

VTXTS - A COOPERATIVE EFFORT BETWEEN THE USER,  
THE CHIEF OF NAVAL AIR TRAINING, AND THE  
CONTRACTOR, MCDONNELL DOUGLAS CORPORATION

Mr. Jerome J. Schuck  
Douglas Aircraft Company  
Long Beach, CA 90846

Mr. Eldon W. Riley  
CNET Code N4A  
Chief of Naval Education and Training  
NAS Pensacola, Florida 32508

Commander William D. Jones, USN  
CNATRA Code N221  
Chief of Naval Air Training  
NAS Corpus Christi, Texas 78419

#### ABSTRACT

VTXTS is the totally integrated training system designed to satisfy the U.S. Navy's Undergraduate Jet Flight Training requirements for the 1990s and beyond. The acquisition of the VTXTS to replace the current Intermediate and Advanced Strike Flight Training programs of the Naval Air Training Command will climax several years of intense effort on the part of the Naval Air Systems Commands, McDonnell Douglas Corporation and the ultimate user, the Naval Air Training Command. VTXTS is one of the first major defense acquisitions wherein the entire training system is being designed, developed and produced by a single contractor. This process is affording the Navy the opportunity to explore innovative ideas and advances in technology in all areas of the training system.

In this paper we will demonstrate how the operational and instructional inputs by the Chief of Naval Education and Training (CNET) and its major functional command, the Chief of Naval Air Training (CNATRA), have been and will continue to be significant factors in ensuring that VTXTS will be responsive to the needs of the Navy for a state-of-the-art jet training system through the next twenty years.

#### BACKGROUND

The Naval Air Training Command has been training highly skilled and qualified aviators for the fleet for decades. In recent years the flying skills and tactical knowledge required of the newly designated aviator as he moves to his fleet assignment have advanced to a level undreamed of in years past. The unique and demanding requirements of carrier aviation have always been reflected in the training methodologies of the Naval Air Training Command, and the training system has continually been revised and updated to reflect the current fleet needs. The structure of the Navy's Undergraduate Pilot Training Program has also changed to meet the current needs of each era. The Naval Air Training Command utilizes separate training "pipelines" for different aircraft missions. With this pipeline concept, separate training systems are established for three general aircraft mission types: tactical or strike aircraft, multiengine aircraft and helicopters.

Student Naval Aviators (SNA) for the Navy, Marines and the Coast Guard enter the Naval Air Training Command from a variety of sources including the U.S. Naval Academy, The Coast Guard Academy, College ROTC programs and both Navy and Marine Corps Officer Candidate Schools. They are trained within the Naval Integrated Flight Training System (NIFTS) which begins for all students with Preflight at the

Naval Aviation Schools Command in Pensacola, Florida. After Preflight the Student Naval Aviators begin their flight training in a common Primary phase flying the T-34C aircraft. At the completion of Primary flight training, students are selected for one of three Intermediate training pipelines, strike, maritime (multi-engine) or helicopter. Students in the strike pipeline fly the North American T-2C twin engine jet for Intermediate phase and the McDonnell Douglas TA-4J for Advanced. The VTXTS will replace these two aircraft with a single aircraft and a totally integrated training system for the strike pipeline.

#### CONCEPT

VTXTS is a total training system, composed of a jet trainer aircraft, a suite of simulators, academics, and a computerized training management system. These four elements are integrated into mutually supportive building blocks which enable the Student Naval Aviator to meet the training requirements in the most effective and efficient manner. The VTX training system is the functional integration of these building blocks within a working process. This integration is shown schematically in Figure 1. The ongoing evaluation and coordination of this functional integration by CNET as well as by CNATRA will ensure that the final product of

this system, the designated Naval Aviator, will meet the needs of the fleet. It will also ensure that fleet feedback is promptly evaluated and appropriate revisions to the training system are effected. VTXTS is one of the first major defense acquisitions wherein the entire training system is being designed, developed and produced by a single contractor and procured by the Navy as a fully integrated system and program package. This process is affording the Navy the opportunity to explore innovative ideas and advances in technology in all the elements of the training system, not just in the area of aircraft design. The acquisition process is also providing an exceptional opportunity for the immediate using command, CNATRA, to provide continual and ongoing inputs throughout the design and development cycles. The fact that the end product of this acquisition is a training system, not a weapons system, has facilitated the exploration of new and innovative ideas in training equipment, methodologies, and advanced training technologies. A key task of the prime contractor is to include the operational inputs of the using command in the integrated design engineering development process. The end objective is a working system that provides the required training levels and rates over a 20 year program at the lowest cost to train.

Any discussion of user input to the VTXTS should include a description of the relationship between CNET and CNATRA. Since 1972 CNET has been responsible for all formal Navy training. CNATRA is one of several functional commands under CNET and draws on the assets of the CNET staff for many areas of technical and training support. Some of CNET's other functional subordinates include the Naval Training Equipment Center (NTEC), the Navy Recruit Training Command, the Chief of Naval Technical Training (CNATECHTRA) and the NROTC Command.

The formulation of the VTXTS concept began in the mid-1970s when CNET directed CNATRA to conduct the initial Undergraduate Pilot Training (UPT) Task Analysis. The purpose of that UPT Task Analysis was two-fold: first, to verify the existing training procedures and curricula, and identify any deficiencies, and second, to apply these findings to the training program in achieving the required modifications and improvements. The results of this task analysis were published in the Phase I and Phase II Task Analysis Reports. This UPT Task Analysis initiated the participation of the CNATRA staff in the acquisition process for the VTXTS. It has been this participation at each step in the conceptualization and design process that will help to ensure that the VTXTS will meet the needs of the using commands.

The thread of CNATRA's active participation in the VTXTS process continued when the Chief of Naval Operations (CNO) requested industry participation in conceptual design studies of an Advanced Navy Jet Trainer. A competitive solicitation was conducted to obtain ideas, approaches and conceptual designs for this aircraft. The Naval Air Development Center (NADC) contracted with four aircraft manufac-

turers, McDonnell Douglas Corporation, General Dynamics Corporation, Northrop Corporation and Vought Corporation for the conceptual design studies. Briefings and dialogue with the four contractors established a definite need to address all elements of this total training system rather than just the aircraft. Both CNET and CNATRA had been very active in the early efforts leading up to these studies. In addition to the UPT Task Analyses that CNATRA had conducted, the Naval Training Equipment Center had completed the Training Situation Analysis (TSA) specifically for the VTXTS, in which various training media required for a state-of-the-art training system were addressed. The baseline requirements of the system used by the four contractors in their technology studies were based on discussions with the Naval Air Training Command staff and instructor pilots. VTXTS workshops were conducted at CNATRA in preparation for the technology base studies and the contractors had access to the Task Analysis Reports, the TSA and the then-current NIFTS curriculum. At the completion of these technology base studies, an analysis team was established to review and summarize the results of the studies. CNET and CNATRA were again heavily involved in the review process. Members of the CNET and CNATRA staffs, as well as Subject Matter Experts (SME's) from Training Wings Two and Three were included on the analysis/review committee. The review committee assessed the study data in various areas including methodology, concept options, effectiveness measurement and cost.

In March 1979 the Mission Element Need Statement (MENS) for the VTXTS was signed by the Secretary of Defense signalling the formal initiation of the VTXTS program. Under OMB Advisory Circular A-109, the Mission Element Need Statement formally establishes the need for the system involved and signals Department of Defense concurrence. The signing of the MENS is Milestone zero in a specified series of decisions by the Defense System Acquisition Review Council (DSARC). Following the issuance of the MENS, a Request for Quotation (RFQ) was issued for the Alternative Systems Exploration studies in December 1979. Once again, CNATRA participation in the acquisition process was evident. CNATRA assembled a team composed of CNATRA VTXTS Special Projects members, representatives of the training wing staffs and instructor pilots from the training squadrons. In conjunction with the CNET Educational Specialists, this team developed the Terminal Learning Objectives (TLO's) for the VTXTS. The 87 TLO's provided the means to define the specific goals of the VTX training system. The TLO's describe flying skills that the student pilot will be expected to demonstrate prior to the completion of the VTXTS curriculum. CNATRA staff members also provided operational inputs to the Naval Air Systems Command (NAVAIR) for the Constraints and Guidelines section of the Request for Quotation. As a result of this competitive solicitation, six contractors were awarded contracts for Alternative Systems Exploration (ASE) studies. These six-month studies enabled the contractors to complete in-depth analyses and trade studies on the varied aspects of

the training system requirements. Within the limitations of the MENS, the RFQ Constraints and Guidelines, and the TLO's, each contractor was able to propose its own training system including recommendations for the allocation and arrangement of the system elements.

As the acquisition process was originally established under the provisions of OMB Advisory Circular A-109, The Naval Air Systems Command was to evaluate the ASE studies and select one or more contractors for continuation into the following acquisition phase, Demonstration/Validation (DEM/VAL). The DEM/VAL phase was to be a risk reduction process in which the contractor would develop selected portions of the proposed training system for demonstration and validation of the concept. In November 1981 the McDonnell Douglas/British Aerospace proposal was chosen in the source selection as the winning entry. With the narrowing of the selection process to a single contractor team, the concept of a DEM/VAL phase has changed to a Pre-Full Scale Development phase, Pre-FSD. The Pre-FSD phase will be followed by the Full-Scale Development and ultimately the Production phase of the VTXTS acquisition. As the VTXTS acquisition process continues, a cooperative working relationship will be established between the contractor, McDonnell Douglas Corporation, and the using commands, CNET and CNATRA. The beginnings of this working relationship that have evolved after the source selection are helping to ensure adequate user input to the training system in its design phase. In the future, the benefits of this early user input to the development process will be even greater. By the early integration of the end user's requirements into the training system development process, the resultant system will reflect more accurately the real needs and requirements of the users.

#### PROJECTIONS

Early in the VTXTS acquisition cycle, CNATRA, as the primary using command, established a VTXTS Special Project team. This group is composed of CNATRA staff personnel with extensive backgrounds in all areas of the Naval Air Training Command operations including flight operations, simulator instruction, academics, maintenance, facilities management and general military training. The experience of this group, coupled with CNET's staff of instructional technologists, enabled the using commands directly involved with the VTXTS to provide the operational input that is so vital to the acquisition of a totally integrated system.

McDonnell Douglas Training Systems Engineers recognize the importance of this operational expertise to the success of the VTXTS. The timely and proper utilization of that expertise as the system acquisition progresses will be a key factor in ensuring that the VTX training system will be responsive to the real world needs of the training command users in the late 1980's beyond.

CNET/CNATRA input to the development process is expected to be especially valuable in

the areas of curriculum outline refinement, final definition of the simulator functional requirements and operational inputs to the Training Management System (TMS). The final integrated academic, simulator and flight curriculum will be a reflection of the total VTX system concept. It is essential that the ever-changing operational requirements as identified by CNATRA staff as well as training wing and training squadron personnel be integrated into the VTXTS curriculum to ensure that it is both operationally and instructionally sound. The Training Management System (TMS) represents another area where the user input will be especially important. In the current NIFTS the individual squadron's schedules officer is a key to the successful flow of students through the curriculum. The schedules officer assembles information on student and instructor availability, aircraft availability, academic and simulator requirements, and a myriad of scheduling directives into a daily flight schedule. The operational expertise of key personnel such as these schedules officers will be vital to the implementation of the Training Management System into the training command structure.

#### CONCLUSIONS

The operational environment of the Naval Air Training Command is unique and demanding. It is one of the best military pilot training programs in the world. It is dynamic and ever-changing in response to the needs of the fleet. The fact that the Naval Air Training Command has maintained this pre-eminent position is a tribute to the CNATRA staff, the Training Wing staffs, the training squadron personnel and the support personnel at the training bases. The challenges presented to the prime contractor, McDonnell Douglas, in developing the VTXTS, integrating the elements of the system and implementing the system into the Naval Air Training Command are indeed formidable. The task will require a closely coordinated effort between the contractor and the using command for identification of real-time operational requirements and the integration of those requirements into the training system. The ground work for this close cooperation between user and contractor has been laid. As the development effort moves ahead during the FSD phase, this ground work will form the basis for a cooperative working relationship between user and contractor that is vital to the ultimate success of the training system. To date all contacts between contractor and user have been closely coordinated and controlled by the VTXTS acquisition manager, the Naval Air Systems Command. NAVAIR will continue to function in this important position as coordinator between user and contractor.

The entire VTXTS concept of a total training system with all of its elements-- aircraft, simulators, academics and training management system, designed and developed by a single contractor-- is new. The challenges facing the training command today are also new and ever-changing. The cost of training resources has risen dramatically and the continued availability of current assets has

## ABOUT THE AUTHORS

become difficult to maintain. VTXTS will enable the Navy to reduce the cost to train each student by providing a fuel-efficient training aircraft, improved simulator capability, an interactive computer-assisted academic system and an automated training management system. The ever-rising cost of fuel is a significant factor in the total cost to train. The new VTX aircraft with its fuel-efficient engine and its increased reliability over the current strike pipeline aircraft will provide a major reduction in training costs. The state-of-the-art VTXTS simulator suite and the interactive Computer Assisted Instruction (CAI) system allow the number of required flight hours to be reduced substantially, providing yet another major cost reduction. Many of the peripheral administrative demands placed on flight instructors by the current NIFTS will be automated in VTXTS by the Training Management System. Instructors, relieved of many of those administrative, bookkeeping type responsibilities, will have more productive time available for actual direct instructor to student interface within the instructional environment, ensuring an even more well-trained Naval Aviator than ever before. The level of sophistication and advanced technology in the Navy's modern fleet aircraft requires ever-increasing flying skills and systems management skills on the part of the newly designated Naval Aviator. VTXTS will provide him with basis of those skills.

The need for VTXTS is clear, and the need for close integration of the CNET and CNATRA experience in training command operations with the broad base of McDonnell Douglas expertise in aircraft and systems engineering is equally evident. It will be the cooperative working relationship between user and contractor which will result in the development of a viable training system capable of producing quality Naval Aviators for the fleet at a lower cost-to-train than ever before. The VTXTS will meet the Navy's need for a quality training system in the Naval Air Training Command. The VTXTS trained Naval Aviator will be even more well prepared to transition to the fleet aircraft of the next two decades than his predecessors were. He will be ready to meet the challenges and rewards of a career in carrier aviation with the United States Navy.

Mr. Schuck is a Training Systems Analyst at Douglas Aircraft Company in Long Beach, California. He is currently involved in ISD and curriculum development efforts for the VTXTS. He previously participated in the development and implementation of courseware for the U.S. Navy's F-14. Mr. Schuck is a former Naval Aviator whose background includes experience in U.S. Navy carrier and training command operations.

Mr. Riley is the Assistant Chief of Staff for flight training at the office of the Chief of Naval Education and Training. He has coordinated the implementation of the T-34C aircraft into the Primary phase of the NIFTS curriculum and the T-44 aircraft as the Advanced Training aircraft in the multiengine pipeline. He has been directly involved with the VTXTS project for the Navy's strike training pipeline since the inception of the program in the mid-1970s.

Commander Jones is currently the Chief of Naval Air Training Program Manager for VTXTS. He is directly responsible for CNATRA involvement and operational inputs for all elements of the VTXTS. Commander Jones' background includes extensive experience in Navy tactical carrier aircraft as well as the strike training pipeline of the Naval Air Training Command.

# SYSTEM CONCEPT

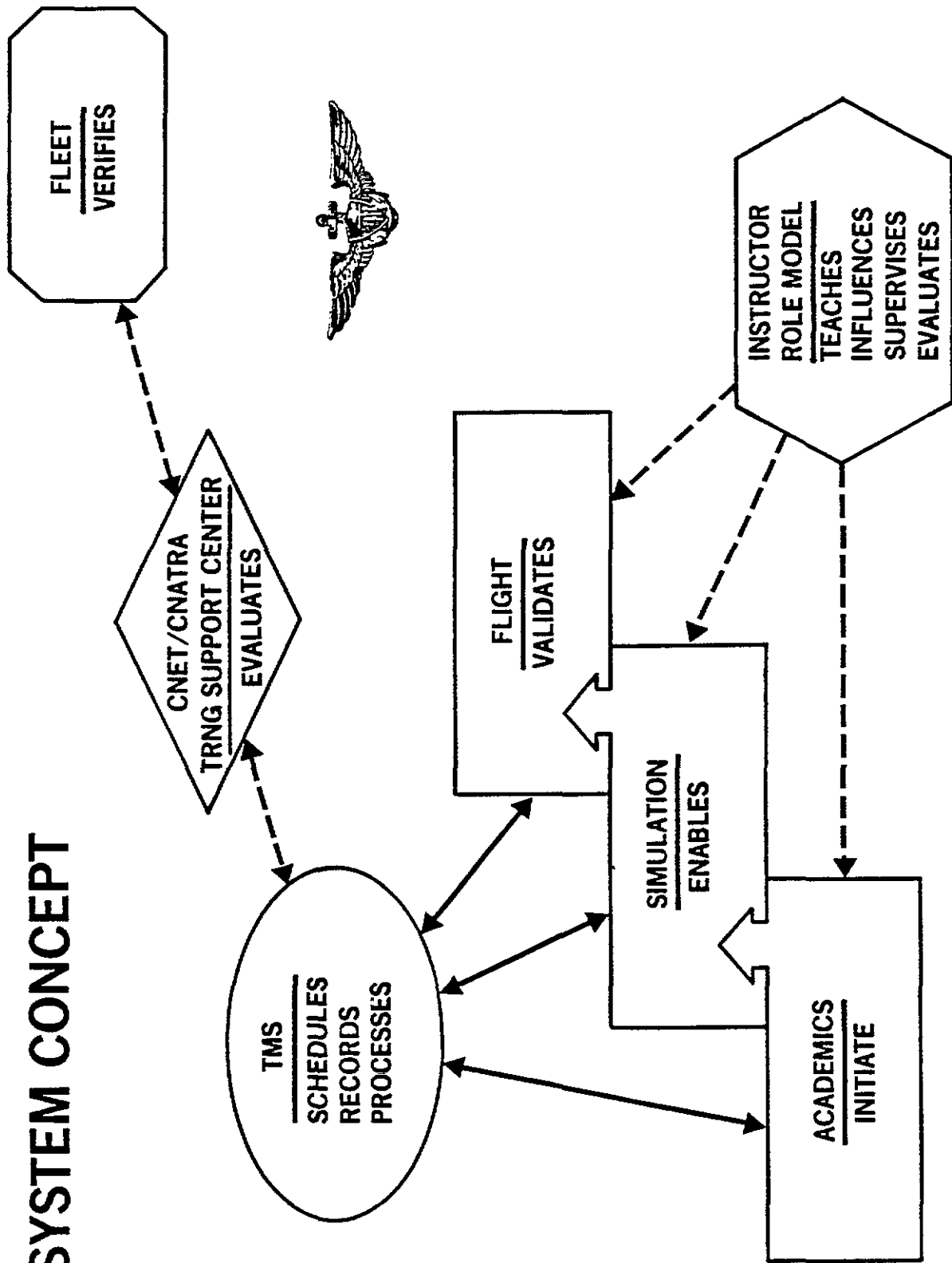


FIGURE 1

# SYSTEM CONCEPT

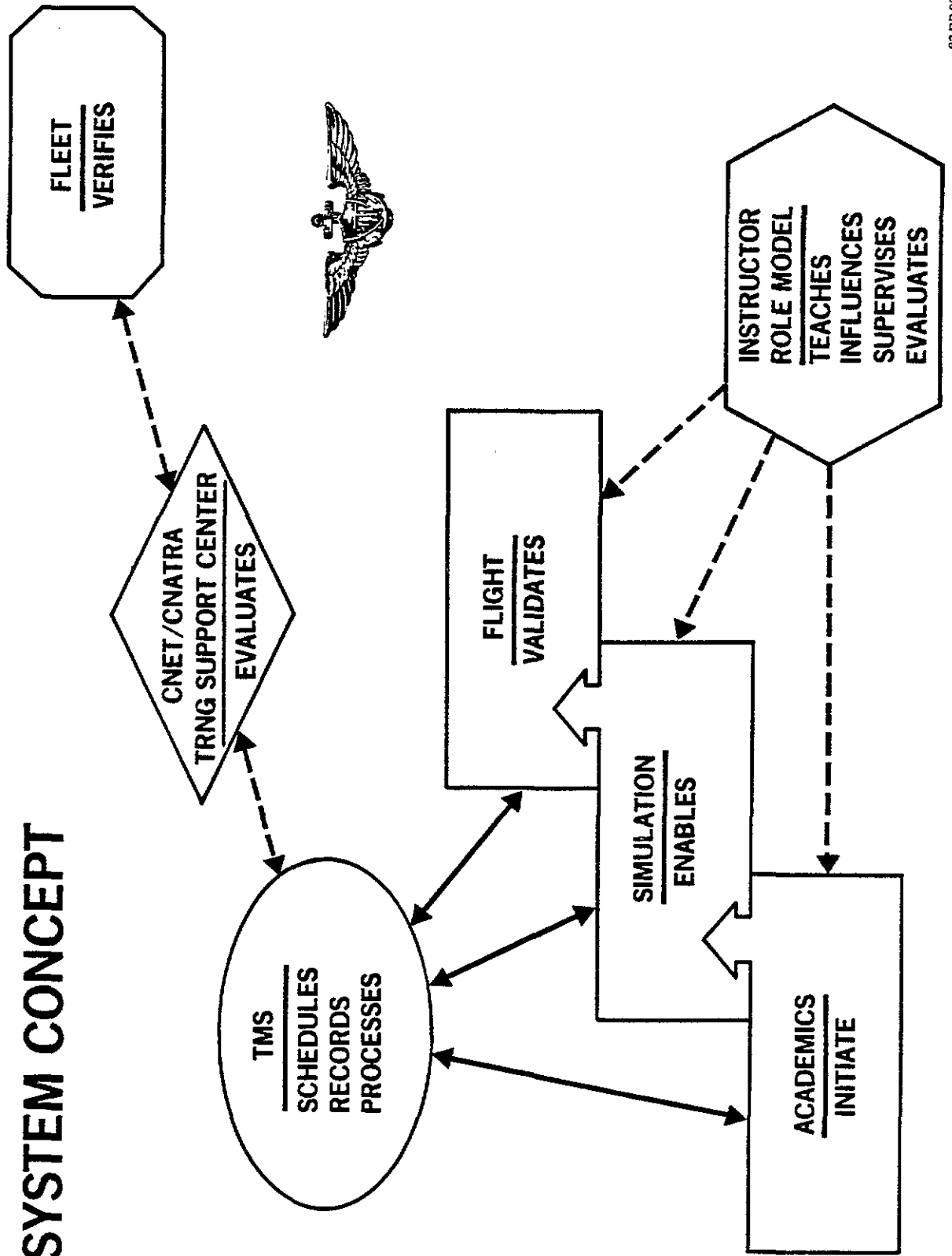


FIGURE 7