Training Situation Document

For the

Undergraduate Military Flight Officer (UMFO)
Training Program

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Foreword/Preface

The U.S. Navy's Training Air Wing 6 (TW-6), located aboard Naval Air Station (NAS) Pensacola, Florida, operates the Undergraduate Military Flight Officer (UMFO) Training Program. TW-6 is responsible for the training of Military Flight Officers (MFOs) for the United States Navy, United States Marine Corps, United States Air Force, and Foreign Military Forces as arranged through the Foreign Military Sales (FMS) Program. The purpose of the UMFO program is to provide commissioned officers, in preparation for follow-on aviation assignments, with the appropriate training required to safely aviate, navigate, communicate, and manage aircraft systems and employment in a training environment reflective of military operational conditions. This Training Situation Analysis (TSA) was conducted to analyze the existing T-39 Intermediate and Advanced training program (Intermediate, Advanced Core, Advanced Strike, and Advanced Strike/Fighter) and to assess the effectiveness of current UMFO curricula for training. Any areas of training where inconsistencies were found or improvements could be made are identified, documented, and recommendations are made for improvement.

Definitions

AA	Air-to-Air
AF NAV	Air Force Navigator
AG	Air-to-Ground
ANAV	Airways Navigation
AIRT	Air Intercept RADAR Trainer
AITC	Aviation Instructor Training Course
API	Aviation Preflight Indoctrination
AQT/FAR	Aviation Qualification Test/Flight Aptitude Rating
ATC	Air Traffic Control
ATD	Advanced Training Device
ATM	Advanced Tactical Maneuvering
BDHI	Bearing Distance Heading Indicator
CC	Crew Coordination
CM	Configuration Management
CNATRA	Chief of Naval Air Training
CNETC	Commander, Naval Education and Training Command
CRM	Crew Resource Management
CST	Composite Synthetic Trainer
CV	Aircraft Carrier
ELO	Enabling Learning Objective
EP	Emergency Procedure
FAA	Federal Aviation Administration
FLIP	Flight Information Publication
FITC	Flight Instructor Training Course

FRS	Fleet Replacement Squadron
FS	Fighter Strikes
FTI	Flight Training Instruction
GBNT	Ground Based Navigation Trainer
GBTS	Ground-Based Training System
GMRT	Ground Mapping RADAR Trainer
ICS	Inter-cockpit Communications System
ICW	Interactive Courseware
INAV	Instrument Navigation
IT	Information Technology
ISD	Instructional Systems Development
IUT	Instructor Under Training
JPATS	Joint Primary Aircraft Training System
LO	Learning Objective
LL	Low Level
MATSG	Marine Aviation Training Support Group
MCG	Master Curriculum Guide
MFD	Multi-function Display
MFO	Military Flight Officer
NAMRL	Naval Aerospace Medical Research Laboratory
NAS	Naval Air Station
NATOPS	Naval Air Training and Operating Procedures Standardization
NAVAIR	Naval Air Systems Command
NETC	Naval Education and Training Command
NFO	Naval Flight Officer

NOTAM	Notice to Airmen
NSS	Navy Standard Score
PTT	Part Task Trainer
RN	RADAR Theory and Operation
RNAV	RADAR Navigation
RST	RADAR Synthetic Trainer
SA	Situational Awareness
SME	Subject Matter Expert
TLO	Terminal Learning Objective
T/M	Training/Model
TSA	Training Situation Analysis
TSD	Training Situation Document
TW-6	Training Air Wing SIX
UMFO	Undergraduate Military Flight Officer
VNAV	Visual Navigation

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1 Application of Training Data Product

1.1 Composition

The Training Situation Document (TSD) for the UMFO training program is a compilation of analysis from surveys, interviews, and observations conducted for the Training Situation Analysis (TSA) study.

This document includes: the study background, the existing training situation, the situation analysis and impact statements, as well as a description of solutions, alternatives, and recommendations.

This study was conducted in accordance with the development standards of MIL-PRF-29612B.

1.2 Function

The function of this TSD is to document the capability and efficiency of the current UMFO training program as it relates to the T-39 aircraft in satisfying existing training objectives and for recommending alternatives and solutions to any inefficiency found through this analysis.

1.3 Use

The data generated for this TSA will provide the Government with the background and current capabilities of T-39 UMFO training. The analysis of information gathered will provide the Government with an understanding of where efficiencies and deficiencies exist in the current training; this can be used to further an understanding of the training requirements. Recommendations of solutions and alternatives that may correct or take advantage of the current training situation identified in the UMFO training program will provide the Government with the means to scope and evaluate recommendations provided by prospective contractors of the T-39 replacement.

1.4 Executive Summary

The existing T-39 UMFO training syllabus is predominantly based on training principles that are fifteen to twenty years old. It is evident that funding constraints have negatively impacted the UMFO program over the years. With the exception of the 2B49 PTTs that were procured in 2002 the paucity of training and simulation technology used in the syllabus is astounding. The majority of the syllabus consists of instruction based on classroom lectures, Part Task Trainer (PTT) events and flying in the aircraft. This training methodology results in the student receiving their introduction to the cockpit environment in the aircraft and spending early stage cockpit time learning aircraft and sensor familiarization rather than refining skills that they have previously learned.

A lack of Instructional System Development (ISD) influence has left a training curriculum that is disjointed and ineffective in achieving all the stated learning objectives. While Computer Based Training (CBT) has been developed under the Revision and Maintenance program, the CBT is

rudimentary and has not been incorporated as part of the curricula. Similarly, the Microsim is not part of the syllabus, but the students are encouraged to utilize both of these training aids in their own time, yet given little instruction or direction on what to use them for. The instructional material has also suffered with the passage of time and turnover of instructor personnel. The Flight Training Instructions are outdated and conflict with other training materials, learning objectives are not consistent between the Master Curriculum Guides and the training materials, and there is a lack of standardization. In more than one case, multiple versions of a lecture were found on the network.

In 2002, the 2B49 AIRT/GMRT Part Task Trainer (PTT) was introduced into the syllabus as a replacement for the previous PTTs. This device allows the student to practice both air-to-air and ground mapping RADAR skills on the same device and also contains a partial visual system. While an improvement in some areas over the prior PTTs, this device is touch screen based and with the exception of the RADAR controller, does not accurately replicate the knobs and switches of the aircraft and RADAR. The visual system and cockpit instrument panels also do not replicate the size of the aircraft and the devices are not enclosed; therefore, they do not emulate the confined space of the aircraft cockpit. Students have ample room to spread out charts and other materials and the ambient noise level is not conducive to a positive learning environment. A RADAR PTT for the T-48TS would be an effective component of the training continuum, though the PTT should not take the place of a full cockpit Aircrew Training Device (ATD).

The placement of the 2B49s in building 3268 is representative of the facilities being used for the T-39 Intermediate and Advanced UMFO curriculum. Space for the Intermediate and Advanced stages appears to have been obtained and utilized on an "as available" basis rather than designed and dedicated for a positive training environment. With the expanded space requirements generated by the introduction of the T-6 into the Primary and Intermediate phases, the T-48TS will lose access to space that is currently being utilized by the T-39 program. This, combined with the additional space requirements that will be needed for the T-48TS, necessitates space that is dedicated to the T-48TS. The optimum solution for providing an environment that is conducive to positive learning and training transfer is a facility that houses all of the T-48 GBTS elements and is located within walking distance of the hangar facility.

The Fleet Replacement Squadrons (FRS) instructor, undergraduate student, and undergraduate instructor survey results all indicate that a shortfall of the current syllabus is that graduates of the program do not possess the Situational Awareness (SA) and Crew Coordination (CC) skills that are desired by the FRS. The lack of a cockpit representative ATD is a contributing factor to the degraded SA and CC skills demonstrated by the UMFO graduates. ATDs that are an exact replica of the aircraft cockpit, including visual field of view, side panels, and cabin overhead, provide the student with the enclosed environment that they will experience in the aircraft and will contribute to a developed sense of SA. ATDs configured in this way will also assist in developing CC skills and provide the UMFO student the opportunity to take a more active role in the cockpit while in a controlled environment. . A replacement aircraft and RADAR that meet or exceed the performance requirements of the T-39 and the APG-66 RADAR will also ensure that the delta between desired and achieved levels of Situational Awareness, Crew Coordination and Crew Resource Management that exist today in UMFO graduates will not be exacerbated. Fleet aircraft performance and the increased amount of data that fleet aircrew have to assimilate and process continues to increase

exponentially, requiring aircrew who have strong SA, CRM and CC skills and are capable of multi-tasking.

Of all the Undergraduate Flight Training Programs, the UMFO program is the most ideally suited to maximize the use of simulation technology in CBT, CAI, PTTs, and ATDs. The principal focus of training UMFO students is on cognitive and limited psychomotor skills for aircraft sensor operations and therefore a basic efficiency can be achieved in a simulated environment. For any program, the greatest advantage of using simulation vice the aircraft to meet the learning objectives is the reduced operating and support costs. This tradeoff is only conducive to meeting the training and learning objectives if the fidelity of the simulation accurately replicates the performance characteristics of the aircraft and sensors.

The fidelity of the visual system and RADAR simulation technology that are available commercially today for use in ATDs is more than capable of meeting the majority of the learning objectives of the UMFO program. Simulation can also be used in the CBT, CAI and PTTs to train operation and familiarization of the RADAR and the aircraft instruments. Additional advantages of using simulation in an ATD to meet the UMFO learning objectives are the ability to control the environment, inject emergency procedures, freeze the training evolution, and provide immediate instructor feedback. When an event is flown in the aircraft, the instructor has no control over the weather or other environmental factors such as smoke, winds, ducting, or the position of ground objects. Because of this, it is possible for a student to fly every flight in the syllabus in ideal weather conditions, thus never experiencing the impact of environmental factors and their effect on sensor performance. Conversely, a student could be placed in a situation where all or the majority of their early stage flights were conducted in less than ideal conditions and this would adversely affect their ability to learn in an ideal environment before being subjected to external factors that affect the aircraft and sensors. Use of an ATD will also allow the introduction and practice of emergency procedures that, due to safety reasons, cannot be accomplished in the aircraft and will allow the instructor to stop the training event to provide immediate feedback when a student is doing something incorrectly. If the ATD has pre-programmed flight evolutions, it can also be used to demonstrate a maneuver to the student prior to flying the event, thus providing the student with a visual portrayal of how the event is conducted.

Effective training is best accomplished through a combination of auditory, visual, and tactile kinesthetic learning, which is the science of learning through doing. A training continuum combines all three types of learning and is most effective in an incremental process that begins in a controlled environment and progresses to the actual aircraft. The U.S. military, through the use of Mission Rehearsal Systems has validated the learning concepts of visual and tactile kinesthetic learning and the relationships in a training continuum that includes electronic classrooms, CAI/CBT, PTTs, ATDs, and the aircraft and is similar to the relationship between Mission Rehearsal and flying the mission.

The acquisition of the T-48TS provides the opportunity to build upon the technology infusion in the UMFO Primary stage and inject existing state-of-the-art training technology into the UMFO Intermediate and Advanced phases. T-6 aircraft cockpit representative ATDs are part of the primary UMFO syllabus and will provide an introduction to CC and SA that should be continued in the Intermediate and Advanced syllabus. The T-48TS should maintain the ATD level of fidelity

that the students will be using in the T-6 ATDs. The T-48TS introduction should field a Training System that focuses on a training continuum approach to learning and utilizes the aircraft flights to refine and practice previously introduced items, rather than as the primary training device for the student to become acclimated to the cockpit environment and for introducing maneuvers. The training continuum approach should replicate that which is being successfully used in other undergraduate and FRS curriculums and should consist of Computer Based Training with Computer Managed Instruction for self paced systems, navigation, weather, RADAR and flight procedure theory; Instructor led Computer Aided Instruction in an electronic classroom for additional system, navigation, communication, weather, RADAR and flight procedure theory; Part Task Trainers for RADAR system and basic procedures; Aircrew Training Devices for cockpit familiarization, normal and emergency procedure introduction, practice and system; and the aircraft.

2 Training Situation Analysis Data

2.1 Study Background

2.1.1 Reason for Study

This TSA was conducted in order to evaluate the current curriculum for the Undergraduate Military Flight Officer (UMFO) T-39 training program. Through this analysis, the project team sought to validate current Terminal Learning Objectives (TLOs) and Enabling Objectives (ELOs) and the effectiveness of current curriculum in training those learning objectives (LOs). The analysis would identify training deficiencies and make recommendations to correct or improve these areas.

2.1.2 Principal Result

The principal result of the analysis displays the lack of funding and attention the UMFO program has received. The curriculum lacks a supportive and connective ISD structure, which would ensure that events, training materials and training equipment, students and instructors all receive the correct and necessary learning objectives and that all these entities would be kept up to date and current with the latest changes. Most of the training equipment, with the exception of the 2B49 AIRT/GMRT trainer, is out-dated and is being utilized to fulfill requirements outside of the equipment's initial design capabilities (this includes the 2B49) or is too generic to present a proper training scenario in relation to the learning objectives of the phase of training. The current training equipment is prohibiting the necessary practice students require in developing their aircrew skills. There is extrication in the perception between the Training Command and Fleet Replacement Squadrons (FRS) regarding the preparedness of the newly winged Military Flight Officers (MFOs). Situation awareness, crew coordination and basic RADAR and communication skills are found to be insufficient for entrance into the complex aircraft and environments.

The T-39 replacement aircraft will provide CTW-6 with a RADAR capable aircraft in the Intermediate stage. Based on the issues discussed, this should predicate the introduction of RADAR to the Intermediate phase.

The correction to many of the deficiencies noted within this document is to acquire a robust ground based training environment with training equipment and materials that are representative and maintained current with the aircraft and allows the acquisition and practice of the skills required of an MFO through a training continuum. This should be accomplished through an Instructional Systems Development (ISD) providing the materials and equipment constructed to meet the increasing requirements of the Intermediate and Advanced phases of instruction. A simulated cockpit environment allowing instruction to be conducted in a realistic setting and within realistic scenarios must also be included. This is vital to the establishment of situational awareness (SA) and crew coordination skills as well as advancement of basic aviate, navigate and communicate skills.

2.1.3 Main Assumptions

The Training Situation Analysis was conducted under the following assumptions:

- The T-39 is nearing its life expectancy and will be replaced.
- The T-1 aircraft will also be replaced when the T-39 is replaced.
- Organizational
  - Structure is established and functional
  - Personnel staffing is adequate
- Facilities
  - Training location will not change
  - Utilization and/or expansion of existing facilities as an alternative to new construction
- Training
  - TW6 will continue to provide all UMFO training
  - Analysis of individual fleet aircraft requirements and how they relate to UMFO training is not required; the Operational Requirements Document for the T-39 replacement includes the existing LOs. The basic assumptions of what to teach the UMFO are established and sound.

2.1.4 Major Restrictions

The major restriction to this analysis was time as it relates to the amount of survey and interview data that could be collected, as well as the time to fully validate the outcome of the analysis. The results of data collected are thought to be sufficient and representative of the overall opinions and evaluation of UMFO training. This is supported by observations and discussions with individuals involved with UMFO training and the analysis team experience with all of Naval Undergraduate Flight Training.

2.1.5 Scope of Study

This analysis reviewed the T-39 curricula of the UMFO training program, including those T-39 events supplemented by the T-1 aircraft. Emphasis was placed on the training requirements for replacing the T-39N/G as well as the T-1 aircraft and associated training materials and equipment.

2.1.6 Study Objectives

The objectives of this study were to:

- Provide a description of the existing training situation to allow understanding of the analysis and recommendations.
- Analyze the validity and applicability of the existing T-39/T-1A UMFO training objectives.
- Identify learning objectives that do not complement or fully support the UMFO training program mission.
- Identify learning content that is not supported within the learning objectives.
- Identify learning objectives not accomplished within the curriculum.
- Analyze efficiency of the training program to satisfy learning objectives.
- Identify any training deficiencies of UMFO training.
- Provide recommendations for improvement to UMFO training, considering the T-39 will be replaced.

2.1.7 Basic Methodological Approach

In order to meet the study objectives, data collection was conducted through surveys, interviews, record review, and observations. Surveys were designed to maximize information gathered in a prompt manner and with the least disruption to training as possible. The surveys were administered and/or interviews were held with UMFO students, graduates, instructors, and the appropriate FRS instructors and students.

According to Donald Kirkpatrick, Ph.D. (1975), a nationally recognized expert in training program development and evaluation from the University of Wisconsin-Madison, there are five main periods at which to take measurements, conduct assessments, or reach judgments, in order to evaluate a training program. These five intervals are: before training, during training, after training/before applying training, in the workplace/while applying training, and upon exiting the applied training situation. Using the students, graduates, instructors, and FRS instructors and students effectively covered all of the correct time periods to evaluate the training program. As stated below, Kirkpatrick also defines the four levels for which training is evaluated.

Level 1 – Reactions: Level 1 typically measures how well the trainees like the training program. This is usually measured during or at the end of training. To accomplish this level of evaluation, the UMFO students and recent graduates will be surveyed and/or interviewed.

Level 2 – Learning: Level 2 measures what in the training program was understood and absorbed by the trainees. In order to get a true indication of the knowledge and skills resulting from training, the trainees' entry-level knowledge and skills must also be known. Therefore, level 2 can be measured before, during, and after training. Students, graduates, instructors, and FRS instructors and students will be surveyed and/or interviewed as well as analyzing student achievement metrics will be accomplished in order to evaluate what the students learned during the UMFO training program.

Level 3 – Behavior: Level 3 measures the extents to which trainees implement what they learned at training. This would be measured in the workplace, while applying training. Graduates and FRS instructors and students will be surveyed/interviewed for the evaluation of level 3.

Level 4 – Results: Level 4 measures changes that have occurred in the workplace as a result of the training. Anything from improved morale to reduction in costs is measured at this level. These results would be measured in the workplace, while applying training. This level of evaluation will be accomplished through surveys/interviews with the UMFO instructors and FRS instructors and students.

In addition to the levels of training evaluation listed above, this study will also gather information on the optimal performance of training and the causes and solutions for deviation from that optimal performance. According to Dr. Allison Rossett (1995), an Ed.D. in Instructional Systems Design and Educational Technology from the University of Massachusetts, well known for her work in e-learning and needs assessment, needs assessment is the "initial pursuit of information about a situation." It is intended to gather information about actual performance, optimal performance, feelings (opinions), causes, and solutions. There are five tools used to collect needed information. These five tools are:

- Interviews: Interviews are an appropriate tool for gathering data related to all five areas.
- Observations: Observations are effective for gathering data related to analyzing optimal performance.
- Examination of records: Examination of records is appropriate for gathering data related to the outcomes of personnel performance.
- Group Facilitation: Group facilitation is appropriate for gathering data related to all five areas.
- Surveys: Surveys are excellent for gathering data from a large number of individuals for information related to cause, opinions, and solutions.

2.1.8 Study Sponsor

The Naval Air Systems Command (NAVAIR) PMA-273 has sponsored this study.

2.1.9 Data Sources

- CTW-6 In-Flight Guide Section III, T-39 Sabreliner, 2003
- Advance Instructor Survey Data
- Advanced Core Phase Student Survey Data
- Advanced Strike Phase Student Survey Data
- Advanced Strike/Fighter Student Survey Data

- CNATRA P-825 Strike Fighter Intercept Procedures Textbook, 2002
- CNATRA 1542.131B Intermediate Naval Flight Officer (NFO)/ Air Force Navigator (AF NAV) Training Curriculum, 2001
- CNATRA 1542-117 Aircrew Coordination Training Instructors Course, 1996
- CNATRA 1542-121B Advanced Strike/Fighter NFO Master Curriculum Guide, 2002
- CNATRA 1542-122C Advanced Strike NFO Master Curriculum Guide, 2002
- CNATRA 1542-123A NFO Advanced IUT Training Curriculum Guide, 1997
- CNATRA 1542-123A NFO Advanced IUT Training Curriculum Guide, 1996
- CNATRA 1542-132B Advanced Core NFO Master Curriculum Guide, 2002
- CNATRA 1542-134 NFO Intermediate IUT T-1A Training Curriculum Guide, 1997
- CNATRA 1542-151A Flight Hour-Simulator Allocation, 2002
- CNATRA 1542-154 NFO Primary-Intermediate IUT Training Curriculum Guide, 1998
- CNATRA 1542-15E NFO Flight Instructor Training Curriculum Guide, 1996
- CNATRA 1542-16G Aviation Instruction Training Course, 2000
- CNATRA 1550-6D Training Improvement Program
- CNATRA 3501.2 NFO Introductory Flight Screening Program Guide, 2003
- CNATRA 3710.13E NFO Flight Instructor Standardization and Training Program, 2001
- CNATRA 5224-1A Trainer Management Team, 1994
- CNATRA 5351.1A Naval Air Training Advisor Program, 1995
- CNATRA 857 Trainee T-39 NATOPS Workbook Flight Training Instruction, Intermediate Phase Basic SNFO, 2002
- CNATRA P 1542-54L Primary NFO Master Curriculum Guide, 2002
- CNATRA P-607 Instrument Ground Training, Strike Student Guide, 1997
- CNATRA P-806, Voice Communications Student Guide, 1998
- CNATRA P-812 Student Guide for Visual Navigation Volume II (T-1A/T-39), Intermediate NFO, 2000
- CNATRA P-816 PAT CV Procedures, 1997
- CNATRA P-819A PAT RADAR Planning and Navigation Strike, Advanced SNFO/SNAV, 1997
- CNATRA P-819A PAT RADAR Planning an Navigation Strike, Advanced SNFO/SNAV, 1997
- CNATRA P-820 PAT RADAR Theory Ground Mapping/Intercept Fundamentals, Strike/Strike Fighter, 1994
- CNATRA P-825 Strike Fighter Intercept Training, 2002

2.2 Existing Situation

2.2.1 Training Program Mission Statement

The mission statement, as per the Master Curriculum Guides (MCGs) for UMFO training, is to "plan for, supervise, support and conduct flight training of quality student Naval Flight Officers (NFOs), undergraduate Navigators, and International Military Students to satisfy service requirements."

2.2.2 Organizational Chart of Command Relationships

Figure 2.2.2-1 identifies UMFO program executing commands. The figure also provides the training platform, training time and actual or simulated events. It provides the graduation points and future platforms to which UMFOs are detailed.

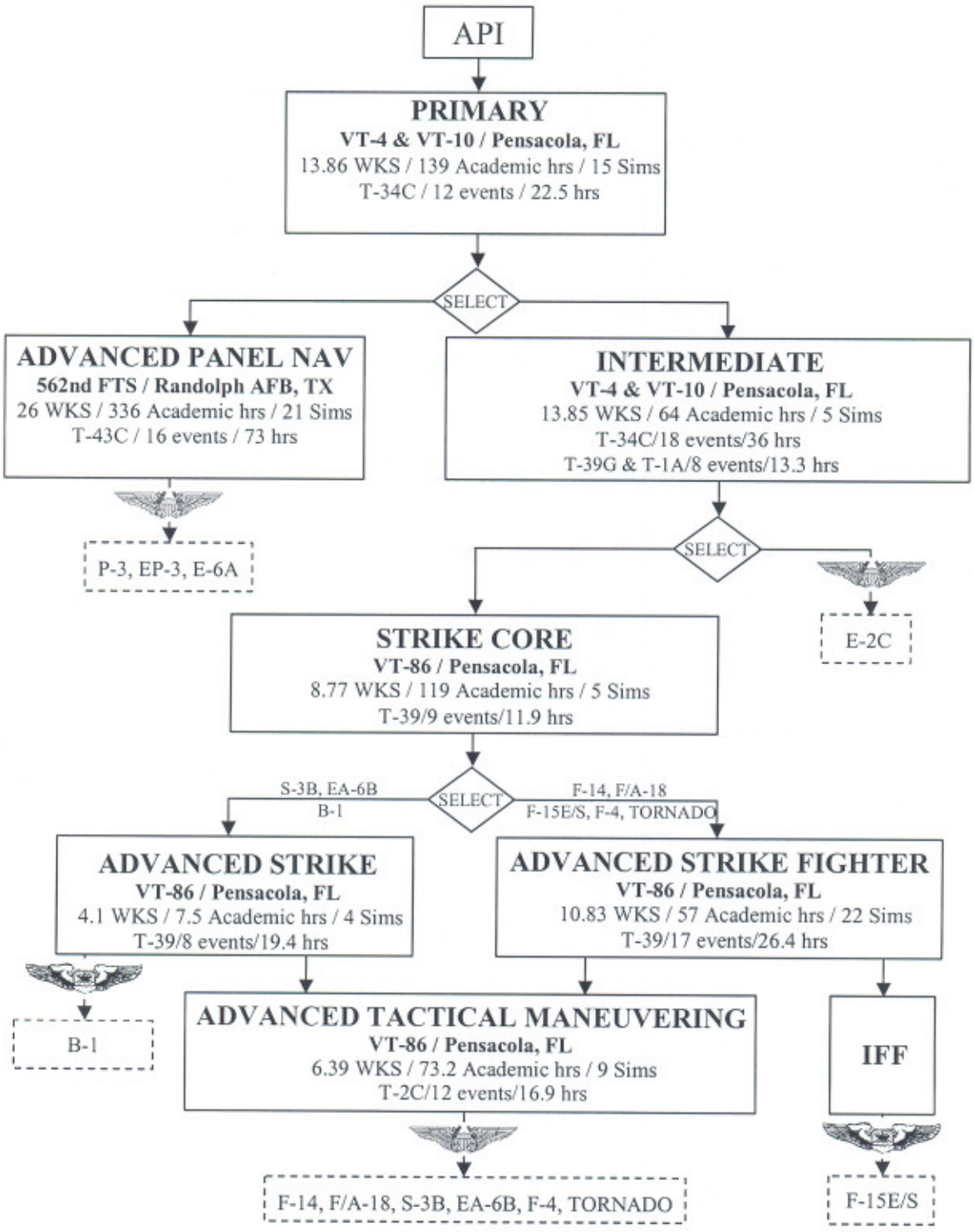

Figure 2.2.2-1 Major Roles and Responsibilities of Executing Commands

2.2.3 Manning and Personnel Authorization

The number of Naval Flight Officer (NFO)/ USAF Navigator (AF NAV)/Military Flight Officer (MFO) instructors required for each training group within the UMFO program is listed in Table 2.2.3-1.

Squadron	Instructors
VT-4	25
VT-10	25
VT-86	50

Table 2.2.3-1 Personnel

All UMFO instructors are required to complete the Flight Instructor Training Course (FITC) prior to beginning the applicable Instructor Under Training (IUT) courses. The hour breakdown for IUT courses is listed in Table 2.2.3-2.

Course	Flight Hours	Simulator Hours	Flight Support Hours	Academic hours
Primary/Intermediate NFO AF NAV T-34C IUT Curriculum	46	9	42.5	167.5
Intermediate NFO/AF NAV T-1A IUT Curriculum	24.5	0	29	155.5
Advanced NFO/AF NAV T-39 IUT Curriculum	38.3	8	161	N/A

Table 2.2.3-2 IUT Hours Breakdown

The Primary/Intermediate NFO/AF NAV T-34C IUT curriculum is designed to qualify personnel to train UMFOs in the areas of Aircraft Familiarization, Airways Navigation (ANAV), Formation Flight and Visual Navigation (VNAV). The length of this course is 71.41 training days, or 14.26 training weeks for USN instructors; 75.63 training days, or 15.11 training weeks for the USAF.

The Intermediate NFO/AF NAV T-1A IUT curriculum is designed to provide NFOs and NAVs instruction in the techniques and procedures required to administer the approved Chief of Naval Air Training (CNATRA) Intermediate phase UMFO training curriculum. The length of this course is 56.55 training days, or 11.31 training weeks.

The Advanced NFO/AF NAV T-39 IUT curriculum is designed to provide instructors the techniques and procedures required to administer the various approved CNATRA Advanced NFO/AF NAV training curricula. The length of this course is 55.98 training days, or 11.20 training weeks for Strike; 55.88 training days, or 11.18 training weeks for Strike/Fighter.

The Aviation Instructor Training Course (AITC) is designed to enhance the instructional and leadership capabilities of CNATRA academic instructors in the areas of group-paced instruction and audiovisual instruction. The length of this course is 12 days in length.

2.2.4 Existing Student Curriculum for Each Training Phase

Phase	Hours
Primary	187.6
Intermediate	120.3
Advanced Core	140.9
Advanced Strike + ATM	164.1
Advanced Strike/Fighter + ATM	242.7
Primary to Advanced Strike + ATM	612.9
Primary to Advanced Strike Fighter + ATM	691.5

Table 2.2.4-1 Hours per student for each phase

2.2.4.1 Performance Measurement Methods and Applications

Flight and simulator events are graded subjectively using the standards described in the ELOs and MCGs. Procedural knowledge and application must be in accordance with applicable directives or manuals. The standards serve as a guide and describe the parameters within which a student must perform to acceptably meet the training objectives. Going beyond the standards described is expected and acceptable provided that corrections are made quickly and the safety of the flight is not compromised. Final judgment regarding the satisfactory completion of any learning objective rests with the instructor.

The flight support instructional units use criterion reference testing for examinations. A student must receive a minimum of 80 percent in order to pass the criterion reference test. Performance measurements take place during simulator and flight missions. The flight and simulator grade averages are maintained separately using the following criteria for both:

- Above Average (AA): Performs maneuver/item with only very minor deviations and corrects immediately. Complete knowledge of procedures, demonstrates thorough knowledge of material.

- Average (A): Performs maneuver/item within performance standards delineated in the appropriate enabling objectives of the instruction. Makes the proper corrections to errors. Good knowledge of material and any deficiencies are very minor in non-critical areas.

- Below Average (BA): Deviations may occasionally exceed limits of the performance standards, slow to recognize errors and make corrections. Knowledge of material is not quite complete in non-critical areas.

- Unsatisfactory (U): Frequently exceed limits of performance standards without recognizing or correcting. Cannot perform the maneuver/item. Does not know procedures.

Below standard performance is handled on a case-by-case basis. A student who receives a grade of unsatisfactory on a flight, simulator event, examination or who's cumulative score falls into an unsatisfactory range will be given a 'down' and shall receive additional instruction as deemed appropriate. If presented more than one down, the student will likely be sent to a review board that will review the student's performance and make suggestions toward continuing training. At specific points in UMFO training, final flight support, flight, and simulator grades are combined algebraically and applied to the Navy Standard Score (NSS) System. If the student has better than marginal scores and has passed all learning objectives, including check events, they move on to the next stage of training. Students with marginal performance grades are handled in accordance with CNATRAINST 1500.4 Series. If the student does not pass all of the learning objectives and check events or has marginal grades, they may be excused from the program. There is no chance to repeat any phase of UMFO training.

The academic portion of the Primary phase of UMFO training consists of multiple examinations, each containing 25-100 questions. These examinations will determine the academic portion of the student's grade. Academic and flight grades are combined using NSS normative reference measurement procedures to derive a final Primary phase grade.

2.2.4.2 Feedback and Evaluation Procedures

UMFO students are evaluated and graded for every simulator or flight event they execute as per the MCG. When running a simulation, the instructor may freeze the simulation to give the student immediate feedback on what and how they are doing. The instructor has the ability to replay the simulations to examine student performance and provide feedback at appropriate times. After each aircraft flight or simulator event, the instructor will debrief the student reviewing the event and performance and assign grades for that performance.

2.2.4.3 Primary Phase

2.2.4.3.1 Major Goals, Content, Length, and Integration into Curriculum

The Primary NFO/AF NAV Training Curriculum is designed to teach basic aeronautical skills: situational awareness, mission planning, and communications. The terminal learning objectives currently covered in the primary phase are:

- Apply without error the policies and guidance of Squadron and Naval Aviation Safety Programs to identify, avoid, and report hazards.
- Maintain spatial orientation while controlling an aircraft through the use of visual and instrument scan in meteorological conditions with instructor assistance, during day and night shore-based operations.
- Navigate an aircraft via visual references and navigation instruments with the assistance of a flight instructor.

- Communicate with appropriate facilities via two-way radio using standard Navy and Federal Aviation Administration (FAA) terminology.
- Comply with specified flight policies, guidance and procedures provided by OPNAVINST 3710.7 Series, Naval Air Training and Operating Procedures Standardization (NATOPS), FAA regulations and command directives.
- Use Flight Information Publications (FLIPs), Notices to Airmen (NOTAMS) and other applicable flight information to plan and fly in the FAA Air Traffic Control (ATC) system.
- Use forecast and observed weather conditions, and knowledge of meteorology and meteorological theory and its effects on aircraft performance to plan and conduct safe and efficient flight operations.
- Determine aircraft condition and readiness for flight during preflight and post-flight.
- Operate and assess an aircraft and its systems in accordance with NATOPS and Flight Training Instructions (FTIs), reporting any anomaly to the instructor.
- Apply crew coordination concepts and procedures during aircraft operations.
- Demonstrate adequate preparation for flight and mission accomplishment.

The Primary Phase course length consists of 69.25 training days. This translates into 13.86 training weeks or 98 calendar days. The training time of the Primary Phase is divided into 125.1 academic hours, 15 simulator events, and 12 flight events. The simulator and flight breakdown for the Intermediate phase is shown in Table 2.2.4.3.1-1.

Type	Simulator Events	Flight Events
T-34C Familiarization		6
T-34C Airways Navigation (ANAV)		6
2B37 Cockpit Procedures Trainer	3	
2B37 Instrument Navigation Simulator	4	
2B47 Instrument Navigation Trainer	8	

Table 2.2.4.3.1-1 Primary Events Breakdown

The Primary phase of training integrates into the remainder of the UMFO training program in that completion of the Primary phase is a prerequisite to progress to the Intermediate Phase of training.

2.2.4.3.2 Academic, Synthetic, Operational Equipment, and Practical Job Training Instructional Units

The Primary phase of UMFO training is divided into three modules. Module 0 is the Administrative module, which enables students to check-in and become indoctrinated in UMFO training. Module 1 covers Primary flight support instruction, T-34C cockpit procedures simulator training, and familiarization flight training. Module 2 contains ANAV content. The academic, synthetic, and operational equipment instructional units used for the Primary training curriculum are listed below.

Academic

- Safety (SAF)
- Communication (COMM)
- Instrument Navigation (BINAV)
- Familiarization Preparation (FAMP)
- Air Crew Coordination (ACT)
- Airways Navigation Preparation (ANP)
- RIOT Training (RIOT)
- GBNT (2B47) Familiarization (TP 0)
- Bailout Training (BOT)
- T-34C Familiarization (FAM-0_
- Meteorology (MET)
- Flight Information Publications (FLIP)
- Flight Planning (FPLN)
- T-34C Aircraft Systems (NAMO)
- T-34C NATOPS (NATOPS)

Synthetic

- 2B37 Cockpit Procedure Trainer (CFT)
- 2B37 Instrument Navigation Simulator (IFT)
- 2B47 Instrument Navigation Trainer

Operational Equipment

- T-34C Familiarization (FAM)
- T-34C Airways Navigation (ANAV)

2.2.4.4 Intermediate Phase

2.2.4.4.1 Major Goals, Content, Length, and Integration into Curriculum

The Intermediate NFO/AF NAV Training Curriculum is designed to teach the skills and knowledge required to safely aviate, navigate, communicate, manage aircraft systems, and describe two-plane

formations in naval aircraft in both visual and instrument conditions. The current TLOs covered in the Intermediate phase are:

- Operate and assess an aircraft and its systems in accordance with NATOPS procedures and limitations, and Flight Training Instructions, reporting any anomaly to the instructor or pilot
- Navigate an aircraft via visual references and navigation instruments with instructor assistance, and through coordination with a pilot.
- Compute and evaluate fuel requirements and en route times, factoring in the effects of aircraft performance, meteorological conditions, fuel requirements and en route times.
- Communicate with appropriate ATC facilities and other aircraft.
- Use FLIPs, NATOMs, and other applicable flight information needed to plan flights and operate in the FAA ATC system.
- Determine the condition and readiness of an aircraft for flight during preflight and post-flight.
- Apply aircrew coordination concepts and procedures during aircraft operations.
- Perform, with instructor assistance, specified aircraft maneuvers.
- Direct, with instructor assistance specified two-plane formation maneuvers.
- Demonstrate adequate preparation for flight and mission accomplishment.

The Intermediate phase course length is 69.19 training days. This translates into 13.85 training weeks or 98 calendar days. The training time of the Intermediate phase is divided into 63.5 academic hours, 5 simulator events, and 26 flight events. The simulator and flight breakdown for the Intermediate phase is shown in Table 2.2.4.4.1-1.

Type	Number of Events
2B37 Simulators	5
T-34C Airways Navigation (ANAV)	11
T-34C Visual Navigation (VNAV)	4
T-34C ANAV/VNAV Check	1
T-34C Formation	3
T-1/T-39 ANAV	4
T-1/T-39 VNAV – Low Level (LL)	3
T-1/T-39 ANAV/VNAV Check	1

Table 2.2.4.4.1-1 Intermediate Event Breakdowns

The Intermediate phase is integrated into UMFO training in that successful completion of the Primary phase is a prerequisite. Successful completion of the Intermediate phase is also a prerequisite for progressing to the Advanced Core phase of training.

2.2.4.4.2 Academic, Synthetic, Operational Equipment, and Practical Job Training Instructional Units

The Intermediate phase of UMFO training is divided into three modules and consists of a total of six stages. Module 0 is the Administrative module and is given after all other events are complete. Module 1 covers the T-34C training and Module 2 covers the T-1A/T-39 training. The stages of the Intermediate phase are INAV, T-34C and T-1A/T-39 ANAV, T-34C and T-1A/T-39 VNAV, and T-34 Two-Plane Formation. The academic, synthetic, and operational equipment instructional units used for the Intermediate training curriculum are listed below.

Academic

- Instrument Navigation Preparation (INP)
- Air Crew Coordination (ACT)
- Visual Navigation (VN)
- Intermediate Airways NAV Preparation (IANP)
- Form Preparation (FMP)
- T-1A/T-39 NATOPS (NATOPS)
- T-1A/T-39 Flight Preparation (FP)
- Graduation, Winging, Check-out (ADM)

Synthetic

- 2B37 Operational Flight Trainer (OFT)

Operational Equipment

- T-34C Airways Navigation (ANAV)
- T-34C Visual Navigation (VNAV)
- T-34C Airways/Visual NAV Check (AVX)
- T-34C Formation (FORM)
- T-1A/T-39 Airways Navigation (ANAV)
- T-1A/T-39 Visual Navigation (Low-Level) (VNAV)
- T-1A/T-39 Airways Visual NAV Check (AVX)

2.2.4.4.3 Performance Measurement Methods and Applications

Academic and Flight grades are assigned using the same method used in the Primary phase of training. These scores are combined with Primary grades to form a cumulative NSS.

2.2.4.4.4 Feedback and Evaluation Procedures

Intermediate students are evaluated for marginal performance at the completion of the following events:

- AVX-1X
- AVX-2X

2.2.4.5 Advanced Core Phase

Major Goals, Content, Length, and Integration into Curriculum

The Advanced NFO/AF NAV Core training curriculum is designed to teach the skills and knowledge required to safely aviate, navigate, communicate, and manage aircraft systems. A major emphasis of training is placed on performance in the airborne environment of Visual and Ground Mapping RADAR Navigation and Radio Instrument Navigation. The terminal learning objectives covered in the Advanced Core phase are:

- Ground Mapping RADAR Navigation. Effectively navigate using preflight planning data and a ground mapping RADAR system.
- Radio Aids Navigation. Effectively navigate using preflight planning data and radio navigation aids.
- Visual Navigation. Effectively navigate using preflight planning data and visual reference to the ground.
- Communicate. Communicate in an aircraft using the radio, hand signals, and the Inter-cockpit Communications System (ICS) using standard Navy and FAA terminology.
- Aircraft Operation. Continually assess aircraft and aircraft systems operation and ensure operations are within limits and are maintained in accordance with NATOPS.

The Advanced Core phase course length is 43.88 training days, which translates into 8.77 training weeks or 68 calendar days. The training time of the Advanced Core phase is divided into 119 academic hours, 5 Part Task Trainer (PTT) events, and 9 flight events. The simulator and flight breakdown for the Advanced Core phase is shown in Table 2.2.4.5-1.

Type	Number of Events
RADAR Synthetic Trainer (RST)	5
Airways Navigation (ANAV)	2
RADAR Navigation (RNAV)	3
Visual Low Level (LL) Navigation	4

Table 2.2.4.5-1 Advanced Core Event Breakdown

Successful completion of the Intermediate phase of UMFO training is a requirement for assignment to the Advanced Core phase of training. The Advanced Core phase of training is a prerequisite for advancement into either the Advanced Strike or the Advanced Strike/Fight phases of UMFO training.

2.2.4.5.1 Academic, Synthetic, Operational Equipment, and Practical Job Training Instructional Units

The Advanced NFO/AF NAV Core training curriculum is structured to enable students to master the essential skills of ANAV, RADAR Theory and Operation, and Visual LL Navigation. This phase of training is taught in three modules consisting of flight support events (academic), simulator training events (synthetic), and flight events (operational equipment). The academic, synthetic, and operational equipment instructional units used for the Advanced Core training curriculum are listed below.

Academic

- Welcome Aboard/Check-in (ADM)
- NATOPS and Safety (NS)
- T-39N Flight Preparation (PREP)
- Low-Level and RADAR Planning (LL/RP)
- Turn-point Procedures (TPP)
- RADAR Systems (RS)
- Aircraft Carrier (CV Procedures (CVP)
- Strike Seminar (SS)
- USN/USMC/USAF Fleet Brief (FB)
- Instrument Ground School (IGS)
- Strike Phase Review/Exam (SPX)

Synthetic

- RADAR Synthetic Trainer (RST)

Operational Equipment

- T-39N Airways Navigation (ANAV)
- T-39N RADAR Navigation (RN)
- T-39N Low-Level (LL)

2.2.4.5.2 Feedback and Evaluation Procedures

Advanced Core students are evaluated for marginal performance at the completion of the following events:

- AN 2

- RST 4
- RN 3X
- LL 4X

2.2.4.6 Advanced Strike Phase

2.2.4.6.1 Major Goals, Content, Length, and Integration into Curriculum

The Advanced NFO\AF NAV Strike training curriculum is designed to teach the skills and knowledge required to safely aviate, navigate, communicate, and manage aircraft systems. Training is still based around performance in the basic skills of the airborne environment of visual navigation, ground mapping RADAR navigation, and radio instrument navigation. Major emphasis in this stage, however, now concentrates on developing overall student SA. This is defined in four areas: Strike Mission Planning, Real World Timing Problems and Solutions, Crew Coordination, and Mission Commander Responsibilities. The NFO/AF NAV ATM training is designed to teach the skills and knowledge required to adapt students to the tactical high "G" environment. The terminal learning objectives covered in the Advanced Strike phase are:

Advanced NFO/AF NAV Strike

- Strike Mission Planning. Effectively plan high-low-high profiles with strike scenarios using preflight planning data.
- Real World Timing. Effectively plan and execute briefed learning objectives of route entry and target time all referencing real world time.
- Crew Coordination. Effectively coordinate with crew to ensure aircraft is flying intended flight path to successfully complete mission all in concise and accurate verbiage.
- Mission Commander Responsibilities. To take charge of the mission in all aspects of planning and execution to include making all decisions necessary to complete the learning objectives of the specific mission.
- Aircraft Operation. Continually assess aircraft and aircraft systems operation and ensure operations are within limits and are maintained in accordance with NATOPS.
- Radio Aids Navigation. Effectively navigate using preflight planning data and radio navigation aids.
- Visual Navigation/Weapons. Effectively navigate using preflight planning data and visual reference to the ground.
- Communicate. Communicate in an aircraft using the radio, hand signals, and the ICS using standard Navy and FAA terminology.

- Aircraft Operation. Continually assess aircraft and aircraft systems operation and ensure operations are within limits and are maintained in accordance with NATOPS.

- Advanced Tactical Maneuvering. Identify advanced tactical maneuvers and function as a crewmember in a high "G" maneuvering flight environment.

The Advanced Strike phase course length is 59.04 training days, which translates into 11.81 training weeks or 90.93 calendar days. The training time of the Advanced Strike phase is divided into 6 academic hours, 4 PTT events, and 8 flight events. The simulator and flight breakdown for the Advanced Core phase is shown in Table 2.2.4.6.1-1.

Type	Number of Events
Strike Timing Simulator (STS)	2
Composite Synthetic Trainer (CST)	2
Strike	2
Composite	5
FRAG-X	1

Table 2.2.4.6.1-1 Advanced Strike Event Breakdown

The Advanced Strike phase is integrated into the UMFO program in that successful completion of this phase is a prerequisite for progressing to the Advanced Strike phase, completion of which is a requirement to enter FRS training.

2.2.4.6.2 Academic, Synthetic, Operational Equipment, and Practical Job Training Instructional Units

The Advanced NFO Strike training curriculum is structured to enable students to master three essential skills and also to gain overall Situational Awareness (SA) in four combined areas. RADAR Theory and Operation (RN), Visual Low-Level Navigation (LL), and Airways Navigation (ANAV) are the skills that students will study in the Advanced Strike training curriculum. Strike planning, real world timing, crew coordination, and mission commander responsibilities are the four areas of situational awareness that students will be exposed to in this phase of training. ATM is also taught in the Advanced Strike phase of UMFO training. The Advanced Strike training curriculum consists of four modules containing flight support events (academic), simulator training (synthetic), and flights (operational equipment). The academic, synthetic, and operational equipment instructional units used for the Advanced Strike training curriculum are listed below.

Academic

- RADAR Terrain Interpretation (RS)
- Composite Strike Planning (CSP)
- Delayed Jet Water Survival (DJET)
- T-2C NATOPS and Safety (NS)
- Advanced Tactical Maneuvering (ATML)
- T-2C Emergency Procedures (EPL)

- Basic Instrument Procedures (BIPL)
- Section Low-Level/Weapons Tactics (SLL/WT)
- Division Weapons Tactics (SLL/WT)
- Final Phase Review (FX)
- Critique and Graduation (CG)

Synthetic

- T-39N Strike Synthetic Trainer (SST)
- T-39N Composite Synthetic Trainer (CST)
- T-2C Basic Instruments (BIS)
- T-2C Radio Instruments (RIS)
- T-2C Emergency Procedures (EPS)
- T-2C Special Use Airspace Ops (SUA)

Operational Equipment

- T-39N Strike (STK)
- T-39N Composite Strike (COMP)
- T-2C Familiarization (D)
- T-2C Tactical Low-Level/Weapons (TL/W)
- T-2C Advanced Tactical Maneuvering (ATM)

2.2.4.6.3 Feedback and Evaluation Procedures

Advanced Strike students are evaluated for marginal performance at the completion of the following events:

- SST, STK 2
- CST 3
- COMP 6X
- BIS 3S
- RIS 3SX
- EP 2SX
- D 3X
- TL/W 3
- ATM 6X

2.2.4.7 Advanced Strike/Fighter Phase

2.2.4.7.1 Major Goals, Content, Length, and Integration into Curriculum

The Advanced NFO/AF NAV Strike/Fighter Training Curriculum is designed to teach the skills and knowledge required to safely navigate, communicate, and manage aircraft systems. A major training emphasis is placed on performance of air-to-air intercepts and development of tactical

weapons skills. The ATM training is designed to teach the skills and knowledge required to adapt students to the tactical high "G" environment. The terminal learning objectives (TLOs) covered in the Advanced Core phase are:

- Strike Mission Planning and Execution. Effectively plan high-low-high profiles with strike scenarios.
- Air-To-Air RADAR Operation. Operate an airborne intercept RADAR system in an air-to-air environment.
- Intercept. Direct air-to-air intercept of a simulated enemy (target/bogey) aircraft in an airborne environment.
- Communication. Communicate in an aircraft using the radio, hand signals, and the ICS using standard Navy and FAA terminology.
- Aircraft Operation. Continually assess aircraft and aircraft systems operation and ensure operations are within limits and are maintained in accordance with NATOPS.
- Radio Aids Navigation. Effectively navigate using preflight planning data and radio navigation aids.
- Visual Navigation/Weapons. Effectively navigate using preflight planning data and radio navigation aids.
- Advanced Tactical Maneuvering. Identify advanced tactical maneuvers and function as a crewmember in a high "G" maneuvering flight environment.

The Advanced Strike/Fighter phase course length is 92.94 training days. This translates into 18.59 training weeks or 143 calendar days. The training time of the Advanced Strike/Fighter phase is divided into 57 academic hours, 22 PTT events, and 17 flight events. The simulator and flight breakdown for the Advanced Core phase is shown in Table 2.2.4.7.1-1.

Type	Simulator Events	Flight Events
Fighter Strikes		4
Attack/Re-attack	6	3
Unknown Intercepts	3	2
Conversion Intercepts	7	3
Advanced Intercepts	6	4

Table 2.2.4.7.1-1 Advanced Strike/Fighter Event Breakdown

The Advanced Strike/Fighter phase is integrated into the UMFO program in that successful completion of the Advanced Core phase is a prerequisite to progress to the Advanced Strike/Fighter phase, completion of which is a requirement to advance on to the FRS.

2.2.4.7.2 Academic, Synthetic, Operational Equipment, and Practical Job Training Instructional Units

The Advanced Strike/Fighter training curriculum is structured to enable students to master five critical strike-fighter skills. These skills are: Fighter Strikes (FS), Attack-Reattack Intercepts, Conversion Intercepts, Unknown Intercepts, and Advanced Intercepts. The training includes seven modules consisting of flight support events (academic), simulator training (synthetic), and flights (operational equipment). The academic, synthetic, and operational equipment instructional units used for the Advanced Strike/Fighter training curriculum are listed below.

Academic

- Preflight Planning System (PFPS)
- Intercept Procedures (IP)
- Air Intercept RADAR (AIR)
- Fighter Environment (FE)
- End of Basic Intercepts Review/Exam (EBIX)
- Professional Training (PT)
- Delayed Water Survival (DJET)
- T-2C NATOPS and Safety (NS)
- Advanced Tactical Maneuvering (ATML)
- T-2C Emergency Procedures (EPL)
- Basic Instrument Procedures (BIPL)
- Section Low-Level/Weapons Tactics (SLL/WT)
- Division Weapons Procedures (DIVWEP)
- Final Phase Review (FX)
- Critique and Graduation (CG)

Synthetic

- Attack0-Reattack (SR)
- Unknown Intercepts (SU)
- Conversion Intercepts (SC)
- Advanced Intercepts (SA)
- Demonstration (DST)
- Basic Instruments (BIS)
- Radio Instruments (RIS)
- Emergency Procedures (EPS)
- Special Use Airspace Operations (SUA)

Operational Equipment

- Fighter Strikes (FS)
- Attack-Reattack Intercepts (FR)
- Conversion Intercepts (FC)

- Multiple Approach (AP)
- Unknown Intercepts (FU)
- Advanced Intercepts (FA)
- Familiarizations (D)
- Tactical Low-Level/Weapons
- Advanced Tactical Maneuvering (ATM)

2.2.4.7.3 Feedback and Evaluation Procedures

Advanced Strike/Fighter students are evaluated for marginal performance at the completion of the following events:

- FS 4X
- SR 6X
- FR 3X
- SU 2; FU 2X
- SC 5X
- FC 3X; AP-1
- SA 4X
- FA 4X
- BIS 3S
- RIS 3SX
- EP 2SX
- D 3X
- TL/W 3
- ATM 6X

2.2.5 Student Population

2.2.5.1 Entry Level Requirements and Noted Exceptions

A person entering the UMFO program must have a college degree and be a commissioned military officer, pass medical and physical fitness exams, possess minimum Aviation Qualification Test/Flight Aptitude Rating (AQT/FAR) scores, and complete Aviation Preflight Indoctrination (API). There are no exceptions to these entry-level requirements.

The following are the accession sources for the UMFO program:

Navy/Marine Corps – USNA, NROTC, AOCS, Warfare Transition
Air Force – USAFA, AFROTC
Foreign Military Forces – Various

2.2.5.2 Attrition Rate

The attrition rate for UMFO training varies per phase of training. The attrition rate for each phase is listed in Table 2.2.5.2-1.

Phase	Attrition
Primary	9%
Intermediate	8%
Advanced Core	3%
Advanced Strike	2%
Advanced Strike/Fighter	3%

Table 2.2.5.2-1 Attrition Rate

2.2.5.3 Current Class Size and Range of Anticipated Size

VT-4/VT-10 have an average of 553 students per year enter the Primary phase of training. Approximately 514 of those students complete the Primary phase. On average 110 of those students who complete the Primary phase will progress to other UMFO training outside TW-6, leaving approximately 404 advancing to the Intermediate phase of training at VT-4/VT-10.

VT-86 holds approximately 24 classes per year, with an average class size of 15-20 students or approximately 385 students per year. All 385 students at VT-86 come from the Intermediate phase of training at VT-4/VT-10.

Currently, there are no proposed UMFO student population increases expected for the next five years. However, there have been discussions of the USAF sending a greater number of students through the UMFO program, which would increase student population by approximately 240 students a year.

2.2.5.4 Prerequisite Deficiencies

There are no prerequisites deficiencies.

2.2.6 Existing Training Equipment and Materials

2.2.6.1 Training Simulators

The types, locations, and available numbers of UMFO training simulators for the T-39 curriculum are listed in Table 2.2.6.1-1.

Type	Location	No. Available
2B47	Griffith Hall	40
AIRT/GMRT	Simulator room	10
Microsim	Griffith Hall	4

Table 2.2.6.1-1 Training Simulators

2.2.6.1.1 2B47 Nav/Com Trainer

The 2B47 Aviation Navigation/Communication simulators located in Griffith Hall are utilized in the Primary phases of training. The simulator is used for practice in basic navigation and communication procedures and allows interactions between an instructor station and the student stations for communication and limited malfunction practice.

These simulators are designed with a canopy covering them. The canopy acts as a barrier between simulators. Although the cockpit and enclosure are not true representations of the aircraft, the space contributes to the feeling of being in an aircraft.

The 2B47 can be programmed by a main terminal in the simulator room to represent scenarios based on the T-34, T-39, T-1, or T-6 aircraft. Although not part of the T-39 curriculum, students are informed to use this simulator to practice and maintain their skills.

2.2.6.1.2 2B49 AIRT/GMRT

The Air Intercept RADAR Trainer (AIRT)/Ground Mapping RADAR Trainer (GMRT) APG-66 RADAR Training System, 2B49, primary use is to train flight personnel to successfully operate the Air Intercept RADAR and Ground Mapping RADAR flight systems in the T-39 aircraft. It is used to teach RADAR skills by providing aircrew part task training that emulates (not simulate) the Air Intercept RADAR and Ground Mapping RADAR flight station. The Student Station uses LCD monitors with touch screens to present the trainee with representations of the required controls and indicators of the T-39 co-pilot cockpit instruments and provides an aircraft likeness in terms of relative position and instrument visual scan. The RADAR and EHSI are the major RADAR controls and are the only instruments, which are the actual size of the aircraft instruments. Various other cockpit controls and instruments are functional, the trainer possesses an aircraft representative crew seat, but does not represent a full functioning cockpit nor provide any sort of enclosure. The RADAR control stick is an accurate representation of the aircraft control. There is a limited out the window visual providing students the ability to view major terrain features, intercept planes upon the discretion of the instructor, display of an airport layout, significant terrain, and instructor inputted weather. The trainer is capable of 32 emergency procedures, instrument as well as carrier approaches. There are a total of ten PTTs, which are capable of being networked together to provide a single training environment with multiple PTTs operating in the same training scenario.

2.2.6.1.3 Microsim

The Microsim Part Task Trainer (PTT) was initially developed in 1999 by adapting Microsoft's Flight Simulator software and housing the associated PC hardware in a cockpit-type setting for the T-34C. The Microsim provides a cockpit and outside view that is generated by a PC operating the Flight Simulator software and is operated with semi-replicative aircraft controls and a PC mouse/keyboard. The first Microsim PTTs were installed at CTW-4 and the concept has since been refined and expanded by Naval Education and Training Command (NETC). The latest version of

the Microsim PTT has been developed by the Microsim PTT Support Office and the new hardware and software supports all training wings.

Currently, Microsim is deployed for the voluntary use of the student population in CNATRA. Preliminary studies and anecdotal data suggest strongly that the Microsim PTT greatly enhances the students Basic and Radio instrument scan and awareness. At CTW-6, the NFO students in the preparation for T-34C VNAV and INAV flights use it extensively. Being able to "see", or preview, the route before flight and practicing procedures has provided a tremendous training benefit. Each Microsim costs less than $18K and currently provides the only visual training aid in the Navy for the T-34C aircraft. An official NETC/Naval Aerospace Medical Research Laboratory (NAMRL) study of the benefits of the Microsim PTT will be launched in the very near future; the results of which will be published via an official study report from NAMRL

2.2.6.2 Operational Equipment

There are six different aircraft currently in use by CTW-6 for UMFO training. The six types of aircraft and the number available of each are listed in table 1.3.6.2-1.

Aircraft	Number Available
T-34C (Primary)	53
T-6* (Primary)	48**
T-1A	6
T-39N	15
T-39G	8
T-2C	14

*Scheduled replacement for the T-34C
**All aircraft are not currently onboard

Table 2.2.6.2-1 Operational Equipment Available

2.2.6.3 Instructional Media/Materials

2.2.6.3.1 Computer-Based Training (CBT)

A representative sampling of the computer-based training (CBT) programs available to the UMFO students were analyzed. Logging into a courseware management system (1E14 management system, which is scheduled to be replaced by TIMS in FY '04) accesses the courseware available to students. Each student is provided a personal login that enables his or her progress to be tracked. Once logged into the system, students come to the "Lesson Selector", which lists all of the available courses. The courses are:

- 2-FAM
- Basic Instruments
- Basic RADAR (Air-Air, Air-Ground)
- COMM 1 Communications Trainer
- Electronic Classroom Lesson Review

- FLIP
- INAV Flight Procedures
- Meteorological Flight Planning
- PAFP
- ParTest Online
- PFSP Software
- RIOT Trainer
- T-2C Courseware
- T-34 GPS
- T-34C NATOPS/EPs
- T-39 Systems
- T-6A Courseware
- Training Video Review
- VNAV
- VT-86 Air-to-Air RADAR
- VT-86 Ground Mapping RADAR
- VT-86 Intercept Procedures

The student would choose a course, such as T-39 Systems, from the list. Once the course is selected all of the lessons available within that course are displayed. The student would then choose the appropriate lesson to be taken. The Lesson Selector, although listing all of the courses and lessons available, does not specify which courses belong with which phase of UMFO training. The T-39 systems, Meteorological Flight Planning, RADAR Principles and VT-86 Ground Mapping RADAR courses were analyzed.

T-39 Systems

When the T-39 System course is selected, nine lessons are incorporated within the course. The nine lessons are created using Macromedia Authorware and include:

- T-39 Systems – Engines
- T-39 Systems – Fuel
- T-39 Systems – Hydraulics
- T-39 Systems – Flight Control
- T-39 Systems – Anti-ice
- T-39 Systems – Environmental
- T-39 Systems – Avionics
- T-39 Emergency Procedures
- T-39G Differences

Each lesson within the course contains an Introduction, Information Topics, Summary and Progress Check topic. The Introduction topic lists the LOs for each topic within the lesson; this is the only reference to the learning objectives presented in the lesson. Once inside a specific topic, the LOs to be covered within that topic are not repeated; this makes it difficult to know which learning objective(s) are being covered within that specific topic. The Summary topic of each lesson

recapitulates the major topics within the lesson. The number of questions generated for the test is dependent on the number of major topics within that lesson and regardless of the number of questions generated for the test; it is required that the students answer 80% of the questions correctly in order to complete the lesson. After completing the progress check, a screen display informs the student of the score received on the test and lists each of the major topics in either green or red. The green topics portray the student's correct answers and the topics answered incorrectly are displayed in red, which students are asked to review again. Once the student has completed the introduction for a lesson, and prior to entering the summary and progress checks, the main content of the lesson is displayed.

The first lesson within the T-39 Systems, Engines, is intended to cover the T-39 Engine Nomenclature, Thrust, Fuel Control, Oil Systems, Ignition, Bleed Air System, Fire and Overheat Detection, Thrust Reversers, and Engine Operating Limits. The lesson LOs listed in the Introduction topic of the T-39 System – Engines are:

1.1 Recall the type of jet engine used in the T-39.
1.2 Recall the related takeoff thrust at sea level.
1.3 Identify the type compressor and turbine used in the JT12A-8A jet engine.
1.4 Recall the airflow through the JT12A-8A jet engine.
1.5 Recall the location of the igniters in the JT12A-8A jet engine.
1.6 Identify the primary instrument used for setting takeoff power.
1.7 Recall the suction feed capabilities restriction, if a wing tank mounted boost pump fails.
1.8 Identify the primary purposes of the oil system.
1.9 Recall the normal oil pressure.
1.10 Identify which stage of bleed air is used for the airframe.
1.11 Recall the type of fire detection system used in the T-39.
1.12 Identify the action completed when pulling the fire handle.
1.13 Recall the start sequence.
1.14 Recall the start abort criteria.
1.15 Recall the air-start envelope.
1.16 Recall the principle use of thrust reverses.
1.17 Identify normal engine operating limits.

Each of the above LOs is numbered the exact way that is appears in the CBT. A connection between the numbering system used within the CBT lesson and the numbering system used in the MCG for each phase of UMFO training is nonexistent. All of the lessons within the T-39 Systems course use the same numbering system, with Fuel starting with 2.1, Electrical starting with 3.1 and so on. This is a common numbering system with the CBT but as discussed later, is not entirely consistent.

While examining the major topics of the T-39 Systems course lessons, several similarities were found. Each of the lessons is a Level 1 CBT as per MIL-PRF-296123A; commonly know as a "page turner". There is no student interaction with the CBT with the exception of answering multiple choice style Comp Check questions at the end of some of the topics and within the Progress Check topics.

Virtually every page consists of text with a static photo or graphic pertaining to the text information. Many of these static photos/graphics are identical graphics with various highlighted sections to emphasize the specific component related to the text. The specific highlighted section of the photo is often too small to view any detail of the component. For example, the T-39 Systems – Engine lesson, Fuel Control topic displays a photo of the engine with the Fuel Control System components labeled. The actual labeled parts of the photo show no detail of the Fuel Control System components.

It was also found that in many topics the placement of "Comp Checks" is not logical. For example, at the end of T-39 Systems – Engine lesson, Thrust topic there is a Comp Check asking a question regarding Engine Nomenclature but no question pertaining to engine thrust. The Progress check topic within each lesson is a randomly generated test from a pool of questions regarding each of the major topics.

Meteorological Flight Planning

When the Meteorology Flight Planning course is selected the eight lessons contained within the course are displayed. These eight lessons are simply titled "Lesson One" through "Lesson Eight" with no other indication of the subject contained within the tittles. The described naming convention is not beneficial to students searching for a specific subject within the course. The eight lessons are all created using Macromedia Authorware.

Upon entering a Meteorology lesson, the first screen, the menu screen, presented no instructions or prompts on the screen. The only menu item displayed on the screen was the word "Introduction", which did not appear to be a selectable item. Only after rolling the mouse over the selection and having the arrow change to the hand, was it apparent that it was a menu item. In addition, the menu screen presented blue text on a green background. This color combination created reading difficulty and is a difficult color combination to distinguish. Returning to the menu screen at the completion of a topic prompts a new topic on the menu for the student to select. The menu system does not allow for the student to know the number of topics or the breakdown of the information contained within the lesson.

The lesson LOs listed in the Introduction topic of the Meteorological Flight Planning course were written in the same format as the T-39 Systems LOs. Lesson One LOs began at 1.1, Lesson Two at 2.1, and so on.

A review of the topics illustrated the similarity between the T-39 systems course and the Meteorological course set up. Just as before, each lesson is a "page-turner," with virtually no student interaction. All Comp Check and Progress Check questions are multiple-choice questions.

The layout of the pages within each topic is somewhat inconsistent. While some pages do not include a visual, most screens consist of a graphic depicting a METAR report, and text explaining a selection of the report. On most screens, the specific portion of the report that is being explained is highlighted but the highlighting method is often inconsistent. Some pages include a box surrounding the specific component, some pages present the portion of the report written in a

different color than the rest, and on yet other pages, there is no distinction between the specific portion and the other areas of the report.

The Progress Check topics of the Meteorological Flight Planning course are setup similar to the T-39 Systems course Progress Checks, however, the test questions within the Progress Checks for the course do not randomly generate. The students receive the same test each time it is taken and every student receives the same test.

RADAR Principles

Another CBT program reviewed was RADAR Principles, which was created using Mandarin. The purpose of the RADAR Principles CBT is to explain the transmission characteristics affecting pulsed RADAR systems. The information was confusing in verbiage and sometimes inaccurate the information. This was confirmed by having two SMEs review this lesson who had to read multiple times to understand the presentation and then verified it was incorrect. The acronyms used throughout the CBT were often undefined, adding to the confusion. The SMEs also commented that some of the information provided was not applicable to this level or type of training or RADAR usage in general. Having extra information in the CBT can often cause more confusion than it eliminates for the student.

VT-86 Ground Mapping RADAR

There are six lessons within the VT-86 Ground Mapping RADAR course: INU Initialization, Air to Ground Multi-function Display (MFD), Ground Mapping RADAR Operations, RADAR Controls Review, RADAR Imagery, and Pulsed RADAR Characteristics. All lessons were created using Macromedia Authorware. The setup of the course is the same as the others, opening with an Introduction topic, proceeding to the informational topics, and ending with Summary and Progress Check topics. The LOs for the VT-86 Ground Mapping RADAR course are formatted as a bulleted list, again lacking a connection between the course LO list and the MCG learning objective lists.

This course has more student interaction than many of the other CBT courses offered. It requires students to select keys on the graphic of a RADAR monitor to simulate tasks such as changing the RADAR mode.

Although the VT-86 Ground Mapping RADAR course uses navigation buttons uniform to the rest of the UMFO courses (Exit, Menu, Navigate, Back, Resume, Repeat, Help, and More), the navigation system does not operate in the same manner as it does in other courses. In this course, the Resume button does not function, while in other courses it is used as a "return" button. The help button, which in other courses explains the navigation buttons, in this course also does not function.

There are also undefined terms used within the VT-86 Ground Mapping RADAR course. For example, a progress check question in the INU Initialize lesson uses the acronym MFD, however, MFD is never defined within the INU Initialize lesson.

The Progress Checks in the VT-86 Ground Mapping RADAR course work the same way as described for the Meteorological Flight Planning course. The multiple-choice questions on the test are not randomized.

2.2.6.3.2 Flight Training Instructions (FTI)

Many of the books, including Flight Training Instruction books, which are used to accompany the UMFO training program, were analyzed. The books examined include:

- T-39 Flight Preparation (2002)
- Student Guide for Visual Navigation, Volume II (2000)
- Instrument Ground Training (Strike) (1997)
- Instrument Navigation Flight Training Instruction (1993)
- Strike Fighter Intercept (2002)
- Voice Communications Student Guide (1998)
- Intermediate Flight Preparation (T-1A) (2000)
- CV Procedures (1997)
- RADAR Planning and Navigation Strike (1997)
- RADAR Theory Ground Mapping/Intercept Fundamentals (1994)
- Trainee T-39 NATOPS Workbook Flight Training Instruction (2002)

All of the course books analyzed, with the exception of Strike Fighter Intercept and Voice Communication Student Guide, included a form of LOs listed at the face of the book. The LOs listed for the Student Guide for Visual Navigation Volume II, T-39 Flight Preparation, and Trainee T-39 NATOPS Workbook Flight Training Instruction replicates the LOs listed in the MCG. Learning objectives listed for the Instrument Navigation Flight Training Instruction, Intermediate Flight Preparation (T-1A), Instrument Ground Training (Strike), CV Procedures, RADAR Planning and Navigation Strike, and RADAR Theory Ground Mapping/Intercept Fundamentals do not necessarily correspond with the LOs listed in the current MCG.

The notation "Learning objectives are listed in CNATRAINST 1542.121.D" is located in the learning objectives section of the Strike Fighter Intercept book. CNATRAINSTR 1542.121.D is the MCG for the Advanced Strike/Fighter phase of training and although the LOs are referenced in the MCG, it is not specified which LOs the book will be covering.

The T-1A Intermediate Flight Preparation guide lists the TLOs for the Intermediate phase of training. This list is out-of-date and is not a complete catalog of the terminal objectives located in the Intermediate MCG. At the beginning of each unit, ELOs are listed and numbered in relation to the terminal objectives located in the front of the book. Although the numbering system used corresponds to the format used in the Intermediate MCG, the LOs are out-dated and are not identical to those in the MCG.

At times, updating the LOs consists of altering the standards or conditions students must adhere to, not necessarily changing the task they are asked to perform. For example, enabling objective 1-6 in the T-1A Flight Preparation book states, "Perform T-1A checklists in accordance with the Dash 1, given a mission in a T-1A", the corresponding LO in the Intermediate MCG states, "Perform T-1A

checklists in accordance with NATOPS, given a mission in a T-1A". While these two LOs are very similar, they give the students conflicting information as to what standards they must adhere to.

The beginning of the T-39 Flight Preparation guide lists terminal objectives 1-7 and 10 for the Intermediate and A – E for the Advanced Core phases of UMFO training. The beginning of each unit in the FTI lists the enabling objectives from the Intermediate and the Advanced Core phases to be covered in the unit. Both the terminal and enabling objectives are numbered as they are in the MCG for their respective phases. Because the terminal objectives list are not a complete list of all terminal objectives for the phase, it is unclear as to why Intermediate terminal objectives 7 and 10 and Advanced Core LOs A, C, and D are listed. No enabling objectives associated with these terminals are covered in the T-39 Flight Preparation book.

The Trainee T-39 NATOPS Workbook FTI lists the enabling objective to be covered in the beginning of each unit. Although the LO listed in the FTI is an exact match of the LO listed in the MCG, there is a small difference in the numbering system. The FTI uses the letter A in place of the number 1 used in the MCG.

The Instrument Ground Training and CV Procedures books list the enabling objective to be covered in the beginning of each unit. These LOs have no numbering system and do not match any of the LOs listed in the MCG for any phase. These topics are essentially unnecessary and unapproved topics as far as the MCG is concerned.

The RADAR Planning and Navigation, and RADAR Theory Ground Mapping/Intercept Fundamentals list both terminal and enabling objectives to be covered at the beginning of each book. The LOs listed have a numbering system, but the numbering does not match the numbering in the MCG. The LOs listed also do not match the LOs in the MCG.

Many of the FTIs and other course books, such as Trainee T-39 NATOPS Workbook Flight Training Instruction and Instrument Navigation Flight Training Instruction, have pictures and diagrams scattered throughout. Most of these pictures and diagrams are hard to read and difficult to distinguish any detail.

2.2.6.3.3 Lecture Materials

The materials used to assist UMFO instructors during their lectures consist of PowerPoint and Authorware presentations, which were developed several years ago in accordance to the MCGs. Each instructor amends and updated the content as necessary and any changes to the lecture material are expected to undergo approval from the Subject Matter Expert (SME), the Stage Manager, and the Standardization Officer before the modification can be implemented. Currently, the PowerPoint lectures are being converted into Authorware as a CNATRA-wide effort to amalgamate the courseware into TIMS compatibility requirements. The conversion excludes enhancements or further development of the lectures, resulting in presentations with equal appearance and functionality as the original PowerPoint.

Several of the lecture materials were analyzed, including:

- T-39 Flight Preparation
- Turn Point Procedures
- RADAR Predictions
- Instrument Ground School
- Introduction to Low Level/RADAR Navigation
- Low Level/RADAR Planning
- RADAR Operations
- T-39 Aircrew Coordination Training
- ANAV Preparation
- IP-17 Lead Collision Intercepts
- Intermediate VNAV

Inconsistencies are presented within the lecture materials, as LOs are included within some and omitted from others. In comparing the lecture materials to the MCGs it was found that lectures such as the T-39 Flight Preparation and Intermediate VNAV presentations list the LOs to be covered in correspondence with the LOs presented in the MCG. Other lectures, such as RADAR Predications, Low-Level/RADAR Planning, RADAR operations, T-39 Aircrew Coordination Training, AVAV Preparation, and IP-17 Lead Collision Intercepts, list LOs for the lecture but the LOs do not necessarily correspond to those published in the MCG. Learning objectives within other lectures, including Turn Point Procedures Instrument Ground School, and Introduction to Low-Level/RADAR Navigation, are not listed.

All of the lectures vary on how well they actually cover the content listed in the lecture LOs. Some of the PowerPoint presentations, for example, the T-39 Preparation lecture, are very thorough in explaining the content and can be understood virtually without the assistance of an instructor. However, other lectures, such as the Introduction to Low Level/RADAR Navigation, require the assistance of an instructor for clarification.

The lectures are stored on a network, allowing each instructor to access the lectures from any instructor's station. The network often contains multiple versions of lectures, creating difficulty in determining which version is accurate. Although the versions are similar, the information contained within is not always identical. For example, there are two versions of the Turn Point Procedures lecture on the network and both lectures discuss BDHI, however, both lectures give different, not necessarily conflicting, information on the topic.

2.2.7 Existing Facilities

The Primary, Intermediate, Strike Core, Advanced Strike, and Advanced Strike/Fighter phases of the UMFO Program currently share space in several buildings located in the general vicinity of the VT-86 hangar. While these facilities provide adequate space for the ground training requirements associated with the T-34C and the T-39 aircraft, they will not provide sufficient space to meet the UMFO program requirements during the T-34/T-6 and T-39/T-48 transitions nor when the T-6 and the T-48 have completely replaced the existing aircraft.

The Ground Based Training Systems for both the T-6 and the T-48 will have facility requirements that do not currently exist for the T-34 and T-39 training systems. The training technology that is

available today versus that available at the time the T-34 and T-39 training systems were fielded will generate space requirements for Aircrew Training Devices, associated briefing/de-briefing rooms, electronic classrooms, and student learning centers.

The facilities examined below are currently used or have the ability to house Intermediate and Advanced UMFO training. All are located on NAS Pensacola in the vicinity of the squadron spaces.

2.2.7.1 Griffith Hall

Griffith Hall houses instructor directed classes for the Primary and Intermediate phases of training and the classrooms for VT-4 and VT-10, as well as any overflow of VT-86 classes. However, discussions with the local NAVAIR Orlando In Service Engineering Office (ISEO) indicated a plan to completely occupy Griffith Hall with Joint Primary Aircraft Training System (JPATS) classrooms and equipment, leaving no room to accommodate VT-86 overflow. Griffith Hall also provides the location for the student computer lab; students can go to this computer lab to access the CBT/CAI courses and exams available to them.

The condition of the building is structurally sound and the exterior is in good condition, however, the location of Griffith Hall in relation to the squadron hangars is distant and not likely to be accessed by foot. Many of the rooms within the interior of Griffith Hall are austere and dated and are not representative of an optimal instructional environment. Griffith Hall does not appear to feature a design structure capable of maintaining modern electronic classrooms without major redesign, although TW6 has adapted this facility to the best of their ability.

To reach optimal instructional condition, the interior of Griffith Hall should be repainted to present a brighter and more appealing atmosphere. The positive atmosphere created would assist in promoting student alertness. The classrooms should also be redesigned to reach optimal instructional conditions. At the present time, student desks in many of the rooms do not face all of the permanent instructional elements. In order to view lecture presentations, students must turn 90° away from the instructor to face the projector screen on the side of the room. The classrooms should be rearranged to ensure that the student desks face all permanent instructional elements in the room.

2.2.7.2 Building 3245 Academic Facility

Building 3245houses the classrooms for VT-86, charting facility, and academic offices. Three classrooms located in the building are used exclusively by VT-86: an Advanced Core classroom, and Advanced Strike classroom, and an Advanced Strike/Fighter classroom. This building is within walking distance of the Squadron Hangars.

Currently (as of August 2003), the exterior of the building is undergoing repair. The interior of the building is in good condition. The classrooms have appropriate lighting and setup for an instructional environment, and are wired for CAT 5 network connections.

This building as it exists has ample parking and could be expanded into a portion of the existing parking lot to house new training devices, briefing rooms, and electronic classrooms.

2.2.7.3 Simulator Building

Building 3268 houses the 10 AIRT/GMRT simulators used by the UMFO training program. The building is undersized and has been reutilized from its intended function to house the original AIRT/GMRT simulators. Although the building is structurally sound and the exterior is in good condition, it was not designed to house the simulators. The AIRT/GMRT room is small and the simulators are arranged in assorted positions in order to fit them in the space, causing a cramped feeling to the room. Noise in the room can be intolerable (for a learning environment), but due to the ill placement of the simulators, movements and actions of students in the space and in the simulators create distractions. The open design of the AIRT/GMRT trainers is not suitable for close and/or facing placement because it can distract the trainees.

This building is located directly behind the VT-10/VT-4 hangars and if properly designed and analyzed, it could be beneficial for training. Currently, there are no planned modifications for this building.

2.2.8 Future Development – CTW-6 Vision

The future outlook of the Navy includes more capable, technologically advanced, and highly complex weapons systems. It also includes multi-mission capable platforms – new technologically superior multi-mission capable tactical airframes where the limiting factor is aviator task saturation. As complexity of the aircraft and the missions increase in the future, NFOs will require superior basic to advanced skills.

The fundamental competencies of airmanship, navigation, communication, situational awareness, multi-task management, airborne battle management/decision making, and cockpit leadership must be mastered before more complex skills can be added. In order to accomplish this, CTW-6 plans to improve/enhance current concepts of NFO training, implement curriculum improvements/additions, and replace outdated airframes with modern integrated training systems. The revised training concept for the future of CTW-6 is depicted in figure 2.2.8-1.

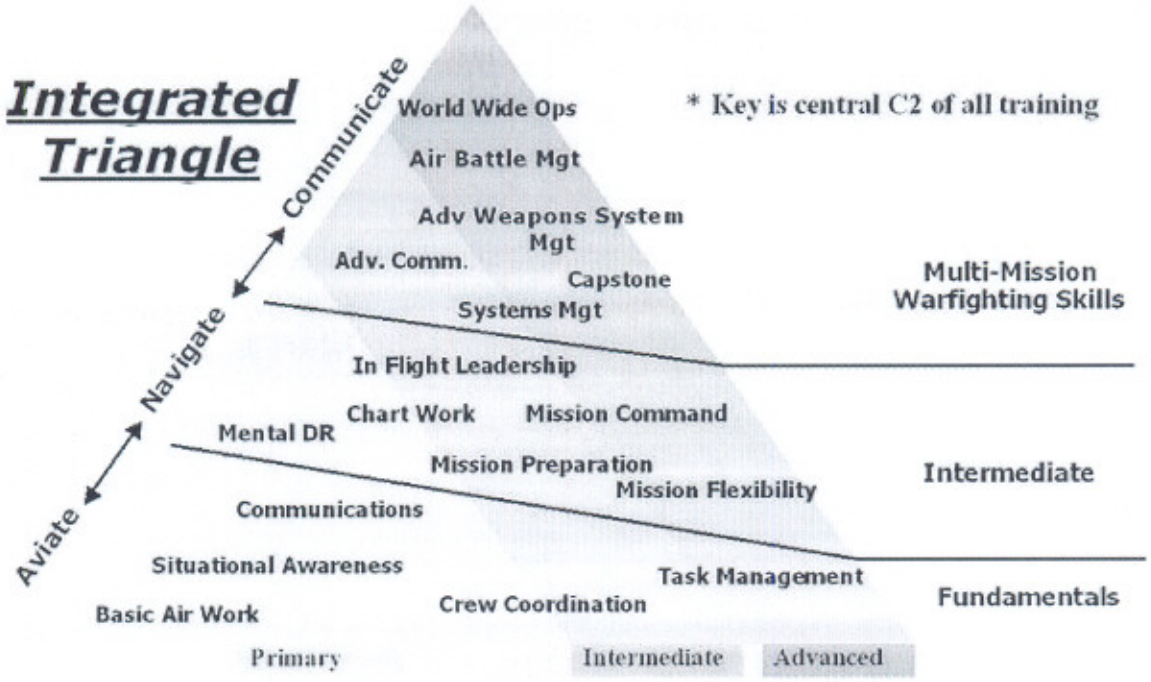

Figure 2.2.8-1 CTW-6 Revised Training Concept

In addition to the new training concept, the future development of CTW-6 also includes phasing out the T-34 and replacing it with JPATS and phasing out the T-39 with a replacement training system.

3 Situation Analysis

3.1 Surveys

The main elicitation of information concerning the validity of LOs was accomplished through surveys. A total of eight different surveys (see Appendix A) were produced to retrieve the data (see Appendix B) needed for the Training Situation Analysis. The surveys were administered to students of each phase of UMFO training utilizing the T-39, the Intermediate and Advanced UMFO Instructors, as well as the corresponding FRS instructors and FRS students.

UMFO student surveys were designed using three sections. The first section listed each ELO found in the corresponding MCG and applied a 5-point Likert Scale rating the importance and efficiency of each ELO (see Table 3.1-1). The students were also able to check a block indicating Not Applicable (NA); marks in this area give an indication of LOs that were possibly not being taught properly or not taught at all. The Likert Scale was also applied to Section Two, which served to evaluate the importance and efficiency of training equipment and training devices and also included a text box allowing further explanation of the response. The training equipment presented in this section included, the T-39 Aircraft, CAI (all instruction delivered via a computer) equipment and content, T-39 Cockpit Mock-up, 2B49 AIRT/GMRT, 2B47 Nav/Comm trainer, Microsim, Classroom Environment, Classroom Automation (to include Mediated Interactive Lectures, online

testing, and projection capability), and FTIs/other course books. Questions discussing the overall curriculum and training phase were presented utilizing a short answer method in Section Three of the student surveys.

	Learning Objective Importance Rating		Learning Objective Efficiency Rating
5	Extremely Important	5	Extremely Efficient
4	Very Important	4	Very Efficient
3	Important	3	Efficient
2	Somewhat Important	2	Somewhat Efficient
1	Unimportant Important	1	Inefficiency Efficient

Table 3.1-1 Likert Scale Used for UMFO Student Survey Ratings

Instructor surveys were designed in a similar manner; however, the instructors were asked to rate student preparation, student application, and the ease of instruction for each ELO (see Table 3.1-2). In order to reduce the length of the instructor surveys, learning objectives were condensed into smaller groupings, although traceablity was maintained to the ELOs used in the student survey so that relationships could be investigated. Sections Two and Three retained the same format as the student survey and questions were simply modified to relate to instructors.

	UMFO Student Preparation Rating		UMFO Student Application Rating		Ease of Instruction Rating
5	Extremely Prepared	5	Extremely Efficient	5	Very Simple
4	Very Prepared	4	Very Efficient	4	Simple
3	Prepared	3	Efficient	3	Reasonable
2	Somewhat Prepared	2	Somewhat Efficient	2	Very Difficult
1	Unprepared	1	Inefficiency Efficient	1	Extremely Difficult

Table 3.1-2 Likert Scale Used for UMFO Instructor Survey Ratings

FRS surveys were designed using only two sections. Again, Section One of the survey provided a grouping of learning objectives traceable to the original ELOs in the student surveys and provided the Likert scale to assess incoming student competency and rate the relevancy of learning objectives (see Table 3.1-3). A series of short answer questions similar to the other surveys but relating to the preparedness of UMFO graduates entering into FRS training were provided in Section Two.

	Learning Objective Assessment Rating		Training Relevancy Assessment Rating
5	Extremely Competent	5	Extremely Relevant
4	Very Competent	4	Very Relevant
3	Competent	3	Relevant
2	Somewhat Competent	2	Somewhat Relevant
1	Incompetent	1	Irrelevant

Table 3.1-3 Likert Scale Used for FRS Survey Ratings

In order to elicit areas where FRS students may feel unprepared by UMFO training, surveys developed for FRS students displayed selection boxes for preparedness or lack of preparedness

according to learning objective groupings. The remainder of the survey applied the short answer method, encouraging comment on the UMFO program preparation for FRS training.

Student and Instructor surveys were administered by a member of the analysis team and confidentiality was assured. A website was developed to host the FRS and FRS student surveys.

Cover pages of the student and instructor surveys requested simple demographics (name, branch, degree field, etc.) and further demographic information regarding student academic standings were obtained through a separate TW-6 source. Academic scores, Navy Standard Scores, downs, and other comparisons were investigated utilizing this method and without prior student knowledge to reduce non-response errors and/or response biases. The instructors were asked to report the weekly or monthly time spent in different instructor contact duties.

Some of the main advantages of applying the discussed survey designs to collect primary raw data, presented by Dr. Hossein Arsham, Professor of Decision Science and Statistics at the University of Baltimore, are the ability to accommodate large sample sizes, generalizability of results, ability to distinguish small differences between diverse sampled groups, ease of administering and recording questions and answers, increased capabilities of using statistical analysis, and the abilities of tapping into latent factors and relationships. In contrast, Dr. Arsham notes the main disadvantages of the surveys research designs tend to focus on the potential inaccuracies in construct and scale measurements of factors and limitations to the depth of the data structures. However, the major issue affecting this survey process was time. More data collected would have served beneficial to this analysis, especially within the FRS Instructor and FRS student analysis. Improvements to enhance the clarity of instruction and definition of rating numbers for the different surveys may have also aided in eliminating issues and/or misunderstandings.

The next sections will describe trends and indications that were seen in the results of the surveys. The significance of data from the surveys relies on other corroborating sources of data, be it observation, interview, relationships between the surveys such as student and instructor, or strong statistical significance. The comments received were considered very candid and is related to the assured and displayed anonymity of the surveys. The analysis team is confident that the opinions expressed represent a majority opinion and consider the surveys a reliable source.

3.1.1 Intermediate Student Survey Results

Survey data was compiled from 23 students in the Intermediate phase of UMFO training. The four classes surveyed held a diverse group of students from the Navy, Marine Corps, Air Force, and Foreign Military Services.

48% of students, including each international student surveyed, rated at least 25% of the learning objectives as efficient or below. Only a small percentage (7%) of students rated 25% of the learning objectives important or below.

Many of the Intermediate phase learning objectives yielded high importance ratings but lacked in efficiency. For example, 25% of the Instrument Flight Planning and Navigation learning objectives and 30% of the NATOPS learning objectives were noted as being inefficient yet, highly important

to training. General Flight Procedures rated the lowest in both importance and efficiency with the lowest results applying to administrative duties of MAFs (importance and efficiency mode of 0) and the Naval Aircraft Flight Record (importance and efficiency mode of 0). Visual Low-level Flight Planning/Navigation and Communication generated high importance and efficiency ratings; however, the trend of the efficiency scores remained lower than the importance ratings. In fact, all of the learning objectives listed for Communication and 80% of the Low-level Flight Planning and Navigation learning objectives rated higher in importance than efficiency. Although statistically insignificant in the data collected, 1.57% of the learning objectives and/or tasks were noted as "not applicable" in the Intermediate phase of training. Three of the learning objectives within the General Flight Procedures section, observe completion of MAFs, complete a Naval Aircraft Flight Record, and determine aircraft suitability for flight; all held the highest number of N/A notations.

Examination of "retaliation" in marking low surveys due to low grades awarded was examined; the findings displayed no bias in survey scores according to training grades. 45% of the Intermediate students surveyed possess at least one academic, administrative, flight, or simulator down within the T-39 curriculum. Of the students assigning the lowest importance ratings to learning objectives, 40% were assigned at least one down and half of those students went on to improve their academic scores in the following phase. Students scoring learning objectives low in efficiency present 43% holding at least one down. Only one student did not academically improve in the subsequent training phase. Of the students presenting the highest learning objective efficiency scores, 64% suffered declining grades in the next training phase. The students rating the highest efficiency scores, as well as equally high importance rates, held the lowest academic score in this phase of training.

The significance of technical versus non-technical degree was considered to determine if there was an aptitude for completing this curriculum associated with college major (a technical degree was a requirement for entrance into Naval flight school in the past). There appears to be more understanding from technical degreed students than non-technical students. Of the students assigning the lowest importance to learning objectives, only 20% held a technical college degree whereas, 56% of the students assigning high importance hold technical degrees; 48% of the students overall hold technical degrees. The majority of students assigning low efficiency ratings were non-technical graduates and 80% of the students supplying high efficiency scores to learning objectives were technical college graduates.

There were no noticeable trends regarding student scores and military branch.

The analysis of training equipment generated similar results as seen in the LO ratings, 78% of students rated the importance of the training equipment items higher than the efficiency of the equipment. Of the 78% of students providing low overall efficiency scores, 39% are Navy, 23% Air Force, and 16% Marine Corps. The T-39 Cockpit Mock-up, 2B47 Nav/Comm trainer, and FTIs/other course books were found by students to be extremely important; however, the efficiency ratings for these pieces were regarded as moderate to low. The Microsim rated the lowest in both efficiency and importance as no students actually utilized this equipment, and the classroom environment and T-39 Aircraft were rated the highest among the equipment devices in importance and efficiency. The Computer-Aided Instruction equipment and Content were both rated in the moderate range for importance and efficiency as students presented commentary on the need for

consistency and modernization. The majority of the students did not use the T-39 Cockpit Mock-up or were unaware of its existence. Other students found it not useful or ineffective due to its inaccuracy, old age, and/or damaged/nonfunctional components. Students found the 2B47 Nav/Comm training simulator, as being "somewhat effective", to be "great for navigation" and for "practicing Point to Point and Turn-Point procedures" and although important, is not currently "beneficial to the other areas of training." As the FTIs and other course books rated extremely important, many students felt "confused and frustrated due to age and inaccuracy" of the current books, as well as the "lack of detail in some and extraneous information in others".

Other observations of Intermediate student commentary include:

- Primary instruction is too long, extensive T-34 training created bad habits
- Need more VNAV preparation and simulation in Intermediate training
- NFO responsibilities, leadership and mission commander instruction needed
- Need more simulators and mock-ups to aid training
- NATOPS workbook questions were not covered in CBTs and lectures
- Flight Logs and DD-175s are viewed as unimportant and inefficient

3.1.2 Intermediate Instructor Survey Results

Fifteen Intermediate phase instructors, comprising of Navy (60%), Air Force (33%), and Marine Corps (7%) personnel, were surveyed and requested to rate learning objectives in three categories: Student Preparation, Student Application, and the Ease of Instruction. The instructors, averaging thirteen years of military service, present a standard of 6.7 hours of weekly flight instruction, .6 hours of weekly simulator instruction, and 2.6 hours of monthly classroom instruction, for an average of 7.95 weekly instruction hours.

Overall, instructors rated the majority of the Intermediate phase learning objective areas as satisfactory in student preparation and 22% below satisfactory. Only one learning objective, assessing pre-flight condition and readiness of aircraft, ranked above a satisfactory rating, yet was regarded amid the least important and effective learning objective by students. Instructors regarded students the least prepared in assessing post-flight aircraft conditions and completing MAFs and Naval Aircraft Flight Record, which students also rated among the lowest in importance and efficiency. With eight T-39 flights in the Intermediate phase, Low-Level Flight Planning and Navigation, Crew Coordination, and Communication learning objectives held high efficiency and importance scores in the student data but suffered low preparation ratings from instructors. NATOPS and General Flight Procedure learning objectives, noted inefficient by students, also displayed low preparation scores from instructors.

The majority of learning objective areas rated satisfactory for student application, 24% below satisfactory, and only one learning objective, possessing required flight materials during mission briefing, ranked above satisfactory. General Flight Procedures, NATOPS, and Aircrew Coordination Concepts presented the lowest student application ratings, with specific objectives in servicing procedures, maintaining VNAV course, and Dead Reckoning suffering the lowest student application scores. Again, Visual Low-level Flight Planning and Navigation learning objectives rated low in student application by the instructors but were regarded by students as highly

important and efficient. Instrument Flight Planning and Navigation, rated high in importance and efficiency by students, maintained high application scores by instructors.

The learning objective areas for Intermediate training were found to be moderately easy to instruct. Instructors found possessing required flight materials during mission briefing, as well as preparing flight logs and DD-175s, which students viewed as unimportant and inefficient in instruction, among the easiest to instruct. Although still rated "easy to instruct", NATOPS, General Flight Procedures, and Crew Coordination presented the most difficulty in instruction. Trends, within the instructor data, display the specific areas of student weakness in preparation and application to be in Point-Point, Turn-Point and Checkpoint procedures, Low-level Wind Analysis, Crew Coordination, Decision-Making, and Situation Analysis. These areas, as well as Communications and Checklists, portray the same trend in instructional difficulty.

The Intermediate Instructors rated all equipment devices with the exception of the classroom environment and Microsim as holding high importance to the UMFO training program. The classroom environment resulted in moderate importance and efficiency ratings and the Microsim displayed extremely low importance as well as efficiency levels. NATOPS and the T-39 Aircraft presented above average efficiency ratings and the CAI and FTIs resulted in moderate efficiency scores. Low efficiency ratings were provided to the 2B47 Nav/Com simulator and the T-39 Cockpit mock-up.

Though the T-39 Aircraft ranked high in efficiency, instructor commentary displayed that the "T-39 N/G differences are inefficient in training", "there should only be one [model] aircraft", and the "airspeed on low-levels is too restricted, need an aircraft with higher "G" tolerance." Students found the 2B47 beneficial in navigation, Point to Point, and Turn-Point procedures; however, many instructors regarded the 2B47 as "lacking in significant help", "worthless", and "very outdated and difficult to use." Instructor results seem to differ in respect to the T-39 Cockpit Mock-up, as some regard it as "substandard and nonfunctioning" due to damage and age and others present the Mock-up to be "helpful in instruction." Also displaying differing views are the FTIs and NATOPS, which like students, some instructors believe them to be critical to training but "often confusing and inaccurate" and other instructors describe the FTIs and NATOPS as "well written and updated."

Other commentary collected from instructors includes:

- 20% describe the need for enhanced simulation
- 27% believe the IUT syllabus did not adequately prepare them to instruct this phase of training
- Majority of instructors feel instruction is consistent within the squadron but not within UMFO training
- Some instructors felt that instructional standardization presented a problem
- Point to Points and Low-level situational awareness are consistently students weak areas
- More focus is needed in crew coordination, situation awareness and decision making

3.1.3 Advanced Core Student Survey Results

Surveys of graduating Advanced Core classes were conducted on 23 students advancing to the next phase of training. The classes held a diverse group of students for the Navy, Marine Corps, Air Force and FMS. 44% of the students held at least one academic, administrative, flight and/or simulator down within the T-39 curriculum and four or more downs were associated with 17% of the students. Of the Advanced Core students surveyed, 65% suffered a decline in their academic grade from the previous training phase; however, each student continues to improve his/her score in subsequent phases.

Only one student rated the overall importance of Advanced Core learning objectives below satisfactory, however, 26% of students rated overall learning objective efficiency as satisfactory or below. Overall, the Air Force students presented the highest ratings for learning objective importance and the Navy students specified the lowest scores. Although rather insignificant in the data collected, 1.55% of the learning objectives and/or tasks were noted as "not applicable" in the Advanced Core phase of training. Two learning objectives associated with the flying of NDB approaches held the majority of the N/A notations resulting in an overall mode of 0 in learning objective importance.

RADAR operations, RADAR Navigation, Communications, NATOPS and 75% of the Instrument Flight Planning learning objectives were rated high in importance. RADAR Theory learning objectives suffered the lowest importance ratings as students scored 45% as moderately important and 15% as unimportant. Students also regarded each learning objective within RADAR Navigation, 80% of Visual Low Level Navigation, and 66% of Communication learning objectives high in efficiency. RADAR Operation and 71% of the General Flight Procedures learning objectives were rated as efficient as 38% of NATOPS and 30% of RADAR Theory learning objectives were rated as inefficient. Specific learning objectives rated among the highest in importance were the adjustment of RADAR Controls and "immediate action" emergency learning objectives. Students rated the Ground-Mapping RADAR Navigation, flying victor routes and the operation of the T-39 aircraft within NATOPS limitations among the highest in learning objective efficiency and returning the aircraft to intended course and fuel consumption learning objectives rated high in both importance and efficiency. Learning objectives concerning the relationship between frequency and wavelength, pulse length computation, and the relationship between PRF and pulse repetition time rated the lowest in both importance and efficiency. Noticeable trends have indicated low efficiency scores throughout the Advanced Core learning objectives in the following areas:

- Preparing Jet Logs
- Preparing DD-175
- Interpreting DD-175-1
- RADAR predictions procedures
- RADAR principles
- Aircraft rate of climb or descent
- Using a ground-mapping RADAR display for navigational information

The data collected from the student surveys suggests that the training equipment items for the Advanced Core stage are inefficient in some manner. The general classroom equipment and the Microsim rank low in importance and efficiency, as the classroom automation rated high in both importance and efficiency. Ranking high in importance and low in efficiency are the T-39 Cockpit Mock-up, the FTIs, and the CAI Content. The T-39 rated high in importance but only moderately efficient.

Many Advanced Core students found the T-39 Aircraft to be a "good training aircraft but is getting unreliable due to old systems." Students also found "the G models difficult to fly due to the lack of standardization of instrument placement" and the overall "lack of continuity with instrument placement is a comfort limiting factor with airplane operation." Some students found the Microsim "extremely effective for low-levels," however several students did not utilize the equipment device.

The following are notable areas found in the data collected:

- 29% of the students never used the T-39 Cockpit Mock-up
- 19% of students were unaware of the T-39 Cockpit Mock-up's existence
- Benefit of the CAI displayed by the overall response of students but many also expresses a sense of confusion due to extraneous information
- Old age and damaged condition of the Cockpit mock-up
- Need for an instructor to reinforce the information from the CAI
- 2B47 not utilized by most students, others use it for basic practice only
- Majority of students did not use the Microsim
- FTIs are described as outdated (46% of students), and filled with superfluous information and errors (52% of students)

Overall, the Air Force students rated the training tools for Advanced Core the highest in importance but the lowest in efficiency.

3.1.4 Advanced Strike Student Survey Results

Survey data was complied from a class of 16 Advanced Strike phase UMFO students. The class is comprised of 81% Navy and 19% Marine Core students, of which, 57% maintain technical college degrees. 57% of the students hold at least one down within the T-39 curriculum, as 29% of the students possess four downs. Within this class, only one student's grade did not improve greatly from the previous phase of training.

In the data collected, each category of Advanced Strike training was indicated as highly important. Overall, learning objectives were regarded by 94% of students as highly important. General Flight Procedures and Communications held the highest importance scores and NATOPS held the lowest importance ratings, as 47% of the learning objectives were rated satisfactory.

RADAR prediction procedures and computed wind learning objectives produced the lowest importance and efficiency ratings, as T-39 "Immediate action" emergency procedures held the highest importance and efficiency scores. Mission commander responsibilities and radio

communications were also among the learning objectives rating the highest in importance. Aircraft servicing procedures rated within the least effective learning objectives, as T-39 Checklists and T-39 operation learning objectives were among the highest efficiency ratings. Noticeable trends throughout the Advanced Strike stage indicate other low efficiency scores in the following areas:

- FLIPS
- Preparing Jet Logs
- Preparing DD-175
- Interpreting DD-175-1
- Fuel requirements
- Airways Navigation skills and procedures
- Mission Execution tasks, System Operations, Crew Coordination

55% of the learning objectives were described as efficient or lower, with the lowest efficiency scores issued to learning objectives and tasks in the Strike Mission Planning and Communications areas. General Flight Procedures held the highest efficiency ratings, 66%, followed by NATOPS and Strike Navigation/Mission Execution, both displaying 47% of learning objectives as highly efficient

The student presenting the lowest importance and efficiency scores to the learning objectives held one down and the highest overall grade in the class, 100%. The sole student suffering a decline in overall Advanced Strike grading (11 points) and four cumulative T-39 downs rated the efficiency and importance of the learning objectives above average.

The CAI, Cockpit Mock-up, 2B47 Nav/Com trainer and the Microsim were all designated with low importance and efficiency scores and were not used by the Advanced Strike students. The CAI was described as "important for familiarization with systems but not a great practice tool" and "although such training could be valuable employed as a back-up, using it as a primary learning tool in the place of an instructor was ineffective." One student took advantage of the T-39 Cockpit Mock-up and felt that "it gave students the opportunity to gain familiarity" however the training device "vanished about half-way through the T-39 syllabus."

The 2B49 AIRT/GMRT trainer and the FTIs, each rated with extremely high importance, displayed moderate efficiency ratings. Several students found the AIRT/GMRT trainer only "effective for RADAR terrain work" and "for strike and COMPs, it was only effective for looking at the RADAR returns in routes." Others found the trainer "very helpful but the touch screens are annoying and difficult to use." Students found the FTIs for the Advanced Strike phase to be an improvement from the subsequent phases and fairly adequate, though some presented the need to update the FTIs. Advanced Strike students also felt that the FTIs are "not as useful as instructors," and the "FTIs for the strike program should have had some instruction for preparing strip charts."

The T-39 Aircraft rated as a highly effective and "extremely reliable" training device. Student commentary regarding the T-39 Aircraft included "RADAR would have problems at least once a week and a flight would not be able to complete" and "non-standardization of the T-39N and T-39G made it difficult to be evaluated on standard procedures."

Other commentaries collected from students regarding the Advanced Strike training phase include:

- More PFPS training and better quality of PFPS printouts are needed
- Emphasis on RADAR prediction procedures is unnecessary
- Crew Coordination/Roles were clearly defined
- Standardized instruction is needed
- Amount of strip chart preparation is overwhelming

3.1.5 Advanced Strike/Fighter Student Survey Analysis

Data was collected from 9 Advanced Strike/Fighter students. Of which, 60% of the students hold at least one academic, administrative, flight or simulator down within the T-39 curriculum and only 40% showed an academic grade improvement from the previous phase.

Importance ratings for many of the learning objectives were in the moderate range, with 64% scoring satisfactory of lower, as were the efficiency scores, with 56% attaining a satisfactory rating or lower. Keeping with the trend established in the other phases of training, the importance of learning objectives is, on average, rated higher than the efficiency.

91% of learning objectives in General Flight Procedures rated highly important followed by Strike Mission Planning and Air-to-Air RADAR Procedures and Intercepts. Strike Navigation/Mission Execution presented the lowest importance rating with 80% of learning objectives noted as satisfactory followed by Communications with 75% and NATOPS with 47%. Learning objectives presenting the lowest importance were associated with sufficient fuel requirements, counterturns, and weather studies and the learning objectives related to RADAR display controls adjustments rated the highest in importance.

Strike Mission Planning held the highest efficiency ratings with 56% of learning objectives rated as highly efficient. Air-to-Air RADAR Procedures and Intercepts followed with 52% of the learning objectives rated as highly efficient. Communications, General Flight Procedures, and Strike Navigation/Mission Execution held the lowest efficiency scores, as NATOPS learning objectives displayed moderate efficiency ratings.

Advanced Strike/Fighter students scored RADAR predictions, rating low in efficiency in previous phases and unimportant by Advanced Strike students, low in efficiency. T-39 Aircraft servicing procedures and all-weather operating procedures ranked the lowest in efficiency but interceptor's position, cut heading/air speed, RADAR navigation planning and visual low-level planning presented specific areas of high efficiency. Although rated low in efficiency in previous phases, learning objectives associated with DD-175s gained high efficiency in the Advanced Strike/Fighter phase. Trends also presented notably low efficiency scores in the following areas:

- GCI
- Automatic RADAR Track
- RADAR predictions procedures
- Flight recommendations/intended flight path
- Angle off/Automatic Tracking Display

- NATOPS/Systems operations
- Displacement turn, Collision Course
- Target Aspect/Target Heading
- Attack-reattack intercepts

75% of the students rating learning objectives low in both importance and efficiency hold technical college degrees and rank high in class academic grades. Two of the students providing data for the Advanced Strike/Fighter analysis are international students from the Royal Saudi Air Force, RSAF. The efficiency rates of these students concerning NATOPS and the performance of attack-reattack intercepts, in comparison to other students are considerably lower. One RSAF student recognized over 40% of the learning objectives below student average yet maintained an average course grade.

The T-39 Cockpit Mock-up, 2B47, and Microsim were rated low in importance and efficiency, as students did not utilize the equipment in this phase of training. CAI also rated low in importance and efficiency as students found the "content was very applicable and useful, just would have been better in a different delivery method." The T-39 Aircraft, 2B49 AIRT/GMRT RADAR trainer, classroom environment, and FTIs rated high in both efficiency and importance. Students found the T-39 Aircraft to be the "most important tool for training" though "the systems are a little outdated" and "some RADARs were not as accurate as others." The AIRT/GMRT trainer was described by students as invaluable, "very realistic to the aircraft", and "a good tool." Although students found the trainer to be a "great use of equipment", "it was hard to turn dials with the touch screen" and they felt it "could be more user friendly." The FTIs were described as ""very important, but have too many flaws" and in need of updating.

Other commentary recorded in Advanced Strike/Fighter student data include:

- Felt prepared to enter training phase but was a "big jump and learning curve"
- Students are sometimes "shut out" by pilots
- At time "pilots seemed to be working against us rather than for us"
- Crew Coordination issues exist with individual pilots
- NATOPS/PCLs are not sufficiently error checked and easy to use
- Too much emphasis on low level navigation
- RADAR in the aircraft and simulator should have a stronger resemblance

3.1.6 Advanced Instructor Survey

33 instructors throughout the advanced stages of UMFO training completed surveys for this analysis.

As student surveys note low efficiency scores for Operating Aircraft Systems, Flight Planning, Mission Planning, and RADAR Theory, Advanced instructors rated these learning objective areas above average for student preparation. Low-level Navigation, scored low by both Intermediate Phase and Advanced Phase instructors, maintains high efficiency scores throughout student responses. Mission Planning and Airborne Intercept learning objectives presented satisfactory and

below scores for student application. Instructors found each of the learning objective areas simple to instruct with the exception of Airborne Intercepts, which was noted as difficult to instruct.

Instructors assigned training devices as important to the training program; however, the CAI, 2B49, and classroom environment were designated as moderately efficient. The T-39 Aircraft, FTIs, and NATOPS presented high ratings, while the Microsim scored extremely low. Notable assessments presented by instructors include:

- T-39 is good but any degradations in replacement aircraft capability is unacceptable
- CAI is sufficient
- T-39 Cockpit Mock-up is useless
- 2B49 is good for instructing RADAR procedures only, EP training is poor
- 2B49 dials are difficult to manipulate
- FTIs and NATOPS have improved but need to be updated frequently
- More flights and accrued experience are needed for students
- Crew coordination sims would be beneficial to the program
- Lack of sufficient equipment is the main reason for TTT delays
- 25% of instructors did not feel IUTs prepared them to instruct Advanced phases of training

3.1.7 FRS Instructor Survey

A total of 13 FRS instructors, 9 instructors from the VFA/VF FRS/F-15E RTU, 4 from the VAQ/VS FRS/B-1B RTU, and 1 from the VP/VQ FRS RTU instructor, provided data for the analysis.

In the assessment of learning objective efficiency, 25% of the learning objective areas ranked above satisfactory, 44% ranked satisfactory, and 31% rated below satisfactory. The highest efficiency ratings were given to computing and evaluating en route times and fuel requirements, understanding and applying aviation safety principles, complying with aviation policies and guidance, and operating an airborne intercept RADAR system. Assuming decision-making responsibilities, ground-mapping RADAR navigation, strike scenarios, air-to-air intercepts, and "communication" were all assigned substandard efficiency ratings.

Relevancy of training for the majority of the learning objective areas displayed high scores but 25% noted moderate relevancy. Among those areas were meteorology principles application, radio navigation, and visual ground navigation, and rating the lowest in relevancy was ground-mapping RADAR navigation.

Overall, 40% of the FRS members surveyed believed that students are not prepared to begin FRS training. Many believe that students are "showing up without an assertive attitude, happy to sit back and let the pilot make the decisions, even if it's the wrong decision." As the lack of communication, crew coordination, and situational awareness training and knowledge were presented in both Advanced student and Advanced instructor data; FRS members also noted the need for an increase in incoming student knowledge in situational awareness and ground-mapping RADAR, as one member stated "they have spent a large amount of time doing 'headwork'

computation and calculation and less time understanding the concepts and actual execution of intercepts, navigation, and making decisions."

3.1.8 FRS Student Survey

There were not enough student responses to make any determinations.

3.2 Situation Statement

3.2.1 Instructional Systems Design (ISD)

3.2.1.1 The UMFO curriculum structure and training management lack formal ISD structure.

The ISD process is used to develop and maintain content that represents the desired training and training outcomes/expectations, ensure that the material is taught in a logical flow, maintain configuration management of the material, and ensure the most appropriate media is used.

Lack of an ISD structure leads to inconsistency in instructional material development and maintenance, hindering student learning and potentially contributing to academic downs. Underdeveloped as well as overdeveloped content areas often produce confusion and comprehension difficulty within students. Inconsistency in lesson instruction from one class to another or from one instructor to another is often displayed with a lack of a formal ISD structure. This inconsistency coupled with the irregular, non-managed development of training materials often results in additional time required by instructors to review materials and correct or supplement previous instruction. These factors can be seen in the UMFO curriculum and are reviewed in this section as individual impact areas, but are all tied to the lack of an ISD structure to develop and maintain all the instructional materials used in UMFO training.

Impacts
The specific mission impact of this situation is the inability of the learning materials to satisfactorily teach the learning objectives necessary to produce quality MFOs and satisfy service requirements. This impact is supported by the student (and instructor) surveys in direct comments about the learning materials and from the overall evaluation of the LOs as showing high importance but low efficiency in training.

3.2.1.2 ISD is inconsistent, intermittent, and repetitive from Primary to Intermediate to Advanced Phases. The current ISD is not approached from an overall UMFO program perspective but rather focuses on the individual phases.

The 1999 Training Situation Analysis (TSA) is indicative of this situation. The LOs for the T-34 were the primary focus of that study, in anticipation of the introduction of the JPATS system, the T-34's replacement. Review of the T-39 learning objectives is the sole focus of this TSA, which is being conducted for the replacement of the T-39 training aircraft. The inattention to the UMFO

program as a whole from an ISD perspective produces negative impacts for the instructors, students, training equipment, facilities, and training materials.

The individual phase approach to ISD of the UMFO curriculum creates distance between instructors of the separate phases and their teachings, impairing consistency of training and thus student progress. It causes the instructors to omit and/or repeat pertinent information and in some instances to teach previously covered (similar) LOs using a completely different or opposing method than in prior instruction. One student was noted as saying, "It makes no sense to learn something one way and then have to re-learn it another way." There are instances when different approaches to training are necessary or appropriate, but the difference must be properly related to the instance in training; without logical flow and orientation of LOs, the effect is disparate training. This could imply to students that previously learned instruction is not important or correct, and that they could begin to disregard that training all together.

Students are also impacted by the disparities in standards, instructional approach, and amount of training materials associated with the individual phase approach to training. Comments submitted by students include "acceleration of the program is unexpected and ill planned," "procedures should be the same in all squadrons," and "the increased level of performance required is an unexpected jump." The narrow focused phase approach to ISD leads to student confusion and frustration. Student comments consistently indicated that the number of flights in Primary were too many, "bad habits are formed in T-34s compared to the jet", "too many ANAVs in Primary"; this apparent extended curriculum could be a resultant of only investigating a portion of the UMFO curriculum vice the whole. The increase in performance expectations or increased difficulty of training, seen in any progressive development, should not "shock" the students. The curriculum must prepare them for the higher expectations associated with progression through the UMFO training phases. The CTW-6 Revised Training Concept (Figure 1.3.8-1) addresses the progressive development through the UMFO training phases. Accordingly, it must be considered in any ISD analysis or implementation in or revision to UMFO training.

Training equipment has been created using a phase-centric approach. Development by different contractors has resulted in dissimilar training equipment across the UMFO training program as a whole. This situation imposes increased maintenance staff requirements and more than likely, increased numbers of contract instructors due to the inability to cross-train on dissimilar systems. Fidelity of training across the UMFO curriculum must be maintained, the student can not be expected to go from high fidelity simulation and training to low fidelity within the UMFO curriculum or resultant motivational and comprehension problems will result.

Impacts

Facility impacts associated with this situation fall under facility planning. With the introduction of new aircraft to CTW-6, facilities appear to have been allocated on a first come first serve basis. This is the current situation with the introduction of JPATS, according to the NAS Pensacola ISEO, "JPATS will take over almost all of Griffith Hall", leaving the T-39 replacement to find other building space.

Training materials have been influenced by the erratic approach to ISD. Training materials are produced for individual phases without consideration of the methods or styles used in the training

material development for other phases, resulting in an overall inconsistency. This situation requires the students to adapt to new instructional methods and formats as they progress through the phases of training.

The specific mission impact of this situation is inadequate training of students in the UMFO program due to an inconsistent approach in training material and equipment development. Student training can often be confusing and lacking in a progressive nature. Also, unnecessary instructional time is expended due to recurring adaptation required for disparate instructional methods and equipment.

3.2.1.3 Learning Objectives

3.2.1.3.1 There are too many tasks covered and/or multiple conditions associated with singular Enabling Learning Objectives.

A learning objective is meant to clarify what it is that should be instructed and what it is that students should accomplish. Multiple tasks and/or conditions within a single ELO make creating exacting instruction and assessment difficult since multiple tasks/conditions are tied to a single ELO. For example learning objective, B-7 from the Advanced Core stage of UMFO training is:

NO.	TASK	CONDITION	STANDARD
B-7	Ensure compliance with SIDs, approaches, and Air Traffic Control (ATC) clearances.	Day, night, VMC, IMC, given a flight or simulator event	IAW FARs

This example ELO combines both multiple tasks and multiple conditions. By doing so, the necessary granularity is not provided for appropriately creating exacting instruction and assessing performance. For example, it is impossible to perform ensuring compliance with SIDs at the same time as ensuring compliance with approaches as well as to fly an event during the day and during the night at the same time.

Impacts

UMFO students are negatively impacted by the multiple tasks and conditions listed in single learning objectives. The objectives become difficult to understand and appear to take a monumental effort to accomplish a single ELO. When an ELO becomes confusing, the likelihood of the task being performed correctly drops significantly.

Training material impacts associated with this situation have to do with the inability to design instruction to meet a single ELO and perform complex tracing of ELOs and associated conditions throughout the material. This also increases maintenance efforts in that changes to portions of many ELOs would be unnecessarily propagated through instructional material that would not have necessarily been affected by the change.

The specific mission impact of this situation lends to the learning objectives and materials being confusing and instructionally vague, and has the potential to cause an overall performance decline among UMFO students.

3.2.1.3.2 Training materials do not contain LOs or do not match LOs designated in the MCGs.

As an example, the Strike Fighter Intercept FTI does not list any LOs, while the T-1A Intermediate Flight Preparation Guide lists LOs that are out-of-date and do not match the corresponding LOs in the Intermediate MCG. From an instructional perspective, teaching content areas without properly designated learning objectives means the instructor may not be aware of all of the items that must be taught for proper understanding of the topic. Without learning objectives, the instructor may not know what standard to grade the student against, or established standards may be out of date with the content.

Students are unable to trace a given LO back to the associated MCG to determine which LOs they have completed and which ones they have not. Lack of adequate LO association may also lead students to believe that one topic is somewhat less important than another topic that has an appropriate list of accompanying LOs. They may in turn pay less attention to the topic areas that do not have designated LOs. In these situations, the students will have trouble finding the correct information because they cannot tell from where the LOs originated. One UMFO student said about the FTIs, "Sometimes contradictory…" and another stated, "The FTIs are outdated and filled with extraneous information that isn't pertinent to what I'll be asked to do." This type of confusion is often indicative of material that is built from a malformed LO structure.

Impacts
This situation also has an impact on UMFO administrative personnel. It is difficult to track student progress on learning objectives that do not exist. The absence of LOs does not allow for effective curriculum development according to MIL-PRF-29612B. Configuration management and maintenance of training materials becomes more involved without LOs.

A potential training equipment impact associated with this situation includes misappropriated and improper training system design and function to support achievement of LO goals.

Because many subject areas are not properly associated with a LO, training materials are impacted because their development is incomplete making them difficult to maintain.

The specific mission impact of the different learning objective designations is that training may not flow in the most logical order or may contain extraneous information and therefore can become confusing for the student; equipment and/or materials may not be properly updated or revised with a change in MCG LOs.

3.2.1.3.3 Current training of UMFOs in carrier (CV) procedures has no LOs and execution in the simulator is inappropriate.

The inclusion of CV procedures was requested by the FRSs and completed in 1997. However, the MCG does not have any LOs for this task area and the incorporation into the Advanced Core phase of training is not considered optimal. Currently there is a lecture in the Advanced Core phase of training covering CV procedures and an associated FTI. Students who receive this training, which is minimal and unrelated to the aircraft that they are training in, will not use this knowledge in the

follow-on stages of UMFO training and then for many months after their graduation from UMFO training.

CV instruction in the 2B49 simulator is not optimal as the trainer is ill equipped to visually simulate the CV environment. The minimal exposure to the environment in UMFO training will be lost and may be better spent increasing the skills and knowledge of the students associated with carrier operations without actually having to simulate the carrier. References to skills and knowledge required for carrier operations must be related to actions and procedures that are similar in nature but accomplished in both carrier and non-carrier environments. For instance, a Carrier Controlled Approach is similar to a Precision Approach RADAR (PAR) approach and these skills should be progressively increased in their instruction and precision as they relate to the carrier environment. This would better hone the skills of the UMFOs to perform these events when appropriate in training without having to incur the expense of unrealistic simulation.

Impacts
The students are impacted by being held responsible for additional information that is not related to the current curriculum. Expending effort on CV Procedures information can distract the students from content that is more important for them to learn at this stage in their training.

Regarding the impact on training equipment, extra funding has been (or may be) needlessly spent on training equipment in order to simulate CV procedures, which are unrealistic for the UMFO training aircraft.

The specific mission impact of this situation is that the students are being given information that is unnecessary during Advanced Core training and is not related to existing LOs. Teaching CV Procedures can be a distraction for students from more important, relatable topics, and reduces the amount of training which could be spent on those more important topics.

3.2.1.4 Standardization

3.2.1.4.1 The presentation of equipment and training materials lacks an overall style guide.

The impact of training with dissimilar presentations is seen in the T-39G cockpit configuration. Many students commented on the difficulties in adapting to the varying cockpit configurations. For example one student said, "The T-39G needs to have the same equipment in the same places." This situation is also evident throughout UMFO training materials; the courseware used by the UMFO training program is inconsistent in the placement of information on the screen from course to course. An example of the lack of standard presentation is in the CAI, the navigation buttons look the same from course to course, but function differently. This can cause frustration among the students to the point of disinterest in the CAI courses (especially when they are not a required part of the curriculum). The FTIs are also inconsistent in overall format, structure and presentation of content. Without a standard presentation style, the equipment and training materials are confusing and difficult to use, distracting from the learning experience.

Impacts
The lack of an overall presentation style guide has a negative impact on UMFO training and personnel, which includes instructors, support personnel, and students. The impact to the

instructors increases the amount of time they must spend correcting and covering materials in order to eliminate confusion. Support personnel, such as learning center monitors, will also have to spend more of their time explaining training materials or equipment to students. The students will be negatively impacted as the lack of a standard appearance leads to confusion. There is also an impact in time to the student who must continually reorient themselves with the training equipment/materials.

Lack of an overall style guide affects training materials by creating inconsistencies within the content, functionality, and presentation. In addition, because they are not standardized, the training materials are also impacted because they can not be properly maintained if a LO is changed or updated.

The specific mission impact of this situation is a decrease in training efficiency. This is due to poor student comprehension and increased training time resulting from constant reorientation to new learning formats. Maintenance time is also increased due to the lack of a common style within training equipment and materials.

3.2.1.5 Lecture Material

3.2.1.5.1 The degree of clarity and standardization in lectures varies.

The content of some lectures is easily understood regardless of the instructor, while other lectures need further explanation from the authoring instructor responsible for the intended subject matter. This is reflective of the varying depth and standardization of the lecture presentations. In the instances when an instructor teaches a lesson using a lecture presentation written by another instructor, the lecture presentations or instructor outline/notes must be written clearly so that required (standardized) information is properly presented to each class.

Impacts
The clarity and standardization of the lectures impacts the instructors teaching the courses. If the lecture presentation lacks clarity, depth and standardization, it is likely that different instructors will errantly present different instructional information.

The degree of clarity will also impact the UMFO students. In the instances when different instructors are sharing responsibility for teaching the same lecture, the students may not be taught the same information, which could lead to poor performance and extra instruction.

The varying degree of depth and lack of standardization in the lecture presentations impacts the training materials by making them not as effective as they could be in delivering training. Training, and the information relayed to students, becomes nonstandardized with these characteristics.

The specific mission impact of this situation is that instructors may provide non-standardized lectures and different student classes may not get all of the information on the same topic. Training after these lectures is then impacted in the form of lower grades or wasted training time to individually instruct students on material that should have been learned in the lecture.

3.2.1.5.2 There is often more than one version of a lecture on the network.

Upon review of the lectures available on the TW-6 network, there were many instances of multiple versions of lectures for the same topic.

Having more than one version of the same lecture on the network can have a negative impact on the instructors by allowing for the possibility that instructors will select the wrong version of the lecture to teach. If the wrong version of a lecture is chosen the information being taught may be obsolete or out-of date. This will in turn have a negative impact on the students if they are not receiving the most current and accurate information. If there are multiple versions of a lecture on the network (e.g. different instructors have their own lecture materials), then updating all versions of the lectures with current information may not be feasible.

Impacts
There is potential for this situation to have an impact on training equipment. Depending on the information given, it is possible that a student with the wrong information may inadvertently produce an unsafe situation or damage equipment.

The impact on training materials of having more than one version of a lecture on the network is they cannot efficiently be updated and the possibility of the instructor choosing the wrong version to teach is possible.

The specific mission impact of this situation is students may not receive the most current and accurate information in lectures presented which can be a source of confusion and can translate into wasted instructional opportunity.

3.2.1.6 Computer-Based Training

3.2.1.6.1 Most of the Computer-Based Training courses lack any type of interaction from the student.

A majority of the CBT courses available to UMFO students can be rated at Level 1 according to standards presented in MIL-HDBK-29612B, Level 1 CBT is also know as "page-turners". This type of courseware offers limited opportunity for the students to become actively engaged with the courseware and drive the learning process. When students are not engaged by CBT, comprehension levels drop significantly (especially when the CBT is not part of the curriculum).

Impacts
Instructors and students are affected by the lack of interactivity offered in the current CBT programs. Instructors must spend more time than necessary training on topics that could have been more thoroughly covered through CBT if the interactivity was present. This situation also impacts the UMFO students. It is likely that students will quickly lose interest in the CBT when there is no interactivity. Also the students will have a lower comprehension rate for certain types of information, such as RADAR operation, when presented without the opportunity for interactivity. An Advanced Core student commented that the CBT "would be better if they were more interactive" and another student said, "(the CBT)…needed further explanation by instructor."

The lack of student interactivity in the CBT makes the training materials not as effective as they could be in the delivery of training since students fail to comprehend the key points presented.

The specific mission impact of the lack of interactivity is that the students cannot receive the full benefit of CBT. The interaction within in the CBT appears inadequately designed for the content since instructors must reiterate the content in order for many students to comprehend it.

3.2.1.6.2 Many of the graphics/photographs shown in the Computer-Based Instruction are not detailed enough for the student to receive any true benefit from them.

Many of the graphics/photographs in the current CBT courses lack sufficient detail when the level of technical content is considered. As an example, in the T-39 Systems course, Engine lesson, in many instances where a small component of the engine was being discussed, a photo of the entire engine was displayed with only a label pointing to the specific component which was too small to achieve understanding.

Impacts
The lack of detailed graphics and photographs in the CBTs has an impact on the UMFO students. Because the graphics/photos are not detailed enough, the students must find alternate ways to gain a clear understanding of what the graphic/photo is depicting.

The training equipment can be affected by this situation because extra training time will be required on simulators and other equipment to comprehend information that could have been conveyed with a proper graphic or photograph.

The lack of detailed graphics and photographs in the CBTs make the training materials less effective since extra training time is likely to be required to explain concepts that could be explained with improved pictures or diagrams.

The specific mission impact is lost instructional and knowledge transfer opportunity, which ultimately results in increased training time.

3.2.1.7 FTIs

3.2.1.7.1 The FTIs are outdated

Many of the current FTIs have not been updated in a several years, some as long as 1993. There have been updates to the curriculum made in that period of time that are not accounted for in the FTIs.

Impacts
The Flight Training Instruction (FTI), being outdated, impacts both the UMFO instructors and students. The instructors will need to spend unnecessary training time to verbally update the information covered in the FTI. If the instructors neglect to take the extra time to verbally update the information, incomplete and possibly incorrect information could be retained by the students.

The outdated FTI impact on the students is that they are likely not getting the most current and accurate information. The FTIs may also cause confusion among the students by the information not matching the information in other more updated forms of training. For example, one Intermediate phase UMFO student is quoted as saying, "Many FTIs were out of date and some material was not applicable. This was very confusing and frustrating at times…"

There is potential for this to have an impact on training equipment. Depending on the information given, it is possible that a student with the wrong information may inadvertently produce an unsafe situation or damage equipment.

The specific mission impact of the outdated FTIs is that the students may not be receiving the most current and accurate information, which may result in confusion and frustration. It may also lead to poor student performance as student knowledge and instructor expectations are not correlated as well as extra training time so that the instructor can update the student.

3.2.1.7.2 Diagrams and pictures located in the FTIs are difficult to understand.

The text contained within the graphics is often blurry and hard to read, which makes understanding of the material within the FTI very difficult.

Impacts
This impacts both the instructors and the students. The instructors are impacted because they will likely spend extra time explaining concepts that could have been explained by more accurate diagrams/pictures. The students are impacted because the diagrams and pictures provided by the FTIs are insufficient, therefore the students must find other ways to get a clear understanding of what the diagram/picture is trying to convey. There is the possibility that students in attempting to understand the graphics on their own misinterpret the information and receive inaccurate training.

There is a time impact associated with the training equipment due to this situation. The students will probably spend more time on simulators and other equipment attempting to decipher what the diagrams/pictures were trying to show them.

The lack of detailed diagrams and pictures in the FTIs make the training materials less effective since extra training time is likely to be required to explain concepts that could be explained with improved pictures and diagrams.

The specific mission impact of this situation includes potential misinterpretation of the material presented in diagrams/pictures, lowering student comprehension rate, and increasing the training effort.

3.2.2 Student Performance

3.2.2.1 Situational awareness (SA) training objectives are not being developed enough.

Based on FRS comments and discussions, the situational awareness of UMFO graduates is underdeveloped. Possessing SA is a critical ability required for performance in a Fleet

environment, which involves multi-seat aircraft being employed in a task-saturated multi-mission arena. Despite the fact that stated LOs in the existing UMFO curricula are designed for development of SA, those LOs are not being adequately fulfilled. For example, an Advanced Core student said, "The big picture was/is neglected a bit" while another student said, "I felt behind the aircraft almost every time…"

It seems that the LOs associated with SA are underdeveloped and lack the inclusion of the foundational characteristics of SA in the ELOs. Primary introduces SA and is supported in the LOs by "spatial orientation" as an introduction; considering the phase of training and other Primary LOs, this appears to be sufficient. However, the Intermediate Phase of training does not provide enough emphasis on SA, only splitting a .5hr lecture between SA and Crew Coordination, with no direct supporting LOs. The Advanced Core stage has no LOs associated with SA and only emphasizes Navigational Situational Analysis. Collectively, all phases do not establish progressive instruction, practice and immersion in SA. Advanced Strike has a strong emphasis on SA throughout the flights as a graded item, but the LOs are blended into Mission Commander and other LOs. There is no direct measurement of SA listed in the MCGs, leaving grading to the discretion of the instructor. SA, being an esoteric characteristic, lends itself to a subjective measurement by an expert (e.g., the instructor); however, defining evaluation guidelines for levels of achievement would be beneficial to the student's understanding of what is expected in this area.

The criticality of this ability is a resource management matter and potential safety of flight issues. Regarding the impacts to FRS/RTU customers, the burden is transferred to them for developing adequate SA ability, which is an elemental ability that students should possess upon arrival for FRS/RTU training.

Impacts

Underdeveloped SA ability negatively impacts UMFO personnel, including the students, instructors, and contract pilots, as well as the FRS/RTU customers that continue the training of UMFO graduates to prepare them for Fleet duty. Students are impacted because they are missing out on the development of an ability that is a determinant for Fleet success. The impact to TW-6 instructors and contract pilots is that instructional workload is unnecessarily increased and convoluted due to underdeveloped student ability in the realm of SA.

Training materials are not providing the foundational information or depth required to establish SA knowledge and attitudes. In order to rectify this situation the training materials will need to be improved and therefore will be impacted.

The specific mission impact is that students leave UMFO training lacking an elemental ability required for Fleet success, which is to skillfully and safely manage the employment of multi-seat aircraft in a task-saturated, multi-mission environment. Additionally, UMFO training is impacted in situ because of the increased instructional burden attributable to underdeveloped SA ability.

3.2.2.2 Crew Coordination

Although crew coordination -- a critical skill required for managing the employment of multi-seat aircraft in a task-saturated, multi-mission environment -- is currently supported throughout the

existing UMFO curricula, the curricula should be restructured and enhanced to facilitate the CTW-6 Revised Training Concept and to address the CNO-mandated Crew Resource Management (CRM) Program requirements.

The CTW-6 Revised Training Concept, considered an enabler for developing MFOs capable of safely and effectively achieving mission goals, requires development of advanced skills founded on basic crew coordination. These skills include task management, mission flexibility, in-flight leadership, advanced weapons system management, and air battle management. Furthermore, in October 2001, the CNO mandated in OPNAVINST 1542.7C that "standardized training strategies shall be used in such areas as academics, simulators, and flight training. Practicing CRM principles will improve mission effectiveness and serve to prevent mishaps that result from poor crew coordination." This program calls for a specific, standardized training regimen for developing defined behavioral skills derived from task-based analyses. These behavioral skills include assertiveness, decision-making, communication, leadership, adaptability/flexibility, situational awareness, and mission awareness, and developing them would form the basis for solid crew coordination instruction.

In comparatively reviewing the UMFO Intermediate and Advanced curricula, there are many training objectives, academic events, and graded event items related to crew coordination. Considering this, some, but not all of the necessary skills development is currently supported. Specifically, the current curricula do not develop the desired behavioral skills of crew coordination; there is a gap between existing structure for developing crew coordination skills and the future structure required for fulfilling the CTW-6 Revised Training Concept and for addressing the CNO's CRM requirements. For example, although crew coordination is a graded item in the Advanced Core syllabus there are no supporting LOs; such is also the case with the Advanced Strike/Fighter syllabus. In short, the timing and content of existing academic training events seems disjointed considering the goals of the CTW-6 Revised Training Concept and the CRM Program.

Impacts

The insufficient development of crew coordination skills negatively impacts UMFO personnel, including the students, instructors, and contract pilots, as well as the FRS/RTU customers that continue the training of UMFO graduates to prepare them for Fleet duty. One student commented, "Sometimes the pilots seemed to be working against us rather than with us" while one UMFO instructor said, "Crew coordination is difficult for students to grasp…molding a decision maker can be the most challenging aspect of instructing." Students are impacted because they are missing out on the development of a skill that will weigh heavily in determining their success as a Fleet aviator. The impact to TW-6 instructors and contract pilots is that instructional workload is unnecessarily increased and convoluted due to underdeveloped student skills. Regarding the impacts to FRS/RTU customers, the burden is transferred to them for developing adequate crew coordination skills, which are elemental skills that students should possess upon arrival for FRS/RTU training.

Training materials do not contain the foundational or progressive information or depth required to establish crew coordination skills and attitudes.

The specific mission impact is that that students leave UMFO training without the fundamental crew coordination skills required for FRS/RTU and Fleet success. Additionally, UMFO training is

internally impacted because of the increased instructional burden attributable to underdeveloped crew coordination skills.

3.2.2.3 The ability of UMFO graduates to communicate via radio is lacking.

Because communication is among the fundamental skills required to safely aviate and navigate stated training objectives in the existing UMFO curricula are not being completely fulfilled. This situation is founded upon critical feedback from the FRS/RTU customers who continue the training of UMFO graduates in preparation for Fleet duty. One instructor commented, "Comms are poor. Students hear but they don't understand what is said to them, so they just read it all back like parrots." A UMFO student said, "There should be some kind of comm simulator, anything to teach the radio better."

Impacts
Students are impacted because they are missing the development of skills that are important to their continued success in aviation. The impact to TW-6 instructors and contract pilots is that instructional workload is unnecessarily increased due to underdeveloped student skills; in essence, the criticality of communication from this perspective is a resource management and safety-of-flight related matter.

Existing training equipment, with the exception of the aircraft, is not capable of providing the learning environment required to establish adequate communication skills. Across the entire spectrum of UMFO training, a building block approach for progressively developing communications skills is not implemented within the training equipment used. For example, a robust capability for simulating and practicing communications does not exist other than one commercial CAI module that simulates civilian IFR communications. This CAI is available to UMFO students and could be a useful tool, but does not address the nuances of military aviation communication. In order to address this situation the training equipment, specifically simulators and electronic classrooms, will need to be improved and therefore will be impacted.

The specific mission impact is that students leave UMFO training lacking in elemental communication skills. Additionally, UMFO training is itself impacted because of the increased instructional burden and oversight attributable to underdeveloped communication skills.

3.2.2.4 The ability of UMFO graduates to apply NATOPS emergency procedures needs emphasis.

NATOPS usage is among the fundamental skills required to safely aviate, navigate, and communicate, however, UMFO students are not receiving adequate training in the use, application, and importance of NATOPS. This situation is based on FRS/RTU comments and the results of student surveys, Intermediate and Advanced Core students found NATOPS learning objectives as highly important to the UMFO curriculum. However, 30% of the Intermediate LOs and 38% of the Advanced Core LOs were found to be inefficient by students. NATOPS LOs displayed neutral scores in the Advanced Strike and Advanced Strike/Fighter data. Emergency Procedures, though among the NATOPS LOs, were rated among the highest in both importance and efficiency by students throughout each phase of training. This presents a contradiction to the FRS instructor

view that students are lacking basic NATOPS and EP skills when entering FRS training, "there are individuals who have the basic skills and talent, but who fail to utilize them to continue developing those basic skills and abilities. Examples include repeatedly not knowing emergency procedures, not correcting deficiencies even after receiving multiple below average flights and SODs and, in general, lacking the basic attitude required to become a competent Fleet aviator."; Intermediate and Advanced Instructors also found NATOPS and Emergency Procedures to present a problem in student training. As noted by one instructor "NATOPS, EPs, aircraft performing is not covered adequately. Better simulation is needed."

Existing Intermediate and Advanced UMFO training equipment is not capable of providing the learning environment required to develop NATOPS usage skills. Specifically, there are currently no training devices that allow realistic Emergency Procedure (EP) training, leaving the aircraft itself as the only environment for this type of training. One UMFO instructor said, "EPs are also a shortfall because the procedures can only be done in the aircraft." The ability to conduct EPs in the aircraft is constrained by safety of flight issues, which limits the ability to introduce or practice all EPs. The AIRT/GMRT does not provide the controls, or fidelity to introduce, practice, and stress the importance of NATOPS orientation.

Impacts

Underdeveloped NATOPS usage skills negatively impact the students, instructors, and contract pilots, as well as the FRS/RTU customers. FRS comments included, "Some students do not understand the importance of NATOPS and NATOPS procedures" and "More emphasis on EPs and handling them in a scenario driven arena to a logical conclusion versus memorization of boldface and no application discussion (is required)." Students are impacted because they are missing out on the development of knowledge and skills that must be understood and employed to safely manage their aircraft.

Training equipment must be developed to effectively train in NATOPS EPs.

The specific mission impact is that students leave UMFO training lacking an elemental skill that hinders their ability to safely operate an aircraft.

3.2.2.5 Quality of UMFO Graduates.

Within FRS comments there are indications that some UMFO graduates are "marginal performers", "We unfortunately get a few rare students that make it through flight school but get cut from our program. My feeling is not everyone can hack it, those students should be cut in flight school, especially those that are obviously deficient."; "The two most troubling problems that we have consistently seen regarding recently winged Naval Flight Officers is a complete lack of screening out of truly marginal (sometimes even incompetent) individuals, and individuals coming to the FRS who are not lacking in ability but who are lacking in the requisite drive to learn and practice NATOPS procedures and limitations as well as basic S-3B tactics."; "We have had several cases of individuals who not only possessed marginal abilities but additionally did not have a basic understanding of how far behind their peers they stood. Although the determination of who is marginal and who is not always requires a certain amount of judgment and discretion, if these individuals are not prepared to put forth the effort to successfully complete the syllabus, they

become a detriment to timely training."; "There are also individuals who have the basic skills and talent, but who fail to utilize them to continue developing those basic skills and abilities. Examples include repeatedly not knowing emergency procedures, not correcting deficiencies even after receiving multiple below average flights and SODs and, in general, lacking the basic ATTITUDE required to become a competent Fleet aviator. Although other skills are very important, especially maintaining situational awareness and navigation/communication skills, the number one problem I have seen in my two and a half years here are NFOs who do not possess an attitude that lends itself to study or responding to instructor correction, short of a FNAEB. When combined with marginal skills and capabilities which probably should have precluded them from receiving their wings in the first place, the results could be deadly."; "Most arrive motivated and ready to go. We have had more than one student behind their peers in competency, but worse, lacking in motivation to improve. I was pretty surprised to run into something like that in this profession."

These comments are validated when examining the number of flight, simulator, academic, and admin downs that the students are able to carry through the UMFO curriculum: cumulatively to and through the stated stage, 45% of 22 Intermediate students have 1 down, 5% have 2; 43% of 23 Advanced Core students have 1 down, 17% have 2 or 3, and 13% have 4 or more (one student has 5 and another has 6); of the 7 Advanced Strike students, 4 have downs, 1 student has 1 down, 1 student has 2 downs, and 2 students have 4 downs; of the 5 Advanced Strike/Fighter students, 1 student has 1 down, 2 students have 2 downs. The students that were surveyed were used as a cross-section of students to evaluate overall performance (and to validate responses to the surveys were not malicious) prior to receiving the FRS/RTU comments.

The number of downs in the curriculum is a definite indicator of many of the situations that have been discussed. The lack of consistency throughout the instructional materials, inadequate training equipment being used to instruct techniques and procedures, and multiple sources of instruction, missed instruction, or incorrect instruction all contribute to the cause.

The quality of students entering into the training command is also a factor. CTW-6 staff indicated that the quality of students is very dependent on the economic times. The entry criteria of students entering aviation training must be evaluated to ensure that marginal students are not entering these programs and that the Training Command is receiving students who possess positive indicators towards aviation. If the quality of incoming students dips below a certain threshold the training command must be notified so that extra attention to training can be instituted.

Impacts

Students and the FRS are impacted most by this situation. Marginal students or those with many downs indicate they may not be able to handle the nature and material of aviation work. The earlier this is realized the better for both the student and training commands. The FRS is impacted in that they must work with and attempt to develop characteristics that may not be available in certain students, and could have been realized earlier in their training.

Training equipment and training materials are a major contributor to this situation and the impacts have been discussed in other areas of this study.

The specific mission impact is that training resources, those of TW6 and the FRS/RTU, may be spent on students who do not have the aptitude for aircrew positions.

3.2.3 Training Devices

3.2.3.1 T-39/T-1A Aircraft

3.2.3.1.1 The Type/Model/Series footprint of the training aircraft is problematic

The Type/Model/Series footprint of the training aircraft is problematic in that multiple layouts of the aircraft must be taught. The use of the T-1A also exacerbates this problem area. The students are exposed to multiple cockpit layouts in the same type of aircraft and this can cause hesitation or confusion in the development and execution of instrument scans, procedures, and SA. The training materials, CBT, FTIs, Cockpit Mock-up, AIRT/GMRT do not account for all configurations of the T-39.

USMC students may be exposed to as many as five different aircraft during their UMFO training: T-34C/T-6A, T-1A, T-39N, T-39G, and T-2C. USN students may be exposed to as many as four aircraft not seeing the T-1A. This situation lends itself to students focusing on the details of aircraft transition rather than developing their aviation skills in a progressive cockpit environment. Students and instructor commented that, "Aircraft is good in N models. G models have a very poor designed cockpit instrument panels."; "Having G and N models of the aircraft is rather inefficient and can be confusing to students."; "Our T-39s are never set up the same. The student doesn't have access to all the switches/gauges/indicators that provide SA."

Survey questions, which asked about the efficiency of T-39 as training equipment, generated many comments about its replacement platform. Many instructors commented "any less capabilities than the T-39 will be unacceptable". Other comments were: "T-39 specifications need to be maintained. The transition to a fleet aircraft after earning wings is a difficult one. If the proper step height is not maintained with the follow-on jet, the transition will be more difficult", "We cannot downgrade with the replacement aircraft. 300 kts LLs, 4 Gs capable RADAR, adequate fit time cannot be sacrificed", "A jet capable of 3-4 Gs in a LL environment at speeds of 300+. We need to provide them with the best training to be ready for the fleet and a LL at 240 kts is not going to cut it", "The follow on aircraft to the T-39 must be able to meet the current capabilities: 300 kts at LL with up to 360 min of 3.5 Gs for the A/A syllabus. Real RADAR with capabilities 740 nm, GPS integration, DBS and SAR capabilities." At the FRS/CTW-6 meeting the Air Force "raised an eyebrow" about the lack of capabilities in the follow-on aircraft, not only could this cost the Navy the training of AF crew but also the discussed additional AF crew training.

The students are impacted by the necessity to learn multiple cockpit layouts within the same type aircraft, causing uncertainty in the application of procedures and a breakdown in SA.

The Training Equipment and Materials are impacted in that they must describe and display different cockpits. This also adds confusion in that multiple graphics of cockpit layouts may have to be shown for a single concept or procedure.

The resultant mission impact is that students may not be performing up to their potential or taking longer to achieve SA, since they must be familiar with and operate in multiple versions of the aircraft while just beginning to establish the ability to aviate. This also impacts time-to-train because there is an additional training burden associated with transitioning to another aircraft model.

3.2.3.1.2 The opportunity for realigning training objectives between the Intermediate and Advanced Core Phases to improve training should be capitalized on.

The replacement platform for the T-39 will replace all T-39s and the T-1 with one aircraft type; all aircraft purchased will be equipped with multi-mode RADAR. This will provide UMFO training with RADAR equipped aircraft for use in the Intermediate Phase of training; unlike what exists currently. In light of the situations discussed in this analysis, consideration should be given to restructuring the Intermediate syllabus to account for the increased availability of RADAR-equipped aircraft. This proposed realignment is also based on many comments about getting the students out of Primary and into the jet earlier (which does not consider the performance of the T-6A as the future Primary UMFO Trainer). In these comments, it was stated "We spent too much time in the T-34… The same objectives could be covered in half the flights" and "Not enough time for T-39 preparation… Transition from T-34 to T-39 needs more training." By instituting Basic RADAR Theory and operation in Intermediate a clear demarcation point would exist which would allow a point and goal to be set for the students. It is also recommended, based on comments by the students and instructors that the number of Intermediate ANAVs in the T-34 be cut to seven and that the number of ANAVs in the T-48 be increased to eight including a final check ride (T-34 lose 4 flights, T-48 would gain 4 flights, plus account for time to teach Basic RADAR Theory and use of the simulators in the proposed progression). This will allow for a smoother and longer transition from turboprop speeds into jet speeds, thus allowing for an earlier establishment of jet SA and Crew Coordination.

In addition to the above, T-1/T-39 VNAV is being taught in Intermediate to students that more than likely will not perform that type of navigation in their follow-on assignments, e.g., E-2 selection occurs after Intermediate completion. Conversely, all RADAR topics are taught in Advanced and do not allow exposure to RADAR for E-2 selectees; background information which could help them in their FRS training. This situation lends itself to moving some basic RADAR topics from Advanced to Intermediate and teaching jet VNAV solely in Advanced, where all graduating UMFOs will use that information. Specifically, RADAR theory and limited A/A RADAR operation, done in conjunction with increased numbers of jet ANAV events, could be introduced in Intermediate. Other advantages of such realignment would include offering students an "early look" that could shape their selection preferences and reducing the "fire hose" effect of introducing RADAR in Advanced. The RADAR topics of the Advanced Core, Strike, and Strike-Fighter syllabi would remain intact minus the introductory RADAR topics.

Considering the E-2 selectees, there appears to be no reason to teach students in the Intermediate stage formation skills, as they will rarely if ever be utilized by those who are winged out of the Intermediate stage. Therefore, eliminate the two formation flights from the Intermediate stage. This time savings can also be used to compensate for other changes if needed, but provides time to introduce and teach the proposed revised crew coordination concepts.

Impacts
The realignment proposal will impact personnel and training materials. From the personnel aspect, if changes were made to the numbers and types of events, as well as the aircraft used, downstream effects to instructor assignments may occur. Training materials would be influenced in that they would have to be reviewed and revised to support the transfer of training objectives between phases.

The specific mission impact of this situation is potential improvement to overall UMFO training and production of better-prepared graduates for follow-on training. This also allows for an earlier transition to the jet and concentrates on establishing jet SA as early as possible.

3.2.3.1.3 The T-39 cockpit mock-up is not an effective and may have a negative effect on training.

The T-39 Cockpit Mock-up has several damaged components and is brittle due to old age. The configuration of the cockpit has not been updated and does not provide orientation for all T-39 layouts. The lack of movable knobs and switches provides only limited training in the location but not the operation or tactile motion. The mock-up is not introduced to students as being available or how to use the mock-up as a possible training device (including limitations associated with the configuration). Many students commented that they did not know the trainer existed.

Impacts
Students are affected in that those that do use the trainer may be establishing an incorrect orientation within the cockpit. Students who are unaware of the trainer are missing out on the opportunity to utilize the trainer as assisting in organization and limits within the cockpit prior to getting in the aircraft.

3.2.3.2 2B49 AIRT/GMRT RADAR Trainer

The 2B49 as an air-intercept and ground-mapping RADAR part task trainer (PTT), which is described as the mission of the trainer, is somewhat effective. However, the capabilities that were specified outside these requirements, such as emergency procedures, instrument approaches, and Automated Carrier Landing System/Instrument Carrier Landing System approaches, and the use of the 2B49 to train in these areas is ineffective. The expansion and expectations of the PTT to be able to meet learning objectives in the intermediate and advanced training curriculum outside of RADAR procedures is not effectively accomplished.

The touch screens and smaller scale cockpit instrumentation make the simulators inaccurate and ineffective for practicing equipment operation or as a procedures trainer. The many student comments on the AIRT/GMRT touch screens include, "The touch screen make the GMRT useless for practicing equipment operation or AIRNAV procedures because it is too much trouble to operate radio and NAVAID frequencies," "The touch screen…is too time consuming to use any dials," "It is too hard to do any turn dials with the touch screen." Having a limited field of view also makes it nearly impossible to practice visual low-level navigation. Observations of the simulator demonstrate that standard cockpit procedures could not be accurately accomplished in

this simulator due to the smaller scale instrumentation and touch screens. Often trying to manipulate a control on the touch screen would cause an unintentional activation of another control.

The open configuration of the 2B49 and lack of an enclosure does not allow for the students to have the feeling of actually being in the aircraft and working within a confined space. The openness of the configuration also allows for distractions; seven of the ten 2B49 simulators are situated together in a large, expansive room, with nothing separating the simulators. The noise levels and extraneous movements from students and instructors working on the other simulators is not conducive to a positive learning environment.

Impacts
Students are impacted by the limited use of the 2B49 since all procedures cannot be effectively replicated in this ground based training device. This impact contains a negative connotation in that the 2B49 does not replicate the cockpit environment or instrumentation, yet is used to train in these areas.

The overall mission impact is that there is limited capabilities to train in procedures prior to entering the aircraft. The ability to effectively train in a ground based cockpit simulator would allow the students to be better prepared to master techniques in the aircraft vice only achieving a basic efficiency.

3.2.3.3 2B47 Nav/Comm Trainer

The 2B47 Nav/Comm Trainer was stated as being introduced to and used by students for practice and remedial training. The 2B47 is not an effective trainer for the intermediate and advanced stages of training. While the 2B47 is an efficient tool for practicing basic navigation skills, it is too general to be an efficient tool for the development of advanced navigation skills that are required by the intermediate and advanced curriculums. The configuration of the 2B47 Nav/Comm Trainer does not furnish the sense of being in an aircraft cockpit, causing fixations on single task although is consider a better enclosure than the 2B49.

Impact
The student is impacted by not having a trainer capable of providing the level of capabilities and complexity that match their stage of training. This can allow for a sense of confidence on the ground that is rapidly depleted in the actual aircraft.

The mission impact is that there is insufficient ground based training, thus forcing initial skills development to take place in the aircraft. This is an expensive proposition in the terms of training time and operating costs compared to ground based solutions.

3.2.3.4 The Microsim is a useful but underutilized asset.

The Microsim is currently not in any of the UMFO curricula and is not introduced to all students as an available training device. Whereas this is an excellent training asset to the T-34 curriculum, not having a cockpit configuration that resembles the T-39 limits its applicability and use as an asset to

those students. The trainer provides for cost-effective training even if only utilized for extra-time. Those Intermediate and above students that do use it, commented that it was very useful for low-level and FAM training. It is expected that with a T-39 cockpit (RADAR not necessarily required) that the use and advantages would increase. To achieve these benefits the trainer must be integrated into curriculum and introduced as a training device. The Microsim is considered a better alternative than the 2B47, more realistic training and more cost effective, for Intermediate and Advanced UMFO students, provided a cockpit shell is developed. The Microsim's small footprint and easy to use interface and shell allows it to be located in opportune areas close to student access and could use standard office partitions placed between cockpits to avoid distractions from other trainers.

Impacts
The impact to students would be more representative visual and cockpit training, with a T-39 shell. Students can utilize this trainer to assist themselves in working out procedures without tying up a major simulator.

Impact to facilities is negligible to none, as the small footprint and power requirements are standard.

The specific mission impact is availability of a better resource than currently exists for the student to practice flight procedures on their own in a simulated environment that is of sufficient fidelity for the level of training.

3.2.4 Facilities

3.2.4.1 Many UMFO classrooms are not set-up for optimal student performance.

There are several shortcomings in the design of the classrooms in Griffith Hall. The interior motif does not provide a positive, appealing atmosphere that promotes student attentiveness. The classrooms present a dark and drab appearance. Also, student desks in many of the rooms do not face all of the permanent instructional elements, including the projection screens, whiteboards, and systems training devices. For example, in order to view lecture presentations, students must turn away from the instructor to face the projection screen on the side of the room.

Impacts
The less than optimal set-up of UMFO classrooms has a negative impact on the instructors and students. The instructors will be more likely to lose the attention of the students and the set-up of the classrooms may also cause physical discomfort for some students when having to turn to the side to view presentation materials. The color and lighting in the classrooms may also cause drowsiness for many students. For example, an Advanced Strike student described the classroom environment as "Like being in a prison, classroom ambience is lacking, poor learning environment."

The specific mission impact of the classroom set-up is that if the classroom environment cannot keep the students alert and comfortable the reduction in learning may be significant.

4 Solutions and Alternatives

Since the T-39 follow-on platform is anticipated to build a robust Ground-Based Training System (GBTS) incorporating a number of these solutions, costs associated with each individual solution or alternative will not be presented. A cost estimate for the GBTS will be provided to PMA-273 for separate evaluation and consideration.

4.1 Solution 1

The following solution and alternative presented are a possible solution for the following situation statements:

- ISD is inconsistent, intermittent, and repetitive from Primary to Intermediate to Advance Stages. The current ISD is not approached from an overall program perspective but rather focuses on the individual phases.
- Many enabling objectives have conflicting conditions listed within the same learning objective.
- ISD is inconsistent, intermittent, and repetitive from Primary to Intermediate to Advance Stages. The current ISD is not approached from an overall program perspective but rather focuses on the individual phases.
- There is often more than one version of a lecture on the network.
- All LO associated situations
- Curriculum items contain or do not contain LOs as designated in the MCG.
- Various FTI learning objectives do not match learning objectives presented in the Master Curriculum Guides.
- Various learning objectives contained in the lectures do not match the learning objectives presented in the Master Curriculum Guides.

The contractor who will be selected to institute the T-48 for UMFO training should analyze all UMFO LOs as a whole curriculum. Disregard the concept of training phases and analyze all LOs, creating a progressive development in instruction, standards and consistency throughout the UMFO curriculum. Work through all of the LOs eliminating areas of conflicting or repeated LOs. The TW6 Future Development should be taken into account on any future developments.

4.1.1 Alternative to Solution 1

The introduction of JPATS to CNATRA brings the Training Integration Management System (TIMS) and its requirements for computer based instruction (CAI/CBT) to TW6. The requirements for computer-managed instruction are dictated by TIMS and established a graphical user interface and instructional material development methodology and standards. CNATRA intends to manage all undergraduate aviation instructional materials and content from the Fleet Training Support Center (FTSC) in Corpus Christi, TX, through the TIMS network. This will assist in maintaining standardized, managed instruction. This solution is based on these facts and accounts for the fact that a whole look at the UMFO curriculum may not be prudent at this time considering the recent introduction of the T-6 and the evaluation of its capabilities will still be in process when the T-39 follow-on aircraft is awarded.

The T-48 contractor will utilize CNATRA approved version of the TIMS courseware Authorware model and the T-6 graphical user interface and authoring standards. This will ensure consistency in the CBT/CAI presentation and operation for the student throughout UMFO training thus eliminating the time wasted on re-learning interfaces and their operation; also allowing the FTSC to only have to maintain expertise and knowledge in one interface, thus increasing material maintenance and CM efficiency. The T-48 contractor should only concentrate on the Intermediate and Advanced stages of UMFO training and implement a training continuum that continues the fidelity of training established by JPATS. The FTSC would then be responsible after the T-48 has been accepted to begin a better blending of UMFO curriculum and LOs with input from CTW-6. This solution satisfies the following situations:

- ISD is inconsistent, intermittent, and repetitive from Primary to Intermediate to Advance Stages. The current ISD is not approached from an overall program perspective but rather focuses on the individual phases.
- There is often more than one version of a lecture on the network.
- All LO associated situations
- Curriculum items contain or do not contain LOs as designated in the MCG.
- Various FTI learning objectives do not match learning objectives presented in the Master Curriculum Guides.
- Various learning objectives contained in the lectures do not match the learning objectives presented in the Master Curriculum Guides.

4.2 Solution 2

A standard configuration management process should be followed throughout every portion of every phase of UMFO training. A team should have the responsibility of making sure that any update or change made to any portion of the UMFO training program is followed through to all effected areas of training. All UMFO training materials must be put under a single CM control.

The predicted effect of this process will be increased efficiency of UMFO training materials and increased comprehension for the students.

A standard configuration management process is a possible solution for the following situation statements:

- ISD is inconsistent, intermittent, and repetitive from Primary to Intermediate to Advance Stages. The current ISD is not approached from an overall program perspective but rather focuses on the individual phases.
- There is often more than one version of a lecture on the network.

- All LO associated situations
- Curriculum items contain or do not contain LOs as designated in the MCG.
- Various FTI learning objectives do not match learning objectives presented in the Master Curriculum Guides.
- Various learning objectives contained in the lectures do not match the learning objectives presented in the Master Curriculum Guides.

4.3 Solution 3

Examine all graphical materials presented within UMFO training, including FTIs, CBT/CAIs, and lecture presentations (input from the students should be solicited). All graphics that appear too small, blurred, difficult to read, not showing enough detail, or not specific to the accompanying information should be recreated. The new versions of the graphics should then be inserted back in the appropriate places.

Recreating the insufficient graphics would allow for the students to learn more from training materials and free up more instructor time for teaching other concepts. It would also free up time on other training equipment that the students must examine to get the information they could have gotten from a graphic.

This is a possible solution for the following situation statements:

- Diagrams and pictures located in the FTIs are difficult to understand.
- Many of the graphics/photographs shown in the Computer-Aided Instruction are not detailed enough for the student to receive any true benefit from them.

4.3.1 Alternative to Solution 3

As each individual piece of instructional media/material is updated or changed in some way, analyze the graphics within that item. Revise and reinsert any necessary graphics.

Although the process would take longer, the benefits of recreating the graphics in this manner would be the same as the original solution. It would allow for the students to learn more from training materials, free up more instructor time for teaching, and free up time on other training equipment.

This is a possible solution for the following situation statements:

- Diagrams and pictures located in the FTIs are difficult to understand.

- Many of the graphics/photographs shown in the Computer-Aided Instruction are not detailed enough for the student to receive any true benefit from them.

4.4 Solution 4

More student interaction should be added into the CBT/CAI lessons. The CBT/CAI lessons should have more types of progress check questions other than multiple choices. They should include questions such as drag/drop and fill in the blank. More interaction can also be added within the content of the courseware by adding features such as selecting a photo to see a more detailed view or when instructing on a procedure have the students select the buttons in the appropriate order in order to continue.

Adding more student interaction throughout the lessons would help to keep student interest while going through the topics. This will make the courseware a more valuable instructional tool for the students. The predicted effect of this solution is to increase student understanding of the CBT/CAI programs, in turn decreasing the time instructors must spend reinforcing information presented in the programs.

This solution is a possible solution for the following situation statement:

- Most of the Computer-Aided Instruction courses lack any type of interaction from the student.

4.5 Solution 5

The classrooms need to be setup to reach optimal student performance. Whichever direction the desks face in the classroom, they should be facing the instructor as well as the whiteboard/blackboard and the direction the lecture presentation will be displayed.

By having the student desks face all of the instructional elements (i.e., instructor, board, screen) they will not be forced to turn from one side to another to view necessary information. This will avoid physical discomfort for students, while making it easier for the instructor to keep the student's attention.

In addition, the color and lighting of the classrooms should be changed. The rooms should be made brighter with paint and lighting, this would increase student alertness.

This solution is a possible solution for the following situation statement:

- Many UMFO classrooms are not set-up for optimal student performance.

4.6 Solution 6

From the master list of learning objectives an instructional designer should write a pool of assessment tools. There should be a minimum of two types of questions written for each learning objective with a minimum of two questions for each type. This will give a pool of at least four assessment questions per learning objective allowing each student to receive slightly different tests.

This will ensure that all learning objectives are being tested properly. It will help to be certain that a true measurement of the training success is being achieved.

4.7 Solution 7

A standards guide should be created that includes development standards for each type of training materials. Standards would be applied to FTIs, CBT/CAI, lecture presentations, and videos used in training. The standards will inform instructional designers, graphic artists, and developers on all elements of the delivery method such as what is required to be included and the ordering and layout of required information.

Using a standards guide will ensure that all presentations of information, regardless of delivery method, include certain types of information. It will also ensure that functionality and layout are the same within any one type of delivery method. All training created should utilize the standards guide.

This will help to make the training materials more efficient and easier for the instructors to train with and the students to understand.

This solution is a possible solution for the following situation statements:

- The presentation of equipment and training materials lacks an overall style guide.
- The degree of clarity in lectures varies. Some lectures are easily understood, others need further elucidation from the instructor.
- Certain presentations list the learning objectives to be covered while others do not.
- Diagrams and pictures located in the FTIs are difficult to understand.
- Curriculum items contain or do not contain LOs as designated in the MCG.
- Various FTI learning objectives do not match learning objectives presented in the Master Curriculum Guides.
- Various learning objectives contained in the lectures do not match the learning objectives presented in the Master Curriculum Guides.
- There is no connection made between the learning objectives listed in the Computer-Aided Instruction and the objectives in the Master Curriculum Guides
- Most of the Computer-Aided Instruction courses lack any type of interaction from the student.
- Many of the graphics/photographs shown in the Computer-Aided Instruction are not detailed enough for the student to receive any true benefit from them.

4.8 Solution 8

Solution 8 (Crew Coordination, Situational Awareness, and Other FRS-identified Deficiencies)

Increased realism, delivered through the use of quality training materials, CBT, and flight simulation, must be injected into UMFO training for the purpose of continuously developing crew coordination skills across the entire continuum of UMFO training. This solution should obviously involve a supporting ISD team for evaluating and updating existing UMFO curricula and training materials (refer to Solution 1). Additionally, this solution should include a requirements definition, design, and delivery of a high fidelity simulation capability where student UMFOs could directly and realistically apply crew coordination principles. These principles, target learning objectives, and the associated solutions must be conceptually founded on the fact that MFOs will ultimately be responsible for managing the employment of multi-seat aircraft in task-saturated, multi-mission situations.

In addition to addressing crew coordination development, this solution is also applicable to the development of situational awareness. Situational awareness, defined as the capability to "perceive environmental elements internal and external to an aircraft at any specific point in time, and interpret and comprehend their meaning and the projection of their state in the near future" (Kirlik & Strauss, 2003), is a critical skill related to the ability to manage the employment of multi-seat aircraft in task-saturated, multi-mission situations. Developing situational awareness for succeeding in this type of environment should involve the realistic training immersion of UMFOs with focus on teaching big-picture thinking and task management, which could be provided through mission-representative, high fidelity simulation.

Furthermore, this solution is directly applicable to addressing other FRS-identified deficiencies such as communication and NATOPS usage skills.

Beyond evaluating and updating existing UMFO curricula and training materials, the ideal simulation capability should directly replicate the physical environment and crew interaction that occurs during training events. As a result, UMFO students would be better prepared for flight events and could continually build their crew coordination, communication, and NATOPS usage skills, as well as their situational awareness ability throughout their training. This solution should ultimately enhance the flight experience, not replace it, and would address inadequate preparation of UMFO graduates for entry into FRS/RTU training, where they are expected to achieve the capability to effectively and safely employ Fleet aircraft.

This solution is a possible solution for the following situation statements:

- Crew Coordination
- Situational Awareness
- Other FRS-identified Deficiencies

4.8.1 Alternative 1 to Solution 8

Increase academic and training event emphasis on continually developing situational awareness ability and crew coordination, communication, and NATOPS usage skills. This could be accomplished by applying the format of scenario development and discussion in the academic setting and applicative reinforcement by assigning specific, progressive development goals for each

individual training event. Creating and implementing this alternative would involve a supporting ISD team for evaluating and updating existing UMFO curricula and training materials (refer to Solution 1). This alternative should be implemented with Solution 8 and is listed as an alternative dependent on funding.

This solution is a possible solution for the following situation statements:

- Crew Coordination
- Situational Awareness
- Other FRS-identified Deficiencies

4.9 Solution 9

Trainers must parse the intermediate and advanced learning objectives and level of expertise, as seen in the surveys 2B47 good for practicing intermediate T-34 learning objectives but not used past that. Microsim has the potential to support this area, with the new cockpit simulated, but must be integrated into the curriculum and not simple set aside for extra use. Current intermediate curriculum is only 8 flights and 1 sim, this may change with the integration of TW6 vision, but still leaves room to use Microsim to support the intermediate learning objectives better than the 2B47. Introduction of the Microsim in the Intermediate phase may assist Advanced students in maintaining or refreshing skills learned in the previous phases. Students that do use it find it helpful, TW6 should more thoroughly examine the benefits that this inexpensive trainer may hold, also allowing students a sufficient simulated environment to practice basic skills.

4.10 Solution 10

CV procedures being unrelated to the T-39 (or its replacement platform) does not support teaching CV procedures during T-39 stages. Move CV procedures to the ATM curriculum where the information will be introduced at the latest point in training so that it may be better recalled upon graduation. Remove any requirements from the T-39 follow-on aircraft or associated trainers to simulate the CV environment. This will ensure that funds are not expended on unrelated, unrealistic training.

Maintain the CV Procedures lecture and all CV LOs in academic instruction only. Ensure the LOs are incorporated into the MCG as an introduce item.

4.10.1 Alternative 1 to Solution 10

The current ATM platform, T-2C, does not have a visual simulator capable of training in the CV environment; considering the age of the platform this is not recommended. Many of the basic CV procedures could be accomplished in the aircraft using the carrier-boxes outlined and Fresnel Lens at NAS Pensacola, and local ATC could be used to assist in establishing "local" approaches, which mimic those of the CV. This would allow actual flights simulating the carrier environment and in conditions of a more representative aircraft. Moving the CV LOs to the ATM curriculum where they can be more effective will impact the requirement for the T-2 follow-on.

4.11 Solution 11

Remove the two formation flights from the Intermediate curriculum, the purpose of these flights at this stage of training is not clear, as some of the students graduating from Intermediate will not need these skills. Use this time to enact further jet flights and/or simulation or crew coordination instruction.

4.12 Solution 12

The T-48 fleet will all be purchased with RADAR capability, therefore introduce RADAR theory and basic operation in the Intermediate syllabus. This will allow for earlier exposure to the RADAR and allow a progressive introduction of RADAR tasks, vice the current approach. This will also allow E-2 graduates exposure and background to RADAR.

4.13 Solution 13

The UMFO curriculum should revise and add the following LOs:

- Add LOs for Situational Awareness to all phases as a graded item since these are critical skills required by aviation and the FRS.
- Add objectives for Crew Coordination to all phases and add the instruction of the "7 Skills" which are outlined by CNO memorandum.
- Align the LOs in similar portions of the strike and strike/fighter curriculums.

5 Recommendations

Since this is a new procurement, NAVAIR with assistance from CNATRA is the principal action agency for implementing any recommendations that are accepted from this study.

5.1 Recommendation 1

With the acquisition of the T-48 to replace the T-39, the Navy has the opportunity to re-baseline the UMFO Intermediate and Advanced training phases that will rectify the shortfalls of the existing training program. It is recommended that an integrated Training System be acquired from a single source prime contractor. It is further recommended that this training system be developed using a training continuum concept not only within the Intermediate and Advanced phases, but also in concert with the Primary and Advanced Tactical Maneuvering phases of the UMFO program. The integrated training system continuum is depicted in Figure 13.1-1 and should follow an ISD methodology and consist of the elements that are addressed in the following recommendations. The ISD methodology should be consistent with the policies and methods established by the CNATRA FTSC.

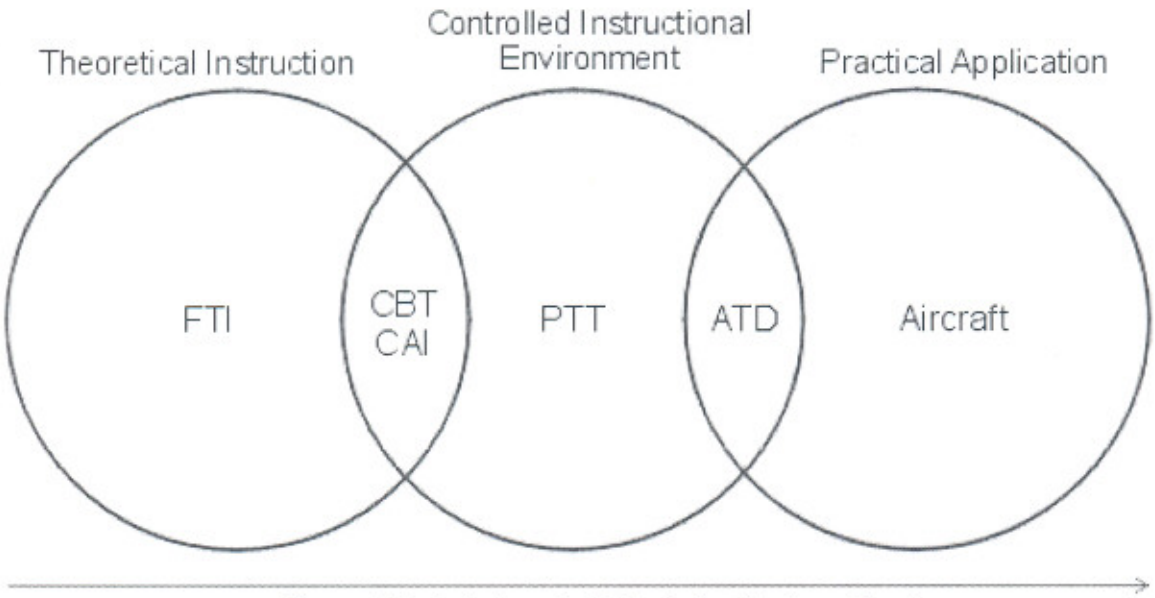

Figure 5.1-1 Integrated Training System Continuum

5.2 Recommendation 2

Facilities for the Intermediate and Advanced phases need to be either modified or built to provide a positive training environment. It is recommended that a facility that houses all of the T-48 GBTS elements and is located within walking distance of the hangar be obtained. The optimum solution is a new facility that is dedicated to the T-48TS, however budgetary and time constraints may not permit this option. If a new facility is not feasible, it is recommended that an expansion of Building 3245 or a modification of the VT-86 (if vacated by the Blue Angels) hangar be considered for the T-48TS. The ramification of not implementing this recommendation is that there will not be facility space for the elements of the training continuum.

5.3 Recommendation 3

It is recommended that new Flight Training Instructions, Computer Based Training and Computer Aided Instruction be procured from the T-48 contractor. It is also recommended that the Instructional Systems Development process be used in the development of these materials and that the process considers the Intermediate and Advanced stages as components of the entire UMFO program rather than as individual stages. Procurement of FTIs, CBT and CAI will ensure that the instructional material is based on the learning objectives, reflects the aircraft and RADAR configuration, graphics and schematics are of instructional quality and is developed to the CNATRA TIMS standards. New materials will also ensure that a baseline is developed for the CNATRA FTSC to maintain configuration management of the CBT, CAI and FTIs. The ramifications of not implementing this recommendation is that the existing configuration management issues and poor quality of graphics and schematics will continue to impact student training, the CBT and CAI will not be TIMS compliant and the infusion of simulation and emulation technology into the CBT and CAI will not be achieved.

5.4 Recommendation 4

It is recommended that a minimum of four (4) Electronic Classrooms and a 30-seat Student Learning Center be procured either from the T-48 contractor or by the government in a separate procurement action. The ECs and the SLC will need to meet the requirements of the NMCI specifications and also ensure compatibility with the CNATRA TIMS. The ramification of not procuring the ECs and SLC is that the configuration management of the CBT and CAI will not be locked in to the CNATRA TIMS and the CM and standardization problems that exist today with lectures and courseware will continue. An additional ramification is that students will not have an option for self-paced review and self-paced instruction to supplement the instructor led lessons.

5.5 Recommendation 5

It is recommended that eight (8) RADAR Part Task Trainers be procured from the T-48TS contractor. The RADAR PTTs should be used for early stage Intermediate RADAR instructional events and for student practice and should accurately replicate the functionality, switches and knobs of the RADAR that will be in the aircraft. The PTTs should meet performance requirements that will permit the student to learn systems operation and perform basic air-to-air intercepts and ground mapping RADAR procedures. The ramification of not implementing this recommendation is that RADAR familiarization and early stage basic RADAR procedures will need to be accomplished in an ATD or in the aircraft and that the students will not have a device to conduct independent RADAR practice.

5.6 Recommendation 6

It is recommended that a minimum of eight (8) Aircrew Training Devices that replicate the configuration and functionality of the aircraft cockpit be procured from the T-48TS contractor. The ATD should also have a visual system that simulates the aircraft field of view. The ATDs should be used for student cockpit and sensor familiarization, normal and emergency procedure training, and the introduction and practice of flight and RADAR procedures. The ATD can also be used in the Instructor Under Training Syllabus and for instructor qualifications. The ramifications of not implementing this recommendations are the loss of flexibility to migrate aircraft flights to the ATD, increased time spent on cockpit familiarization in the aircraft, the lack of a device to conduct training in a controlled environment, no device to conduct all emergency procedures, and the loss of a device to conduct additional situational awareness and crew coordination training. An additional and perhaps the most important ramification is that UMFO students will have a high fidelity ATD in the primary phase of training and regress in the Intermediate and Advanced phases.

5.7 Recommendation 7

It is recommended that the replacement aircraft and RADAR that will be procured from the T-48TS contractor meet or exceed the performance requirements of the T-39 and the APG-66 RADAR. The delta between desired and achieved levels of Situational Awareness, Crew Coordination and Crew Resource Management that exist today in UMFO graduates will be exacerbated if the performance levels of the replacement aircraft and RADAR do not at least match the existing systems. Fleet aircraft performance and the increased amount of data that fleet aircrew

have to assimilate and process continues to increase exponentially, requiring aircrew who have strong SA, CRM and CC skills and are capable of multi-tasking.

6 Summary

Procure an integrated training system from a single source prime contractor. The ISD process should be utilized to ensure a training continuum concept not only within the Intermediate and Advanced phases, but also in concert with the Primary and Advanced Tactical Maneuvering phases of the UMFO program.

Modify or build facilities that will be dedicated to the T-48 GBTS. This will permit all elements of the GBTS to be co-located and increase the efficiency of the program and ensure a positive learning environment.

Procure new Flight Training Instructions, Computer Based Training and Computer Aided Instruction.

Procure Electronic Classrooms and a Student Learning Center for the CBT and CAI.

Procure RADAR Part Task Trainers that replicate the functionality, switches and knobs in the aircraft RADAR.

Procure Aircrew Training Devices that replicate the functionality and configuration of the aircraft cockpit as well as the aircraft field of view.

Procure aircraft and RADAR that meet or exceed the performance characteristics of the existing systems.

Appendix A
Surveys
See Attachments