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THESIS

**TECHNOLOGY ASSESSMENT OF THE INSPECTION
READINESS PLAN IN CHEMICAL WEAPONS
CONVENTION CHALLENGE INSPECTIONS**

by

Anthony R. Woodley

September 1998

Thesis Advisor:
Second Reader:

James J. Wirtz
William J. Haga

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CHALLENGE INSPECTIONS**

Anthony R. Woodley
Lieutenant, United States Navy
B.S., Norfolk State University, 1989

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September 1998**

Author: Anthony R. Woodley
Anthony R. Woodley

Approved by: James J. Wirtz
James J. Wirtz, Thesis Advisor

William J. Haga
William J. Haga, Second Reader

Reuben Harris
Reuben Harris, Chairman
Department of Systems Management

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I. INTRODUCTION

A. BACKGROUND

On, April 29 1997 the Chemical Weapons Convention (CWC) went into affect. The CWC is a detailed and intrusive treaty designed to ensure that no nation is producing or proliferating chemical weapons. The signatories of the treaty use it as the basis of a verification regime to detect the presence of chemical weapons and report any existing infraction. The book *Shadows and Substance: The Chemical Weapons Convention*, states the treaty was designed to insure that signatories will not

produce, stockpile, use or transfer chemical weapons; they will agree to internationally supervised destruction of existing stockpiles of chemical weapons; and they will support and participate in complex verification and compliance mechanisms [Morel and Olsen, 1993, p. 1].

The verification regime includes declarations and on-site inspections to monitor CWC compliance. Chemical Warfare (CW) weapons produced after 1 January 1946 and current CW production facilities are required to have declarations describing the chemical weapons activities that have occurred at the installation. An international inspection team assigned by the Organization for the Prohibition of Chemical Weapons (OPCW) conducts on-site inspections. OPCW

is the administration and verification organization established under the treaty.

The CWC inspection regime includes systematic inspections, facility inspections and challenge inspections. Systematic inspections are on-site inspections of declared facilities using permanent inspectors, installed instrumentation monitoring or both. Facility inspections are short-notice, on-site inspection focused on verifying the compliance of the chemical industry to the convention. Finally, Challenge Inspections are short-notice intrusive, on-site inspections that may occur anywhere. Any facility may be subject to a challenge inspection. Under the challenge inspection regime, the challenged state does not have the right to refuse the inspection. [IPO-5, 1997,p. 2]

Challenge inspections are the most intrusive of the three types of inspections. When the initial notification of a challenge inspection is received a series of coordinated events occur. First, notification of the inspection facility happens immediately. This usually is a phone call to the site's Commanding Officer (CO) or Command Duty Officer (CDO). This leaves the base with less than 48 hours after notification to prepare to receive the inspectors. Second, a liaison contingent, usually a flag officer and several service representatives greet the international inspectors at the Point of Entry (POE) and escort the international inspectors to the inspection facility. Third, a coordination

point at the inspection facility is established to enhance the inspection process. Finally, there are on-site negotiations for up to 72 hours to set the exact terms of the visit followed by up to 84 hours of continuous inspection activity. [IPO-5, 1997, p. 2]

The Navy Arms Control Directorate, International Programs Office (IPO-5) has developed an Inspection Readiness Plan (IRP) to prepare Navy Facilities for challenge inspections and to reduce potential confusion upon notification that an international inspection team is coming. The Navy has a Tiger Team on four-hour alert in the event of a challenge inspection. The Tiger Team will be assigned Temporary Duty (TEM DU) to the base CO for the duration inspection. The Tiger Team consists of 20 technical experts/treaty experts and is led by a Navy O-5/GS-15.

B. PURPOSE OF THESIS

This thesis examines the IPO-5 current support equipment and compares how current Information Technology (IT) could benefit IPO-5. It focuses on the existing equipment and through a technical evaluation determines the feasibility of replacing the current architecture with new IT enhancements. These initiatives will serve as a means of ensuring IPO-5 has the most capable IT equipment available to complete its mission.

This thesis will also include the results of a short questionnaire conducted at IPO-5. This questionnaire provided information used to focus on existing telecommunications, and computing capabilities. The information provided in the questionnaire highlighted individuals' different perspectives [on the equipment] used by the organization.

Currently, IPO-5 has some equipment that is technically obsolete or has limited capabilities. This thesis examines the various IT technological advancements available, and evaluates the durability of the equipment that might be used as a replacement for current systems.

C. SCOPE AND METHODOLOGY

This thesis will determine if the IRP can implement current Information Technology to benefit the process of conducting challenge inspections. This thesis will identify and evaluate IRP current inspection equipment.

Information technology has been around for quite some time and technological improvements are occurring on an exponential scale. The Inspection Readiness Plan (IRP) has inspection equipment that is out dated or no longer used. Currently, there are no scheduled equipment improvements; technical advancements being achieved today could help the IRP in reducing the amount of equipment needed for each inspection and reduce the amount of costs of maintaining the equipment.

The objective of this thesis is to evaluate the IRP inspection equipment and compare current IT available to enhance the IPO-5's mission.

The methodology used in this thesis is to conduct a thorough assessment of the equipment used by the IRP, review maintenance requirements for current IRP equipment, and determine requirements of the current architecture. The thesis will identify the current IT that improves the IRP's mission by interviewing with Tiger Team personnel from IPO-5. Finally, the thesis will evaluate the benefits and costs of implementing new technological enhancements.

D. DISCUSSION OF CONTENTS

Chapter II introduces the reader to the CWC challenge Inspection timeline. It includes an introduction to the IRP. It also describes the IPO-5 Tiger Team, especially the responsibilities of the key Tiger Team members.

Chapter III reviews the steps involved in the technology assessment. A discussion of current IPO-5 equipment architecture is provided. It includes a utilization review of challenge inspection equipment. Also included in this chapter is a discussion of compatible Information Technology equipment. Finally, this chapter reviews the results of the personnel questionnaire.

Chapter IV reviews accounting terminology. This chapter identifies the assumptions made in the evaluation. It includes a discussion of the benefits of purchasing new

technology. This chapter provides an evaluation of current architecture. Also the chapter evaluates new IT architecture.

Chapter V offers recommendations for IPO-5. Included in this chapter is a current architecture recommendation [about available] technology. This chapter describes IT mission enhancement recommendations. It also suggests overall equipment feasibility enhancements. The thesis will conclude with recommendations for implementing the new technology enhancements.

II. CWC CHALLENGE INSPECTIONS

A. CWC TIMELINE

The CWC Challenge Inspection is an intrusive inspection with a rigorous timeline. [Triplett, 1997, p. 7] The Challenge Inspection begins when "a signatory State Party to the CWC makes a request to the Organization for the Prohibition of Chemical Weapons (OPCW)" [IRP, 1997, p. iii]. All of the evidence that the state party has gathered to reinforce their position for the OPWC to conduct a challenge inspection of the suspected Chemical Weapons facility in the target country is included in this request. Once accepted, the OPWC issues a mandate to the target country indicating their intent to conduct a Challenge Inspection under the CWC. This mandate also includes the original statement from the requesting state party, the justification for the inspection to provide to the OPWC, and, the composition of the International Inspection Team (IIT). [Triplett, 1997, p. 7] The requesting state party can send an observer, although this observer does not participate in the inspection. The inspection clock starts once the challenged country receives the mandate from the OPWC.

Upon receipt of this mandate, US government procedures call for the formation of a host team. This host acts as the US government representative. The US government sends a member of the Joint Staff to be the Host Team Leader. The

rest of the host team will consist of representatives from each of the four services. The host team member will meet the IIT at the point of entry (POE) which is designated as the On-Site Inspection Agency (OSIA) at Dulles International Airport. [Triplett, 1997, p. 7] The IIT will arrive at the POE no later than 12 hours after the receipt of the mandate. The IIT leader will then give the host team leader the requested perimeter around the challenged facility. The Navy representative will then transmit the perimeter to the facility Commanding Officer. The challenged state party must begin self-monitoring at the specified location 12 hours after the IIT arrival at the POE. [Triplett, 1997, p. 7] This self-monitoring "consists of monitoring in a manner that will provide a permanent record (i.e., traffic logs, videotapes, air operations logs, and/or harbor logs) of all vehicular traffic exiting the requested inspection perimeter"[IRP, 1997, p. iv]. It is imperative, that this information be disseminated to the facility expeditiously.

The transport of the IIT to the facility is the next hurdle in the inspection timeline. Negotiations on the location of the perimeter and various briefings will be conducted at OSIA, but they must be conducted in time for the IIT to be at the perimeter of the facility 36 hours after their arrival at the POE. [Triplett, 1997, p. 7]

If the perimeter has not been agreed to prior to the IIT arrival at the facility, negotiations will continue at a

predetermined place located outside of the facility. [Triplett, 1997, p. 7] The IIT and the host team have up to 72 hours after their arrival at the facility to negotiate the final perimeter. If no agreement is reached, the alternative perimeter offered by the host team will become the final perimeter and the inspection will commence. The perimeter cannot be physically crossed by the IIT until the perimeter issue is settled.

The IIT must be given access into the final perimeter no later than 108 hours after its arrival at the POE. IIT inspection within the perimeter may continue for up to 84 continuous hours. [Triplett, 1997, p. 8] Inspection activities may include record reviews, personnel interviews, photography, sampling and the physical inspection of structures, areas, and equipment inside the inspection boundary. [IPR, 1997, p. iv-v] The IIT presentation of its preliminary findings is the final phase of the CWC Challenge Inspection. The IIT has 24 hours after concluding the inspection to present their findings.

B. INSPECTION READINESS PLAN

Whether located inside or outside of the continental United States, any naval facility might be inspected under the CWC treaty. Inspection under the CWC treaty is very unlikely and the base COs should primarily focus on their missions and normal routines. To aid the challenged

facility's command and support staff the navy created a manual, called the Inspection Readiness Plan for the Navy Facilities in response to Chemical Weapons Convention Challenge Inspection (IRP).

An IRP is prepared for facilities that may be subject to a CWC Challenge Inspection. The IRP begins within an executive summary, the basic plan on how to conduct an inspection, a description of the various phases of the inspections and the key events that are to be conducted during each phase. [Triplett, 1997, p. 9] The primary parts of the book are the checklists for the facility positions and functions such as the CO, Challenge Inspection Officer (CIO), Inspection Operations Center, Base Preparation, Base Escorts, Self-Monitoring, Physical Security, Operations Security, Counterintelligence, Safety, Communications, Supply, Public Affairs, Legal, and Medical/Dental. Also included within these sections are various appendices that delineate tasks to be completed or provide amplifying information to the people filling key base positions.

Key facility positions and functions such as the CIO, Inspection Operations Center, Base Preparation, Base Escorts, and Self-Monitoring are highlighted by the IRP. [Triplett, 1997, p. 9] Designated by the CO, the CIO is responsible for the overall management and coordination of the Challenge Inspection preparation and support activities.

During the course of a CWC Challenge Inspection, the CIO is the CO's primary representative. This person has many duties such as coordinating the activities that must be done prior to the arrival of the Tiger Team, preparing and presenting the pre-inspection briefing, providing direction to all of the inspection activities from the Inspection Operations Center and assisting the CO during the perimeter negotiations. [IRP, 1997, p. B-1]

The facility's command and control center for managing the CWC Challenge Inspection process is the Inspection Operations Center. All information passes through the Inspection Operations Center. Another function of the Inspection Operations Center is to communicate with higher levels in the chain of command and to IPO-5 headquarters. Support functions that are handled from here are transportation, supply administration support operations, recording of all inspection-related activities, and briefings. [IRP, 1997, p. C-1]

Base preparations readiness the installation to accomplish the tasks necessary to meet the requirements of the CWC Treaty provisions for the challenge inspections while protecting sensitive, classified, and proprietary programs from inadvertent disclosure. [Triplett, 1997, p. 10] Base preparation facilitates the inspection. The Base Preparation Coordinator highlights any sensitive areas and protects other areas' classified material. Additionally,

this process communicates the seriousness of this inspection to the entire facility. [IRP, 1997, p. D-1]

The Base Escorts "make an important contribution toward the success of a challenge inspection" [IRP, 1997, p. E-1]. The base escorts are familiar with the base and all of the buildings, structures, and entry points of the facility. The base escorts are extremely important and set the tone for the inspection. "They travel with the IIT wherever the IIT goes on the facility. Additionally, they ensure that the US government (USG) escorts are aware of the facility's sensitivities" [IRP, 1997, p. E-1]. To help with the inspection, the U.S. government provides professional escorts from the OSIA. The primary points of contact for the IIT inspectors are the base escorts. The OSIA escorts are there for assistance.

No later than 12 hours after the IIT arrival at the POE, self-monitoring must begin. The facility will be required to keep a factual record of all land, air, and water traffic exiting from the facility. [Triplett, 1997, p. 11] This process is continuous until the IIT arrives and takes over exit monitoring from the facility. To coordinate this effort, the CO will appoint someone, usually the Physical, Security Officer. Facility self-monitoring will help set the tone for the inspection: this is one of the first things that the IIT will observe once they are allowed

to cross the perimeter and conduct a turnover with the base personnel. [IRP, 1997, p. F-1]

Each of these checklists provides guidelines for the person filling the set positions with excellent information on inspection procedures and when the particular task needs to be accomplished. The IRP along with the Navy Tiger Team, discussed in the next section, provide support during a CWC Challenge Inspection.

C. NAVY TIGER TEAM

The CWC Challenge Inspection is executed on very short notice and is conducted expeditiously. Freedom of movement is required to move the IIT in and out of the facility as fast as possible in as little time as necessary for them to collect their findings. [Triplett, 1997, p. 11] The Navy understands that this type of inspection will happen rarely and that base preparation may be minimal at best, so they designated an assistance team called the Inspection Tiger Team to "support the CO and staff of a challenged facility in the event of a challenge inspection" [Tiger Team Manual, 1996. p. 1]

In the event of a Challenge Inspection, the Tiger Team is on four-hour alert to travel. It is to be on site at the inspection facility within the first 24 hours if initial notification by the OPCW to conduct a Challenged Inspection. "The Navy CWC Tiger Team provides expertise in the DON CWC

Inspection Readiness Plan IRP and its use in CWC treaty implementations, as well as in planning policy, contracting, and inspection preparation and support directly to the Commanding Officer to meet the requirements of a CWC challenge inspection." [Tiger Team Manual, 1996, p. B-1]

Key team members include a Team Leader, Inspection Operations Center Specialists, Self-Monitoring Specialist, Base Pre Specialist, Base Escort Specialist, Naval Criminal Investigative Service (NCIS) Representative, and the Treaty Information Management System (TIMS) Specialist. [Triplett, 1997, p. 12]

The senior member is the Team Leader. He or she is responsible for ensuring the team provides the required inspection preparation assistance and support to the challenged facility. The Team Leader is an expert in all aspects of CWC challenge inspection methodology. He or she has several primary responsibilities. First, this person directly supports the challenged facility CO in all aspects of the inspection process. Some specific tasks are the implementation of the IRP checklists, perimeter and inspection plan negotiations, site preparation and managed access methodologies. Second, the leader provides direct liaison between the facility CO and the Navy Headquarters Treaty Operations Center (HTOC). Third this person maintains liaison with HTOC by providing inspection status reports as necessary. Fourth, this person manages direct tiger team

activities. Finally, the Team Leader assists the CO coordinate with the USG Escort Team Chief prior to and during the Inspection. [Tiger Team Manual, 1996, p. B-2-3]

The Inspection Operations Center Specialist is responsible for initial set up the challenged facility's operations center. This person selects the staff, conducts on-site training, sets up the communications, and executes the Inspection Operations Center Coordinator portion if the IRP checklist. [Tiger Team Manual, 1996, p. B-4]

The self-monitoring specialist supports the facility's self-monitoring. This individual delivers the self-monitoring brief to the facility command and self-monitoring personnel. Additionally, this person assists with the selection, organization, and training of self-monitoring personnel. [Tiger Team Manual, 1996, p. B-4]

The Base Preparation Specialist assists the Base Preparation Coordinator in ensuring that the facility is fully prepared for a CWC Challenge Inspection. Additionally, this individual delivers the Base Preparations Training Brief to the facility command and base preparation personnel and assist with selection, organization, and training of base preparation personnel. [Tiger Team Manual, 1996, p. B-5]

The Base Escort Specialist directly supports the Base Escorts Coordinator in ensuring that the facility's escorts are prepared to conduct their duties and all aspects of base

escort operations during perimeter monitoring and inspection activities. Additionally, this person delivers the Base Escorts Training Brief to the command and escort personnel. [Tiger Team Manual, 1996, p. B-6]

The NCIS representative serves as the NCIS Headquarters representative. This person provides counterintelligence and criminal investigative support to the inspection process and to provide national-level guidance and direction to local NCIS personnel as needed. [Tiger Team Manual, 1996, p. B-6-7]

The TIMS Specialist coordinates the input of data into the various TIMS databases using two assistants, one of whom is devoted primarily to supporting the Base Preparation Coordinator. This person determines the TIMS configuration and the display and distribution of TIMS information to support Inspection Operations center operations and Base Preparations functions. [Tiger Team Manual, 1996, p. B-7]

D. TIGER TEAM EQUIPMENT

All of the personnel assigned to the Tiger Team have various functions to perform while a challenge inspection is unfolding. Along with these jobs are numerous pieces of equipment that support the Tiger Team members performing their duties. The Inspection Operations Center is the location where the essential activities occur and it is crucial that the equipment is functioning properly when

crucial that the equipment is functioning properly when used. The equipment used by the Tiger Team maintains an idle status until it is transferred to the challenged facility. The equipment has to be durable in order to travel to various locations throughout the world. The equipment used during a challenge inspection is vital to the Tiger Team and the challenged facility because the challenged facility may not have the capabilities to support the IIT. The equipment helps the inspection process to run properly and efficiently. This equipment varies in nature and provides information and communications support for the Tiger Teams' mission. A list of Tiger Team equipment is given in Appendix A.

III. TECHNOLOGY ASSESSMENT

A. OVERVIEW

The technology assessment (TA) process is a complicated task. There are a few research and consulting companies in the business of conducting technology assessments. One company specializing in technology assessments is Summit Research Associates. Their web page ad states, "We are experienced, we are straight shooters, and we will give you unbiased opinions on your plans and your products." [Summit Research Associates, 1997, p. 2] Another TA professional states "For end-users, it means understanding new technologies and finding the right products for their industrial control solutions. For vendors, it means meeting these challenges head on to give customers the best choices." [Susan Conwell, 1997, p. 1] Most TA professionals believe technology assessment has several elements, although there is no general accepted definition of what is meant by the term. ISIS Organization Consultants TA approach is "We provide information technology consultation and project management." [ISIS, 1997, p. 1] Armstrong and Harman (1980) offer the following definitions:

- (1) Technology assessment is the name for a class of policy studies which attempt to look at the

widest possible scope of impacts in society of the introduction of a new technology or extension of an established technology in new and different ways. Its goal is to inform the policy process by putting before the decision-maker an analyzed set of options, alternatives and consequences... It is extremely wide sweeping in scope; it is not the decision process itself, but only input into that process.[Joseph Coates, p. 139]

- (2) Technology assessment is the systematic identification, analysis, and evaluation of the potential secondary consequences of technology in terms of its impacts on social, cultural, political, economical, and environmental systems and processes. TA is intended to provide a neutral, factual input into the decision making process. [Vary T. Coates, p. 11]

The two assumptions these definitions share are that the implementation of new technology should be a conscious societal choice and technology is not harmful if it is managed effectively.

Technology assessments started in the late 1960s, when the government needed a way to evaluate certain technologies. In 1967 "Congressman Emilio Q. Daddario cited this according to two students of technology assessments [technology assessment] as an early federal attempt to

particular technological enterprise. Daddario called for a new form of policy research that he termed technology assessment. TA was intended to provide policy makers with a novel and powerful tool for coping with the dynamic and pervasive impacts of technology on the fabric of society."

[Porter and Rossini 1980, p. 30] The objective of a technology assessment is to present the client with a series of options. Another goal is to determine the best course of action. Research and analysis are conducted, the results are recorded and a determination is made. The researcher submits an unbiased opinion on what the client's options are. Once the options are presented to the client, the decision-making process for the client should be minimized. The series of options presented to the client are the basis of the technology assessment.

B. TYPES OF ASSESSMENTS

There are three types of technology assessments:

- (1) Project Assessment;
- (2) Problem-oriented assessment;
- (3) Technology-oriented assessment.

Project assessment is directed at a particular localized project such as a highway or industrial plant. Project assessments are technologically and geographically

constrained. They usually result in several options for the decision-maker. The problem-oriented assessment focuses on solutions for a specific problem. The assessment is determined by the problem at hand. Such assessments often have a strong policy content because they address problems of current concern. [Porter and Rossini 1980, p. 51]

The technology-oriented assessment focuses on examining new technology and its impact on society. Important considerations in a technology-oriented assessments are the forms of the technology, the duration of the innovation process, and how implementation of the technology is likely to occur. [Porter and Rossini 1980, p. 51] In this type of TA the time frame is not constrained and the policy content is more open than other assessments. This type of assessment produces more options because it begins with fewer constraints.

Because of its flexibility, the technology-oriented assessment will be used in this thesis. There are three sequential functions in conducting TA.

(1) Description of technology alternatives: Defining the technology or area to be assessed a technological description to be developed.

(2) Impact assessment: An impact assessment is examining a broad set of criteria of the social

impacts. The social impacts are how the TA can enhance the tiger teams inspection process.

(3) Policy analysis: Policy analysis is finding the best combination of policies and strategies for implementing technological alternatives.

The framework used in conducting this TA is from Coates [1976]. By reviewing Coates's ten elements of TA, a guideline was established. Some of the steps in Coates's elements were not applied in this thesis because findings for these steps were available. This methodology are the general steps that should be taken for any form of TA. These steps are not in chronological order but should be followed carefully to produce useful results. The steps are:

- (1) Examine problem statements
- (2) Specify systems alternatives
- (3) Identify possible impacts
- (4) Evaluate impacts
- (5) Identify the decision apparatus (DA)
- (6) Identify action options for DA
- (7) Identify parties of interest
- (8) Identify macro systems alternatives
- (9) Identify exogenous variables or events possible having affects on 1-8
- (10) Conclusions and recommendations

In this thesis, emphasis has been placed on steps two, three, seven and ten, following the technology-oriented assessment approach. This approach relates to the technology-oriented assessments by focusing on the new

technology available in the current market. The market offers numerous technical advances and options for the decision-makers. The basis of the technology assessment is conducted by following the steps two, three, seven and ten assessing the current technology being used by the Tiger Team and making a comparison with the technology available on the current market.

C. CHALLENGE INSPECTION EQUIPMENT UTILIZATION REVIEW

Navy Tiger Teams do not use the latest technology during challenge inspections. The term Tiger Team is used to signify that a special operation has to occur in order for the team to be activated. The equipment the Tiger Team has is only used during a challenge inspection exercise or an actual challenge inspection. It is maintained in a standby status at Naval Warfare Center, Indian Head, Maryland. An equipment manager is responsible for conducting maintenance checks and transportation of the equipment to the different inspection sites. The equipment is used to assist the Tiger Team in the inspection preparation process and during the inspection. Once notified that an inspection is going to occur, the equipment is taken out of storage and put into use. By having this equipment available for usage prior to the inspection and during the inspection, the entire inspection process can be completed efficiently.

Reviewing the formal documentation of the inspection process and interviewing members of the Tiger Team added important information to the assessment. The interview questionnaire is given in Appendix B. A total of eight personnel were interviewed and the results met the needs of this technology assessment. The interview questionnaire had six general questions on technology and some personnel information related to the Tiger Team member. "Interview demographics such as: grade or rank, gender, title, and position held in the department were collected." [Boston, 1997, p. 7] The interviews with Tiger Team personnel focused on what technology they wanted. It also focused on what they thought the assessment should give them. The general answer was technology is advancing and we (the Tiger Team) would like to know what is out in the current market. In the interviews it was revealed that most of the members believed their inspection equipment was old. They pointed out some of the flaws with their current equipment. In today's fast changing world of technology, some pieces of equipment have a relatively short technology life span. The usual time frame for IT equipment to stay state of the art is 18 months. Most of the Tiger Team equipment evaluated was based on early 1990's technology.

The equipment assessment provided information needed to conduct the comparison of the old technology versus the new technology. Inspection of equipment, maintenance records,

shelf life, battery usage, range of effectiveness, speed (information processing), and portability were evaluated. Price of the equipment was assessed, but did not determine the assessment. Review of videotapes of the challenge inspection process illustrated how the equipment is used in the field. All equipment inspected was in good working condition and maintenance records were in order.

D. COMPATIBLE INFORMATION TECHNOLOGY EQUIPMENT REVIEW

The IT equipment [cellular phones, pagers, hand-held radios, portable printers and laptop computers] reviewed are the latest models available on the commercial market. A list of Tiger Team IT reviewed equipment is given in Appendix C. These pieces of IT equipment all have sufficient capabilities for Tiger Team usage. Some of the equipment varies in price and capability, but the overall performance is the criterion of importance in selecting equipment.

Pagers are needed during an inspection because tiger team members may be off-site and vital information may need to be received. Unfortunately, pagers are only as good as the available coverage areas. Some challenge inspections occur in remote areas where commercial telecommunication service is a minimum.

Cellular phones are an essential part of Tiger Team communications. The cellular phones are also only as good as the coverage available. Cellular phones can be used to pass

information between the inspection teams and the command post. Often inspectors want to examine buildings where access to the building was not planned; therefore to expedite access into buildings cellular phones would be a vital communication tool for Tiger Team members.

Laptop computers are the main system used for communication with HTOC. The Tiger Team uses computers that can handle most tasks but they could always use more processor speed. Reports and e-mail messages are sent back and forth to HTOC. The Tiger Team's laptop computers must function at 133MHZ and be able to handle the large volume of messages.

Portable printers have been a problem for the Tiger Team because of transportation limitations. The portable printers have been damaged during transportation to an exercise. Some portable printers available are not suitable for handling the large volume of documents generated during the inspection.

Hand-held radios are used during the inspection for communications between the individual groups of inspectors. These radios help base escorts and inspection coordinators know the inspectors' locations. The radios in service now are the Motorola Saber Analog. They offer a limited range of up to two miles depending on airway traffic and other local conditions.

E. ASSESSMENT OF CURRENT ARCHITECTURE

According to market vendors, available equipment is leading edge technology. Several different strategies were used to acquire the information available on the market. The Internet provided the most useful and quickest source of information. By exploring this resource, locations of different technologies were identified. Information on IT, and computer trade shows events was displayed, and some sites were visited to review the technology. Computer magazines were another resource used to uncover the latest market technology. Magazines Computer World, Computer Shopper, IT World, and PC Magazine were some of the periodicals reviewed for information. Investigating the local market was another technique used to review available technology. Discussions with local vendors (i.e., Silicon Valley) provided information. Some of the sites visited to gather information were Internet and Electronic Commerce Trade Show at Jacob K. Javits Convention Center New York, April 27 - 29, 1998. This site revealed Internet solutions for electronic commerce. Different laptop computers were being used to illustrating laptop electronic commerce capabilities. Communications Plus Wireless Center located in Rockville, Maryland was also visited. The center displayed wireless communications devices such as pagers and cellular phones. Another site visited was Fry's Electronics, which

displayed laptop computers, cellular phones, pagers, bubble-jet printers, bubble-jet fax-phones, and conference callers. The site had the specifications of the different pieces of equipment displayed.

One of the first pieces of equipment reviewed was the pagers and cellular phones. The pagers available offer a variety of service and options. One of the important issues with IPO-5 and the Tiger Team is the ability to have nationwide coverage with their pagers. Another function desired by IPO-5 of its pagers is the ability for the pager system to translate messages from the pager to a computer for expediting messages to Tiger Team members. These were some areas reviewed in the pager systems.

For cellular phones a similar capabilities are needed. The cellular phones must have national coverage and be able to operate in rural areas. Battery life also was a critical capability reviewed for the cellular phone.

Another piece of equipment assessed were hand-held radios. For the Tiger Team, the use of the hand-held radios are essential because of the need for real-time communications. Inspection plans can change at a moment's notice because of the very nature of a challenge inspection: "The inspection team shall have the right of access to any area which could be affected by the alleged use of chemical weapons." [*Convention on the Prohibition of the Development, Production, Stockpiling and Uses of Chemical Weapons and on*

Their Destruction, October, 1993, p.164] Hand-held radios provide communications to various personnel on the Tiger Team because the inspectors may wish to inspect areas that attract their attention during an otherwise preplanned inspection route. The radios must be sturdy, have a long battery life of 12 hours continuous use, and be able to transmit messages over a distance of three miles. The current radios surveyed on the market offer digital service.

Laptop computers were reviewed for operating capacity. The computers were evaluated on processing speed, hard drive space, CD-ROM capable, and support for upgrades. Networking options were a key factor in assessing the laptops. There were several laptops available in the market that met the tiger team's requirements.

Bubble-jet printers and bubble-jet fax-phones were the next pieces of equipment reviewed. The ability of the Tiger Team to print out reports, maps and various pieces of information is vital in the conduct of an inspection. Printers were evaluated on speed, clarity of printing and compatibility. There were several options on the market with these desired capabilities.

Conference calling devices were reviewed for reliability and clarity when transmitting voice signals. During the inspection, communication with HTOC occurs and instructions and messages are passed. The conference caller

device should be a full duplex type able to transmit and receive voice messages simultaneously.

Current performance availability of secure telephones (STU III) and Global Positioning Systems (GPS) devices was explored. Unfortunately, information on these devices was not as accessible when compared to the other equipment under consideration. The government has information on this equipment and some of it is not available to the public. There was some Internet information on GPS; however, the information was only descriptive. No information was retrieved on STU III phones.

IV. NEW VERSUS CURRENT TECHNOLOGY EVALUATION

A. ACCOUNTING TERMS AND ASSUMPTIONS

In determining whether to purchase new technology, some accounting terms need to be identified. The terms identified were cost of capital, disposal costs, maintenance/warranty costs, and other costs (capabilities).

The cost of capital is the amount a Federal agency would pay for a product or service. In this case, the amount invested (capital cost) would be the cost of the new technology.

Disposal costs are the costs associated with the disposal of government property. When the IT equipment is purchased by Federal agency, the asset should be turned over for disposal through the Defense Resource Management Office. Most of the equipment will be donated to other resources; therefore disposal costs were not used as a criterion for purchase.

Maintenance/warranty costs associated with the equipment will be the same for the current and new technology; therefore maintenance costs were not used as a criterion for purchase. Most new technology equipment comes with a standard one-year warranty.

The price information on the Tiger Teams' current technology was based on 1997 computer magazines and

estimated for 1992 technology prices. The weights were assigned randomly with emphasis based on interviews conducted with Tiger Team members.

B. COSTS OF PURCHASING NEW TECHNOLOGY

There are several areas that were analyzed to determine the option of purchasing new technology.

1. Purchase price. There were several technologies available for purchasing. The price of each purchase item will be discussed separately. This price of the item is the value on the current market.

2. Capability Cost. The new technology capabilities are the value of the items. It was the price of the new technology that was compared to the existing tiger team equipment capabilities that is the basis for the analysis.

C. BENEFITS OF PURCHASING NEW TECHNOLOGY

1. OWNERSHIP. When an agency purchases new technology outright the agency has complete ownership of the equipment. There is no misunderstanding of what department owns what equipment. The purchasing agency will have full control over the new equipment.

2. ADVANCED CAPABILITY. New technology has the latest capabilities available on the market. The new equipment can produce, handle and perform better than the older technology. The technological advances will help the

tiger team complete challenge inspections more efficiently and effectively.

3. PUSHDOWN EFFECT. Older technology can be taken out of use and be put in other areas of the organization, which may not have cutting edge technology. The life of the older equipment may be extended and provide benefits to another organization.

4. COMMUNITY GOODWILL. To enhance community relations older technology equipment can be donated to local schools or churches. The gesture will improve the community's outlook on DOD facilities.

D. BENEFITS OF NOT PURCHASING NEW TECHNOLOGY

1. CONSERVATION OF CAPITAL. The non-purchasing of the new technology saves the organization capital. Investments could possibly be made elsewhere in the agency.

2. REDUCED TRAINING REQUIREMENTS. No new training is necessary if the new equipment is not purchased. The organization can concentrate on performing other tasks without the interruption of new technology training.

3. CHANGING CAPABILITIES. New technology changes frequently; it is hard to keep pace with this change. The capabilities of the older equipment meet the requirements for the tiger team members.

The following section (Section E) will show the cost (one time costs) and benefits of purchasing new technology

versus current technology. This Section E will be organized by equipment type. Therefore, Section E subsection (1 through 14) will show laptop computers followed by bubble-jet printers, bubble-jet fax-phones, portable radios, cellular phones, pagers, and conference callers. Furthermore, the capabilities/benefits of the technologies will be weighted and evaluated. The weights are assigned a ranking of one through ten. One is for the lowest ranking and ten is for the highest ranking. Then the weights are cumulated and compared. This will be the format for each of the items evaluated.

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E. NEW TECNOLOGY PURCHASE/TIGER TEAM TECHNOLOGY COMPARISON

1. Purchase of Laptop Computer

CAPITAL COSTS

ONE TIME COSTS (\$3191.40)

<u>CAPABILITIES/BENEFITS</u>	<u>WEIGHTS</u>
PROCESSING TIME	7
HARDDRIVE SPACE	8
OPERATING SYSTEM	6
CD ROM	5
TOTAL	26

One Time Costs: purchase price

2. Current Laptop Computer

CAPITAL COSTS

ONE TIME COSTS (\$6000.00)

<u>CAPABILITIES/BENEFITS</u>	<u>WEIGHTS</u>
PROCESSING TIME	5
HARDDRIVE SPACE	4
OPERATING SYSTEM	5
CD ROM	5
TOTAL	19

One Time Costs: purchase price

3. Purchase of Bubble-jet Printer

CAPITAL COSTS

ONE TIME COSTS (\$279.00)

<u>CAPABILITIES/BENEFITS</u>	<u>WEIGHTS</u>
PRINTING SPEED	8
QUALITY	6
COLOR	4
TOTAL	18

One Time Costs: purchase price

4. Current Bubble-jet Printer

CAPITAL COSTS

ONE TIME COSTS (\$400.00)

<u>CAPABILITIES/BENEFITS</u>	<u>WEIGHTS</u>
PRINTING SPEED	7
QUALITY	5
COLOR	3
TOTAL	15

One Time Costs: purchase price

5. Purchase of Bubble-jet Fax-phone

CAPITAL COSTS

ONE TIME COSTS (\$599.00)

<u>CAPABILITIES/BENEFITS</u>	<u>WEIGHTS</u>
PRINTING SPEED	8
QUALITY	6
COLOR	4
TOTAL	18

One Time Costs: purchase price

6. Current Bubble-jet Fax-phone

CAPITAL COSTS

ONE TIME COSTS (\$400.00)

CAPABILITIES/BENEFITS

WEIGHTS

PRINTING SPEED

7

QUALITY

5

COLOR

3

TOTAL

15

One Time Costs: purchase price

7. Purchase of Portable Radio

CAPITAL COSTS

ONE TIME COSTS (\$200.00)

<u>CAPABILITIES/BENEFITS</u>	<u>WEIGHTS</u>
RANGE	9
DIGITAL AND ANALOG	6
NUMBER OF CHANNELS	6
BATTERY LIFE	7
TOTAL	28

One Time Costs: purchase price

8. Current Portable Radio

CAPITAL COSTS

ONE TIME COSTS (\$200.00)

<u>CAPABILITIES/BENEFITS</u>	<u>WEIGHTS</u>
RANGE	9
DIGITAL AND ANALOG	6
NUMBER OF CHANNELS	6
BATTERY LIFE	7
TOTAL	28

One Time Costs: purchase price

9. Purchase of Cellular Phones

CAPITAL COSTS

ONE TIME COSTS (\$229.00)

<u>CAPABILITIES/BENEFITS</u>	<u>WEIGHTS</u>
RANGE	7
BATTERY LIFE	6
CLARITY	8
PAGING	7
MESSAGES	7
TOTAL	35

One Time Costs: purchase price

10. Current Cellular Phones

CAPITAL COSTS

ONE TIME COSTS (\$300.00)

<u>CAPABILITIES/BENEFITS</u>	<u>WEIGHTS</u>
RANGE	7
BATTERY LIFE	4
CLARITY	6
PAGING	1
MESSAGES	1
TOTAL	19

One Time Costs: purchase price

11. Purchase of Pagers

CAPITAL COSTS

ONE TIME COSTS (\$75.00)

<u>CAPABILITIES/BENEFITS</u>	<u>WEIGHTS</u>
COVERAGE	10
BATTERY LIFE	6
MESSAGES	7
VOICE MAIL	7
MEMORY MESSAGES	7
COMPUTER LINK-UP	8
TOTAL	45

One Time Costs: purchase price

12. Current Pagers

CAPITAL COSTS

ONE TIME COSTS (\$90.00)

<u>CAPABILITIES/BENEFITS</u>	<u>WEIGHTS</u>
COVERAGE	7
BATTERY LIFE	6
MESSAGES	7
VOICE MAIL	1
MEMORY MESSAGES	2
COMPUTER LINK-UP	1
TOTAL	24

One Time Costs: purchase price

13. Purchase of Conference Caller

CAPITAL COSTS

ONE TIME COSTS (\$499.00)

<u>CAPABILITIES/BENEFITS</u>	<u>WEIGHTS</u>
KEYPAD	6
FULLDUPLEX	6
TOTAL	12

One Time Costs: purchase price

14. Current Conference Caller

CAPITAL COSTS

ONE TIME COSTS (\$550.00)

<u>CAPABILITIES/BENEFITS</u>	<u>WEIGHTS</u>
KEYPAD	6
FULLDUPLEX	6
TOTAL	12

One Time Costs: purchase price

V. RECOMMENDATIONS AND CONCLUSION

A. NEW TECHNOLOGY RECOMMENDATION

The technology assessment revealed many options for the IPO-5 to pursue. The assessment reviewed IT equipment available on the commercial market and used the results of the interview questions to focus on the important capabilities of different pieces of technology. These pieces of IT equipment all have sufficient capabilities for Tiger Team usage, but the capabilities of some equipment is very limited compared to today's technology. Technology advancements are so rapid that technology becomes obsolete after 18 months. IT equipment reviewed was laptop computers, bubble-jet printers, cellular phones, hand-held radios, pagers, and conference callers. The overall performance (capability) is the criterion of importance in selecting equipment.

The Laptop computer recommendation is the Twin Cam laptop computer. The author suggests the Twin Cam because the computer has a Pentium 266MHZ processor, 4.0 Gigabyte hard-drive, and 20X CD-ROM. The tiger team uses computers for reports, e-mail messages, and maps of installations. The computer has the capabilities able to meet the Tiger Team needs.

The author recommends the Canon BJC-4550 bubble-jet printer. The speed and quality of the printer are the primary benefits in selecting the Canon BJC-4550. The capabilities are the speed of the printer 5PPM/blk and 1PPM/clr and the PC interface.

The cellular phone recommendation is the Motorola I600. The benefits are the digital service, voice mail and text/numeric paging. The cellular phones are an essential part of tiger team communications especially in the initial stages of an inspection. Cellular phones are used to contact certain members of the tiger team to start the pre-inspection process. Cellular phones are vital for Tiger Team member communications.

The author recommends the Motorola pager with national coverage package from Nextel. The national coverage is needed because Tiger Team members may be on-site and vital information may need to be received. Unfortunately, pagers are only as good as the available coverage areas. Some challenge inspections occur in remote areas where civilian population is a minimum.

B. CURRENT TECHNOLOGY RECOMMENDATION

After reviewing the hand-held radios the author recommends the Tiger Team should continue to use the Motorola Saber Analog radio during an inspection for communications between individual groups of inspectors. The

current market radio reviewed offered no extra benefits. Future upgrade if technology becomes available.

The author recommends the current conference caller used should not be upgraded. The available conference caller on the commercial market reviewed did not add any more benefits. The conference caller being used is adequate.

The portable printers available on the market did not offer adequate printer capabilities for Tiger Team usage. The author recommends the IPO-5 not invest in portable printers. Portable printers have been a problem for the Tiger Team because of transportation limitations. The portable printers have been damaged during transportation to an exercise. The portable printers available on the market are not suitable for handling the quantity of documents generated during the inspection.

C. MISCELLANEOUS RECOMMENDATIONS

During the review of Tiger Team equipment at Indian Head some other areas of the inspection process were noticed. These recommendations are areas IPO-5 could improve the inspection process. The author reviewed the maintenance records for the Tiger Team equipment and the records were kept in excellent condition; however, the author recommends the equipment be inspected randomly by a Tiger Team member other than the equipment manager. Random equipment checks

ensure the equipment is maintained at the highest levels of readiness.

The transportation cases currently used are old, worn and are not going to last much longer. The author recommends the IPO-5 invest in some new transportation cases for the equipment. Also the author suggests the IPO-5 invest in a fully capable transportation vehicle for the Tiger Team equipment from Naval Station Indian Head to Dulles International Airport. A sub-contracted or IPO-5 owned vehicle should be available for transporting the equipment transportation cases or have a vehicle on call. Personal vehicle transportation should not be used during an exercise challenge inspection or actual challenge inspection.

The recommended laptop computer (Twin Cam) must be compatible with the HTOC computers. The author recommends the four HTOC computers be networked compatible with the new laptop. Currently, only two of the HTOC computers are networked together. The benefit of networked HTOC computers is the same information would be available on all machines. The four HTOC computers should have compatible operating systems with the laptop computers on an inspection site.

D. CONCLUSION

This thesis illustrated Information Technology initiatives to help improve the CWC Challenge Inspection process. This thesis evaluated Information Technology and

made recommendations on the results of the assessment. Identified Information Technology equipment on the market that would facilitate the CWC Challenge Inspection process.

In summary, this thesis reviewed the CWC Challenge Inspection process, and documentation for a CWC Challenge Inspection and assessed the current Tiger Team equipment. The Inspection Readiness Plan is an excellent document and the technology assessment of the equipment found there are technology improvements available. IPO-5's ability to conduct a CWC Challenge Inspection is a complicated evolution and this thesis intended to make the process more efficient and effective.

APPENDIX A. TIGER TEAM EQUIPMENT LIST

35 mm camera w/accessory kit
Instant cameras
Tripods
Tr-81 8 mm camcorders w/accessories kits
Tr-61 8 mm camcorders w/accessories kits
8 mm VCR
8 mm Video viewers
Global Positioning Systems w/accessories kits
Belt tool kits
Magnetic flashlights
Head-lamps
Magnetic compass
Cassette recorders
Backpacks
First Aid kits
Saber 1 portable radios
Securenet repeater
Shoulder mics
Portable overhead projectors
Laptop computers
Bubble-jet printers
Bubble-jet Fax-phone
STU-III phones
Voice Point (conference caller)
Cellular phones

APPENDIX B. INTERVIEW QUESTIONNAIRE

Date:_____ Time:_____

Division:_____

Interviewee:_____

Position:_____

Grade:_____

General Questions

1. What does the term technology assessment mean to you?
2. Why does the department want a technology assessment?
3. What equipment do you want evaluated?
4. Has anyone in the command ever conducted a technology assessment before?
5. How would this technology assessment benefit the command?
6. What are the problems with the current equipment?

APPENDIX C. COMPATIBLE IT EQUIPMENT LIST

Global Positioning Systems w/accessories kits
Saber 1 portable radios
Laptop computers
Bubble-jet printers
Bubble-jet Fax-phone
STU-III phones
Voice Point (conference caller)
Cellular phones

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