



# NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

---

MBA PROFESSIONAL PROJECT

---

## OTHER TRANSACTION AUTHORITY (OTA) APPLICATION FOR WARFIGHTING DEVELOPMENT

---

December 2020

**By:**                    **Jonathan H. Berry**  
                              **James D. Mulski**

**Advisor:**             **Glenn A. Hodges**  
**Co-Advisor:**       **Justin P. Davis**  
**Co-Advisor:**       **Amilcar A. Menichini**  
**Second Reader:**   **Paul Lester**

*Approved for public release. Distribution is unlimited.*

**THIS PAGE INTENTIONALLY LEFT BLANK**

<b>REPORT DOCUMENTATION PAGE</b>			<i>Form Approved OMB No. 0704-0188</i>
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the 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 Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.			
<b>1. AGENCY USE ONLY (Leave blank)</b>	<b>2. REPORT DATE</b> December 2020	<b>3. REPORT TYPE AND DATES COVERED</b> MBA Professional Project	
<b>4. TITLE AND SUBTITLE</b> OTHER TRANSACTION AUTHORITY (OTA) APPLICATION FOR WARFIGHTING DEVELOPMENT			<b>5. FUNDING NUMBERS</b>
<b>6. AUTHOR(S)</b> Jonathan H. Berry and James D. Mulski			
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b> Naval Postgraduate School Monterey, CA 93943-5000			<b>8. PERFORMING ORGANIZATION REPORT NUMBER</b>
<b>9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b> N/A			<b>10. SPONSORING / MONITORING AGENCY REPORT NUMBER</b>
<b>11. SUPPLEMENTARY NOTES</b> The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.			
<b>12a. DISTRIBUTION / AVAILABILITY STATEMENT</b> Approved for public release. Distribution is unlimited.			<b>12b. DISTRIBUTION CODE</b> A
<b>13. ABSTRACT (maximum 200 words)</b>  Naval Special Warfare (NSW) forces are often regarded as the best trained, most flexible, rapidly deployable, and most innovative forces in the Armed Services, yet, a clunky and troubled acquisition history has presented obstacles to find emerging, new, disruptive concepts that allow us to compete against the world's Great Power Competition. How can we improve warfighter development within NSW and create acquisition agility and flexibility?  The purpose of our project is to analyze Other Transaction Authority (OTA) use to procure and develop innovative technology solutions that benefit the warfighter. By using Information Warfare Research Project's (IWRP) OTA consortium, we will act as consultants to Naval Special Warfare Command (WARCOM) throughout procurement of the Interactive Synthetic Environment (ISE). ISE will act as a case study for this acquisition vehicle but will also be analyzed as an innovative prototyping technology in NSW. Traditional prototypes help to test and validate the desired warfighter capability; however, in many cases, the development of a proper prototype is too difficult, expensive, and time consuming. ISE is an emerging technology development initiative to produce a Minimal Viable Product (MVP) prototype of a virtual environment that can make it possible to collect valuable usage and design data to make a go/no-go decision, or to refine a new capability at a fraction of the cost of traditional prototypes.			
<b>14. SUBJECT TERMS</b> Other Transaction Authority, OTA, Naval Special Warfare Command, interactive synthetic environment, early synthetic prototyping, acquisition agility, unmanned aerial system, Naval Information Warfare Center, Information Warfare Research Project			<b>15. NUMBER OF PAGES</b> 93
			<b>16. PRICE CODE</b>
<b>17. SECURITY CLASSIFICATION OF REPORT</b> Unclassified	<b>18. SECURITY CLASSIFICATION OF THIS PAGE</b> Unclassified	<b>19. SECURITY CLASSIFICATION OF ABSTRACT</b> Unclassified	<b>20. LIMITATION OF ABSTRACT</b> UU

THIS PAGE INTENTIONALLY LEFT BLANK

**Approved for public release. Distribution is unlimited.**

**OTHER TRANSACTION AUTHORITY (OTA) APPLICATION FOR  
WARFIGHTING DEVELOPMENT**

Jonathan H. Berry, Lieutenant Commander, United States Navy  
James D. Mulski, Lieutenant, United States Navy

Submitted in partial fulfillment of the  
requirements for the degree of

**MASTER OF BUSINESS ADMINISTRATION**

from the

**NAVAL POSTGRADUATE SCHOOL  
December 2020**

Approved by: Glenn A. Hodges  
Advisor

Justin P. Davis  
Co-Advisor

Amilcar A. Menichini  
Co-Advisor

Paul Lester  
Second Reader

Amilcar A. Menichini  
Academic Associate, Graduate School of Defense Management

THIS PAGE INTENTIONALLY LEFT BLANK

# **OTHER TRANSACTION AUTHORITY (OTA) APPLICATION FOR WARFIGHTING DEVELOPMENT**

## **ABSTRACT**

Naval Special Warfare (NSW) forces are often regarded as the best trained, most flexible, rapidly deployable, and most innovative forces in the Armed Services, yet, a clunky and troubled acquisition history has presented obstacles to find emerging, new, disruptive concepts that allow us to compete against the world's Great Power Competition. How can we improve warfighter development within NSW and create acquisition agility and flexibility?

The purpose of our project is to analyze Other Transaction Authority (OTA) use to procure and develop innovative technology solutions that benefit the warfighter. By using Information Warfare Research Project's (IWRP) OTA consortium, we will act as consultants to Naval Special Warfare Command (WARCOM) throughout procurement of the Interactive Synthetic Environment (ISE). ISE will act as a case study for this acquisition vehicle but will also be analyzed as an innovative prototyping technology in NSW. Traditional prototypes help to test and validate the desired warfighter capability; however, in many cases, the development of a proper prototype is too difficult, expensive, and time consuming. ISE is an emerging technology development initiative to produce a Minimal Viable Product (MVP) prototype of a virtual environment that can make it possible to collect valuable usage and design data to make a go/no-go decision, or to refine a new capability at a fraction of the cost of traditional prototypes.

THIS PAGE INTENTIONALLY LEFT BLANK

# TABLE OF CONTENTS

<b>I.</b>	<b>INTRODUCTION.....</b>	<b>1</b>
<b>II.</b>	<b>BACKGROUND .....</b>	<b>5</b>
	<b>A. THE CHALLENGE WITH ACQUISITION PRACTICE TODAY .....</b>	<b>5</b>
	<b>B. INTRODUCTION TO SPECIAL OPERATIONS FORCES.....</b>	<b>6</b>
	<b>1. How Is SOCOM Changing?.....</b>	<b>7</b>
	<b>2. Naval Special Warfare.....</b>	<b>8</b>
	<b>C. NAVAL SPECIAL WARFARE ACQUISITION PROCESSES.....</b>	<b>8</b>
	<b>D. IMPROVING ACQUISITION IN NAVAL SPECIAL WARFARE.....</b>	<b>10</b>
	<b>E. REVIEW .....</b>	<b>10</b>
<b>III.</b>	<b>OTHER TRANSACTION AUTHORITIES .....</b>	<b>13</b>
	<b>A. WHAT IS AN OTA?.....</b>	<b>13</b>
	<b>B. DEVELOPMENT OF THE SOW FOR ISE .....</b>	<b>15</b>
	<b>C. WHY OTAs ARE PREFERRED.....</b>	<b>16</b>
	<b>D. OTA PURPOSES .....</b>	<b>17</b>
	<b>E. FAR-BASED CONTRACTING .....</b>	<b>19</b>
	<b>1. Contracting Overview .....</b>	<b>19</b>
	<b>2. FAR Based Contracting Methods.....</b>	<b>22</b>
	<b>3. Contracting Steps to Award.....</b>	<b>22</b>
	<b>F. REVIEW .....</b>	<b>27</b>
<b>IV.</b>	<b>ISE TEST CASE .....</b>	<b>29</b>
	<b>A. THE ISE TEST CASE.....</b>	<b>29</b>
	<b>B. SYNTHETIC PROTOTYPING RELATED WORK.....</b>	<b>30</b>
	<b>1. Synthetic Prototyping Success Outside of DOD.....</b>	<b>31</b>
	<b>2. Synthetic Prototyping in DOD.....</b>	<b>31</b>
	<b>3. Operation Overmatch.....</b>	<b>35</b>
	<b>C. REVIEW .....</b>	<b>36</b>
<b>V.</b>	<b>ISE DEVELOPMENT METHODOLOGY.....</b>	<b>37</b>
	<b>A. IWRP VIRTUAL INDUSTRY DAY.....</b>	<b>37</b>
	<b>B. WHITE PAPER SOLICITATIONS .....</b>	<b>38</b>
	<b>C. WHITE PAPER EVALUATION CRITERIA .....</b>	<b>39</b>
	<b>D. TECHNOLOGY DEMONSTRATIONS .....</b>	<b>40</b>

E.	FULL PROPOSALS .....	41
F.	REVIEW .....	41
VI.	RESULTS AND FINDINGS .....	43
A.	TRADITIONAL CONTRACT VERSUS OTA PROCESS .....	43
1.	Improved Interaction with Industry .....	43
2.	Technology Demonstration Discussion .....	45
3.	Vendor Selection and Project Status .....	45
B.	FUTURE ISE CONCEPTS .....	47
C.	RECOMMENDATIONS FOR FURTHER RESEARCH .....	48
1.	Project Turnover .....	48
2.	Army Overmatch Process Versus Navy OTA Process .....	49
3.	Other Continued Areas of Study .....	50
D.	SUMMARY .....	51
	APPENDIX A. TECHNOLOGY DEMONSTRATION SCENARIO.....	53
	APPENDIX B. VENDOR EVALUATION RUBRIC .....	55
	APPENDIX C. STATEMENT OF WORK (SOW) .....	57
	APPENDIX D. CODED VENDOR LIST .....	69
	REFERENCE LIST .....	71
	INITIAL DISTRIBUTION LIST .....	75

## LIST OF FIGURES

Figure 1.	Investment Trends in Technology Research and Development. Source: Stratton-Feix (2017).....	3
Figure 2.	Defense Acquisition Lifecycle. Adapted from Defense Acquisition University (2019).....	4
Figure 3.	Defense OTA Obligations by Customer, 2014–2018. Source: McCormick (2019).....	14
Figure 4.	Non-FAR versus Traditional FAR-Based Contracting. Source: Bold (2019).....	18
Figure 5.	Traditional FAR Based Contracting Process. Source: Mortlock (2019).....	23
Figure 6.	Major Capability Acquisition Process. Adapted from Acq Notes (2020).....	30
Figure 7.	ESP and SBA in the Acquisition Process. Adapted from Murray et al. (2014).....	32
Figure 8.	Virtual Prototyping versus Physical Prototyping Process. Source: Force Technology (n.d.).....	33
Figure 9.	Physics-Based Digital Warfighting Connection to Tradespace Decision Tools. Source: Smith and Vogt (2017).....	34
Figure 10.	Early Synthetic Prototyping Enables Soldiers and Engineers to Co-Develop Solutions. Source: Smith and Vogt (2017).....	35
Figure 11.	ISE for Warfighting Development Slide from Industry Day .....	38
Figure 12.	Technology Demonstration Snapshot. Source: Givens (2020).....	40
Figure 13.	Technology Demonstration UAS Snapshot. Source: Givens (2020).....	41
Figure 14.	Vendor Proposal Rubric.....	55

THIS PAGE INTENTIONALLY LEFT BLANK

## LIST OF TABLES

Table 1.	Circumstances for OTA Use for Prototypes. Source: Peters (2019). .....	18
----------	------------------------------------------------------------------------	----

THIS PAGE INTENTIONALLY LEFT BLANK

## LIST OF ACRONYMS AND ABBREVIATIONS

CO	Contracting Officer
COR	Contracting Officer Representative
DFARS	Defense Federal Acquisition Regulation Supplement
DOD	Department of Defense
ESP	Early Synthetic Prototyping
FAR	Federal Acquisition Regulation
FY	Fiscal Year
GSA	General Service Administration
IDIQ	Indefinite Delivery Indefinite Quantity
ISE	Interactive Synthetic Environment
IWRP	Information Warfare Research Project
MVP	Minimum Viable Product
N3	Navy Operations Department
N4	Navy Logistics Department
N8	Navy Requirements and Combat Development Department
NIWC	Naval Information Warfare Command
NPS	Naval Postgraduate School
NSW	Naval Special Warfare
OTA	Other Transaction Authority
R&D	Research and Development
RFP	Request for Proposal
SBA	Simulation-Based Acquisition
SME	Subject Matter Expert
SOCOM	Special Operations Command
SOF	Special Operations Forces
SOW	Statement of Work
UAS	Unmanned Aerial System
WARCOM	Naval Special Warfare Command

THIS PAGE INTENTIONALLY LEFT BLANK

## **ACKNOWLEDGMENTS**

We would like to thank everyone at Naval Special Warfare Command (WARCOM), Naval Information Warfare Command (NIWC), Information Warfare Research Project (IWRP), and Naval Postgraduate school for their assistance in our MBA project.

THIS PAGE INTENTIONALLY LEFT BLANK

## I. INTRODUCTION

Since World War II, Americans have maintained the belief that the U.S. military has the best of everything. However, when we look at the world stage today, we see how the technological superiority that the U.S. once enjoyed over its competitors has diminished. In some areas, the U.S. is already being left behind. In a future with Great Power Competition against nations such as China and Russia, there will be a never-ending race for military modernization advantages that could tip the existing balance of power to offset American strengths and military advantages. One modern example is the development of hypersonic missiles. Reports indicate that both China and Russia have conducted several successful tests of hypersonic missiles and may potentially field an operational capability ahead of U.S. efforts (Sayler, 2019). Other potential areas where the U.S. may fall behind exist in new capabilities in the cyber domain, artificial intelligence, and ballistic missiles (Ernst, 2019). “By 2030, unless we [U.S. military] pursue ‘urgent change at significant scale,’ as former Defense Secretary Gen. James Mattis put it, it’s likely the U.S. will face an enemy with superior weapons, superior equipment and superior capabilities” (Inhofe, 2019). How has this happened?

All over the world, the speed of technological development is accelerating, expanding access and opportunity to more actors and altering the nature of war (Inhofe, 2019). While there are a multitude of reasons for the reduction in U.S. superiority, perhaps one is the way that the U.S. Department of Defense (DOD) acquires capabilities. This study investigates alternative contracting processes in the DOD acquisition process, specifically Other Transactional Authorities (OTA), to see if the U.S. can improve the speed at which it acquires materials to put us ahead of our competitors once again. Next, we will provide a brief introduction to DOD acquisition and highlight some key aspects that we will analyze in our paper.

The U.S. DOD is one of the largest and most complex business organizations in the world. It operates thousands of installations worldwide and executes millions of contracts each year. Out of the millions of Americans that the DOD employs, tens of thousands of military and civilian personnel work to develop, procure, and maintain countless weapons

systems and equipment (Fox, 2012, p. 1). It appears that Defense programs are continuing to expand, in size, budget, contracting, and purchasing each year. In order to manage such a large acquisition organization, robust and detailed regulations have been developed.

“The Federal Acquisition Regulation (FAR), which had its beginnings in the Armed Services Procurement Regulation established in 1947, is a substantial and complex set of rules governing the federal government’s purchasing process” (Halchin, 2006). The FAR was created to enforce rules, regulations and, procedures for government purchases. When employees are well educated in these regulations, and programs are run efficiently, the FAR should be effective in maintaining a fair, consistent, and fiscally responsible acquisition process.

Bureaucracy, while slow, is employed to provide controls to thwart preventable issues and to ensure that American’s tax dollars are spent responsibly and efficiently. However, the bureaucratic process within DOD acquisition is not perfect and is full of inefficiencies. Defense news reports, congressional hearings, and Government Accountability Office audits on the Pentagon’s acquisition process report that the process “consistently yields undesirable consequences—cost increases, late deliveries . . . and performance shortfalls” (Costa, 2006, p. 13).

Congress and DOD are constantly working to try and enhance the efficiency of the existing acquisition process, especially in an era of explosive technological germination. Decades ago, military research and government sponsored science and technology cells, led the nation in technology discoveries and created competitive advantages for the U.S. military. Today, industry moves at an increasingly rapid pace while continually added layers of bureaucracy in the DOD have slowed down the government acquisition loop. As seen in Figure 1, the gap between industry and DOD investment in research and development continues to widen. The rules of doing business with the federal government are full of obstacles and are typically much more restrictive from the commercial arena.

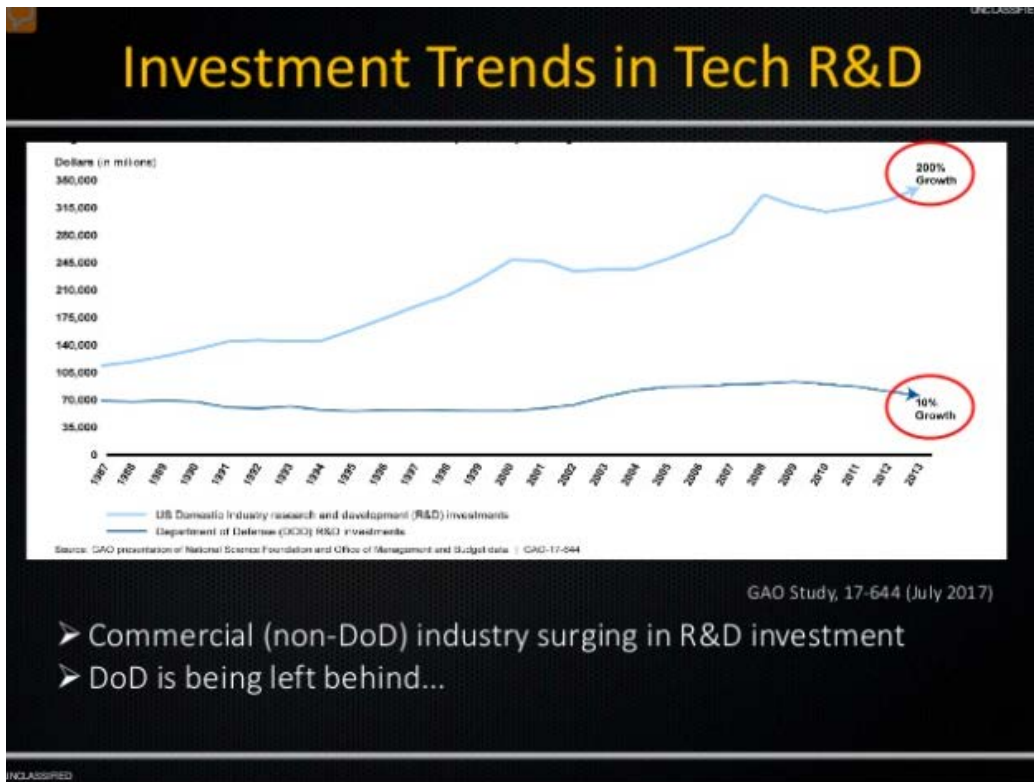
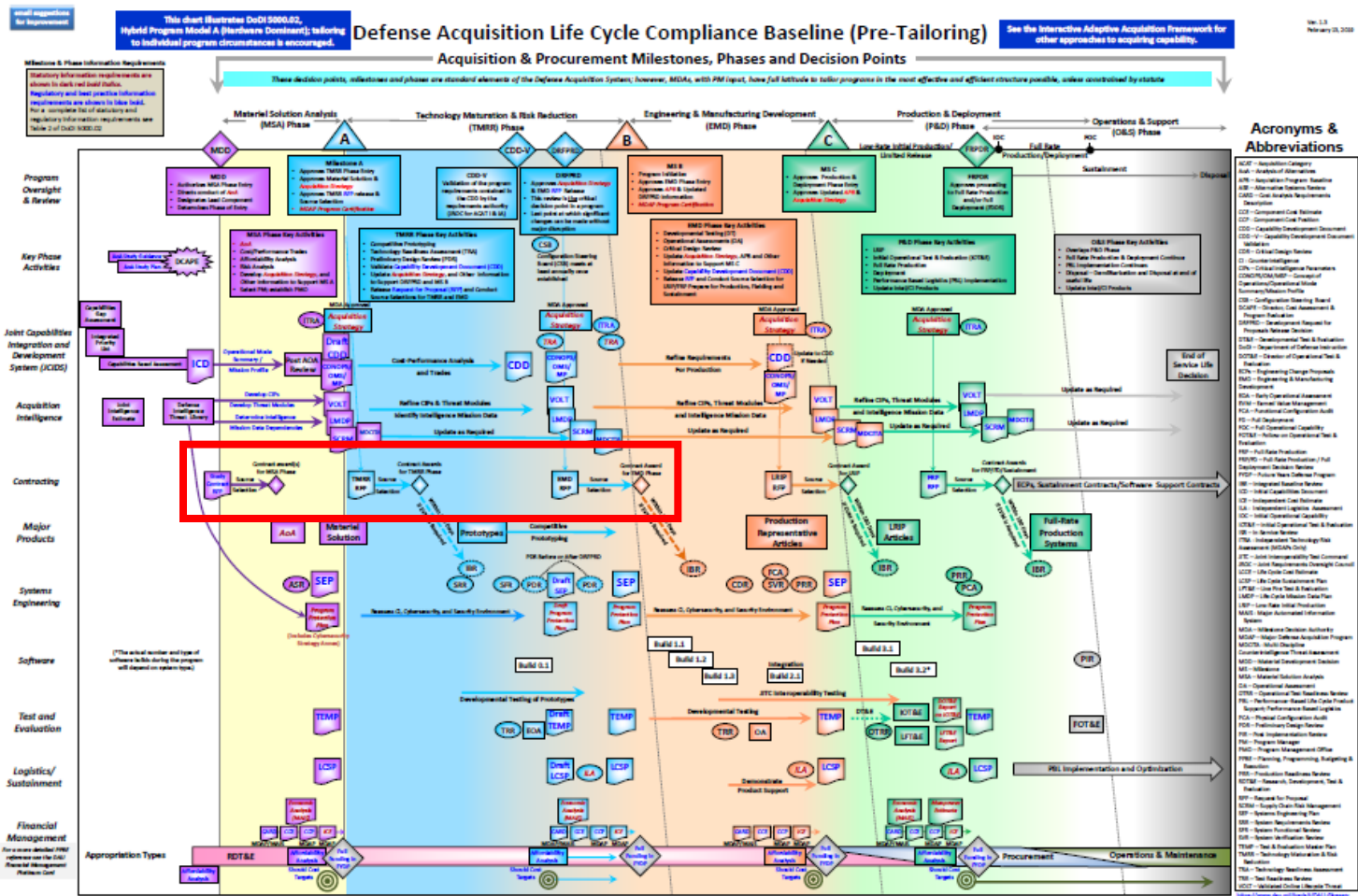


Figure 1. Investment Trends in Technology Research and Development.  
Source: Stratton-Feix (2017).

While the problems with the current acquisition process are apparent in a variety of areas, the system is too large and complex to address all the problems at once. This study focuses on the contracting portion of the DOD acquisition process with a non-FAR-based approach to improve efficiency. This focus area is highlighted within the Defense Acquisition Life cycle in Figure 2.

This paper will be divided into three sections. The first section will scope the problem space in a specific community in Special Operations Forces (SOF), called Naval Special Warfare (NSW), and discuss the gaps in acquisition contracting. In the following section, we will define the OTA contracting process and discuss its application as an alternative contracting vehicle. The final section will analyze our application of an OTA in our use case; procuring a technological capability called Interactive Synthetic Environment (ISE) at the Naval Special Warfare Command (WARCOM) to aid in the acquisition of an Unmanned Aerial System (UAS).



The red box indicates a small portion of the defense acquisition process. The purpose of this study aims to identify, discuss, and provide recommendations to optimize the acquisition decisions and activities within this contracting space. Contracting will be discussed in depth in subsequent chapters.

Figure 2. Defense Acquisition Lifecycle. Adapted from Defense Acquisition University (2019).

## **II. BACKGROUND**

This paper will provide recommendations to improve the efficiency in the acquisition of emerging technology and prototypes within NSW. Specifically, this paper will examine the contracting portion of acquisition. We will analyze a use case utilizing a non-traditional contracting vehicle called OTA to procure a prototype of a new technology capability in NSW. We will discuss our process to provide useful data and recommendations for future acquisition decisions and improvement.

In this chapter we will begin by providing some context about NSW and the SOF community. This will provide the reader an overview of SOF, what they do, why it matters, how it is changing, and how acquisitions, specifically contracts, relate to special operations forces. Then, we will provide a summary of how we recommend improving acquisition in NSW using OTAs to support acquisition of new technology.

### **A. THE CHALLENGE WITH ACQUISITION PRACTICE TODAY**

In the past, SOF have enjoyed a significant advantage over their adversaries in missions such as counter-terrorism. Historically, SOF were sometimes decades ahead of their adversaries in the special mission equipment they trained with and utilized on mission, giving them a tactical advantage in achieving mission success and mitigating a significant amount of risk to their own personnel.

Today, people around the globe can access and procure cutting edge technology with their home computers from commercial vendors and have it on the battlefield in a matter of days. Current acquisition practice in NSW, and SOF in general, is not keeping pace with the competition in the global marketplace. This is especially apparent in rapid employment of novel technology and the procurement and fielding of cutting edge equipment. The military created SOF to be a smaller, more flexible force that can be adaptable and quickly deployed as first responders in a wide range of military scenarios, yet, today they face adversaries who are much more flexible and agile due to the way they acquire their capabilities.

Adaptation is necessary for SOF to continue to operate in the spirit of its genesis. If the DOD does not adapt, America is forfeiting their advantage as a global power and opening the door for innovative competitors to assert dominance. If the acquisition process that SOF employ do not adapt, SOF may become irrelevant in the future multi-domain fight.

## **B. INTRODUCTION TO SPECIAL OPERATIONS FORCES**

SOF of the U.S. Armed Forces are organized under United States Special Operations Command (SOCOM), the unified combatant command that oversees the subordinate Special Operations Component Commands of the Army, Marine Corps, Navy, and Air Force. These include the Air Commandos, USMC Raiders, Army Rangers, Green Berets, and Navy SEALs; collectively, they are generally considered the nation's elite fighters and tacticians.

The Chairman of the Joint Chiefs of Staff identified five current and enduring threats in the new National Military Strategy: Violent Extremist Organizations, Russia, Iran, North Korea, and China. Special Operations Forces are the main effort in every location Al Qaeda and Islamic State of Iraq and Syria (ISIS) are found. From Afghanistan to the Middle East, and parts of Africa to include Somalia and Libya, SOF is present to disrupt, destroy, and deter these Violent Extremist Organizations. SOCOM plays a critical role in the global campaigns but has the fewest number of personnel and consumes a tiny amount of the DOD budget. (Thomas, 2017b).

SOCOM operators are specially trained, often relying on unconventional methods and resources, including special equipment, weapons, and tactics in their engagements. They are typically deployed in operations against guerillas, insurgents, or irregular forces, and are often associated with unconventional warfare and counter-insurgency. A hallmark of their effectiveness, and a key driver of their performance, is their agility and adaptiveness. They have the ability to deploy and operate on short notice in often novel missions.

This adaptive characteristic relies on an acquisition process that can respond rapidly to critical mission requirements today, but also, is visionary and agile in testing and

implementing future capabilities and tactics to respond to the unknown conflicts of tomorrow. Operators use a wide range of hardware and software, and frequently develop urgent needs for new specific capabilities not previously anticipated. They work with a variety of systems, all generating a constant flow of demands for new solutions.

There is a strong do-it-yourself ethos amongst SOF; problem-solving along with practical and tactical flexibility are highly valued. This frequently involves reimagining existing equipment to meet new or previously unmet needs (Leonard et al., 2018).

## **1. How Is SOCOM Changing?**

While we are prepared for continued global counterterrorism operations, SOF also executes a variety of critical missions in support of activities to counter every threat facing our Nation. The National Security Strategy (NSS) and the National Defense Strategy (NDS) emphasize the requirement to compete with our rivals and recognize that near-peer competition reemerged as a central challenge to the U.S. and its interests. SOF is uniquely capable of effectively competing below the level of traditional armed conflict and across the spectrum of conflict as part of the Joint Force. (Thomas, 2017b, p. 3)

Currently, SOCOM is forcing its organizations to reflect on how they have been conducting business to adapt to the current political shifts and global trends. As in any transitional period, status quo processes need to be analyzed to ensure that they are continuing to support the refined direction of the organization. “To keep pace with the accelerating rate of change, let alone get in front of it, we must build agility—both operational and institutional - into all that we do” (Thomas, 2017a, p. 14).

SOCOM and DOD are struggling to adapt their acquisition practices. As industry moves faster in developing and fielding novel technology and capability, adversaries are gaining an advantage because they are not hampered by bureaucracy in their speed to procure and employ new or advanced capabilities ahead of U.S. forces.

As stated in the 2017 SOCOM Posture Statement before the House Armed Services Committee, “in pursuit of increased lethality and other effects we will continue to streamline our efforts to rapidly prototype and experiment to field needed capabilities” (Thomas, 2017a). Through research and development, SOCOM continues to support agile

acquisition through academia, non-traditional partners, and other government organizations (Thomas, 2017a).

## **2. Naval Special Warfare**

Naval Special Warfare (NSW) is one component of SOCOM composed of about 10,000 people, consisting of Sea Air, Land (SEAL) and Special Warfare Combatant Crewmen (SWCC) operators, as well as the critical enablers that support operations. Their mission is to “man, train, equip, educate, deploy, resource, and sustain forces to conduct direct action and special reconnaissance, support advise-and-assist programs, and build partner capability, in or out of the maritime environment, by employing tailored capabilities in support of military commanders, chiefs of mission, interagency, and foreign partners and allies” (USSOCOM Office of Communication, 2020).

Agile acquisitions help NSW fail fast, learn fast, and recover fast, leaving acquisition professionals plenty of time, money, and energy to explore new concepts to support warfighter development in the 21<sup>st</sup> century. We are attempting to outline an alternative process for acquisition in SOF using a non-FAR based approach to reduce traditional barriers in DOD acquisition. We will analyze an OTA, where acquisition is supporting procurement and utilization of emerging technology, to procure and develop an ISE, a technological MVP that will support acquisition.

### **C. NAVAL SPECIAL WARFARE ACQUISITION PROCESSES**

Imagine, for example, a SEAL Platoon of 20 warfighters deployed with a reconnaissance mission in a politically sensitive, denied environment against a developed state adversary. Intelligence within NSW, and across other U.S. Defense agencies indicates that the enemy has a new detection system capable of alarming against the insertion of SEALS in the water and over land. Due to the risk involved with this mission, predominantly due to the existence of this new enemy detection system, the approval of the mission is denied or delayed. Since acquisition of counter-system will take longer than a year under current FAR acquisition processes, that SEAL platoon and the next SEAL platoon relieving them, are unable to operate and support U.S. intelligence requirements.

To address this kind of problem, NSW attempts to procure the new detection system. If procured, operators would be able to test against this system and learn about its vulnerabilities. New technology may be needed in order to defeat the system, or tactics may be adjusted to mitigate the probability of detection. Since this is a significant intelligence requirement for the U.S., the requirement is validated, and money is allocated for procurement. Assuming the acquisition process went smoothly, it took one year to get the new system in the hands of NSW tacticians.

One year after the system is procured, NSW has learned about the complexity of the new technology and is able to defeat the detection or reduce enough risk for the mission to be approved. However, it has been two years since the initial concept of operation and the intelligence environment in this location has changed significantly. The adversary has now built up even more robust detection and denial technologies. Missions approvals continue to be denied due to these new adversarial technologies and the intelligence gaps that exist because of their existence. NSW is unable to operate and the adversary can continue to operate and grow in the shadows of U.S. intelligence.

NSW's acquisition loop is being outpaced by the adversary and critical operational opportunities are missed. NSW was designed to operate in these politically sensitive and denied areas, but a slow acquisition loop prevents NSW from procuring new technology. This leads to missions not being approved due to high risk, or worse, this endangers the lives of U.S. military members who operate in these scenarios.

All NSW commands are required to check with mandatory sources such as Federal Prison Industries, People Who Are Blind or Severely Disabled, Defense Logistics Agency, and General Service Administration (GSA) before purchasing from the open market. If these mandatory sources cannot provide the good or service required, the command is authorized to use local vendors such as Home Depot, Staples, etc. They may use one of the six prime vendors such as Darley Defense, Atlantic Dive Supply, Quantico Tactical, etc. This is where prototype projects such as ISE run into problems and why OTAs are authorized by Congress.

In Chapter III, we will discuss the specifics of traditional FAR based contracting and OTAs.

#### **D. IMPROVING ACQUISITION IN NAVAL SPECIAL WARFARE**

This thesis is attempting to create a template for future acquisition in NSW using a non- FAR based approach to reduce traditional barriers in DOD acquisition. We will analyze a use case of an OTA being applied to the development and procurement of an emerging technology to capture the success or failure of this process and provide recommendations for the future acquisition professionals and NSW leadership.

The big question being examined in this research is how an OTA be used as an alternate pathway in acquisition to support NSW units? The OTA is a recently reformed contracting process designed to increase acquisition efficiency in emerging technology areas. The OTA process is less restrictive than the traditional FAR process and allows for increased collaboration and competition amongst industry vendors for desired capabilities from the warfighter. OTAs are restricted to specific activities, mainly research, development and prototyping (McCormick, 2019). However, the ability to use OTAs to support research, development, and prototyping makes them suitable to be used as an alternative for innovative technology acquisition supporting special operations forces in the DOD.

As a specific example and use case, this research analyzes the procurement of a minimally viable product (MVP) of the interactive synthetic environment for warfighting development (ISE) to support acquisition agility within NSW. The desired prototype virtual environment (ISE) will make it possible to collect valuable usage and design data on current and future capabilities. That data will better support decision-making and engineering refinement to capabilities at a fraction of the cost of traditional prototyping.

#### **E. REVIEW**

In this chapter we introduced U.S. SOF and NSW communities to explain why an agile acquisition process is critical to respond to novel mission sets in time sensitive situations. The current contracting vehicles used in the NSW acquisition process do not

adequately complement effective employment of special operations forces i.e. NSW personnel. Great powers, like China and Russia, are encroaching on U.S. military supremacy, especially in the areas of new technology and capability development. To address this problem, this study focuses on the use of the OTA in DOD acquisition as an avenue for improvement in acquisition agility.

The OTA is a non-traditional contracting process designed to increase acquisition efficiency in emerging technology areas. The OTA process is less restrictive than the traditional FAR process and allows for increased collaboration and competition amongst industry vendors for desired capabilities from the warfighter. This research analyzes a use case of an OTA in the development and procurement of an emerging technology prototype, ISE, to capture the success or failure of this process and provide recommendations for future acquisition professionals and NSW leadership.

In the next chapter, we will explore and provide an overview of contracting in traditional DOD acquisition processes and how it compares with OTAs. We will discuss OTAs in detail and why they should be used more frequently within NSW when purchasing new prototype technology.

THIS PAGE INTENTIONALLY LEFT BLANK

### **III. OTHER TRANSACTION AUTHORITIES**

#### **A. WHAT IS AN OTA?**

“An OTA is a streamlined contracting vehicle that brings innovative research findings and state-of-the-art prototypes from industry to the Federal Government. Congress created the first OTA as a contractual tool for NASA to acquire and apply breakthrough technologies at the advent of the Space Race” (IWRP, 2020). Congress gave the DOD other transaction authority in 1990 under 10 U.S.C . § 2371 for research projects. 10 U.S.C. § 2371b (Figure 4)-granting authority to use OTAs for prototype projects and follow-on production. For follow-on production, an OTA can only be used to fund prototype projects that were successfully awarded and completed. An item that was initially funded using an OTA should be added to a future planning budget.

“OTAs enable fast acquisition of critically needed technologies in areas as diverse as armaments, satellites, medical devices, and electromagnetic spectrum technologies” (J. Fickling, PowerPoint Slides, June 16, 2020). OTAs are awarded faster than FAR based contracts, have far fewer barriers to competition, and utilize consortiums to help the end user think outside of their box. Consortiums, (i.e., organizations of several businesses joining together as a group for a shared purpose) are used in OTAs. If you have a prototype in mind, but have no idea how to create the product, a consortium is the perfect place to get assistance. A consortium allows the military or government agency to state a requirement or problem they are trying to solve and allows for traditional and non-traditional defense contractors to submit white papers describing their ideas on how to tackle the challenge for consideration. Nonprofit organizations, academic institutions and defense contractors typically make up a consortium (Peters, 2019). The outside management a consortium offers a large amount of flexibility and efficiency to the OTA process. Whereas the process to secure standard government contracts can be incredibly lengthy, the duration from releasing of a white paper to issuing an award through a consortium could be little as ten weeks. The case study described in this paper utilized Information Warfare Research Project (IWRP) to facilitate the use of the OTA in developing and procuring ISE. The A in OTA often stands for Agreement. Since an OTA is not regulated by the FAR, it is not considered a contract. Another way to look at an OTA is to

think about two parties trying to reach the same end goal. One of those parties is going to pay for a good or service and the other party receives money in exchange for providing a good or service. Most of the DOD and several government agencies have adopted the use of OTAs for research and development and prototype activities (Reynolds & Angle, 2018).

There has been a broad increase in DOD OTA obligations in the last five years as seen in Figure 3. “In total, DOD OTA obligations have increased 352 percent over the last three years,” and this trend suggests future growth across all joint services (McCormick, 2019). While other services, most notably the Army, have substantially increased the usage of OTAs, the Navy has been the laggard, accounting “for less than one percent of the defense total defense obligation between FY 2015 and FY 2017” (McCormick, 2019). While initial OTA usage in the Navy was limited, more recently, it seems that the Navy is starting to catch on to the trend, spending \$24.96 million in OTA in FY 2018, compared to the \$7.3 million combined total from FY 2015 to FY 2017 (McCormick, 2019).



Figure 3. Defense OTA Obligations by Customer, 2014–2018. Source: McCormick (2019).

## **B. DEVELOPMENT OF THE SOW FOR ISE**

The WARCOM N87 Director of unmanned aerial systems (UAS), first reached out to NIWC in early June 2020 with a specific interest in IWRP's Consortium. After a few weeks of emailing NIWC back-and-forth, we connected with a representative from NIWC Atlantic. They became our primary point of contact and entry point for the Consortium/OTA process. WARCOM gave the NSW students at NPS permission to act as consultants on their behalf to develop ISE using an OTA contracting vehicle. By the middle of August 2020, we began working with IWRP representatives to generate a SOW for the desired ISE capability.

The generation of the SOW was completed by leveraging a variety of sources including acquisition documents from a similar capability as well as input from a vendor. An NPS Provost brought one company to NPS in November 2019 for an unrelated technology demonstration. NPS leadership were working with several companies to foster relationships between industry and academia. Representatives from this company informally met NSW representatives working at NPS and initially began discussion about potential avenues for partnership. Over time, this morphed into back-and-forth correspondence between NSW academia representatives at NPS, and this company. Some of the initial brainstorming sessions between these stakeholders helped shape the SOW as the scope of work was refined. In addition to the influence from industry, we also leveraged the SOW from a previous Marine Corps contract for a similar capability. Both sources helped jumpstart SOW development. The SOW can be viewed in Appendix C.

The IWRP consortium seemed like a perfect fit for our project since it brought together NPS students and faculty, WARCOM government contractors, and industry professionals. NIWC has access to the IWRP consortium that supports research, development, and prototyping. IWRP uses a company called Advanced Technology International who is an OTA Consortia management firm. This firm manages eight different government consortiums such as undersea technology, countering weapons of mass destruction, and aviation and missile technology.

### C. Why OTAs ARE PREFERRED

Unlike the traditional FAR contracting process, OTAs use the consortium which allows government and industry to communicate more openly. It was highly encouraged by IWRP personnel to interact with the various vendors throughout the OTA process. Once the white papers had been released, our team reached out to several vendors to establish communication with the ones we liked the best. In chapter 4, we go more into the vendor interactions and product demonstrations. We were able to have free and open discussions with as many or little vendors as we choose. The only topic we were told to stay away from was budget. IWRP personnel repeated several times that the benefit of the consortium was being able to balance cost with the technical aspect. Both cost and technical performance needed to be equally weighed.

OTAs were created to allow the DOD and other government agencies to bypass certain procurement regulations by allowing them to be more innovative. An OTA can allow for “much greater speed, flexibility, and accessibility in performing research and prototyping activities” (Stevens, 2020). The government is notorious for purchasing services and supplies that are “good, fast, and/or cheap.” Going with the lowest bidder or cheapest price is not always the best solution. Contracting officers review the RFP and choose the best vendor usually based on price and availability of the item or service. The SME requesting the item or service does not have the ability to interact with the vendor once the RFP’s have been submitted. In the past, we have seen both East and West Coast NSW commands included on the same contract to try and save time and money. For example, one of the commands SME’s had submitted a sole source justification because their equipment requires certain certifications that the other commands do not have. The contracting officer failed to take into consideration the requirement for different certifications needed for maintenance and relied on one contract for both East and West coast commands. As a result, the vendor who was awarded the contract, did not have the proper certifications to conduct maintenance on one of the commands equipment. By choosing the cheapest source and the not allowing the SME to interact with the vendor, the contract was only in effect for two of the three commands.

OTAs are more flexible than traditional contracting methods. Since OTAs are not a contract, both parties can make sure the good or service being developed caters to the unique

characteristics of the program and the requirements of the end users.). “OTAs also can free up government procurement personnel, particularly when contractors are selected to run consortiums whose members compete for OTAs. In these situations, the government will announce its interest in receiving from consortium members white papers that address a particular topic or problem, and based on these papers, the contractor or agency may select a number of consortium members to submit more formal proposals, followed by a further down select process” (Reynolds & Peters, 2018).

There will always be risks involved using an OTA for prototypes. “A prototype project is used to evaluate the technical or manufacturing feasibility or military utility of a particular technology, process, concept, end item, effect or other discrete feature” (J. Fickling, PowerPoint slide, June 16, 2020). Similar to a copyright, if nobody has developed your idea, you can consider it a prototype and do an OTA through a consortium. The FAR was written to protect the government and taxpayer interests and people might wonder if money is being wasted on a new prototype. On the other hand, in the private sector, companies often develop technology much faster than the government due to the lack of regulations. For example, the TALOS project, the development of an exoskeleton suit to be worn by special operators, was intended to be outsourced through a consortium type forum where the private sector could offer ideas and solutions for a future battlefield concept. The TALOS suit looked similar to the suit worn on the popular XBOX video game HALO. The acquisition idea was taken from the Red Bull Stratos project (Red Bull, n.d.) where Austrian skydiver Felix Baumgartner jumped out of a helium balloon from space to Earth. The project took approximately two years from start to finish. If the government had done this project, Mr. Baumgartner would have passed away before completing his mission.

#### D. OTA PURPOSES

The federal government allows OTAs to be used for the following: research, prototype, or contract for follow-on production. For ISE, we fell under prototype since we were creating, designing, and developing technology for defense purposes. Other military units have used modeling and simulation in the past, but none of them shared the same criteria as ours. By building ISE, we will be able to use students at NPS to test and evaluate different prototype

unmanned aerial systems (UAS). ISE is also envisioned for use as a training tool to teach students how to fly UAS's. The increased use of UAS on the battlefield are hypothesized to allow more freedom of movement in and around the battlefield for U.S. forces.

Table 1 describes how OTAs can only be used for prototype if one of the following applies.

Table 1. Circumstances for OTA Use for Prototypes. Source: Peters (2019).

- At least one nontraditional defense contractor significantly participating in the project
- All significant participants are small businesses or nontraditional defense contractors
- At least one-third of the total cost of the prototype project is provided by nongovernment participants; or
- The senior procurement acquisition official provides in writing an explanation of the exceptional circumstances justifying an OT.
- Follow-on production can only be conducted when:
- The underlying prototype OT was competitively awarded, and
- The prototype project was successfully completed.

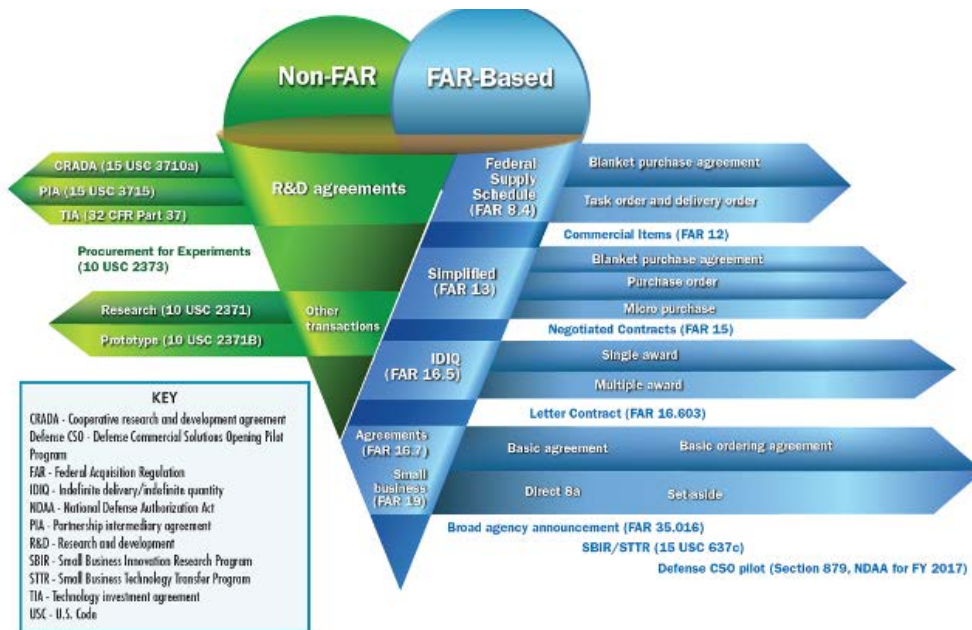


Figure 4. Non-FAR versus Traditional FAR-Based Contracting. Source: Bold (2019).

## **E. FAR-BASED CONTRACTING**

### **1. Contracting Overview**

“The vision for the Federal Acquisition System is to deliver, on a timely basis, the best value product or service to the customer, while maintaining the public’s trust and fulfilling public policy objectives” (FAR 1.102(a)). “The procurement process is defined as the processes required to acquire goods and services from outside the performing organization” (AcqNotes, 2019). The DOD has three processes: The Defense Acquisition Process, the Joint Capability Integration Development System (JCIDS), and Planning, Program, Budget, and Execution (PPB&E) process. When procuring goods and services for the DOD, it is the buyer’s job to make sure they are being good stewards of taxpayer dollars. Buyer’s must make sure they are only purchasing the amount needed for a specific requirement and at a fair price. Procurement for the DOD uses a binding contract whether it’s a government credit card, OTA, or a FAR regulated contract (AcqNotes, 2019).

Generally, the current NSW contracting timeline can be very lengthy. First, the Requirements Department (N8) must validate a requirement for the good or service. This is done by holding review boards to vote on the good or service, make sure there isn’t a conflicting contract already in place, and that the commodity can legally be purchased. The N8 is responsible for bridging the gap between the SEAL Teams and WARCOM. Made up of active duty, government employees, and contractors, the N8 is broken into several commodities such as Visual Augmentation Systems (VAS), UAS, and communications.

Once a requirement has been generated, the customer needs to generate a Request for Proposal (RFP), then a Statement of Work (SOW) and possibly a Sole Source Justification. Once all the documents have been filled out, they are sent to Contracting Office and reviewed. Next the Contracting Office begins Market Research and looking into the possible vendors to fulfill the contract. During the Market Research phase, the customer has little to no interaction with possible vendors. According to the Force Logistics Manual, “the commands Judge Advocate General should be notified in advance and in writing of the date, location, and subject of any formal or informal briefing to government personnel by representatives of industry for the purpose of providing information on proposed services, commercial materiel,

research areas, research descriptions, proposed exploration, or technical inquiries” (Naval Special Warfare Command [NSWC], 2017, para 5500.a). The Contracting Officer is also the person who awards a contract to a specific vendor. The customer is typically not involved in awarding a contract unless a sole source justification is used and those are not always guaranteed.

The Logistics Department (N4) is responsible for submitting contracts to the contracting office. The N4 is made up of Supply Officers, Civil Engineering Officers, Logistic Specialists, Seabees, and Gunnersmates. They are not provided much training in contracting before coming to a command and the process can seem a bit overwhelming at times. It is important for the N4 to fully understand the requirement before submitting any documents to contracting. Most end users do not have knowledge of acquisitions or constraints in the contracting process and can become frustrated. The N4 acts as a liaison between the command and the contracting office. This lack of interaction and understanding of different departments and processes, is often a point of friction in the acquisition process between warfighters and acquisition professionals.

In NSW, a typical example for procuring a new capability may look like this. An acquisition professional representing a SEAL Team meets a vendor at a SOCOM approved trade show. The vendor demonstrates a new technology on how to counter a UAS threat. This capability is believed to be required by NSW to carry out missions. Since this is a new prototype technology, mandatory sources cannot be utilized. The N4 on a SEAL Team takes the requirement to the N8 at Naval Special Warfare Group ONE or TWO and submits the required acquisition documents to the contracting office. These documents include justification for the requirement as well as detailed information that defines the capability. The N4, with support from the N8 and Operations Department (N3), fill out the SOW, RFP, and sole source justification. The N3 is required to validate the impact to the Team’s mission with or without the good or service.

The N4 submits the documents to the contracting office. Usually a week, or more, will transpire before the contracting office sends the documents back to the N4 with feedback and errors that need to be fixed before resubmission. After a multi-departmental coordination

effort, between the N4, N8, N3, and the contracting office, documents are fixed and resubmitted.

Once the contracting office has the required paperwork needed, departments are forbidden to communicate with a vendor in fear of unauthorized commitments. People without the proper training, may give information to a vendor giving them an unfair advantage to other vendors competing for award. The contracting office also does not want anyone negotiating the terms of the contract committing the government to accept pricing and delivery “In accordance with FAR 1.602-3, it is illegal for personnel without contracting authority (i.e., warranted contracting officer or warranted government purchase cardholder) to order supplies or services, change the terms of existing purchase(s), or commit the government to pay a vendor for any supplies or services. An unauthorized commitment is not binding solely because the government representative who made it lacked the authority to enter that agreement on behalf of the Government” (NSWC, 2017, para 5400).

Several months may go by without any status from the contracting office. The vendor may send correspondence to acquisition professionals from NSW asking if they are still interested in the product. The vendor may also communicate that they have made improvements to the original system that was shown over six months ago. Not being able to interact with the vendor or help conduct market research makes the N4, N8, and N3 unable to provide feedback to the vendor and makes them less influential in shaping the development of this new technology for NSW use.

The result of the process described above is that when a contract is finally awarded, a year may have gone by since the initial demonstration at the trade show. During this year, there has been almost no interaction between the vendor, the end user, the operations department, or other NSW acquisition professionals. During that year, newer technology may have rendered the original capability less effective or obsolete. In addition, adversaries that are not constrained by this contracting process may have already purchased this technology, improved upon it, and begun using it on the battlefield against American military forces. Acquisition is a significant bottleneck in the U.S. contracting process that impedes NSW in their ability to be responsive with new technologies in missions against a nimbler adversary. Now we will outline our process for helping to close this observed gap.

## **2. FAR Based Contracting Methods**

There are several types of FAR-Based contracting methods, to include *fixed price*, *cost reimbursement*, and *indefinite-delivery-indefinite-quantity (IDIQ)* contracts (Figure 4). A contract is an agreement between two or more parties. It must contain: Offer, Acceptance, Consideration, Legal, and Competent Parties. *Fixed price contracts* are used when risk of performance is low (e.g., purchasing technology that is mature, proven processes, commercial off the shelf items, etc.). The contractor is obligated to deliver the requirement called for by the contract at a fixed price. A contractor will receive no more than the agreed amount, regardless of actual costs incurred. The amount of profit warned is dependent on the contractor's costs incurred. Cost savings become profit while cost overrun reduces profit or increases loss.

*Cost reimbursable* contracts are used when the risk of performance is high (e.g., cutting edge technology, unproven processes, untried materials, etc.). The government is obligated to reimburse the contractor for all allowable, reasonable, and allocable cost incurred, and to pay a fee in accordance with the contract terms. The contractor agrees to provide "Best Effort," which could result in delivery of nothing and the contractor is not held accountable. Any cost savings is returned to the government and any cost overrun is paid for by the government.

*IDIQ* or blanket purchase agreements are used when you are going to purchase several goods or services from a vendor but do not have a specified quantity of time of need. Basic Underwater Demolition School (BUD/s) used to have an IDIQ with Darley Defense and Drager for buying replacement parts for dive equipment. Drager had very long lead times for all the replacement parts for the Mark 25 dive rig and the IDIQ created a demand for the parts so they could be ordered when needed.

## **3. Contracting Steps to Award**

The following steps are involved in putting a FAR based contract into place through its eventual close-out. See Figure 5. This can all happen in a span of days or over many years, depending upon the size and scope of the procurement action.

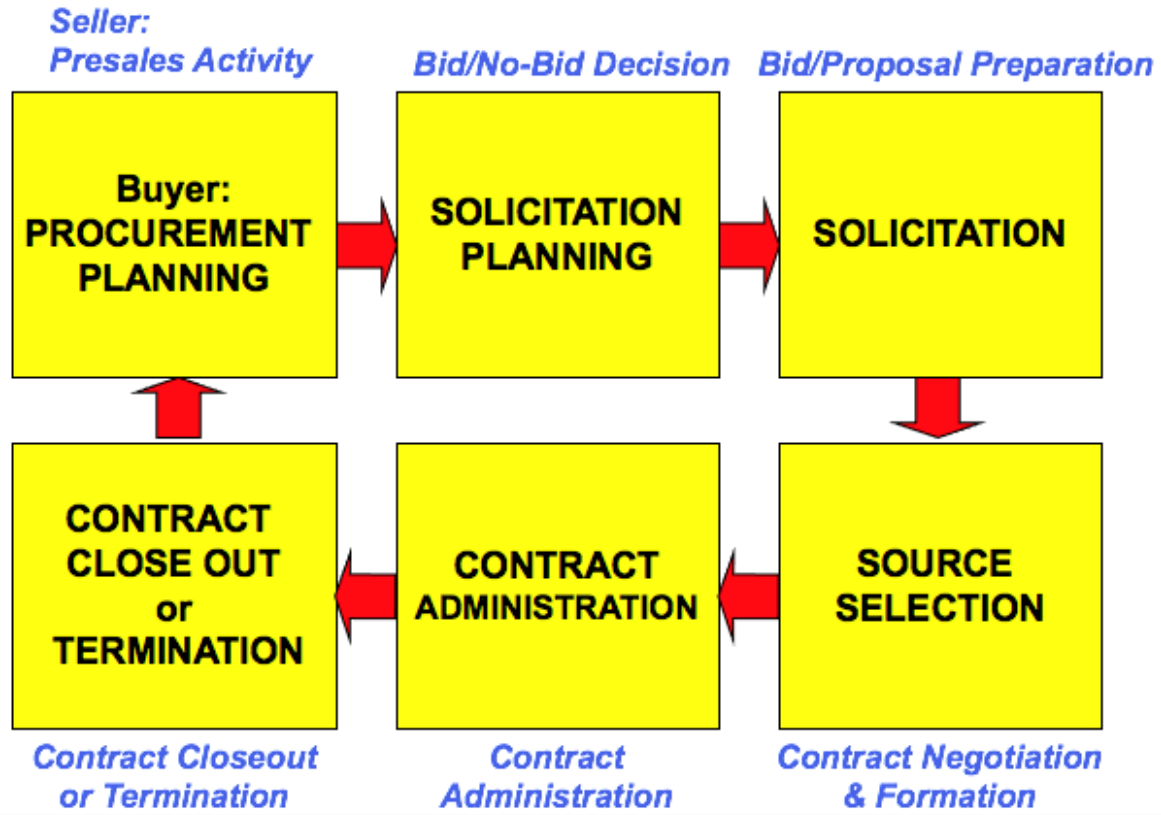


Figure 5. Traditional FAR Based Contracting Process. Source: Mortlock (2019).

*a. Procurement Planning*

During a lecture on procurement planning, Dr. Mortlock (2019) listed the following government’s considerations

- Whether to procure (outsource decision)
- How to procure (procurement method and contract type: Fixed or Cost Reimbursement)
- What to procure (products and services needed)
- How much to procure (quantity desired)
- When to procure (delivery schedule) (B. Mortlock, PowerPoint slides, October 17, 2019)

There are two different procurement methods, *competitive* and *noncompetitive*. *Competitive* allows for full and open competition. With this type of procurement method, a contract is usually awarded to the lowest priced bidder that meets all technical requirements. *Noncompetitive* methods of procurement are sole-source negotiations

meaning one specific vendor is requested to provide the product or service and requires approval. Dr. Mortlock (2019) covered seven exceptions to the full and open competition rule in accordance with FAR:

1. Only one responsible source and no other supplies or services will satisfy agency requirements.
2. Unusual and compelling urgency
3. Industrial mobilization; engineering, or research capability; or expert services
4. International agreement
5. Authorized or required by statute
6. National security
7. Public interest (B. Mortlock, PowerPoint slides, October 17, 2019)

***b. Solicitation Planning***

During the Solicitation Planning phase, the product/project requirements are fully documented, and potential sources are identified. The requirement must be stated in terms of mission need and minimum operational performance. In stating our needs to vendors, we try to be as vague as possible to allow for the maximum amount of creativity. We communicate in terms of performance rather than specifications and we never discuss budget. Evaluation factors must be developed in order to set priorities in general order of importance. For example: technical performance, past performance, cost, supportability, producibility, and management approach.

A Contracting Officer must conduct market research during this phase. Market Surveillance is conducted by attending trade shows, viewing research reports, reading trade journals and from symposia proceedings. Market Investigation involves collecting, evaluating & analyzing specific information needs to meet agency needs, identify potential sources, survey manufacturers, and analyze responses. If product or service is available, they can proceed with a commercial off the shelf buy. If the product or service is not available via commercial sources, a requirement for new development must be generated.

A RFP is generated and sent out to all potential vendors. A RFP must include what the system must do/service must accomplish; essential elements & characteristics; verification criteria and methodologies; and SOW.

The purpose of a SOW is to establish and define in clear, understandable terms what the contractor must do and what goods are to be provided or what services are to be performed for the contractor to be paid. A SOW facilitates contractor understanding and improves contractor proposal; helpful in data call, proposal evaluation and source selection, and provides a standard for contractor performance.

*c. Solicitation*

DOD “solicits” potential contractors to submit bids or proposals for required equipment and services using two basic methods, invitation for bid and RFP. An invitation for bid is more typical for fixed price production contracts for items such as repair parts. Discussions with bidders is prohibited and more than one bidder is expected. RFP’s are typically used for R&D, cost-reimbursable type contracts. The solicitation process requires formal, public advertisement on sites such as FedBizOps and GSA.

*d. OTA Solicitation*

We solicited our OTA through a request for white papers, in which the solicitation will state all evaluation factors and information. This allows the government to solicit information on potential pricing and prototyping within the scope of a particular project. Vendor must join a particular consortium in order to submit white papers and be in competition for an OTA award. “On the other hand, a board could issue a Broad Agency Announcement. Such an announcement will likely be general in nature and identify the areas of interest for a particular prototype. This allows the government to seek information from all parties who may be capable of satisfying its needs” (Peters, 2019).

*e. Source Selection*

This is a formal, structured process for evaluation proposals and selecting “Best Value” offers. It is the job of the Contracting Officer to make sure the best value good or service is going to be procured by the government. Best Value means the most

advantageous tradeoff between price and performance for the government. It is designed to prevent bias and ensures a “level playing field” for all offerors. The Source Selection Plan (SSP) must be prepared once a decision has been made to follow formal source selection procedures. It is a major document prepared in the solicitation process and approved prior to RFP release (B. Mortlock, PowerPoint slides, October 17, 2019). The Contracting Officer also debriefs unsuccessful offerors and lets them know why they were not selected. In chapter four, we will discuss the feedback report process used with the consortium.

*f. Contract Administration*

During the last phase of the contracting process, the Contracting Officer Representative (COR) will monitor the contract’s performance. A COR is in charge of managing the contract once it has been awarded. If the COR does not see a reason for the contract to continue, it may be terminated. There are two kinds of contract termination. *Termination for Convenience*, a sovereign right of the government, is not at all typical for private industry. Termination costs can be charged against the government if they were lawfully incurred by the terminated contractor. *Termination for Default* is when there has been a real deficiency in performance. This may happen if the contractor fails to make timely delivery, perform any contract provision, or make satisfactory progress thus endangering performance.

In March 2020, a group of NPS students, advisors, professors, and members of WARCOM discussed the game plan for ISE. Since NPS is an academic organization, collaboration with private companies is quite common. Companies donate money to NPS and in exchange, receive research done by students on various projects. One of the companies we started working with had software developers and designers that drew up a model of what Ise should look like. Getting the project on contract was our biggest concern. In Chapter IV, we talk about how we used the IRWP Consortium to solicit a vendor to fulfill our requirement.

## **F. REVIEW**

This chapter defined and discussed important features about the OTA contracting process and how this differs from traditional FAR contracting in the DOD. Our research concluded that there are many advantages in using a consortium for an OTA. IWRP conducted market research and found vendors that were interest in our SOW. Vendors work with IWRP in submitting all white papers and full proposals. All we had to do was talk to various vendors, answer questions and give feedback on the IWRP portal. We, the end users, were encouraged to talk to the vendors as much as possible. This is frowned upon in the FAR contract environment. The end user deals with the contracting office and isn't allowed to speak the vendors about job or product specifics. Hopefully NSW starts using OTAs more often for prototypes and new technology requirements.

The next chapter will discuss how we used an OTA in our case study for WARCOM. We will explain our case study and why we chose to apply OTA contracting processes. We will also provide context into the application of the case study technology.

THIS PAGE INTENTIONALLY LEFT BLANK

## **IV. ISE TEST CASE**

Our application of OTA contracting is in support of the procurement of technological capability, called ISE, at WARCOT. This chapter will discuss the concept of ISE and explain why we decided to use this as our test case. We will provide information about related work in synthetic prototyping and virtual environments and discuss how it has been used to benefit both industry and DOD in acquisition.

### **A. THE ISE TEST CASE**

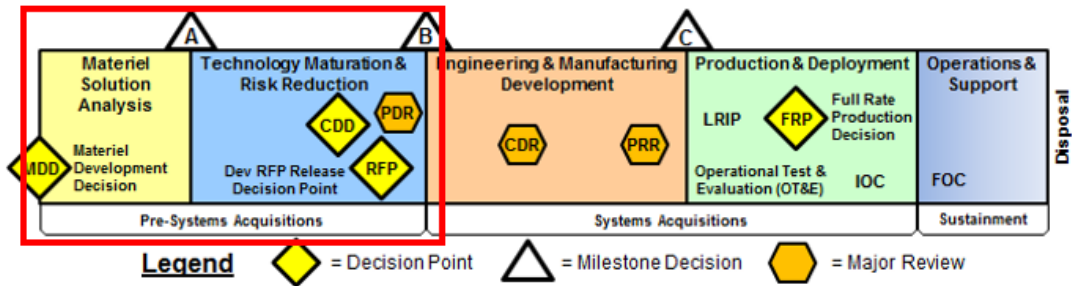
The NSW headquarters, WARCOT, has a particular department assigned to combat development and the management of existing programs that the community benefits from. One specific focus area in this department is the management of NSW UAS. These are various sized aerial drones that can have autonomous or remote-controlled capability to support Navy SEALs operating on the ground.

One specific UAS, called the ScanEagle, was developed by a subsidiary of Boeing to be a small, long-endurance, low-altitude aerial platform that is used for intelligence, surveillance, and reconnaissance. Like many other military systems, this UAS was originally developed by industry for non-military application and later adapted to the needs of the warfighter. The ScanEagle UAS program continues to be managed by acquisition professionals at WARCOT. Emerging technology that can be incorporated into the ScanEagle and new employment ideas for NSW to utilize this system, all provide the impetus for evolution of this existing capability. WARCOT is currently working towards the next generation of this capability.

The authors are working in collaboration with WARCOT as consultants for the development of the next generation ScanEagle. Our team is composed of SEALs, NSW supply, and WARCOT civilian acquisition professionals. The goal for our team is to utilize the reformed contracting process of an OTA and analyze potential increases in acquisition efficiency using this process. The OTA process should enable us to pursue development of ISE, an emerging technology capability that can aid in cost-effective system design and testing of desired capabilities for the warfighter. ISE will provide WARCOT with a new

tool that can aid in the development of the next generation ScanEagle, and we hope, future systems that WARCUM intends to explore.

The concept of ISE, which is a physics-based simulation environment, has already been proven to be an effective tool in aiding system design. In addition, ISE may be used as an alternative to some of the expensive and resource heavy tasks in physical prototype creation and operational testing. This specific area of the acquisition cycle has been highlighted in Figure 6. There has been ISE related work within the DOD as well as in industry. In the next section we will discuss some of these efforts and explain some of the potential benefits of the envisioned ISE prototype.



The red box shows the portion of the acquisition process where ISE would be utilized for virtual system design and refinement. An ISE tool provides timeline and cost reduction specifically in this phase of the acquisition process.

Figure 6. Major Capability Acquisition Process.  
 Adapted from Acq Notes (2020).

## B. SYNTHETIC PROTOTYPING RELATED WORK

The use of simulation and virtual environments in the acquisition process is not a new concept. There have been multiple initiatives to leverage virtual simulation and modeling to increase efficiency in system design, testing, and evaluation. Some of these initiatives have proven successful in theory but have not proven beneficial in execution; while other initiatives have disrupted traditional acquisition practices and led to new and improved operating procedures. In DOD, as well as in industry, it is important to

understand the benefits and limitations of using a virtual environment simulation tool effectively.

## **1. Synthetic Prototyping Success Outside of DOD**

One such success in commercial industry is with Boeing's 777 airframe. Like many programs in DOD, the Boeing 777 is a complex and expensive mobility platform where performance and safety are critical. The development of the 777 marked a new strategy in how Boeing designed and developed new airframes, with a much greater extent on modeling and simulation for virtual prototypes. "When the Boeing 777 entered service in 1995, it dramatically advanced the state of the art by being the first airplane ever to be 100 percent digitally designed in three dimensions using computers" (Spenser, 2009).

According to information from the July 2009 Boeing Frontiers Magazine, written by Jay Spenser, compared with traditional, physical mockup design techniques that were used for the Boeing 757 and 767 designs, the virtual process used in the Boeing 777 led to several design efficiencies. These include:

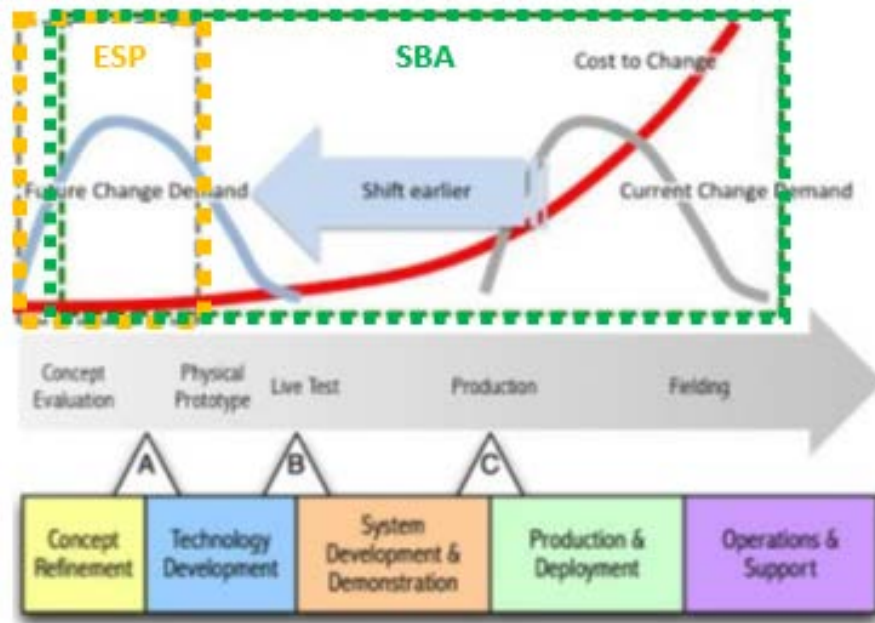
- Elimination of more than 3000 assembly interfaces
- 90% reduction in engineering change requests (6000 to 600)
- 50% reduction cycle time for engineering change request
- 90% reduction in material rework
- 50x improvement in assembly tolerances for fuselage (Spenser, 2009)

The use of virtual prototyping was an enormous success for Boeing. The heavy reliance on modeling and simulation was used throughout the entire development and fielding process. From product proposal, product design, modeling the factory environments, testing the system, modeling variant and enhancements, and even to train pilots and maintainers. The use of this technology helped aid decision makers in avoiding risk and maximizing value in practically every stage of the airframe's development to ensure timeliness of schedule, cost-effectiveness, and quality performance that meets the desired needs of the company and customer (Spenser, 2009).

## **2. Synthetic Prototyping in DOD**

Early Synthetic Prototyping (ESP) and Simulation-Based Acquisition (SBA) are two concepts that the DOD has explored to aid acquisition. The two concepts are similar

in theory and leverage virtual prototyping and testing rather than costly physical mock-ups and live testing. ESP and SBA differ in how and where they are applied in the acquisition process. These differences are shown visually in Figure 7.

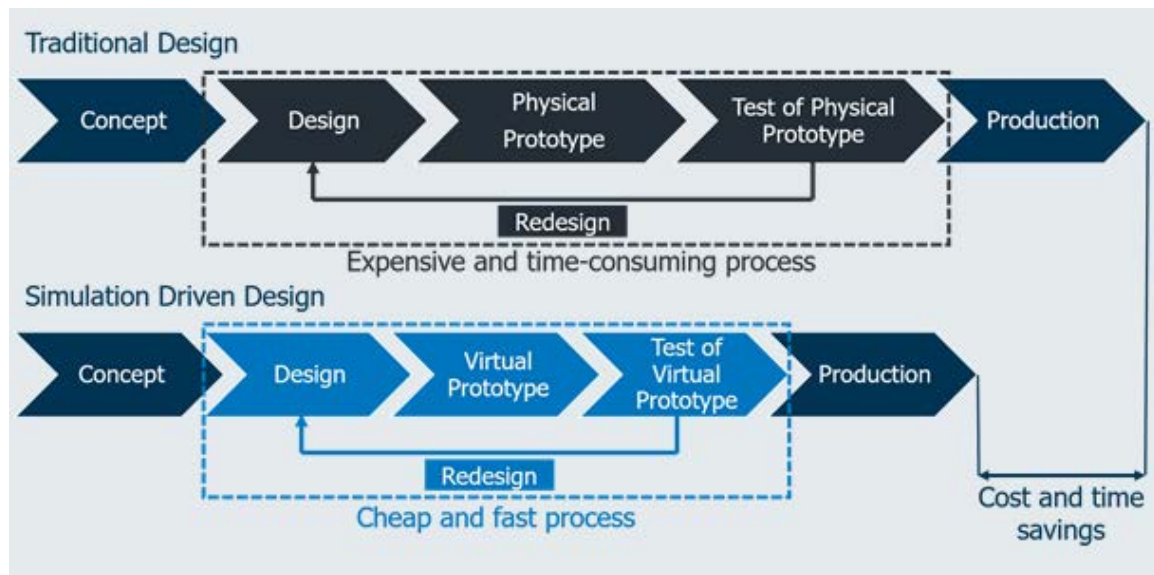


ESP (orange box) targets change early in the acquisition process when cost is low and SBA (green box) attempts to address the entire life cycle.

Figure 7. ESP and SBA in the Acquisition Process.  
Adapted from Murray et al. (2014).

SBA attempted to address the entire life cycle from idea generation and concept evaluation through fielding and employment. Despite interest in the concept, SBA failed to achieve success with that large of a range in the acquisition process. Part of the reason for its failure was that the use of simulation at each phase of the acquisition process differs. Unlike SBA, ESP addresses the unique needs only in the early phases, pre-milestone A, when change is typically much cheaper than later in subsequent milestones. This idea focuses on early concept development when costs are relatively low, and it is easier to make changes and shape major design decisions. These lessons helped aid DOD's understanding of how best to utilize synthetic prototyping and virtual environments in the acquisition process.

ESP also has desired use in aiding source selection in competitive prototyping. Competitive prototyping incentivizes “vendors to provide innovative solutions and ensure acquisition dollars are spent toward development and evaluation of a production solution” that meets the warfighters needs (Smith & Vogt, 2017). Traditionally, high costs are associated with competitive prototyping to include multiple full-scale mockups for evaluation against alternative options. Not only is there cost associated with the prototype manufacturing, but there is commonly travel cost, venue cost, time cost, and manpower costs associated with the evaluation. The cost and time savings between traditional and simulation driven processes can be seen visually in Figure 8.



“It is important to note that physical and virtual prototyping are not two competing technologies; they are complementary. It is not recommended to try and entirely eliminate physical prototyping from the design process, but instead, integrate virtual prototyping and simulation at appropriate development stages” where physical prototypes and field testing have particular weaknesses and limitations (Churazova, 2020).

Figure 8. Virtual Prototyping versus Physical Prototyping Process. Source: Force Technology (n.d.).

By implementing a virtual environment for prototyping, in this study ISE, NSW can develop a UAS system that meets its requirements prior to material development of the physical system ESP can be very beneficial to the government by lowering costs in the long run. It can be used in testing all types of prototype vehicles in the DOD without having

to spend millions in actual production. ISE will allow us to create a “virtual environment before a physical prototype is produced. The ability to refine requirements facilitates pre-milestone A concept refinement and supports acquisition process improvement and agility.” (Murray et al., 2014).

“To facilitate the evaluation of trades between capabilities and resources, tools are required to visualize information” (Smith & Vogt, 2017). This is where a robust, physics-based, virtual world is essential to provide rapid exploration of engineering design tradeoffs in an operationally representative environment. See Figure 9. Performance parameters, system attributes, reliability, and employment of a system can be explored in this comprehensive virtual environment.

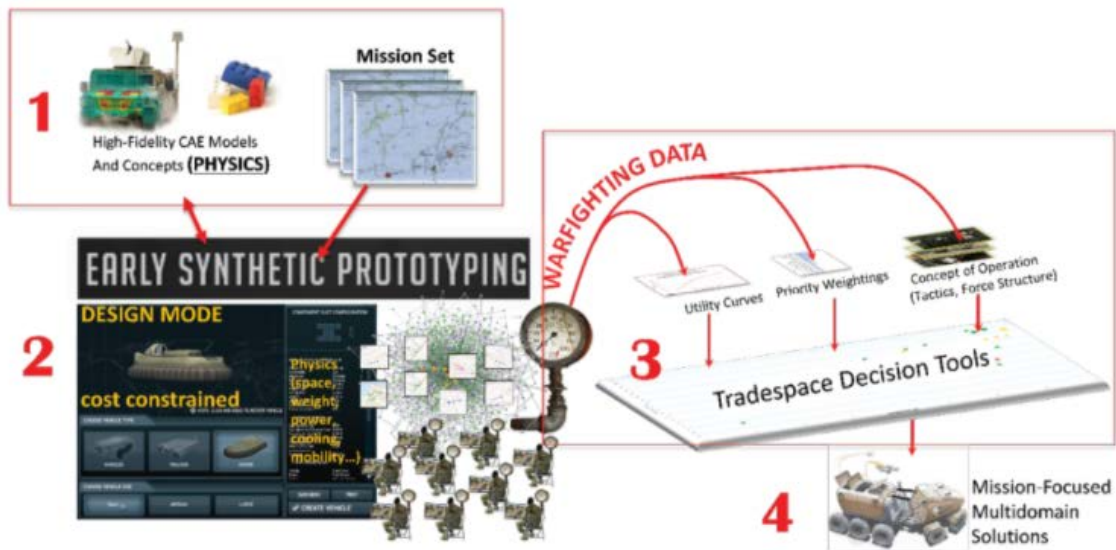


Figure 9. Physics-Based Digital Warfighting Connection to Tradespace Decision Tools. Source: Smith and Vogt (2017).

ESP creates a digital operational assessment loop, linking warfighter to system engineers and acquisition developers. In many ways, ESP is a communication tool that provides measurable data, in a meaningful way, to a variety of stakeholders in the acquisition process.

The next section describes one specific Army initiative to use ESP in a crowd-sourced gaming environment called Operation Overmatch.

### 3. Operation Overmatch

Through a collaborative effort between Army Capabilities Integration Center and the Army Game Studio, a gaming environment, within the ESP effort, was created to test technology and tactics. This project, named Operation Overmatch, intended “to connect soldiers with concept and capability developers, scientists, and engineers across the Army” (Robinson, 2017). This put the warfighter at the center of the acquisition feedback loop as depicted pictorially in Figure 10.

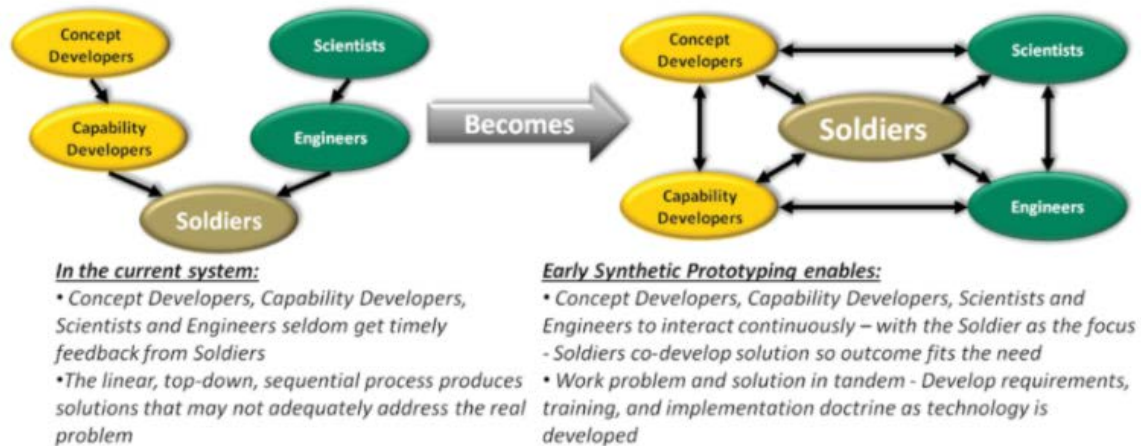


Figure 10. Early Synthetic Prototyping Enables Soldiers and Engineers to Co-Develop Solutions. Source: Smith and Vogt (2017).

The basic idea was to crowd source data in a virtual environment from many military operators to inform future capabilities and tactics. “ESP facilitates the development of an unbounded number of design options in the concept phase. Those options are tested and assessed as virtual prototypes in a game network. Warfighter players ‘play’ the virtual systems while analysts gather data via game analytics to identify what works and what does not” (Murray et al., 2014, p. 3).

There are many challenging questions when dealing with the data analytics for this initiative. Some still have not yet been addressed. The goal is that the data from gameplay would be “logged, sorted, and then analyzed, using insights from sports and commercial

video games” (Dobkin, 2017). The developers hoped this data would “inform the Army’s decisions about which technologies to purchase and how to develop tactics using them, all with the aim of building a more forward-thinking, prepared force” (Dobkin, 2017).

Many past initiatives in ESP efforts from the DOD have become stagnant due to a range of factors including lack of consistent funding and support, data mining and analytics challenges, and difficulties in inspiring sufficient amount of end users to make crowd sourcing valuable. However, there is still significant interest in leveraging technology advances in virtual simulations and ESP in a proven system in the DOD. The theoretical and practical value of this concept has already been proved outside of DOD in the commercial arena (e.g. Boeing 777).

### **C. REVIEW**

There has been related work, inside and outside of DOD, proving the benefits of virtual environments in acquisition. Developing an ISE tool for NSW would complement existing development and testing practices, driving down cost and saving time early in the acquisition process. ISE would improve the connection of warfighters into the acquisition process by connecting them with engineers and acquisition professionals in a more meaningful way. This loop of virtual data capture, feedback, and system refinement will drive higher customer satisfaction as well as greater efficiency in resource allocation in the acquisition of future capability. In the next chapter, we will chronologically discuss the steps that our team has taken using an OTA in support of our ISE test case.

## **V. ISE DEVELOPMENT METHODOLOGY**

The ISE development methodology chapter will provide a detailed explanation of the stakeholders involved and data to quantify the vendor space and our interactions throughout the OTA contracting process.


### **A. IWRP VIRTUAL INDUSTRY DAY**

NAVWAR and the IWRP Consortium Manager worked with FedBizOps.gov, a website for finding government RFP's, and the Consortium website to advertise the ISE requirement as well as other government-initiated problem statements from other agencies. IWRP coordinated a virtual industry day where all the consortium members would brief respective problem statements to potential vendors. The IWRP manager gave online training a week prior to industry day to go over what to expect and things we are and are not allowed to talk with vendors about. We were told to generate a quad slide (see Figure 11) that would be briefed and distributed to the entire consortium.

After IWRP made the opening remarks on industry day, the consortium manager turned the floor over to the four military units to brief their concepts to the vendors. Each unit briefed for approximately 15 minutes and was followed by a question-and-answer session. Vendors had to submit their questions to a moderator in order to remain anonymous. During industry day, NSW representatives briefed approximately 40 vendors with background information, top level requirements, scope of work, and key milestones for the development of ISE. Immediately preceding the presentation, vendors had a chance to ask questions in front of the entire group.

Once all the industry day briefs were finished, we hosted nine 30-minute phone calls with potential vendors. Vendors had to sign up for these calls through the consortium a week in advance. These calls were used for the vendors to ask amplifying questions pertaining to our statement of work and brief. Each of the vendor phone calls were different. Some calls started with the vendor telling us who they were, what they have done in relation to our scope of work, and what their strengths were. Other companies spent the entire 30 minutes posing questions to further clarify the desired capability. Some examples

of questions that were asked include: “why do we need to be able to see the UAS from a 3<sup>rd</sup> person,” “are we looking for an Xbox or PlayStation console vs a PC,” “how many users at one time will be playing the game,” “are we looking for wargaming or augmented reality virtual reality,” etc.



## ISE for Warfighting Development

FY20-Q4 AWARD PROJECTION

---

### Background

- December 2019, the Naval Postgraduate School (NPS) Naval Special Warfare (NSW) Chair started formulating the concept for an Interactive Synthetic Environment (ISE) for Warfighting Development.
- ISE is an emerging technology development initiative to produce a Minimum Viable Product (MVP) prototype mission simulation environment that can rapidly run mission scenarios resulting in a better understanding of the potential operating environment and how to best employ mission resources, including experimentation with future concepts and capabilities.
- The initial vision was to explore two primary objectives:
  - Man-Unmanned Aircraft System interface during a Special Reconnaissance mission
  - UAS operating capabilities and characteristics based on mission objectives

### Scope of Work

- 3D models, operating characteristics, and profiles of UAS platforms will be provided by selected manufacturers leveraging standard Computer Aided Design (CAD) or 3D modeling tools.
- ISE will leverage flight simulation tools that will be configurable for the various air vehicle configurations to accurately model UAS flight dynamics and performance.
- Additional air simulation tools may be leveraged in the future for collection and exploration of artificial intelligence (AI), Machine Learning (ML), and Reinforced Learning (RL) technologies to aid further mission and acquisition insights.

---

### Top Level Requirements

- The overall objective for the ISE prototype is to provide a dynamic, interactive synthetic environment for modeling and simulation of UAS capabilities in support of a Special Reconnaissance mission.
- The ISE prototype will enable operators, project management offices (PMOs), faculty, and students a simulated digital environment to test emerging technologies, capabilities, and concepts via a representative Special Reconnaissance mission scenario.
- An additional objective is to ensure ISE is extensible to easily incorporate future mission scenarios, resources, equipment, variables, geo-locations, and environmental fidelity.
- A *Design Thinking* and *Agile Development* approach is expected—providing the awardee continuing collaborative access to stakeholders and representative users, including NPS, NSW, UAS manufacturers, and other DoD units relevant to the mission.

### Milestones

Contract Award Date	4 Sep 2020
Engagement Kick-Off Meeting	15 DAA
Q1 Milestone Status Meeting	90 DAA
Q2 Milestone Status Meeting	180 DAA
Q3 Milestone Status Meeting	270 DAA
Q4 Final Milestone Delivery Meeting	360 DAA

**Data Rights:** Seeking Government Purpose Rights for Intellectual Property

Figure 11. ISE for Warfighting Development Slide from Industry Day

The next three weeks after the virtual industry day, we received emails and phone calls from eleven vendors expressing interest in subsequent meetings and expressing willingness to respond with initial proposals.

## B. WHITE PAPER SOLICITATIONS

White papers are used to explain new technology or products that are being developed. They are similar to a proposal but go into more detail about how the technology

or product is supposed to work. It took thirty-three days after the IWRP Virtual Industry Day to receive White Papers from eleven potential vendors. A brief description of the eleven companies are included in Appendix D. We read through all solicitations and began sorting vendors that appropriately responded to fit our scope of work and the vendors that were lacking in response. IWRP uses a portal that allows project leaders to provide feedback to the various vendors regarding the White Papers. During the feedback process, we were allowed full interaction with the vendors to ask questions or give comments in response to their submitted White Papers. In FAR based contracts, we, the end users, would not be allowed to reach out to the vendors after a formal request had been made.

After reading all the White Papers, we had to log onto the IWRP portal and indicate whether the vendor is RED or GREEN. RED indicates weakness or risk in the vendors proposal, and GREEN indicates that a vendor is invited to submit a Full Proposal. For RED vendors, a detailed write up was required to explain weaknesses in initial proposals. This process is helpful towards the vendor and the government by allowing the vendor to see where they missed the mark, how to do better next time, or gives them a clearer picture of what to include for a Full Proposal, should they choose to submit one. From the government's point of view, it may reduce risk by telling a vendor there is no interest in their proposal. For GREEN vendors, feedback was also required so that companies could refine proposals for the final submission. In addition to the qualitative feedback that we provided in response to each proposal, we generated a rubric to quantitatively rate each vendor.

### **C. WHITE PAPER EVALUATION CRITERIA**

We developed an evaluation rubric to objectively assess vendors' proposals. Vendors were numerically rated in areas of relevance, experience, and affordability. Using multi-dimensional criteria for scoring vendors, we could consistently evaluate vendors and quantitatively justify decisions to rate companies RED or GREEN. Relevance measured proposals against our desired capability and SOW, experience measured vendor related experience that could be leveraged, and affordability evaluated the cost against the value outlined in proposal deliverables. See Appendix B for the evaluation rubric.

## D. TECHNOLOGY DEMONSTRATIONS

Upon completion of the initial proposal review, technology demonstrations were requested from the GREEN vendors. This request was separate from the OTA and IWRP process and was driven from our desire to evaluate the vendors and existing technology. An NSW relevant scenario was generated and distributed to the companies that we proceeded with for final proposals. Of the five companies, two agreed to generate and present technology demonstrations based on the provided scenario. All companies were given a relatively short amount of time, two weeks, to respond to the request. The technology demonstration was a purposeful request to help gauge the current technology maturity of the virtual interactive environments for each respective vendor.



This image was provided with the permission of the technology proprietor for purposes of this academic paper.

Figure 12. Technology Demonstration Snapshot. Source: Givens (2020).



This image was provided with the permission of the technology proprietor for purposes of this academic paper.

Figure 13. Technology Demonstration UAS Snapshot. Source: Givens (2020).

## E. FULL PROPOSALS

We did not have time to fully participate in the evaluation of the Full Proposals before this MBA project was due. The proposal process takes approximately two to four weeks to complete before awarding a vendor. In an effort to fully document our research, this project will be continued by acquisition professionals at WARCUM in coordination with current and future NPS students. The continuation of the project and opportunities for further research will be discussed in the next chapter.

## F. REVIEW

In this chapter we discussed the ISE case study and impetus for our project. We walked through our partnerships, the vendor space, and our actions as we proceeded through the IRWP Consortium to solicit a vendor to fulfill the ISE requirement. In the next chapter, we will discuss the benefits of this process and how it may differ from traditional FAR based contracting. The next chapter will also provide recommendations for continuation of this case study as well as avenues for further research to improve future acquisition in NSW.

THIS PAGE INTENTIONALLY LEFT BLANK

## **VI. RESULTS AND FINDINGS**

This chapter will discuss the overall experience of the case study as it applies to acquisition supporting technology and technology supporting acquisition. We will provide our key takeaways from our process and recommendations for future study to improve acquisition in NSW.

### **A. TRADITIONAL CONTRACT VERSUS OTA PROCESS**

This section will discuss the benefits and weak points of the OTA contracting process in our experience from this case study. We will compare this experience with that of traditional FAR based contracting to highlight the most significant differences. In our experience, the OTA process is much more flexible and allows more agile and frequent communication between requirement sponsors and vendors. This benefit provides more quality in the formulation of supporting acquisition documents and helps build the professional knowledge of all stakeholders involved in the acquisition. OTAs have less restrictive contracting rules compared to traditional contracts. With that being said, the DOD can use OTAs to fulfill the needs of the warfighter quicker.

#### **1. Improved Interaction with Industry**

The OTA process flattens communication between the stakeholders in the contracting process. This is a key advantage over traditional contracting, especially when developing a new capability. To commonly in the government contracting process, industry becomes frustrated with the government for not providing enough detail and feedback. Government employees are prohibited to give exact product specifications during the RFP process leaving vendors guessing and more likely to lose an award because they are not meeting the expectations of the government. Contractors and end users are limited in their ability to persistently communicate with vendors during the evaluation and selection process. This often leads to delays in schedule and sub-optimal delivery of performance of the good or service. The OTA process was designed to make acquisition of emerging technology and prototypes easier. An employee of a defense contractor agreed to provide a statement to capture their perspective on OTAs as opposed to FAR contracting:

I've worked in the Defense environment for over 30 years and been involved in many proposal activities, most of which followed FAR processes. I have recently been involved in several Other Transaction Authority (OTA) procurements and find them to be very efficient in terms of facilitating *communication* between customers and contractors to identify and create solutions. I believe the OTA model provides an agile approach to procurement that supports rapid innovation and inclusion of today's rapidly evolving technology. OTAs allow for more efficient responses, reducing costs for traditional contractors and reducing the barrier to entry for non-traditional contractors. The OTA process is well suited to the rapid evolutions that will be needed to maintain a strong defense and ensure that our warfighters have the latest technology when they need it.

—Employee of a Major Defense Contractor

OTAs provide significant benefits for all stakeholders involved. As representatives of the requirement holder, we found OTAs to provide much more control in shaping contracting and acquisition. At any point in the contracting process, we were empowered to organize question and answer sessions with the vendor as often as we liked. Not only did this provide educational opportunity for the vendor to learn more about the desired capability and refine their proposals, but as acquisition agents, we were able to learn more about different vendors and how to be effective in communicating on behalf of the requirement holder. During our correspondence, we were able to develop, test, and refine our interaction with vendors. This occurred in identifying key questions to ask in the process both about the capability and about the companies experience with OTA contracting. In addition, the frequent exposure to industry led to more refined development of our desired capability and what was in the realm of possible for near-term and long-term iterations of development.

We never realized ISE was going to draw so much attention from technology companies and consulting firms. After the virtual industry day, there were at least eight more companies we did one-on-ones with to make sure we maximized the potential number of White Papers received. We went from knowing who we wanted to work with, to eleven competitors and a preponderance of engagement opportunity. The OTA process provided the ability to have frequent and productive interaction with vendors during the contracting

process. This benefit led to greater learning by both the requirement sponsor and vendor and more refined acquisition documents.

## **2. Technology Demonstration Discussion**

Had we been using conventional FAR contracting; we would not have had the authority to correspond in new unique ways with potential vendors during the contracting process. The OTA process allowed us the flexibility to request technology demonstrations from vendors that were competing for the ISE contract award. We found the virtual demonstrations of the simulators to be decidedly helpful in down selecting the companies prior to and during evaluation of final proposals. The demonstration requests revealed varying levels of motivation, willingness, and capacity for each company to provide and respond to the desired capability. In addition to the technology maturity, our team was able to gauge the proficiency, competency, communication skills, and rapport of the industry program managers and subject matter experts. One of the companies that did not provide a technology demonstration said it cost too much money to create something in this short of a timeframe. When it comes to analyzing the prospective vendors, every detail is important. ISE is going to be a long-term agreement between NSW, a vendor and eventually SOCOM.

As we have learned in graduate school and all of our careers, there is nothing more important than knowing your material before presenting it to an audience. In the military, if a plan or mission goes exactly as rehearsed, we are lucky. During one of the demonstrations, the vendor told us ahead of time to change the scenario on the fly during the presentation. They wanted us to be able to see exactly what we would get if we awarded them the OTA. We had them modify the ocean sea state to show how a UAS can be launched from a RHIB in pitching seas. As seen in Figure 13 in chapter 4, the UAS was armed with a hellfire missile. We wanted to see the UAS in action and ordered a strike on the enemy gun trucks.

## **3. Vendor Selection and Project Status**

There are a few reasons why we do not yet have a vendor on contract, but the main reason is time. We started brainstorming the ISE concept with WARCUM in March 2020. We reached out to NIWC in regards to IWRP on June 4, 2020. On July 9, 2020, we were

put in contact with the IWRP Program Manager and a representative from NIWC-Atlantic. Once we submitted our SOW on July 20, we were informed about the consortium process and timeline. On August 7, we were informed by NIWC Atlantic that the award date for ISE would be in the first quarter of FY21 at the earliest. In an effort to get our project awarded as soon as possible, we looked into using the Defense Information Technology Contracting Organization's (DITCO) IDIQ at the end of FY20. They got back to us and said we did not meet the criticality threshold for an end-of-year contract action. We decided that the IWRP's OTA seemed to be the best option even in FY21.

IWRP has three different processing options in which an OTA can be used. *Option 1* is White Paper to Full Proposal: preferred in most cases to maximize feedback at the white paper state and then better align SOO, SOW and proposals to government needs. *Option 1* is the preferred option in most cases even though the white paper does not include costing information and they are not intended for use in fourth quarter for end of FY award. *Option 2* Enhanced White Papers: preferred option to support urgent requirements. This is a condensed process where cost information is included in the white papers and can be awarded in fourth quarter of the FY. *Option 3* Full Proposal: preferred option when NIWC has clear requirements in the SOW and wants to limit the period of collaboration. We were told to use *Option 1* because it allowed the most collaboration with vendors and more opportunities to update our SOW and because our requirements were not firm enough to go to full proposals.

Within the three options, there are six stages: Stage 1 Initiation; Stage 2 White Paper, Enhanced White Paper; Stage 3 Proposal; Stage 4 Source Selection; Stage 5 Awards; and Stage 6 Execution & Close-out. Option 1 includes all stages 1–6 and takes approximately 14–16 weeks; Option 2, stage 3 is omitted and takes 10–12 weeks; and Option 3 omits stage 2 and takes 10–12 weeks.

If we had the opportunity to begin this project again knowing what we know now, we would have begun coordination with IWRP in April, about 2 months earlier than our process. We believe that if we had been full time acquisition staff and not also balancing the graduate study requirements that we could have awarded a contract in under 14 weeks. After speaking to several of presidents from various tech companies, they all agree that

they enjoy the OTA process much better than the traditional contracting method. Most of the OTAs they won were awarded in 75–90 days versus 250–400 days in a traditional contract.

We believe that the OTA contracting process provided benefits to rapidly develop and procure technology in our case study and we think that this process could be completed faster provided there is dedicated staff to expedite. In the next section of this chapter we will discuss the future concepts for the ISE capability that we helped develop in this case study.

## **B. FUTURE ISE CONCEPTS**

We believe that procurement of an ISE will provide multi-dimensional benefit for NSW. We have discussed how in the short term, ISE can be used as an acquisition tool to evaluate new systems and provide meaningful data back to engineers and developers to refine and test new prototypes in a low-cost, expedient virtual environment. If our test case proves successful, ISE may also open to a variety of other benefits for the NSW community.

Today, ISE can be used to test existing systems and be used to make minor adjustments to system parameter and attributes. The next iteration of ISE may provide much more in-depth engineering capability for the development of creative solutions. This means that a warfighter with little experience in engineering, could ideate, build, and test novel solutions in the ISE. ISE would essentially be a low-cost, R&D capability for next generation military concepts. Not only could virtual prototypes be built, but they also could be tested for fast failure and rapid adaptation. For example, a warfighter imagines a new aerial vehicle that could be used in a unique way by NSW. He would then be able to quickly access ISE to generate a rudimentary prototype and test the feasibility of that capability. If the new idea proves successful, ISE could be utilized to develop new tactics and employment concepts for NSW units. ISE empowers any user with the ability to generate and test new capability and innovative systems that could potentially benefit the military. Why would we not leverage the talent of existing military members to identify and explore potential competitive advantages in military application?

ISE can also be utilized in an enhanced mission planning capacity. Approval of NSW missions heavily depend on the careful planning of briefs called concepts of operation (CONOP). Historically, CONOPs are created in PowerPoint with snapshots of images garnered from collected intelligence products, satellite imagery, or even open sources like Google Earth. Overlaid on the map are phased schemes of movement and maneuver of SOF and opposition forces in the mission scenario. Using ISE, this aspect of mission planning has the potential to be significantly enhanced. An ISE capability enables detailed planning anywhere in the world. Rather than working to communicate plans verbally using PowerPoint visual aids, ISE would have the ability to virtually demonstrate a tactical plan or scenario to military and civilian leadership.

Looking further into the future, we believe that ISE could eventually be used to run realistic military scenarios and provide wargaming information to the intelligence community. By integrating artificial intelligence into enemy forces and the standard operating procedures for a SOF unit, or by using military personnel, scenarios could be created and run at faster than real time speed. The data that this provides would provide value at the tactical level in mission planning as well as data for mission analysis that could inform major campaign planning at the operational or strategic level of military planning.

Like the use of OTAs in contracting, the use of ISE provides significant benefit in cutting time and cost to support more agile acquisitions. In addition, ISE has the potential to produce new, enhanced capability in mission planning and wargaming. The next section of this chapter will discuss what we left out in our case study and provide recommendations for continued study.

## **C. RECOMMENDATIONS FOR FURTHER RESEARCH**

### **1. Project Turnover**

The contract awarding process for ISE is still ongoing during the completion of this paper. Since we will not be able to continue analyzing this case study, we will have incoming NPS students, with multi-disciplinary related experience, to continue monitoring and participating in the development of ISE using the OTA contracting process. The next step to be completed is the Proposal Evaluation. Evaluation centers around an assessment

of whether technical requirements are satisfied and can be implemented. During this evaluation, factors are set and communicated to the consortium with the release of the RPP. Each factor is evaluated for a simple statement explaining that the factor has been met, not met, or partially met. For a complete outline of the five factors to be evaluated see Appendix D. Once the proposals have been evaluated to ensure cost and technical aspects are equally weighted, a vendor can be selected for award. Once the vendor has been selected, an Information Technology Purchase Request must formally be submitted for funding.

## **2. Army Overmatch Process Versus Navy OTA Process**

One opportunity for follow-on study is on the differing approaches between Army's acquisition of Operation Overmatch and our acquisition of ISE. These two initiatives could be analyzed and compared from conception of the respective systems through their termination or successful result. Because we were not able to complete the contracting process of this acquisition, we were unable to sufficiently compare the differing contract methods in a meaningful way. Possible follow-on studies could address the following research questions:

- Did one contracting process seem to work better for this type of similar technological capability?
- What were the major obstacles for success? Were they similar or different?
- How much of the resident expertise was utilized across the ideation and development of this similar technology?
- Is there weakness in DOD ability to share lesson learned in capability acquisition that can be leveraged for future processes?
- For future iterations of ISE – should we continue to use OTA, or will lessons learned influence a different process? How did the vendor solicitation process and IWRP consortium affect the performance of ISE?

### 3. Other Continued Areas of Study

Beyond this case study, we can recommend supplemental avenues for further research. These topics are related to pursuing improved acquisition in NSW either by optimizing the use of OTA in future contracts, alternative contracting vehicles to OTA and FAR based contracting processes and leveraging the NPS partnership with acquisition professionals in NSW. These topics and possible research opportunities have been included below:

- **OTA Optimization**—Is there a point in development, or iteration, of a capability where OTA would not make as much sense? In this case study, we have shown how OTA contracting created a more rapid process and enabled superior communication authorization when compared to FAR based contracting. OTAs were designed for particular use in acquiring emerging technology and prototypes, so would they be ineffective past a certain point of development? Perhaps OTAs have useful applications in contracting of other types of capability.
- **Contracting Agility**—Are there other contracting vehicles, or considerations, that create agile contracting for new technology and prototype development? In addition to OTAs, what other non-FAR based alternative methods exist that could be leveraged in NSW acquisition? Are there other significant points of friction in contracting that could be analyzed and improved?
- **Academia Partnership in Acquisition**—There is a persistent supply of graduate students at military universities such as NPS. Is an enduring partnership between the MBA students at NPS and acquisition professionals at WARCUM worth pursuing further? From the WARCUM perspective, are the active duty students well leveraged to enhance the progress at WARCUM? How could collaboration with other academic specialties benefit NSW?

## **D. SUMMARY**

The Commander at WARCOM wanted to better utilize the students at NPS who work in NSW. Students spend several months doing research and writing their thesis to only seemingly have the documents lost in the archives of the Dudley Knox Library. We were asked to investigate two topics; how can we improve warfighter development within NSW and how can we create acquisition agility and flexibility. With manning levels in NSW currently capped, finding ways to incorporate new technology is one low-cost way we can enhance and improve the warfighters capability in the future. Our ISE project is only one area where new technology can provide new capability and increase efficiency of current processes. We helped WARCOM N87 develop ISE to test and develop the next generation Scan Eagle. By creating a flight simulator that can be analyzed in a virtual world, we can refine and test a requirement for unmanned aerial surveillance without spending millions of dollars on real prototypes or live testing. ISE could also be used to create new weapon systems, water and land vehicles. Students at NPS coming from the special operations community should be utilized to develop a wargaming environment that allows us to conduct battlefield simulation.

After a phone call with NIWC-Atlantic, we soon realized that ISE was the perfect fit for an OTA. Since we were not considered mission essential, we needed to find the fastest acquisition method and make it successful. In our opinion, working with the consortium during the past four months has proven more efficient than traditional FAR contracting. It has been a steep learning curve but IWRP has been there to help, every step of the way. They held virtual training on Microsoft Teams before every milestone to make sure the customers understood what to do next.

A traditional contracting office acts as the middle person between the end user and the vendor. In contrast, the OTA process seemed to put more trust on the end user. Instead of a contracting officer making the decision of who to award the contract to, our entire team gets to vote. We are authorized to communicate with the vendor for clarification on anything in the proposal. Unlike FAR contracting, communication with vendors during the contracting process was something that we were empowered to do throughout the duration of the process and provided significant value to evaluating potential vendors. Developing

a rapport with the potential vendor who you are going to work with for the coming years is very important. There is a sense of confidence to be gained from having the autonomy to communicate and make a more informed decision about how we spend taxpayer dollars. Choosing the lowest bidder does not always work in the favor of the government. Often, product quality is more important than cheaper solutions.

Overall, the OTA process went well. If we had been working at WARCOM full time on this OTA, we would most likely have a vendor on contract. We were given all the responsibility to hold interviews, meet with vendors and work with the consortium but did not have power to make the final decision. It is like having your parents tell you to buy whatever car you want, but they are paying the bill and will make the final decision. In the future, we would do another OTA through one of the consortiums. If we are developing a new prototype, the freedom and flexibility of the OTA was less stressful than other acquisition routes we have used in the past.

## **APPENDIX A. TECHNOLOGY DEMONSTRATION SCENARIO**

SEAL Team THREE (ST3) is off the coast of the Bahamas (or equivalent in size) doing a special reconnaissance (SR) mission of a known terrorist network training cell. ST3 is launching a Vertical Takeoff and Landing (VTOL) UAS from a Combatant Craft Medium (CCM) seven nautical miles off the western coast of the island.

After successful launch of the VTOL from the CCM, the OIC takes control of the UAS and starts conducting SR from the southwest tip of the island. Once over the southwest part of the island, the camera feed picks up four jeeps, two of them have mounted .50's. There is a total of 13 troops on the ground, 10 of them are carrying AK-47's. They appear to be conducting range operations.

Just north of the four jeeps, is a small watch tower with two armed snipers not paying attention to anything. The tower appears to be surrounded by razor wire and sandbags. There is a crew served weapon at the base of the tower covered by sniper hide netting.

North of the guard tower is a small harbor with two small docks and two larger docks. There are four 11-meter rigged hull inflatable boat RHIB's parked at the smaller docks and three larger gun boats tied up to the large docks. There appears to be one gunboat missing from a slip. The harbor contains 10 buildings and is surrounded by razor wire and sandbags. The entry control point (ECP) is guarded by two main towers, a swing gate, and two crew served .50's. There are roughly 50 troops who appear to be in training and another 30 around the compound. Also, inside the compound is a small obstacle course.

Northwest of the harbor/compound is another guard tower set up very similar to the one in the south. Two guards in the tower with sniper rifles and two more are near a .50 cal.

As the drone is completing its flight, the OIC notices the missing gunboat from the harbor heading in the direction of the CCM. The CCM must take evasive action and head away from the island and a hasty recover will be needed to ensure the crew is not compromised.

THIS PAGE INTENTIONALLY LEFT BLANK

## APPENDIX B. VENDOR EVALUATION RUBRIC

We developed an evaluation rubric to objectively assess vendors’ proposals. Vendors were numerically rated in areas of relevance, experience, and affordability. Using multi-dimensional criteria for scoring vendors, we could consistently evaluate vendors and quantitatively justify decisions to rate companies RED or GREEN. Relevance measured proposals against our desired capability and SOW, experience measured vendor related experience that could be leveraged, and affordability evaluated the cost against the value outlined in proposal deliverables. Our rubric can be viewed in Figure 14.

	<b>Extent of Fulfilling Requirement</b>	<b>No/Non-existent</b>	<b>Low Level</b>	<b>Medium Level</b>	<b>High Level</b>	<b>Score</b>
	<b>Numerical Scale</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	
<b>Relevance (1x)</b>	Did the proposal identify a potential solution or prototype concept that addresses the desired capability?					
	Does the company have high technology readiness levels of existing platforms/gaming engines/models/etc.?					
	Does the proposal indicate an acceptable level of involvement with NPS multi-disciplinary academia and warfighter/end-user?					
	Does the proposal indicate a capacity and willingness for follow-on coordination and effort in future					
<b>Experience (1x)</b>	Does the company have related experience in modeling and simulation environments?					
	Does the company have related experience in DoD and/or NSW?					
	Does the company have related experience working with ScanEagle or similar unmanned systems?					
	Does the company have related experience utilizing OTA?					
<b>Affordability (3x)</b>	Does the proposal indicate an affordable cost for the desired capability?					

Figure 14. Vendor Proposal Rubric

THIS PAGE INTENTIONALLY LEFT BLANK

## APPENDIX C. STATEMENT OF WORK (SOW)

### STATEMENT OF WORK

Submitted by NSWC N87 under Request for IWRP-

For

Other Transaction Agreement # N65236-18-9-0001

**Proposal number:** [ Unique ID number from IWRP PM]

**Awardee:** [IWRP Member Company Name]

**Title:** Interactive Synthetic Environment (ISE) for Warfighting Development

**Place of Performance:** Contractor Facility and remotely

**Period of Performance:** One Year

#### 1.0 Introduction/Background:

In December 2019, the Naval Postgraduate School (NPS) Naval Special Warfare (NSW) Chair started formulating the concept for an Interactive Synthetic Environment (ISE) for Warfighting Development. The initial vision was to explore two primary objectives:

- Man-Unmanned Aircraft System interface during a Special Reconnaissance mission
- UAS operating capabilities and characteristics based on mission objectives

By February 2020, basic goals and objectives were codified further and interaction began with the Naval Special Warfare Command (NSWC) as these goals were aligned with the developing Multi-Mission Tactical Unmanned Aerial Systems (MTUAS) program (*i.e.* ScanEagle follow-on). Embracing the *Design Thinking* methodology—a highly adaptive and iterative approach—enabled NPS and NSWC teams to refine the ISE requirements to meet both commands’ goals and objectives.

While the initial Minimal Viable Product (MVP)<sup>1</sup> v1.0 is focused on a specific SR mission and selected UAS platforms, it is envisioned that the interactive synthetic environment developed will be extensible to incorporate other missions, operating environments (across all domains), platforms, equipment, players, and data analytics leveraging hyper-scale cloud technologies

---

<sup>1</sup> Minimal Viable Product (MVP) – “that version of a new product which allows a team to collect the maximum amount of validated learning about customers with the least effort.” from *The Lean Startup* by Eric Ries, 2011.

The Interactive Synthetic Environment (ISE) for Warfighting Development is an emerging technology development initiative to produce a MVP prototype mission simulation environment that can rapidly run mission scenarios resulting in a better understanding of the potential operating environment and how to best employ mission resources.

The first ISE MVP scenario is to develop a Special Reconnaissance (SR) mission commencing from a Combatant Craft Medium (CCM) at sea. The CCM crew will launch an Unmanned Aerial System (UAS) which will fly to and conduct reconnaissance of a target and then the UAS will be recovered by the CCM.

It is envisioned that the ISE MVP v1.0 prototype will run the synthetic mission environment on a robust Windows 10 gaming personal computer (PC) with future intentions of leveraging the benefits of the hyperscale cloud. ISE will be accessed via an icon from the desktop to launch the simulation. ISE will provide three basic functions:

- Build scenario
- Run scenario
- Replay and analyze results

After being welcomed to the ISE environment with a brief description of the SR mission, the operator will begin by building the scenario with environmental, and mission options. Next the operator runs the game, which will provide a visually rendered mission executed in the synthetic environment following preset parameters and the variables selected by the operator. High fidelity rendering of the UAS launch and recovery from the CCM and the selected target is desired primarily from a birds-eye view. MVP v1.0 will have the capability to record data from each mission run for playback and analysis. It's envisioned that the simulation will run at an accelerated rate since the real-time mission is expected to run 8–12 hours.

The long-term goal of the ISE initiative (beyond MVP v1.0) is to provide a synthetic environment in which any warfighting resource can be rapidly and accurately tested in various operating environments and multiple mission profiles to aide procurement selection decisions and inform tactics, techniques, and procedures (TTPs), especially for autonomous systems. Additionally, it is envisaged that the synthetic environment could even be used to rapidly model a real-world environment in support of mission planning.

The ISE prototype must serve operators, program managers, resource sponsors, NPS faculty and students, and DOD partners responsible for rapid prototyping and manufacturing. Key benefits include improved insights for doctrine and TTP development, increased mission success, reduced cost, and shorter development timelines.

## **2.0** Scope/Initiative Objective:

As mentioned above, during the build scenario the operator will be presented with environmental and mission profile options. From the “Environment Panel” the operator will be able to select:

- Season (spring, summer, autumn, or winter)
- Location (San Clemente Island, CA)
- Weather conditions (clear, cloudy, precipitation, fog, haze, dust)
- Time of day (day or night)
- Temperature (cold, warm, or hot)
- Wind speed (0, 10, 20, or 25 knots)
- Wind direction (north, east, south, west)
- Sea state scale (0 to 9)
- Global Positioning System (GPS) denied (yes or no)
- Command & Control (C2) denied (yes or no)

From the “Mission Panel” the operator will be able to select:

- Target type (underground facility, missile site, naval base)
- CCM distance from shore (e.g. 12–25 nm)
- UAS platform (limited to one Vertical Takeoff & Landing (VTOL))
- Sensors (day/night cameras, infrared camera)
- Payload; number of quadcopters (1 to 4)
- Altitude (2,000, 4,000, 8,000 feet)
- Speed (40 or 75 knots indicated airspeed)
- Course (straight line or up to 5 waypoints)
- Endurance (4, 8, or 12 hours)
- Navigation/line of sight (yes or no)
- Survivability (high, medium, or low)
- Detectability (acoustic, radar, or IR)
- Collection success (100, 75, 50, 25, or 0 percent)
- Metadata (UAS location, true north compass, center field of view location, target range, slant angle, and time stamp)
- UAS system logs (aircraft, propulsion, and GCS critical parameters)

Three dimensional (3D) models and operating characteristics and profiles of UAS platforms will be provided by selected manufacturers leveraging standard Computer Aided Design (CAD) or 3D modeling tools (or as an additional CLIN, the prime contractor will create the 3D model for use in ISE). MVP v1.0 will be limited to one UAS platform. ISE will leverage flight simulation tools that will be configurable for the various air vehicle configurations to accurately model UAS flight dynamics and performance. Additional air simulation (AirSim) tools may be leveraged in the future for collection and exploration of artificial intelligence (AI), Machine Learning (ML), and Reinforced Learning (RL) technologies to aid further mission and acquisition insights.

### 3.0 References/Specifications:

Section	Document Title	Document Date
4.1	Mi2 Request for System Performance Summary	June 2020
4.3	Education for Seapower	February 2019
4.6	Rand: Next Generation Wargaming for the U.S. Marine Corps	2019
4.7	Representative Military Users/Operators scenarios, profiles, use cases	TBD

### 4.0 Requirements:

The overall objective for the ISE prototype is to provide v1.0 of a dynamic, interactive synthetic environment for modeling and simulation of UAS capabilities in support of a Special Reconnaissance mission. The ISE prototype will enable operators, project management offices (PMOs), faculty, and students a simulated digital environment to test emerging technologies capabilities via a SR mission. Furthermore, an additional objective is to ensure the interactive synthetic environment is extensible to easily incorporate future missions, resources, equipment, variables, geo-locations, and environmental fidelity.

A *Design Thinking* and *Agile Development* approach is expected--providing the awardee continuing collaborative access to stakeholders and representative users, including NPS, NSWC, UAS manufacturers, and other Department of Defense units relevant to the mission. The government intends to allow the awardee(s) maximum flexibility to use their respective commercial/industry best practices (*e.g.*, methodology details, tool sets, and sprint cycle time, etc.). The government envisions the following MVP v1.0 requirements (Set of Stated Objectives) to be refined and clarified by stakeholder dynamic and continuous interaction with awardee(s) at the kickoff meeting and subsequent interactions/ milestones with the agile development team.

#### 4.1 Technical Requirements:

- 4.1.1 Selection of industry-leading simulation platform.
- 4.1.2 Selection of an open and advanced 3D engine and associated editor for runtime environment.
- 4.1.3 Selection of UAS flight simulation tools, including flight planning.
- 4.1.4 ISE will run on DOD standard operating system Windows 10.
- 4.1.5 Produce PDF storyboard of the ISE scenario.
- 4.1.6 Produce a MP4 video trailer of the storyboard (optional CLIN).
- 4.1.7 Develop user interface/experience (UI/UX).
- 4.1.8 Create or ingest 3D model of Naval CCM.

- 4.1.9** Create or ingest 3D model of a single UAS
- 4.1.10** Build Scenario:
  - 4.1.10.1** Create synthetic environment with selection options outlined in section 3.0.
  - 4.1.10.2** Determine and create fidelity of launch and recovery from CCM and target site.
  - 4.1.10.3** Determine and create gameplay geo-box around San Clemente Island, CA.
  - 4.1.10.4** Leverage imagery and terrain data from San Clemente Island, CA.
  - 4.1.10.5** Determine and create specific targets (up to three).
  - 4.1.10.6** Determine and create environmental effects for three locations: UAS launch from CCM; target site; and UAS recovery on CCM.
  - 4.1.10.7** Determine and create adversary threat (up to three types, e.g., radar, Surface to Air Missile (SAM), mine field).
  - 4.1.10.8** Determine flight path (straight line or up to 12 waypoints).
  - 4.1.10.9** Determine and create non player characters required (NPCs) (optional CLIN).
    - 4.1.10.9.1** Determine and create what additional actors/entities would need to be injected into the scenario (optional CLIN).
    - 4.1.10.9.2** Determine if NPCs need to be controlled or programmed (optional CLIN).
- 4.1.11** Run scenario:
  - 4.1.11.1** Integrate and run CCM and UAS in synthetic environment.
  - 4.1.11.2** Determine and create views as operator executes Special Reconnaissance mission, (e.g., bird's eye view).
  - 4.1.11.3** Determine flight model accuracy.
    - 4.1.11.3.1** Sub-system modeling or simulation
      - 4.1.11.3.1.1**Electrical
      - 4.1.11.3.1.2**Flight controls
      - 4.1.11.3.1.3**Sensor packages
      - 4.1.11.3.1.4**Communications
      - 4.1.11.3.1.5**Propulsion
      - 4.1.11.3.1.6**Flight Management System
      - 4.1.11.3.1.7**Ground Control Systems
  - 4.1.11.4** Determine and create UAS sensors requirements.
    - 4.1.11.4.1** Types of sensors (FMV EO and IR, LRF, LP).
    - 4.1.11.4.2** For a given sensor, especially visual, the system is not required to capture actual sensor output data.
  - 4.1.11.5** Sensor data collection success will be determined by various factors including how close the sensor was to target, weather conditions, terrain, or other factors that could cause degradation or visual blanking
- 4.1.12** Replay and analyze results:



risk reduction and/or an opportunity exploitation tool for the program to pursue, for example, an increase in technology, inform the requiring activity about the Technology Readiness/ Manufacturing Readiness (TRL/MRL) level and/or provide cost and schedule reduction considerations.

**5.0 Milestone and Deliverables Schedule:**

	Milestone			Due Date	Cost
	Award Date			TBD	
5.1	Technical Approach Validation				\$XX,XXX
	<b>Deliverable</b>	<b>Task Reference</b>	<b>Data Rights</b>		
5.1.1	Prototype Project Plan	4.1-4.4	Unlimited		
5.1.2	Testing and Quality Control Plan	4.2	Unlimited		
5.2	Technical Capability Demonstration				\$XX,XXX
	<b>Deliverable</b>	<b>Task Reference</b>	<b>Data Rights</b>		
5.2.1	1 <sup>st</sup> Quarterly Capability Demonstration	4.1	Unlimited	90 days after award	
5.2.3	Sprint Wrap-Ups	4.1	Unlimited	TBD	
5.2.4	2 <sup>nd</sup> Quarterly Capability Demonstration	4.1	Unlimited	180 days after award	
5.2.5	Sprint Wrap-Ups	4.1	Unlimited	TBD	
5.2.6	3 <sup>rd</sup> Quarterly Capability Demonstration	4.1	Unlimited	270 days after award	
5.2.7	Sprint Wrap-Ups	4.1	Unlimited	TBD	
5.2.8	GovCloud Deployment	4.1	Unlimited	TBD	
5.3	Final Prototype & Testing				\$XX,XXX
	<b>Deliverable</b>	<b>Task Reference</b>	<b>Data Rights</b>		
5.3.1	Final report of ESP Capabilities and Testing Results	4.1-4.4	Unlimited	Per IWRP base contract requirements	
5.4	Monthly Status Reports				\$XX,XXX

	Milestone			Due Date	Cost
	Deliverable	Task Reference	Data Rights		
5.4.1	MSR Reports	4.1-4.4	Unlimited	Per IWRP base contract requirements	
5.5	Determination of Successful Prototype (Should be no cost to the Government)				\$XX,XXX
	Deliverable	Task Reference	Data Rights		
5.5.1	ESP prototype software/services	4.1-4.4	Unlimited Govt Use	Per IWRP base contract requirements	
5.5.2	ESP prototype Users' Manual	4.1-4.4	Unlimited Govt Use	Per IWRP base contract requirements	
5.5.3	Roadmap for projected work for ESP prototype to meet anticipated production quality product delivery	4.1-4.4	Unlimited Govt Use	Per IWRP base contract requirements	
5.6	Quarterly Technical and Business Status Reports				\$XX,XXX
	Deliverable	Task Reference	Data Rights		
5.6.1	Quarterly Technical and Business Status Reports	6.1	GPR	Quarterly	
5.7	Final Technical & Business Status Report				\$XX,XXX
	Deliverable	Task Reference	Data Rights		
5.7.1	Final Technical Report	4.1.10, 6.2	GPR	End of PoP	
Grand Total					\$XX,XXX,XXX
Total Period of Performance					XX Months
Contract Type					FFP/CPFF

IWRP Member: Use table above OR use this table if cost sharing is done.

	Milestone			Due Date	Gov't Cost	Cost Share
	Award Date			TBD		
5.1	Technical Approach Validation				\$XX,XXX	\$XX,XXX
	Deliverable	Task Reference	Data Rights			

	Milestone			Due Date	Gov't Cost	Cost Share
5.1.1	Prototype Project Plan	4.1-4.4	Unlimited			
5.1.2	Testing and Quality Control Plan	4.2	Unlimited			
5.2	Technical Capability Demonstration				\$XX,XXX	\$XX,XXX
	<b>Deliverable</b>	<b>Task Reference</b>	<b>Data Rights</b>			
5.2.1	1 <sup>st</sup> Quarterly Capability Demonstration	4.1	Unlimited	90 days after award		
5.2.2	Sprint Wrap-Ups	4.1	Unlimited	TBD		
5.2.3	2 <sup>nd</sup> Quarterly Capability Demonstration	4.1	Unlimited	180 days after award		
5.2.4	Sprint Wrap-Ups	4.1	Unlimited	TBD		
5.2.5	3 <sup>rd</sup> Quarterly Capability Demonstration	4.1	Unlimited	270 days after award		
5.2.6	Sprint Wrap-Ups	4.1	Unlimited	TBD		
5.2.7	GovCloud Deployment	4.1	Unlimited	TBD		
5.3	Final Prototype & Testing				\$XX,XXX	\$XX,XXX
	<b>Deliverable</b>	<b>Task Reference</b>	<b>Data Rights</b>			
5.3.1	Final report of ESP Capabilities and Testing Results	4.1-4.4	Unlimited	Per IWRP base contract requirements		
5.4	Monthly Status Reports				\$XX,XXX	\$XX,XXX
	<b>Deliverable</b>	<b>Task Reference</b>	<b>Data Rights</b>			
5.4.1	MSR Reports	4.1-4.4	Unlimited	Per IWRP base contract requirements		
5.5	Determination of Successful Prototype (Should be no cost to the Government)				\$XX,XXX	\$XX,XXX
	<b>Deliverable</b>	<b>Task Reference</b>	<b>Data Rights</b>			
5.5.1	ESP prototype software/services	4.1-4.4	Unlimited Govt Use	Per IWRP base		

	Milestone			Due Date	Gov't Cost	Cost Share
				contract requirements		
5.5.2	ESP prototype Users' Manual	4.1-4.4	Unlimited Govt Use	Per IWRP base contract requirements		
5.5.3	Roadmap for projected work for ESP prototype to meet anticipated production quality product delivery	4.1-4.4	Unlimited Govt Use	Per IWRP base contract requirements		
5.11	Quarterly Technical and Business Status Reports				\$XX,XXX	
	<b>Deliverable</b>	<b>Task Reference</b>	<b>Data Rights</b>			
5.11.1	Quarterly Technical and Business Status Reports	6.1	GPR	Quarterly		
5.12	Final Technical Report				\$XX,XXX	
	<b>Deliverable</b>	<b>Task Reference</b>	<b>Data Rights</b>			
5.12.1	Final Technical Report	4.1.10, 6.2	GPR	End of PoP		
Total Cost Shares					\$XX,XXX	\$XX,XXX
Grand Total						\$XX,XXX,XXX
Total Period of Performance						XX Months
Contract Type						Cost Share

**6.0 Delivery Method:**

**Deliverables shall be sent to the following government point of contact:**

**Receiving Officer: [To be filled in before submission]**

**7.0** Data and Reporting:

**7.1 Periodic Reports:** The contractor shall prepare a Periodic Status Report which will include a Business Status section and a Technical Status section in accordance with the terms and conditions of the OTA Base Agreement or as modified by the Contract Officer's Representative (COR). For the projects that are 4–6 months, the periodic reports will be at least monthly. For any project over 6 months, the periodic reports will be quarterly.

**7.2 Final Business/Technical Report:** At the completion of the initiative, the contractor shall submit a Final Business/Technical Report, which will provide a comprehensive, cumulative, and substantive summary of the progress and significant accomplishments achieved during the total period of performance (POP) and provide summarized details of the business resource status of the initiative, in accordance with the terms and conditions of the OTA Base Agreement.

**8.0** Patents, Data Rights and Copyrights:

Desire Government Purpose Rights (GPR) for software and documentation for delivered ISE prototype.

**9.0** Classification:

The security classification level for this initial MVP v1.0 effort is UNCLASSIFIED.

**10.0** Government Furnished Items:

**Not applicable.**

**11.0** Close-Out:

Depending on the success of the ISE prototype with the military user community, the sponsor anticipates the desire to transition this ISE prototyping effort to production using OTA transition mechanisms. If the prototype project is successful (as determined by achieving the milestone for determination of success) the effort may transition to fielding and / or production with the following deliverables required:

**11.1** ISE prototype software and services O&M

**11.2** ISE prototype (digital) Users' Manual

**11.3** Roadmap for projected work for ISE prototype to meet anticipated production quality product delivery

All information above is part of Phase I. The information below refers to future options Phase II and Phase III.

Multiple options and variations for the flight profiles are envisioned, but recommended for MVP v2.0, (Phase II) including but not limited to: variations in air vehicle properties (physical and flight dynamics updates), flight plan development, manual flight mode, increased environmental fidelity, larger geo-areas, longer distances to the target, etc. Additionally, comprehensive data capture and use of the resulting data sets for enhanced wargame analysis including Cognitive Services, AI, ML, and RL are out of scope for MVP v1.0.

The long-term goal of the ISE initiative (Phase II and Phase III) is to provide a synthetic environment in which any warfighting resource can be rapidly and accurately tested in various operating environments and multiple mission profiles to aide procurement selection decisions and inform mission tactics, techniques, and procedures (TTPs), especially for autonomous systems. It is foreseen that in the near future the synthetic environment could be leveraged to rapidly model real-world environments in support of mission planning.

**12.0** Agreements Officer representative (AOR) Info:

**Agreements Officer Representative (AOR) Contact Info: [To be filled in before submission]**

## APPENDIX D. CODED VENDOR LIST

This list is provided to give the reader a sense of the vendor space that was explored throughout this case study. We have provided an anonymous list of the companies that showed interest during the IWRP industry day and submitted an initial white paper proposal. Names of companies have been redacted due to the ongoing contract awarding process.

1. A small, privately held analytics and software engineering company that provides software development and information engineering solutions to customers in government and private industry. Focus areas are in Data Fusion, Software Engineering, Predictive Analytics, Text Analysis, Simulation, Tracking, Optimization, Cybersecurity, Visualization, and Software Engineering. Employees: 50–200
2. A privately held, high-tech small business focusing on software and hardware system integration. Employees: Unknown
3. A mid-size company that provides engineering services. The company offers information, communications, electronic warfare, simulation, training, and instrumentation systems. Employees: Unknown
4. This large, global technology company focuses on intelligent infrastructure for buildings and decentralized energy systems, on automation and digitalization in the process and manufacturing industries, and on smart mobility solutions for rail and road transport. Employees: 385,000
5. Large American multinational technology that develops, manufactures, licenses, supports, and sells computer software, consumer electronics, personal computers, and related services. Areas of focus are in Software Development, Computer Hardware, Consumer Electronics, Cloud Computing, Video Games. Employees: 163,000
6. A mid-size subsidiary of a major government contracting company that is one of the world's largest suppliers of aerospace and defense products. Areas of focus are in aerospace. Employees: 78,000
7. A mid-size American technology company, defense contractor and information technology services provider that produces C6ISR systems and products, wireless equipment, tactical radios, avionics and electronic systems, night vision equipment, and both terrestrial and spaceborne antennas for use in the government, defense, and commercial sectors. They specialize in surveillance solutions, microwave weaponry, and electronic warfare. Employees: 50,000
8. A small business focused on applied technology, simulation software, robotics, and data science that provide solutions for DOD and NASA. Employees: Unknown

9. A small, employee-owned company that offers service in engineering, application development, modeling and simulation based training, spatial analysis, and technical trained development. Employees: 400
10. A mid-size information technology company focused on serving DOD and intelligence agencies with C4ISR and cyber. Engineering services, enterprise IT, mission support. Employees: 23,000
11. A small, employee-owned technology for DOD, intelligence agencies, and defense contracting companies. The focus areas are in applied mathematics, statistical inference, operations research, physical modeling, signal processing, autonomy, and software development. Employees: Unknown

## REFERENCE LIST

- Acq Notes. (2020, September 15). *Acquisition process overview*. <http://acqnotes.com/acqnote/acquisitions/acquisition-process-overview>
- Acq Notes. (2019, February 7). *DOD procurement overview*. <http://acqnotes.com/acqnote/acquisitions/procurement-overview>
- Bold, M. (2019, April 19). *What's your acquisition approach-FAR or non FAR?* Georgia Tech Contracting Education Academy. <https://contractingacademy.gatech.edu/tag/adaptive-acquisition-framework/>
- Churazova, A. (2020, March 10). *Virtual prototyping & benefits to your product design process*. SimScale. <https://www.simscale.com/blog/2018/06/virtual-prototyping-benefit/>
- Commander, Naval Special Warfare Command. (2017, February 24). *Force logistics manual* (COMNAVSPECWARCOMINST4460.1E). Department of the Navy.
- Costa, K. J. (2006, May 24). House calls DOD acquisition process “broken.” Authorizers: strategy needed to help program managers do their jobs. *Inside missile defense*, 12(11), 13–14. <http://www.jstor.org/stable/24784701>
- Defense Acquisition University. (2019, February 13). *Defense acquisition life cycle wall chart*. <https://www.dau.edu:443/tools/t?TermStoreId=dce24bd1-67d5-449a-a845-034b26f02d5e&TermSetId=47e2d122-b6b9-4c25-bcd9-05fdc13942a9&TermId=065e4f97-f541-4cad-b41b-a3d9288ef8d1&UrlSuffix=Department-of-Defense-Acquisition-Life-Cycle-Chart>
- Dobkin, A. (2017, October 26). Operation overmatch: A video game that could shape the future of war. *The Atlantic*. <https://www.theatlantic.com/technology/archive/2017/10/operation-overmatch/544062/>
- Ernst, S. J. (2019, October 30). *Index of military strength report*. Heritage Foundation. <https://www.ernst.senate.gov/public/index.cfm/press-releases?ID=BCC6C3AB-09B6-4E55-98A6-BC4A186225AB>
- Force Technology. (n.d.). *Simulation driven product and process development*. Retrieved October 30, 2020, from <https://forcetechnology.com/en/services/processing-system-simulations>
- Fox, J. R. (2012). *Defense acquisition reform, 1960–2009: An elusive goal*. Government Printing Office.
- Halchin, L. E. (2006). *Overview of the federal procurement process and resources*. Congressional Research Service.

- IWRP. (2020). OTA. <https://www.theiwrp.org/otas/>
- Stratton-Feix, K. (2017, November 12). *USSOCOM acquisition agility directorate/ SOWWERX*. USSOCOM. Slideshare.net. <https://www.slideshare.net/TonyGrayMBAPMP/socom-agile-acquisition>
- Leonard, H., Weiss, M., Paik, J. H., & Herman, K. (2018). *SOWWERX: Innovation at U.S. special operations command*. Harvard Business School. <https://www.hbs.edu/faculty/Pages/item.aspx?num=54751>
- McBride, C. (2018, April 25). *Jette calls for shift in contracting practices, discretion with OTAs, reduction in UCAs*. Inside Defense. <https://insidedefense.com/daily-news/jette-calls-shift-contracting-practices-discretion-otas-reduction-ucas>
- McCormick, R. (2019). *Defense acquisition trends 2019*. Center for Strategic and International Studies.
- Murray, K., Darken, R., Vogt, B., & Goerger, S. R. (2014). *Early synthetic prototyping: exploring new designs and concepts within games*.
- Naval Special Warfare Command N87. (2020, August 11). *Other transaction agreement # N65236-18-9-0001*. [Working paper].
- Peters, H. M. (2019, February 22). *Department of defense use of other transaction authority: background analysis, and issues for congress*. Congressional Research Service. <https://crsreports.congress.gov/product/pdf/R/R45521>
- Red Bull. (n.d). *Red Bull stratos*. <https://www.redbull.com/int-en/projects/red-bull-stratos/the-mission>
- Reynolds, T., & Angle, V. D. (2018, Feb 21). *Acquisition disruption – innovative concepts in government contracting*. Government Contract Insights. <https://govcon.mofo.com/compliance/acquisition-disruption-innovative-concepts-in-government-contracting/>
- Robinson, Amy. (2017, August 23). *Army seeks gamers’ input to help shape future force*. U.S. Department of Defense, U.S. Army Training and Doctrine Command. <https://www.defense.gov/Explore/News/Article/Article/1286948/army-seeks-gamers-input-to-help-shape-future-force/>
- Sayler, K. M. (2019). *Hypersonic weapons: background and issues for Congress*. Congressional Research Service.
- Schwartz, M. (2010). *Defense acquisitions: how DOD acquires weapon systems and recent efforts to reform the process*. Library of Congress. Congressional Research Service. <https://apps.dtic.mil/sti/citations/ADA520832>

- Inhofe, J. (2019, December 2). *The U.S. must build the national security innovation base our defense strategy requires*. Defense News. <https://infoweb.newsbank.com/resources/doc/nb/news/178258EC2CEC9C40?p=AFNB>
- Smith, Dr. R., & Vogt, B. (2017). *Warfighting for systems engineering*. Journal of Cyber Security and Information Systems. <https://www.csiac.org/journal-article/early-synthetic-prototyping-digital-warfighting-for-systems-engineering/>
- Spenser, J. (2009, January). *Technology pollination*. Boeing Frontiers Magazine. [https://www.boeing.com/news/frontiers/archive/2005/december/ts\\_sf10.html](https://www.boeing.com/news/frontiers/archive/2005/december/ts_sf10.html)
- Stevens, M. (2020, June 30). *A guide to OTA proposals*. Defense Acquisition Solutions Group. <https://www.defenseacq.com/a-guide-to-ota-proposals/>
- Thomas, R. (2017a, May 2). *USSOCOM posture statement before the house of armed services committee*. USSOCOM Posture Statements. <https://www.socom.mil/pages/posture-statement-hasc.aspx>
- Thomas, R. (2017b, May 4). *USSOCOM posture statement before the senate armed services committee*. USSOCOM Posture Statements. <https://www.socom.mil/Pages/posture-statement-sasc.aspx>
- USSOCOM Office of Communication. (2020, October). *USSOCOM*. USSOCOM Factbook 2020. <https://www.socom.mil/#>
- Woolley, J., & Peters, G. (2013, September 14). *Dwight D. Eisenhower: statement by the President upon signing the national aeronautics and space act of 1958*. The American Presidency Project. <https://www.presidency.ucsb.edu/documents/statement-the-president-upon-signing-the-national-aeronautics-and-space-act-1958>

THIS PAGE INTENTIONALLY LEFT BLANK

## **INITIAL DISTRIBUTION LIST**

1. Defense Technical Information Center  
Ft. Belvoir, Virginia
2. Dudley Knox Library  
Naval Postgraduate School  
Monterey, California