

A HYPERMEDIA TRAINING MODULE

FOR THE

NAVY'S P-3C ARMAMENT SYSTEM

EDWARD J. CAMPBELL

JULY 1993

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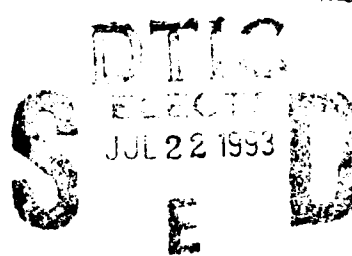
**A Hypermedia Training Module
For The
Navy's P-3C Armament System**

**A Research Paper
Presented to
the Faculty of the College of Education
San Jose State University**

**In Partial Fulfillment
of the Requirements for the Degree
Master of Arts
Plan B**

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ABSTRACT

TITLE: A Hypermedia Training Module for the Navy's P-3C Armament System

AUTHOR: Edward J. Campbell, LT, U.S. Navy

This project focuses on the development of a low cost hypermedia training module aimed at clarifying the mechanics of the Navy's P-3C armament system. Historically, this system has been an area of great ambiguity for the officers assigned to man the P-3C as evidenced by scores recorded on both written and practical evaluations. Reduced funding available for training has served to complicate this problem by affording these officers significantly reduced opportunities for actual hands on training and manipulation of the armament system. Consequently, this project was developed as a self-paced training module for use on a Macintosh home computer and combines the information contained in all three P-3C reference manuals along with actual representations of the aircraft's armament panels. The program was created utilizing the HyperCard 2.1 development software and affords the learner the opportunity for a great deal of interactivity and feedback.

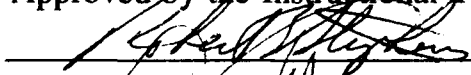
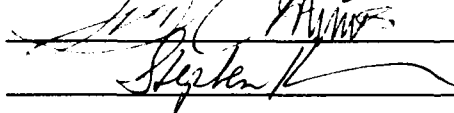
The project is divided into five chapters including an introduction, review of the literature, methodology, program description, and summary and conclusions. The literature review concentrates on the following topics: adult learners, computers and adult learning/motivation, learner and program control considerations, Hypermedia, Hypermedia design principles, review of the present P-3C training syllabus, and interviews with officers assigned to the P-3C training squadron.

As a guide, the Kemp model of instructional design was used in the development of the final program along with data gathered via interviews and questionnaires, review of historic written and practical evaluations, investigation of the present training syllabus and reference manuals, and a review of the literature outlined above. A complete needs assessment and data analysis was completed relying heavily upon results from interviews, questionnaires, and the researcher's own extensive experience in the P-3C aircraft. Data gathered overwhelmingly indicates the presence of a training problem and that the existing syllabus is in need of augmentation.

The training module developed by this project conforms to the guidelines recommended within the review of the literature and addresses all concerns unveiled in the data analysis portion of the project. The module is divided into four separate Hypercard stacks addressing the MK-46 torpedo on and off line procedures, the Harpoon missile, and review questions. Exact replicas of the armament panels contained within the aircraft are used and accurate indications of proper and improper weapon release procedures are provided for the learner. The program allows the learner to move between different segments of the module or to quit the program entirely at will. Direct feedback for correct and incorrect responses to the review questions are displayed immediately to the learner. An instructional brochure describing the function of all buttons and directions for navigation within the stacks is also provided.

In conclusion, the research examined by this project supports the notion that a self-paced training module would effectively lend itself to the needs of the officers assigned to the P-3C aircraft. Small scale Alpha testing of the program has yielded very positive feedback and almost no difficulty has been encountered with the actual operation of the program itself. It is recommended that a complete series of Alpha and Beta testing be completed and results forwarded to the Chief of Naval Education and Training for review.

Approved by the Instructional Technology Program

Approved by the Division of Educational Leadership and Development

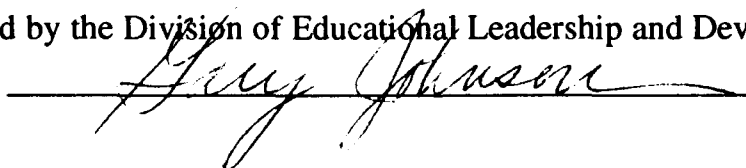


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CHAPTER ONE

Introduction

The close of the Cold War and an easing of tensions among the Superpowers has spawned a corresponding shift in the role of the U.S. Navy both at home, and abroad. A Fleet-wide reduction of personnel and available funds for operations and training has yielded a unique challenge to unit commanders for maintaining force readiness with drastically reduced assets. The world, however, remains an unstable and volatile place and this in turn dictates the necessity for the maintenance of a strong and swift militia capable of defending this country's vast interests around the globe.

The era of seemingly unlimited military funding and force build up has disappeared almost as quickly as the destruction of the Berlin wall, leaving in its wake a once insatiable military now faced with the directive to do more with less. The Navy has begun the unwelcome task of dismissing a large percentage of its valuable and highly skilled personnel and directing its attention to the timely and cost-conscious training of the remaining select few.

While the force as a whole draws down, individual skills and adaptability must be greatly accelerated. No longer will the Navy be able to reap the benefits of expert systems specialists who spent their entire careers dedicated to one specific system or platform. Instead, personnel will be required to be multi-faceted and capable of applying their skills in a myriad of different and challenging environments.

Indeed, even the warfighting platforms themselves (ships, aircraft, submarines, etc.) are being re-evaluated and retrofitted to accommodate a more expanding role. The term "multi-mission" is the prevalent word of the day and this concept is being applied to all facets of Naval operations. Gone are the aircraft dedicated solely to the attack or fighter missions. In their place come new aircraft carrying both the fighter and attack

designations. This type of consolidation can be seen throughout the Navy and it was only this year that the last of the great battleships was decommissioned and replaced by newer, faster, multi-mission platforms.

This shift toward increased flexibility and multi-mission consciousness has produced a tremendous training challenge to the Navy's personnel. Considering the reduced funding available for fuel, equipment, tools, civilian support, etc., how can these officers and men be trained in more diverse roles with fewer assets and still maintain the standard of excellence which has been the Navy's trademark for so many years? The most obvious solution is to maximize the use of synthetic trainers, especially in the field of aviation.

By nature, aviation is a demanding, dangerous, and unforgiving environment which requires total professionalism and constant training for both new and seasoned aviators alike. The actual hands-on flying of the aircraft is only half of the job. The other half translates to the control and delivery of the aircraft's sophisticated and often complex weapons systems. It is this half that will serve as the focal point for this research.

As was mentioned earlier, the use of synthetic trainers is becoming more and more prevalent in the training of Naval Aviation personnel. These trainers, however, also cost money and require civilian contractors to fulfill operation and maintenance roles. Obviously, these units cannot be expected to operate twenty four hours a day, but a great amount of training still needs to take place. Students are, therefore, limited to the time they are allotted for trainer utilization and, because these units are operated by civilian personnel, no opportunity is available for them to use the trainers individually to hone their skills or address weaknesses.

This research will focus on addressing this problem and will culminate with the presentation of a Hypermedia computer program dedicated to the training of Naval Flight Officer students in the area of weapons systems aboard the P-3C Update aircraft. This program will provide availability for individual home study of this system on a Macintosh

computer. The software program "HyperCard" was utilized to develop this module. This software must be installed on the computer in order to operate the program.

Background

The U.S. Navy's P-3C Orion Aircraft represents the epitome of the multi-mission platform. Originally designed as an Anti-Submarine Warfare (ASW) asset, its role in Maritime Patrol Aviation has evolved to include Anti-Surface Warfare (ASUW), offensive and defensive Mining, Narcotics Intervention, Intelligence gathering, Search and Rescue (SAR), and long range Surface Search and Surveillance. Its ability to carry a wide array of weapons, coupled with its record setting on station endurance profile, make the P-3C the ideal battle group support or stand alone platform.

As a result of its multi-mission capabilities, the aircrew compliment of the P-3C must be absolute experts at their many tasks and undergo extensive and rigorous training to achieve designation as qualified crewmembers. At the heart of this twelve man crew is the Naval Flight Officer who serves as the Tactical Coordinator (TACCO) and Mission Commander.

It is the Tacco's responsibility to ensure that the aircraft's many sensors and capabilities are used to the greatest extent possible in order to accomplish the assigned mission. Other responsibilities assigned to this officer include mission planning, crew coordination, safe and accurate navigation, tactical communications, and, most importantly, control of the aircraft's armament system.

It was mentioned previously that the P-3C is capable of carrying and delivering a myriad of weapons in anticipation of accomplishing its assigned mission. These weapons include: the Harpoon air to surface missile, the MK-46 and MK-50 ASW torpedo, mines, depth bombs, rocket launchers, and flares. The Tacco is the aircraft's armament system

expert and is responsible for the proper utilization of all variances of the afore-mentioned weapons. His knowledge must be extensive and absolute as the margin for error in this business is unmeasureably slim.

Intensive training is required to enable the Tacco to develop and hone the many skills demanded of his assigned responsibilities. Typically, the majority of the Tacco's attention during training is devoted to the study and manipulation of the aircraft's armament system. This is an extremely complex and intricate system which requires countless hours of hands-on training in order to master. Even after extensive training and reference manual study, student Taccos routinely have difficulty demonstrating the required flawless utilization of this system. With the recent reduction in funding available for training, this problem is predicted to worsen.

This research, and the corresponding development of the Hypermedia program that accompanies it, has been undertaken in anticipation of relieving some of the training lapses evident as a result of decreased funding. The researcher has over six years of extensive experience as a Naval Flight Officer and is presently assigned as the NFO Training Officer for the West Coast P-3C training squadron (VP-31). Accordingly, the researcher will assume the role of subject matter expert (SME) and product designer.

This research will address students who are all adult males and typically between the ages of 25 - 35. All students are commissioned Naval Officers and have completed at least a four year college degree program. The officers will predominantly be divided into two groups labeled First Tour and Second Tour. First tour students are generally junior officers assigned to their first operational squadron, while second tour students are more senior ranking officers who have previously completed at least one full squadron tour. These second tour students have previously achieved designation as a qualified Tacco, but have been away from the aircraft for 3 to 5 years due to assignments elsewhere. Typically, motivation within both groups is considered high.

Research Problem Statement

Evidence shows that, even after extensive reference manual review, reduced training opportunities have inhibited the development of Naval Flight Officer students progress toward Tacco designation. As a result, these students exhibit only a cursory understanding of the P-3C weapons system, as demonstrated on both written and practical evaluations.

Research Purpose Statement

It will be the purpose of this research project to design a Hypermedia program focused on clarifying the mechanics of the P-3C weapons system in order to enhance student comprehension and improve performance ratings on annual evaluations.

Research Questions

To conduct this research, a thorough understanding of the characteristics of the learners as well as their estimation of the existing problem is required. Also at issue is the effectiveness of computer-based training, and specifically the use of a hypermedia program, as a basis for a self- paced learning program. The following questions will serve as a guide to the development of this research:

1. What are the characteristics and needs of adult learners?

2. How do self-paced computer instruction programs satisfy the needs of adult learners and contribute to their motivation to learn?
3. What is Hypermedia and what characteristics of this medium are beneficial to the learning environment?
4. Why does extensive review of reference manual material fail to yield acceptable student comprehension of the P-3C weapons system?
5. Why do students fail to recognize and properly respond to the indications of real and potential weapons system malfunctions?
6. Why will student's use of a self-paced supplemental computer training module enhance their comprehension of the P-3C weapons system?

Limitations/Delimitations

Within the scope of this study, factors arise and exist which will be both controlled by the researcher and beyond the researcher's ability to manipulate. These factors warrant consideration and are described as follows:

Limitations

The project will be limited by the following conditions/circumstances:

1. The success of any instructional program is a function of the student's motivation. Every effort will be made to develop the program with the student's attention in mind, but it

is recognized that motivation is often an inconsistent variable.

2. The project will be developed for use on a Macintosh computer and will not have the capability to function with any other operating system.
3. It is recognized that the use of color in computer programs can serve as a vehicle to promoting student interest and motivation. The software program, "Hypercard", will be utilized in the development of this module and has no color capabilities.
4. The scope and depth of this project will be limited by the time afforded the researcher for project completion.

Delimitations

The project will be limited to the following conditions/circumstances:

1. The P-3C update model aircraft will be the focus of this project and older variances of the P-3 will not be addressed.
2. Due to security considerations, the project will remain unclassified and, as such, specific weapons' operating characteristics will not be included within the scope of this module.
3. The research gathered via survey for this project concerning student's attitudes and opinions will be limited to personnel presently assigned to VP-31, NAS Moffett Field, Ca.
4. The focus of this project will be limited to the two most commonly utilized weapon

systems aboard the P-3C; the ASW torpedo and the Harpoon air to surface missile.

Terminology

ASUW - Anti Surface Warfare

ASW - Anti Submarine Warfare

Harpoon - an air to surface missile carried on the P-3C.

MK-46 - an ASW torpedo

MK-50 - a newer ASW torpedo with advanced operating characteristics

NATOPS - Naval Air Training and Operating Procedures Standardization

Nav/Comm - Navigator/Communicator

NFO - Naval Flight Officer

P-3C - a four engine, turboprop, multi-mission aircraft operated by the U.S. Navy.

PPC - Patrol Plane Commander (Pilot)

PPMC - Patrol Plane Mission Commander

TACCO - Tactical Coordinator

Summary

The field of Naval Aviation is most demanding and unforgiving of error. The key to success in such an environment is the persistent and quality training of all personnel engaged in this profession. Only through this rigorous and regimented training doctrine, can the officers and men assigned to man our aviation assets perfect their skills in order to protect this country's interests throughout the world.

A combination of reduced funding for training and the ineffectiveness of present reference manuals, has created a deficiency in Naval Flight Officers' comprehension and operation of the P-3C weapons system. Synthetic trainers are being employed to replace actual "real world" training events, but the opportunity for students' utilization of these assets is severely limited.

This project will produce a computer-based Hypermedia training module designed to enhance students' comprehension of the P-3C weapons system. It will be a self-paced program suited to match the characteristics of adult learners and provide opportunity for individual study. This module will boost student comprehension levels with no additional costs to the U.S. Navy and is designed as a supplement, not replacement, to the existing training syllabus.

CHAPTER TWO

Review of the Literature

Introduction

The present syllabus, under which U.S. Naval Flight Officers (NFOs) are trained in regard to the P-3C aircraft weapons system, has failed to yield satisfactory competency for these officers. Evidence shows that, even after extensive reference manual review, reduced training opportunities have inhibited the development of NFO students' progress toward designation as a qualified Tactical Coordinator (Tacco). As a result, these students exhibit only a cursory understanding of the P-3C weapons system, as demonstrated on both written and practical evaluations.

The Tacco's knowledge and manipulative skill of the aircraft's weapons system must be absolute, as there is no tolerance for error in a war time scenario. The deficiencies recognized above result in part from:

1. Drastically reduced funding for training.
2. Inability of the aircraft's reference manual to serve an instructional role

These two complications contribute to an unsatisfactory and dangerous situation which must be addressed. The present training syllabus needs to be enhanced without substantial additional cost.

Accordingly, the purpose of this project is to design a Hypermedia training program focused on clarifying the mechanics of the P-3C weapons system in order to enhance student comprehension and improve performance ratings on annual evaluations. This program will be contained on a disk compatible with a Macintosh computer and will remain unclassified, thus enabling learner control over time and place of operation.

The project will focus on the two most commonly utilized weapon systems aboard the P-3C; the MK-46, and the AGM-84 Harpoon Missile. Identical representations of the actual control panels aboard the aircraft will be utilized throughout the program. The project will also contain a thorough review of the present training program and will identify common student weaknesses exhibited during competency evaluations.

As an aid to the researcher in designing a suitable training program, the following topics were examined and the summaries are contained in this literature review.

- The characteristics of adult learners.
- The relationship between self-paced computer instruction programs and adult learning and motivation.
- Hypermedia and its influences on education and training.
- The P-3C NATOPS manual and its role in student comprehension of the weapons system.
- NFO student and instructor attitudes and opinions regarding the present training syllabus and their estimate of success of the proposed computer based training module.

Methodology

This study seeks to address the research questions outlined in chapter one and the methodology of the research reflects these concerns. A great amount of data is capable of retrieval through traditional methods (manual searches through journals/periodicals and electronic searches; ERIC), but the nature of this project will require a great degree of reliance upon interviews and evaluation results.

MANUAL SEARCHES

The manual search consisted primarily of investigating educational indexes and journals relative to computer based training programs, and specifically, Hypercard. It also included close examination of numerous written and practical NFO evaluations over the past three years which are contained on file at Patrol Squadron Thirty One (VP-31), NAS Moffett Field, California.

ELECTRONIC SEARCHES

The electronic searches were conducted exclusively on the ERIC CD-Rom and the On-Line computer catalogue located at the Clark Memorial Library, San Jose State University, California.

DESCRIPTORS

The descriptors utilized for the search consisted of the following:

- Adult Learners
- Computers and Adult Learning
- Computers and Learning
- Computers and Learning Motivation
- Computers and Military Training
- Computer Based Training (CBT)
- Hypermedia
- Hypermedia and Learning

Learning Characteristics

Learning Theory

Simulation Learning

INTERVIEWS

The researcher generated a standard five point Likert scale survey (see appendix A) and distributed this document to instructors, students, and senior officers attached to VP-31. The results and data generated from this survey will serve a great value to the researcher during the design of the Hypermedia program.

SCOPE

The field of computer based training is changing at a rapid rate. Therefore, in order to ensure utilization of the most pertinent data, the literature reviewed on this topic was generally limited to the last ten years. Overall, the data gathered that predated 1981, was omitted (pertinent theories and items of historical significance excluded). Sources consulted for the study included books, periodicals, journals, government publications, microfiche, interviews, results of surveys and student evaluations, conference papers, and masters and doctoral theses.

THE LITERATURE

Adult Learners

Before effective instruction can be designed, great attention must be paid to the characteristics of the audience which the particular instruction will address. Essential planning elements such as selection of topics, sequencing, degree of learner control, etc., are a direct function of the particular learning group's needs. The concept of an instructional design that is generic in nature has no place in the advanced educational environments encountered in today's realm of education and training.

An important factor that serves to reduce the homogeneity of the vast learning population encountered in today's society is the increasing number of adults who have re-entered the learning spectrum in these settings: returning to colleges and universities, participating in adult community education, and engaging in job training for new skills in business, industry, health services, government service, and the military (Kemp, 1985). This phenomenon has inspired great amounts of research in the field of adult education and led to the conception of the term *andragogy* by Malcolm Knowles who defines it as, "The art and science of helping adults learn" (Knowles, 1970).

So who then are we to classify as the "adult learner"? Should we consider any educational endeavor beyond the completion of high school as an adult learning environment? Most researchers agree on the following axiom: the adult learner is age 25 and above, and in most cases has not been involved in formal learning for an extended period of time, usually at least three years (Murk, 1987).

It is recognized that multiple variables exist which contribute to the assemblage of one particular learning style as opposed to another. The aspects of human brain hemisphere functions, learning conditions, and cognitive learning styles are all contributors (Kemp, 1985), but, for the purposes of this study, the primary condition under examination will be adult characteristics.

In its most basic form, successful learning is a function of the particular student's motivation. Obviously, it is unrealistic to conceive of the design of one singular instructional or training module which would conform perfectly to the specific motivational needs of each and every aspect of the infinite array of individual learning styles. It seems best then to identify the common characteristics of the target group for whom the instruction will be intended, and to develop the module accordingly.

As noted previously, much research has been devoted to the concept of adult learning. Predominantly, the pioneer in this field has been Malcolm Knowles who identifies the characteristics of adult learners as follows:

- highly motivated to learn
- are most open to learning in a *life* change; new job, change of residence, marriage, etc.
- have many life experiences and have played several roles
- like to serve as resources to the class and share their competencies and experiences
- relate new learning to their life experiences and current circumstances
- view education as only part of their lives and like assignments/expectations far in advance
- often lack confidence in their ability to learn and need to re-build their self-confidence
- prefer active techniques of discussion, real problem-solving, simulations to passive learning
- want to apply learning to life problems and opportunities they face
- want to participate in goal setting - want quick feedback about their progress

- prefer a degree of informality between themselves and the instructor
- want to direct their own learning and set their own pace
- take responsibility for their own learning and conduct
- want learning to promote better life quality

(Knowles, 1970)

Other observations noted state that: adults will resist any learning experience which they believe is an attack on their competence (Wood and Thompson, 1980), adults will predominantly use curiosity for motivation (Camilleri, 1990), and, adults do not like to waste time because they have outside considerations (Kemp, 1985).

Computers and Adult Learning/Motivation

Knowing the general characteristics of adult learners is essential prior to the development of a training program targeted at this group. However, it is necessary to examine a more specific attribute of the adult learner prior to the design of this training module; the relationship between adult learners and computers.

The word "computer" itself can conjure up an infinite variety of images in different people's minds. Some have adjusted well to this new information age where the computer in the home or workplace is as common as the telephone, whereas, others view the computer as the enemy, a colossus of unimaginable complexity beyond the scope and comprehension of the average person's intellect and capability. But yet, children in the earliest of primary grades, are being taught to use these monstrosities with minimal effort. How can this be? In the case of the adult learner, we must refer back to the characteristic noted by Wood and Thompson; that adult learners will resist any learning experience which they believe is an attack on their competence. Since adult learning is ego based, there is a

natural resistance to avoid these machines that children have mastered but which adults have had precious little indoctrination.

The fact that adult learners were not assimilated into the use of the computer at a young age is perhaps the major contributor to the prevailing problem of computer anxiety. It is not surprising then that the research reveals that adult learners are more anxious about computers than younger students (Cambre and Cook, 1987).

The general conclusion that computer anxiety can be significantly lessened by direct exposure to computers (Honeyman and White, 1987) creates a paradox when compared to the following four behaviors demonstrated by adult learners who exhibit the symptoms of computer anxiety:

1. avoidance of the computer and the general area where it is located
2. excessive caution when working with the computer
3. negative remarks about the computer
4. attempts to cut the computer training session short.

(Cambre and Cook, 1985)

These behaviors noted by Cambre and Cook are, however, being overcome by the adult learners and one need only refer back to the characteristics of this group noted by Malcolm Knowles to understand why. Given that adult learners prefer to relate new learning to their current circumstances and want to have control over their own learning and set their own pace (Knowles, 1970), computer based training is the logical choice for instruction. Adults also tend to be realists, and therefore recognize that the computer is here to stay and as a result, acceptance must replace rejection. In nearly every business or industry environment, the computer is a prevalent apparatus and proficiency must be mastered if the individual is to remain competitive with his peers. As a result, a degree of motivation is also becoming more and more prevalent in the adult's attitudes toward

computers. Adults will learn, retain, and use what they perceive to be relevant to their personal and professional needs (Knowles, 1970).

This concept of learner motivation is paid too little attention in the available literature, and, most research studies aimed at identifying learner motivation, arrive at overly vague and generalized conclusions. However, the available research does support the notion that computerized instruction, involving a degree of learner control, does tend to contribute to enhancing the learner's motivation. An interesting observation was noted by Bostock and Siefert (1986) who conclude that "computerized learning appears to attract those very individuals who would otherwise be reluctant learners in continuing education". Another study equates computerized learning with a sink or swim scenario by summarizing that "computerized learning strongly motivates those whom it does not alienate" (Gerber, 1987).

Creating instruction that appeals to the affective domain of learning is of great importance in education, but it is the one area in which we have been able to do the least (Kemp, 1985). Learner motivation is a function of an infinite number of variables which tend to be dynamic in nature, thus contributing to the unreliability of selective case studies available for research. It would seem then that a reliance on results from attitude studies may only be considered conclusive when an over-abundance of data reflects similar conclusions. For instance, Theodore Shlechter conducted an examination of the research available for computer-based instruction in the military, and summarized that "the most seemingly pervasive finding in the CBI literature is that students favor taking a course by this medium" (Shlechter, 1986). This conclusion is seemingly unmeasurable statistically, so reliance upon "affective domain" data, such as learner attitudes and motivation, must be accepted in this generalized format.

Of the few statistical analyses of the effects of computer-based instruction on student attitudes, it was found that students in 17 studies generally liked instruction more when aided by a computer, and this yielded an average effect size of 0.33 and effected a positive change in attitude toward instruction of .28 standard deviations (Kulick and Kulick, 1987). In a separate investigation, the same researchers found that students learned more in classes where there was some form of computer interaction. The average effect over 199 studies was to raise exam scores by 0.31 standard deviations, that is, from the 50th to the 61st percentile (Kulick and Kulick, 1987).

This last statistic is significant and reflects the growing acceptance of the concept that computers not only contribute to increasing student motivation, but also enhance the quality of instruction and learning in general. This is especially true in a military training environment. Challenges facing the military training community are immense. Time and resources grow short while technical complexity increase daily. Undoubtedly the use of interactive training programs will prove their worth in this environment (Platt and McConville, 1982). The same researchers also state that "the use of computers will not experience the burn-out which followed the rapid rise of programmed text. Computers have simply proven too usefull".

Indeed this sentiment is shared by many branches and levels of the military. In an article prepared by staff members at the United States Military Academy , resounding praise is offered for the effectiveness of the computer as an aid to instruction, and noting that it is a powerful tool, predict its utilization will grow considerably in the future at West Point (Grubbs, Miszkevitz, Sheridan, and Ennis, 1986).

Interest in the computer has been sparked in the Navy's officer corp as well. A study revealed that, on the average, 3 out of 5 top choices among Naval Aviation Officers' preferences for post-graduate education, concerned computer sciences (Smith, 1987).

Clearly, the computer has manifested itself in the heart of the military's training programs and it is obvious that its use and development for training curriculums will continue at an accelerated rate.

Learner Control

In contemplating the design of a computer-based training module, an important element to consider is the amount of control over the program's progression that should be afforded to the learner. The majority of the research supports the concept that a greater degree of learner control contributes positively to the effectiveness of a computer-based instructional program. Individual differences in abilities and attitudes will be accommodated if learners have more control over the pace, and amount of practice or style of instruction they receive (Gay, 1986).

This appraisal of the impact of learner control on computer-based instruction is echoed and reaffirmed in the majority of the research reviewed by this study. When the research on computer-assisted instruction has included student attitudes, learner control has generally resulted in more positive attitudes toward instruction (Kinzie, Sullivan, and Berdel, 1988). A review of computer-based training materials conducted by Pritchard, Micceri, and Barrett assessed that the ability of the learner to control a lesson's sequence and timing is critical. Controlling the timing of the lesson permits the learner to set the pace for learning, without a feeling of being force-fed or having to wait for a lesson. "We believe that the dynamics of the human-computer interface are crucial to the success of any CBT package. It is through the give-and-take of content material that the student gains an understanding of the subject matter, so the quality of the interaction is critical" (Pritchard, Micceri, and Barrett, 1989).

While most experts will agree that there is evidence that increased control enhances feelings of self-efficacy and self-determination and helps learners take independent responsibility for their own learning and behavior (Papert, 1980), there exists a school of thought which maintains that the positive effects of learner control are audience dependent. The studies that have found positive advantages for learner control have involved highly motivated and or intelligent subjects, who might be expected to do better under less structured conditions (Tennyson and Rothen, 1979).

This author tends to agree with the conclusion stated above and recognizes its relevance to this study. Referring back to the description of the learner that this training module will address, that they are college graduate, adult learners, who exhibit a high degree of motivation, the findings of Tennyson and Rothen serve to bolster the decision to account for a high degree of learner control in the design of this training module.

Hypermedia

The concept of *Hypermedia* derives from the term *Hypertext* which was coined in the mid-1960s by Ted Nelson to describe a process for the creation of storage and retrieval of non-linear ideas and information (Fraase, 1990). The term non-linear in this case refers to the concept of offering the learner branches and choices for areas to explore at the learner's discretion. Where Hypertext refers mostly to text and static visuals, Hypermedia advances this notion to include sound, animation, music, and full motion video (Fraase, 1990).

Although not officially named until the 1960s, the concept of Hypertext can be traced back to the 1940s when, during World War II, then president Franklin D. Roosevelt appointed Vannevar Bush to supervise all federally funded research through the Office of Scientific Research and Development. Bush submitted an article to The Atlantic Monthly

entitled "As We May Think" which became the impetus for the vast array of computer concepts we see employed today. Bush envisioned the use of high-resolution displays, rapid information retrieval, and mass storage as a means of instruction and research for the future. Ted Nelson expanded on Bush's vision as he conceptualized a project he called Xanadu, which he conceived as a global information repository consisting of many nodes around the world (Fraase,1990).

In Nelson's own words: "By 'Hypertext', I mean non-sequential writing - text that branches and allows choices to the reader, best read at an interactive screen. As popularly conceived, this is a series of chunks connected by links which offer the reader different pathways" (Nelson,1987). This seems a very plain language description, but when adding the concepts of sound, animation, and motion, this serves us well as a template for the concept of Hypermedia.

By its very nature, Hypermedia employs a great deal of program interface and, in most cases, a corresponding emphasis on learner control of the instructional program. It would appear then, that this medium should be well suited for the learner population that this study will address.

The recent literature has predominantly commented favorably on the utilization of Hypermedia in an instructional environment. Marchionini, in an article for *Educational Technology* writes that there are three main characteristics of Hypermedia that have great potential for learning and teaching. First, Hypermedia systems allow for a tremendous amount of information to be stored in various media forms (text, visuals, videodisc, CD-ROM, animation, etc.) that are accessed readily and easily. Second, Hypermedia is "an enabling rather than a directive environment" which affords the learner a high amount of control over the presentation. Third, Hypermedia serves to alter the crucial interface between student and teacher (Marchionini, 1988). The interface referred to here suggests

that the teacher will be afforded the opportunity to direct more individual attention to the learner as opposed to dedicating his time to the rote dispensing of information.

In a similar appraisal, Friedler and Shabo applaud the flexibility of the Hypermedia platform by focusing on the availability and ease of adding additional information to already existing databases, as well as writing new learning activities and exercises within the same program. "Thus the teachers or other curriculum developers are able to adapt the coursewares to specific target users without having to master programming or other complicated technical material" (Friedler and Shabo, 1989).

It is important to recognize that to date, there has been very limited actual testing of the Hypermedia platform as an instructional advantage over standard CBT programs or other conventional mediums of instruction. As is the case with any new product or process, dissensions also exist. Allred and Locatis, (1988), write that Hypermedia programs are more geared for information retrieval as opposed to teaching, and provide little, if any, additional instructional support that helps the transition from novice to expert.

This author disagrees with this passage from Allred and Locatis, and maintains that the effectiveness of any educational or training program is a function of the quality of its design. Also at issue is the identity of whom the particular instruction is being designed for. To this end, Locatis latter writes that persons who have high general ability may learn most from a Hypermedia program (Locatis, Letourneau, and Banvard, 1989). It may be concluded then that the learners targeted for this author's project, having been identified as adult learners with high motivation and previous college experience, are uniquely suited to benefit from the many instructional attributes common to Hypermedia training programs.

Hypermedia Design

As is true of any computer based instructional program, its degree of success in a training environment is dependant on the quality of its design. In addition to the design considerations inclusive in any standard CBT package, Hypermedia programs require attention to many other elements (sound, navigation, motion, etc.) as well. Research shows that for any simulated training program to be a success, the system must be designed so that the skills learned via simulated training will transfer to the actual task that the student is being prepared for (Platt and McConville, 1982).

The major design issue confronting the developer of any Hypermedia program is the requirement for ease of navigation through the program. By the nature of its branching format, Hypermedia programs have the potential to lose the learner in "Hyperspace". The term Hyperspace refers to the frustration the user feels at not having a clear sense of direction or of his present position within the program (Semrau and Lu, 1992). Semrau and Lu offer the following five suggestions for avoiding Hyperspace and affording the user control of the Hypermedia program:

1. Let users exit from anywhere. Place a "Quit" button on every screen within the program.
2. Let user know where they are within the whole program...place a graphic icon representing the menu subsection at a standardized location on every screen within that section.
3. Let users jump back to the main menu from anywhere in the program. Place a "Main Menu" button at a standardized location on every screen.
4. Let users control the pace of the program with the use of navigational buttons for moving forward or backwards in the Hypermedia.

5. Structure the knowledge in small chunks. Limit the number of sequential screens containing text to three.

Adherence to these guidelines is essential for ensuring the users success with the program and for maintaining his interest.

Another issue of great relevance in the design of the program is the format and contents of the computer screen itself. Care must be taken to avoid including too much or too little information, and, concern also needs to be directed to the organization of the screen's content.

In the design of a Hypermedia presentation, as with any form of CBT, consistency is the key. Any global buttons that are used should be used consistently throughout the program and should appear in the same location on each screen (Semrau and LU, 1992). These same authors continue on to suggest that screen design is more effective when icons that are familiar to the user are used, and, that they too appear in a consistent location.

Heines (1984) identified the five functional areas of a screen, also noting that not all five need be used on each screen.

1. A screen should have orienting information (ie: how many frames remain etc.).
2. The screen should have directions for the learner in a consistent location.
3. The program should echo or display the student's responses.
4. A display area for informative error messages should be provided.
5. The options available to the student should be displayed in a consistent area.

The use of liberal white space, double spacing, and left justification are all common suggestions found in the research regarding screens that will utilize text.

As noted previously, proportionality is an issue when developing screen design, especially in a Hypermedia program where excessive options can lead to overuse. This is true of any of the media forms available, including sound and animation. It is noted here

that sound is a good source to get the user's attention or to alert that something unexpected has happened. However, sound should not be used as the sole indicator of a matter requiring attention. A visual indicator or printed text should accompany the audio channel (Semrau and Lu, 1992).

The Present Training Syllabus

The present training syllabus which Naval Flight Officers undergo with regards to the P-3C's weapons system is intensive. However, in many cases, intensity does not equate to adequacy, and the data collected for this study will support this view. There exists no published literature addressing the nature and value of the present training program conducted for Naval Flight Officers. The data utilized in this study will be gathered predominantly via interview and survey, and, will be investigated and elaborated upon in chapter 3. It was mentioned in chapter one that the P-3C is capable of carrying a variety of weapon platforms, however, this study, and the corresponding training module, will be limited to applications concerning the ASW torpedo and the Harpoon ASUW missile.

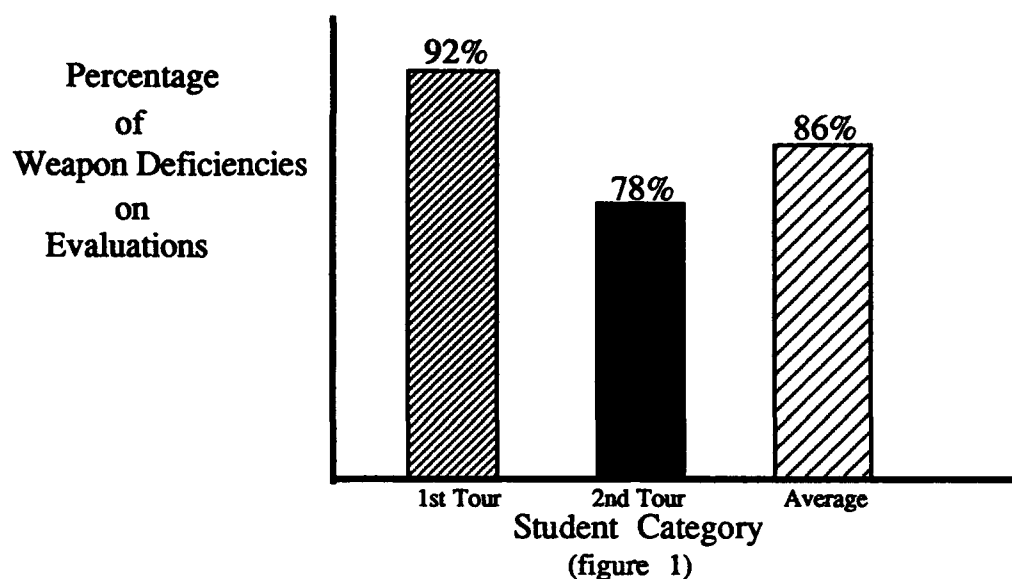
In the present training syllabus, NFOs are originally indoctrinated into the weapons system by means of an overview style lecture/discussion. A bibliography is presented to the student who is then afforded a good deal of self-study time in order to familiarize himself with the various weapon characteristics, operating modes, capabilities and limitations, and finally, the operation of the delivery system itself. Due to the complexity of the Harpoon missile and its unique operating characteristics, a separate instructional unit is devoted to the address of this system.

As a compliment to the lecture series, a hands on lab period is conducted on each weapon system aboard the aircraft where the student physically performs the necessary

actions required to successfully employ the particular weapon. During these lab periods a qualified instructor is on hand to aid the student and answer any questions that may arise. Typically, the student to instructor ratio is 2 : 1. These lab periods are conducted in both the simulator and aboard the aircraft. The cost to train a student for one three hour lab period on the aircraft, in a static condition, with power supplied by the aircraft's auxiliary power unit, is approximately \$200. As a result, the majority of these lab periods are conducted synthetically in the simulator.

After the lab period, the student is exposed to 7 full simulation events with an entire crew compliment in the trainer, and then, has three tactical flights with the crew in which total exposure to the weapons system is given. The student's training is culminated with the successful completion of a NATOPS checkride in which proficiency with the utilization of the weapons system is evaluated. Prior to the start of fiscal year 1992, the student's training syllabus involved 8 tactical training events in the simulator and four training flights.

A review of NATOPS evaluation results administered by Patrol Squadron Thirty One (VP-31) over the past three years, indicated that out of 127 evaluations conducted, weapons system deficiencies of some magnitude were recorded on 109 events (86%). Of the 127 evaluations, 73 were administered to first tour students (rank of Lt or Junior), and the remainder were administered to second and third tour students (rank of LCDR or higher). Out of the 73 first tour evaluations, deficiencies were noted on 67 evaluations (92%), while 42 discrepancies were recorded on second tour checkrides (78%). (Refer to figure 1 for a graphic representation of this data)



Interviews

A great portion of the data gathered to support this study was assembled via interview and a questionnaire, which was distributed to 40 Naval Flight Officer instructors attached to Patrol Squadron Thirty One (VP-31), NAS Moffett Field, Ca. The primary interview subjects are Lt Mark Miller, and Lt William Muyres, both of whom are attached to The Commander of Patrol Wings Pacific Fleet NATOPS Evaluation Team (CNET). Their responsibility with CNET involves administering NATOPS evaluation checkrides to all patrol squadrons throughout the pacific fleet, including, California, Hawaii, Alaska, and Guam. The role these two individuals play is to ensure standardization is maintained throughout the VP community and they are charged, as the model manager, with the maintenance and review of the entire NATOPS program, including updates and revisions to the NATOPS manual itself.

The focus of the interview revolved around student deficiencies in weapons utilization and the structure of the NATOPS manual itself. The Questionnaire also addresses these topics and the data collected from this survey will be addressed in chapter three of this study.

Both Lt Miller and Lt Muyres are in concurrence that the NATOPS manual is unsatisfactory as an instructional reference for students' study of the P-3C weapons system. However, they are also quick to point out that this was not the intent of the design of the manual to begin with. The manual was originally conceived as a reference manual only and was not designed to be utilized as an instructional source. Miller states that "The NATOPS manual can be perceived as more of a rules and procedures document vice a textbook. All aviators are charged with the responsibility of knowing and understanding the content of their respective manuals, but it does not function as an aid to systems comprehension". There are further reference documents available to aid students study of the complexities inherent in the P-3C weapons system, but availability of these documents is limited. Miller continues on to state that the best source for maintaining proficiency and comprehension of the system is hands on training and practice.

The majority of the officers interviewed and surveyed via questionnaire, concur with Lt Miller's conclusion. Herein, however, lies the problem. The reduction in funds for flight hours and training has already eliminated one training flight and one simulator event. It was mentioned earlier that the simulator is unavailable for individual training, so what methods can students employ to practice with and maintain their proficiency with the weapons system?

Both Miller and Muyres, as well as the majority of the officers surveyed, agree that an individual training module, such as the one being developed in this study, will serve as an effective training aid to students provided that , to the greatest extent, actual representations

of the control panels and indications of malfunctions displayed in the aircraft are utilized. These indicators of weapons system malfunction have been identified by most instructors as the primary facet of the weapons system that students fail to recognize or understand. All are in agreement that this is evident due to the lack of training time with the system available to the student.

Summary of the Literature

It is clear that the present training syllabus concerning Naval Flight Officer students' comprehension of the weapons system aboard the P-3C aircraft is in need of augmentation. The results of checkride evaluations reveal an alarming level of discrepancies present among the NFOs in the P-3 community. In addition, the recent reduction in funding for training has served to have an adverse effect on student competency, and the fiscal situation is predicted to worsen in the very near future. Consequently, it has been determined that the development of a computer-based Hypermedia training module would offer the student a suitable means by which he could enhance his knowledge and utilization of this system by affording him the opportunity to conduct training at his own pace, and at the time of his discretion.

The characteristics of adult learners seem well suited to the concept of computer-based instruction and Hypermedia programs in particular. Computers, while not proven to be a better instrument for instruction in all cases, offer the learner the opportunity for control over the pace of the instruction, the time that the program is used, the particular training to be conducted, and the ability for unlimited review of the instruction. All of these attributes have been identified as common needs of the adult learner, and will be well served in the Hypermedia environment.

The success or failure of a Hypermedia training module is a function of its design. Strict attention must be paid to issues concerning navigation, screen design, use of sound and animation, and the way text is presented to the learner. The potential to over-burden the learner with excessive information is also a very real concern which must be monitored and considered throughout the program's design.

It must be remembered that, the development of this training module is meant to serve as a supplement to the already existing training syllabus, not a replacement. The NATOPS manual, although identified as poor instrument for instruction, must still be studied and mastered for this supplemental training module to be effective.

CHAPTER THREE

Project Design and Methodology

Introduction

The U.S.Navy's P-3C aircraft is a multi-mission platform, demonstrating unsurpassed on-station endurance, and the capability to employ a wide variety of weapon suites, should the need exist. The key to the successful implementation of this versatile aircraft is the quality of the training experienced by its crew.

Evidence shows that, even after extensive reference manual review, reduced training opportunities have inhibited the development of Naval Flight Officer students' progress toward designation as Tactical Coordinators for the P-3C aircraft. As a result, these students exhibit only a cursory understanding of the aircraft's weapons system, as demonstrated on both written, and practical evaluations.

It will be the purpose of this research project to design an interactive hypermedia training module focused on clarifying the mechanics of this weapons system in order to enhance student comprehension, and improve performance ratings on annual evaluations.

This research project is both historic and descriptive in nature and its success as a viable training aid will be dependant upon the following:

1. Quality of design
2. Versatility of the authoring software program; Hypercard
3. Accuracy of data gathered via interview and questionnaire
4. Identification of tasks requiring training
5. Student motivation

Also, the project will be limited to the following conditions/circumstances:

1. The P-3C update model aircraft
2. The ASW torpedo and Harpoon Missile weapon systems
3. The unclassified features of the weapons system

Sample Population

The sources for the data collection used for the development of this project are all presently, or formerly, attached to Patrol Squadron Thirty One (VP-31), NAS Moffett Field, California (VP-31 is the West Coast P-3 training squadron where all Naval Flight Officers conduct their preliminary training prior to reporting to operational squadrons in California, Hawaii, Alaska, and Guam). Evaluation results researched are also maintained on file at VP-31. A total of 40 officers make up the population sample for the interview/questionnaire portion of this study and fall into one of the following three categories:

- Naval Flight Officer (NFO) Instructors
- NFO Students
- Senior Officers aboard VP-31

Presently, there are a total of 132 P-3 Naval Flight Officers actively serving in the Pacific Fleet.

Tools and Instruments

The tools and instruments utilized for the collection of data and design of the program, consist of the following:

- interviews with NFO instructors
- questionnaires
- historic review of written and practical evaluations
- review of literature concerning CBT and hypermedia
- investigation of present NFO training syllabus and related reference manuals
- the Kemp model of instructional design

The questionnaires were distributed to 40 NFO instructors, and interviews were conducted with the individuals primarily assigned to administer evaluations and checkrides. The researcher has over 6 years experience in the P-3C and has been assigned as the NFO training officer at VP-31 for the last 13 months.

The Kemp instructional design model (figure 2) was selected as a guide to the training module's development as a result of its comprehensive nature and flexibility.

Kemp Model

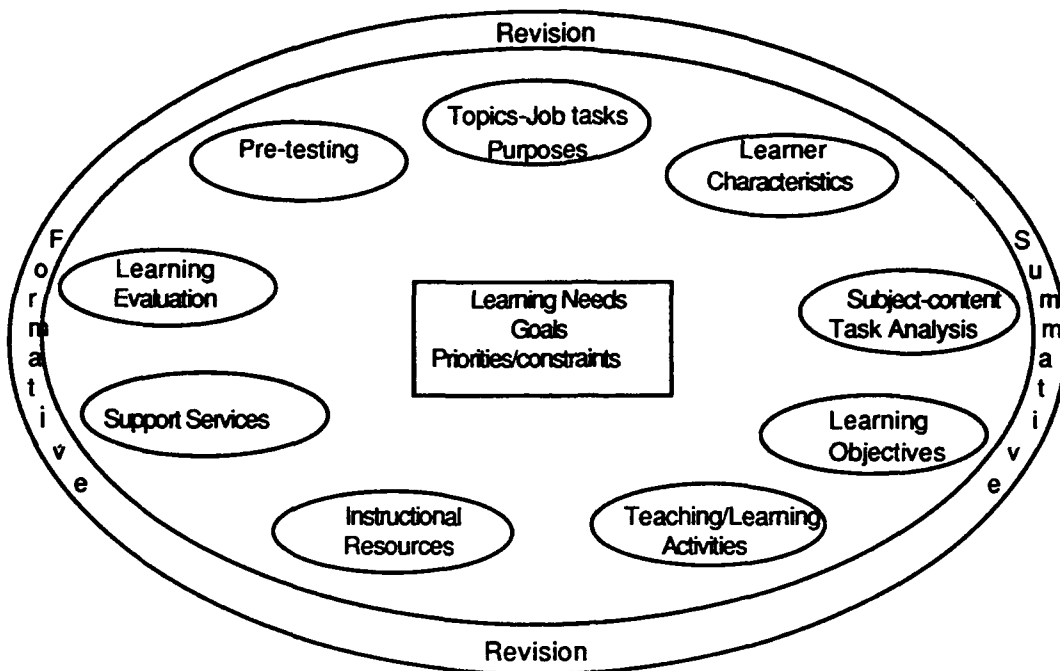


figure 2

The elements of successful instructional design identified in this model, will serve as a guide to the development of this module, and are expounded upon as follows:

GOALS

The goal of this project is derived from the needs addressed in the research problem statement (chapter 1) and as such, reflect the research purpose statement. Therefore, the goal of this project is to develop an interactional hypermedia program focused on illustrating the mechanics of the P-3C weapons system in order to enhance student comprehension and improve performance ratings on annual evaluations.

TOPICS-JOB TASKS

The following tasks will be addressed by the training module:

1. ASW torpedo weapon launch procedures
 - a) on-line
 - b) off-line
2. Harpoon Missile weapon launch procedures
3. Armament system malfunctions
4. Checklist utilization
5. Weapons envelope
6. Signal flow

LEARNER CHARACTERISTICS

The characteristics of the target audience that this module will address were outlined in chapter 1, and in summary are; all adult males, commissioned Naval Officers having at least a 4 year college education, and generally highly motivated. The level of prerequisite knowledge will vary with the learner. As a minimum, the learner should have already earned designation as a NAV/COMM, and be in the process of beginning study toward qualification as a TACCO.

TASK ANALYSIS

I. ASW Torpedo Weapon Launch Procedures

A. On-Line

1. provide means to access checklist on screen (button)
2. manual armament panel (if not in off position, give visual and audio alert)
3. torpedo pre-set panel (if not in auto, give visual and audio alert)
4. torp pre-set button, when depressed, give indication of function
5. torpedo function selected, give cues: bomb bay doors, and master arm
6. provide indications of kill ready (weapon release light)
7. provide indications of successful launch after malfunction is rectified
8. cue user to turn off all arm switches

B. Off-Line

1. Provide means to access checklist on screen
2. manual armament panel
 - a. when bomb bay station selected, show diagram of station numbers to avoid selection of blocked station.
 - b. if rack release is not selected mode, provide visual and audio cue
3. torpedo pre-set panel
 - a. provide description of various alternatives
 - b. provide indication that torpedo is presetting when selected.
4. provide cues for master arm and bomb bay doors
5. provide audio and visual indications of kill ready
6. Provide indications of successful weapon launch

II. Harpoon Missile Weapon Launch Procedures

- A. provide means to access checklist on screen
- B. provide cue to turn off manual armament panel
- C. missile bit check
- D. fire detector test
- E. harpoon control panel
 - 1. upon weapon selection, provide description of proper and improper indications
 - 2. provide description and limitations of the three launch modes
 - 3. provide cue to enter range and bearing data (provide reference for capabilities and limits)
 - 4. provide description and function of applicable control boxes
 - 5. provide cues for master arm
- F. Describe indications of missile ready
- G. Program weapon malfunctions and provide means for random access
- H. Provide indications of successful launch

III. Armament System Malfunctions

- A. Provided for in above procedures
- B. General armament system malfunctions (provide description)
 - 1. arm/ord control panel
 - 2. logic unit two malfunction
 - 3. arm hazard alert
 - 4. arm safety circuit disable switch

IV. Checklist

- A. Provide means to access weapons checklist at any time during program via visible button

V. Weapons Envelope

- A. Provide reference for classified data

VI. Signal Flow

- A. Animate signal flow and provide information on each unit

LEARNING OBJECTIVES

At the completion of this training module, the learner will be able to accomplish the following:

1. In accordance with the NATOPS checklist, correctly perform the steps required to successfully deploy an ASW torpedo
2. Recognize the indications of a weapons system malfunction and apply the necessary procedures to rectify the situation.
3. Perform the steps required to successfully deploy a Harpoon ASUW missile.
4. Given any degree of system degradation, select the appropriate missile launch mode required to successfully release the missile.
5. Successfully conduct a missile BIT and fire detection test in accordance with the weapons delivery checklist.
6. In accordance with published evaluation standards, demonstrate adequate signal flow knowledge during a practical evaluation.

TEACHING/LEARNING ACTIVITIES

1. Provide means for learner to repeat or by-pass sections of the module
2. Assess mastery of each section of module
3. Provide HELP button on every screen
4. Provide means to quit program at any given time
5. Provide feedback related to each objective
6. Provide learner with simple, but accurate navigation instructions
7. Provide accurate visual replicas of aircraft armament panels
8. Match aural and visual cues to actions requiring decision making

INSTRUCTIONAL RESOURCES

1. Macintosh computer with Hypercard 2.0 or higher program loaded.
2. 3 Training module disks
3. Training module overview package including instructions and recommendations
4. NATOPS manual (NAVAIR 01-75PAC-1.1)

SUPPORT SERVICES

None required

LEARNING EVALUATION

Provide means for feedback throughout training module. Develop comprehensive exam at close of module providing feedback for correct and incorrect responses.

PRETESTING

None required

FORMATIVE/SUMMATIVE EVALUATION

Conduct preview sessions with NFO instructors at the completion of each stage of module.

Revise as necessary. Present final training module to NFO instructors for review, suggestions, and critique. Revise final product as deemed necessary.

Data Collection/Needs Assessment**QUESTIONNAIRE**

A questionnaire aimed at identifying methods of improving the weapons training syllabus administered at VP-31(Appendix A), was distributed to 40 NFO instructors. The results of the questionnaire are as follows:

ITEM 1: Is present training syllabus adequate

<u> </u>	<u>18</u>	<u>8</u>	<u>14</u>	<u> </u>
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

ITEM 2: Has flight hour reduction adversely affected weapons system training?

<u>2</u>	<u>17</u>	<u>9</u>	<u>12</u>	<u> </u>
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

ITEM 3: NATOPS manual is an adequate source of instructional reference

<u> </u>	<u> 9 </u>	<u> </u>	<u> 24 </u>	<u> 7 </u>
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

ITEM 4: Individual training opportunities in the simulator would increase student proficiency

<u> 7 </u>	<u> 21 </u>	<u> 4 </u>	<u> 8 </u>	<u> </u>
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

ITEM 5: Recognition of weapons system malfunctions is a common problem among students

<u> 12 </u>	<u> 25 </u>	<u> 2 </u>	<u> 1 </u>	<u> </u>
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

ITEM 6: Hands-on training is the best approach to increasing proficiency

<u> 27 </u>	<u> 13 </u>	<u> </u>	<u> </u>	<u> </u>
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

ITEM 7: NATOPS checklists are adequate for utilization of weapons system

<u> 3 </u>	<u> 23 </u>	<u> </u>	<u> 12 </u>	<u> 2 </u>
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

ITEM 8: Proficient with a home computer

<u> 9 </u>	<u> 19 </u>	<u> 2 </u>	<u> 10 </u>	<u> </u>
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

ITEM 9: Access to a computer outside of the workplace

<u> 17 </u>	<u> 11 </u>	<u> </u>	<u> 8 </u>	<u> 4 </u>
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

ITEM 10: Students prefer to study in a self-paced environment

<u> 10 </u>	<u> 16 </u>	<u> 8 </u>	<u> 6 </u>	<u> </u>
Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree

WRITTEN EVALUATIONS

Written evaluations for Naval Flight Officers consist of a 40 question closed book exam, of which 12 questions are dedicated to the aircraft's weapons system, and, a 24 question open book exam, with 6 questions pertaining to the weapons system. These evaluations are administered annually and when attempting initial positional qualification.

The results of 127 written evaluations retained on file at VP-31, were surveyed for difficulties encountered with the armament system. Of these 127 exams, 73 were administered to first tour students (rank of Lt or junior), and 54 were administered to second or third tour students (rank of LCDR or higher). Rounded to the nearest whole number, the mean number of discrepancies noted on the closed book exam for both groups was 3 (M=3), and on the open book exam, the mean number of missed questions was 2 (M=2).

<u>CLOSED BOOK</u>		<u>OPEN BOOK</u>	
1st tour	2nd tour	1st tour	2nd tour
M=4	M=2	M=2	M=1
total, M=3		total, M=2	

These totals indicate that, on the average, the combined groups committed errors on 25% of the closed book, and, 33% of the open book questions dedicated to the aircraft's armament system.

PRACTICAL EVALUATIONS

As noted in chapter 2, the corresponding practical evaluations from the 127 events surveyed revealed the following:

On 109 out of 127 events (86%), students encountered difficulties with the utilization of the weapons system (see figure 3). First tour students demonstrated discrepancies on 67 of the 73 events surveyed (92%), while second tours recorded discrepancies on 42 of their 54 events (78%).

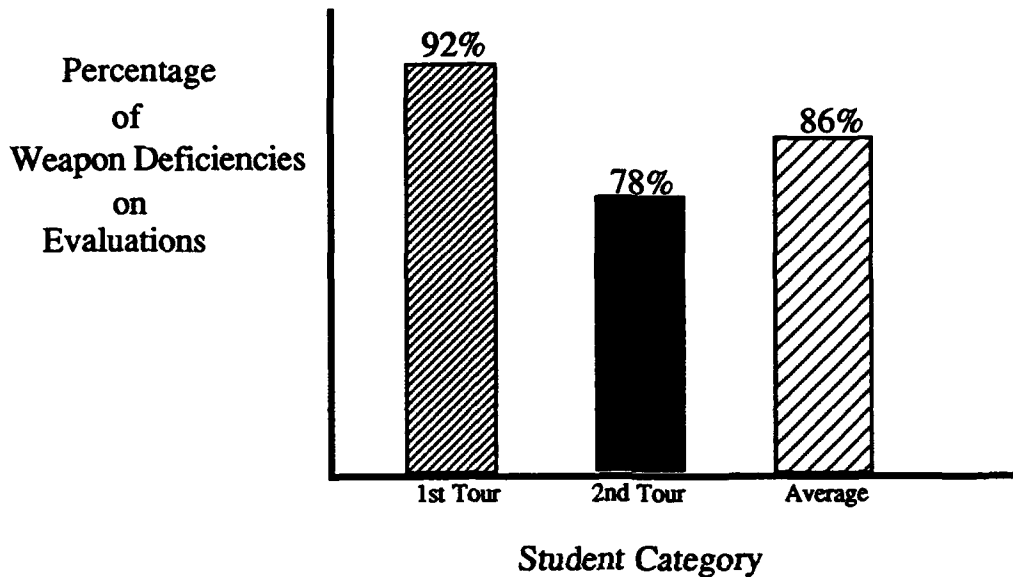


figure 3

INTERVIEWS

As identified in chapter 2, Lt Mark Miller, and Lt William Muyres are the primary P-3C NFO NATOPS evaluators for the Pacific fleet. These two individuals were interviewed at great length regarding the status of the present training syllabus, and the prospect for success of the module being developed in this project.

Both Miller, and Muyres agree that the present training syllabus is in need of augmentation. The number of discrepancies demonstrated on practical evaluations regarding the aircraft's weapons system, is reaching chronic proportions. They further agree that the

NATOPS manual, in itself, is not of great instructional value to the student, but rather should be utilized as a reference document and instrument of standardization only. This was the manual's original intent when designed.

The most frequent difficulties encountered by students during evaluations are their inability to recognize weapons system malfunctions, and their incapacity to rectify the existing problem, or to operate the system in a default mode. Miller equates this phenomena to a lack of exposure and training. "The present weapons simulator at VP-31 is adequate for mission training, however, it is not capable of simulating all of the possible malfunctions inherent to the armament system". According to Muyres, "the students simply do not get enough practice on the actual aircraft manipulating the weapons system".

The recent reduction in available funds for training has inhibited the students' development of expertise with the weapons system, and often students will attempt to be added on to other students' events to absorb what they can as observers. It has been stated previously that the training syllabus has eliminated one full training flight and one simulator event in an attempt to meet the declining allocation of training resources. This has served to put a greater demand on both students and instructors alike. The students must expend more effort in self-study practices, while the instructors are forced to "cram" more information and training into each event. The students interviewed by the researcher unanimously feel that at least two more training flights should be factored into the syllabus prior to an evaluation check-ride. This "fire hose" method of training presently being practiced, has served to frustrate and annoy the students to a great extent.

Both Miller, and Muyres agree that the level of knowledge demonstrated by the majority of the students evaluated has been cursory in nature, and lacks the in-depth understanding of the system that is characteristic of a true system expert. Both agree that

the premise of an individual training module for the weapons system is a great idea, however, they also offer some cautions. First, it is essential that the graphics used in this program exactly match the actual control panels in the aircraft. Secondly, if the program does not follow the same sequence as the aircraft's actual system, some bad habits and practices may result. Third, the need to incorporate audio signals for the student is essential in order to develop crew coordination skills. With these points in mind, Miller and Muyres believe that the module may be a great success, and a major contribution to the students' training.

Data Analysis

QUESTIONNAIRES

The questionnaire results gathered for this project , for the most part, reflect the responses that the researcher had anticipated from the sample group. However, a few of the responses were not characteristic and require further elaboration.

The results indicate that the majority of the NFOs interviewed believe that the syllabus is adequate in its present form, yet also agree that the reduction in available funds for training have hindered the students' development. On the surface, this would appear to be a disparity, but upon studying the accompanying comments to these questions, it is clear that the syllabus is judged as adequate mainly because there are few actual failures on evaluations. The fact that the students demonstrated minimum proficiency was regarded as an indicator of success with the program.

A surprising number of the sample indicated that they did not feel that individual training time in the simulator would increase proficiency and comprehension. The

common sentiment here is, that without an instructor present, students might develop bad habits, and would not have the ability to have their questions answered. The intent of this item in the questionnaire was that the individual training time would be supplemental in nature, not primary. It is likely that this item was possibly poorly drafted by the researcher.

As anticipated, the total sample agreed that the "hands-on" method of training yields the best results. Almost all were in agreement that recognition and reaction to weapons system malfunctions are the predominant weaknesses that students exhibit. The two respondents that were not sure on this point, as well as the one instructor in disagreement, are relatively new instructors who haven't had extensive evaluation experience.

The NATOPS weapons checklists were viewed by the majority to be adequate for the purpose of deploying the particular weapon. There are, however, a reasonable amount of dissenting views which echo the comments of one of the squadron's senior officers who states: "the checklists in their present form are cumbersome, time consuming, and omit limitations and considerations which the operator must employ during the weapon release cycle". This is a valid point, but due to the classified nature of these limitations, they will not be addressed in this researcher's project.

It serves this project well that, 70% of those surveyed exhibit competency with the operation of a home computer. It cannot be assumed that this is representative of the entire student population which will receive training in the P-3C, but it does indicate the existence of a trend. If the same question were posed two, or even one, year ago, the results almost certainly would have been different. Not surprisingly, 70% of the sample population also responded that they had access to a computer outside of the workplace.

As a final note regarding the questionnaire, it is curious that 14 respondents indicated that they were not sure, or disagreed with the notion that students prefer to study

in a self-paced environment. The comments accompanying this response generally proposed that, in their opinion, students prefer to be "spoon fed" the necessary information instead of being given the opportunity for self-exploration. Referring to the review of the literature on adult learning characteristics contained in chapter two, the researcher disagrees with this point of view, and will not consider it in the design of the module.

WRITTEN EVALUATIONS

To determine if a significant difference exists between 1st tour and 2nd tour student performance on written evaluations concerning the weapons system, a difference between the means was calculated as follows:

CLOSED BOOK EXAM

1st tour data: $M_1 = 4$, $N = 73$, $\sum X^2 = 118$ 2nd tour data: $M_2 = 2$, $N = 54$, $\sum x^2 = 86$

$$\text{Standard Deviation} = \sqrt{\frac{\sum X^2}{N}} = 1.27 \quad \text{Standard deviation} = \sqrt{\frac{\sum x^2}{N}} = 1.26$$

Standard Error of Difference Between Means

$$\begin{aligned} \text{Se diff M} &= \sqrt{\frac{N_1(S.D.1)^2 + N_2(S.D.2)^2}{N_1 + N_2 - 2} \left[\frac{1}{N_1} + \frac{1}{N_2} \right]} \\ &= \sqrt{\frac{203.39}{125} \times .033} = .23 \end{aligned}$$

$$\text{Test For Significance } z = \frac{\text{difference between means (2)}}{\text{standard error of diff. (.23)}} = 8.69$$

A significant difference therefor exists between 1st and 2nd tour students' closed book evaluation results. The training module must then offer the more advanced 2nd tour student the opportunity to by-pass rudimentary sections, while keeping these basic concepts available to the 1st tour student.

The same procedure outlined for the calculation of the difference between the means for the results from the closed book exam, were applied to the results of the open book exam as well.

OPEN BOOK EXAM

1st tour data:

$$M = 2, N = 73, \sum X^2 = 92$$

Standard Deviation = 1.12

2nd tour data:

$$M = 1, N = 54, \sum X^2 = 76$$

Standard Deviation = 1.19

Standard Error of Difference Between Means

$$= .21$$

$$z = 4.76$$

Again, a significant difference between the 1st and 2nd tour students' exam results is evident. This, coupled with the percentage of errors exhibited on practical evaluations, reinforces the need to provide a means of progressing through the training module at different rates, depending upon the skill level of the student utilizing the program.

CHAPTER SUMMARY

This chapter has identified the sample population utilized by the researcher to gather data in support of designing an effective training module for use by Naval Flight Officers in advancing their proficiency and competency with the weapons system aboard the P-3C aircraft.

The Kemp model of instructional design was identified as the guidelines by which the project will be developed. Attention was given to all facets of the Kemp model, and an in-depth needs assessment, and task analysis were conducted to serve as a guide during the construction of the training module.

A great deal of the data utilized by the researcher was derived via interview and questionnaire. The results of both were discussed, and the unanticipated discrepancies were examined. These instruments were of great value for gathering required information involving P-3C specific data which is unavailable in literature form. This data tends to support the researcher's original identification of the problems inherent in the NFO training syllabus, and supports the proposed training module which this project shall produce.

Raw score data from historic written and practical evaluations kept on file at VP-31 was examined to identify if students did, in fact, typically encounter difficulties with the P-3C weapons system. This data overwhelmingly indicates that a training problem in this area exists, and that the present syllabus is in need of augmentation. A statistical evaluation of differences between 1st tour, and 2nd tour students was also conducted, and, a significant difference between the groups was found to exist.

All of the data compiled thus far in the context of this study, will be utilized as a tool, and as a guideline in the development of the training module. From the researcher's point of view, majority of the data supports the use of the Hypermedia platform as a viable

training medium for the development of Naval Flight Officers' competency and proficiency with the P-3C weapons system.

CHAPTER FOUR

The Project

Introduction

This chapter describes the completed project and includes a map of the HyperCard stack, and directions for navigating through the program. Instructions for loading the program on to the computer are also included. A printout of the cards contained within the program is provided in appendix "B". A brochure containing loading and navigation instructions similar to those contained within this chapter, is included with the program disks.

The HyperCard Stack

The project was developed within the context of the guidelines discussed in chapters two and three, and addresses the MK-46 Torpedo and AGM-84 HARPOON Missile launch procedures. Both aural, and visual cues are used throughout the program as necessary to alert the learner to specific items requiring his attention. Animated sequences that indicate successful completion of a specific task are also included. The number of cards which contain only text were kept to a minimum and exact replicas of the actual armament panels inherent to the aircraft were used. At the conclusion of the program, a 25 question comprehensive exam, including actual questions from the Navy's P-3C NATOPS Evaluation Team, is available for the learner to evaluate his comprehension level. Wrong answers to the questions on this exam are automatically displayed upon selection.

The program is actually divided into 4 HyperCard stacks labeled P-3C ARMAMENT #1 - #4, and is contained on three doubled sided/double density disks. These disks were used due to the inability of some computers to read high density disks. In its present form, the program is only available for use on Macintosh computers containing the HyperCard software program. The original HyperCard software was included free with newly purchased Macintosh computers and has been available since 1987. Plans are in work to convert the program into a format compatible with IBM PC platforms.

Loading Instructions

This training module is contained on three disks and it is recommended that they be copied on to the computer's hard drive prior to use. To copy the program to the hard drive, simply create a new folder and copy all three disks into the folder. Disk #1 contains the first stack labeled "P-3C ARMAMENT #1" and contains instructions for loading the program and navigating through the stacks.

Stack Navigation

This section describes the instructions for navigating through the stack. The overall goal of this design was to provide the learner with easily manipulated tools with which to proceed through the program and avoid getting lost within a particular module. Where necessary, the program will prompt the learner to perform a specific task in order to continue with the program.

Travel throughout the program is accomplished by positioning the mouse pointer over a button on the screen and clicking the mouse once. **NOTE:** Computers all operate at different speeds so the selected button may not activate immediately when it is clicked.

Click each button ONLY ONCE.

Button Descriptions



Returns to previously viewed card in stack



Continues with program by advancing to the next card in the stack



Displays more in-depth information about that particular topic



Displays the information and instructions card



Displays the topic selection card



Quits the program



Provides a description of the HARPOON selection panel (HACLCS)



Displays the checklist for the current procedure in use

The Quit, Topics Selection, and Information/Instructions cards are available on all cards throughout the stack to provide the learner with the option of continuing on with the present segment, selecting another topic, or quitting the program at any time. A different topic can be selected at any time by clicking on the topic selection icon, and choosing a new segment from the menu.

The navigation buttons are located at the bottom right hand corner of each screen. The Checklist, In-Depth, and HACLCS information buttons are located at the top right hand corner of the screen when displayed. These are not navigation buttons, but rather provide additional information or guidance to the learner.

Orientation icons are also provided at the top left hand corner of the screen to identify which segment of the program is in use.



MK-84 Harpoon



on-line

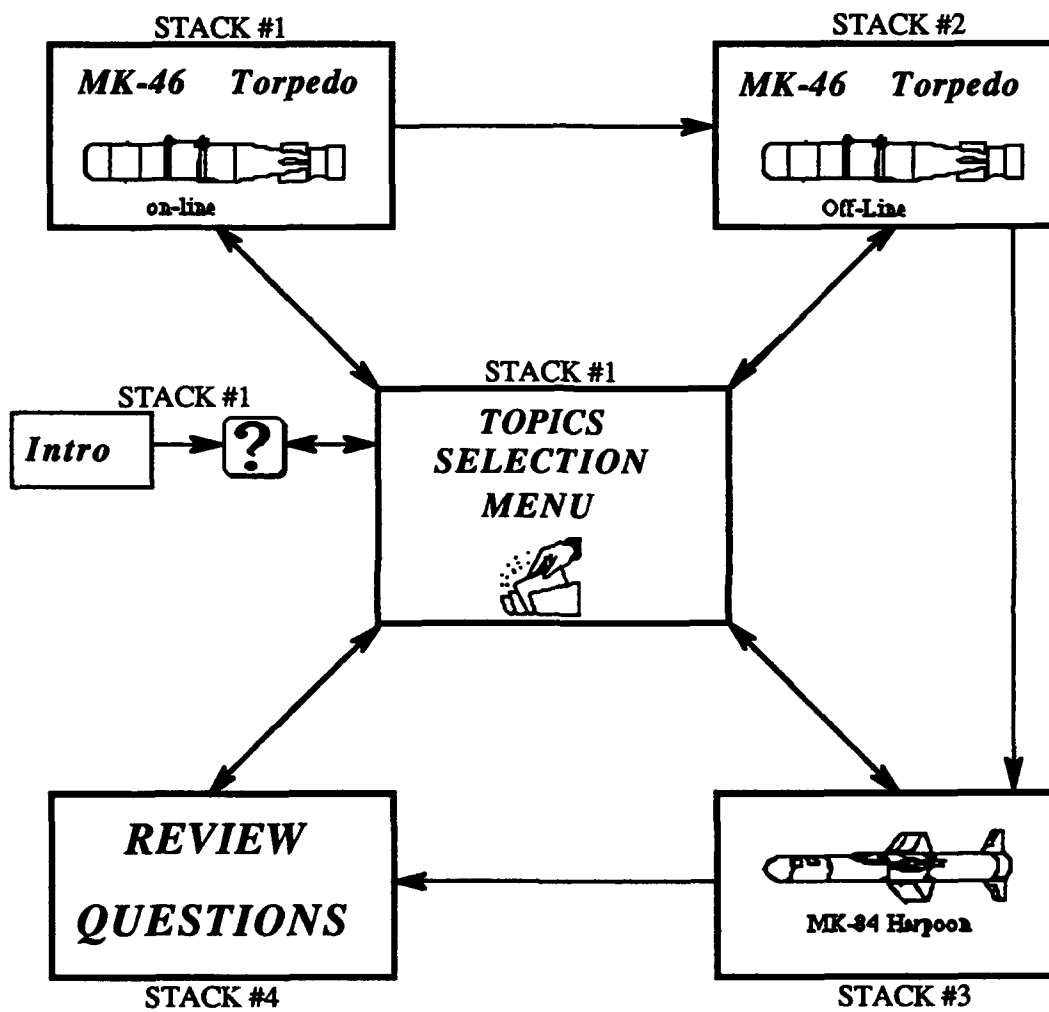


Off-Line

Orientation Icons

The orientation icons provide no function other than to inform the learner of his location within the program. Clicking on these icons will not result in any program action.

Stack Map



The Quit, Information/Instructions, and Topic Selection cards are available on all cards within the four stacks.

CHAPTER 5

Summary, Conclusions, and Recommendations

Summary

Since the time of this project's inception, the financial barriers facing the United States Military have become more drastic. The recent announcement of further base closures and stated goals of reducing the defense budget by billions more dollars than originally anticipated, have accelerated the complications of securing ample funding for military training. Consequently, new training philosophies and programs need to be developed which address this new cost - conscious environment.

Seemingly, programs such as the one developed in this project, have great potential to fill the void created by a drastic reduction in funds available for training. This program is highly interactive, displays accurate representations of actual aircraft armament system operations, and provides immediate constructive feedback to the learner. Perhaps its greatest attribute is the relative low cost of production that accompanies a training module of this type. However, the program's effectiveness for training on a wide scale has yet to be evaluated.

Conclusions

The literature examined in this study seems to support the premise that a self-paced training program would effectively lend itself to addressing the needs of adult learners. Of key importance is the provision within the program for a great deal of interactivity and

direct feedback to the learner. The module developed in this research project contains a great deal of both prerequisites, and has succeeded in meeting the project's goals as outlined in chapter three.

The project has been issued to several Naval Flight Officer instructors for alpha testing and has since been revised to address the problems identified by these individuals. Overall the critiques have been extremely positive and all users have praised the project's potential worth to new students and seasoned veterans of the P-3C alike. The review questions contained at the end of the program received particularly favorable comments as a result of the immediate, and comprehensive feedback that is provided to the learner if a question is answered incorrectly.

This researcher has consulted with designers of similar Hypermedia programs at the Naval Postgraduate School in Monterey, California, in an attempt to receive constructive feedback on the project's merits, and to derive a certain degree of standardization inherent in future Naval training programs of this nature. Again the feedback received was overwhelmingly positive and a great deal of design topics were discussed and interpreted based on each individual's research.

This project has also been forwarded to the Chief of Naval Education and Training (CNET) in Pensacola, Florida for review and critique. Unfortunately, only a portion of the project was delivered due to the time restraints afforded this researcher, and many revisions have taken place since the original draft of the program. To this point, no feedback has been received from this command. A copy of the final project will again be forwarded to CNET in the near future.

Recommendations

The potential for the development of inexpensive, and effective training programs, such as the one produced by this project, is unlimited. An extensive background in computer programming is not required, and with minimal instruction, any individual can develop a program similar to this one. In order to derive the greatest training value from this program, attention should be given to the following points:

1. An extensive beta test should be conducted as soon as practical involving a sample population of dissimilar backgrounds (ie: junior officers, senior officers, limited experience, extensive experience, etc.)
2. The present program should be expanded to cover all armament capabilities of the P-3C (the present program was limited due to time constraints)
3. A classified version should be produced to include weapon operating envelopes.
4. Provisions should be made to translate this program into an IBM PC compatible software package for more universal use.
5. A link to an interactive video disk or desktop video program such as QuickTime would enhance the realism of the program.
6. Designers of Naval training programs should be made more aware of the characteristics of adult learners, and consequently concentrate their efforts toward addressing the particular needs of this target group.

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APPENDIX: A

Survey on P-3C Training Efficiency

Name/Squadron: _____

Rank: _____

This survey is designed to aid in identifying methods to improve our scope of instruction regarding weapons utilization in the P-3C. Historically, this has been the topic which students have the most difficulty mastering as evidenced on both written and practical NATOPS evaluations. The data collected here will be utilized in the development of a Masters Thesis project presented by Lt E.J. Campbell aimed at improving student's comprehension of the P-3C weapons system. Please take the time to answer each question by placing a check mark in the appropriate space below each question item. Space is also provided for any additional comments you would like to make regarding each topic. Thank you for your time!

1. The present syllabus for weapons instruction is adequate in its present form.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

Comments:

2. The recent reduction in flight hours has adversely affected weapons system training.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

Comments:

3. The NATOPS manual is adequate as a source of instructional reference.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

Comments:

4. The availability for individual study in the trainer would increase proficiency and comprehension of the weapons system.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

Comments:

5. Recognition and proper response to weapons system malfunctions is a common problem during NATOPS evaluations.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

Comments:

6. "Hands-On" training is the best approach to increasing proficiency.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

Comments:

7. NATOPS checklists are adequate for successful utilization of the P-3C weapons system.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

Comments:

8. I am proficient with the use of a home computer.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

Comments:

9. I have access to the use of a computer outside of the workplace.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

Comments:

10. Students prefer to study in a self-paced environment.

Strongly Agree Agree Not Sure Disagree Strongly Disagree

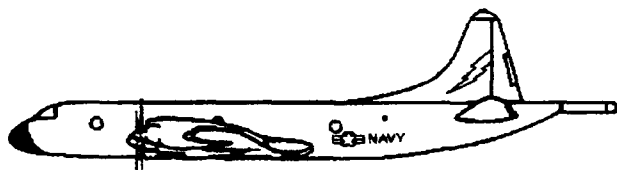
Comments:

In your opinion, would a self-paced training module, designed for use on a home computer, aid in increasing proficiency with the P-3C weapons system? Why/Why not?

APPENDIX: B

Stack cards

**P-3C Update
Armament System
Mk-46 Torpedo & MK-84 Harpoon**



NOTE

This program is for official use only!
To load this program, create a folder
on your hard drive, and copy all disks
into the folder. Disk #1 Contains
directions for navigating through the
program.

This module was created utilizing Hypercard
version 2.1

Developed by:
Lt E J Campbell
VP-31
May, 1993

Click here
to continue

INTRODUCTION

The P-3C(update) armament system is an elaborate, and often confusing system which demands extensive study, and "hands on" training to ensure complete mastery. This module is designed to augment your traditional training syllabus by serving as a compliment to the WST when the former is unavailable.

INTRODUCTION (cont)

This module is designed for beginning TACCO students with limited exposure to the P-3C Armament system, as well as, experienced operators for use in preparation for practical evaluations.

This program is unclassified and will be limited to the MK-46 Torpedo and the MK-84 missile.

Click Here
to Continue

Click Here
to Continue

MODULE INSTRUCTIONS

To proceed through this program, simply click the mouse on one of the icons described below

Continue with program

Review previous card

Exit(Quit) the program

Returns to the topic selection menu

Returns to this card to review instructions

This icon indicates that an in-depth discussion of this item is available by clicking on the icon

When this icon is displayed, a copy of the NATOPS checklist for this procedure is available

Return to previous card

Topic Selection Menu



Introduction

Mk-46 Torpedo (on-line)

Mk-46 Torpedo (off-line)



MK-84 Harpoon



Review Questions

Click on any of the above icons to bring you directly to that topic, or, use the arrow buttons to proceed sequentially through the program

**MK - 46
Torpedo**

On - Line Procedures

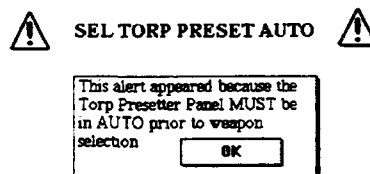
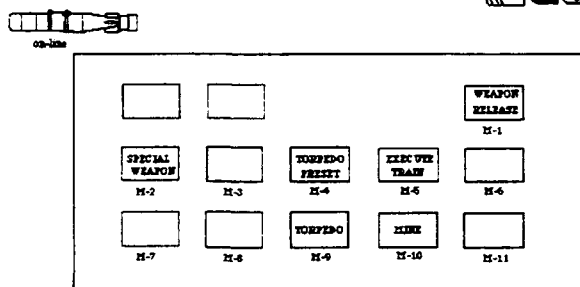
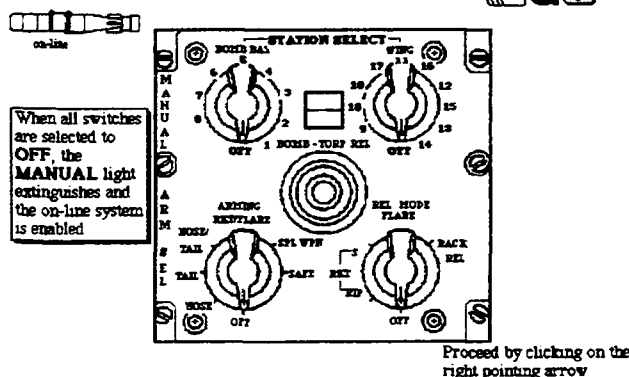
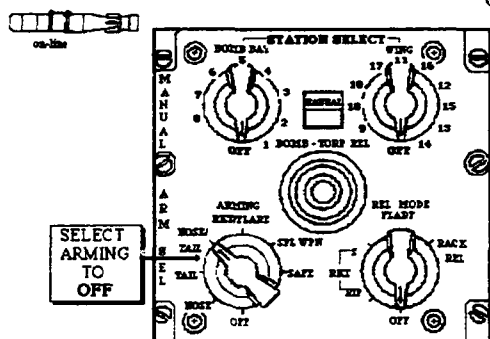
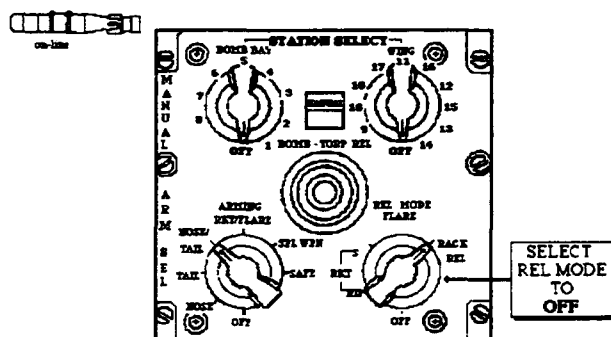
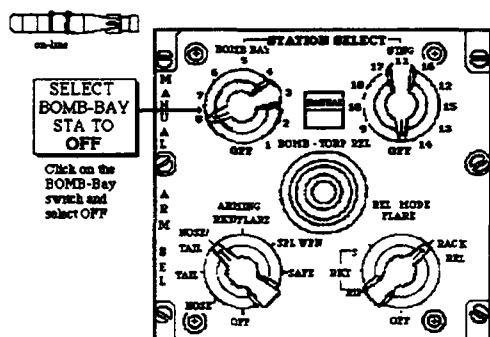


The on-line mode of weapon launch permits the central computer to perform all selections, arming, and release functions as directed by the TACCO via keyset inputs

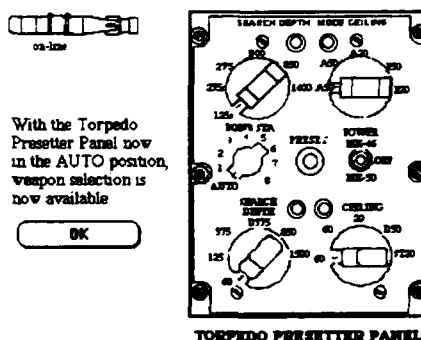
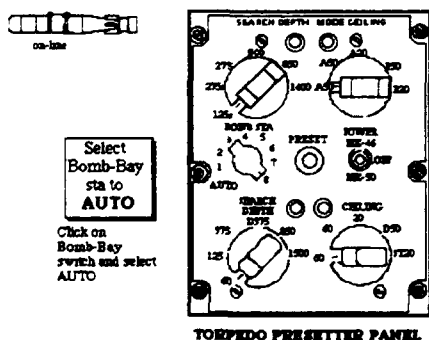
THIS IS THE PRIMARY METHOD OF WEAPON RELEASE!

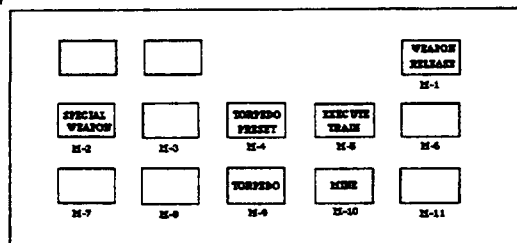
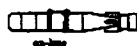
Note

In order to enable automatic operation of the armament system, all switches on the manual armament selection panel must be OFF!!!



View checklist and proceed with weapon selection

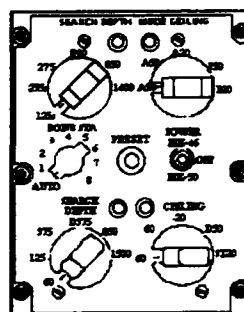




View checklist and proceed with weapon selection

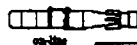


**TORPEDO POWER
SEARCH DEPTH
CEILING MODE**



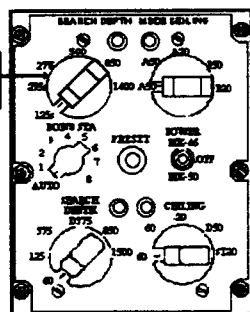
Click on POWER switch and select MK-46

TORPEDO PRESETTER PANEL

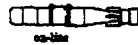


**SELECT
SEARCH
DEPTH**

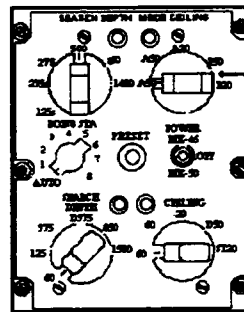
**TORPEDO POWER
SEARCH DEPTH
CEILING MODE**



TORPEDO PRESETTER PANEL



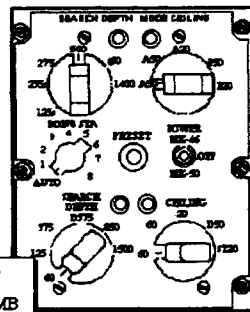
**TORPEDO POWER
SEARCH DEPTH
CEILING MODE**



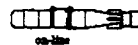
TORPEDO PRESETTER PANEL



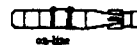
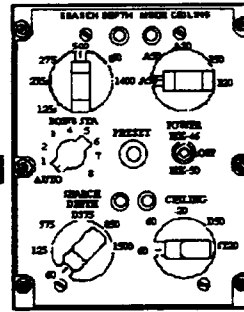
**TORPEDO POWER
SEARCH DEPTH
CEILING MODE**



With presetter panel properly set (power-MK46, BOMB STA-AUTO, depth and ceiling set), Select **TORPEDO PRESET**. Presetting requires 3 seconds



TORPEDO PRESETTING



The program has now preset the highest priority station carrying a torpedo. The weapon station priority for this configuration is: 8, 7, 6, 5, 4, 3, 2, 1. Therefore, weapon station 8 has been selected and preset automatically by the computer.

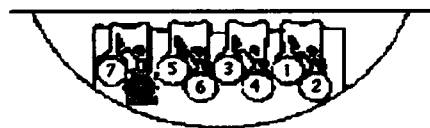
NOTE: Stations 2 & 4 block are 1, 4 & 6 block are 3, 6 & 8 block are 5, and 8 block are 7.



Ensure Bomb Bay doors are open. If doors are closed the alert **BOMB BAY DOORS CLOSED** is presented on TACCO display

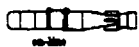


Ensure Master Arm switch on. If Master Arm switch is off, the alert **MASTER ARM SWITCH OFF** is presented on TACCO display.

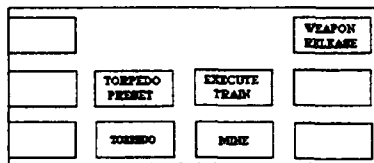
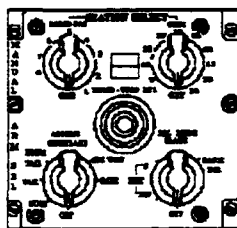


VIEW LOOKING FORWARD FROM REAR OF AIRCRAFT

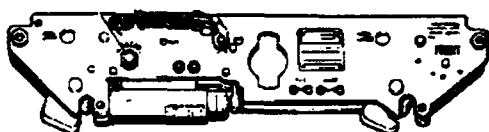
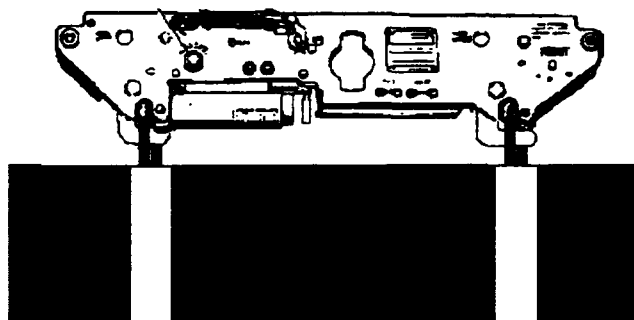


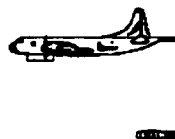


Weapon may be released by selecting either WEAPON RELEASE, BOMB-TORP REL (man arm panel), or, pilot YOKE switch



NOTE:
KILL READY does not illuminate on the MAN ARM PANEL in the on-line mode







1.1.1.1

1.1.1.1



1.1.1.1

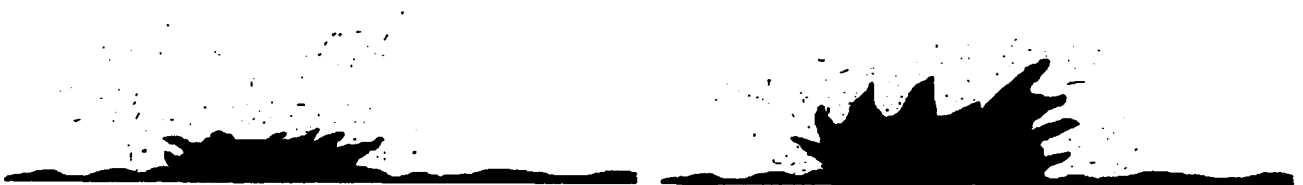
1.1.1.1



1.1.1.1

1.1.1.1







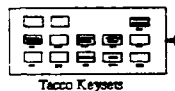


MK-46 TORPEDO

REVIEW SEQUENCE



ON - LINE SIGNAL FLOW



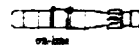
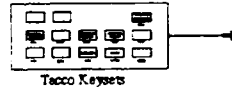
Click the right
pointing arrow
to continue



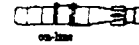
ON - LINE SIGNAL FLOW



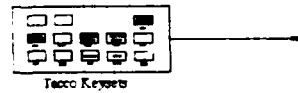
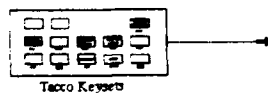
ON - LINE SIGNAL FLOW



ON - LINE SIGNAL FLOW

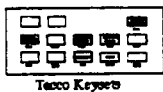


ON - LINE SIGNAL FLOW





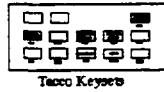
ON - LINE SIGNAL FLOW



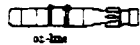
Tacco Keyset



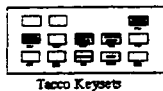
ON - LINE SIGNAL FLOW



Tacco Keyset



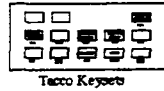
ON - LINE SIGNAL FLOW



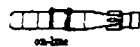
Tacco Keyset



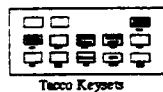
ON - LINE SIGNAL FLOW



Tacco Keyset



ON - LINE SIGNAL FLOW



Tacco Keyset

Click on Logic unit 2, or the ARMWORD TEST panel for description of function.



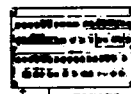
ARMWORD TEST PANEL



LOGIC UNIT 2



ON - LINE SIGNAL FLOW

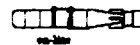


ARMWORD TEST PANEL

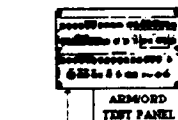


LOGIC UNIT 2

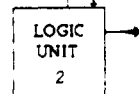
CONTINUE



ON - LINE SIGNAL FLOW



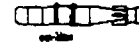
ARMWORD TEST PANEL



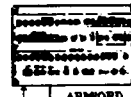
LOGIC UNIT 2



MASTER ARM SWITCH



ON - LINE SIGNAL FLOW



ARMWORD TEST PANEL

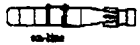


LOGIC UNIT 2

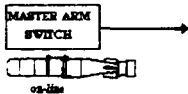
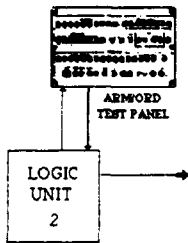


MASTER ARM SWITCH

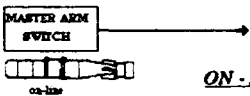
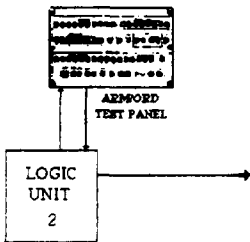




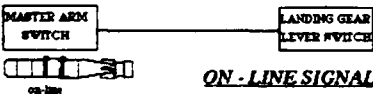
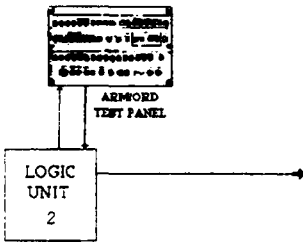
ON - LINE SIGNAL FLOW



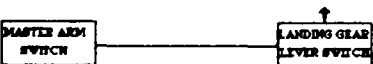
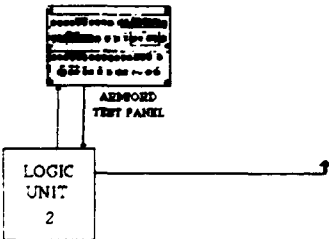
ON - LINE SIGNAL FLOW



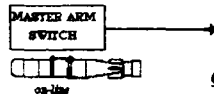
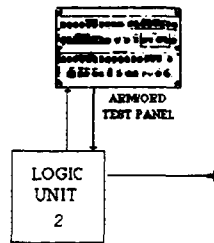
ON - LINE SIGNAL FLOW



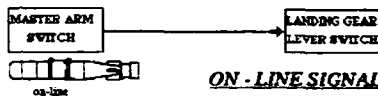
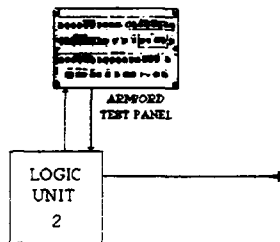
ON - LINE SIGNAL FLOW



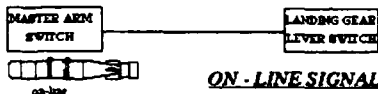
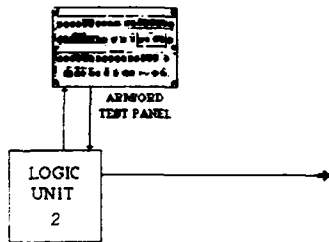
ON - LINE SIGNAL FLOW



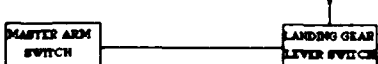
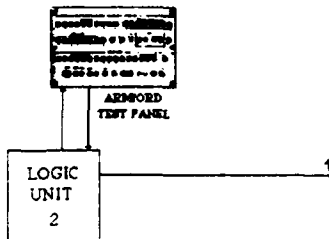
ON - LINE SIGNAL FLOW



ON - LINE SIGNAL FLOW

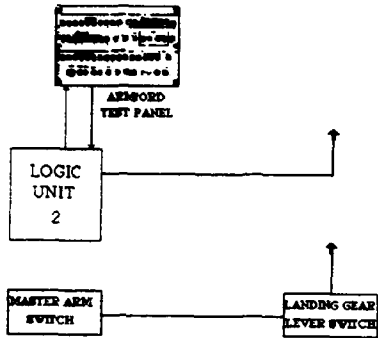


ON - LINE SIGNAL FLOW

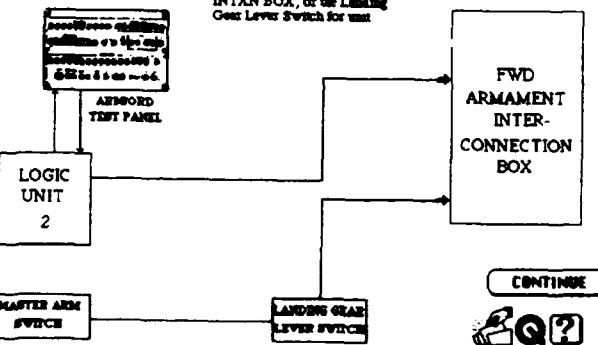
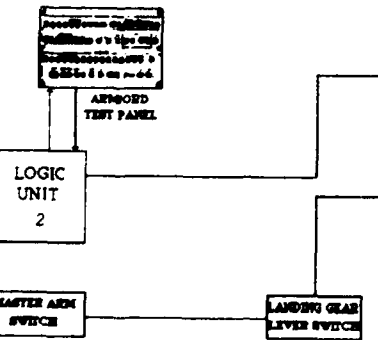
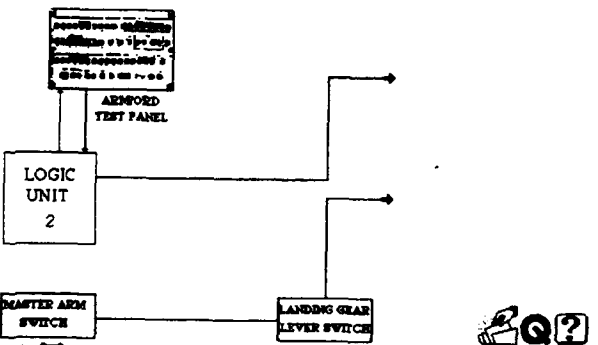
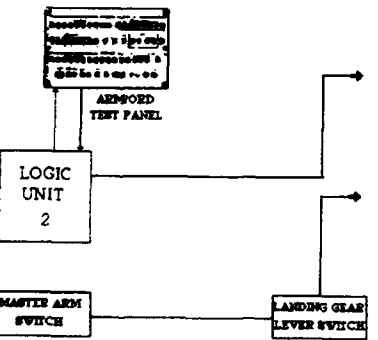
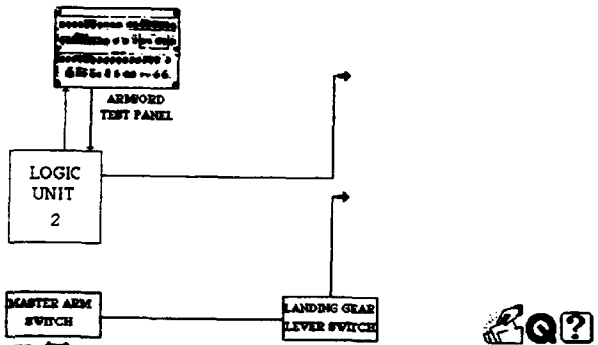
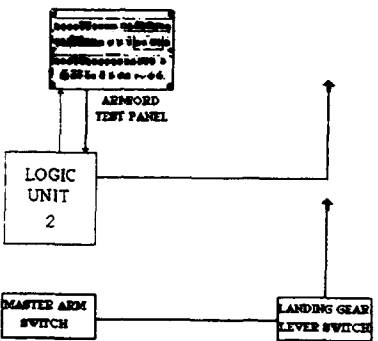
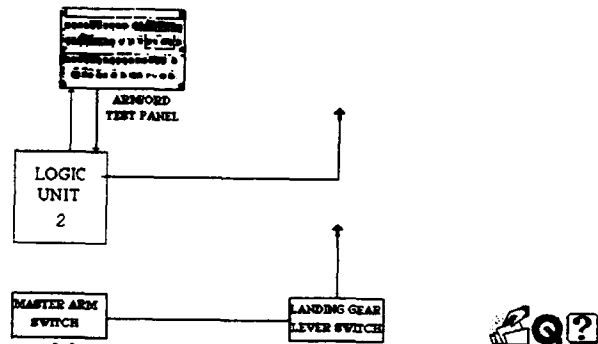




ON - LINE SIGNAL FLOW



ON - LINE SIGNAL FLOW



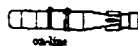
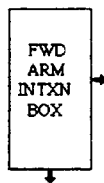
Click on either the FWD ARM INTXN BOX, or the Landing Gear Lever Switch for next

FWD ARMAMENT INTER-CONNECTION BOX

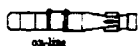
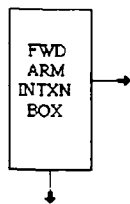
CONTINUE



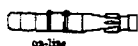
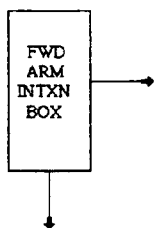
ON - LINE SIGNAL FLOW



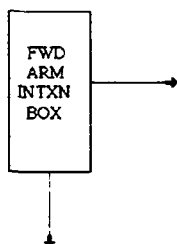
ON - LINE SIGNAL FLOW



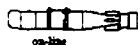
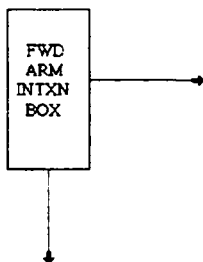
ON - LINE SIGNAL FLOW



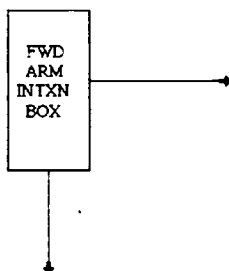
ON - LINE SIGNAL FLOW



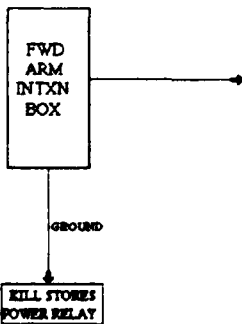
ON - LINE SIGNAL FLOW



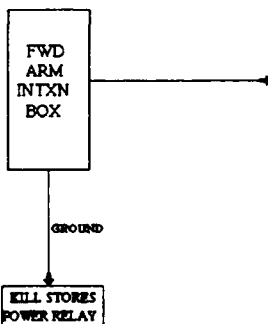
ON - LINE SIGNAL FLOW

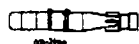


ON - LINE SIGNAL FLOW

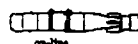


ON - LINE SIGNAL FLOW

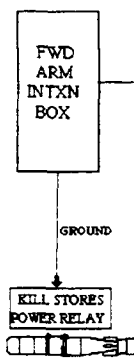




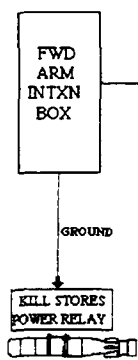
ON - LINE SIGNAL FLOW



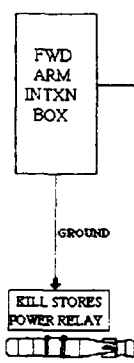
ON - LINE SIGNAL FLOW



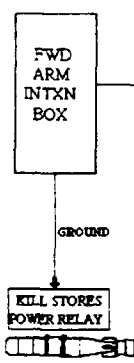
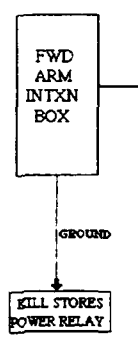
ON - LINE SIGNAL FLOW



ON - LINE SIGNAL FLOW



ON - LINE SIGNAL FLOW



VIEW LOOKING FWD FROM REAR OF AIRCRAFT

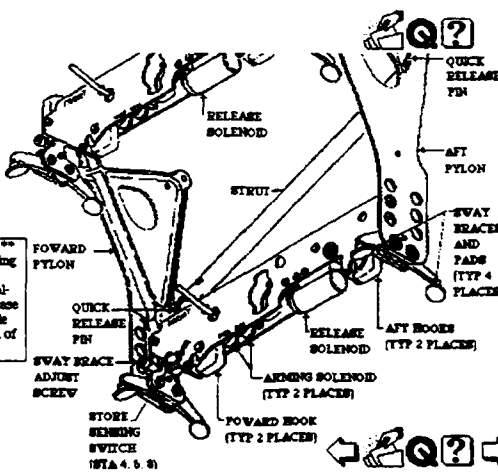


For a more detailed description of the weapon racks, click on the CONTINUE button.

CONTINUE



*****NOTE*****
 Information regarding the Store Sensing Switch, Arming Solenoid, and the Release Solenoid is available by clicking on each of these units.



*This concludes the
 MK-46 on-line Torpedo
 procedures module*

To review this module, simply click on the REVIEW button

REVIEW





MK - 46 Torpedo Off - Line Procedures



The manual (off-line) mode is the degraded mode of operation for the armament system. It allows the TACCO control of selection, arming, and release of all conventional and special weapons via the manual armament select panel.

The on-line system is inhibited, and the system is off-line, when any of the four wafer switches on the manual armament panel are in any position other than off. NOTE: There are unlabeled positions on the four wafer switches. These positions do not energize relays, and the MANUAL light will not illuminate, and the system is still on-line, if these positions are inadvertently selected. THESE SWITCH POSITIONS SHALL NOT BE USED!

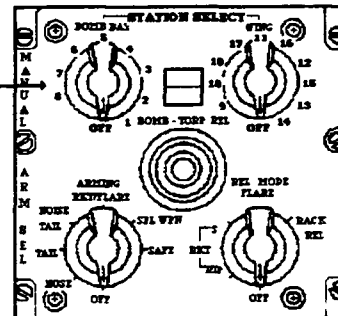


Regardless of your experience factor, it is always advisable to utilize a checklist for all weapon drop sequences! For this reason, an off-line procedures checklist is available throughout this module by simply clicking on the check-mark in the upper right hand corner of the screen.

To proceed with the off-line weapon drop sequence, click on the right pointing arrow



SELECT WEAPON STATION



THIS STATION IS BLOCKED BY ANOTHER WEAPON

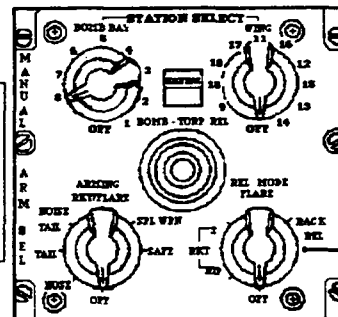
OK



VIEW LOOKING FWD FROM REAR OF APC



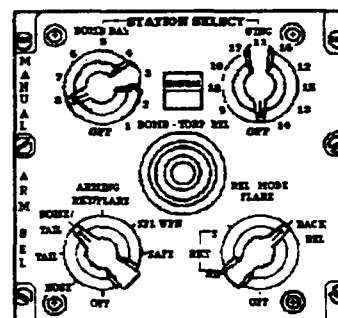
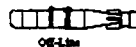
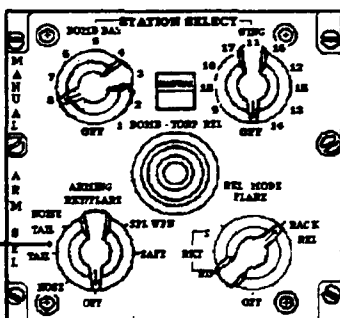
NOTE
When any switch is moved from the off position on this panel the manual light illuminates to inform you that the system is now in the off-line mode and all on-line functions are inhibited!



SELECT REL MODE AND CHOOSE RACK REL



SELECT ARMING AND CHOOSE NOSE/TAIL



CONTINUE BY CLICKING ON THE RIGHT POINTING ARROW

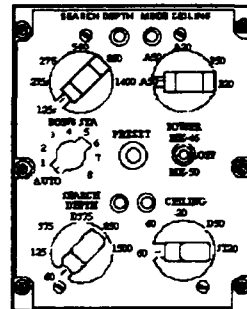




THE WEAPON HAS BEEN
SELECTED AT STATION 8
AND MUST NOW BE PRESET
BEFORE CONTINUING.
WOULD YOU LIKE TO
REVIEW THE SELECTION
PROCEDURE ?

REVIEW

CONTINUE

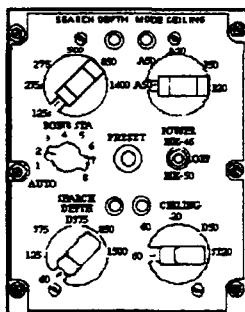


SELECT
POWER
TO
MK-46

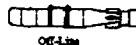
TORPEDO PRESETTER PANEL



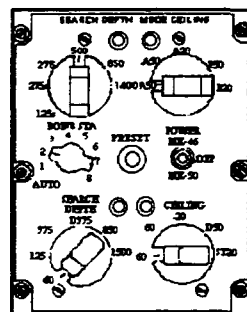
SELECT
SEARCH
DEPTH



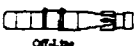
TORPEDO PRESETTER PANEL



SELECT
MODE
CEILING



TORPEDO PRESETTER PANEL



VIEW LOOKING FWD FROM REAR OF A/C

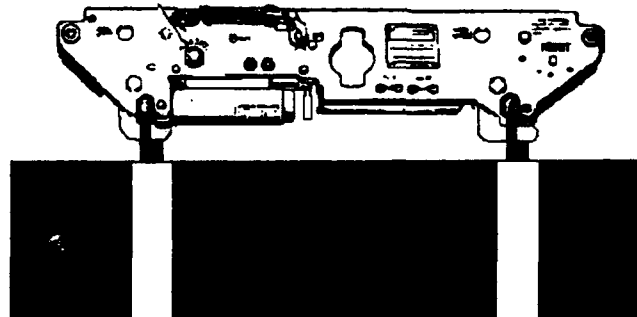
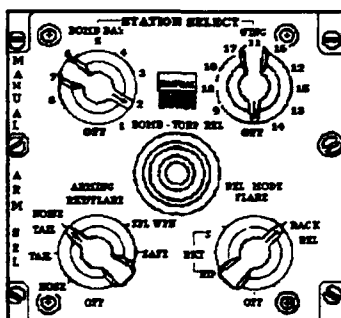
The torpedo is now selected and
preset at Bomb Bay station #2.
Click on the right pointing arrow
to continue with the weapon
release sequence.

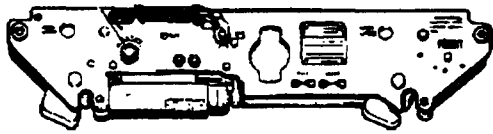
Once the weapon is selected and preset, the flight
station will get a cue to open the Bomb Bay Doors
and turn on the Master Arm Switch.
This will cause the Kill Ready light to illuminate in
the Flt Sta, and on the TACCO's Man Arm Panel.
The torpedo will be released by pressing the
Bomb-Torp Switch on the Man Arm panel, or the
pilot /co-pilot yoke switch.

CONTINUE



RELEASE
WEAPON !













0.00



0.00



0.00



0.00



0.00



0.00



P-3C Armament #2



P-3C Armament #2





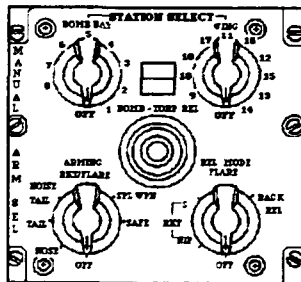


REVIEW

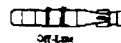
CONTINUE



Off-Line



At the conclusion of the off-line weapon drop sequence, **ALWAYS** be sure to return **ALL** switches on the MAN ARM PANEL to the OFF position!!!

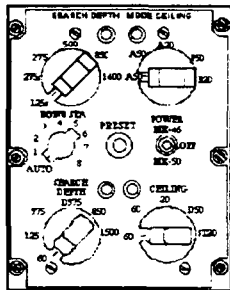


Off-Low

This concludes the MK-46 Off-Line Weapon Release segment. You can review this segment by selecting the topics icon  and choosing MK-46 Off-Line,  or you can Quit the program by selecting the QUIT icon. 

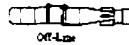
To begin the HARPOON segment, click on the right pointing arrow.



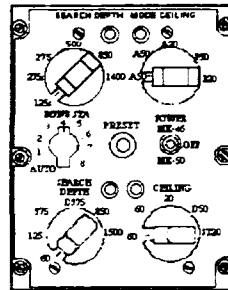


TORPEDO PRESETTER PANEL

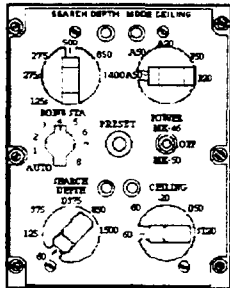
SELECT
POWER
TO
MK-46



SELECT
SEARCH
DEPTH

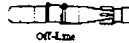


TORPEDO PRESETTER PANEL



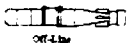
TORPEDO PRESETTER PANEL

SELECT
MODE
CEILING



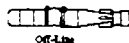
VIEW LOOKING FWD FROM REAR OF AC

The torpedo is now selected and preset at Bomb Bay station #4. Click on the right pointing arrow to continue with the weapon release sequence.

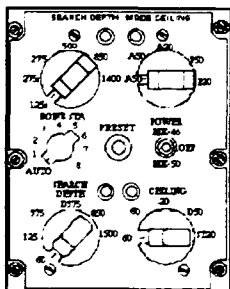
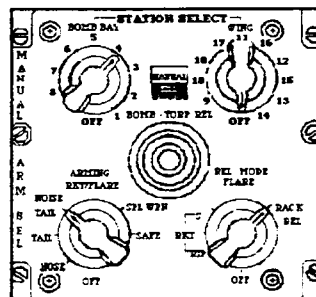


Once the weapon is selected and preset, the flight station will get a cue to open the Bomb Bay Doors and turn on the Master Arm Switch. This will cause the Kill Ready light to illuminate in the Flt Sta, and on the TACCO's Man Arm Panel. The torpedo will be released by pressing the Bomb-Torp Switch on the Man Arm panel, or the pilot/co-pilot yoke switch.

CONTINUE

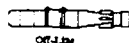


RELEASE
WEAPON !

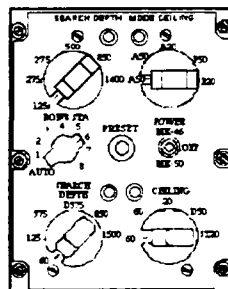


TORPEDO PRESETTER PANEL

SELECT
POWER
TO
MK-46

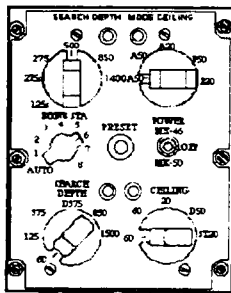


SELECT
SEARCH
DEPTH



TORPEDO PRESETTER PANEL

P-3C Armament #2



SELECT
MODE
CEILING

TORPEDO PRESETTER PANEL

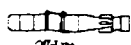


The torpedo is now selected and preset at Bomb Bay station #6. Click on the right pointing arrow to continue with the weapon release sequence.

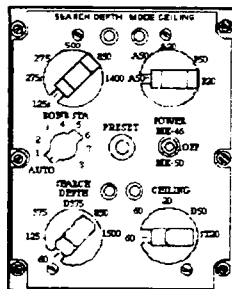
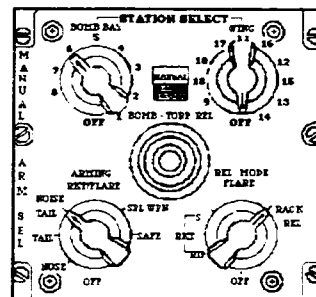


Once the weapon is selected and preset, the flight station will get a cue to open the Bomb Bay Doors and turn on the Master Arm Switch. This will cause the Kill Ready light to illuminate in the Flt Sta, and on the TACCO's Man Arm Panel. The torpedo will be released by pressing the Bomb-Torp Switch on the Man Arm panel, or the pilot/co-pilot yoke switch.

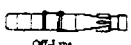
CONTINUE



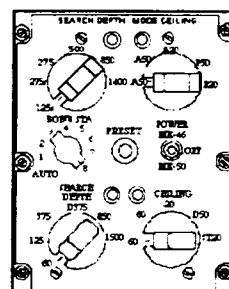
RELEASE
WEAPON !



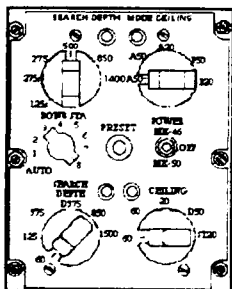
TORPEDO PRESETTER PANEL



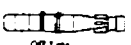
SELECT
SEARCH
DEPTH



TORPEDO PRESETTER PANEL



TORPEDO PRESETTER PANEL



The torpedo is now selected and preset at Bomb Bay station #8. Click on the right pointing arrow to continue with the weapon release sequence.



Off-Line

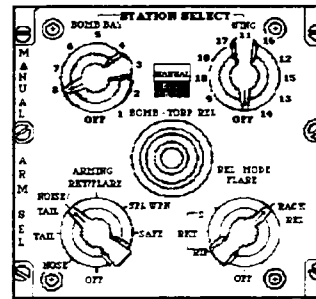
Once the weapon is selected and preset, the flight station will get a cue to open the Bomb Bay Doors and turn on the Master Arm Switch. This will cause the Kill Ready light to illuminate in the Pit Sta. and on the TACCO's Man Arm. Panel. The torpedo will be released by pressing the Bomb-Torp Switch on the Man Arm panel, or the pilot/co-pilot yoke switch.

CONTINUE



Off-Line

RELEASE
WEAPON !

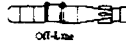


Off-Line

THE WEAPON HAS BEEN SELECTED AT STATION 6 AND MUST NOW BE PRESET BEFORE CONTINUING. WOULD YOU LIKE TO REVIEW THE SELECTION PROCEDURE ?

REVIEW

CONTINUE



Off-Line

THE WEAPON HAS BEEN SELECTED AT STATION 4 AND MUST NOW BE PRESET BEFORE CONTINUING. WOULD YOU LIKE TO REVIEW THE SELECTION PROCEDURE ?

REVIEW

CONTINUE



Off-Line

THE WEAPON HAS BEEN SELECTED AT STATION 2 AND MUST NOW BE PRESET BEFORE CONTINUING. WOULD YOU LIKE TO REVIEW THE SELECTION PROCEDURE ?

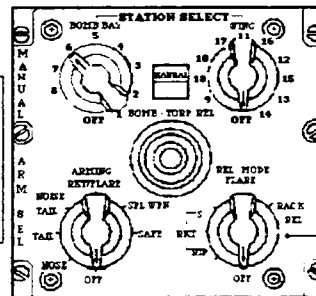
REVIEW

CONTINUE

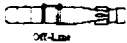


Off-Line

NOTE
When any switch is moved from the off position on this panel the manual light illuminates to inform you that the system is now in the off-line mode and all on-line functions are inhibited.

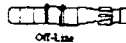
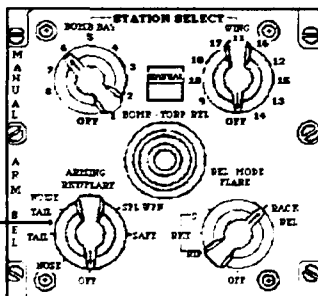


SELECT
REL. MODE
AND CHOOSE
RACK REL

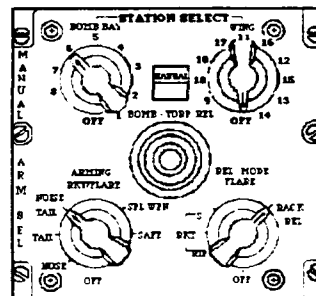


Off-Line

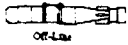
SELECT
ARMING AND
CHOOSE
NOSE/TALE



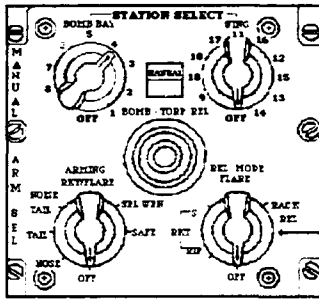
Off-Line



CONTINUE BY CLICKING ON
THE RIGHT POINTING
ARROW



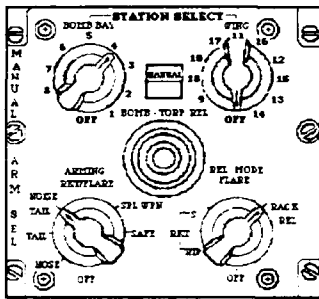
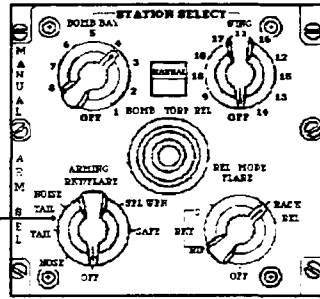
NOTE
When any switch is moved from the off position on this panel the manual light illuminates to inform you that the system is now in the off-line mode and all on-line functions are inhibited.



SELECT REL MODE AND CHOOSE RACK REL



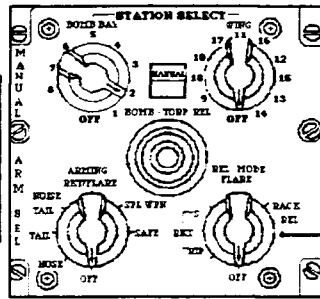
SELECT ARMING AND CHOOSE NOSE/TAIL



CONTINUE BY CLICKING ON THE RIGHT POINTING ARROW



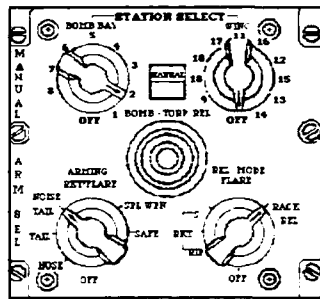
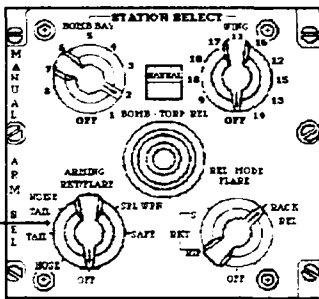
NOTE
When any switch is moved from the off position on this panel the manual light illuminates to inform you that the system is now in the off-line mode and all on-line functions are inhibited.



SELECT REL MODE AND CHOOSE RACK REL

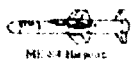


SELECT ARMING AND CHOOSE NOSE/TAIL

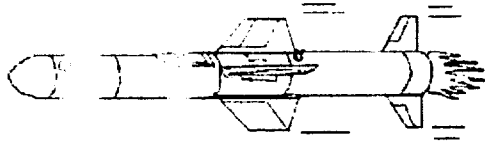


CONTINUE BY CLICKING ON THE RIGHT POINTING ARROW





MK-84 HARPOON



This module on the Harpoon missile has 2 sections. Section 1 is a very detailed discussion of the Harpoon launch procedures while Section 2 is a more challenging scenario incorporating weapon degradation and minimal prompting from the program.

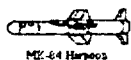


If you would like to skip to the more challenging scenario without the accompanying in-depth system discussions, click on the SKIP button. Otherwise, click on the right pointing arrow to begin a comprehensive overview of the Harpoon system.

SKIP

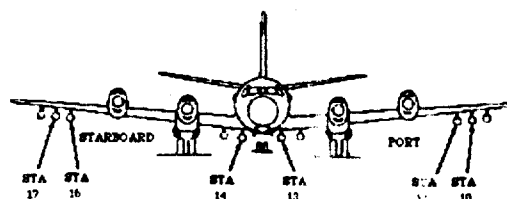
The HARPOON missile is an all-weather, low-altitude, antiship cruise missile. It incorporates the following features:

- low-level cruise trajectory
- over-the-horizon range
- active guidance
- counter-countermeasure capability
- contact-detonated high explosive warhead



The Harpoon Aircraft Command Launched Control Set (HACLCS) interfaces with the armament system for weapon control and release functions. The flight station maintains final control over the weapon via the Master Arm Switch.

The Harpoon can be fired singly or in pairs.



The Harpoon is a 1,000 # class weapon and can be carried and launched from the weapon stations shown.

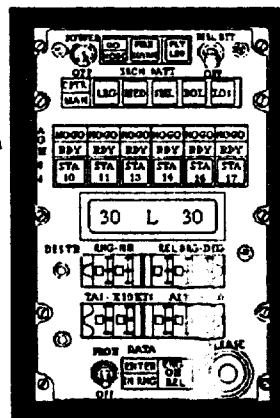


The Harpoon has no on-line capability!

In the manual mode, the TACCO enters all missile parameters into the missile via the HACLCS control panel.

Click on any item on the panel for a description of its function.

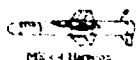
(The information will repeat automatically)



HACLCS CONTROL PANEL

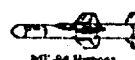
Click here to return previously viewed

RETURN



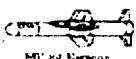
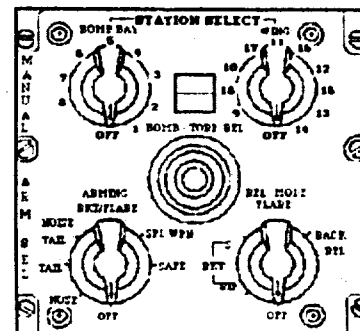
ME-84 Harpoon

The Previous card is available for reference throughout this segment of the module by clicking on this icon.



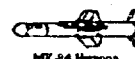
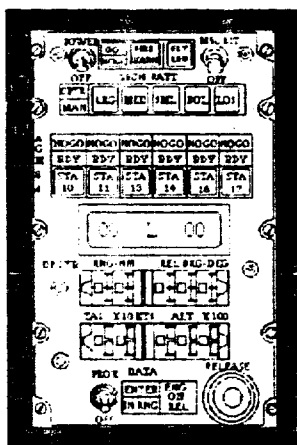
ME-84 Harpoon

Before applying power to the HACLS panel **ALWAYS** inspect the MAN ARM PANEL to ensure all switches are OFF



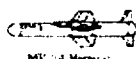
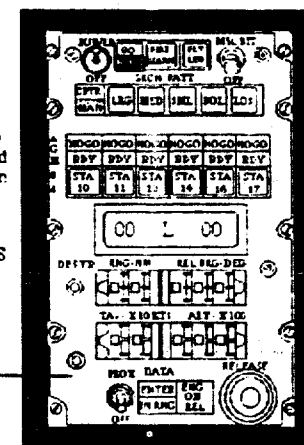
ME-84 Harpoon

Begin the missile selection process by turning power on. This initiates the HACLS BIT check. Click on the power switch.



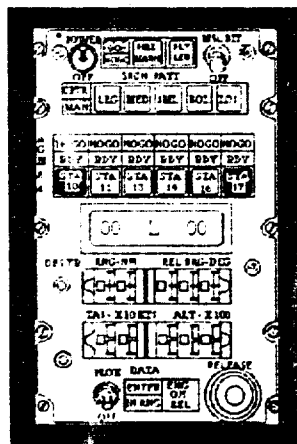
ME-84 Harpoon

When power is applied, the NOGO light illuminates red for 6 - 12 secs, then the GO light illuminates green. This indicates a successful HACLS BIT check.

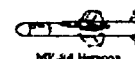


ME-84 Harpoon

When power is applied, the NOGO light illuminates red for 6 - 12 secs, then the GO light illuminates green. This indicates a successful HACLS BIT check.

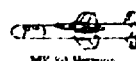


STA 10 & 17 are illuminated green indicating a weapon present at each station.



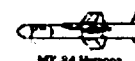
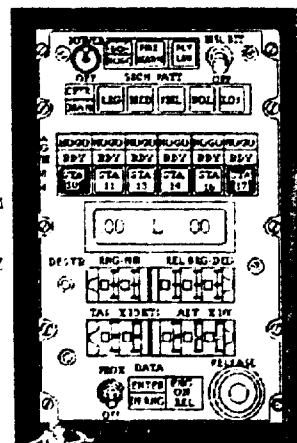
ME-84 Harpoon

If the HACLS NOGO light remains illuminated, there is a fault in either the DPC or the Encoder - Decoder. In this case, the LOS mode must be selected.



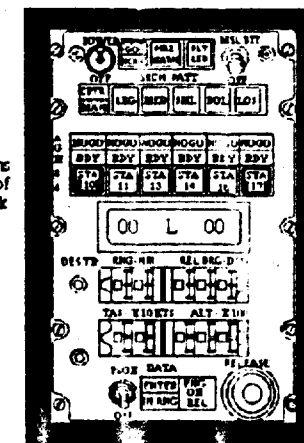
ME-84 Harpoon

View the MSL BIT checklist by clicking on the icon and conduct the MSL BIT check on Sta. 10 & 17 simultaneously.



ME-84 Harpoon

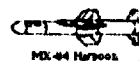
Deselect the stations at the completion of the MSL BIT check.





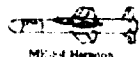
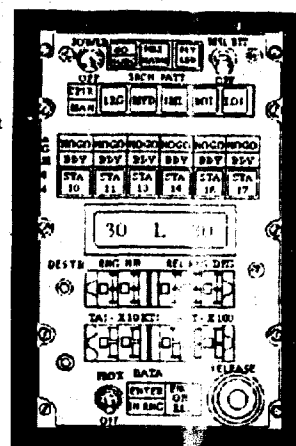
MK-44 Harpoon

Missile may be BIT checked a total of 3 times. If it fails 2 consecutive times out of 3 checks, it is considered a bad missile and SHOULD not be used.



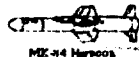
MK-44 Harpoon

Conduct Fire detector test. Select FIRE WARN. Correct indications are the FIRE WARN light illuminated, flashing NOGO at loaded stations, and flashing alert on fire station glare shield.



MK-44 Harpoon

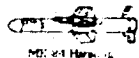
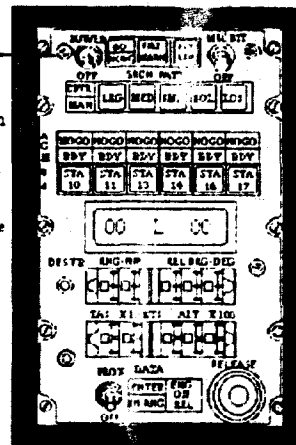
With the MSL BIT and Fire detection tests complete, you can proceed with normal HARPOON selection procedures. USE THE CHECKLIST!!!



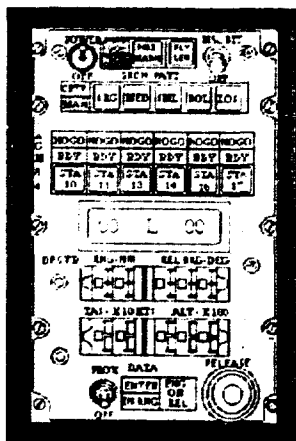
MK-44 Harpoon

View checklist and proceed with weapon selection at station 10.

The checklist can be accessed by clicking on the icon in the upper right corner of the screen.

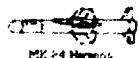
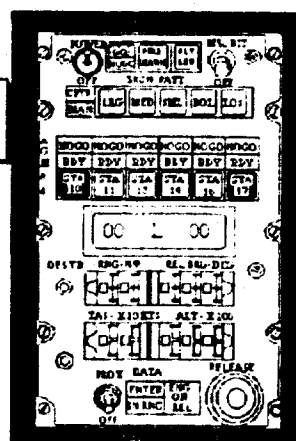


MK-44 Harpoon

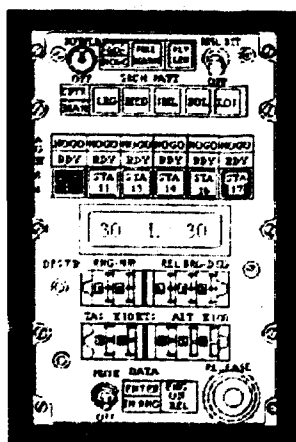


MK-44 Harpoon

SELECT SEARCH PATTERN LRG, MED, OR SMALL.

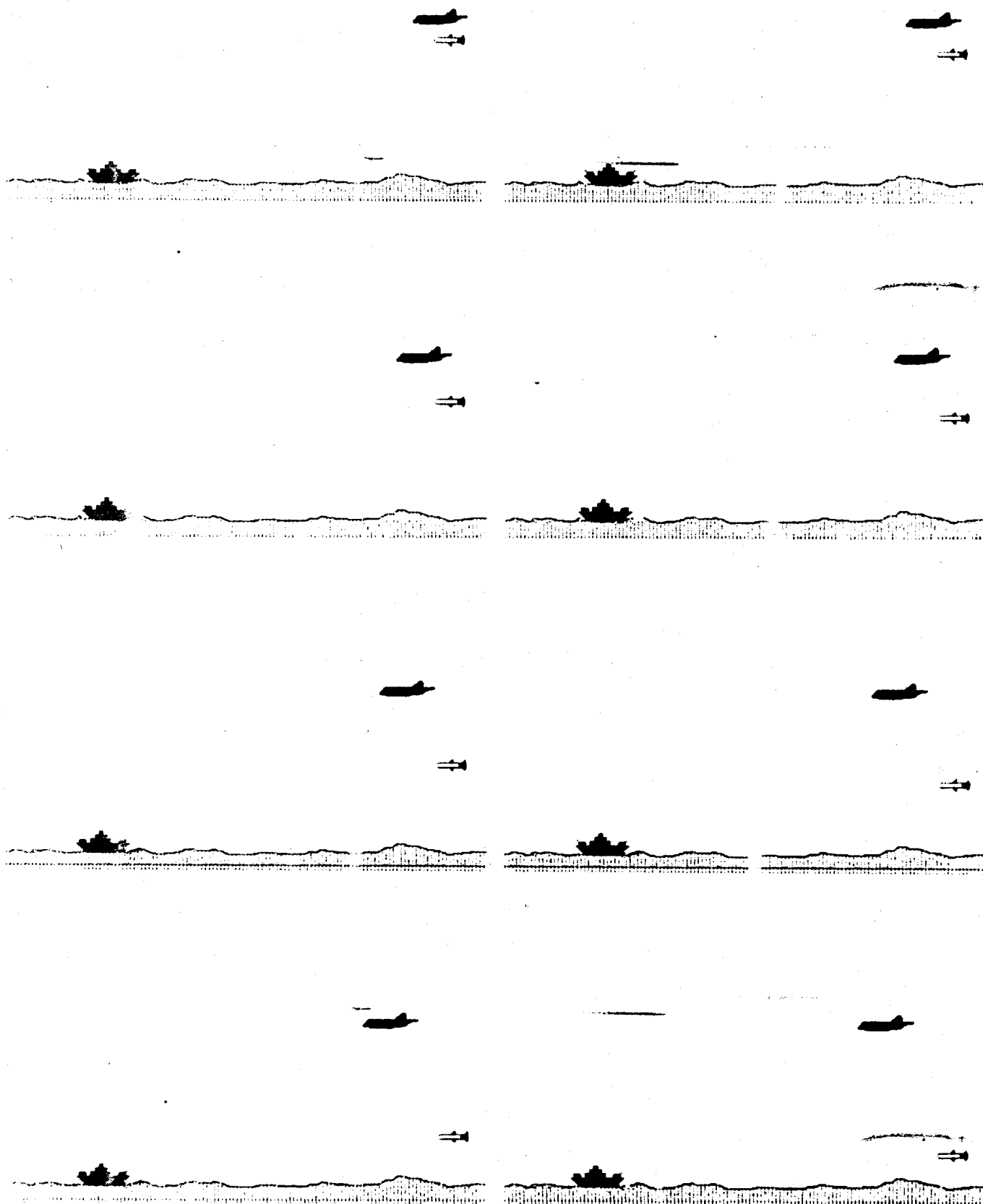


MK-44 Harpoon

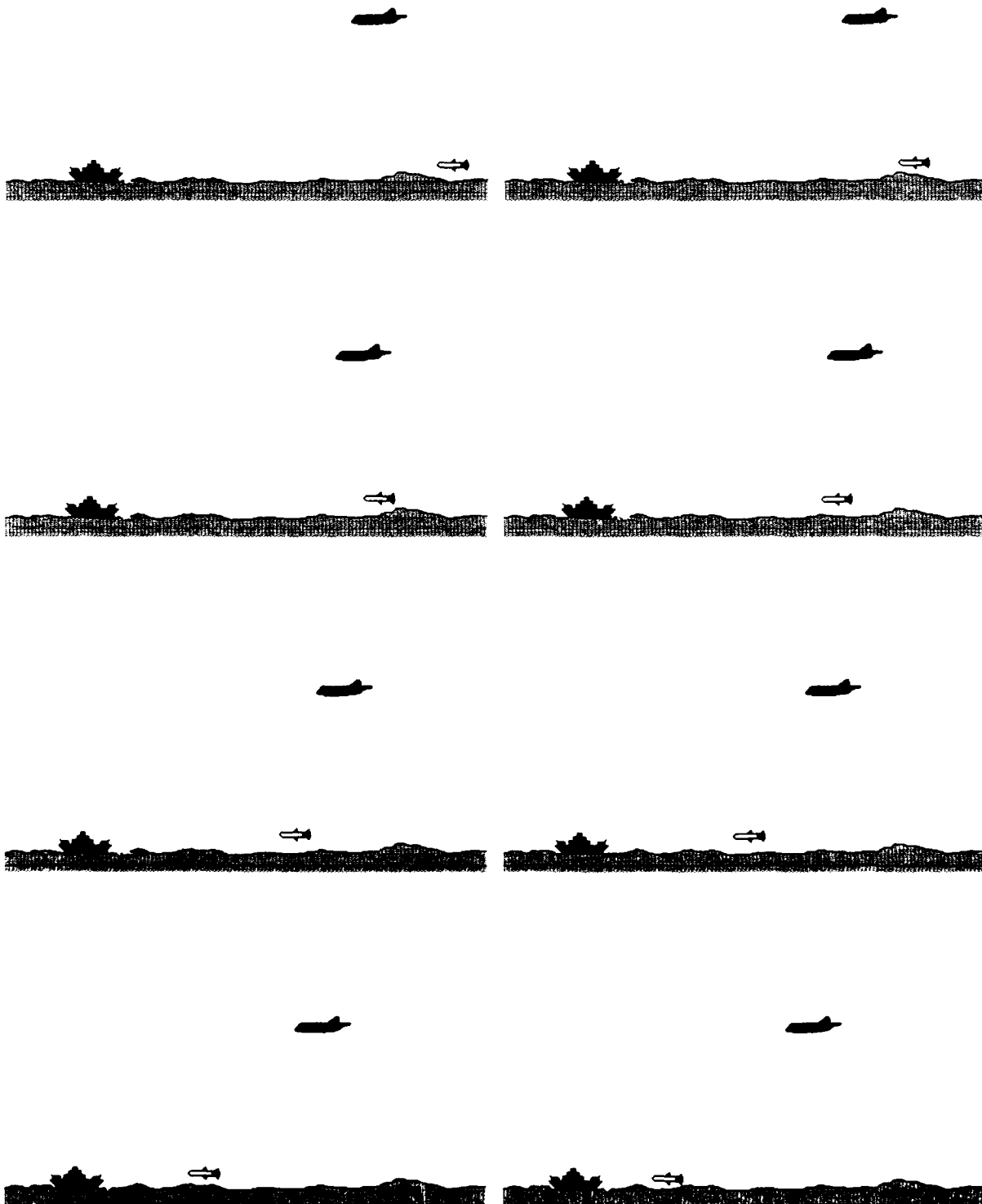


SELECT DATA ENTER

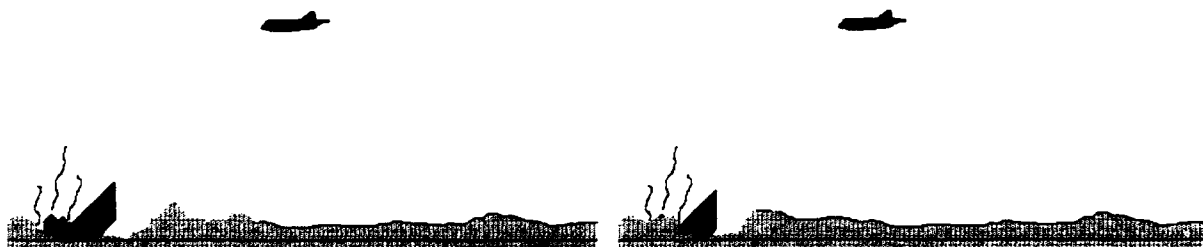
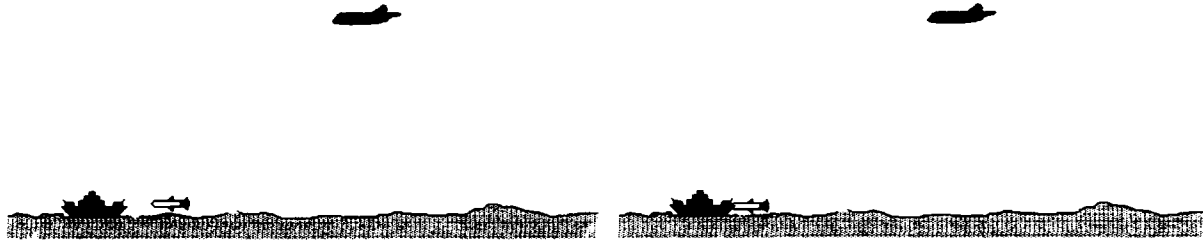




P-3C Armament #3



P-3C Armament #3



P-3C Armament #3





At the conclusion of this or any other weapon drop sequence, ALWAYS be sure to turn all armament switches OFF and secure power to all panels !!!



*HARPOON
SIGNAL FLOW*



*HARPOON
SIGNAL FLOW*

PILOT
ARM
CONTROL
PANEL

PILOT
ARM
CONTROL
PANEL

HACLOS
MISSILE
CONTROL
PANEL

HACLOS
CONTROL
DISTRIBUTION
BOX

HACLOS
MISSILE
CONTROL
PANEL

HACLOS
CONTROL
DISTRIBUTION
BOX



*HARPOON
SIGNAL FLOW*



*HARPOON
SIGNAL FLOW*

PILOT
ARM
CONTROL
PANEL

PILOT
ARM
CONTROL
PANEL

HACLOS
MISSILE
CONTROL
PANEL

HACLOS
CONTROL
DISTRIBUTION
BOX

HACLOS
MISSILE
CONTROL
PANEL

HACLOS
CONTROL
DISTRIBUTION
BOX



*HARPOON
SIGNAL FLOW*



*HARPOON
SIGNAL FLOW*

PILOT
ARM
CONTROL
PANEL

PILOT
ARM
CONTROL
PANEL

HACLOS
MISSILE
CONTROL
PANEL

HACLOS
CONTROL
DISTRIBUTION
BOX

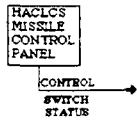
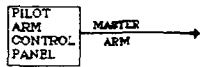
HACLOS
MISSILE
CONTROL
PANEL

CONTROL
SWITCH
STATUS

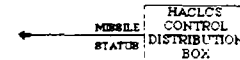
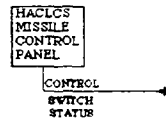
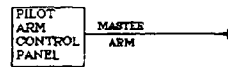
MISSILE
STATUS
HACLOS
CONTROL
DISTRIBUTION
BOX



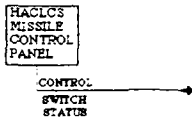
*HARPOON
SIGNAL FLOW*



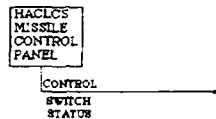
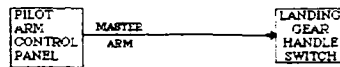
*HARPOON
SIGNAL FLOW*



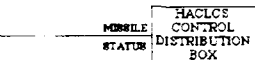
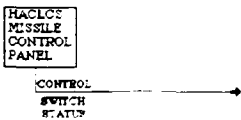
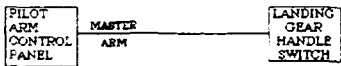
*HARPOON
SIGNAL FLOW*



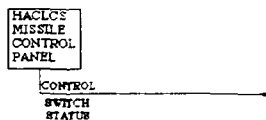
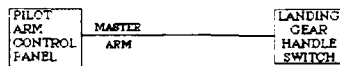
*HARPOON
SIGNAL FLOW*



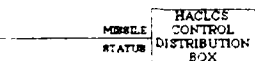
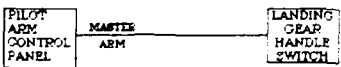
*HARPOON
SIGNAL FLOW*



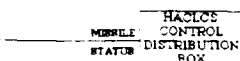
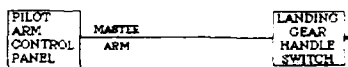
*HARPOON
SIGNAL FLOW*

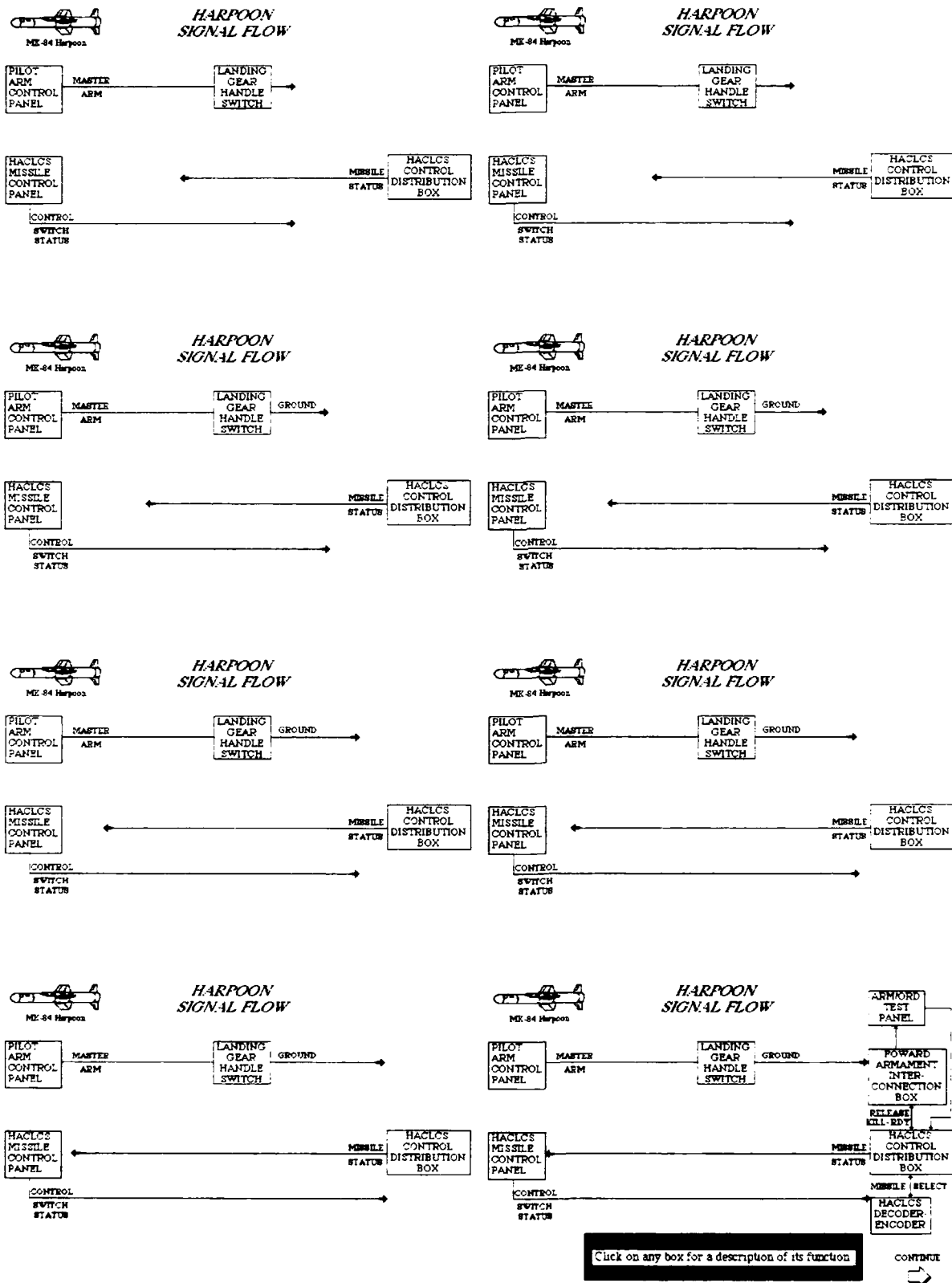


*HARPOON
SIGNAL FLOW*



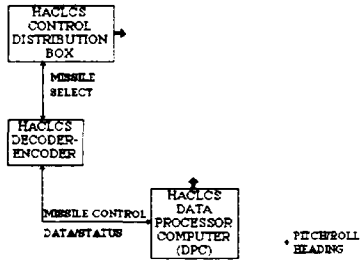
*HARPOON
SIGNAL FLOW*



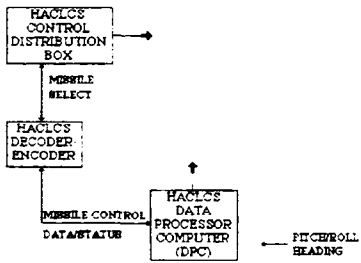




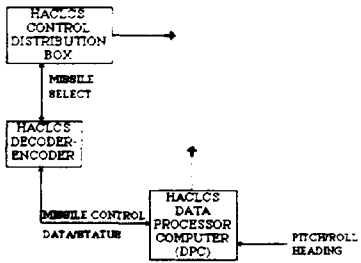
*HARPOON
SIGNAL FLOW*



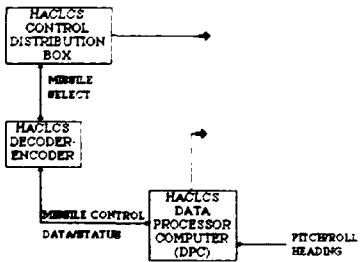
*HARPOON
SIGNAL FLOW*



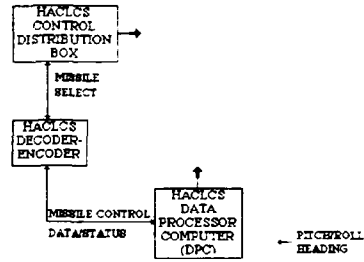
*HARPOON
SIGNAL FLOW*



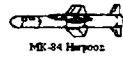
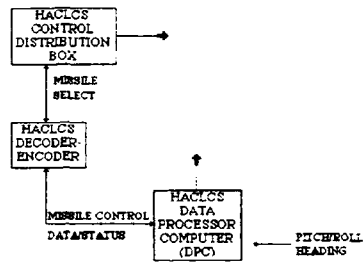
*HARPOON
SIGNAL FLOW*



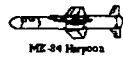
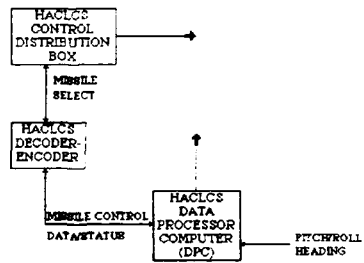
*HARPOON
SIGNAL FLOW*



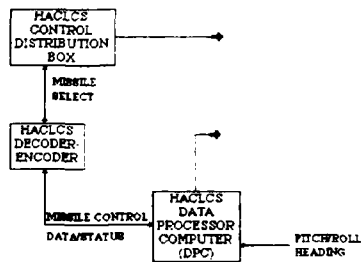
*HARPOON
SIGNAL FLOW*

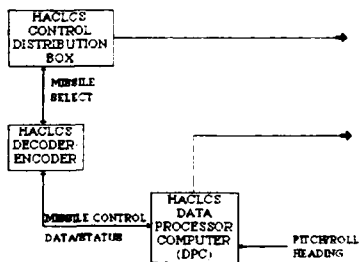
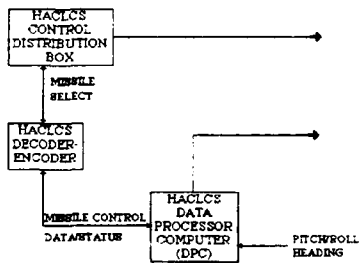
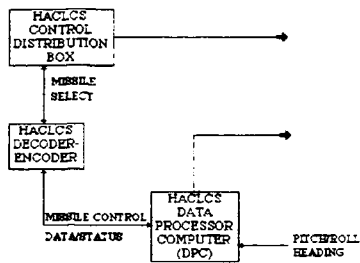
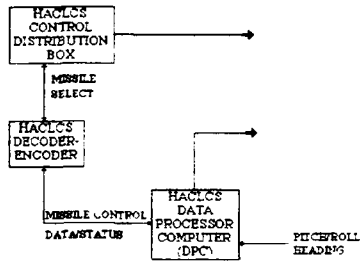
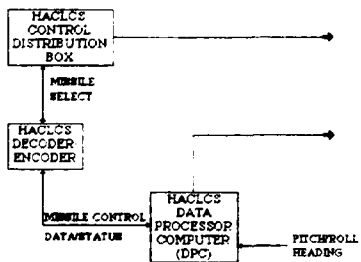
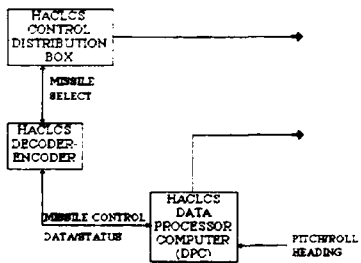
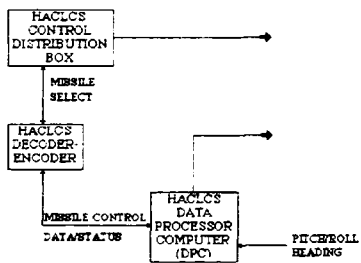
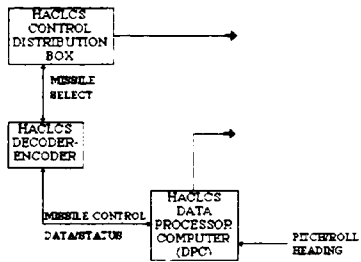


*HARPOON
SIGNAL FLOW*



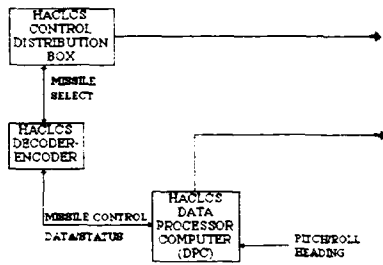
*HARPOON
SIGNAL FLOW*



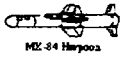
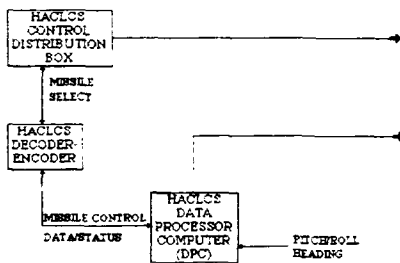




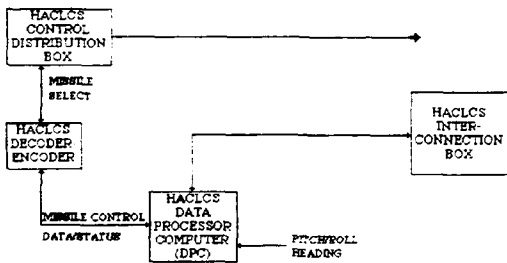
*HARPOON
SIGNAL FLOW*



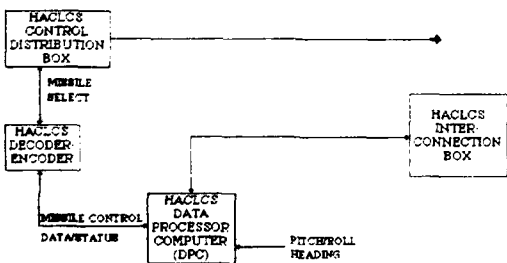
*HARPOON
SIGNAL FLOW*



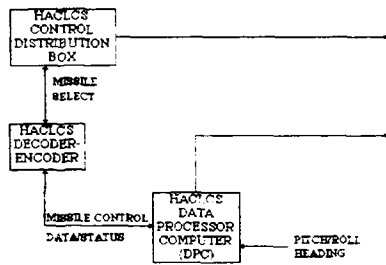
*HARPOON
SIGNAL FLOW*



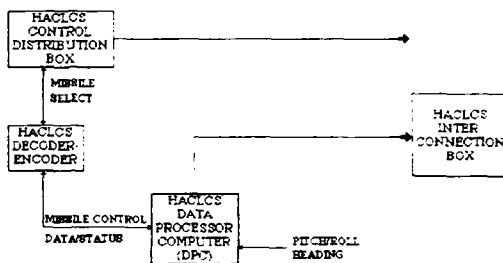
*HARPOON
SIGNAL FLOW*



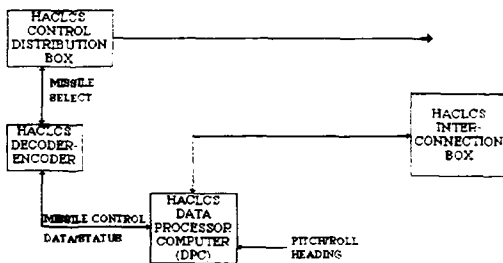
*HARPOON
SIGNAL FLOW*



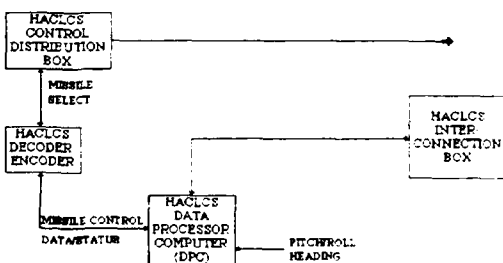
*HARPOON
SIGNAL FLOW*



*HARPOON
SIGNAL FLOW*

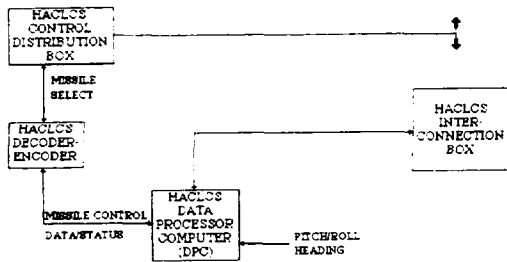


*HARPOON
SIGNAL FLOW*

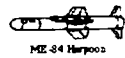
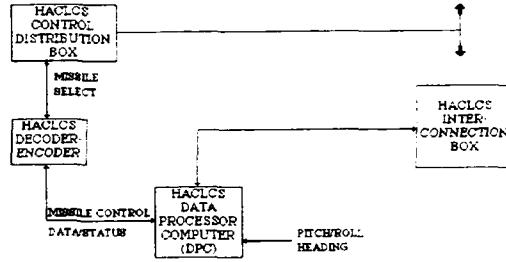




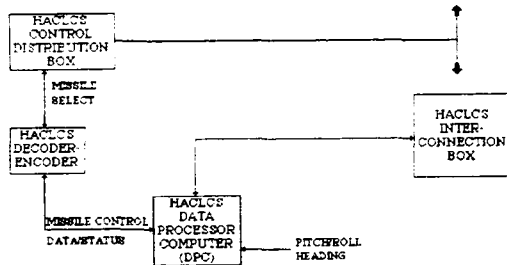
*HARPOON
SIGNAL FLOW*



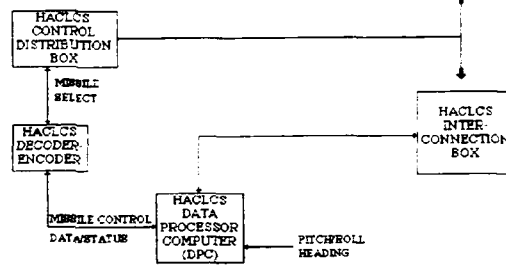
*HARPOON
SIGNAL FLOW*



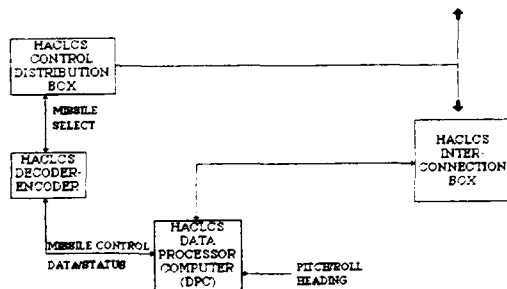
*HARPOON
SIGNAL FLOW*



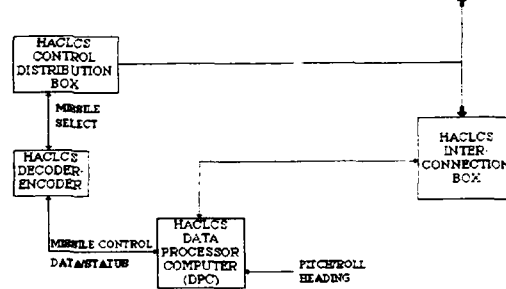
*HARPOON
SIGNAL FLOW*



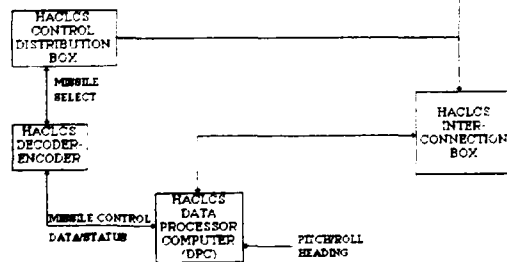
*HARPOON
SIGNAL FLOW*



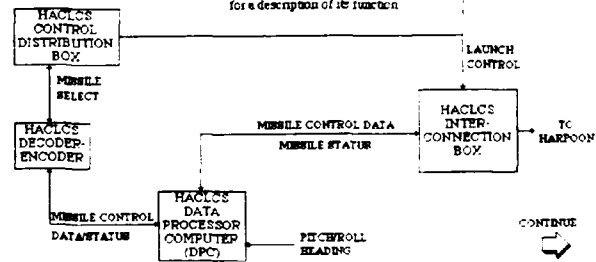
*HARPOON
SIGNAL FLOW*



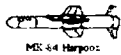
*HARPOON
SIGNAL FLOW*



*HARPOON
SIGNAL FLOW*



Click on any of the additional units for a description of its function.

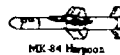


This concludes this segment. You may either:

1. Review the entire sequence
2. Review the Signal Flow
3. Choose to drop another weapon under more challenging conditions (ie. weapon malfunctions and limited prompting from the program)
4. Click on the to quit program
5. Choose another topic by clicking on the icon

REVIEW WEAPON SEQUENCE
REVIEW SIGNAL FLOW
CHALLENGE ME!!

Click on one of the three large buttons, or the icons below



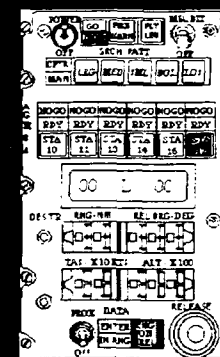
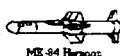
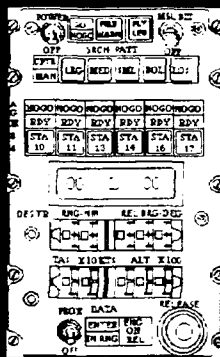
This section of the module will present you with difficulties which may be encountered during an actual, or simulated Harpoon shoot. You will receive minimal prompting from the program. The checklist is always available by clicking on the CHECKMARK in the upper right hand corner of the screen. A description of the HACLOS panel's functions is also available by clicking on the icon.

Always use the Checklist!!

GOOD LUCK !

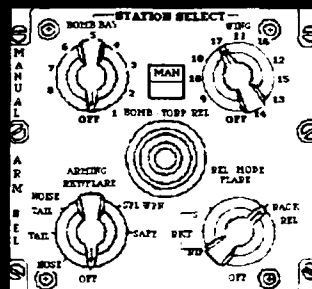
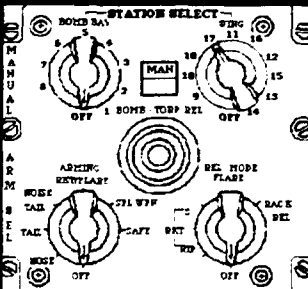
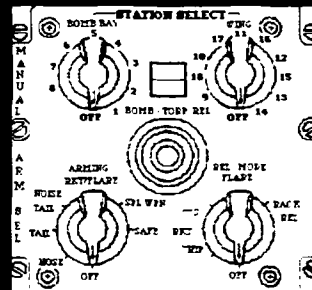
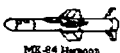


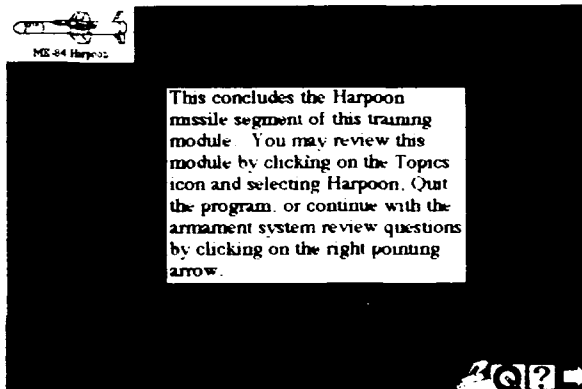
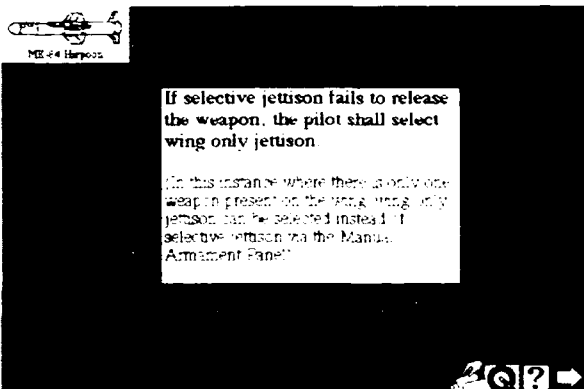
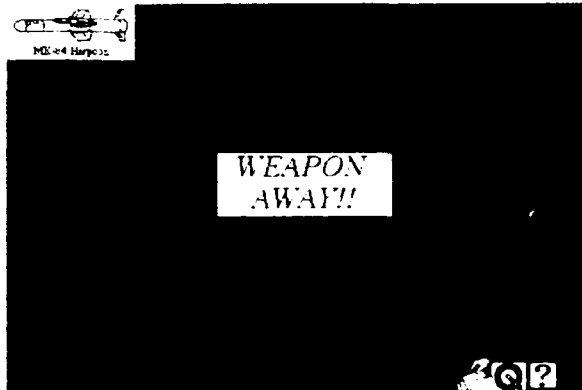
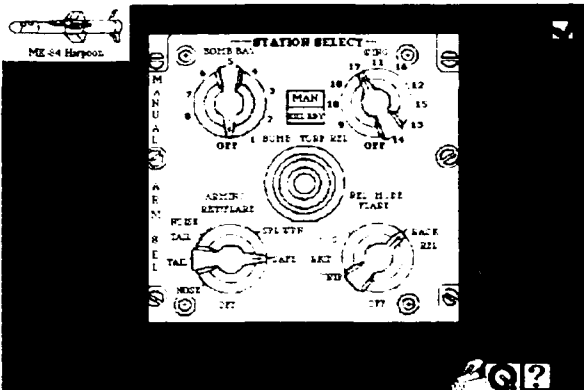
Assume that the Missile BIT, and Fire Warn checks are complete and that all armament switches are off



Natops states that the TACCO **SHALL** selectively jettison a missile with an overheat condition

OK





Review Questions

Proceed through these review questions by clicking on the answer which you believe to be correct. Explanations for wrong choices will be provided automatically. You can Quit the program at any time using the Quit icon, or review previous questions by clicking on the left and right pointing arrows.

GOOD LUCK!!!Review Questions

3. Which of the following statements is/are correct concerning the HARPOON system?

- The TACCO has the capability of selecting only one station at a time for release.
- When a station is selected for launch, the Station NOGO light illuminates for approximately 1/4 second.
- When preparing to launch, if the selected station NOGO light remains illuminated, the missile shall not be launched in any mode.
- All of the above are correct.

4. Two missiles at a time may be BIT checked provided they are on opposite wings.

- TRUE
- FALSE

Review Questions

7. For a HARPOON Line Of Sight (LOS) launch

- The DESTS light illuminates on the HACLOS panel.
- ENG ON REL must be manually selected by the TACCO.
- FLY LEVEL will automatically be selected with the selected mode.
- All of the above are correct.

8. A digital fault in the missile is indicated by

- Missile remains in wing after ITT.
- Station NOGO light remains illuminated when station is selected.
- Status select light remains green after weapon selection.
- HACLOS NOGO light illuminates after weapon selection.

Review Questions

11. The Control Distribution Box performs which function(s)?

- Supplements the Aft Arm Inter Box for HARPOON missile control.
- Provides missile communications, commands and status.
- Provides for arming, sequencing, and interlock functions required to launch missiles singly or in pairs.
- Interprets Fire Warning of the HARPOON missile and transmits it to the Line Of Sight (LOS) mode.
- All of the above are correct.

12. ENG ON REL is selectable in all launch modes but should be selected in LOS mode only.

- TRUE
- FALSE

Review Questions

1. When the ENTER and IN RANGE switchlights illuminate green simultaneously,

- the HARPOON missile is ready to fire.
- the data entered on the launch panel is out of the missile-leveling.
- the DFC will soon terminate the entered track solution.
- the Harpoon has initiated a missile hit track.

2. The TACCO shall selectively jettison a HARPOON missile when

- the missile had an overheat condition.
- abnormal missile control panel indicators occur within the ITT content to launch sequence.
- The DESTS light illuminates amber.
- the HACLOS NOGO light remains illuminated after digitally power to the HACLOS panel.

Review Questions

5. During a HARPOON shot, the TACCO selects LOS. However, the station NOGO light does not illuminate for the selected weapon. The TACCO must

- Select another weapon.
- De-select FLY LEVEL.
- Service MASTER ARM.
- None of the above.

6. The indication at the TACCO station that a selected missile is unsafe is

- NOGO light illuminated at selected weapon station.
- Station switchlight goes dark when selected.
- Status switchlight remains green when selected.
- HACLOS NOGO light illuminated when station selected.

Review Questions

9. Which of the following is/are true concerning the Forward Armament Interconnection Box?

- Enables selection, arming, except for all weapons, and release of Bomb Bay stores.
- Enables the Target Forward control.
- Master Arm and Search Power wiring flow through a test point in this box.
- All of the above are correct.

10. Which of the following is/are true concerning the Aft Armament Interconnection Box?

- Provides control, arming, release, and jettison of weapons.
- Depends on the physical presence in the FWD ARM INTER BOX.
- Contains the fire detection circuitry for HARPOON missiles.
- Exists & has no current.
- All of the above are correct.

Review Questions

13. The HACLOS system provides for several launch modes. Which of the following is/are correct?

- LOS is a casualty mode used when either the TACCO or the FWD REL is OFF/DEF have malfunctioned.
- When LOS selected, the Aft must maintain 4 second straight and level flight prior to weapon release.
- FLY LEVEL is not selectable in or defaulted to in when LOS is selected.
- BOL and LOS are casualty launch modes.

14. The ARM/ORD TEST PANEL is an extension of Logic Unit Two and monitors the on-line selection of search and kill stores. If power is removed from this unit, all on-line capabilities of the armament system are inhibited.

- TRUE
- FALSE

Review Questions

15. A successful release of a HARPOON missile can be accomplished by utilizing which of the following?
- Pilot or Co-pilot yoke switch
 - HARPOON release button on HACLS panel
 - Bomb-Torp release switch on MAN ARM PANEL
 - a & b are correct
 - All of the above are correct
16. A red HACLS NOGO light illuminated continuously after the TACCO applies power to the panel indicates:
- A failure in the DPC or ENCODER-DECODER
 - An unsafe missile indicator
 - A BIT, CYCLO or digital fault in one of the modules
 - Loss of altitude or true information by the DPC

Review Questions

17. If any switch on the TACCO's MAN ARM PANEL is left in any other position than off, no on-line weapon selections are possible
- TRUE
 - FALSE
18. A torpedo which has been selected via the on-line mode may be released by
- The Pilot or Co-pilot yoke switches
 - The WEAPON RELEASE switch on the TACCO's keypad
 - The Bomb-Torp release switch on the MAN ARM PANEL
 - a & b are correct
 - All of the above are correct

Review Questions

19. The on-line method of weapon release is the preferred method. If a torpedo is loaded on all 8 stations in the Bomb Bay, which station will the computer arm first?
- 1
 - 2
 - 3
 - The computer will select station 4 (the middle rack) to avoid an arithmetic loading situation
20. The alert "SELECT TORP PRESET AUTO" was displayed during an on-line torpedo selection. This indicates that:
- The TACCO should select AUTO on the Torp Presetter Panel
 - The computer is automatically presetting the torpedo
 - The torpedo must be selected in the manual mode
 - None of the above

Review Questions

21. With all 8 torpedo stations loaded, the TACCO manually selects station 1 for release but fails to get a KILL READY light. The probable cause is:
- The torpedo is defective
 - Station #1 is blocked by another weapon
 - There is a malfunction in the FWD ARM INTXN BOX
 - Master Arm must be recycled to ON
22. To manually preset the torpedo, the preset button must be pressed and held until the indicator lights extinguish.
- TRUE
 - FALSE

Review Questions

23. What unit prevents enabling the Master Arm Switch on the ground?
- Main landing gear weight on wheels sensor switch
 - ARM HAZARD SWITCH
 - Landing gear lever switch
 - Master Arm can be enabled on the ground
24. In the event of a loss of electrical power, the Bomb Bay doors can be opened by a switch under the floor at the TACCO station. The cue light indicates:
- The Bomb Bay doors are closed
 - The Bomb Bay doors are open
 - The Bomb Bay doors are transitioning (light will extinguish when the doors open or close)
 - The flight station has control over the Bomb Bay doors

Review Questions

25. The proper indications of a successful HARPOON launch are:
- Sta READY light extinguishes, illuminates, then the station ready and station select lights both extinguish
 - The KILL READY light on the MAN ARM PANEL extinguishes
 - All lights on the HACLS panel extinguish
 - Both a & b are correct
 - None of the above are correct

End Of
Review questions
click on REPEAT button
to repeat

REPEAT

The correct answer is "b".
Referring to the diagram
below, it can be seen that
station #1 is blocked by
stations #2 and #4



VIEW LOOKING FORWARD FROM
REAR OF AIRCRAFT

This completes the P-3C Armament Training Module

You can repeat any segment of this
module by selecting the TOPICS menu
icon and clicking
the particular topic of interest.

If you wish to quit the program, click
on the Quit icon.

OK