
- Trainee Information – learner background/experience
- Command Oversight – control of training delivery and training content
- Current Technology Systems for Training JPM/GPM/JTPE – part task trainers (PTT), patient simulators, training capture (audio/visual (AV)), environmental control (noise, smoke, etc.), training control (instructor console, etc.) and learning management systems
- End of Training Assessment – instructor generated, automated assessment methods
- Performance Feedback – after action reviews (AAR), debriefing (immediate or delayed) and learner feedback
- Training Consistency – between training sites and/or Service components, barriers to Joint training
- JPM/GPM/JTPE and En Route Care – what will we see in the next decade, standardization and challenges

The IVIR Inc. and SimQuest team conducted the one-on-one interviews by using telephonic, Skype and face-to-face methods. The SME participants included active duty, retired and civilian personnel having different roles and rankings across the Service components, NATO/Coalition and Government. The SME responses were reviewed and incorporated into the DoDAFs.

Reference ANNEX A: SME INTERVIEW SUMMARY

3.1.1.2 MILITARY HEALTH SYSTEM OVERVIEWS

The Military Health System (MHS) fosters, protects, sustains, and restores health to support the mission. It also provides the direction, resources, health care providers, and other means necessary for promoting the health of the beneficiary population. These include actions to develop and promote health awareness issues to educate customers, discover and resolve environmentally based health threats, provide health services (including preventive care and problem intervention services), and improve the means and methods for maintaining the health of the beneficiary population by constantly evaluating the performance of health support. The MHS supports all eligible beneficiaries addressing health support for the military personnel in joint and Service component organizations in the preparation and conduct of operations.

Research of Service component and NATO specific doctrinal resources regarding how each is currently structured for conducting health services including casualty care and patient movement (evacuation and transportation) throughout the continuum of care was conducted. Further to that, Service component and NATO specific training guidelines and requirements were also researched. The results of this research were reviewed and incorporated into the Department of Defense Architecture Frameworks (DoDAF) contained in **ANNEX B: ARCHITECTURAL DESCRIPTION OF 2017 DRAFT CDD**

Reference ANNEX C: USAF MEDICAL SERVICE OVERVIEW

Reference ANNEX D: USA MEDICAL SERVICE OVERVIEW

Reference ANNEX E: USN and USMC MEDICAL SERVICE OVERVIEW

Reference ANNEX F: NATO MEDICAL SERVOCE OVERVIEW

3.1.1.3 *"A simulation inventory of LVCG technologies currently used that would support a joint patient evacuation transport system of system for training and assessment will be generated. Each technologies data elements and formats will be investigated for interoperability and incorporation into a standardized data transfer definition".*

Transitions in care (evacuation, transport, handoffs and transfers) have long been considered danger points in the patient care process contributing to medical errors and adverse events. Communication breakdowns, decreased situational awareness, absent or non-effective training, and lack of resources are common threats to patient safety. Using LVCG simulations to train and study patient transitions in a controlled and standardized way can help address these areas.

The intent of this research was to generate a simulation inventory of live, virtual, and constructive simulation, gaming and affective measurement technologies currently used that would support a JETS SoS for initial and sustainment training, with a focus on patient transitions. The research also focused on technologies that could capture data for cognitive, psychomotor, decision-making, communication, and situational awareness skill sets for the purposes of interoperability considerations and assessment capabilities of the system architecture. A JETS SoS should map the integration of Service component-specific, cross-cutting operational sub-system components, including, but not limited, to the functions of inter-Service qualifications, communication, mission planning, mission rehearsal, en route care, patient evacuation and transfer, command and control, logistics and their associated operational supporting sub-systems for training and assessment.

Research was completed on current simulation, communication, assessment, affective measurement and PTT technologies for initial and sustainment training across the continuum of care. Emphasis was placed on their capability to be integrated into a JETS SoS focusing on patient transitions (evacuation, transport, handoffs and transfers). Thus, the focus was on identifying the requirements for data standards and interoperability. The sampling of 204 identified technologies in the simulation inventory are either commercially available, Government-owned equipment, or are currently in development.

Given the focus, the JETS SoS architecture should strive to accommodate all identified data types and formats to allow for the integration of the technologies identified with additional effort.

An analysis was conducted which included identifying, describing, and documenting capabilities and variances between each technology's ability to be incorporated into a JETS SoS architecture, focusing on patient handoffs and transfers. Although the technologies identified in the research are capable of integration into a joint en route care system of systems framework, they will require extensive additional effort to complete integration and to minimize their intrusive effects.

Reference ANNEX G: LVCG SIMULATION INVENTORY
Reference ANNEX K: LVCG SIMULATION MATRIX

3.1.2 OBJECTIVE #2: Conduct Review and Verification Conference

Site Visits: The goal is to gather information regarding existing training systems. In addition, the verification portion of this Objective will be accomplished by creating and executing a Verification Matrix to ensure that all line items in the requirements documents are reflected to DoDAF views and documents the link".

Due to the limited period of performance for Phase I, the Government Technical Representative approved changing the Verification and Review Conference to on-site meetings at military locations and extensive interviews pertaining to joint patient evacuation and transport. Upon conduct and analysis of the front-end domain research, elements were reviewed and discussed with Subject Matter Experts (SMEs), military clinicians, and stakeholders to assess the accuracy of the information gathered, to assess its usefulness and appropriateness in meeting current and future requirements and desired system capabilities.

The JETs team visited sites where views, ideas, and advice were gathered from SMEs with previous experience from relevant units and levels of organization which focused on JETS elements. This information was gathered in person, individually and in groups, by telephone or teleconference, and questionnaires. This allowed the research team to clearly understand all training and operational needs, their constituent parts and interrelationships necessary to complete the required deliverables.

Information collected has been disseminated within the Capabilities Traceability Matrix, the SME Interview Matrix and the Site Trip Reports.

Site Visits Conducted:

- Fort Rucker: The U.S Army School of Aviation Medicine (USASAM)
  - AMEDD Aviation Crewmember Course (AACC)
  - Joint En Route Critical Care (JERCC)
- Wright Patterson Air Force Base: Air Force School of Aerospace Medicine 711th Wing
  - Critical Care Air Transport (CCAT)
- The University of Cincinnati: Air Force Center for Sustainment of Trauma and Readiness Skills (CSTARS)
- Scott Air Force Base: USTRANSCOM
  - Global Patient Movement (JPM/GPM/JTPE)
  - En Route Critical Care (ERCC) Transport

Full reports for each of the above visits were submitted previously within the Monthly and Quarterly Technical Reports. Furthermore, **Reference ANNEX A: SME INTERVIEW SUMM**ARY for an overall summary of the interviews as well as **ANNEXES C, D, E and F** which contain U.S. Service component and NATO specific summaries, respectively.

3.1.3 OBJECTIVE #3: Develop JETS Architectural Plan and Requirements Definition

“Create a system of systems framework that will utilize a High-Level Architecture (HLA) as a foundation to create an integrated simulation system for joint evacuation and transport to support training, analysis, test and evaluation, and concept development”.

“Establish standards for data transmission for medical simulation training. A standardized Federation Object Model (FOM) will be the main focus of the effort. Standards for communication among medical simulations using multiple modalities will be designed and demonstrated (Phase 2)”.

As part of the research, IVIR Inc. began to create a Medical Modeling and Simulation (MMS) Federation Object Model (FOM) as part of the effort to begin defining standards of communication in the medical modeling and simulation field. The FOM, which will work within a High Level Architecture (HLA) instantiation, is meant as an example for the JETS architecture, rather than a sole solution to the problem of setting standards.

The use of HLA and a custom MMS FOM can be used to demonstrate the proof of concept of a JETS architecture. HLA uses a publish-subscribe methodology, where each connected system (called a federate) publishes the information it offers to other federates and subscribes to only information it needs from other federates. An HLA network allows for systems to come online and go offline as necessary and is designed to be extensible to adapt to new requirements.

An HLA-based system of systems operates according to a predefined FOM, which is a data dictionary that defines the data elements that can be used within the system of systems. As part of this program, a custom MMS FOM has been drafted to begin identifying the necessary standards for a global medical modeling and simulation architecture. To date, the primary data modules are: communications, instructional, medical logistics, physiological, simulation control, patient transfer, facility, and pharmacological. Each module contains specific data variables that are required in a medical simulation, though not all simulations will use all available variables.

In order to efficiently use the FOM in a system of systems, several Federation Agreements must be documented. The Federation Agreements will be documented within the FOM itself. While the FOM supports interoperability at the data level, the Federation Agreements support interoperability at the semantic level. Federation Agreements serve several purposes:

- Participating simulations have to agree to them in order to interoperate.
- New simulations wanting to join JETS understand what they need to achieve data interoperability.
- If JETS is used as part of a larger exercise, the Federation Agreement document helps them understand how to interoperate with JETS.

One example of a Federation Agreement is how Patients will be associated with Injuries and Treatments, described below.

Patient, Injury, Treatment Relationship: This section describes how Patients, their Injuries and Treatments are associated. The identification for each of these is unique to an execution. This will allow post execution examination of patients, their injuries and treatments. The tables below contain only the attributes used to form the relationships. There are many more Patient, Injury and Treatment attributes that are not listed here. Refer to the Federation Object Model (FOM) contained in **ANNEX H: HLA and FOM.**

The JETS system execution may include zero or more Patient instances. Each Patient may be associated with zero or more Injury instances and zero or more Treatment instances, also each Injury instance may be associated with zero or more Treatment instances. Some treatments may be administered to the patient for either multiple injuries, or not related to an injury such as oxygen administered at high altitudes. Each injury and treatment are timestamped. The physiology engine applies the injuries and treatments to the patient to update patient physiology parameters. Additional injuries may be applied to the patient even after treatment begins. Each Injury and Treatment are timestamped at the time they are applied to the patient. If multiples of the same treatment (e.g., pain control) are administered, the timestamp of each administration are timestamped. When executions are "saved", retrievals may be made based on patient, injury or treatment.

The Patient: Each Patient instance will have an execution unique Demographic.PatientID as described in Table 2 below. The naming convention will be Patient_*unique_string*.

Table 2. Patient ID

ATTRIBUTE NAME	DATATYPE	DESCRIPTION
Demographic_PatientID	HLAASCIIstring	PatientID associates a particular patient to a particular InjuryID. Once a Patient object is created, the ID is static and cannot be changed or reused during a single execution.*

*The same PatientID can be reused and modified in other executions. For example, the same patient can be put through multiple scenarios, either concurrently or sequentially, without needing to recreate all of the variables for each patient.

The Injury: Each Injury Instance will link to a patient using the Demographic_PatientID and will have an execution unique InjuryID as described in Table 3 below. The naming convention will be Injury_*unique_string*.

Table 3. Injury ID

ATTRIBUTE NAME	DATATYPE	DESCRIPTION
Demographic_PatientID	HLAASCIIstring	PatientID ties a particular patient to a particular InjuryID
InjuryID	HLAASCIIstring	A unique ID to tie an injury to a treatment(s). Once an injury object is created, the ID is static and cannot be changed or reused during a single execution

The Treatment: Each Treatment Instance will link to an injury using the InjuryID and will have an execution unique TreatmentID as described in Table 4 below. The naming convention will be Treatment_*unique_string*.

Table 4. Treatment ID

ATTRIBUTE NAME	DATATYPE	DESCRIPTION
Demographic_PatientID	HLAASCIIstring	PatientID ties a particular patient to a particular InjuryID
InjuryID	HLAASCIIstring	A unique ID to tie an injury to a treatment(s). Once an injury object is created, the ID is static and cannot be changed or reused during an execution

TreatmentID	HLAASCIIstring	Treatment for an injury to a patient are all associated by the PatientID and an optional InjuryID. Multiple treatments may be applied for the same injury. A Treatment Instance will be created for each individual treatment. Some treatments may not be associated to an injury (e.g., oxygen administered to a patient at high altitude.) In this situation, the InjuryID would be a Null string. A more confusing situation is where a treatment is administered for multiple injuries (e.g., Pain medication for a burn and a broken limb) In this situation, the most direct injury might be referenced in the InjuryID or InjuryID might be a Null string. Each Treatment Instance will have a unique TreatmentID. Once a TreatmentID is used, it cannot be reused during an execution.

The custom MMS FOM ensures that all data transferred to and from the architecture is in a standardized format and is readable by all federates that join the architecture. Variables for the FOM have been identified from the front-end analysis, research of Service component protocols and curriculum, and from SME input. To date, the primary data modules are: communications, instructional, medical logistics, physiological, simulation control, patient transfer, facility, and pharmacological. Each module will have an extensive list of variables to allow for standardized communication between medical simulations.

3.1.4 **OBJECTIVE #4:** Develop JETS Capability Models and **OBJECTIVE #5:** Develop JETS Operational and Systems Models

"Architectural viewpoints will be composed of all data gathered and organized to facilitate understanding. The developed capability models will articulate the system of systems capability requirements, the delivery timing, and the deployed capability".

"The operational viewpoints (OVs) and system viewpoints (SVs) will be generated which will tie together and identify the flow of data and resources among the subsystems. The architecture will be account for functions such as interoperability, expandability, data transmission, usability and assessment".

3.1.4.1 DoDAF SUMMARY

The Architectural Description uses the DoD Architectural Framework (DoDAF) to convey the decisions made in architecting the JETS system. The purpose is to inform the Defense Health Agency (DHA), acquisition organizations, contracting companies, Schoolhouses/Cadre, and other stakeholders about a recommended approach to address identified needs in training JPM/GPM/JTPE. The contained information is intended to assist in evaluating architectural scope and design trade-offs, dividing the full operating capability into highly-focused Increments, tracing requirements to capabilities to operational activities to services to systems, defining subsystems and their connectivity, and developing testing metrics (e.g., testing system attributes or metrics for user performance). This architectural description will accompany the Capabilities Development Document (CDD) to be submitted to the DHA, for an expected Joint Capabilities Integration and Development System (JCIDS) Milestone A regarding JETS.

The architecture is designed from the viewpoints of multiple anticipated users, including instructors, technicians, learners, and Command and Control (C2) organizations involved in patient movement training. The JETS architecture is advocated by the DHA, supports capabilities defined in the Joint Force Health Protection (JFHP) Concept of Operations (CONOPS) and addresses identified gaps in the JFHP Initial Capability Document (ICD). The JETS system supports the Force Support JCA 1.4.1.4, Provide GPM.

The purpose of the JETS System is to link the operational needs of the Component and Geographic Combatant Commanders (GCC) to standardized patient movement training within the Military Health System (MHS) continuum of care while ensuring clinical standards of patient management. The end-state is to ensure patients receive the most effective care throughout the patient movement process in the DoD chain of evacuation, while decreasing overall DoD training costs and technology fielding timelines, without effecting the Component's training capabilities already in place. JETS provides the Components with a standardized DoD training platform to support "train like we fight" covering the complete chain of evacuation in the continuum of care. JETS does not replace a Component's unique training requirements, but rather it provides a modular, integrated, sustained, maintained, and modernized training platform on which to execute that training for individuals, teams, and units. The following DoDAF-described views were developed:

- AV-1: Overview and Summary Information
- AV-2: Integrated Dictionary
- CV-1: Capabilities Vision
- CV-2: Capabilities Taxonomy
- CV-3: Capability Phasing
- CV-4: Capability Dependencies
- CV-6: Capability to Operational Activities Mapping
- CV-7: Capability to Services Mapping
- DIV-1: Conceptual Data Model
- DIV-2: Logical Data Model
- DIV-3: Physical Data Model
- OV-1: High-Level Operational Concept Graphic
- OV-2: Operational Resource Flow Description
- OV-4: Organizational Relationships Chart
- OV-5a: Operational Activity Decomposition Tree
- OV-5b: Operational Activity Model
- SvcV-1: Services Context Description
- SvcV-3: Systems-Services Matrix
- SV-1: Systems Interface Description
- SV-2: Systems Resource Flow Description
- SV-3: Systems-Systems Matrix
- SV-7: Systems Measures Matrix
- SV-8: Systems Evolution Description

Reference ANNEX B: ARCHITECTURAL DESCRIPTION OF 2017 DRAFT CDD

3.1.4.2 DoDAF REVIEW

Throughout the development of the DoDAF views, IVIR Inc. reviewed each of the DoDAF views and provided feedback in multiple iterations. The reason for the DoDAF review is to ensure that the architectural artifacts and views serve the purpose they are developed for. IVIR Inc.'s review process is explained below.

Architecture artifacts are assessed for the following qualities:

- Clarity
  - Views comply with the DoDAF specification
  - Accurate and unambiguous use of terminology
  - Correct use of diagram symbology
  - The content conveys the desired information to stakeholders
- Consistency
  - Content is consistent between views
  - Content is consistent with source materials
- Validity
  - Views meet the purpose identified in the DoDAF specification
  - Views describe solutions relevant to the "Capabilities Development Document (CDD) for Joint Evacuation and Transport Simulation (JETS) System"

Each artifact developed for the JETS architecture follows the same process as described below.

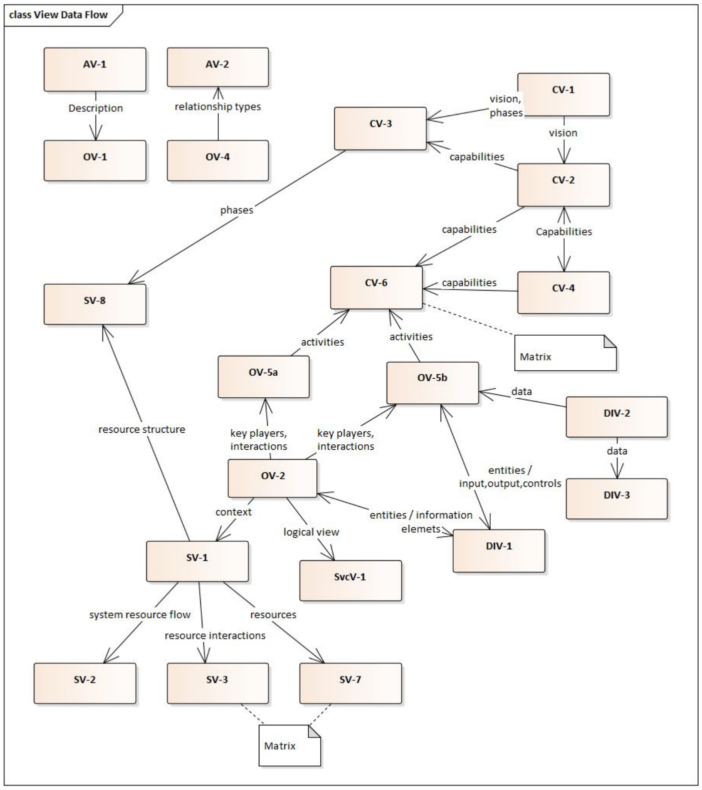
Define/Revise Key Review Points: For each DoDAF view, key review points are defined based on the DoDAF specification, project requirements, and known risks. These are created prior to reviewing the relevant artifacts to independently identify acceptance criteria. With each revision of the architecture artifacts, the related key review points are reviewed and revised, if needed.

Assess Artifacts Against Key Points: For each key review point, the architecture is reviewed to determine if it meets the criteria, fails to meet the criteria, or if the defined review point is not applicable. Each revision of the architecture is assessed against all review points to ensure changes to the artifacts did not cause previously passed items to fail.

Assess Each View Against Its Defined Purpose: Each artifact is viewed as a single entity with a specific purpose. Regardless of any issues found (if any are found), it must communicate the desired information, message, or guidance to the relevant stakeholders.

Cross-Reference Related Views: For each artifact in a review, the data flow is traced from any views that contribute data to the artifact and to any views in which the artifact provides data. Figure 1 below identifies the data flow for the JETS architecture views.

Figure 1. JETS Data Flows



Cross-Reference Source Material: For each artifact in a review, all content is traced to source material such as "Capabilities Development Document for Joint Evacuation and Transport Simulation (JETS) System". The goal is not to ensure that there is a one-to-one relationship between to the contents of source material and the architecture. Instead, the goal is to identify any content in the artifacts that contradict such material.

Capture And Report Findings: Any findings are captured and reported back to the artifact developer. Findings may be in the form of recommendation, questions, or general observations. In some cases, example diagrams are included as well, but only for elaboration. An example of the feedback provided is shown in Table 5 below.

Table 5. Feedback

SV-1		
Area	**Description**	**Feedback**
Key Points		
Focus	The SV-1 addresses the composition and interaction of Systems. For DoDAF V2.0, the SV-1 incorporates the human elements as types of Performers - Organizations and Personnel Types.	Looks good
Scope	The SV-1 depicts all System Resource Flows between Systems that are of interest.	Recommend updating the associations between elements to represent resource flows instead of communications. Identifying which pathways use the MSTA Protocol can be included in the SV-2
Use	The SV-1 is used in two complementary ways: 1) Describe the Resource Flows exchanged between resources in the architecture. 2) Describe a solution, or solution option, in terms of the components of capability and their physical integration on platforms and other facilities.	Looks good
Human Representation	The real benefit of a SV-1 is its ability to show the human aspects of an architecture, and how these interact with Systems	There is a single person called out in the system: Staff. Can we confirm that this is the only human interaction with this solution?

Final Verification Checklist: IVIR created a final verification checklist to test the DoDAF views against the primary capabilities identified through the course of the program. These capabilities came from the following sources:

- Front-end research on the Service component courses, curriculum, and doctrinal requirements

- Site visits
- Subject Matter Expert (SME) interviews
- JETS Draft CDD, including the Key Performance Parameters (KPPs) and Key System Attributes (KSAs)

These capabilities were organized in a checklist that identifies which view(s) contain each of the capabilities, and to identify if any of the capabilities were missing from the DoDAF views.

3.1.4.3 JETS SUPPORT SYSTEMS

In addition to the DoDAF views developed to describe the JETS architecture, additional designs have been developed for the individual support systems identified in the Draft Capabilities Development Document (CDD). The support systems are standardized across the JETS platform, providing necessary support required for the full operation of the system of systems. Four primary support systems have been identified:

- **Virtual Patient System (VPS):** The sub-system that provides scalable, modular medical training products, tools, and devices across integrated Live, Virtual, Constructive, and Gaming (LVCG) environments. The VPS provides patient surrogates, part task skill trainers, sets, kits and outfits (SKOs) and other associated equipment.
- **Instruction Support System (ISS):** The sub-system that provides a scalable and modular training center along with Point of Demand (POD) capabilities. The ISS supports the integration of curriculum, facilities, and scenarios across the Service components. The ISS provides a facility component for LVCG training environments, a virtual library component for standardized and integrated training curriculum and strategies, and a POD component to provide training on a globally integrated environment.
- **Medical Training – Command and Control (MT-C2):** The sub-system that provides components and technologies to enable full remote and wireless control of training and environments, and the capture of training and system feedback and diagnostics. The MT-C2 system provides a training control component, and environment control component, capture components for training and sensory feedback, and a system diagnostics component.
- **Medical Training Evaluation and Review (MeTER):** The sub-system that provides longitudinal learning management and performance data. The MeTER system provides a learning management system (LMS) component, an evaluation component for pre- and post-testing, a training diagnostics component, and an after action review (AAR) component.

Reference ANNEX I: JETS SUPPORT SYSTEMS

3.1.5 OBJECTIVE #6: Conduct Technical Feasibility Studies

"A series of assessments to determine the practicality of the proposed system or system requirements will be conducted. These studies will aim to objectively uncover the strengths and weaknesses of the proposed requirements and evaluate their potential for success. The intent is that they will provide information to the research team upon which decisions can be based from in the final proposed system architecture designs and associated capabilities documentation".

A series of assessments were conducted to determine the practicality of the proposed system and system requirements. These studies aimed to objectively uncover the strengths and weaknesses of the proposed requirements and evaluate their potential for success. The study consisted of reviewing use case scenarios and an analysis for network suitability to provide information to the research team upon which decisions can be based from for the final proposed system architecture designs and associated capabilities documentation.

The scenarios generated during these assessments represent the JETS architecture design. They are meant to showcase a sample of events that will be possible to perform in the eventual JETS system.

3.1.6 OBJECTIVE #7: Update and Finalize JETS CDD

"Provide recommended edits to the JETS CDD. Provide any specific recommended edits of the Draft JETS CDD based on the JETS research along with why the edits are recommended and the impact of accepting or rejecting the recommended edits. Provide recommendations for an implementation strategy aligned to Increments 1 – 4 of the JETS Program based on JETS specific needs".

References: The JETS draft Capabilities Development Document (CDD) was reviewed for completeness based upon the research conducted through literature review, site visits to specific locations related to patient transport and evacuation, and extensive subject matter expertise interviews.

The references noted from the draft CDD were reviewed for currency of the fourteen references originally listed of which five are restricted to Government/DoD access. It is recommended that the Government review these five items for currency and vet accordingly. Four new references have been added that relate to JPM/GPM/JTPE, Army Learning Concepts for Training and Education 2020-2040, Combat Casualty Care Research Program (CCCRP) Gap Analysis, and Joint Health Service publication 4-02.

Reference SUPPORT DOCUMENTS FILE REPORT being submitted under separate cover.

4. PROGRAM SUMMARY

4.1 Program Organization

Table 6 below lists the *Prototype of Joint Evacuation and Transport Simulation Program* organization:

Table 6. Program Organization

RESPONSIBILITY	INDIVIDUAL	ORGANIZATION
Key Personnel		
Principle Investigator	Ms. Catherine M. Strayhorn, BS	IVIR Inc.
Program Manager	Ms. Dee Kuenzig, MS	IVIR Inc.
Educational Engineer	Mr. William Lewandowski, MS	IVIR Inc.
Team Personnel		
Sr. System Engineer	Ms. Erin Honold, BS	IVIR Inc.
Sr. Researcher	Mr. Ray Shuford, BS	IVIR Inc.
Researcher	Mr. Sam Hopkins, BA	IVIR Inc.
Contract Administration	Ms. Mary O'Hara	IVIR Inc.
Subject Matter Experts		
Military Medicine/TCCC	CSM (Ret) David Litteral, PhD	
Software Architectures	Mr. William Lewandowski, Jr., MS	
Physiological Modeling	Mr. Robert Hester, PhD	
Network and Cyber Security, DICAP	Mr. Robert Madden, BS, CISSP	
Government Personnel		
SOTR	Mr. Dave Thompson	MSIS Research Program JPC-1
Contractual Representative	Ms. Rebecca Harmon	ATI

4.2 Program Deliverables

Table 7 below details the contract deliverables for the *Prototype of Joint Evacuation and Transport Simulation Program*.

Table 7. Contract Deliverables

DUE DATE	DELIVERABLES
* 1/23/18	Contract Award

*	2/22/18	● First Monthly Sprint Report o Preliminary Project Plan (Updated Monthly) o Traceability Matrices Templates o Weekly/Monthly Sprint Meeting Minutes (Monthly)
*	3/22/18	● Second Monthly Sprint Report o Preliminary Quality Control Plan (Updated Monthly)
*	4/25/18	● First Quarterly Report
*	5/7/18	● Third Monthly Sprint Report
*	6/7/18	● Fourth Monthly Sprint Report ● Ft. Rucker Site Visit and Report ● WPAFB Site Visit and Report
*	7/3/18	● Fifth Monthly Sprint Report ● USTRANSCOM and AMC SGK Site Visit and Report
*	7/25/18	● Second Quarterly Report
*	8/3/18	● Sixth Monthly Sprint Report o Draft JETS Design Documents
*	8/31/18	● Phase I Final Report o Final Project Plan o Front-End Analysis o U.S. Service and NATO Medical Services Reports o LVCG Simulation Inventory Report o Feasibility Study o JETS Architectural Description o Draft MMS FOM Requirements o JETS Support Systems Report o JETS DoDAF Artifacts and Supporting Documents o JETS DoDAF Verification Matrix and Requirements Diagrams o Draft JETS CDD Recommendations

* Delivered

4.3 Work Performed Summary

The following summarizes the work performed during Phase I.

4.3.1 Month 1: January 23 – February 22, 2018)

- Created preliminary Project Plan
- Held Kickoff meeting between IVIR and SimQuest, February 1 – 2, 2018
- Began daily SCRUM meetings, started February 5, 2018
- Began weekly program meetings, started February 9, 2018
- Began identification of Program SMEs
- Setup “Zoho” portal for sharing of project content and work effort
- Held Government Kickoff meeting at Ft. Detrick February 8, 2018
- Submitted First Monthly Sprint Report February 22, 2018

4.3.2 Month 2: February 23 – March 22, 2018)

- Submitted Project Plan
- Submitted Quality Control Plan
- Continued daily SCRUM meetings
- Continued weekly program meetings
- Continued Program SME list
- Began Front-End Domain Analysis
    - Started review of Government furnished documentation
    - Started review of available Tri-Service CDDs

  - Began Interview Protocol, Questions and Response Matrix
  - Continued research into curricula, protocols and doctrines used for patient evacuation and transport for the Army, Navy, Air Force, and NATO
  - Began generation of inventory of current LVCG data elements/standards to support JETS SoS
  - Began definition of a consistent and comprehensive domain model
- Submitted Second Monthly Sprint Report March 22, 2018

4.3.3 Month 3: March 23 – April 30, 2018)

- Updated Project Plan
- Continued daily SCRUM meetings
- Continued weekly program meetings
- Continued Program SME list
- Transitioned from “Zoho” portal to LT2 for sharing of project content and work effort
- Submitted First Quarterly Report April 25, 2018
- Submitted Request for Modifications to Project to MTEC Contracts April 28, 2018
- Continued Front-End Domain Analysis
  - Continued review of Government furnished documentation
  - Continued review of available Tri-Service CDDs
  - Continued to refine and add to List of SME’s
  - Continued Interview process
  - Continued research into curricula, protocols and doctrines used for patient evacuation and transport for the Army, Navy, Air Force, SOCOM and NATO
  - Began documenting research results in the appropriate matrices
  - Continued inventory of current LVCG data elements/standards to support JETS SoS
  - Continued definition of a consistent and comprehensive domain model
- Participated in site visit at FT. Rucker April 30 – May 1, 2018
- Finalized date for site visit at WPAFB May 8 – 10, 2018
- Submitted Third Monthly Sprint Report April 30, 2018

4.3.4 Month 4: May 1 – May 31, 2018)

- Updated Project Plan
- Continued daily SCRUM meetings
- Continued weekly program meetings
- Conducted two Monthly Review Meetings
- Submitted Third Monthly Sprint Report May 7, 2018
- Submitted Revised Request for Modifications to Contract May 25, 2018
- Continued Front-End Domain Analysis
  - Continued review of Government furnished documentation
  - Continued review of available Tri-Service CDD’s
  - Continued to refine and add to List of SME’s
  - Continued interview process
    - Attended SOMSA conference to conduct additional interviews
  - Continued research into curricula, protocols, and doctrines used for patient evacuation and transport for the Army, Navy, Air Force, SOCOM and NATO
  - Continued work on documenting research results in the appropriate Matrices
  - Completed LVCG inventory
  - Continued inventory of current LVCG data elements/standards to support JETS SoS

  - Worked on generating an inventory of systems and data elements/standards to support the Support Systems of JETS SoS
  - Continued definition of a consistent and comprehensive domain model
  - Began populating the Capability Matrix
- Participated in WPAFB and Cincinnati CSTARS site visit
  - Submitted trip report
- Set tentative schedule date for TRANSCOM site visit – end of June
- JETS Architecture Plan and Requirements Definition
  - Began Support Systems design requirements
  - Began FOM definition
  - Submitted white paper entitled *"A Discussion on the Applicability of the Human Performance Technology Model and the Instructional Systems Design Model to the JETS Architecture Project"*
- JETS Capability Architecture
  - Reviewed Architectural Description draft document provided by SimQuest and provided feedback
  - Began definition of the big picture capabilities of the subsystem that the architecture must provide
  - Began identification of interconnections within/between the capabilities/functions of the subsystem
  - Began definition of JETS Critical Activities
- JETS Operational System Models
  - Began identification of actors and performers in the subsystems
  - Began documentation of resource flows between the capabilities and performers
  - Attended and briefed at SISO on Medical Simulation Federate Object Model (FOM)
- Feasibility Studies
  - Continued identification of DoD networks appropriate for hosting the JETS architecture
- Recommended Edits to JETS CDD
  - Began reviewing CDD vs. JETS research

4.3.5 Month 5: June 1 – June 30, 2018)

- Received notification of acceptance of contract modifications – Updated Project Plan, Payment Schedule and internal documents to reflect the accepted modifications
- Continued daily SCRUM meetings
- Continued weekly program meetings
- Participated in USTRANSCOM site visit at Scott AFB June 28, 2018
- Conducted Technical Design Review June 20, 2018
  - Created Design Review package
  - Submitted meeting minutes
  - Submitted reply to feedback to meeting minutes
- Submitted NATO Medical Training Report June 6, 2018
- Submitted Fourth Monthly Sprint Report June 7, 2018

4.3.6 Month 6: July 1 – July 31, 2018

- Continued daily SCRUM meetings
- Continued weekly program meetings
- Conducted two Agile Review meetings July 3 and 30, 2018
- Submitted Fifth Monthly Spring Report July 3, 2018
- Submitted 2nd Quarterly Report July 25, 2018

- Conducted meeting with JPC-1 to discuss final testing plan of DoDAF documents July 27, 2018
- Completed Capability Traceability Matrix July 3, 2018

4.3.7 Month 7: August 1 – August 31, 2018

- Updated Project Plan
- Continued daily SCRUM meetings
- Continued weekly program meetings
- Completed U.S. Air Force Medical Training Report
- Submitted Sixth Monthly Sprint Report August 3, 2018
    - Submitted draft U.S. Army Medical Training Report
    - Submitted draft MeTER and ISS Design Requirements
    - Submitted draft MeTER and MTC2 Design Requirements
    - Submitted draft VPS and ISS Requirements
    - Submitted draft Speech Recognition Requirements
    - Submitted draft Capability Traceability Matrix
    - Submitted draft MMS FOM
    - Submitted JETS Security Requirements
- Phase I Final Report (Revised December 14, 2018)

5. PRODUCTS

5.1 PUBLICATIONS/PRESENTATIONS/POSTERS/PANEL PARTICIPATION

- Panel Participation: Lewandowski, W., *The Future of Simulation in the Continuum of Care,* Conducted at MHSRS, 23 August 2018, Kissimmee, FL.
- Oral Presentation: Lewandowski, W., *First Steps Towards a Standard for Medical Modeling and Simulation Interoperability*, Conducted at the Simulation Interoperability Standards Organization (SISO) "Seminar on MMS Standards" in conjunction with the ITEC Conference, 14 May 2018, Stuttgart, Germany.

5.2 OTHER REPORTABLE OUTCOMES/PRODUCTS

The following are the products generated during the course of the program:

- Programmatic:
    - Project Plan – Reference **ANNEX J: PHASE I FINAL**
    - Quality Control Plan
    - Technical Design Review Presentation
    - Monthly Sprint Reports (6)
    - Quarterly Reports (2)
    - Site Visit and Program Meeting Minutes
    - Site Visit Verification Document
    - Phase I Final Technical Report
- Research Reports:
    - NATO Medical Training and Simulation Report
    - U.S. Army Medical Service Overview
    - U.S. Air Force Medical Service Overview
    - U.S. Navy/Marine Medical Service Overview
    - SME Interviews:
        - Questions and Protocols
        - Overall Interview Summary Report
        - U.S. Army Interview Summary Report

        - U.S. Air Force Interview Summary Report
        - U.S. Navy/Marine Interview Summary Report
    - Live, Virtual, Constructive and Gaming Simulation Inventory Report
- Traceability Matrices:
    - Live, Virtual, Constructive and Gaming Simulation Inventory Matrix
    - Literature Review Matrix
    - SME Interview Response Matrix
    - Capability Matrix
    - Verification Matrix
- System Design and Architecture:
    - MeTER and ISS Design Requirements
    - MeTER and MTC2 Design Requirements
    - VPS and ISS Design Requirements
    - Speech Recognition Design Requirements
    - Security Requirements
    - Medical Modeling and Simulation (MMS) Federation Object Model (FOM)
    - HLA and FOM Report
    - Feasibility Report
    - JETS Architecture Description (DoDAF Documentation)
    - DoDAF Summary and Review Report
    - JETS CDD Recommendation Report
    - JETS Support Systems Report
- White paper entitled "*A Discussion on the Applicability of the Human Performance Technology Model and the Instructional Systems Design Model to the JETS Architecture Project*".
- Oral presentation entitled "*First Steps Towards a Standard for Medical Modeling and Simulation Interoperability*, Conducted at the Simulation Interoperability Standards Organization (SISO) "Seminar on MMS Standards" in conjunction with the ITEC Conference, 14 May 2018, Stuttgart, Germany.

6. ACRONYMS

Reference Appendix A: ACRONYMS for a listing of acronyms contained in this Phase I Final Technical Report and Annexes.

7. EXTERNAL DOCUMENTS

ANNEX A: SME INTERVIEW SUMMARY

ANNEX B: ARCHITECTURAL DESCRIPTION OF 2017 DRAFT CDD (previously submitted as Annex B(1)

ANNEX C: USAF MEDICAL SERVICE OVERVIEW

ANNEX D: USA MEDICAL SERVICE OVERVIEW

ANNEX E: USN and USMC MEDICAL SERVICE OVERVIEW

ANNEX F: NATO MEDICAL SERVICE OVERVIEW

ANNEX G: LVCG SIMULATION SUMMARY

ANNEX H: HLA and FOM

ANNEX I: JETS SUPPORT SYSTEMS (previously submitted as Annex K)

ANNEX J: PHASE I FINAL (previously submitted as Annex N)

ANNEX K: LVCG SIMULATION MATRIX (not previously submitted)

APPENDIX A: ACRONYMS

ACRONYMS	MEANING
3-D	Three Dimensional
68W	Combat Medic Health Care Specialist
AACC	AMEDD Aviation Crewmember Course
AAR	After Action Review
ACLS	Advanced Cardiac Life Support
ACSC	Advanced Casualty Sustainment Course
ADL	Advanced Distributive Learning
AE	Aeromedical Evacuation
AECM	Aeromedical Evacuation Crewmember
AELT	Aeromedical Evacuation Liaison Team
AEOT	Aeromedical Evacuation Operations Team
AESC	Aeromedical Evacuation Support Cell
AET	Aeromedical Evacuation Technician
AETC	Air Force Education and Training Command
AF	Air Force
AFI	Air Force Instruction
AFMC	Air Force Material Command
AFMMAST	Air Force Medical Modeling and Simulation
AFMS	Air Force Medical Service
AFNET	Air Force Network
AFS	Air Force Specialty
AF/SG	Air Force Surgeon General
AFSOC	Air Force Special Operations Command
AFSOF	Air Force Special Operation Forces
AFTH	Air Force Theater Hospital
AFTTP	Air Force Tactics, Techniques and Procedures
AH	Submarine Tenders
AHS	Army Health System
AI	Artificial Intelligence
AKO	Army Knowledge Online
AMC	Air Mobility Command
AMC	Army Material Command

AMEDD	Army Medical Department
AMEDD C&S	Army Medical Department Center and School
AMFR	Advanced Medical First Responder
AMM	Advanced Modular Manikin
AO	Area of Operations
AOC	Air Operations Center
AOR	Area of Responsibility
API	Application Program Interface
APOD	Aerial Port of Debarkation
APOE	Aerial Port of Embarkation
ASD/HA	Assistant Secretary of Defense for Health Affairs
ATN	Army Training Network
ATP	Advanced Tactical Practitioner
ATP	Army Technical Publication
AV	Audio/Visual
AV-1	All Viewpoint 1: Overview and Summary Information
AV-2	All Viewpoint 2: Integrated Dictionary
BAS	Battalion aid station
BAQ	Basic Aircraft Qualification
BCT	Brigade Combat Team
BMC	Basic Mission Capable
BUMED	Bureau of Medicine and Surgery
BVM	Bag-Valve-Mask
C2	Command and Control
C3	Command, Control and Communications
CA	Comprehensive Approach
CASEVAC	Casualty Evacuation
CBA	Capabilities Based Assessment
CBAN	Color Breach Administrative Net
CCATT	Critical Care Air Transport Team
CCCRP	Combat Casualty Care Research Program
CCMD	Combatant Command
CDD	Capabilities Development Document
CE	Continuing Education
CENTCOM	Central Command
CIHSO	Continuous Improvement in Healthcare Support on Operations
COE	Center of Excellence
COMRDS	Committee of the Chiefs of Military Medical Services
CONOPS	Concept of Operations

CONUS	Continental United States
CPR	Cardiopulmonary Resuscitation
CRM	Crisis Resource Management
CRTS	Casualty Receiving and Treatment Ship
CSTARS	Center for Sustainment of Trauma and Readiness Skills
CT&E	Collective Training and Exercises
CUI	Controlled Unclassified Information
CV	Aircraft Carrier
CV-1	Capability Viewpoint: Vision
CV-2	Capability Viewpoint 2: Capability Taxonomy
CV-3	Capability Viewpoint 3: Capability Phasing
CVN	Aircraft Carrier Night
DA	Department of the Army
DCR	DoTmLPF-P Change Recommendations
DCS	Damage Control Surgery
DCSA	Defense Support of Civil Authorities
DD	Department of Defense
DDS	Data Distribution Service
DDS	Dynamic Data Service
DHA	Defense Health Agency
DHA, CAE (J-4)	Defense Health Agency, Component Acquisition Executive
DHA, E&T (J-7)	Defense Health Agency, Education and Training
DHSC	Deployment Health Surveillance Capability
DIS	Distributive Interactive Simulation
DISA	Defense Information System Agency
DM	Dialogue Manager
DMA	Defense Media Activity
DNBI	Disease and Non-Battle Injuries
DNN	Deep Neural Network
DoD	Department of Defense
DoDAF	Department of Defense Architecture Framework
DoDAF DM2	DoDAF Meta-Model
DoDD	Department of Defense Directive
DoDI	Department of Defense Instruction
DoDPW	Department of Defense Public Web
DOTmLPF-P	Doctrine, Organization, Training, material, Leadership, Personnel, Facilities and Policy
E	Enhanced
E&IT	Education and Individual Training
E&T	Education and Training

EAB	Echelons Above Brigade
EAES	Expeditionary Aeromedical Evacuation Squadron
ECG	Electrocardiogram
ECS	Expeditionary Combat Support
EDA	Electrodermal Activity
EEG	Electroencephalogram
EHR	Electronic Health Record
e-ITEP	Electronic Individual Training and Education Program
EMBI	Emergence Management of Battlefield Injuries
EMEDS	Expeditionary Medical Support
e-MTEP	Electronic Military Training and Education Program
EMT-P	Emergency Medical Technician – Paramedic
EPC	Electronic Patient Card
ER	Emergency Room
ERC	En Route Care
ERCC	En Route Critical Care
ERCCS	En Route Casualty Care System
ERCCT	En Route Casualty Care Team
ERPSS	En Route Patient Staging System
ETOC	Education and Training Opportunities Catalog
EU	European Union
FACS	Facial Action Coding System
FAST	Focused Assessment with Sonography for Trauma
FHA	Foreign Humanitarian Assistance
FHP	Force Health Protection
FM	Field Manual
FMA	Functional Model of Anatomy
FMN	Federated Mission Networking
FN	Flight Nurse
FOC	Full Operating Capability
FOM	Federated Object Model
FRC	Forward Resuscitative Care
FRSS	Forward Resuscitative Surgery System
FST	Fleet Surgical Team
FST	Forward Surgical Team
FTL	Flight Training Level
GCC	Geographic Combatant Commander
GMM	Gaussian Mixed Models
GPM	Global Patient Movement

GSR	Galvanic Skin Response
HA	Humanitarian Assistance
HD	High Definition
HDMI	High Definition Multimedia Interface
HIPPA	Health Insurance Portability and Protection Act
HLA	High Level Architecture
HMMWV	High Mobility Multi-Wheeled Vehicle
HNS	Host Nation Service
HQ	Headquarters
HR	Heart Rate
HRT	Health Response Team
HRV	Heart Rate Variability
HSS	Health Service Support
HST	Home Station Training
HTTP	Hyper Text Transfer Protocol
HUN	Hungary
I2C	Inter-Integrated Circuit Protocol
IA	Information Assurance
IA	Integrating Architecture
ICD	Initial Capabilities Document
ICI	Istanbul Cooperation Initiative
ICOMR	Interallied Confederation of Medical Reserve Officers
ICU	Intensive Care Unit
IDMT	Independent Duty Medical Technician
IEEE	Institute of Electrical and Electronic Engineers
IO	Interosseous
IOC	Initial Operation Capability
IP	Internet Protocol
ISS	Instruction Support System
ISTC	International Special Training Center
ITEC	International Forum for the Military and Civil Simulation, Training and Education Community
ITLS	International Trauma Life Support
IV	Intravenous
IVIR	Information Visualization and Innovative Research, Inc.
JCHS	Joint Concept for Health Components
JCIDS	Joint Capabilities Integration and Development System
JCS	Joint Capability System
JECC	Joint En Route Critical Care
JETS	Joint Evacuation and Transport Simulation

JFHP	Joint Force Health Protection
JKO	Joint Knowledge Online
JMC	JETS Manikin Core
JMC	Joint Medical Committee
JOA	Joint Operations Area
JP	Joint Publication
JPC-1	Joint Program Committee-1
JPM	Joint Patient Movement
JPM MMS	Joint Project Manager, Medical Modeling and Simulation
JROC	Joint Requirements Oversight Council
JSOMTC	Joint Special Operations Medical Training Center
JTFC	Joint Training Functional Concept
JTPE	Joint Theater Patient Evacuation
KLT	Key Leader Training
KPP	Key Performance Parameter
KSA	Key System Attributes
LAN	Local Area Network
LCC	Amphibious Command Ship
LHA	Landing Helicopter Assault
LHD	Landing Helicopter Dock
LiDAR	Light Detection and Ranging
LM	Light Maneuver
LMS	Learning Management System
LN	Lead Nation
LPD	Amphibious Transport Dock
LRS	Learning Record Store
LSD	Dock Landing Ship
LTT	Live Tissue Training
LVC-IA	Live, Virtual, Constructive – Integrating Architecture
LVCG	Live, Virtual, Constructive and Gaming
LWN	Land War Net
MAGTF	Marine Air-Ground Task Force
MARCHPAWS	Massive Bleeds, Airway, Respiration, Circulation, Hypothermia/Head Injury, Pain Management, Antibiotics, Wounds and Splinting
MC4	Medical Communication for Combat Casualty Care
MCD	Medical Crew Director
MCRP	Marine Corps Reference Publication
MD	Mediterranean Dialog
MEDEVAC	Medical Evacuation
MEDEVAL	Medical Evaluation

MEDLOG	Medical Logistics
MEDREGNET	Medical Regulating Net Afloat
METC	Medical Education and Training Campus
MeTER	Medical Training Evaluation and Review
MEU	Marine Expeditionary Unit
MHS	Military Health System
MILMED	Military Medicine
MIMMS	Major Incident Medical Management and Support
MIST	Mechanism of Injury, Injuries, Symptoms and Treatment
MMS	Medical Modeling and Simulation
MMLT	Mobile Medical Lane Training
MMSHA	Military Medical Support in Humanitarian Arena
MoDA	Modular Approach
MODAF	Ministry of Defence Architecture Framework
MOS	Military Occupational Specialty
MOU	Memorandum of Understanding
MR	Mission Ready
MRCO	Medical Regulating Control Officer
MRMC	Medical Research and Materiel Command
MS	Microsoft
MSaaS	Modeling and Simulation as a Service
MSAT	Medical Situational Awareness in the Theater
MSE	Medical Simulation Enterprise
MSIS	Medical Simulation and Information Science
MSOC	Medical Support Operations Center
MSTA	Medical Simulation and Training Architecture
MSTC	Medical Simulation Training Center
mSTE	Medical Synthetic Training Environment
MT-C2	Medical Training Command and Control
MTEC	Medical Technology Enterprise Consortium
MTEP	Military Training and Exercise Program
MTES	Medical Training Evaluation System
MTF	Medical Treatment Facility
NATO	North Atlantic Treaty Organization
NCS	NATO Command Service
NETC	Naval Education and Training Command
NETF	NATO Education and Training Facility
NGEN	Next Generation Enterprise Network
NIPRNet	Non-Secure Internet Protocol Router Network

NIST	National Institute of Standards and Technology
NKO	Navy Knowledge Online
NLG	Natural Language Generation
NLP	Natural Language Processing
NLU	Natural Language Understanding
NMCI	Navy/Marine Corps Internet
NMOTC	Navy Medicine Operational Training Center
NMR	Non-Mission Ready
NMSIC	NATO Medical Staff Introduction Course
NNE	Non-NATO Entity
NPC	Non-Player Character
NREMT	National Registry of Emergency Medical Technicians
NSHQ	NATO Special Operations Headquarters
NSOCM	NATO Special Operations Combat Medic
NTI	National Training Instructions
NTTC	Navy Trauma Training Center
O&M	Operations and Maintenance
OA	Operational Area
OCD	Operational Concept Document
OCONUS	Outside Continental United States
OE	Operational Environment
OJSS	Office of the Joint Staff Surgeon
OPLAN	Operations Plan
OR	Operating Room
OS	Operating System
OV-1	Operations View 1: High Level Operational Concept Graphic
PA	Physician Assistant
PACOM	Pacific Command
PALS	Pediatric Advanced Life Support
PCS	Patient Communication Simulator
PDC	Patient Documentation and Communication
PECC	Patient Evacuation Coordination Cell
PEO	Program Executive Office
PEO	Patient Evacuation Officer
PEO DHMS	Program Executive Office, Defense Healthcare Management System
PEO STRI	Program Executive Office, Simulation, Training and Instrumentation
PEP	Pre-Hospital Emergency Pediatric Care
PET	Patient Evacuation Team
PfP	Partnership for Peace

PHTLS	Pre-Hospital Life Support
PII	Personally Identifiable Information
PJ	Pararescue Jumper
PM	Patient Movement
PMI	Patient Movement Items
PMR	Patient Movement Request
PMRC	Patient Movement Requirements Center
POD	Point of Demand
POI	Point of Injury
POI	Program of Instruction
POINTS	Point of Injury Trauma Simulation
PoR	Program of Record
POV	Point of View
PPS	Ports, Protocols and Services
PPSM	Ports, Protocols and Services Management
PTEC	Partnership Training and Education Center
PTT	Part Task Trainer
PWM	Pulse Width Modulation
RAS	Regimental Aid Station
ReST	Rehabilitation Simulation for Treatment
REST	Representational State Transfer
RMF	Risk Management Framework
RTI	Run Time Interface
SAR	Search and Rescue
SAT	Systems Approach to Training
SBAR	Situation, Background, Assessment and Recommendation
SC	Surgical Company
SCORM	Sharable Content Object Reference Model
SDK	Software Development Kit
SERE	Survival, Evasion, Resistance and Escape
SHOTS	Simulated Hospital Operations and Treatment System
SISO	Simulation Interoperability Standards Organizations
SKO	Sets, Kits and Outfits
SME	Subject Matter Expert
SOA	Service Oriented Architecture
SOCCET	Special Operations Critical Care Evacuation Team
SOCOM	Special Operations Command
SOF	Special Operations Forces
SOFME	Special Operation Medical Element

SoM	System on Module
SoS	System of Systems
SOST	Special Operations Surgical Team
SOTC	Special Operation Training Center
SP	Standardized Patient
SPI	Serial Peripheral Interface
SQL	Standardized Query Language
SRS	Security Requirement Statement
SSP	System Security Plan
STANAG	Standardization Agreement
STE	Synthetic Training Environment
STIG	Security Technical Implementation Guide
STP	Shock Trauma Platoon Support
SV-1	Systems Viewpoint 1: Systems Interface Description
SV-3	Systems Viewpoint 3: Systems-Systems Matrix
SV-7	Systems Viewpoint 7: Systems-Measures Matrix
SV-8	Systems Viewpoint 8: Systems Evolution Description
SysML	Systems Modeling Language
T-AH	Hospital Ship
TADSS	Training Aids, Devices, Simulators and Simulations
TC	Training Circular
TC3	Tactical Combat Casualty Care
TCCC	Tactical Combat Casualty Care
TCCC TtT	Tactical Combat Casualty Care Train the Trainer
TCCET	Tactical Critical Care Evacuation Team
TCCT	Tactical Critical Care Transport
TCN	Troop Contributing Nations
TCP	Transmission Control Protocol
TENA	Test and Evaluation Network Architecture
THOR	Theater Hospital Operations Replication
TLA	Total Learning Architecture
TMDS	Theater Medical Data Store
TMIP-J	Theater Medical Information Program – Joint
TMS	Training Management System
TMTS	Tactical Medical Training Strategy
TRAC2ES	Transportation Command Regulating and Command & Control Evacuation System
TRADOC	United States Army Training and Doctrine Command
TRG	Training Group
TTS	Text To Speech

TtT	Train the Trainer
UK	United Kingdom
UN	United Nations
UPDM	Unified Profile for DoDAF and MoDAF
U.S.	United States
USA	United States Army
USAF	United States Air Force
USAFSAM	United States Air Force School of Aerospace Medicine
USASAM	United States Army School of Aviation Medicine
USB	Universal Serial Bus
USMC	United States Marine Corps
USN	United States Navy
USSOCOM	United States Special Operations Command
USTRANSCOM	United States Transportation Command
VAD	Voice Activity Detector
VFS	Validating Flight Surgeon
VGA	Video Graphics Array
VP	Virtual Patient
VPS	Virtual Patient System
VTOL	Vertical Take-Off and Landing
WAN	Wide Area Network
WarPREP	Warfighter Performance Resilience Effectiveness and Protection
WHO	World Health Organization
WPAFB	Wright Patterson Air Force Base
xAPI	Experience Application Program Interface