Joint Naval Flight Officer / Combat Systems Officer

Training Systems Requirements Analysis

Submitted by:

Aviation Training Consulting, LLC
123 West Commerce Drive, Suite 424
Altus, Oklahoma 73521

Training Situation Document

For

Undergraduate Military Flight Officer Training Program

12 August 2004

Submitted by:
Aviation Training Consulting, LLC
123 West Commerce, Suite 424
Altus, Oklahoma 73521

Approved by: Robert C Gx Date: 8/12/2004
President/CEO

Unclassified

Unlimited Rights Notice

These data are furnished with Unlimited Data Rights to the United States Government in accordance with the provisions of: Contract Number N00421-99-D-1324

Distribution Statement

Distribution authorized to the Department of Defense and the United States DoD contractors only to protect technical or operational data or information from automatic dissemination under the International Exchange Program or by other means, determined February 19, 1992. Other requests shall be referred to Naval Air Systems Command.

Change Record

Revision	Date	Description of changes	Requested by:
0	08/12/04	Initial Release	

Table of Contents

List of Figures

List of Tables

List of Acronyms

ACMI	Air Combat Maneuvering Instrumentation
AETC	Air Education and Training Command
AFS	Air Force Specialty
AHRS	Attitude Heading Reference System
AIRT	Air Intercept Radar Trainer
API	Aviation Preflight Indoctrination
ARIP	Air Refueling Initial Point
ATC	Aviation Training Consulting, LLC
ATIS	Automated Terminal Information System
ATM	Advanced Tactical Maneuvering
ATO	Air Tasking Order
BDHI	Bearing Direction Heading Indicator
CAI	Computer Aided Instruction
CARA	Combined Altitude Radar Altimeter
CBT	Computer Based Training
CCR	Customer's Critical Requirements
CDU	Control Display Unit
CNATRA	Chief of Naval Air Training
CNO	Chief of Naval Operations
COTS	Commercial Off-the-Shelf
CP	Current Program
CPT	Cockpit Procedures Trainer
CPFH	Cost Per Flying Hour
CSAF	Chief of Staff Air Force
CRAG	Contractor Risk Assessment Guide
CRM	Crew Resource Management
CSO	Combat Systems Officer
DIF	Difficulty Importance Frequency
DME	Distance Measuring Equipment
DOFI	Director of Operations Introductory Flight Training
ELO	Enabling Learning Objective
EWO	Electronic Warfare Officer
FAA	Federal Aviation Administration
FLIP	Flight Information Publications
FLIR	Forward Looking Infra Red
FRS	Fleet Replacement Squadron
FTD	Flight Training Devices
FTS	Flying Training Squadron
FTU	Flying Training Unit
FY	Fiscal Year
FYDP	Future Years Defense Program
GBT	Ground Based Training
GFI	Government Furnished Information
GIS	Geo-spatial Information Systems
GMRT	Ground Mapping Radar Training

GPS	Global Positioning System
HSI	Heading Select Indicator
ICSO	Instructor Combat Systems Officer
IFF	Identification Friend or Foe
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMI	Interactive Multimedia Instruction
INFO	Instructor Naval Flight Officer
INS	Inertial Navigation System
IPT	Integrated Product Team
IR	Infrared
ISD	Instructional System Design/Development
IUT	Instructor Under Training
JFACC	Joint Forces Air Component Command
JHT	Jardon and Howard Technologies
JIL	JIL Information Systems, Inc.
JPATS	Joint Primary Aircraft Training System
JSUNT	Joint Specialized Undergraduate Navigator Training
JTI	Job Task Inventory
KSA	Knowledge, Skills, and Attitudes
KTAS	Knots True Airspeed
LLLTV	Low-Light Level Television
LO	Learning Objective
LRC	Learning Resource Center
LRU	Line Replaceable (Repairable) Unit
MANS	Marine Aerial Navigation School
MFD	Multi-Function Display
MFO	Military Flight Officer
MILCON	Military Construction
MOA	Military Operating Area
MOS	Military Occupational Skill
MPA	Multi-Place Aircraft
MPT	Manpower, Personnel and Training
MTL	Master Task List
NAS	Naval Air Station
NASP	Naval Air Station Pensacola
NAV	Navigation
NAVAIR	Naval Air Systems Command
NCS	Navigational Computer System
NETC	Naval Education Training Center
NFO	Naval Flight Officer
NLT	no later than
NVG	Night Vision Goggles
OFT	Operational Flight Trainer
O&M	Operations and Maintenance
ORM	Operational Risk Management

OPNAV	Office of the Chief of Naval Operations
OTS	Over-The-Shoulder
PFPS	Portable Flight Planning Software
POR	Program of Record
PTT	Part Task Trainers
RFP	Request for Proposal
ROI	Return on Investment
RPA	Remotely Piloted Aircraft
RST	Radar Simulation Technology
SA	Situational Awareness
SAT	Systems Approach to Training
SIM	Simulator
SME	Subject Matter Expert
TACAN	Tactical Air Navigation
TAS	True Air Speed
TER	Transfer Effectiveness Ratio
TLO	Terminal Learning Objective
TSA	Training Situation Analysis
TSAR	Training System Alternatives Report
TTP	Tactics, Techniques, and Procedures
TW-6	Training Air Wing Six
UAV	Unmanned Aerial Vehicle
UHF	Ultra High Frequency
UMFO	Undergraduate Military Flight Officer
UTD	Unit Training Device
UTE	Utilization Rate
VDT	Visual Display Terminal
VFR	Visual Flight Rules
VHF	Very High Frequency
VOR	Very High Frequency Omni-directional Radio
WSO	Weapons Systems Operator

1.0 EXECUTIVE SUMMARY

This study was conducted over a 90-day period to meet a financial investment decision deadline imposed on Training Air Wing Six (TW-6) at NAS Pensacola.[1] Given the short timeframe, the study performed a combined, high-level Training Situation Analysis (TSA) and Training System Alternatives Report (TSAR) using the standard Naval Education and Training Command (NETC) templates as guidance. Both the TSA and the TSAR were adapted to support capital investment decisions driven by fiscal pressures, technology/tactics-driven changes in the operational employment of the Naval Flight Officer and the Air Force Navigator, and the impending retirement of the T-39G/N aircraft. Results are summarized in Table 1; greater detail is provided in Section 4.

TRAINING SITUATION ANALYSIS

The TSA was carried out by Aviation Training Consulting, LLC (ATC), an experienced Instructional Systems Development (ISD) and Systems Approach to Training (SAT)[2] curriculum and strategic consulting company, with the aid of Subject Matter Experts (SMEs) from 14 different training squadrons in three Services and two allied nations, representing 13 different aircraft type/model/series. The TSA process included development of a Job Task Inventory (JTI) that captured all Services' undergraduate training requirements at a high level; this may be the first time this has been accomplished. The initial JTI draft was developed by ATC after reviewing applicable Navy and Air Force documents, and was further refined by SME review at NAS Pensacola with NETC Human Performance Center oversight. The final version of the JTI was validated at the 2004 Undergraduate Military Flight Officer (UMFO) conference held July 20-21, 2004 at NAS Pensacola.

Undergraduate Military Flight Officer (UMFO) training at NAS Pensacola runs in parallel with Joint Specialized Undergraduate Navigator Training (JSUNT) conducted at Randolph AFB, TX. Students from both Services as well as international students are swapped between these two programs, under a Memorandum of Agreement[3]. This cooperative program allows the Services to leverage the strengths of the different curricula to achieve their respective desired student performance without completely duplicating the other Service's training program. However, that does not mean the current arrangement is a *joint* training program; students flow between the two programs (Figure 2.1), but the two curricula are not directly linked together. The current linkage between the UMFO curricula and the graduate level training at the Fleet Replacement Squadrons (FRSs) and Field Training Units (FTUs) is also weak and indirect.

[1] *Joint Naval Flight Officer (NFO) / Combat Systems Officer (CSO) Training for the 21st Century: Training Systems Requirements Analysis Statement of Work*, 23 April 2004

[2] Instructional System Development/Systems Approach to Training; see DOD Mil Hdbk 1379 series.

[3] The MoA is between AETC/DO and CNATRA.

TRAINING SITUATION ALTERNATIVES REPORT

The TSAR was completed by Aviation Training Consulting, LLC after surveying the state of technology in the aviation training industry and considering future training requirements. Next, representative sets of notional training media were identified. These sets of media were selected as complementary arrangements of aircraft and simulation that were (a) economically feasible, (b) of interest to the Services, and (c) likely to meet the training requirements of the JTI. In general, it was decided that ground simulation and the T-6A airframe are the most probable common elements in the optimum media mix. The selected notional sets of media (not including Interactive Multimedia Instruction and Computer Aided Instruction) are termed *options*, and are portrayed in Table 1.1. Each option was then evaluated as a training system against the requirements of the JTI to ensure no overall degradation of student performance; all options in Table 1.1 will meet the JTI requirements.

In this analysis, ground simulation is assumed to be composed of Part Task Trainers and networked Flight Training Devices equipped with at least level C visual capability and high-end tactical radar (e.g., F-16) simulation capability. The T-6S is a modified T-6A equipped with high-end tactical radar simulation (synthetic radar), multi-function displays and a mission computer. The MPA-X is a multi-place (pilot, student UMFO, instructor NFO/CSO) aircraft equipped with actual high-end tactical radar, and is provided by a contractor on a fee-for-service basis. A variation on the MPA-X theme also introduces a modified version of the T-1, currently employed by Training Air Wing Six and the USAF. This variant, the T-1S, would incorporate radar simulation in place of operational radar. The current T-45C has neither a mission computer nor radar, simulated or actual. A modified version of the T-45 that incorporates synthetic radar is currently being explored by the United States Navy.[4] This variation has definite utility in the UMFO curriculum and is examined in the alternatives analysis as the T-45S.

Since flying hours are the most expensive and most hazardous aviation training media, and since this media is a principal budgeting tool for the Services, a 15% iterative reduction in flying hours was employed as the primary variable to establish the financial behavior of the options. This approach was applied to the Strike Fighter Advanced Tactical Maneuvering (ATM) pipeline, since it represents the largest investment and the most critical student performance requirement. The flying hours thereby eliminated were then replaced with simulation hours at a 1.5:1 ratio.

Next, the flying hours were distributed proportionally among the media in each option, and then the baseline and 15% reductions were modeled against current student flow projections from FY05 through FY11. The resulting Operations and Maintenance (O&M) costs were captured along with procurement costs where applicable to produce Return-On-Investment (ROI). Also, an assessment of the comparative value and risk is provided for each representative set.

[4] See Request for Information-Airborne Synthetic Tactical Radar (ASTR), 4 Jun 2004, Naval Air Systems Command, www.cbd-net.com/index.php/search/show/611698, accessed 9 Aug 2004.

RESULTS

The following table summarizes the aggregate cost, value and risk associated with each option, evaluated for the Strike Fighter pipeline at the current level of flight hours. As flight hours are traded for simulation uniformly across the options, the net cost figures decrease, but the relative financial ranking of the options do not change. Net cost values are aggregates across the Future Years Defense Program (FYDP) (FY05-11), and include procurement and operating costs and cost avoidance. Risk includes technical, schedule, and performance risk. Value incorporates unquantifiable and intangible aspects such as aerial mentoring between the instructor NFO/CSO and the student. A ranking of 1 is the highest and 7 is the lowest in value.

#	Description	Flight Hours per Student	Financial Comparison			Final Ranking		
			Net Cost, $M	Delta from Current	% from leader	Fiscal	Risk	Value
	Current Program	130	$1,028	0	---	---	---	---
1	T-6A + T-6S	130	$703	-$325	**1**	**2**	**1**	**1**
2a	T-6A + T-6S + T-45A/C	130	$886	-$142	28	4	6	7
2b	T-6A + T-45S	130	$1,524	$496	120	7	5	6
3a	T-6A + MPA-X	130	$694	-$334	**0**	**1**	**3**	**2**
3b	T-6A + MPA-X + T-45A/C	130	$889	-$139	28	5	**2**	**3**
4a	T-6A + T-1S	130	$731	-$297	**5**	**3**	4	4
4b	T-6A + T-1S + T-45A/C	130	$927	-$101	34	6	5	5

Table 1.1 Summary of Alternatives

Financial. Most of the options indicate a significant potential ROI, even before flying hour reductions are imposed. The net cost estimates of the three leading options (3A, 1 and 4A) are within 5.4% of each other; this difference is approximately the margin of error. The difference between 3A and all other options (2A, 2B, 3B, and 4B) is at least 28%; options 1, 3A, and 4A merit further consideration on a purely financial basis. It is worth noting that none of these three options include procurement of the T-45 for the UMFO program; the T-45S option is roughly 50% more costly than the current program, and does not merit further consideration.

Risk and Value. On a combined risk and value basis, option 4A was the fourth best option, and scored 22% below the leader (option 1); the second best option (3A) scored 13% below the leader. Two options tied for fifth in ranking for risk. When risk and value are combined with financial ranking, options 1 and 3A outperform the other options in the analysis.

3a No ATM?

RECOMMENDATIONS

Further analysis is recommended prior to a final investment decision. The proximity of the scores between options 1 and 3A argues for considering a blended approach in any

follow-up analysis. Securing some MPA-X flight hours for five or six years should mitigate risk in the transition period while the T-6S training system matures and the training curriculum follows an ISD-driven spiral development path.

Further effort to directly link NFO and CSO curricula is recommended, and not just to reduce duplication of effort and expense. The degree of overlap between Air Force CSO mission tasks and Naval Flight Officer mission tasks is large, and appears to be getting larger as network-centric warfare becomes the dominant reality; this fact alone is sufficient to justify further refinement of the joint JTI. Operationally, the NFO/CSO serves as the functional on-the-scene link between the tactical employment of Service-specific air power and the operational employment of joint and combined air power. Within the larger scope of Office of the Secretary of Defense Training Transformation strategic initiatives that are designed to "develop individuals and organizations who *think joint* intuitively",[5] it may be appropriate to establish an Integrated Product Team chartered to plan, program and implement an integrated joint training program. This approach would leverage the *primacy of training*[6] principle; graduate NFOs and CSOs would "*think joint* intuitively" because, like the weapon systems they will operate, they are "*born joint*." This approach supports the Air Education and Training Command (AETC) CSO program, the Air Force Task List,[7] the Universal Navy Task List[8] and CNO Guidance for 2004.[9]

This effort was scaled in time and scope to meet a short term need; a follow up ISD/SAT effort across the training continuum (from accession through the FRS/FTU) would help the Services plan and program for long-term success. A detailed joint task analysis and curriculum will assist the Service acquisition communities by properly defining training media performance requirements, and it will serve as the baseline for spiral development as weapon system technology and tactics evolve.

The tasks currently trained at NAS Pensacola are captured in the JTI, which also incorporates the Air Force CSO task list[10]. This high-level JTI should serve as a foundation for further development of a detailed task list suitable for designing curriculum and courseware, should the Services elect to follow the DoD process for developing UMFO training. The JTI also serves as an aid in defining entry level performance for FRS and FTU training, and has implications for Service accession testing, screening and introductory aviation programs. The JTI can be found in Appendix F.

[5] Executive Summary, *DOD Training Transformation Implementation Plan*, 9 June 04
[6] "Teach it right the first time, because that is what makes the most lasting impression."
[7] AFDD 1-1, 12 Aug 1998, Appendix C
[8] OPNAVINST 3500.38A 1 May 2001, Appendix B, NTAs 4.9.1 through 4.9.3.
[9] "Better align for joint warfare. Conduct a study to identify those ratings for which opportunities exist to merge aviation relevant training between USN/USCG/USAF/USMC/USA and commercial activities. Report findings by Jun 04." (www.chinfo.navy.mil/navpalib/cno/clark-guidance2004.html)
[10] Combat Systems Operator, or CSO; an interim Air Force CSO program will begin 1 Oct 2004 at Randolph AFB and will replace Navigator undergraduate training.

2.0 TRAINING SITUATION ANALYSIS

2.1 INTRODUCTION

Undergraduate Military Flight Officer (UMFO) training is conducted by the Naval Aviation Training Air Wing Six (TW-6), Naval Air Station (NAS) Pensacola, FL and by the 12th Flying Training Wing, Randolph AFB, TX. This training is designed to provide commissioned officers from the United States Navy (USN), United States Marine Corps (USMC), United States Air Force (USAF), and Foreign Military Officers with the skills necessary to meet the demanding Naval Flight Officer (NFO) and Combat Systems Officer (CSO) tasks and requirements of present day and future joint military operations. The mission of the NFO/CSO (commonly referred to as UMFO) is evolving, and will continue to do so on the advanced technological battlefield. Emerging Fleet and operational unit requirements will continue to drive training requirements to higher levels of efficiency and effectiveness. To be responsive, the UMFO training curriculum must evolve in parallel with real world requirements.

This study was conducted over a 90-day period to provide input for a financial investment decision deadline faced by Training Air Wing Six at NAS Pensacola. The study accomplished a modified Training Situation Analysis (TSA) and Training System Alternatives Report (TSAR). Both reports are tailored and scaled to the scope of this study, and are contained in this document.

Both the TSA and the TSAR were adapted to support capital investment decisions driven by fiscal pressures and technology-and tactics-driven changes in the operational employment of the UMFO. The alternatives analysis views a sampling of available and emerging technology that could be incorporated into UMFO curriculum. An acceptable alternative should only improve, not degrade the high quality training currently administered at NAS Pensacola. This analysis should form the basis for Navy and Air Force decision makers to effectively determine future training decisions and capital investment plans necessary to keep UMFO training responsive to real world requirements.

2.2 STUDY BACKGROUND

2.2.1 Study purpose

A number of recent circumstances have necessitated a comprehensive review of the way student UMFOs are trained. Specific background details are presented in Section 2.4. These circumstances provided an ideal opportunity to reassess the skills required to meet Fleet Replacement Squadron (FRS)/ Flying Training Unit (FTU) requirements – and to determine the best way to teach those skills. Therefore, ATC was asked to refine the general training need established by Chief of Naval Air Training (CNATRA) and AETC (in conjunction with the follow-on FRSs and FTUs) and to identify and evaluate possible alternative solutions to training integration challenges. Once the training system need was identified, alternative approaches to the design and development of the training system were analyzed and evaluated.

2.2.2 Principle result

The UMFO community has the opportunity to significantly advance their training capabilities in a cost effective manner using innovative yet proven technology. Sufficient programming lead time will be necessary to position training resources at Pensacola NAS to accommodate the challenges of both USN and USAF requirements. Simulation and technology-based training devices, and Interactive Multimedia Instruction (IMI) can provide a large percentage of the training, but are currently under-exploited. However the need to train some metaskills in an airplane remains evident to reinforce higher level learning and instill confidence. Furthermore, UMFO training conducted at Training Air Wing Six needs to be a jointly integrated (US Navy and USAF) curriculum with a jointly developed Master Task List (MTL). Further Instructional System Design (ISD) analysis of both the US Navy NFO and US Air Force CSO curriculum is required for a systematic integration into a combined UMFO program. Further analysis across the training continuum, from Aviation Preflight Indoctrination (API) through the FRS/FTU units, would best define the required tasks needed to meet real world requirements. This effort could greatly increase training efficiencies for both services, and promote joint interoperability concepts to junior military flight officers early in their careers.

2.2.3 Main assumptions

The TSA was conducted under the following starting assumptions:

- The Government Furnished Information (GFI) provided is accurate
- Previous studies conducted by JIL Information Systems, Inc. (JIL) and Jardon and Howard Technologies (JHT) are valid
- There are six major end-state pipelines, see Figure 2.1, Section 2.3.1.1:
  - F-15E
  - Advanced Tactical Maneuvering (ATM) (F/A-18D/F, EA-6B, S-3)
  - B-1B
  - Airlift/Tanker/Maritime (E-6, P-3, KC-135, B-52, C-130)
  - E-2C
  - Electronic Warfare Officer (EC-130, EC-135, RC-135)
- The subject matter experts provided by the FRS/FTU represent the fleet and own the operational requirements of their respective pipelines
- The alternatives will maintain and/or improve current performance
- There will be no increase in the training burden of the FRS/FTU (no upload of training requirements)
- Future focus is critical
- The alternatives will maintain the current Program of Record (POR)
- Alternatives will be affordable

- The optimal solution is a single joint solution
- TW-6 will continue to provide all UMFO training

2.2.4 Major restrictions

The major restriction to these alternatives and recommendations documented in this report was the time limitation. This primarily impacted the level of development and analysis of the task list. Since the goal of this study was to identify and evaluate possible alternative solutions to training integration challenges — vice actually building instruction or preparing RFPs for specific training systems — the level of detail achieved is sufficient to support the study alternatives and recommendations.

A second restriction was the fact that the Air Force and Navy accomplish Electronic Warfare (EW) training at different points in the training continuum. The Air Force conducts EW training in conjunction with Panel Navigation undergraduate training at Randolph AFB; the Navy conducts EW training at NAS Whidbey Island after undergraduate training. The specific issues of merging EW training into a single Joint program are beyond the scope of this study. However, any probable solutions are predominately ground based (e.g. classroom, IMI, simulation) and can be supported by all study alternatives.

2.2.5 Study objectives

The objective of this study was to refine the general training need established by CNATRA and AETC (in conjunction with the follow-on FRSs and FTUs) and to identify and evaluate possible alternative solutions to training integration challenges. Once the training system need was identified, alternative approaches to the design and development of the training system were analyzed and evaluated.

2.2.6 Basic methodological approach

The recommendations and alternatives presented in this study have resulted from the integration of the following main study efforts:

- A literature review of the two recent studies of the UMFO program
- Review of training equipment currently utilized
- Development and analysis of a task inventory, with an associated media analysis
- Development of alternatives based on a technology assessment
- A value and risk analysis of the alternatives
- A financial analysis of selected alternatives

The two recent studies of the UMFO situation provided as GFI were conducted by JHT (Nov 2003),[11] and JIL (Sep 1999).[12] The analysis of the UMFO training situation presented in these studies was viewed by Training Air Wing Six as generally valid, as were many of the assessments and recommendations resulting from the JHT and JIL studies. Consequently, the research presented in these studies was not duplicated by

[11] Contract # N61339-03-D-0008
[12] Contract # N61339-98-D-0005

ATC, and several key observations and recommendations made in the JHT and JIL studies were incorporated in the decision matrix employed for the recommendations and alternatives presented in this study. The following key items were considered most relevant:

- "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 outdated and is being utilized to fulfill requirements outside of the equipment's initial design capabilities… or is too generic to present a proper training scenario in relation to the learning objectives of the phase of training."
- "There is [a disconnect] in the perception between the Training Command and 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 [encountered at the FRS/FTU]."
- "The correction to many of the deficiencies noted … is to acquire a robust, ground-based training environment with training equipment and materials that are representative and maintain current with the aircraft and allows the acquisition and practice of the skills required of a MFO through a training continuum. This should be accomplished through an Instructional System 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."

The assessment of the training equipment utilized in UMFO and JSUNT training programs is based on the JIL and JHT studies, a literature review of curriculum documents, inspection/observation of the training equipment and IMI at NAS Pensacola, interviews with instructors that utilize the equipment for training, and direct input from the study sponsors. A description of the training equipment, how and where it is being utilized in the training curriculum, and brief assessment are covered in sections 2.3.2 and 2.3.3.

The task inventory development was based on a literature review of GFI curriculum documents and interviews with subject matter experts. The tasks, learning objectives, and behavior statements extracted from the GFI documents formed the foundation of the task inventory, which was then refined by ISD professionals as they interviewed the UMFO subject matter experts. The resultant inventory shows common and discreet tasks by pipeline, and provided sufficient detail on learning objectives to perform a media analysis. A detailed discussion of this methodology is presented in Section 2.4.

Technology assessment methodology

The findings of the technology assessment were compared to the outcomes of the media analysis and filtered through the task list to develop various possible alternatives to UMFO training integration challenges. A value and risk analysis was then conducted to prioritize the alternatives relative to program risk and value. Significant considerations were given to cost, return on investment, training effectiveness, engineering risk, schedule implications, manpower, personnel, training (MPT), reliability and maintainability, safety, and feedback from Navy and Air Force training personnel. The values for this analysis were calculated and the alternatives were rank ordered in numerical significance.

A financial analysis was then performed on the various alternatives to quantify the relative risk and reward of each possible solution, and to project the transfer of training from flight hours to simulation hours. This financial analysis finalized the validity of the observations and recommendations.

The specific methodological approach for cumulative costs, return on investment (ROI), and transfer of aircraft hours to simulator hours is contained in paragraph 4.4.2.

A representative from the Naval Education Training Center (NETC) Human Performance Center was an integral member of the study team, whose embedded involvement provided continuous insight, guidance, and objectivity throughout the process.

2.2.7 Study sponsor

CNATRA, Executive Agent
Commander, Training Air Wing Six
LEE LITTLE, Captain, USN
Naval Air Station Pensacola
Pensacola FL 32508

Air Education and Training Command
Chief, Aircrew Standardization & Training
ANTHONY A. IMONDI, Colonel, USAF
Directorate of Operations
Randolph AFB TX 78150-4325

2.2.8 Study proponents

Dr. Tony Kern, Lt Col, USAF (Retired), Convergent Knowledge Solutions, LLC

Ms. Cheryl Malloy, NETC Human Performance Center

2.2.9 Agency performing the study

Aviation Training Consulting, LLC
123 West Commerce, Suite 424
PO Box 754
Altus, OK 73521

2.2.10 Data sources

See Appendix 2.4

The major government or military organizations who made data contributions were:

- AETC/DOFI

- OPNAV/N43
- TW-6

2.3 EXISTING SITUATION

2.3.1 General description

2.3.1.1 Combined student flow

The Combined Flow view (Figure 2.1) provides a depiction of the current training situation including both Air Force and Navy programs.

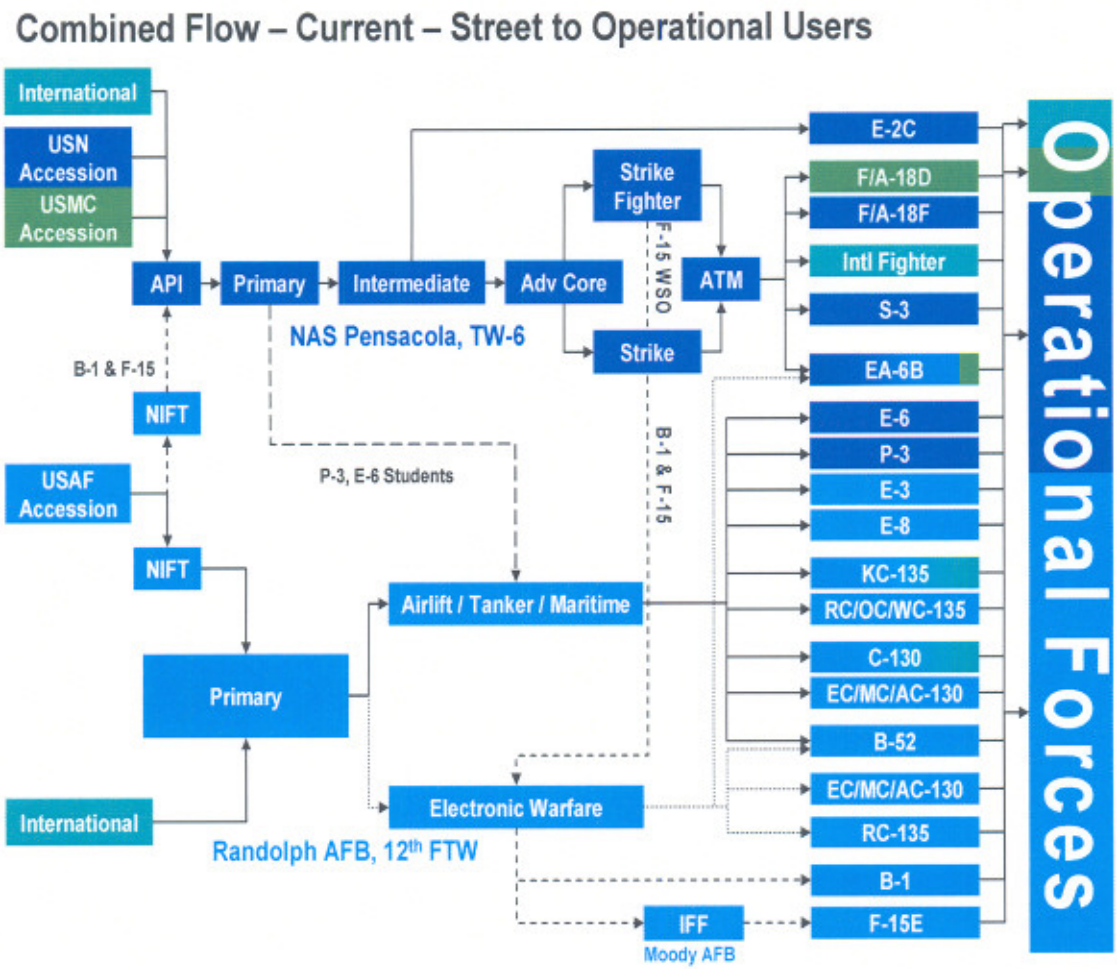

Figure 2.1 Combined Student Flow

The pipelines earlier defined in the main assumptions (Section 2.2.3) are depicted in Figure 2.1 and represent the major training routes that an UMFO must currently follow to move on to an FRS/FTU feeding to the operational forces aircraft. Figure 2.1

graphically depicts the complexity of the training system as it currently exists and should be referred to when examining any of alternatives as they are designed in reference to the current program.

The ATM pipeline moves all UMFO students from their respective accession sources through API, Primary, Intermediate and Advance Core. After Advance Core, the EA-6B and S-3 selected students move on to Strike and then to ATM before moving on to the FRS. The International and F-18 selected students flow through Strike/Fighter and then ATM before moving on to their respective FRSs. Of note in this system is that the training pipeline which represents the greatest time to train and fiscal expense is the ATM pipeline.

The F-15E pipeline flows students from Strike Core through Strike/Fighter. After Strike/Fighter, 75% of the students flow through Introduction to Fighter Fundamentals (IFF) at Moody AFB and then to the FTU. The other 25% flow through Randolph AFB for Electronic Warfare Officer (EWO) training and then to IFF and the FTU.

The B-1B pipeline flows the selected students from the Strike phase to Randolph AFB for EWO training and then to the FTU.

The Airlift/Tanker/Maritime pipeline has a Navy track and an Air Force track. The Navy track (P-3 and E-6 selected NFOs) student completes Primary phase at NAS Pensacola and then flows through the Primary and Intermediate phases at Randolph AFB before moving on to the FRS. The Air Force student flows through the entire Randolph AFB pipeline on the Airlift/Tanker/Maritime track and then to the FTU.

The Navy E-2C student UMFO flows from accession, through API, Primary, and Intermediate phases at NAS Pensacola and then on to the FRS.

The Air Force EWO flows through the entire Randolph AFB pipeline on the Electronic Warfare track and then to the FTU.

2.3.1.2 Combat Systems Officer flow

The proposed CSO pipeline depicted in Figure 2.2 represents the new CSO training pipeline which will replace the lower half of Figure 2.1 in October 2004. The Navy P-3 and E-6 students will continue to flow in from Primary phase at NAS Pensacola and complete Primary and Intermediate CSO training and then move on to their respective FRSs. This new program will not change the training that the Navy students currently receive. For the Air Force students, the flow through NAS Pensacola remains the same, they just enter training at Randolph AFB as depicted in Figure 2.2.

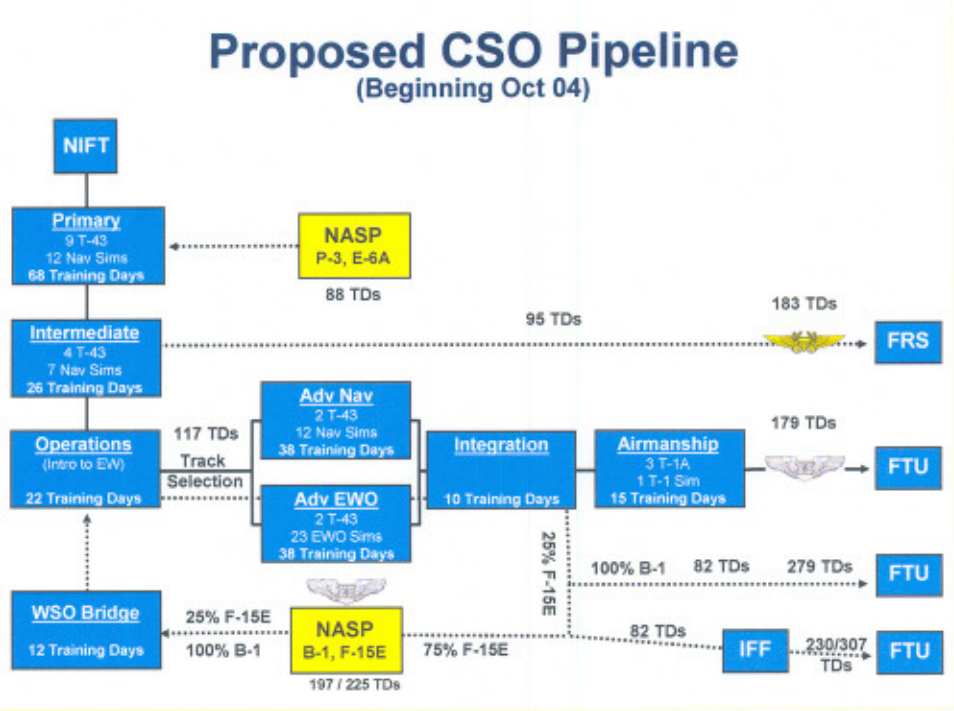

Figure 2.2 Proposed CSO Pipeline

2.3.2 Training equipment at Pensacola Naval Air Station

2.3.2.1 Equipment and materials

The following is a list of training equipment currently utilized in the UMFO training program at NAS Pensacola:

- IMI- 60 workstations
- 2B47 Communication/Navigation Trainer- 40 stations
- Microsim- four units
- T-6 Unit Training Device (UTD) - three devices
- 2B49 Air Intercept Radar Trainer/Ground Mapping Radar Trainer (AIRT/GMRT) - 10 stations
- 2F101 T-2C Operational Flight Trainer (OFT) - three devices
- T-6A Texan II aircraft T-34 (thru July 05)
- T-1A Jayhawk aircraft
- T-39 Saberliner aircraft
- T-2C Buckeye aircraft

The two previous studies conducted by JIL and JHT covered in detail the above listed training equipment with the exception of the T-6 UTD, which was not yet operational

at the time of the studies. With the 90 day constraint placed on this assessment effort, the focus of this section is limited to a general overview of the capabilities and uses of each training media and a brief assessment of their effectiveness.

2.3.2.2 Interactive Multimedia Instruction

For the purpose of this study, the term "Interactive Multimedia Instruction (IMI)" is used to describe self-paced computer-based lessons. In this context, "IMI" is synonymous with the term "Computer Aided/Assisted Instruction (CAI)" used in the CNATRA Instruction (INST) 1542 series of curriculum and the term "Computer Based Training (CBT)" used in previous studies.

Further, the following four levels of interactivity when referring to IMI are provided:

- Level I - Passive. The student acts solely as a receiver of information
- Level II - Limited participation. The student makes simple responses to instructional cues
- Level III -Complex participation. The student makes a variety of responses using varied techniques in response to instructional cues
- Level IV - Real-time participation. The student is directly involved in a life-like set of complex cues and responses

A Learning Resource Center (LRC) is set up in Griffith Hall (the Academic Training Building) with 60 work stations to meet student needs. IMI is currently utilized in the primary and intermediate phases of UMFO training. In the primary and intermediate prop phases, IMI is being utilized in conjunction with classroom lectures in the areas of T-6 Aircraft Systems, Basic Instruments, Communications, Meteorology, Flight Information Publications (FLIP), Instrument Flight Rules (IFR)/Visual Flight Rules (VFR) Flight Planning and Navigation Flight Procedures, and Aerobatics. In the intermediate jet phase, IMI is being utilized in conjunction with classroom lectures in T-39 Aircraft Systems, T-39/T-1 Aircraft Systems Exam, T-39/T-1 Flight Preparation and T-39/T-1 Flight Preparation Exam. In the advanced phase, IMI is being utilized in conjunction with classroom lectures in the areas of T-39 Aircraft Systems, radar theory, radar scope operation and fundamentals, and T-2C preflight and emergency procedures.

Approximately 25% of the training instruction (classroom and IMI) in the Primary phase is conducted via IMI. For the Intermediate and Advanced phases, the percentage is less. Efforts are currently being made to increase the amount of IMI in the UMFO program. The sophistication of the media interactivity is Level I and elementary Level II as defined above. The Media Analysis associated with the JTI leads to the conclusion that a much greater portion of the curriculum can be presented via IMI. This would provide a more cost effective means of instruction. Further, it is recommended that Level II and Level III IMI be utilized as appropriate to increase learning effectiveness.

2.3.2.3 2B47 Communication and Navigation Trainer

The 2B47 is a basic instrument navigational trainer used to introduce and provide practice in instrument navigation procedures including departures, en route radial

tracking and point-to-point (fix-to-fix) navigation, turn point procedures, and approaches. The set up is in a single room with 40 individual cockpit mock-up stations and an instructor/master control station. The 2B47 display is capable of representing the T-34, T-6, T-1, and T-39 aircraft basic flight and navigational instrumentation.

The 2B47 is utilized in the Primary phase for nine events that take the students from an introduction to the trainer and its operating procedures, to radial tracking, point-to-point navigation, arcing procedures, holding procedures, full instrument approaches, to navigating an instrument flight from take-off to landing. In the Intermediate Jet phase, VT-10 utilizes the 2B47 for one non-syllabus, non-graded event prior to the student's first flight in the T-1 aircraft. This event is intended to take the student through all procedures required to complete an instrument flight from take-off to landing. The instructor works with the student to execute checklists, communications between the student and the pilot as well as external communications, and navigation of the route to include turn point procedures.

The communication aspect of this training device is limited to having an instructor either on headset or over the shoulder, attempting to communicate with the primary student simulating all pilot and outside agency communications. In the primary phase of training, there are approximately 11 to 24 students for every instructor during the scheduled training sessions. The instructor to student ratio does not allow for effective individual communications training for the students, however, does provide their first exposure to communications for obtaining Automated Terminal Information System (ATIS) information, Departure Clearance, Taxi Clearance and Take-Off clearance. In the Intermediate Jet phase, the instructor trains with either one or two students per event. The instructor to student ratio is much better than in the Primary phase, however, communications scripting is lacking and the instructor is left to his experience and judgment in simulating standard communications.

The 2B47 is useful for student initial introduction to navigation procedures and for additional practice on their own time. In-flight winds can be programmed into the training session and can be changed throughout. This provides excellent opportunity for the student to practice basic instrument navigation in a realistic environment where the wind direction and speed is not constant. The 2B47 is available for student practice in the evenings from 1800-2200.

The interface with the trainer is somewhat cumbersome for the student. All inputs to initially set and change airspeed, altitude, heading, etc., must be manually entered via a trackball and keyboard. These manual control entry procedures require attention away from the task of navigation and turn point procedures. This is initially distracting and time consuming, however, is generally overcome with practice on the student's part.

2.3.2.4 Microsim

The Microsim device is a "Microsoft Flight Simulator" based, desk top simulator. The Microsim also incorporates Landing Gear and Flap actuation levers, a Trim Control panel, and Very High Frequency (VHF) radio, Tactical Air Navigation (TACAN)/Very High Frequency Omni-directional Radio (VOR) and Identification Friend or Foe (IFF) tuning capability device built utilizing a computer, monitor, flight control joystick, rudder peddles, throttle and chair mounted on a mobile platform. The Microsim also

incorporates Landing Gear and Flap actuation levers, a Trim Control panel, and VHF radio, TACAN/VOR and IFF tuning capability.

The device is not currently integrated into the curricula but is made available for student use. The Microsim is currently designed best for use to train students in aircraft control. It is best suited for practice in preparation for the first six contact flights in the primary phase in which the students are actually manipulating the flight controls.

The Microsim can be utilized for instrument and visual navigation training, however, since the aircraft must be flown by the student while simultaneously attempting to perform navigational procedures, effective navigational training is lost at the expense of flying the simulation.

The Microsim is currently set up for replication of the T-34 aircraft cockpit only. Since the T-34 aircraft will soon be replaced completely by the T-6, to be an effective training device at any level, the simulation should be set up for the T-6 and other aircraft cockpit replication.

2.3.2.5 T-6 Unit Training Device

There are three (3) T-6 UTDs available for training with two more that will be operational by 01 Oct 04. The T-6 UTD is a non-motion, non-visual simulator which is capable of replicating T-6A aircraft operation in instrument flight conditions to include equipment and systems malfunctions for Emergency Procedures training. This training device is best described as a Cockpit Procedures Trainer (CPT).

nav vs. pilot sims

The T-6 UTD is currently utilized in the primary and intermediate prop phases of the training program. In the primary phase, there are three cockpit procedures training events which focus on normal procedures, checklist execution, and emergency procedures. There are also four instrument navigation events in the primary phase which focus on basic operation and navigation of the aircraft from startup and taxi, to departure, to enroute navigation, to approaches and landing. The intermediate prop phase utilizes the UTDs for five Instrument Navigation Flights.

The T-6 UTD, as a basic CPT, provides useful training for the UMFO students as the program is currently designed. This training equipment does a much better job of imitating the actual cockpit and operation of the T-6 aircraft than does the 2B47.

The UDT's were designed as piloting skills trainers and not navigational skills trainers. They were not designed to be flown entirely from the instructor console. Software has been developed to assist the console operator/instructor with flying the UTD from the instructor console, however, operation in this mode is still cumbersome and time consuming, taking the instructors focus away from student instruction.

These training devices provide a limited capability in training compared to what is available with simulation that provides visual presentation, external communications, and multiple-unit linking capability. Much more of the training curriculum (e.g. low-level visual navigation, formation, aerobatics, etc.) could be provided with simulation rather than actual aircraft flight events if simulators of higher fidelity and capability were utilized.

2.3.2.6 2B49 Air Intercept Radar Trainer and Ground Mapping Radar Trainer

The 2B49 is best described as a touch-screen desk top Part Task Trainer (PTT) for the T-39 aircraft. There are 10-2B49 stations available for training. This training device consists of two large touch screens mounted side-by-side with a flight control joystick and radar control joystick. The instructor station is beside the student station and also has a flight control joystick and standard computer monitor. The 2B49 stations are capable of being linked together for section air-to-air radar training missions.

The Advanced Core portion of the syllabus utilizes the 2B49 for one Emergency Procedures event and four Ground Mapping Radar Navigation events. The Advanced Strike phase utilizes the 2B49 for one Strike Synthetic Trainer event (ground mapping radar navigation) and three Strike Composite Synthetic Trainer events (ground mapping radar and visual low level combined). The Advance Strike/Fighter phase utilizes the 2B49 for 22 Air Intercept Radar Training events.

The design and setup of the 2B49 is limiting and difficult to operate. The screens at an elevated position, requiring the student to continually look up at the instrument panel representation and not straight forward and down as in the actual aircraft. The radar control joystick is also in an elevated position on the control panel rather than adjacent to the right leg. The visual presentation above the instrument panel is very limited. The radar scope is at eye level, which facilitates adequate view of the display for radar events however, is unrealistic in simulating the layout of the actual aircraft. The touch screen activation of the equipment is difficult at best to operate and often engages equipment other than that which is intended.

The 2B49 is useful for training radar scope manipulation and interpretation, however, is limited in capability of simulating all other aspects of operating the T-39 aircraft to perform a radar navigation or air-to-air intercept mission (i.e. standard flow of a flight event, proper instrument scan, effective Crew Resource Management (CRM), emergency procedures training, etc.).

2.3.2.7 2F101 (T-2C Operational Flight Trainer)

The 2F101 Operational Flight Trainer (OFT) is a non-visual, non-motion capable trainer for the T-2C aircraft. The 2F101 is capable of simulating T-2C operation in instrument flight conditions to include equipment and systems malfunctions for Emergency Procedures training. Although designated as an OFT, the capabilities are more in line with the T-6 UTD which is best described as a CPT. There are three 2F101 simulators available for training.

The ATM phase of the UMFO curriculum utilizes the 2F101 for three Basic Instrument events, three Radio Instrument events, two emergency procedure events, and one special use airspace operations event. These simulator events are followed by 12 flights in the T-2 aircraft including three Familiarization flights, two section low-level/weapons employment flights, one division low-level/weapons employment flights, five ATM flights and one final ATM check flight.

The 2F101 training device is an effective trainer for basic cockpit procedures, instrument navigation, and emergency procedures training for the T-2C aircraft. The 2F101 is however, an ineffective training device for many of the ATM flight training

profiles that the T-2 aircraft it is currently employed for. Without visual capability, the device is poorly suited for the Tactical Low-Level Navigation (section and division), and Advanced Tactical Maneuvering training which drives this training to the actual aircraft.

2.3.2.8 T-6A Texan II Joint Primary Aircraft Training System

The T-6A Texan II Joint Primary Aircraft Training System (JPATS) is a high performance turboprop, 2-place tandem seat, aircraft. The aircraft is fully aerobatic and features a pressurized cockpit with an anti-G system, oxygen system, ejection seat and an advanced avionics package with sunlight-readable liquid crystal display. The installed navigation equipment includes VOR/DME, ILS, and GPS systems. With a ceiling of 31,000 feet and a cruise speed of approximately 260 knots, the T-6A is capable of operating in both the low and high airways structure. The canopy is demonstrated to be resistant to bird strikes up to speeds of 270 knots. The G limits are +7 to -3.5 with a sustained 2 G capability. Aerobatic limits are 15 seconds inverted flight and 5 seconds zero G (+/- 0.25) flight.

The T-6A is currently in the process of replacing the T-34C aircraft in UMFO training at Pensacola. Full replacement is scheduled to be complete by August 2005. It is the initial flight training aircraft which is being utilized in the Primary and Intermediate prop phases of the syllabus for Initial Familiarization, Instrument Navigation (240-270 KTAS), Visual Navigation (180 Kts ground speed at 1500-2500' AGL on low-level routes) and Formation Flight and Navigation. The curriculum for the T-6A aircraft has been developed to duplicate that of the T-34C and is proving to be a very suitable replacement.

2.3.2.9 T-1A Jayhawk

The T-1A Jayhawk is a multi-place training aircraft. The cockpit is set up with dual control side-by-side seating with an instructor jump seat that slides from the right side of the aircraft to a center position between the two front seats. The T-1A has a weather radar but no air-to-air or air-to-ground mapping capability. The G limits are -1.0 to +3.2. The service ceiling is 41,000 feet.

The T-1A is currently being utilized in the UMFO training syllabus for eight flight events in the Intermediate Jet phase for Airways Navigation and Low-Level Visual Navigation. Cruise airspeed at altitude is 420 knots and low-level flights are flown at 240 knots.

The T-1A aircraft is an Air Force owned aircraft which has been designed to provide flight characteristics similar to heavy transport or tanker aircraft. The T-1s at Pensacola have been provided to UMFO training by the Air Force and are flown by civilian contract pilots. The aircraft is crewed for training with the contract pilot in the left seat, the UMFO student in the right seat, and the instructor in the jump seat.

2.3.2.10 T-39 Saberliner

The T-39N and T-39G are multi-place training aircraft. Both are modified North American T-39 Saberliner aircraft which have an instructor jump seat that rotates from up against the right side of the aircraft into a position between the two cockpit side-by-side seats. The T-39N has an installed APG-66 air-to-air and air-to-ground mapping

radar. The aircraft has a service ceiling of 39,000 feet and is 3.5g capable. The T-39N is equipped with two radar stations and one instructor station in the cabin of the aircraft. The T-39G is not equipped with radar and has five passenger seats in the cabin.

This aircraft is being utilized in UMFO training at Pensacola for the Advanced phase of the syllabus for Airways Navigation, Low Level Visual Navigation, Ground Mapping Radar Navigation, and Air-to-Air radar intercept training. The aircraft is crewed for training with a civilian contract pilot in the left seat, the UMFO student in the right seat, and the instructor NFO/CSO in the jump seat. Airways Navigation flights are conducted at 420 knots and Low-Level Visual Navigation flights are conducted at 300 knots.

The T-39 aircraft scheduled to reach the end of its service life in FY12.

2.3.2.11 T-2C Buckeye

The T-2C is a twin engine, tandem seating, ejection seat equipped, aircraft carrier capable jet training aircraft. The service ceiling is 44,000 feet with a cruise speed of 420 knots at altitude and a low-level flight capability of 300 knots. The G limits are +5.5 to -2.0 with the wing tip fuel tanks empty. The T-2C does not have a radar.

The T-2C is utilized in UMFO training at Pensacola for the ATM phase of the syllabus. The syllabus consists of twelve flight events; three familiarization flights, three tactical low-level/weapons flights, and six ATM flights.

The T-2C is scheduled to reach the end of its service life in FY08.

2.3.3 Training equipment at Randolph Air Force Base

The following is a list of training equipment which is currently being utilized for Joint Specialized Undergraduate Navigator Training (JSUNT) and Marine Aerial Navigation School (MANS) and will be utilized in the CSO training program at Randolph AFB beginning in October 2004:

- Interactive Multimedia Instruction-82 work stations
- T-45 Navigation Simulator-24 stations
- T-43A (BOEING 737-200)
- AN/FSQ-T-25 Simulator for Electronic Combat Training (SECT) – T-25

2.3.3.1 Interactive Multimedia Instruction

Three IMI classrooms are set up in the Navigator Academic Training Building with a total of 82 work stations to meet student needs. One IMI classroom/mission planning room (located in the 562 FTS building) is set up with 20 desktop stations used primarily for mission planning (PFPS). IMI is currently utilized in all phases of JSUNT training. IMI is being utilized in conjunction with classroom lectures in the areas of T-43 Aircraft Systems, Meteorology, FLIP, Flight Planning and IFR/VFR Navigation Flight Procedures in low to high threat environments. Intermediate missions include Aerial Refueling and Operational Area procedures and also incorporate aircraft divert planning while airborne. Navy students graduate after the intermediate phase. Advanced Navigator missions are based on low-level C-130-type

airdrop missions in a variety of threat environments. IMI is being utilized in conjunction with classroom lectures in T-43 Aircraft Systems, T-43 Aircraft Systems Exam, T-43 Flight Preparation and T-43 Flight Preparation Exam. Students have the opportunity to use the Radio Instrument Operations Trainer (RIOT) and Navigator Simulator (NAVSIM) software as self-study aids.

Less than 8% of the training instruction planned for the CSO syllabus, which will be implemented in October 2004, is IMI based. The sophistication of the majority of the media interactivity is consistent with Level I and II IMI. As with the Pensacola UMFO program previously discussed, the Media Analysis associated with the JTI leads to the conclusion that a much greater portion of the curriculum can be presented via IMI. This would provide a more cost effective means of instruction. Further, it is recommended that Level II and Level III IMI be utilized as appropriate to increase learning effectiveness.

2.3.3.2 T-45 Navigation Simulator

There are six (6) T-45 simulator complexes with four student stations per complex available for training up to 24 students at one time. The T-45 is a non-motion, non-visual, Navigator Trainer which operates three 4-hour SIM periods per day (can go up to 16 hours if required). The simulator has a ground mapping radar (APQ-122), Inertial Navigation System (INS), Navigational Computer System (NCS), Doppler, Combined Altitude Radar Altimeter (CARA), pressure altimeter, True Air Speed (TAS) indicator and Mach meter, Attitude Heading Reference System (AHRS) and C9-D compass systems, TACAN and VOR data displayed on the Bearing Distance Heading Indicator, Interphone and an Ultra High Frequency (UHF) radio and a generic threat indicator (tone and visual) which is currently utilized in all phases of the training program. Currently, in the primary phase there are a total of 14 SIM training events and two SIM checkrides which focus on fundamental airmanship, NCS and INS procedures, normal radar procedures, checklist execution, emergency procedures, basic operation and navigation of the aircraft from startup and taxi, to departure, to enroute navigation, to approaches and landing. Intermediate phase currently has five training events and a SIM checkride which focus on time control (Air Refueling Initial Point [ARIP] and Op Area Entry Point), weather avoidance and airborne divert procedures. Students are introduced to PFPS, 1801 Flight Plan, Air Tasking Order (ATO) and authentication procedures. Advanced Navigation phase currently has six SIM training events and a SIM checkride which focus on low-level navigation in a low to high threat environment with multiple Time Control requirements. These events are primarily based on C-130 type airdrop profiles.

The majority of T-45 Simulator Missions is consistent with Level III and IV IMI.

Overall the T-45 training is fair to good, but it can be much better. The need to augment this navigation simulator centers on four identified deficiencies. First, the T-45 simulator uses obsolete hardware that lacks adequate memory, hard disk space and computer processing power capacity to provide additive mission scenarios that simulate the dynamic and increasingly complex enemy threat environment that our aircrews encounter now, as well as new ones expected to emerge in the near future. Second, the computer hardware is increasingly becoming unsupportable because of a

vanishing vendor status. Most of the components are obsolete and require field engineering to obtain additional spare parts. Third, the T-45 does not adequately simulate the advanced avionics models needed to train students with the advanced airmanship and mission management skills required by CSO's. Fourth, the T-45 is functionally stove-piped to train navigation elements of a mission and provides minimal fidelity of modern navigation systems, air defense threats, and self-protection elements of that mission.

2.3.3.3 T-43A (BOEING 737-200)

There are eight T-43A aircraft at Randolph AFB primarily used for JSUNT and MANS. Each aircraft has 12 student stations which have the same instrumentation set up as the T-45 simulator with the exception of Doppler and threat indicators. The T-43 is limited to high-level flights (usually between FL310-FL350) with exception of the RANGER profile (flown twice during the Intermediate Phase) which simulates an aerial refueling and op area requirements flying into a Military Operating Area (MOA) no later than (NLT) 6000' and exposes the students to a moving map display (Falcon View) with an attached GPS antennae. The T-43 has a ground mapping radar (APQ-122), INS, NCS, CARA, pressure altimeter, TAS and Mach meter, AHRS and C9-D compass systems (BDHI). The students can monitor Interphone, a UHF and a VHF radio. Radio controls are in the cockpit. Most systems are just a repeater of the student seated at station #1. Currently, in the primary phase there are a total of ten flight training events and two flight checkrides which focus on fundamental airmanship, NCS and INS procedures, normal radar procedures, checklist execution, emergency procedures, basic operation and navigation of the aircraft from startup and taxi, to departure, to enroute navigation, to approaches and landing. Intermediate phase currently has five training events to include two cross country flights. There is no flight checkride during this phase. Missions focus on time control (simulated ARIP and Op Area Entry Point at a MOA) and airborne divert procedures. Students use PFPS, 175 Flight Plan, ATO and authentication procedures. There are no T-43 flights in the Advanced Navigation phase.

Overall the T-43 training is fair to good and needs to be better. Major issues are that the T-43 cannot perform low-level missions and the students do not have control of the radios. The outdated BDHI should be replaced with a modern Heading Select Indicator (HSI). The radar is in need of being replaced as well. Another major training shortfall of the T-43 aircraft is that only 1 of 12 students has actual navigational control of the mission at any given time during a flight and only 3 of 12 students have control during any one training event. All of the other students are observing, keeping navigation logs, and receiving instruction and questioning from an instructor.

With more advanced simulation for initial training and practice, and aircraft platform that better provides for student navigational control, more effective individual training could be accomplished with fewer flight events per student.

2.3.3.4 AN/FSQ-T-25 Simulator for Electronic Combat Training (SECT) – T-25

The T-25 is an Electronic Warfare trainer that is composed of 6 student stations and 2 instructor stations. The T-25 was originally at the Naval Technical Training Center, Corry Station, Florida. It was moved to Randolph AFB as part of the restructuring of

the JSUNT program when Mather AFB was closed. Historically, the T-25 has been used to train all Air Force EWOs in the Advanced EWO phase of training and is planned to be utilized in the same manner for the CSO program beginning in October 2004.

The T-25 has been operating at surge capability for the past three years and is currently operating at 300% of its designed utilization rate. This situation is propelling the T-25 towards obsolescence since most of the computer hardware is sole source and proprietary and newer components from other vendors cannot be used. Further, many of the original component vendors are no longer in business. Of those vendors still in business, some no longer manufacture or repair T-25 components.

A 1998 AETC Studies and Analysis Squadron Follow-On Test and Evaluation (FOT&E) as well as a 2001 Force Development Evaluation found the T-25 to be unsuitable and operationally non-effective.[13]

2.3.4 Future development

The following is a list of the Navy aircraft planned for leaving service and coming into service in the near future:

- T-34: Planned to be out of service in Pensacola in August 2005
- T-2: Planned to be out of service at Pensacola FY08 due to end of service life
- T-39: Planned to be out of service at Pensacola FY12 due to end of service life
- S-3B's: The last NFO sent from Pensacola to the FRS will be June 2005 (only winging three NFO's between now and then)
- EA-6B: Last Navy FRS class estimated to be held in FY12
- EA-6B: Last Marine FRS class is unknown. The Marines are planning to fly EA-6B's until FY15. The Marine Corps has not published a plan for an Electronic Warfare platform beyond FY15
- EA-18G: First FRS class is planned for FY08. However, this will be Instructor Training to stand up the FRS. Estimate the first NFO's to come out of UMFO training in Pensacola to begin training in FY08

2.4 SITUATION ANALYSIS

2.4.1 Situation statement

Training Air Wing Six, based in Pensacola, Florida, has trained USN and USMC Naval Flight Officers since 1972. In 1995, the training was expanded to include USAF and International Students. The Wing trains approximately 550 students annually, preparing them for all Navy and Marine Corps fixed-wing multi-place aircraft, the B-1 and F-15 communities in the Air Force, and for a variety of follow-on aircraft for the world's air forces. Training methodologies include classroom lectures, computer-based

[13] T-43A Weapons System Capability Roadmap includes Electronic Warfare Training System", *a word document from* HQ AETC/XPPX. *This document is dated 2004.*

training, simulators and aircraft (T-34/T-6 in Primary and Intermediate, T-1/T-39 in Intermediate, T-39 and T-2 in Advanced).

NFOs and Navigators (NAVs) have trained along side each other at Mather AFB since HQ USAF approval on 28 Nov 1975. This relationship continued as the school transitioned to Randolph AFB in the early 1990s. The 12th Flying Training Wing at Randolph AFB trains approximately 500 NAV and NFO students annually, and has added EWOs to the mix. Training methodologies include classroom lectures, computer-based training, simulators, and aircraft (T-43 and T-1).

These programs have worked successfully for more than thirty years, routinely being modified to meet the needs of the customer. A number of recent circumstances, however, necessitate a comprehensive review of the way student NFOs and NAV/EWOs are trained. Some of the pertinent guidance follows:

- CNO Guidance for 2004. CNO requires a minimum 5% reduction in the cost of doing business, a continuation of aviation flight training joint integration efforts, the use of Human Performance Systems Models in acquisition and the establishment of a simulator strategy to enhance training and efficiency. Simulators, computer-based trainers and partial task trainers are currently used in the Training Air Wing Six syllabus – however no comprehensive study has been conducted to optimize their use in conjunction with other training media.
- CSAF 2003 Guidance. Chief of Staff Air Force (CSAF) approved an initiative as part of the ongoing Navigator training reengineering effort to add Remotely Piloted Aircraft (RPA) and Unmanned Aerial Vehicle (UAV) training as options upon graduation from Navigator training. The aviator produced by the reengineered NAV/EWO training pipeline will be called a CSO. The intent is for CSOs to meet emerging Air Force technological and mission needs, and become proficient in employing RPAs and UAVs during their career.
- CSAF 2002 Guidance. CSAF directed AETC to redesign the current NAV/EWO training pipeline in order to produce an aviator who meets the emerging needs of the Air Force.
- Joint Training Requirements. The USAF has determined that the Training Air Wing Six pipeline contains many attributes required to train future CSOs.
- Fleet Replacement Squadron/Flying Training Unit (FRS/FTU) Skill Set Requirements. The Navy is reducing the number of Type/Model/Series flown requiring a change in syllabus requirements. With the sundown of the F-14 and S-3 and the future replacement of the EA-6B by the EA-18G, there is an opportunity to streamline the training pipelines. Some FRS skill set requirements will be kept as new aircraft come on line, but many may no longer be needed.
- FTU Skill Set Requirements. Technological advances in avionics, such as those found in the KC-135 PACER CRAG program and C-130J will continue to reduce the requirement for traditional navigator skills. As the requirement for traditional "position-keeping" skills decreases, the requirement for Combat Systems Officer skills will continue to increase as more RPA and UAVs are brought online.

- T-2 Service Life. After FY04, Pensacola will be the sole remaining base for T-2 operations. In order to retire the last few T-2 aircraft before the currently planned date of 2008, CNATRA is exploring the possibility of eliminating the NFO ATM syllabus, or providing equivalent training with an alternate platform.
- T-43 Service Life. Randolph AFB currently operates the T-43 aircraft for navigator training. Equipped with increasingly difficult to maintain technology and no longer providing the best type of training for CSO, AETC is exploring replacing the T-43 with a more modern system that enables the student more time in actual control of the aircraft.
- Advancements in simulator technology provide potential cost savings for aviation training. While simulators cannot replace flight time for teaching situational awareness and airmanship skills, they can better prepare students for the flight time they do receive. When combined with simulators, that flight time can be reduced while maintaining training quality, and thus warfighting capability. Taken together, these circumstances provide an ideal opportunity to reassess the skills required to meet FRS/FTU requirements – and to determine the best way to teach those skills.

2.4.2 Task list methodology

The primary goal for creating the job task inventory was to identify what skill sets are currently performed by the Navy/Marine Corps NFO and Air Force NAV/EWO (CSO), in order to ensure that future training programs being considered contain all current/necessary tasks, and to look towards future training tasks.

A secondary goal was to provide the foundation for linking UMFO training objectives to Warfighting skills (tasks), both at the service level and Joint Tasks.

Job analysis methodology was a bottom-up review of existing training documentation using ISD methodology to obtain performance-based training requirements.

The Instructional Systems Development (ISD) process was used to define the study entry point. Both ISD and the SAT use the same process of analyze, design, develop, implement, and evaluate. Within this process, the techniques and sub-processes are also similar. The major difference between the two processes is the entry point to the analysis phase. The ISD process has traditionally been used for the development of individual type instructional programs, as is the case for UMFO training. As opposed to the SAT process entry point of analyzing the collective task, the ISD analysis phase entry point is typically at the training situation or job analysis. Then, as the ISD analysis phase continues, individual task analysis and training task analysis follow.

Job analysis was selected as the entry point. The UMFO job analysis is based on a study of documents (literature review) of Navy and Air Force curriculum documents (CNATRA 1542-series Instructions and the Air Force CSO draft Task List, see Appendix 1 for the specific documents used), and survey results from previous studies. These specific documents were chosen as the most applicable and efficient source documents following a review of all GFI. The data obtained from the selected documents was then further refined by conversations with those who know the job (USN, USAF, and USMC subject matter experts) during three separate subject matter

panel of experts meetings convened at Training Air Wing Six. These subject matter experts also served as the task selection board.

The results of the job analysis are reflected in the JTI. The JTI shows the task, as well as representative Enabling Learning Objectives (ELOs) that contribute to mastering the task. During the job analysis process, common and discrete tasks were identified by training pipeline based on task selection board inputs, and by correlating the task data to the source document during the literature review.

The final JTI, which included the associated pipeline information showing which tasks were common and which were discreet to specific pipeline(s), was presented to and approved by a joint panel of USN, USAF, and USMC subject matter experts on 21 Jul 04 at the UMFO Conference convened at NAS Pensacola.

The Difficulty-Importance-Frequency (DIF) Model was the task selection model applied to weight the relative importance of each task, and to lay the groundwork for identifying critical individual tasks. The first task selection board meeting provided the subject matter expertise for applying the DIF model to the tasks in the JTI. See Appendix 2 for specific detail on the DIF methodology used.

A media analysis was performed on the enabling learning objectives contained in the JTI by a panel of experts. The panel consisted of experts in ISD, flight and flight simulator training development, multimedia training development, academic platform (classroom) instruction, and the subject matter. See Appendix 3 for specific detail on the media analysis methodology used.

It is important to note that the ISD analysis effort for this study was scaled to fit the scope of the training situation under review. Since the goal of the study was to identify and evaluate possible alternative solutions to training integration challenges (vice actually building instruction or preparing RFPs for specific training systems), the JTI with the associated DIF and media analysis is viewed as sufficient analysis to support the study alternatives and recommendations. It is imperative, however, that as an integral part of pursuing and implementing any of the recommended alternatives of this study that the remaining ISD analysis phase process steps be completed, to include at a minimum the individual task analysis and the training task analysis.

2.4.2.1 Surveys

As a function of scaling the task inventory to the scope of the training situation under review, it was determined that including surveys/analysis questionnaires in the job analysis process was not required. This was due in part to the tight time and resource constrains of the project, and in part due to the fact that a similar effort had been recently accomplished by JHT. The JHT study sought to validate the Terminal Learning Objectives (TLOs) and ELOs current at the time, and the effectiveness of the current curriculum in training those Learning Objectives (LOs). In order to meet the study objectives, JHT collected data through surveys, interviews, record reviews, and observation. Their surveys were administered and/or interviews were held with UMFO students, graduates, instructors, and the appropriate FRS instructors and students. Repeating this research was viewed by ATC as redundant, wasteful of scarce resources, and potentially disruptive to the UMFO community. The findings of the JHT study

were reviewed and considered by ATC in this study, with the accepted findings filtered though the documents review and by conversations with subject matter experts.

2.4.3 Description of final Job Task Inventory

The final JTI is reproduced in Attachment A. In the attached JTI the tasks are listed in the column labeled "Recommended Task Title," and are further identified by shading. A task is an observable and measurable unit of work activity or operation that forms a part of a duty, with one or more duties making up a job. Changing the tire on a car would be an example of a task. Descriptions of the types of knowledge and skills that contribute to mastering the task (learning objectives) are listed in the column labeled "Recommended Enabling Learning Objectives Title." Examples of learning objectives for changing the tire on a car would include: knowing to pull off to the side of the road, locating and recognizing the jack, loosening lug nuts, jacking up the car, etc. This JTI combines tasks and objectives for both the Navy/Marine Corps NFO and Air Force NAV/EWO (CSO). The list is forward-focused, meaning it is intended to capture future requirements in addition to present tasks.

The columns on the far left of the JTI indicate in which phase of undergraduate training the task is/should be taught. The first five columns list the phases of training at NAS Pensacola: Primary, Intermediate, Advanced Core, Advanced Strike and Advanced Strike Fighter. The next four columns generally represent the phases of training employed at Randolph AFB: Primary, Intermediate, Advanced Panel Navigator, and Electronic Warfare. The Air Force categories listed are only representative of the types of tracks in use (vice listing the exact phases) because at the time of this study the Air Force program was being redesigned to a new phase configuration to be effective Oct 04.

The additional columns labeled "Pipeline" on the far right side of the JTI are used to indicate if a particular task is desired as an entry-level requirement of the gaining Type/Model/Series FRS/FTU. These entries were made based solely on the user subject matter inputs representing the various platform FRS/FTUs. The criteria for a task being considered an entry requirement was defined as: *The training program at the FRS/FTU is built on the assumption that the entering student has received training in the task during undergraduate training. The student does not necessarily need to have mastered the task when they arrive at the FRS/FTU, and the student may not necessarily be receiving additional training in the task at the FRS/FTU, but the basic undergraduate knowledge is still expected/needed in order to be successful in the weapons system.*

The "Media Analysis" columns show the relative ranking of each considered media displayed, with the recommended media shown in the shaded column labeled "Recommendation." Similarly, the DIF Model rankings are shown, with the level of training recommendation shown in shaded column marked "Train."

2.4.4 Job Task Inventory narrative

The items discussed below elaborate on discussions, concerns, and assumptions that occurred during the JTI construction process. Unless specifically noted otherwise, the narrative reflects the subject matter panel of experts discussions and viewpoints.

2.4.4.1 Mission planning and flight planning

A task "Construct Charts Manually" was considered valuable by some in order for the student to gain proficiency with manual chart drawing before progressing to computer generated charts. Others believed that if the student could prepare the chart electronically, transferring that skill to paper would be simple.

The "Plan a Low-Level Flight using Visual Flight Rules (VFR)" task should emphasize the task saturation environment created in low-level training.

For the "Plan an Airborne Radar Navigation Mission," it was suggested by the first two SME panels that radar navigation might be a dying requirement, but remained useful for training the basic skill of operating a tactical sensor on a timeline. However, the SME panel at the UMFO conference countered this viewpoint indicating that the task is still valid as a back-up when other sensors/navigational equipment (GPS, INS) fail.

2.4.4.2 Communications

For the media analysis of this section, many of the simulator training device recommendations made by the media analysis panel are based on the assumption that UMFO simulator training events at Pensacola can be linked to the Air Traffic Control School training/simulation facility, also located at Pensacola. The alternative of having other scripted/non-scripted communications piped into simulator event was also considered adequate, but less desirable, by the media panel.

Although the DIF analysis outcome indicates Train, the panel of experts recommended that the "Communicate Flight Related Information In Flight using Aircraft Communications Systems," the "Communicate Mission Specific Information In Flight using Aircraft Communications Systems" and "Operate the Communication Nets" tasks be Over Trained.

The "Operate the Identification Friend or Foe/Selection Identification Feature (IFF/SIF) System," "Identify the Data Link Systems," and "Perform Encrypted/Secure Communications" tasks are future requirements, not in the current curriculum.

2.4.4.3 Airmanship

The authors of the JTI (ATC) believe it is important to note that the tasks in this section have their genesis in the Pensacola program as it exists at the time of this study, where the first six flights are performed with the student in the front seat of the T-34/T-6 and actually flying the aircraft. The overall focus of this piloting experience is on developing SA, and developing basic airmanship skills and scan techniques in a high stress (mental, environmental, and physical) environment. The tasks developed for the airmanship section reflect these requirements. Furthermore, it should be noted that the first four tasks in the section: "Maintain SA in a High Stress Environment (Environmental, Mental, and Physical)", "Apply Basic Airmanship in a High Stress Environment (Environmental, Mental, and Physical)", "Apply Scan Techniques in a High Stress Environment (Environmental, Mental, and Physical)," and "Operate the Aircraft and Systems in a High Stress Environment (Environmental, Mental, and Physical)" are not technically tasks in the strict definition of the word. These items were added to capture the metaskills that are essential to becoming a successful UMFO.

Metaskills are the mental skills of processing, adapting, monitoring, and correcting the use of individual physical or psychomotor skills in complex performances that integrate all learning processes.

2.4.4.4 Navigation

The tasks "Operate Doppler Navigation System," "Navigate a Microwave Landing System (MLS) Approach," "Navigate an NDB Approach," and "Navigate an ADF Approach" were deleted from the JTI as outdated tasks.

The tasks "Plan an Airborne Radar Point Targeting Mission" and "Perform an Airborne Radar Point Targeting Mission" are recommendations for a future curriculum.

For the "Perform an Airborne Radar Navigation Mission" task it was suggested by the first two SME panels that radar navigation might be a dying requirement, but remained useful for training the basic skill of operating a tactical sensor on a timeline. However, the SME panel at the UMFO conference countered this viewpoint indicating that the task is still valid as a back-up when other sensors/navigational equipment (GPS, INS) fail.

The panel of experts indicated that for the Navy the task "Operate the Inertial Navigation System (INS)" is becoming an outdated task, since the operator no longer interfaces with INS (it is essentially now a "black box" updated automatically through integration with the GPS). The training should be an introduction to INS concepts only.

It was recommended that the "Navigate a Tactical Low-Level Mission" should emphasize the task saturation environment created in low-level training. ATC believes this emphasis is now captured in the collective tasks in the Airmanship section.

The task "Navigate the Aircraft Visually during Night Operations" is not in the current syllabus, but was considered to be a good candidate to add to future training.

2.4.4.5 Formation flight

For the media analysis of this section, the assumption was made by the media analysis panel that a very high fidelity simulator (360 degree view, with two or more simulators linked together) could train the learning objectives marked as simulator candidates. Once the objectives are mastered, the student should still have the opportunity to apply the skills in an aircraft in order to expose them to the environmental and physical (G-force) components that are not replicated in the simulator.

2.4.4.6 Air-to-Air radar operations

The "Perform Unknown Target Heading Intercept Mission" was considered to be an outdated requirement, and may be dropped from the syllabus. At the UMFO conference, all agreed that this is no longer a required task -- not even a building block. The only exception was the International contingent (Italy) that still sees it as necessary, therefore the task remains.

The "Perform Conversion Intercept Mission" is used to teach intercept geometry.

2.4.4.7 Weapons employment

Basic weapons are currently taught, other items represent what was considered by the panel to be a wish list or download from the FRS. The Air Force representatives indicated that much of this requirement at the basic level is in response to CSAF direction. There was also a concern by the Navy representatives that there would be an information overload issue for the students at this undergraduate level.

Operating the FLIR/LLLTV and NVG offensive systems (ELOs) are currently not in the Navy curriculum.

2.4.4.8 Total Force Employment

The Navy does not cover all of the missions listed in the "Plan Total Force Employment Missions." There was also a concern by all (Navy and Air Force representatives) that there would be an information overload issue for the "Total Force Employment," "Information Warfare Procedures," and "Computer Network Operations (CNO) Systems" sections if they were to be taught in undergraduate training because there would be no practice of the skill.

The task "Integrate UAV Missions" was initially drafted as "Plan UAV Missions" in order to capture an anticipated future requirement. At the UMFO conference the panel of experts recommended changing "plan" to "integrate" so as to have it become a task for current operations. The panel also suggested that if UAV operations were to become a UMFO specialty the UAV Operators would likely have their own pipeline sharing many of the training tasks of the larger UMFO community. A placeholder for this future pipeline has been included in the JTI.

The task "Integrate Space Operations Procedures" was initially drafted as "Plan Space Operations Procedures" in order to capture an anticipated Air Force CSO future requirement. At the UMFO conference the panel of experts recommended changing "plan" to "integrate" so as to have it become a task for current operations instead.

2.4.4.9 Electronic Warfare

This section is based on the Air Force's new CSO program. These tasks will be taught in an early stage of the CSO pipeline (just prior to NAV/EWO track selection) beginning in October 2004. The Navy/Marine Corps representatives view this section as far too advanced for UMFO training. The difference of opinion between the Navy/Marine Corps and the Air Force on this section was very significant. There was a concern by the Navy representatives that there would be an information overload issue for the students at this undergraduate level. The Air Force representatives indicated that much of this requirement at the basic level is in response to CSAF direction.

2.4.4.10 General Job Task Inventory

Maintaining in-the-cockpit training in an actual aircraft in flight as a key part of any proposed training solution was repeatedly and emphatically included in many discussions with the subject matter panel of experts. Cited reasons included achieving a realistic level of task saturation in order to teach task management skills, developing scan and situational awareness, experiencing environmental and physical stress (hot/cold weather and pulling Gs), developing coping and flexibility skills to manage

changing mission requirements, and providing real-time pacing (high ground speed) for accomplishing navigational tasks. The recruitment and retention of UMFO instructors was also cited as a reason to keep aircraft in the mix, with the rational that quality instructors were less likely to accept a tour of duty at the schoolhouse if it were a non-flying assignment.

The subject of mentorship was a frequent topic. There was a very strong feeling that UMFO students should be instructed by UMFO instructors, vice pilots, with mentorship cited as a significant factor between the two. The need for mentorship was often included with the topic of requiring a multi-seat aircraft for any proposed UMFO training solution.

Both Training Air Wing Six representatives and the FRS/FTU representatives agreed that no undergraduate UMFO training currently being accomplished can/should be "uploaded" to the FRS/FTU, as these organizations were acknowledged as operating at full capacity, both in time-to-train and in available resources.

2.4.5 Job Task Inventory analysis

The level of detail presented in the JTI was scaled to provide sufficient insight into the training requirements to provide a sufficient foundation to identify and evaluate possible alternative solutions to training integration challenges, and to remain within contractual timeline and budgetary constraints. As such, this JTI should not be considered an adequate baseline for a definitive, in-depth, statistical analysis of UMFO training tasks. Further ISD analysis efforts are warranted once the specific training integration solution path has been selected.

The following is a synopsis of the key points identified during the JTI analysis that influenced/contributed to the alternatives presented and recommendations made in this study.

2.4.5.1 Program complexity

The large number of specific weapons systems supported by the various pipelines is an indicator of the complexity of the UMFO program. Approximately 20 current or potential customers were identified. The difficulty encountered in simply trying to quantify the exact number of using communities during this study is a further indicator of this complexity. For example, the Air Force C-130 has no fewer than four variants, each with differing missions, differing crew complements of NAVs and/or EWOs, and variations of NAV/EWO duties. The complexity of the program is also clearly reflected in the wide variety of training tracks (phases) currently employed in undergraduate UMFO training. Five phases of training are employed at NAS Pensacola, which interact to varying degrees with and at least four separate phases of training at Randolph AFB. See Figure 0.1 for a comprehensive diagram relating the phase and service interrelationship to each other and to the using weapons systems.

The multiple phases are intended to target the training to the end-assigned aircraft of the student. Planning/forecasting individual student progression through a specific track is not possible at the outset, since student performance during several of the early phases of training is used as track selection indicator for future training, and ultimately for the type of weapons system/mission assigned upon graduation.

The complexity inherent to managing training in the various phases/tracks is driven by the wide variety of missions and platforms that utilize the UMFO graduate. These range from performing duties in the cockpit of a two person high performance fighter/attack aircraft executing deep-penetration missions in hostile airspace, to accomplishing duties in the cabin of a large, windowless transport-type aircraft performing stand-off surveillance or command and control duties.

2.4.5.2 Basic Undergraduate Military Flight Officer commonalities

The JTI identified a large number of tasks that are common across all end assigned aircraft/pipelines for both USN and USAF users. The categories containing a high percentage of common tasks include: Meteorology, Flight Policy, the general areas of Mission/Flight Planning, Aircraft Condition, the general areas of Communications, the majority of Airmanship, Fuel Requirements and Enroute Time Calculations, the majority of Navigation, Safety, and with the exception of the P-3, Aircraft and Systems Operations and Mission Commander Responsibilities. In general, the most common outliers to commonality were the E-3 and P-3.

2.4.5.3 Significant Difference

The JTI identified several categories that contain tasks that are very specific to the pipeline/phase of training for the end-assigned Type/Model/Series and mission.

Categories containing tasks predominantly unique to fighter/attack type aircraft include the fighter-specific maneuver in Advanced Tactical Maneuvering and Air-to-Air Radar Operations.

Categories containing tasks predominately unique to Air Force aircraft are Total Force Employment and Electronic Warfare.

The aircraft requiring the fewest training tasks were the E-6, P-3, E-3, and E-8. Categories containing few or no training tasks for these platforms included the ground mapping radar and visual navigation sections of Navigation, Formation, Advanced Tactical Maneuvering, and, with the exception of the E-8, Air-to-Air Radar Operations, Weapons Employment, and Electronic Warfare. Additionally, as noted above in the commonalities section, most tasks in the Aircraft and Systems Operations and the Mission Commander Responsibilities categories were also considered by the subject matter experts representing the platform as not applicable to the P-3.

Differences in task requirements are also evident in the JTI based on the specific equipment installed aboard the various pipeline end-assigned aircraft. These differences are most evident in the Communications, the ground mapping radar portion of Navigation, and the Air-to-Air Radar categories.

2.4.6 Media analysis

An analysis of the media recommendation indicates that significant portions of the training objective are best trained using an appropriate level/fidelity of Interactive Multimedia Instruction and simulation.

Nearly all knowledge level objectives were identified as appropriate candidates for IMI instruction. Exceptions that were recommended for Instructor-led included: objectives that required interaction with other agencies such as Metro Services, all types of

mission planning (both automated and manual) and the associated chart preparation and study, briefings and debriefings, aircraft and personal protective equipment preflight/post flight, anti-G straining maneuver, performance data calculations, ORM and CRM skills, and knowledge of directives.

A very high percentage of performance objectives were identified as appropriate candidates for device-based/simulator training. Exceptions, which were recommended for training in the aircraft, included: communicating in an airborne aircraft, utilizing timely and descriptive communications to build crew situational awareness, utilizing visual signals to communicate with wingman or aircraft ground handling personnel (including hand signals during formation), performing proper anti-G straining maneuver, monitoring aircraft servicing procedures, and maintaining spatial orientation through aircraft instrument and external visual scan with reference to the following: Terrain, Altitude, Airspeed, Attitude, Hard Deck, Soft Deck, Element Deconfliction and Bogey.

Additionally, all metaskills tasks were considered most appropriate for training in an aircraft. These tasks are "Maintain SA in a High Stress Environment (Environmental, Mental, and Physical)," "Apply Basic Airmanship in a High Stress Environment (Environmental, Mental, and Physical)," "Apply Scan Techniques in a High Stress Environment (Environmental, Mental, and Physical)," and "Operate the Aircraft and Systems in a High Stress Environment (Environmental, Mental, and Physical)."

2.4.7 Difficulty-Importance-Frequency analysis

The DIF Model data is presented in the JTI only to provide general guidance on the relative importance of tasks based on the SME inputs received. This panel of SMEs consisted of instructors currently assigned to Training Air Wing Six's flight training units. While appropriate to the scope and timeline of this project's effort, the authors of the JTI feel that additional SME DIF Model inputs from the FRS/FTU and from the Fleet would be necessary in order to provide an adequate sample size and the appropriate level of objectivity necessary to have sufficient valid data from which to accurately determine specific critical tasks.

3.0 TRAINING TECHNOLOGY ASSESSMENT

3.1 STATE-OF-THE-ART ASSESSMENT

ATC conducted a scaled survey of training system technology. The survey effort focused on the most critical issues facing undergraduate UMFO training, with a view to future training requirements with emergent training technology.

3.1.1 General observations--mentoring

The UMFO instructors consider the value of over-the-shoulder mentoring to be invaluable for undergraduate training; hence the priority placed on acquiring a Multi-Place Aircraft (MPA-X) in which the pilot and student UMFO are accompanied by the instructor UMFO in the aircraft. For the following discussion, this over-the-shoulder mentoring is assumed to be occurring during most of the ground-based simulation; retaining this for flight training may become a primary driving factor in the cost-per-student. Some degree of in-flight mentoring is possible with the instructor UMFO on the ground, if equipped with displays that data link to the student's aircraft displays, and a high-quality voice and video link. Incorporation of existing Air Combat Maneuvering Instrumentation (ACMI) technology may allow some remote mentoring advantages not available to the instructor aboard the aircraft. The technical risk of applying this technology to undergraduate training is small.

3.1.2 General observations--future trends

The impending retirement of the T-39N/G aircraft naturally focuses attention on the tasks currently trained in this media: low level navigation and radar operation in both air-to-ground and air-to-air modes. However, as radar functions become more automated, the future role of the NFO should closely parallel, if not converge with, the Air Force concept of the CSO. That is, the NFO/CSO will be tied less and less to the traditional role of navigation systems operator and expanded more and more to focus on the mission of locating, identifying and attacking targets. Just as radar operation superseded the sextant as the principle task driver, so the mission computer and targeting system operations will likely supersede the radar as the principle task driver. This trend will accelerate as more radar management functions are automated and performed by the mission computer and targeting systems; the overall effect is to free the human element of the weapon system from routine systems operation tasks, and enable them to focus on mission management tasks.

3.1.3 Simulation and radar training

Since current UMFO training is centered around radar operation, the principle technology issue for TW-6 is the ability to simulate high-end tactical radar for undergraduate training purposes. The simulation approach to radar training is appealing when compared to the challenge of economically integrating an actual high-end tactical radar on a commercial business jet airframe. Air-to-air modeling is relatively simple; ground-mapping capability has been the primary challenge. Radar Simulation Technology (RST) employs digital terrain data and digital feature data as the basis for modeling electromagnetic wave behavior. Current radar simulation technology is adequate for the existing UMFO training task list, and allows a variety of

sensor simulations, such as Forward Looking Infra Red (FLIR) or passive millimeter wave devices, should non-radar sensors become training tasks for TW-6.

This simulation capability is adaptable for in-flight training as well as ground-based training, both as an integrated system and as a portable, "plug and play" system. The RST is essentially a large-capacity data storage unit and a microprocessor; the output can be fed into a Multi-Function Display (MFD) in any "glass cockpit" aircraft or simulator. In-flight RST systems require access to aircraft position; this would best be accomplished with an aircraft equipped with a data bus. Actual aircraft position is then used to determine the geometrical relationship to virtual terrain data; a virtual radar antenna is simulated based on the student's manipulation of radar controls. The RST microprocessor calculates the behavior of the radar pulse as it interacts with the virtual terrain features. The fidelity of the simulation can be improved by increasing the granularity of the virtual terrain features.

At the undergraduate level, the ground-mapping training tasks do not merit perfect correspondence between the radar simulation and actual radar behavior. This is primarily because few aircraft in the fleet still employ radar as a primary means for navigation, and the trend is to move further toward navigation by automatic combination of inertial and satellite signal. This trend is countered by a concern about excessive dependence on automation that may fail or be countered in combat with a sophisticated adversary. Ground mapping appears to be a secondary means of ensuring accuracy in delivery of precision weapons. This in turn is countered by the argument that a radar emission in proximity to a sophisticated adversary is tactically unsound. The debate then turns to the phase of warfare in which air supremacy has been achieved; unrestricted use of ground mapping radar is available to ensure minimal collateral damage. This debate is likely to continue for the foreseeable future, but at the end of the day, the justification for high-fidelity ground mapping simulation at the undergraduate level remains weak.

RST is suitable for both ground-based and flight training. For air-to-air radar training in actual aircraft, the RST requires access to external antennae for data link. The RST trades own-ship aircraft position and track data with a similarly-equipped cooperating aircraft. The RST continuously determines whether the cooperating aircraft is within the swept volume of the virtual radar antenna as the student UMFO manipulates the radar controls and directs the pilot through aerial maneuvers. If the cooperating aircraft remains within the virtual swept volume, the RST builds a track file and displays appropriate bogey symbology on the MFD. The displayed bogey symbol corresponds directly with the actual view of the cooperating aircraft as seen through the cockpit windows.

Both air-to-ground and air-to-air RST is mature and has been demonstrated to be suitable for undergraduate training tasks. Space, weight, power and cooling considerations are minimal: RST equipment is much smaller and lighter than actual radar, and does not require a radome. It could be integrated into the T-6 or the T-1 at a reasonable cost. The technical risk in adapting this technology to undergraduate UMFO training is negligible.

3.1.4 Actual radar training

Should the Services determine that actual high-performance radar training is required in a multi-place aircraft, but that procuring a new airframe is not possible, it should be possible to procure service by the hour at affordable rates, given that the contractor's perspective is incorporated into the acquisition strategy and contract structure. There are three primary issues that are of top concern for any contractor contemplating a bid for a fee-for-service contract: financial incentive versus risk, FAA certification, and liability.

For example, it is important that the contract options extend well out into the future; the number of option years is a prime consideration in determining the financing arrangements necessary to justify a bid. The greater the number of option years in the contract, the greater the number of banks that will consider financing the venture, and consequently the more advantageous the financing arrangement. This provides greater incentive for companies to bid, and so improves the degree of competition. Conversely, the fewer option years the Navy elects to consider, the more financial risk the Navy will have to bear in order to attract competitive bids. There are other variables in the finance equation that are beyond the scope of this 90-day study, but will become significant if the number of option years is small.

Since the Navy may elect to procure services for far less than the service life of the aircraft, commercial companies also are concerned about resale value; this means maintaining FAA certification for the aircraft is critical. The magnitude of investment required to procure a high-performance business jet and modify it to carry a tactical radar without losing FAA certification at any time will probably require at least nine years of options to amortize the investment at financially attractive rates. Lastly, it is important to commercial companies that the aircraft be useable for non-DoD clients; this points to an exportable version of a high-end tactical radar. Fortunately, undergraduate training tasks are satisfied by exportable versions. The technical risk in adapting an exportable version of a high-end tactical radar to a high-performance, FAA certified business jet suitable for undergraduate UMFO training is manageable.

Closely related to FAA certification is the issue of liability. If the Navy elects to employ a commercial business jet in training student UMFOs in one of the pilot seats, the aircraft will have to be flown with only one pilot at the controls. This usually means that, while the student UMFO is in the pilot seat, the aircraft is not being flown in accordance with its FAA certification; accordingly, the contractor will not be able to obtain insurance for flights under these conditions. Therefore, for the periods when the aircraft is operated out of compliance with its FAA certification, the Navy will have to assume full liability. Fortunately, precedents already exist for this kind of arrangement.[14]

[14] NAVAIRSYSCOM PMA 207 (301-757-8485) has experience contracting for services approximating the MPA-X concept.

3.2 SIMULATION AND INSTRUCTIONAL FEATURES

3.2.1 General

In general, simulation training devices in use at NAS Pensacola are substandard for the aviation training industry in both fidelity and functional capability.[15] This deficiency has led to underutilization of simulation in the training curriculum, and missed opportunities to transfer training from flights to simulation where appropriate.[16] Robust simulation usually more than compensates for aircraft training capability decreases, because military performance can be increased in the simulator beyond the capability of aircraft flights.[17] For example, realistic mission elements such as fighter data link can be emulated in the simulator, as well as weather hazards such as microbursts and turbulence, that would be too expensive or dangerous to incorporate into aircraft flights. Although the T-6A aircraft is only capable of speeds approaching 300 knots, the T-6A simulator can be programmed to fly at speeds that are characteristic of jet trainers; with appropriate software adapted from the T-45 simulator, it can mimic T-45 performance perfectly. This is well worth investigating: the 260 knot speed advantage of the T-45 over the T-6 comes at a premium exceeding $100k per knot annually in UMFO training.

3.2.2 Network simulation

Networking of simulation devices in a virtual training environment would also bring new benefits. For example, radio communication skill is a chronic student performance issue; by networking UMFO simulators with air traffic controller training simulation devices, both student groups could practice radio calls in a realistic virtual environment. Increased use of simulation devices, both with and without visual systems, will ensure that training events in the aircraft media will be worthy of the expense and risk. Generally these events fall into one of two categories: those relatively few events that can only be trained in the aircraft, and those that are considered motivational toward a career in military aviation.

3.2.3 Affective domain

The motivational aspect falls into the affective domain of training, as opposed to the cognitive domain. This is the critical linkage between the uniquely human enthusiasm of the aircrew and their mission. Flying itself is not the goal; it is the use of flight to accomplish military goals. Frequently, these goals are lost from view in the undergraduate training environment, with the result that the full power of student enthusiasm is not tapped, or worse: students can become emotionally disconnected from their ultimate military employment in a weapon system, and eliminate themselves

---

[15] JHT Inc., *Training Situation Document for the Undergraduate Military Flight Officer (UMFO) Training Program*, 12 Nov 2003: "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." P.12, Para 1.4 Executive Summary

[16] Kern, T., *Leveraging Synthetic Experience for Mission Efficiency and Effectiveness*: "High fidelity simulation allows commanders and training experts to redistribute available flight hours into critical mission areas. With less flight time expended on basic procedural training, a greater proportion of total available flying hours are available for mission related flight activities." See Appendix ___ for the full article.

[17] Air Force Handbook 36-2235, Vol. 7, *Information for Designers of Instructional Systems; Design Guide for Device-Based Aircrew Training*, 1 Nov 2002; see Section H, *Training Media Selection*, Part 4 and 5.

from the career field. Typically, this linkage is viewed in terms of flight time, but with realistic simulation capability, this linkage is also strongly reinforced by mission-focused, threat-constrained, virtual formation missions in the simulator. This drives the student UMFO to experience the teamwork context of military flying; teamwork with pilots, other UMFOs, air traffic controllers, joint battlespace management teams, and other C2 elements, all focused on accomplishing a complex task in a challenging environment. The Defense Science Board Task Force ("Training Superiority and Training Surprise") depicted these effects in terms of military performance versus investment, the principal issue for this study, as a hierarchy of learning curves (Figure 3.1).

3.2.4 Operational level of warfare

In considering these effects in the context of UMFO training, it is important to note that the UMFO serves a critical linking function between the tactical employment of an aircraft or flight and the operational level of warfare. More so than the pilots, who are focused on the tactical employment of their aircraft/strike package, the NFO/CSO-Battlespace Manager teams are the most critical on-scene enablers of operational interoperability (joint and coalition) in the 21st century battlespace. This is the sense-and-respond "edge" that must be empowered to leverage joint capabilities on the fly.[18]

It follows that the NFO/CSO training continuum should incorporate joint context that starts in undergraduate training; this leverages the primacy of training principle. The joint context goes beyond mere education in *joint-speak*; it is training against a backdrop of joint operational scenarios, with joint C2 elements embedded at every level. This approach ensures that UMFOs think about air operations from a joint perspective from the beginning of their career; they are adept at dynamic, capability-based mission planning and execution in the joint and coalition context. If this step is taken, the NFO/CSO would arrive at the FRS/FTU with an ingrained understanding of joint operations, including joint doctrine, asymmetric challenges, diverse targets and threats, and realistic C4ISR operations.

[18] USD Personnel and Readiness, *DoD Training Transformation Implementation Plan*, 9 June 2004, Section 1.4 Training Transformation Objectives.

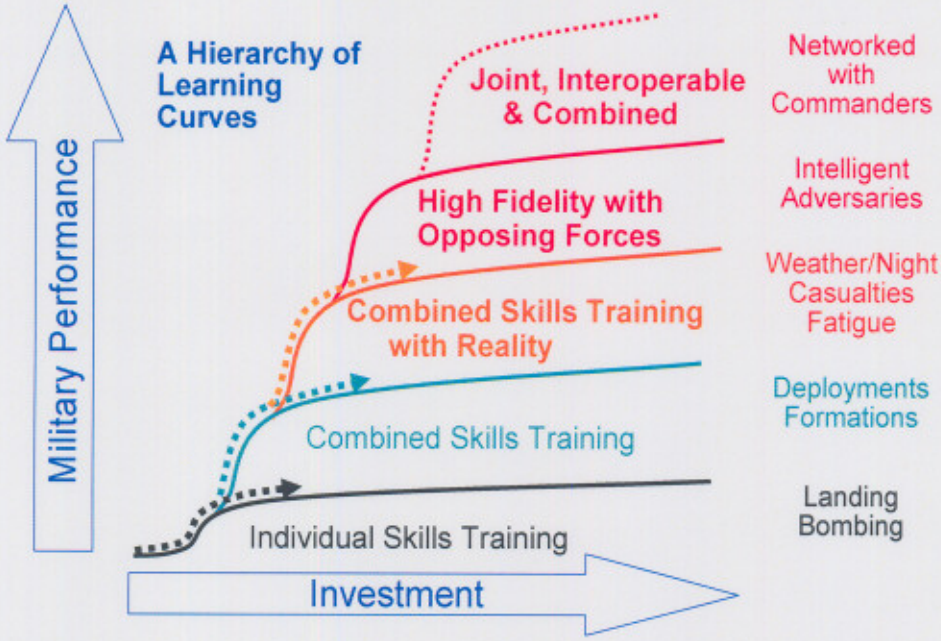

Figure 3.1 Military Performance vs. Investment[19]

3.2.5 Radar Simulation Technology

In addition to networked ground-based simulation, the incorporation of RST devices into actual flights would allow future expansion of undergraduate training to encompass training currently available only at the FRS or the fleet. These may include mission computers, weapon employment, fighter data link and non-radar sensor management. The net effect is to offset the increasing training load imposed on the FRS and operational squadrons by software updates and changes in Tactics, Techniques, and Procedures (TTPs), by transferring appropriate events to TW-6.

3.2.6 Training Continuum

These benefits will not be accomplished without a centralized training management process that exercises oversight on the entire training continuum. This oversight must include student performance and training resource allocation in order to reap the benefits. For example, an FRS may not be able to identify training events in their own syllabus that could be integrated at low cost into undergraduate training, and so provide cost avoidance or real savings to the Services, but these opportunities would be visible to a master curriculum manager with insight into the acquisition and operating costs of training media across the training continuum.

[19] Adapted from Defense Science Board Task Force Final Report, *Training Superiority and Training Surprise*, 13 Dec 2001.

4.0 TRAINING SYSTEM ALTERNATIVES REPORT

4.1 ASSUMPTIONS

- The T-39N/G is nearing its life expectancy and will be retired no later than FY12
- Personnel staffing issues for the alternatives remain to be clarified in a follow-on effort
- Any media could be acquired for training purposes
- The training alternatives will support appropriate joint training
- Simulation will be part of every alternative
- The T-6A will be part of every alternative
- Radar Simulation Technology (RST) will be part of every alternative where on-board radar is not available
- Procurement of an MPA-X is not fiscally feasible

4.2 ALTERNATIVES

Recommended alternatives to the training situation at Training Air Wing Six, Pensacola NAS, FL are listed below in Table 4.1. Each option is described in detail along with a technical description, operational concept, rationale and impact to TW-6. In each option, "Simulation" means increased use of high-fidelity ground-based simulators. Both the T-2 and the T-39 are assumed to have been retired as soon as practical.

All options that follow were developed in light of the JTI requirements; each option proposed supports the JTI when considered as an integrated training system. While proposed devices may have a performance deficit when compared to devices in the current program, it is the student performance that counts. No net degradation of student performance is anticipated under any of the options. Each option will require a phased approach to implementation, including small group try-outs, to ensure that student performance is assured.

Options	Major Training Devices
Current Program	Limited Simulation + T-6A + T-1A + T-39N/G + T-2
1	Simulation + T -6A + T-6S
2A	Simulation + T-6A + T-6S + T-45A/C
2B	Simulation + T-6A + T-45S
3A	Simulation + T-6A + MPA-X
3B	Simulation + T-6A + MPA-X + T-45A/C
4A	Simulation + T-6A + T-1S
4B	Simulation + T-6A + T-1S + T-45A/C
5	Simulation + Navy and USAF Train Separately

Table 4.1 Alternatives

4.2.1 Option 1

Simulation + T-6A + T-6S
This option replaces the T-1A, the T-39N and the T-2 flights with T-6S flights and high-fidelity ground simulation.

4.2.1.1 Technical description

The T-6S is a T-6A airframe equipped with an integrated glass cockpit, a mission computer, GPS, ACMI, and RST that is data-linked with other T-6S aircraft and with a ground station. The mission computer can emulate weapon employment. The Instructor NFO (INFO) and Instructor CSO (ICSO) do not accompany the UMFO during flight. The INFO/ICSO is in continuous voice contact with both the UMFO and the pilot during the flight, and is able to control the RST displays. The pilot performs some of the INFO/ICSO duties during flight, and the balance is performed by the INFO/ICSO at the ground station. The INFO/ICSO can emulate Joint Forces Air Component Command (JFACC) Command and Control elements and threat activity through the ground station data-link. The same link could provide actual digital weather data to the aircraft for display on the MFDs.

4.2.1.2 Operational concept

- Primary - Uses the T-6A aircraft and CPT
- Intermediate - Uses the T-6A aircraft and CPT, and transfers the T-1A flights to the T-6A aircraft and SIM
- Advanced - Uses the T-6S aircraft and SIM in place of the T-39N/G, and transfers the T-2C flights and CPT to the T-6A aircraft and SIM
- Requirements - Procure T-6S aircraft and SIM; procure T-6A SIM

Over-the-shoulder mentoring occurs in the T-6S flight simulator; later simulator missions include a pilot to begin building CRM experience. Air-to-Air flights are preceded by air-to-air flight simulator missions; all high closure rate air-to-air engagements are performed in the simulator. Generally, the UMFO plans the mission on PFPS with the assistance of the INFO/ICSO, and briefs the mission to the pilot/formation. The UMFO uploads the mission data from PFPS to the T-6S mission computer using a data transfer device. While the UMFO is airborne, the INFO/ICSO monitors the UMFO performance and modifies the training accordingly by slowing and/or escalating the pace of events. The INFO/ICSO may direct the pilot to allow "recovery and instruction" pauses to ensure the UMFO is not overwhelmed. During these pauses, the INFO/ICSO mentors the UMFO in-flight by voice link from the ground station. ACMI and mission computer data is employed to debrief the UMFO and pilot.

4.2.1.3 Rationale

The T-6 airframe is likely to remain in the inventory for several more decades, and it is a high-performance aerobatic platform that will support air-to-air training at the undergraduate level. Since all ATM training is currently visual (no radar), all ATM

flights are transferred to the T-6A aircraft and simulator. RST in the aircraft and simulator can emulate any high-end tactical radar or IR sensor.

High closure rate engagements that require a compressed timeline can be simulated on the ground by artificially boosting T-6 performance to that approximating a T-45 or even an F/A-18F. If this task must be trained in flight, the compressed timeline of a high closure rate may be achieved by reducing the radar range performance in the RST; the engagement is completed in a smaller volume of air, but the inertial "g" loads and time compression are equivalent to those in an engagement at T-45 airspeeds. The net effect is to drive the SNFO to perform at a pace that approximates the pace in a high closure rate.[20] This approach would provide the SNFO with an appropriate (undergraduate) introduction to the pacing required for high closure rate engagements.

The future requirement for visual dogfight training in a jet aircraft should be re-evaluated in light of the history of such engagements since the incorporation of high performance radar and long range missiles. In the 21st century battlespace, such dogfight engagements will be rare, and will happen only if multiple failures in tactics and equipment have occurred. In this sense they are no different from emergency procedures, which are prime candidates for simulation training. The predominant air-to-air training tasks should focus on long range sensor and missile employment.

4.2.1.4 Impact to training

Time to train should be reduced significantly: use of a single airframe for the entire program eliminates the need to teach aircraft systems and operating procedures for multiple airframes. Increased use of ground simulation mitigates scheduling issues associated with aircraft availability and weather. Training emergency procedures and high-risk activity in a Ground Based Training (GBT) system significantly increases the overall safety margin for TW-6 operations.

Logistics and sustainment complexity is reduced by roughly 4:1 due to fewer contract and organic maintenance programs. Operating costs are significantly reduced by eliminating the need for a jet training aircraft and by transferring training to simulation that is cheaper to buy, easier to maintain, and more available for training than an aircraft. The RST-equipped model would provide flexibility for increased training in sensor and weapon operation.

T-6A/S pilots would have an increased role in supporting the INFO/ICSO mentorship in the cockpit, both in simulation and in the aircraft; this may require more contract pilots and expanded Instructor Under Training (IUT) programs.

Early simulator missions in each phase would first employ the INFO/ICSO in the cockpit for basic mentoring; later missions would employ a pilot to build CRM skills and experience.

[20] A COMOPTEVFOR assessment in late 2003 did not recommend "the use of the T-6A to support the NFO ATM syllabus of the NFO Strike curriculum due to limitations with regard to airspeed, power, and maneuvering capability." This limited assessment focused only on the aircraft, and did not assess the potential benefits of expanded use of RST and high-fidelity ground simulation in an integrated training system.

Replacing T-2 sorties with T-6S simulator missions with artificially boosted performance would require a progressive, step-wise implementation that evaluates student performance in small group try-outs as the T-2 aircraft is phased out.

4.2.2 Option 2A

Simulation + T-6A + T-6S + T-45A/C

4.2.2.1 Technical description

The T-6 discussion is the same as in Option 1. The T-45A/C is a single engine, two seat tandem, ejection seat equipped, aircraft carrier capable, advanced tactical training aircraft. The C model includes a digital cockpit equipped with two monochrome multifunction displays which provide GPS navigation, weapon delivery, aircraft performance and communications data.

The T-45 began replacing the TA-4J and T-2C aircraft in the Navy/Marine Pilot training program in 1992. The total replacement (in pilot training) will be complete in September 2004.

4.2.2.2 Operational concept

- Primary - Uses the T-6A aircraft and CPT
- Intermediate - Uses the T-6A aircraft and CPT, and transfers the T-1A flights to the T-6A aircraft and SIM
- Advanced - Uses the T-6S aircraft and SIM in place of the T-39N/G, and transfers the T-2C aircraft and CPT to the T-45A/C aircraft and CPT
- Requirements - Procure T-6S aircraft and SIM; procure T-45A/C and SIM

4.2.2.3 Rationale

The T-45A/C is a suitable replacement for the T-2. The T-6S employment is based on similar rationale described under Option 1.

4.2.2.4 Impact to training

Time to train should be reduced significantly: use of a single airframe for most of the program reduces the need to teach multiple aircraft systems and operating procedures to the majority of the students. Increased use of ground simulation mitigates scheduling issues associated with aircraft availability and weather. Training emergency procedures and high-risk activity in a GBT system significantly increases the overall safety margin for TW-6 operations.

Logistics and sustainment complexity is reduced by roughly 2:1 due to fewer contract and organic maintenance programs. Operating costs are significantly reduced by transferring training to simulation that is cheaper to buy, easier to maintain, and more available for training than an aircraft. The RST-equipped T-6S would provide flexibility for increased training in sensor and weapon operation.

T-6A/S pilots would have an increased role in supporting the INFO/ICSO mentorship in the cockpit, both in simulation and in the aircraft; this may require more contract pilots and expanded IUT programs.

Marginal increase in training capability in the ATM phase with the use of the T-45C.

4.2.3 Option 2B

Simulation + T-6A + T-45S

4.2.3.1 Technical description

Same as Option 2A except that RST is integrated into the T-45C instead of the T-6; T-6S is not procured. T-45S cockpit functionality is nearly identical to T-6S described in Option 1.

4.2.3.2 Operational concept

- Primary - Uses the T-6A aircraft and CPT
- Intermediate - Uses the T-6A aircraft and CPT, and transfers all T-1A flights to the T-6A aircraft and SIM
- Advanced - Uses the T-45S aircraft and SIM in place of the T-39N/G, and transfers the T-2C flights and CPT to the T-45S aircraft and SIM
- Requirements - Procure T-45S aircraft and SIM; procure T-6A SIM

4.2.3.3 Rationale

Same as Option 2A. Advanced phases employ the faster T-45C aircraft with RST to provide radar training. Over the shoulder mentoring occurs in the T-6A SIM and T-45S SIM; airborne mentoring provided by pilot in partnership with the INFO/ICSO at the ground station.

4.2.3.4 Impact to training

Time to train should be reduced significantly: use of a single airframe for most of the program reduces the need to teach multiple aircraft systems and operating procedures to the majority of the students. Increased use of ground simulation mitigates scheduling issues associated with aircraft availability and weather. Training emergency procedures and high-risk activity in a GBT system significantly increases the overall safety margin for TW-6 operations.

Logistics and sustainment complexity is reduced by roughly 2:1 due to fewer contract and organic maintenance programs. Operating costs are significantly reduced by transferring training to simulation that is cheaper to buy, easier to maintain, and more available for training than an aircraft. The RST-equipped T-45S would provide flexibility for increased training in sensor and weapon operation.

T-45S pilots would have an increased role in supporting the INFO/ICSO mentorship in the cockpit, both in simulation and in the aircraft; this may require more contract pilots and expanded IUT programs.

Significant increase in training capability in the Advanced phase with the use of the T-45S.

4.2.4 Option 3A

Simulation + T-6A + MPA-X

4.2.4.1 Technical description

The MPA-X is a Commercial Off-the-Shelf (COTS) multi-place aircraft (MPA) equipped with an integrated, high-end tactical radar; it is employed in the curriculum much like the T-39N/G. Flight and simulation hours are procured from an operating contractor on a fee-for-service basis; the contractor guarantees that a high percentage of sorties will be flown as scheduled, and is responsible for all maintenance. The Navy assumes all liability while the aircraft is operated by a single pilot because this is not in accordance with its FAA certification. The tactical radar is an exportable version, so that the contractor may train international students. The aircraft could be equipped with cabin work stations similar to the current design in the T-39N for instruction and mentoring.

4.2.4.2 Operational concept

- Primary - Uses the T-6A aircraft and CPT
- Intermediate - Uses the T-6A aircraft and CPT, and transfers the T-1A flights to the MPA-X aircraft
- Advanced - Uses the MPA-X aircraft and SIM in place of the T-39N/G, and transfers the T-2C flights and CPT to the T-6A aircraft and SIM
- Requirements - Fee for service of MPA-X aircraft and SIM; procure T-6A SIM

4.2.4.3 Rationale

This option preserves over-the-shoulder mentoring while airborne in a maneuvering high-performance aircraft with actual high-end tactical radar. The fee-for-service acquisition strategy allows access to MPA flight hours without procurement and support costs, and accommodates contractor issues such as FAA certification and liability. T-2 sorties are transferred to the T-6A aircraft and simulator to reduce overall cost.

4.2.4.4 Impact to training

Time to train should be reduced: eliminates the need to teach aircraft systems and operating procedures for two airframes. Increased use of ground simulation mitigates scheduling issues associated with aircraft availability and weather. Training emergency procedures and high-risk activity in a GBT system significantly increases the overall safety margin for TW-6 operations.

Logistics and sustainment complexity is reduced by roughly 4:1 due to fewer contract and organic maintenance programs. Operating costs are significantly reduced by eliminating the T-2 jet training aircraft and by transferring training to simulation that is cheaper to buy, easier to maintain, and more available for training than an aircraft. The MPA-X fee-for-service contract would provide flexibility for high fidelity tactical radar training similar to the current T-39N role. Preserves traditional INFO/ICSO mentorship in the cockpit, both in simulation and in the aircraft. Decreased training in visual engagements –due to lower airspeeds and climb performance in the T-6A vice

the T-2—partly offset by use of T-6A simulator with artificial performance boost to emulate F/A-18F.

4.2.5 Option 3B

Simulation + T-6A + MPA-X + T-45A/C

4.2.5.1 Technical description

Same as Option 3A, but adds T-45 aircraft and simulator.

4.2.5.2 Operational concept

- Primary - Uses the T-6A aircraft and CPT
- Intermediate - Uses the T-6A aircraft and CPT, and transfers the T-1A aircraft to the MPA-X aircraft
- Advanced - Uses the MPA-X aircraft and SIM in place of the T-39N/G, and transfers the T-2C aircraft and CPT to the T-45A/C aircraft and SIM
- Requirements - Fee for service of MPA-X aircraft and SIM; procure T-45A/C aircraft and SIM

4.2.5.3 Rationale

Same as Option 3A, except that actual tactical jet aircraft experience is preserved; RST is not integrated into the T-45 to help offset the increased operating costs.

4.2.5.4 Impact to training

Time to train should be reduced: eliminates the need to teach aircraft systems and operating procedures for one airframe. Increased use of ground simulation mitigates scheduling issues associated with aircraft availability and weather. Training emergency procedures and high-risk activity in a GBT system significantly increases the overall safety margin for TW-6 operations.

Logistics and sustainment complexity is reduced by roughly 2:1 due to fewer contract and organic maintenance programs. Operating costs are significantly reduced by transferring training to simulation that is cheaper to buy, easier to maintain, and more available for training than an aircraft. The MPA-X fee-for-service contract would provide flexibility for high fidelity tactical radar training similar to the current T-39N role, but without the burden of maintenance and spares management. Preserves traditional INFO/ICSO mentorship in the cockpit, both in simulation and in the aircraft. Preserves training in visual engagements.

4.2.6 Option 4A

Simulation + T-6A + T-1S

4.2.6.1 Technical description

The T-1S is a T-1A aircraft modified to accept a portable, plug-and-play RST system. The RST device mounts in the cabin, and interfaces with the aircraft data bus to obtain GPS position, altitude and speed; RST display output is interfaced with the MFD. RST data link antennae are semi-permanently mounted on the T-1A; the RST is secured in

the cabin near the jump seat. The INFO/ICSO in the jump seat has access to RST controls and displays that support training while in flight.

4.2.6.2 Operational concept

- Primary - Uses the T-6A aircraft and CPT
- Intermediate - Uses the T-6A aircraft and CPT and transfers the T-1A flights to the
- T-1S
- Advanced - Uses the T-1S aircraft and SIM in place of the T-39N/G, and transfers the T-2C aircraft and CPT to the T-6A aircraft and SIM
- Requirements - Procure T-1S aircraft and SIM; procure T-6A SIM

4.2.6.3 Rationale

This option preserves over-the-shoulder mentoring while airborne in a maneuvering aircraft; actual tactical radar experience is simulated. Use of an airframe currently in the inventory provides cost avoidance. Use of a portable, plug-and-play RST system reduces integration cost reduces the number of RST systems procured, facilitates T-1A airframe rotations with pilot training bases and allows flexibility for future RST upgrade.

4.2.6.4 Impact to training

Time to train should be reduced: eliminates the need to teach aircraft systems and operating procedures for two airframes. Increased use of ground simulation mitigates scheduling issues associated with aircraft availability and weather. Training emergency procedures and high-risk activity in a GBT system significantly increases the overall safety margin for TW-6 operations.

Logistics and sustainment complexity is reduced by roughly 2:1 due to fewer contract and organic maintenance programs. Operating costs are significantly reduced by eliminating the T-2 jet training aircraft and by transferring training to simulation that is cheaper to buy, easier to maintain, and more available for training than an aircraft. The RST-equipped T-1 would provide flexibility for increased training in sensor and weapon operation while preserving traditional INFO/ICSO mentorship in the cockpit, both in simulation and in the aircraft. Decreased training in visual engagements—due to lower airspeeds and climb performance in the T-6A vice the T-2—partly offset by use of T-6A simulator with artificial performance boost to emulate F/A-18F.

4.2.7 Option 4B

Simulation + T-6A + T-1S + T-45A/C

4.2.7.1 Technical description

Same as Option 4A, but adds T-45 aircraft and simulator.

4.2.7.2 Operational concept

- Primary - Uses the T-6A aircraft and CPT

- Intermediate - Uses the T-6A aircraft and CPT and transfers the T-1A flights to theT-1S
- Advanced - Uses the T-1S aircraft and SIM in place of the T-39N/G, and transfers the T-2C aircraft and CPT to the T-45A/C aircraft and SIM
- Requirements - Procure T-1S aircraft and SIM; procure T-45A/C aircraft and SIM

4.2.7.3 Rationale

Same as Option 4A.

4.2.7.4 Impact to training

Same as Option 4A, except that actual tactical jet aircraft experience is preserved; RST is not integrated into the T-45 to help offset the increased operating cost.

4.2.8 Option 5

Current program and Options 1 through 4B with zero USAF students.

4.2.8.1 Technical description

Varies with the options as previously discussed above.

4.2.8.2 Operational concept

This option addresses the situation where the USAF elects to train in a completely independent program; no USAF students flow through any phase at NAS Pensacola, and no USN/USMC students attend any phase of USAF CSO training.

4.2.8.3 Rationale

This option isolates the NFO training from CSO training in the model to highlight the effect of USAF participation.

4.2.8.4 Impact to training

Loss of appreciation for joint operations arising from incidental contact between NFO and CSO students and instructors. Increased cost per student due to overhead. Duplication of effort and expense for IMI, training devices, facilities, instructors, management, etc.

4.3 ANALYSIS OF ALTERNATIVES

4.3.1 Discussion of alternatives selection

Alternatives selection is not always determined by empirical methods. Any solution, to be effective, must also be tempered by feasibility, practicality, and customer desires. Customer input plays an enormous part of any alternative solution set. In this context, the customers includes TW-6 and the FRS/FTUs. Dramatic or abrupt implementation of any solution would certainly impact the customer's culture and acceptance of the proposal. Furthermore, when determining if solutions satisfy the intended goals, consideration must be given to the solution's ability to reduce the root cause of inefficiency and increase performance. Tools that can assist in determining possible

solutions are simulation models (computer programs and spreadsheets), benchmarking, best business practices, research, and professional determination, to name a few. A combination of each of these techniques was employed in the selection of recommended solutions included in this study and analysis.

4.3.2 Alternatives Solution Selection Matrix and Sigma Impact Analysis

The alternatives detailed in paragraph 4.9 were analyzed against risk and values (measures of merit) determined from both client input (USN and USAF) and professional development. To accomplish this, a Solution Selection Matrix and Sigma Impact Analysis were developed to help overcome potential solution selection bias and challenges by replacing opinions and assumptions with data and facts. The Solution Selection Matrix and Sigma Impact Analysis are standard tools employed by Six Sigma methodology. Six Sigma is a problem solving technology that uses human interface, data, measurements, and statistics to identify factors to decrease inefficiencies and waste while increasing productivity, return on investment (ROI), and intrinsic or programmatic value to the customer. The Solution Selection Matrix assures visibility is given to the items considered important to the organization. The amount of importance is determined by the weighting applied to the impact category.

A Sigma Impact Analysis allows for more objective and defensible criteria. The evaluation matrices give visibility to all of the components used to make the selection decision. Each solution is evaluated against several factors that are deemed important to the decision-making process. Each factor's importance is then denoted by its "weighting." Weighting is a process of assigning multiple values to a factor (or value) to increase its overall importance relative to other factors. For example, if time is determined to be twice as important as cost, then time will receive a weighting two times that of cost. Weighting was measured on a scale of "0" to "5," with "0" indicating zero or little importance to the customer or organization. A weighting of "5" would indicate greatest importance to the customer or organization. (See Table 4.2 below) Once a weighting assignment is determined, that value remains constant throughout the analysis. Values (measures of merit) were further given a numerical rating of "1" to "10". A rating of "1" would indicate a value least likely to satisfy the customer's critical requirements (CCR). A rating of "10" would indicate a value most likely to satisfy the customer's CCR. (See Table 4.3 below)

Weighting	
5	Greatest importance to customer or organization
4	
3	Average importance to customer or organization
2	
1	
0	Zero or little importance to customer or organization

Table 4.2 Weighting

Rating	
10	Most likely to meet customer's critical requirements
9	
8	
7	
6	
5	Average likelihood to meet customer's critical requirements
4	
3	
2	
1	Least likely to meet customer's critical requirements

Table 4.3 Rating

4.3.2.1 Risk analysis

As previously indicated, the alternatives listed in paragraph 4.2 were analyzed against risk and intrinsic value (measure of merit). Areas considered in risk were: technical, operational, financial, and scheduling. Values considered were: increase in training efficiency, increase in training effectiveness, programmatic gain, safety, and training transformation gain. Each will be defined in greater detail in the paragraphs below.

- Technical Risk. This risk addresses the performance, fit, and function of the intended solution. Is the performance within the established envelope of range or speed, or are we pushing the edge? How much engineering effort is required to make it work reliably in a training environment? What are the developmental test and operational test efforts required? What level of complexity is appropriate? Is this a new application of a demonstrated existing technology or is it a first use of a new technology? For flight systems, how much space, power, weight, cooling is required vice the type and configuration of aircraft. What are the major maintainability, sustainability, availability, reparability issues? Will the solution incorporate open architecture or hard-wired, fixed technology? Open architecture in LRUs employ a common "backplane" or motherboard that will accept new cards that use a common standard interface. Much the same with software: a "shell" can run new modules. Furthermore, how will the proposed solution interface with other systems?
- Operational Risk. This risk addresses the hazards, inefficiencies, and manpower considerations of implementing an intended solution. What is the adaptability to change in TTPs? What are the manpower requirements, both in numbers and skill sets? What are the backup system requirements? Will airspace for training be an issue? What are the noise and environmental impact considerations for implementation? How will the airfield traffic workloads be affected? Are special tools or hazardous equipment to be used and require additional training? What new scheduling challenges are created? Will there be any inherent performance degradation in the students?
- Financial. This risk addresses many of the unforeseen expenses, liabilities, and out-year financial considerations associated with implementing an alternative. Can the

T-39 be retired earlier? How long can the T-39 continue to fly and at what escalating O&S costs? What is the liability for operating an MPA-X trainer? Can the government easily walk away from an MPA-X program at the conclusion of its useful programmatic life? What are the unknown and unrecoverable costs?

- Scheduling. This risk addresses scheduling issues such as delay, late-to-need, implementation overruns, and student throughput delays. Will the training system be in place in time? Will students return to the fleet as advertised? Will the contractor be finished in time for test and acceptance? Will the system produce a standardized student?

4.3.2.2 Values (measures of merit) analysis

- Increase in training efficiency. This value addresses some of the inherent training efficiencies that a customer would desire or realize after successful implementation of an alternative. Increased student throughput will be a likely benefit of a systematically designed training program. Reduced active duty manpower requirements may be realized as well. Time-to-train reductions and student graduation date reliability are gains to be expected or anticipated.
- Increase in training effectiveness. This value addresses some of the training effectiveness values to be gained by an improved training system. It is very likely and could be expected that a systematically designed training program would be able to train more tasks. Tasks that were previously taught at the FRS or FTU for example, may now be incorporated in the UMFO curriculum. Standardization in training is much easier to achieve resulting in higher performance levels in school graduates. Over-the-shoulder (OTS) mentoring could be a value the customer wishes to maintain. NFO/CSO instructors training UMFO students is an effective and desired method of instruction.
- Training system gain. This value addresses the inherent gains realized in an improved training system, such as: return on investment (ROI) across all types of funding, early retirement date of the last T-39G/N aircraft, and ability to reduce cost of FRS/FTU training load. In addition, over-the-shoulder (OTS) mentoring could be a significant value in any training system assessment.
- Training transformation gain. This value addresses the gains achieved by crafting a joint training syllabus. Training transformation that drives early interoperability, cooperation, planning, and education will provide tangible benefits in every aspect of joint military operations. A joint training syllabus would facilitate a modular and flexible approach that allows for adaptability to changing requirements. This could be especially beneficial for the evolving mission of the CSO.
- Safety. This value must be addressed in any training system. Every training system developed or under development must incorporate safety in every aspect. How do you mitigate risk in a training environment?

Risk Assessment

Option	1 T-6, T-6S, Simulation	2a T-6, T-6S, T-45C, Simulation	2b T-6, T-45S, Simulation	3a T-6, MPA-X, Simulation	3b T-6, MPA-X, T-45S, Simulation	4a T-6, T-1S, Simulation	4b T-6, T-1S, T-45C	5 USN and USAF Train Separately
Technical	5 7 35	5 4 20	5 6 30	5 7 35	5 9 45	5 5 25	5 6 30	5 3 15
Operational	3 8 24	3 5 15	3 5 15	3 5 15	3 5 15	3 6 18	3 5 15	3 1 3
Scheduling	1 5 5	1 5 5	1 5 5	1 5 5	1 5 5	1 5 5	1 5 5	1 5 5
Financial	5 10 50	5 4 20	5 3 15	5 7 35	5 7 35	5 5 25	5 3 15	5 1 5
Total	114	60	65	90	100	73	5[illegible]	28
Ranking by Risk	**1**	**6**	**5**	**3**	**2**	**4**	**5**	**7**

Table 4.4 Solution Selection Matrix, Risk Assessment

Value (Measure of Merit)

Option	1 T-6, T-6S, Simulation	2a T-6, T-6S, T-45C, Simulation	2b T-6, T-45S, Simulation	3a T-6, MPA-X, Simulation	3b T-6, MPA-X, T-45S, Simulation	4a T-6, T-1S, Simulation	4b T-6, T-1S, T-45C	5 USN and USAF Train Separately
Student Throughput	1 10 10	1 5 5	1 5 5	1 5 5	1 5 5	1 5 5	1 5 5	1 10 10
Active Duty Manning	3 7 21	3 6 18	3 6 18	3 3 9	3 2 6	3 3 9	3 2 6	3 8 24
Time to Train	1 9 9	1 5 5	1 5 5	1 5 5	1 5 5	1 5 5	1 5 5	1 7 7
Grad Date Reliability	3 9 27	3 5 15	3 5 15	3 6 18	3 5 15	3 6 18	3 5 15	3 6 18
More Tasks Trained	3 9 27	3 5 15	3 7 21	3 7 21	3 8 24	3 6 18	3 8 24	3 5 15

Standardized Student	3 9 27	3 5 15	3 5 15	3 5 15	3 5 15	3 5 15	3 5 15	3 5 15
Student Performance	3 9 27	3 5 15	3 7 21	3 7 21	3 9 27	3 6 18	3 9 27	3 5 15
OTS TNG Mentoring	5 3 15	5 1 5	5 1 5	5 10 50	5 8 40	5 0 50	5 8 40	5 5 25
Return on Investment	5 10 50	5 2 10	5 5 25	5 8 40	5 5 25	5 7 35	5 5 25	5 1 5
Early T-39 Retirement	3 5 15	3 3 9	3 5 15	3 7 21	3 7 21	3 7 21	3 5 15	3 5 15
Reduced Training load to FRS/FTU	4 9 36	4 3 12	4 5 20	4 7 28	4 9 36	4 6 24	4 8 32	4 5 20
OTS Mentoring (Prog. Gain)	5 3 15	5 1 5	5 1 5	5 10 50	5 9 45	5 9 45	5 8 40	5 5 25
Safety	3 10 30	3 5 15	3 5 15	3 7 21	3 6 18	3 7 21	3 6 18	3 5 15
Modular Training Flexible (CSO)	5 10 50	5 4 20	5 5 25	5 6 30	5 7 35	5 5 25	5 6 30	5 0 0
Joint Training Interoperability	4 10 40	4 4 20	4 5 20	4 6 24	4 7 28	4 5 20	4 6 24	4 0 0
Total	399	180	230	358	345	329	321	209
Ranking by Value	**1**	**8**	**6**	**2**	**3**	**4**	**5**	**7**

Table 4.5 Solution Selection Matrix, Value

4.3.2.3 Rank order of alternatives

Once the weightings and values were populated in the Solution Selection Matrix, the numerical summations were totaled and the values were rank ordered by highest numerical value, (highest to lowest). The alternatives with the highest value are determined to be the best operational fit relative to risk and measure of merit. Those rank orderings are portrayed in Table 4.6.

	Raw Scores							
Option	**1**	**2a**	**2b**	**3a**	**3b**	**4a**	**4b**	**5**
	T-6, T-6S, Simulation	T-6, T-6S, T-45C, Simulation	T-6, T-45S, Simulation	T-6, MPA-X, Simulation	T-6, MPA-X, T-45S, Simulation	T-6, T-1S, Simulation	T-6, T-1S, T-45C	USN and USAF Train Separately
Risk	114	60	65	90	100	73	65	28
Value	399	180	230	358	345	329	321	209
Total	513	240	295	448	445	402	386	237
Final Ranking	**1**	**7**	**6**	**2**	**3**	**4**	**5**	**8**
Normalized to leader	100							

Table 4.6 Alternatives by Rank Ordering

Raw Scores: Risk and Value							
Option	1	3A	3B	4A	4B	2B	2A
Aircraft	T-6A T-6S	T-6A MPA-X	T-6A MPA-X T-45S	T-6A T-1S	T-6A T-6S T-45C	T-6A T-45S	T-6A T-6S T-45C
Risk	114	90	100	73	65	65	60
Value	399	358	345	329	321	230	180
Total (Risk + Value)	513	448	445	402	386	295	240
Risk & Value Rank	1	2	3	4	5	6	7
Normalized Rank	100%	87%	87%	78%	75%	58%	47%

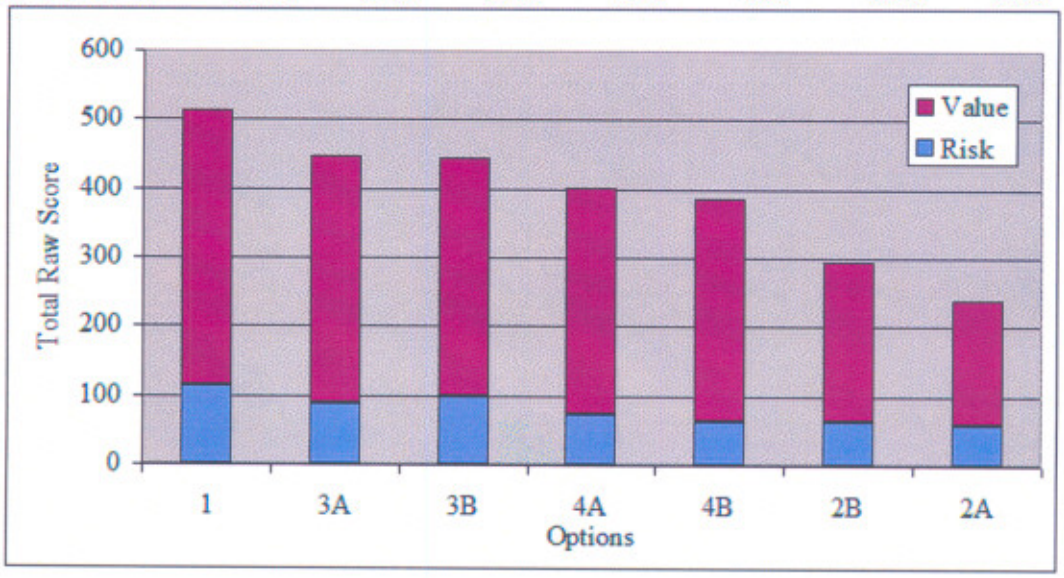

Figure 4.1 Alternatives by Rank Order

4.4 EVALUATION OF CURRENT PROGRAM AND ALTERNATIVES

4.4.1 Evaluation concept

4.4.1.1 General concept

This evaluation was accomplished by developing a sophisticated financial model to complement the Six Sigma assessment of risk and value. The financial model was designed, developed and populated to develop an accurate picture of the Current Program (CP) and to enable evaluation of the options using the CP as the baseline.

4.4.1.2 Concept basis

The financial model was populated with the raw data that are listed below. Each item is identified by definition, source and value. All of the raw data listed below can be adjusted in the model, but most were held constant for this evaluation to limit the

variety of results and tailor the evaluation to both the tasking and the nature of the current culture.

4.4.1.2.1 Device cost data

Cost data was acquired via TW-6 for all aircraft currently in use and their corresponding ground training devices including Cockpit Procedures Trainers (CPT), also known as Part Task Trainers (PTT), and Flight Training Devices (FTD), referred to here as flight simulators (SIM). The specific data acquired for each device type and model is listed below. These cost data were also acquired via TW-6 for devices that are not currently in use for any phase of CSO/NFO at any location but are being considered for future use. The values that were used in this evaluation can be seen in Figure 4.2.

TRAINING DEVICE PARAMETERS

Device	T-6A			T-6S		
	Procure Cost/M	CPFH	UTE Rate	Procure Cost/M	CPFH	UTE Rate
Aircraft	$6	$925	$650	$7	$925	$650
SIM	$6	$500	$3,000	$6	$500	$3,000
CPT/PTT	$4	$215	$3,000	$4	$215	$3,000

Device	T-1A			T-1S		
	Procure Cost/M	CPFH	UTE Rate	Procure Cost/M	CPFH	UTE Rate
Aircraft	$4	$1,750	$650	$5	$1,750	$650
SIM	$6	$500	$3,000	$6	$500	$3,000
CPT/PTT	$4	$250	$3,000	$4	$250	$3,000

Device	T-45A/C			T-45S		
	Procure Cost/M	CPFH	UTE Rate	Procure Cost/M	CPFH	UTE Rate
Aircraft	$30	$3,032	$650	$33	$3,032	$650
SIM	$6	$500	$3,000	$6	$500	$3,000
CPT/PTT	$4	$250	$3,000	$4	$250	$3,000

Device	T-39G/N			T-2C		
	Procure Cost/M	CPFH	UTE Rate	Procure Cost/M	CPFH	UTE Rate
Aircraft	$0	$2,905	$571	$0	$2,364	$600
SIM	$0	$500	$3,000	$0	$500	$3,000
CPT/PTT	$0	$17	$3,000	$0	$250	$3,000

Device	MPAX		
	Procure Cost/M	CPFH	UTE Rate
Aircraft	$0	$2,800	$650
SIM	$0	$500	$3,000
CPT/PTT	$0	$250	$3,000

Figure 4.2 Device Cost Data

4.4.1.2.1 Device Procurement Cost

This is the cost to possess a device (aircraft, CPT, SIM). It includes all costs except MILCON. Aircraft costs were provided by TW-6. Some CPT and SIM costs were provided by either TW-6 or HQ AETC, and the remainder was established by ATC from previous experience.

- Cost Per Flying Hour (CPFH) includes all operating and maintenance costs once a device is up and running at an operational/training unit. All CPFH costs were provided by TW-6 except the T-1A data which was provided by HQ AETC.
- Utilization Rate (UTE) is the number of hours per year that a device should be available (includes scheduled and unscheduled down time). It should be an historical value unique to each device type and model. Target UTE rates have been provided by TW-6. Where historical values were not available, a target UTE rate of 650 has been used.

4.4.1.2.2 Current number of possessed devices

The current number of aircraft, CPTs and SIMs at NAS Pensacola was acquired via TW-6 in July 2004. The values that were used in this evaluation can be seen in Figure 4.3.

Current # of Devices at NAS Pensacola - As of July 2004

Device	Current #
T-6A Aircraft	48
T-6A CPT	5
T-1A Aircraft	10
T-39G Aircraft	4
T-39G PTT	10
T-39N Aircraft	19
T-2C Aircraft	17
T-2C CPT	3

Figure 4.3 Current Devices

4.4.1.2.3 Annual Student Production/Throughput

The current and projected student throughput was acquired from TW-6 in July 2004. It was broken down by phase and fiscal year through FY07. Because there were no projections provided for FY08+, the FY07 values were used for FY08+. The phases that are included in this evaluation are listed below. The values that were used for this evaluation can be seen in Figure 4.4.

NFO Student Production/Throughput					
Phase	FY04	FY05	FY06	FY07	FY08+
Primary	445	468	482	416	453
Advanced Panel Nav	138	138	138	138	138
	Using 190 for FY09+ at NAS Pensacola				
Intermediate	325	310	322	293	313
Stike Core	263	279	275	248	266
Advanced Strike	126	106	93	106	108
Advanced Strike Fighter	126	159	177	169	158
Advanced Tactical Maneuvering	176	166	173	183	175

Note: Since there were no projetions given beyond FY07, the FY07 values were used for FY08+.

Figure 4.4 Annual Student Production and Throughput

- All students attend the Primary phase. Panel Navigator (PN) students are picked off from here and go to Randolph AFB. All other students proceed to the Intermediate phase. PN is included in this evaluation in the manner described herein. For FY05 through FY08, the cost data used for alternative analysis has been fixed at $22M per year. This figure includes both the Navy student numbers attending Primary and Intermediate training at Randolph as well as Air Force student numbers attending the program as a whole. For FY09 and beyond the cost data is based on an assessment of the training program as it currently exists and best fits into each alternative. The analysis considered the CSO curriculum being implemented in October 04. The number and types (e.g. radio instrument navigation, INS/GPS navigation, RADAR navigation) of aircraft flights and simulator events were captured and placed in a suitable alternative aircraft or simulator. When entered in financial models for cost analysis, the events were placed in the T-6A aircraft or simulator if a RADAR is not required and in the alternative RADAR equipped aircraft if a RADAR is required. The numbers and types of events are shown in Table 4.7.

Panel Navigator Pipeline for FY09 and Beyond		
	T-6	Radar Equipped Training device
Flight	15	5
Simulator (CPT)	17	13

Table 4.7 Panel Navigator Training Pipeline

- All E-2C students complete their training in the intermediate phase, while all others move on to the Strike phases.
- All advanced students attend the strike core phase. Afterward they split to either Advanced Strike or Advanced Strike Fighter, and then join back up for Advanced Tactical Maneuvering. In view of the time constraint and complexity of the modeling process, the F-15E and B-1B pipelines were not included in the financial model beyond their respective curriculum at NAS Pensacola (i.e. IFF and EWO).
- All S-3, EA-6 and B-1 students attend the advanced strike phase.
- All F/A-18, F-15, F-4 and Tornado students attend the advanced strike fighter phase.
- All Strike students complete their training in the ATM phase, except as noted in paragraph 4.4.1.2.3.3 above.

4.4.1.2.4 Scheduling Parameters

This evaluation includes the capability to adjust a variety of scheduling parameters which have a direct impact on the number of student events that can be accomplished in a designated period of time, and hence the number of devices required to accomplish those events. The scheduling parameters that are included in this evaluation are listed below. They can be seen in Figure 4.5.

Scheduling Parameters	
Students per Crew	1
Annual Training Days	237
Turns per Day - Aircraft	3
Turns per Day - SIM / CPT	7

Figure 4.5 Scheduling Parameters

- Students Per Crew is the number of students who accomplish a single event in the same device at the same time. This value is adjustable but has been held at one student per single event for all aspects of this evaluation because it is the current ratio being used at Pensacola.
- Annual Training Days is the number of days each year that training will be on going. This value is adjustable, but it has been established as 237 days by TW-6 and, as such, has been held constant throughout all aspects of this evaluation.
- Turns per Day is the number of times that a single device can be used in a single training day. This value is adjustable but has been established at three per aircraft and seven per CPT and SIM. ATC established three per aircraft because it is the point at which the aircraft requirement becomes a UTE rate issue only, and TW-6 established seven per CPT/SIM.

4.4.1.2.5 Syllabus Parameters

This evaluation includes the capability to adjust both the number of events per student per phase, and the number of hours per student per phase for all devices that are included in the CP and each option. The values that have been used in this evaluation were taken from the CP and were validated by our SME via TW-6. Those values have been held constant for all aspects of this evaluation, and can be seen in Figure 4.6 (Syllabus Parameters). As noted previously, a hypothetical PN program at NAS Pensacola beginning in FY09 was developed by our SME for use in this evaluation (see Para 4.4.1.2.3 above).

NFO Syllabus Parameters

Phase	Device	Events per Student	Hours per Student
Primary	Aircraft	12	21.0
	CPT	7	10.5
Primary Sub-Total		19	31.5
Intermediate	Aircraft	27	52.0
	CPT	5	7.5
Intermediate Sub-Total		32	59.5
Strike Core	Aircraft	13	11.9
	CPT	5	10.0
Strike Core Sub-Total		18	21.9
Advanced Strike	Aircraft	8	18.4
	CPT	4	8.0
Advanced Strike Sub-Total		12	26.4
Advanced Strike Fighter	Aircraft	17	26.4
	CPT	31	46.5
Advanced Strike Fighter Sub-Total		48	72.9
Advanced Tactical Maneuvering	Aircraft	12	17.1
	SIM	9	13.5
Advanced Tactical Maneuvering Sub-Total		21	30.6

Figure 4.6 Syllabus Parameters

4.4.1.3 Concept Process

The raw data were fed into the financial model which was built to produce the results listed below. Each result is collected as a total by phase and device, then summarized into a total by phase for all devices, and finally into a grand total for the entire program. The results are charted in a variety of forms including cumulative for the entire NFO program, cumulative by pipeline, and cost per student by phase and device.

4.4.1.3.1 Hours and costs

Flying hours and program costs have been collected in cumulative form for the entire NFO program as well as by phase/pipeline and are charted as such.

- Flying hours have been collected but are not charted specifically. They are charted by way of operations and maintenance (O&M) costs, and costs per student by phase/pipeline (see O&M cost below.).
- The cost to procure additional assets has been collected and is charted by option and FY. The types/models of procured assets are addressed in the descriptions of the CP and the options that were evaluated. A synopsis of the CP and options can be seen in Figure 4.7.

Synopsis of Current Program and Evaluated Options			
Option	**Phase**	**Device Used**	**Device Replaced**
Current Program	Primary	T-6A	
	Intermediate	T-6A	
		T-1A	
	Advanced	T-39G/N	
		T-2C	
Option 1	Primary	T-6A	
	Intermediate	T-6A	T-1A
	Advanced	T-6S	T-39G/N
		T-6A	T-2C
Option 2A	Primary	T-6A	
	Intermediate	T-6A	
		T-45A/C	T-1A
	Advanced	T-6S	T-39G/N
		T-45A/C	T-2C
Option 2B	Primary	T-6A	
	Intermediate	T-6A	
		T-45A/C	T-1A
	Advanced	T-45S	T-39G/N
		T-45A/C	T-2C
Option 3A	Primary	T-6A	
	Intermediate	T-6A	
		MPA-X	T-1A
	Advanced	MPA-X	T-39G/N
		T-6A	T-2C
Option 3B	Primary	T-6A	
	Intermediate	T-6A	
		MPA-X	T-1A
	Advanced	MPA-X	T-39G/N
		T-45A/C	T-2C
Option 4A	Primary	T-6a	
	Intermediate	T-1S	T-1A
	Advanced	T-1S	T-39G/N
		T-6A	T-2C
Option 4B	Primary	T-6a	
	Intermediate	T-1S	T-1A
	Advanced	T-1S	T-39G/N
		T-45A/C	T-2C

Figure 4.7 Synopsis of Current Program and Evaluated Options

- The O&M cost is the cost to accomplish the flying hour program has been collected and is charted by option and FY. Since the flying hour and Operations and

Maintenance (O&M) cost charts are virtually identical except for scale, only O&M costs have been charted.

- The cumulative cost is the sum of procurement and O&M costs has been calculated and is charted by option and fiscal year.

4.4.1.3.2 Costs per student

Additional results were collected regarding cost per student. These results are charted by both phase and device. The charts of costs per individual student are taken from FY04 data for the CP and FY05 data for each of the options that were evaluated. The annual student cost charts were all based on FY05 student throughput. These costs will remain constant within an option group barring a mid-stream syllabus change in the number of hours per student per event. Mid-stream syllabus changes were not addressed in this evaluation.

4.4.2 Evaluation Guidelines

The guidelines listed below were used in this evaluation in conjunction with the assumptions and constraints previously presented (see Para 2.2.3). Their focus is to satisfy the tasking within reasonable time constraints and maximize cost effectiveness for the entire NFO program.

4.4.2.1 Raw Data

While the raw data are all adjustable, they were handled in the following manner for this evaluation.

4.4.2.1.1 Constants

These include items that, once known/validated, will remain constant throughout the entire evaluation process. They are adjustable in the sense that we started with estimated values and replaced them with actual/validated values when the information was made available. These data are held constant within their particular frame of reference in consideration of program continuity (e.g. FY for student throughput). They include Training Device Parameters, Current # of Devices at NAS Pensacola in July 2004, and Student Production/Throughput.

4.4.2.1.2 Current Program Constants

These include items that are the norm for the CP and are likely to be the norm for the future. Their adjustment can significantly affect the cost of a program, but their adjustment at this point is beyond the scope of the current tasking. They include Scheduling Parameters and Syllabus Parameters.

4.4.2.1.3 Variables

These include items that will change at various points in the financial model during the course of developing and analyzing options (e.g. current number of devices that increase with procurement or decrease with phase out/draw-down). These are the only raw data that are charted specifically.

4.4.2.2 Procurement

Device procurement is handled manually instead of by formula so that maximum efficiency can be maintained. All of the options involve multiple models of various types of devices (e.g. T-6A and T-6S). When analyzing the procurement of a new device type and/or model, first consideration is given to the modification of existing assets. The purchase of a new asset is not considered unless there are no existing assets available for modification and/or conversion. For the purposes of this evaluation, a device procurement is charted in the FY that the device becomes fully available for its intended purpose (tail end of the acquisition process). This evaluation does not address the availability of new assets, but only the need for their procurement.

4.4.2.3 Short Term versus Long Term

The evaluation of program costs is being considered from two perspectives. The short term perspective includes the procurement stage and the O&M cost within the immediate future following the procurement stage. This perspective is charted as a combined cost (procurement and O&M). The long term perspective looks beyond the procurement stage at raw savings and is charted as O&M costs only.

4.4.2.4 Aircraft hour to SIM hour conversion (%A-S)

In addition to using a different mix of assets, this evaluation considers the conversion of aircraft hours into SIM hours. This is accomplished by using state of the art equipment which will reduce costs while preserving quality and standards, if not increasing them. An incremental conversion rate of 15% was used for this evaluation (from 0% to 75%), along with a 1.5:1 SIM hour to aircraft hour conversion factor. Aircraft hours were converted into the device most suitable for the type of training already being accomplished in the aircraft, and therefore not necessarily into the type of device that is currently in use at NAS Pensacola. The financial model can accommodate moving hours among ground training devices, but that capability was not used for this evaluation because it is the direct and completely dependent upon a task/media analysis, which is beyond the scope of this tasking.

4.4.3 Observations and Recommendations

The results of this evaluation begin with Figure 4.8, with six sets of four charts each. Each set represents a different level of percent-aircraft-to-simulation (%A-S) transfer, beginning with 0% and then ordered in 15% increments. Each set of charts contains one of the following:

- Cumulative Combined Costs (Procurement and O&M) for the respective %A-S transfer, by FY for the CP and each option. The CP is shown in black and includes all current NFO procurement cost projections
- Return on Investment (ROI) for the respective %A-S transfer, by FY for each option
- Cumulative O&M Costs for the respective %A-S transfer, by FY for the CP and each option
- Annual Procurement Costs for the respective %A-S transfer, by FY for each option

In all of the cumulative combined and O&M charts, a red line has been calculated as the CP less 5%, and represents the CNO mandated cost reduction for 2004.

4.4.3.1 Observation 1

O&M Costs at 0%A-S transfer. At 0% transfer, all options cost less than the CP except for Option 3B, 2B, and 3A. Options 4A, 2A and 1 are below the CNO 5% reduction line. Option 1 is the most cost effective from the O&M perspective alone.

4.4.3.2 Observation 2

O&M Costs as %A-S transfer increases. As %A-S increases, the costs of all options decrease relative to the CP and the range among the options also decreases (compresses). At 30% A-S transfer, all options are below the CNO Guidance (5% cost reduction) line from the O&M perspective alone.

Recommendation

Based on O&M results, transferring aircraft hours to SIM hours should be part of any course of action taken for NFO/CSO training solutions. The efficiencies and effectiveness gained by increased simulation would also better accommodate the CNO total operating cost reduction mandate.

4.4.3.3 Observation 3

Procurement Costs at 0% A-S transfer. Procurement costs were highest for Option 2B due to the number of T-45 aircraft required to support the flying hour program in that option. The second highest procurement costs are seen in Option 2A followed by Option 4B. Both utilize the T-45 aircraft.

Recommendation

Based on procurement cost results, utilizing the T-45 in any solution should be kept to a minimum.

4.4.3.4 Observation 4

Procurement Costs as %A-S transfer increases. As %A-S transfer increases, procurement costs decrease to a minimum point as shown in Figure 4.32. With a Transfer Effectiveness Ratio (TER) of 1.5:1, SIM hours build faster than aircraft hours decline. This results in a "bottom out" point in procurement costs at approximately 45%, with marginal benefit between 30% and 45%. Procurement costs begin to increase beyond 45% transfer.

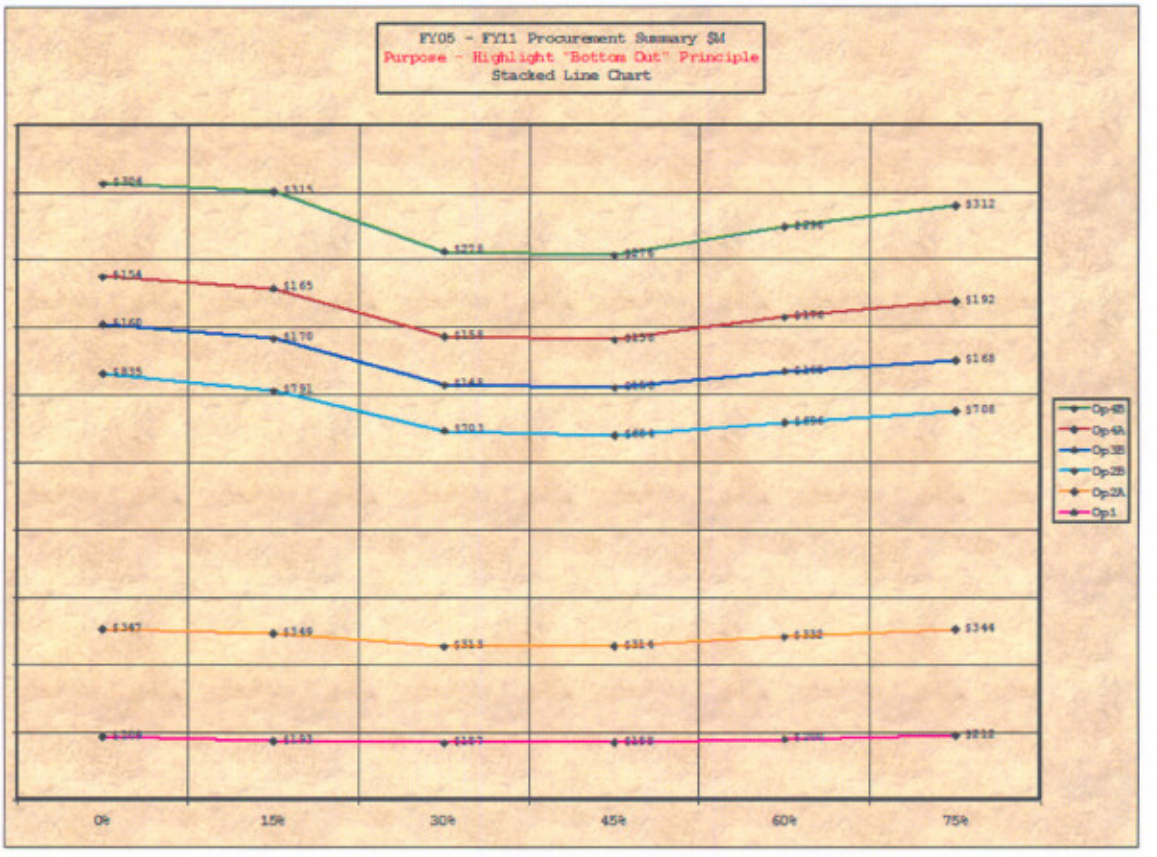

Figure 4.32 "Bottom Out" Principle

Recommendation

At this conservative TER (1.5:1) %A-S transfer conversion is most efficient between 30% and 45%, where effectiveness "bottoms out." Transfer of aircraft hours to simulation beyond this range will continue to save money, but at a gradually decreasing rate. Consideration should be given to using a conversion ratio less conservative than 1:1.5 in the next refinement of the financial model.

4.4.3.5 Observation 5

Combined Costs at 0% A-S transfer. When combining O&M and Procurement costs, all options except Option 2B, are below and remain below both the CP and the CNO 5% mandated cost reduction line.

4.4.3.6 Observation 6

Combined Costs as %A-S transfer increases. As %A-S transfer increases, the combined costs of all options decrease relative to the CP to a minimum point. The incremental decrease in O&M costs plus the "bottom out" feature associated with procurement costs, acts to limit combined cost savings beyond 45% A-S transfer.

Recommendation

Procurement costs contribute more to combined costs than O&M due to the limited timeframe (FY05-11). A longer timeframe should be used in the next refinement of the financial model to help approximate the Total Ownership Cost.

4.4.3.7 Observation 7

Return on Investment (ROI) at 0% A-S transfer. At 0% A-S transfer, ROI closely mirrors combined costs. Options 3A, 1, and 4A have significantly greater ROI, due mainly to the absence of procurement in these options. Option 2B incorporates T-45 procurement and shows significantly lower ROI.

Recommendation

Relative to cost, changes to the NFO/CSO training program should be ordered first on procurement and then on O&M costs. ROI could then be used to validate the proposed solution.

Cumulative Combined Costs – 0% A-S Transfer.

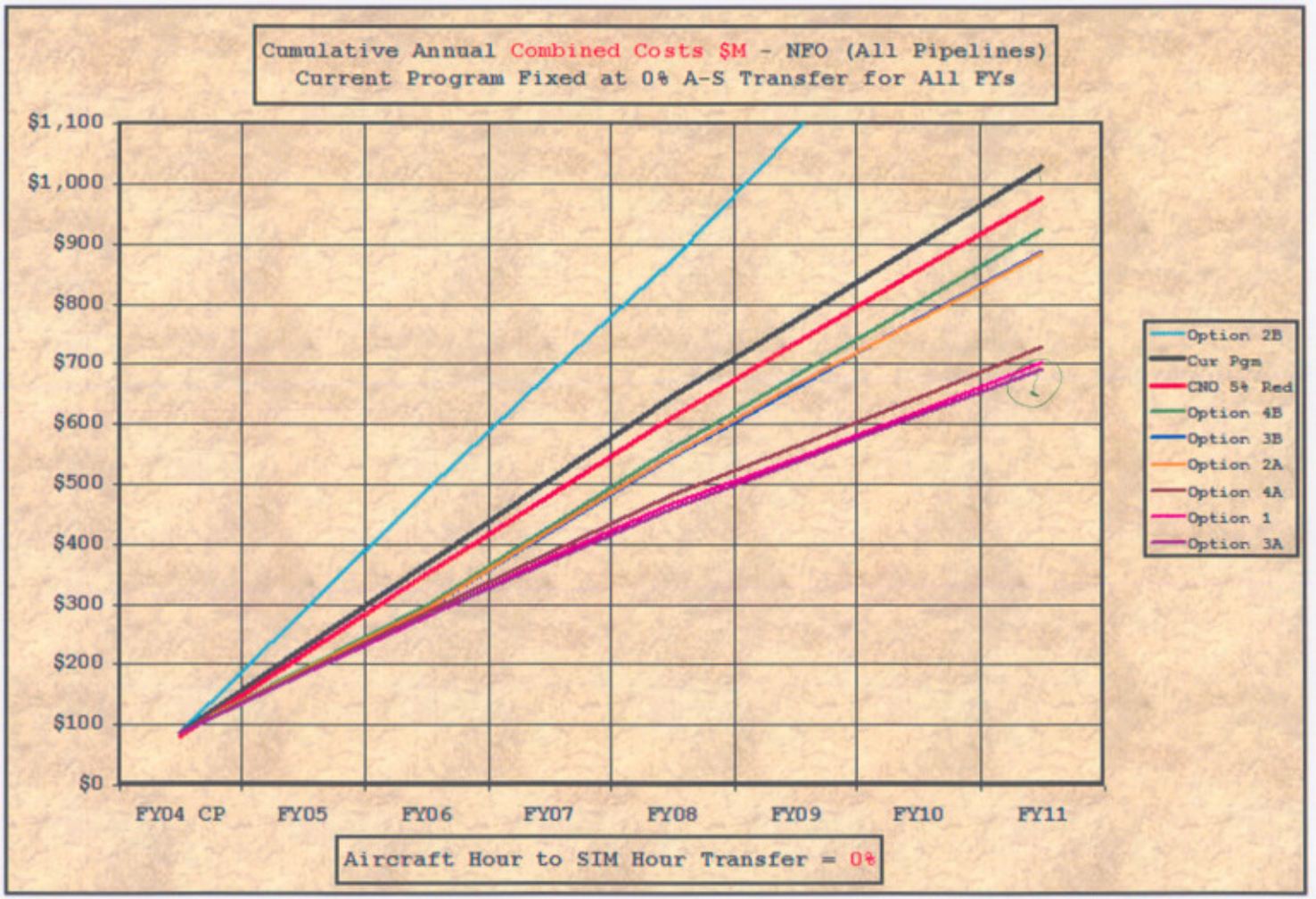

Figure 4.8 Cumulative Combined Costs – 0% A-S Transfer

ROI at 0% A-S Transfer

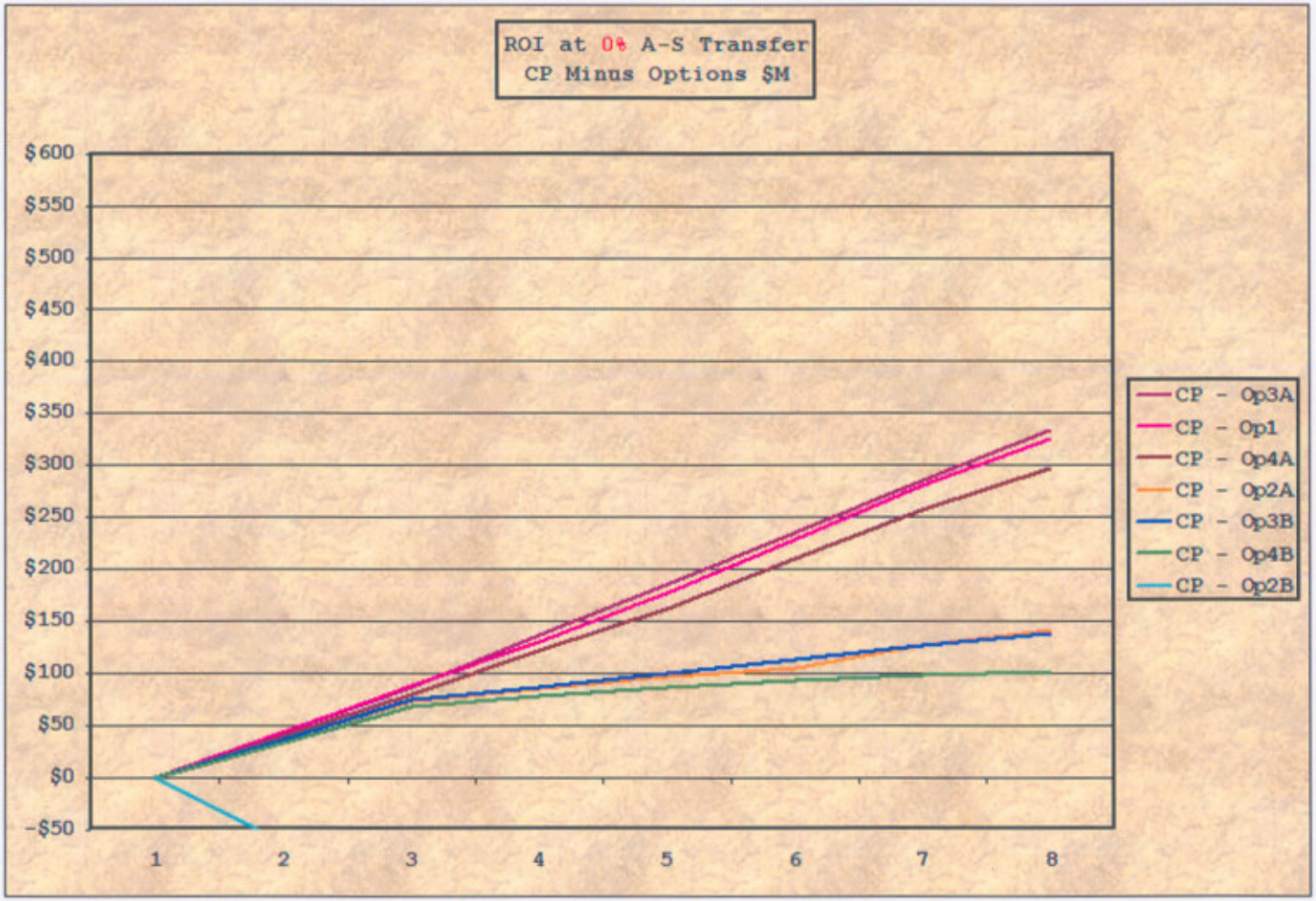

Figure 4.9 ROI at 0% A-S Transfer

Combined O&M Costs – 0% A-S Transfer.

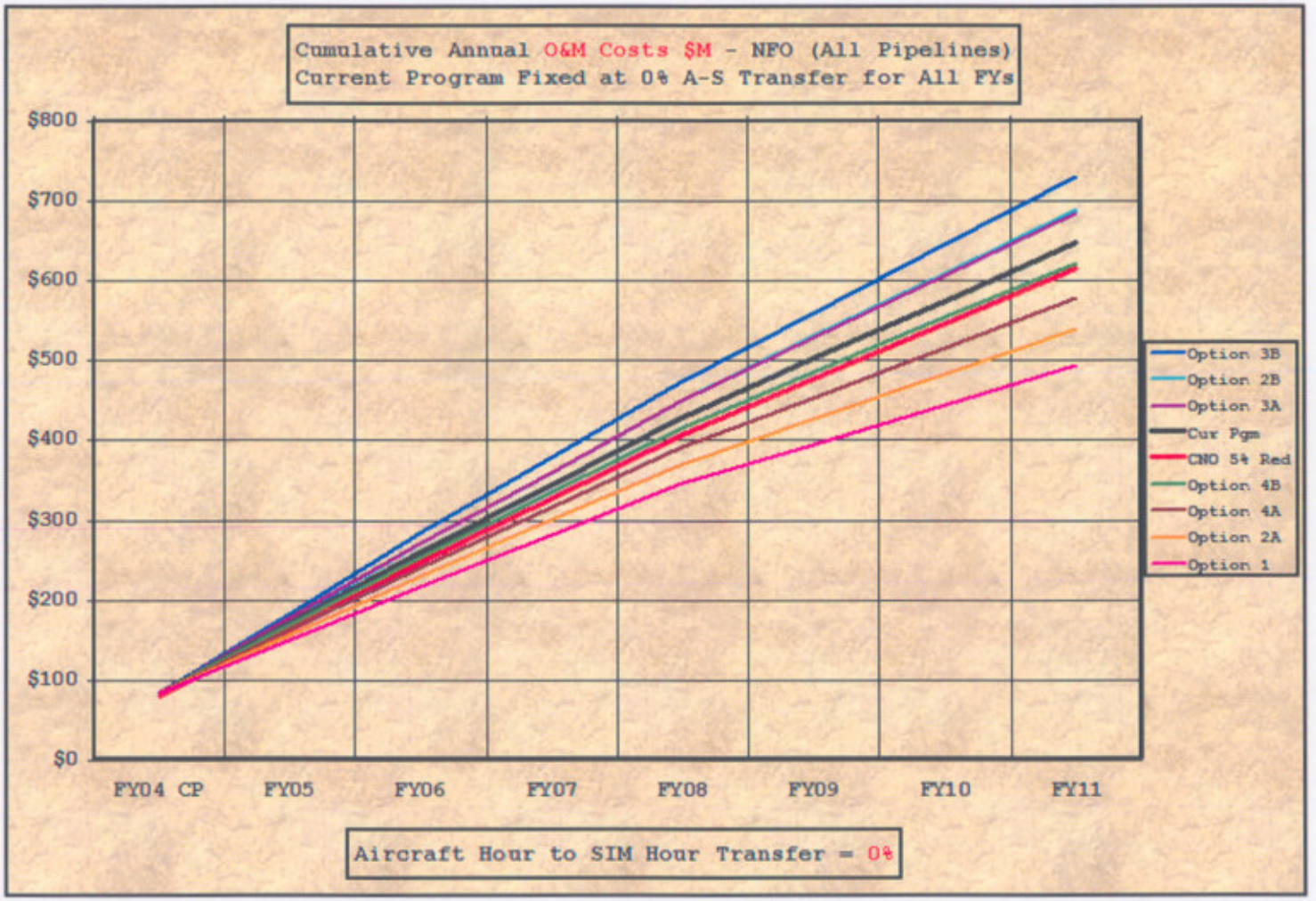

Figure 4.10 Combined O&M Costs – 0% A-S Transfer

Annual Procurement Costs – 0% A-S Transfer.

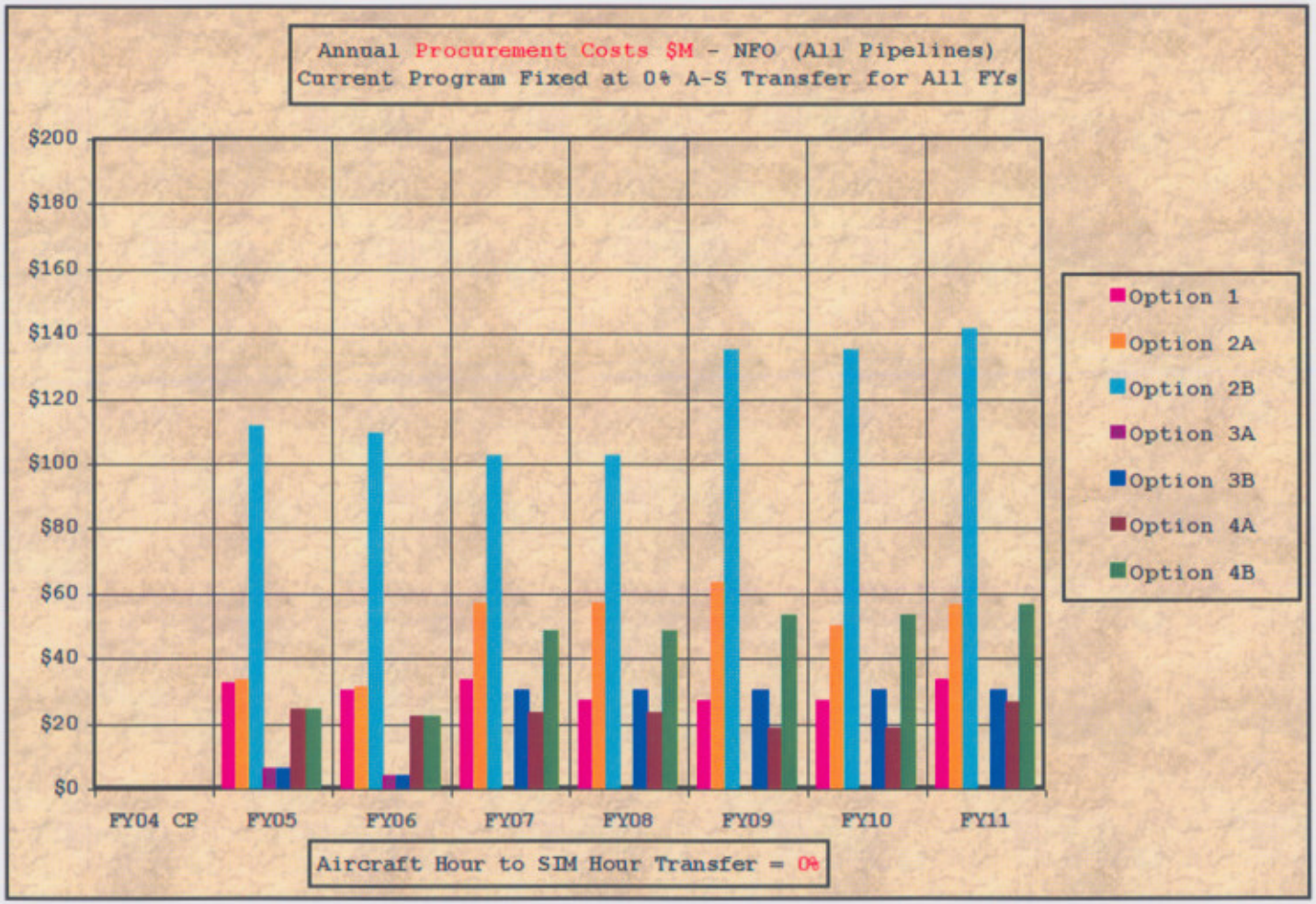

Figure 4.11 Annual Procurement Costs – 0% A-S Transfer

Cumulative Combined Costs – 15% A-S Transfer.

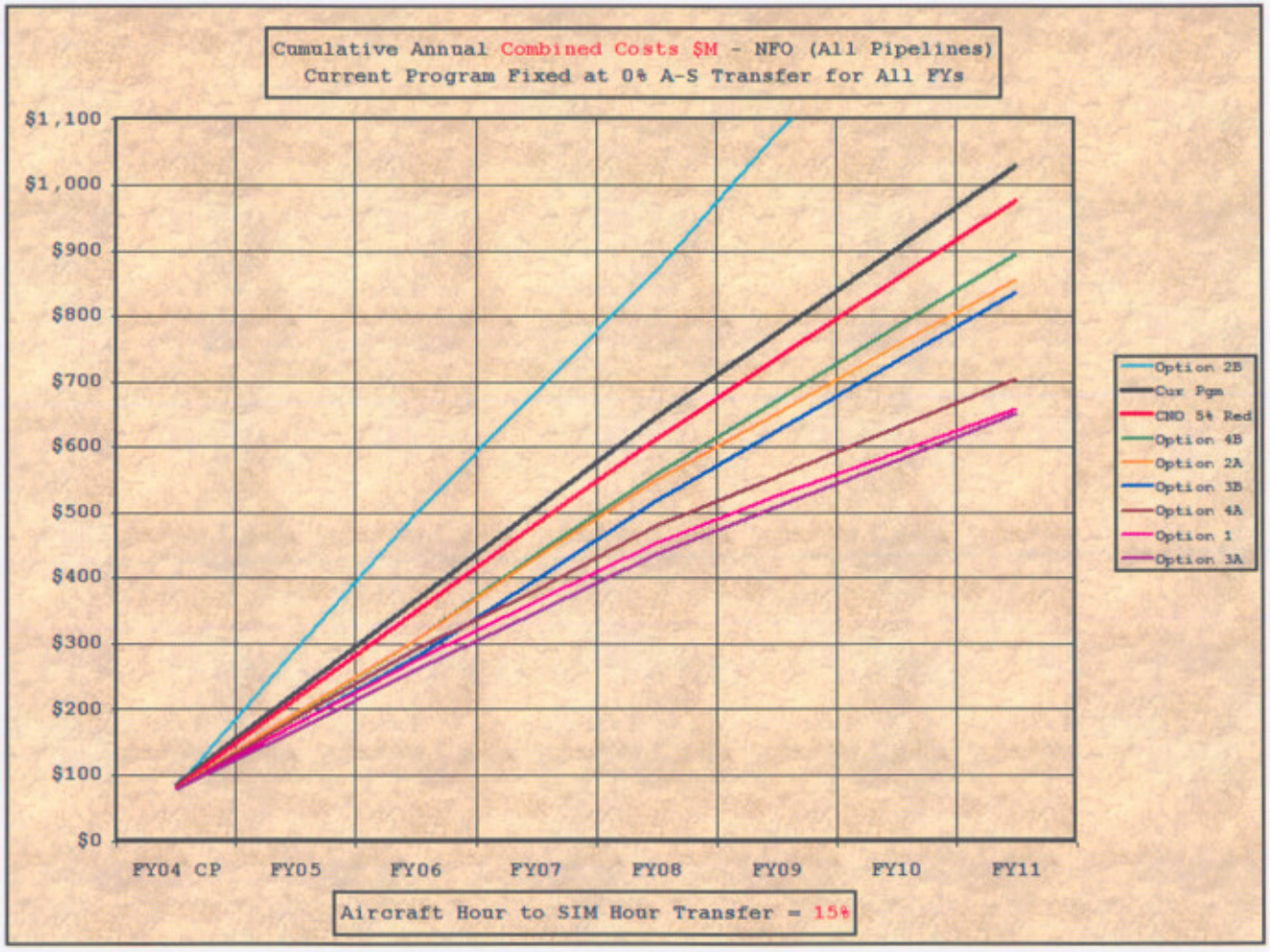

Figure 4.12 Cumulative Combined Costs – 15% A-S Transfer

ROI at 15% A-S Transfer

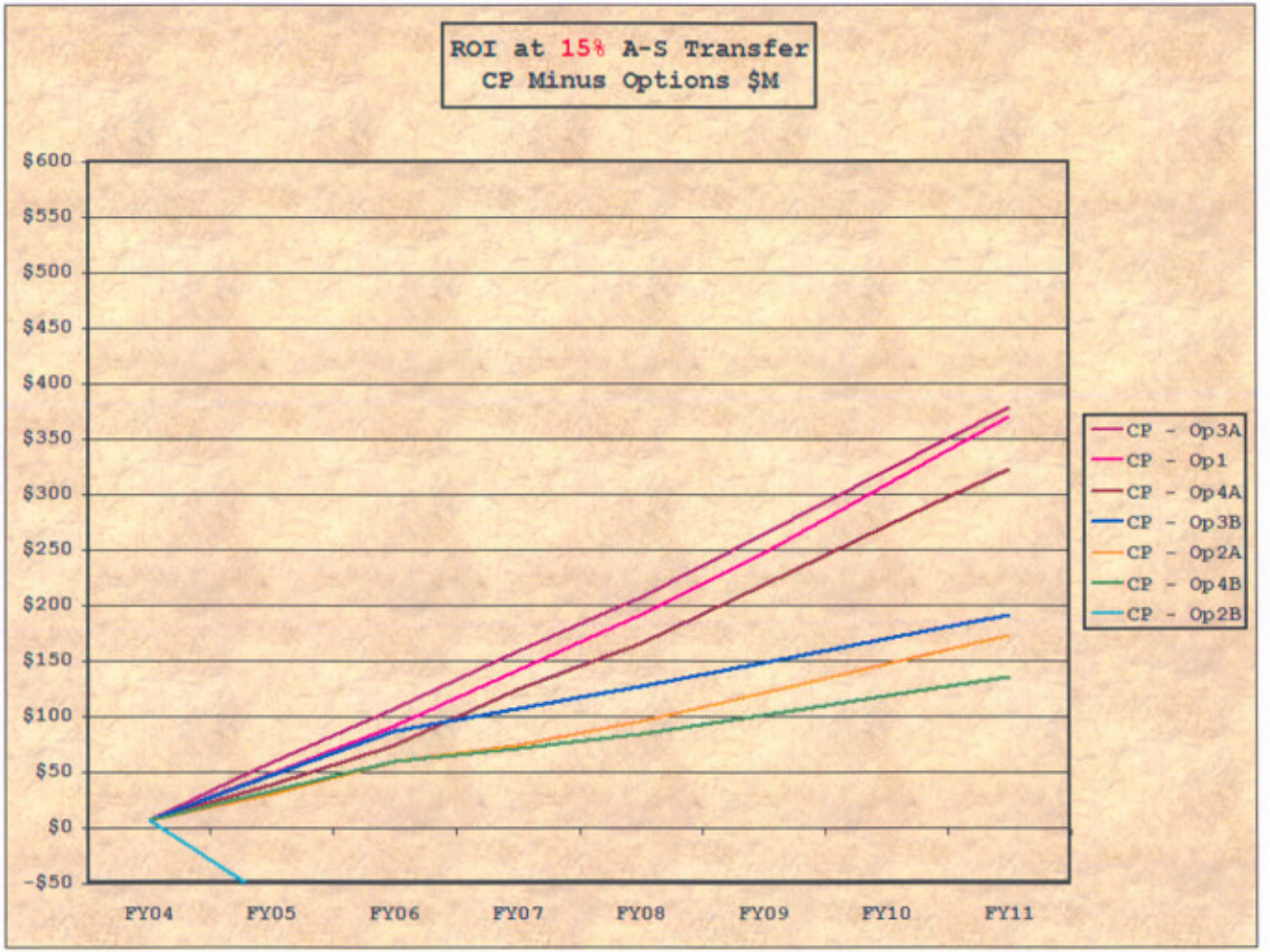

Figure 4.13 ROI at 15% A-S Transfer

Cumulative O&M Costs – 15% A-S Transfer.

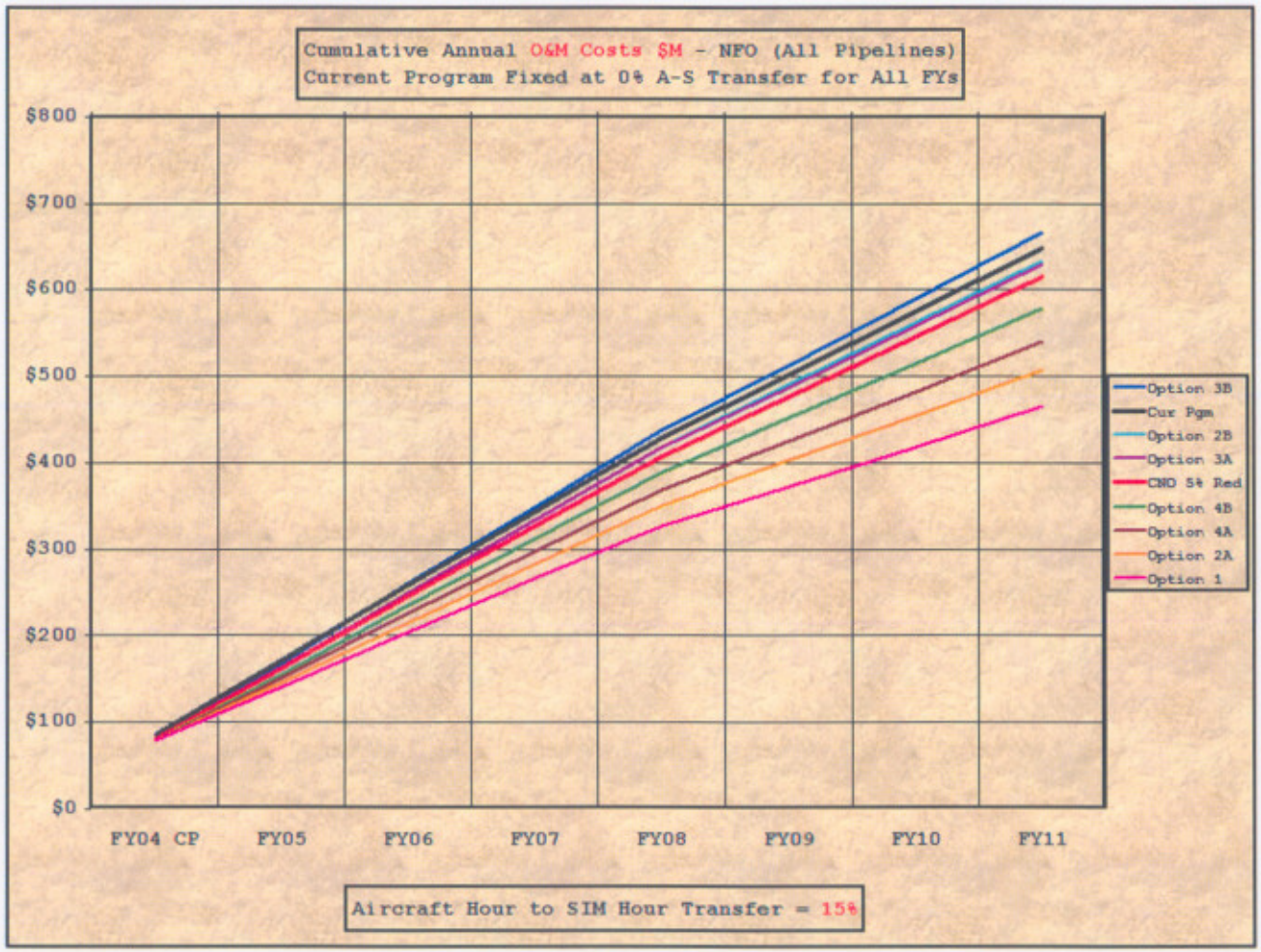

Figure 4.14 Cumulative O&M Costs – 15% A-S Transfer

Annual Procurement Costs – 15% A-S Transfer.

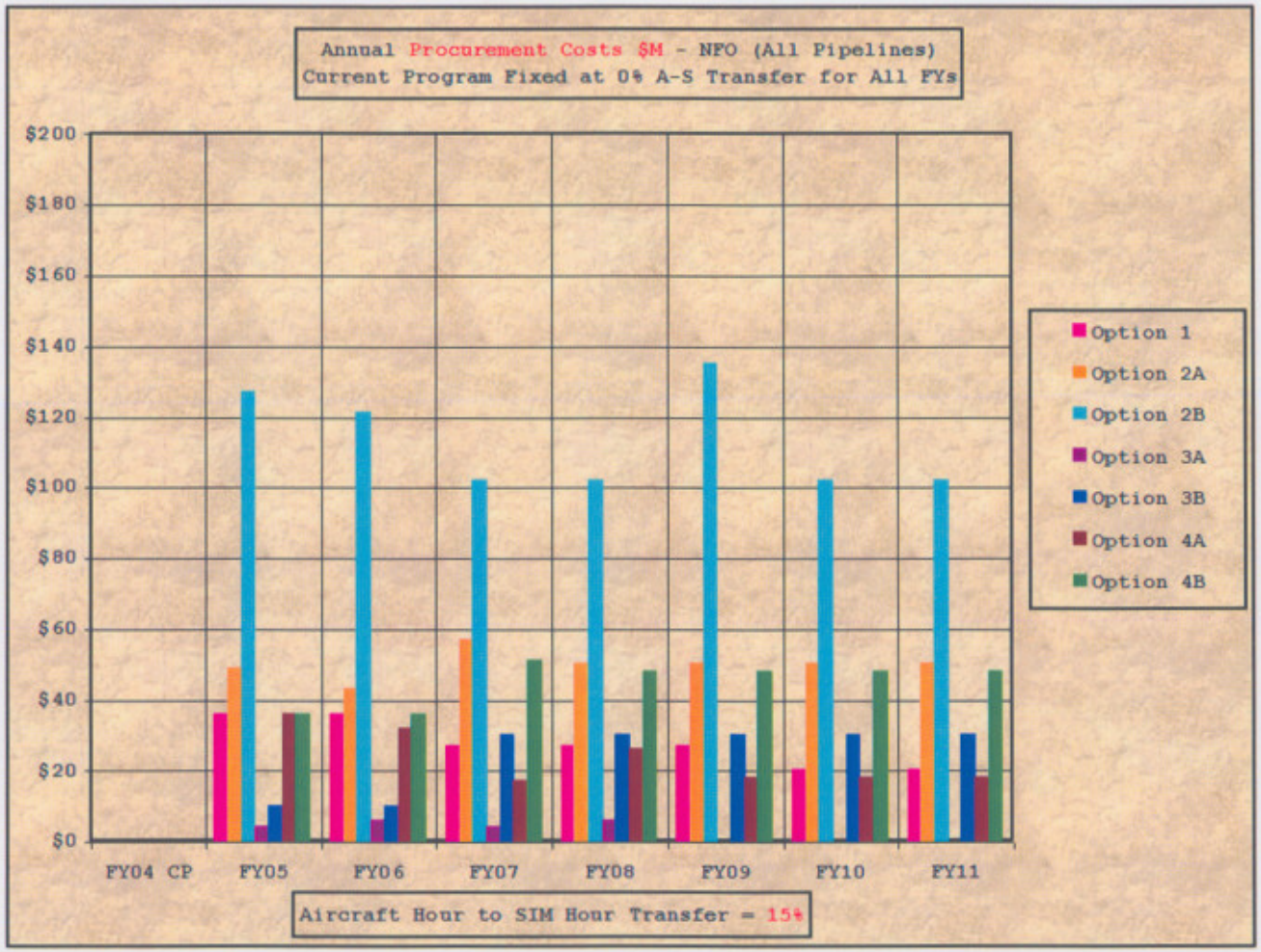

Figure 4.15 Annual Procurement Costs – 15% A-S Transfer

Cumulative Combined Costs – 30% A-S Transfer.

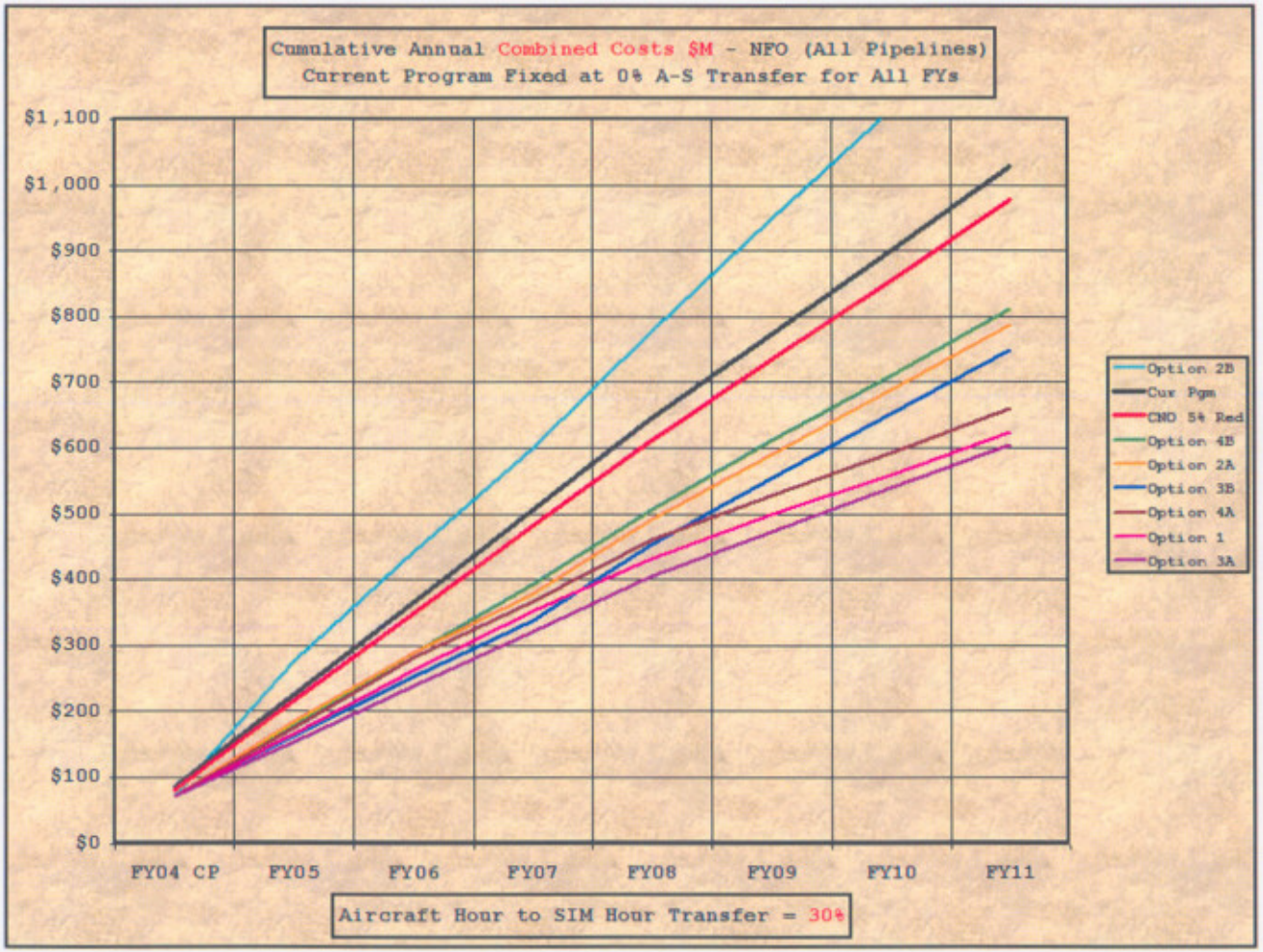

Figure 4.16 Cumulative Combined Costs – 30% A-S Transfer

ROI at 30% A-S Transfer

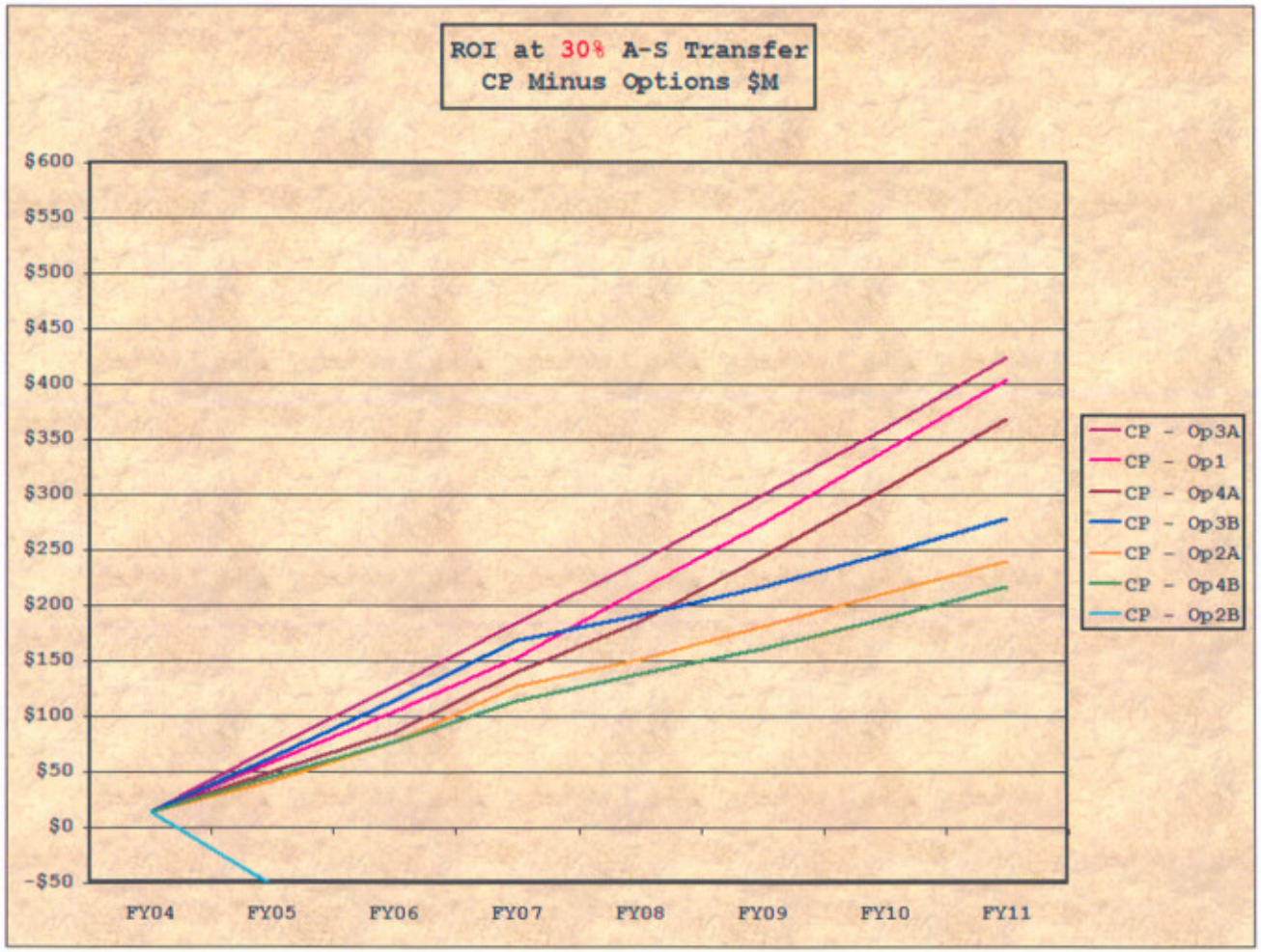

Figure 4.17 ROI at 30% A-S Transfer

Cumulative O&M Costs – 30% A-S Transfer.

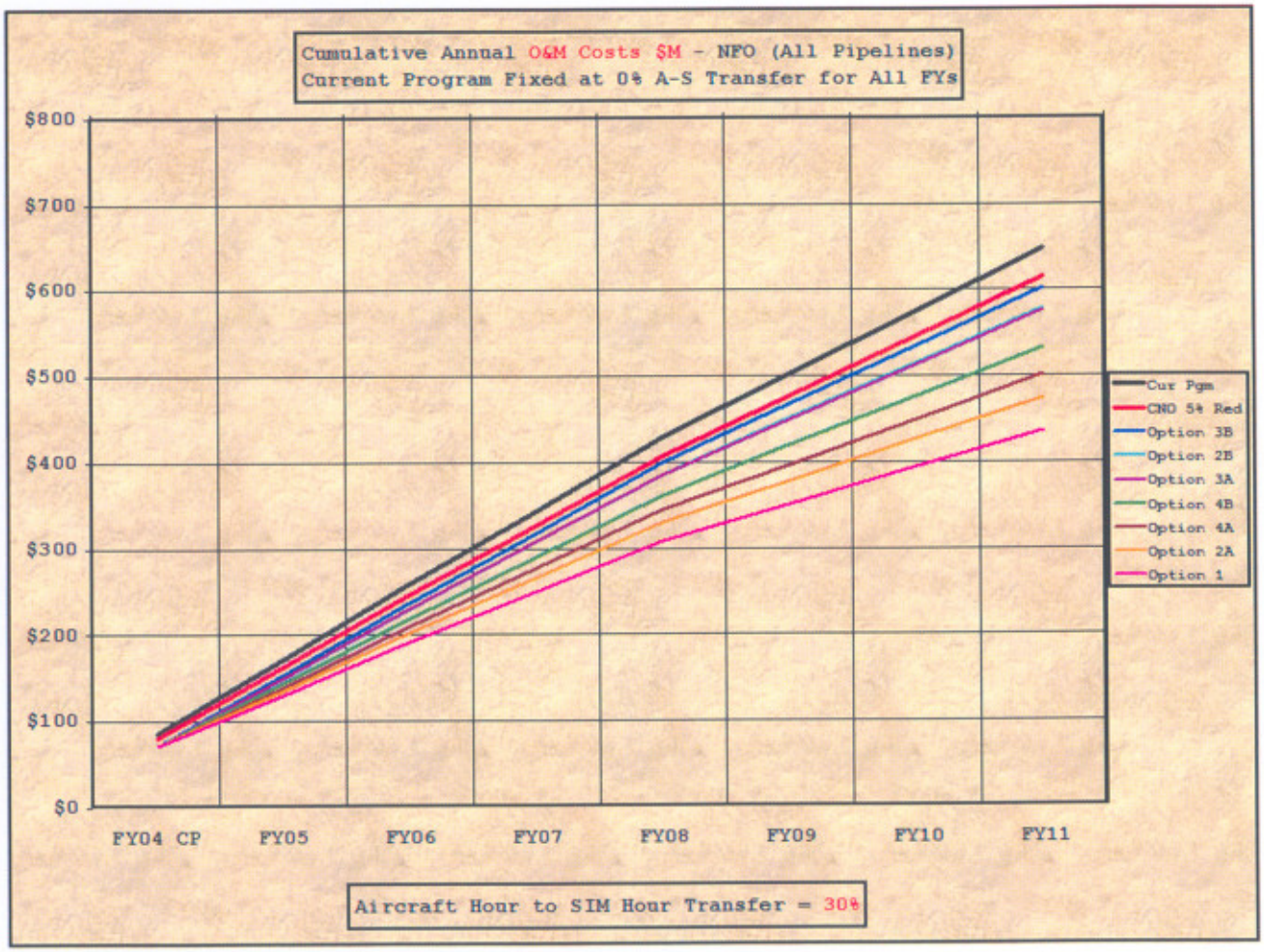

Figure 4.18 Cumulative O&M Costs – 30% A-S Transfer

Annul Procurement Costs – 30% A-S Transfer.

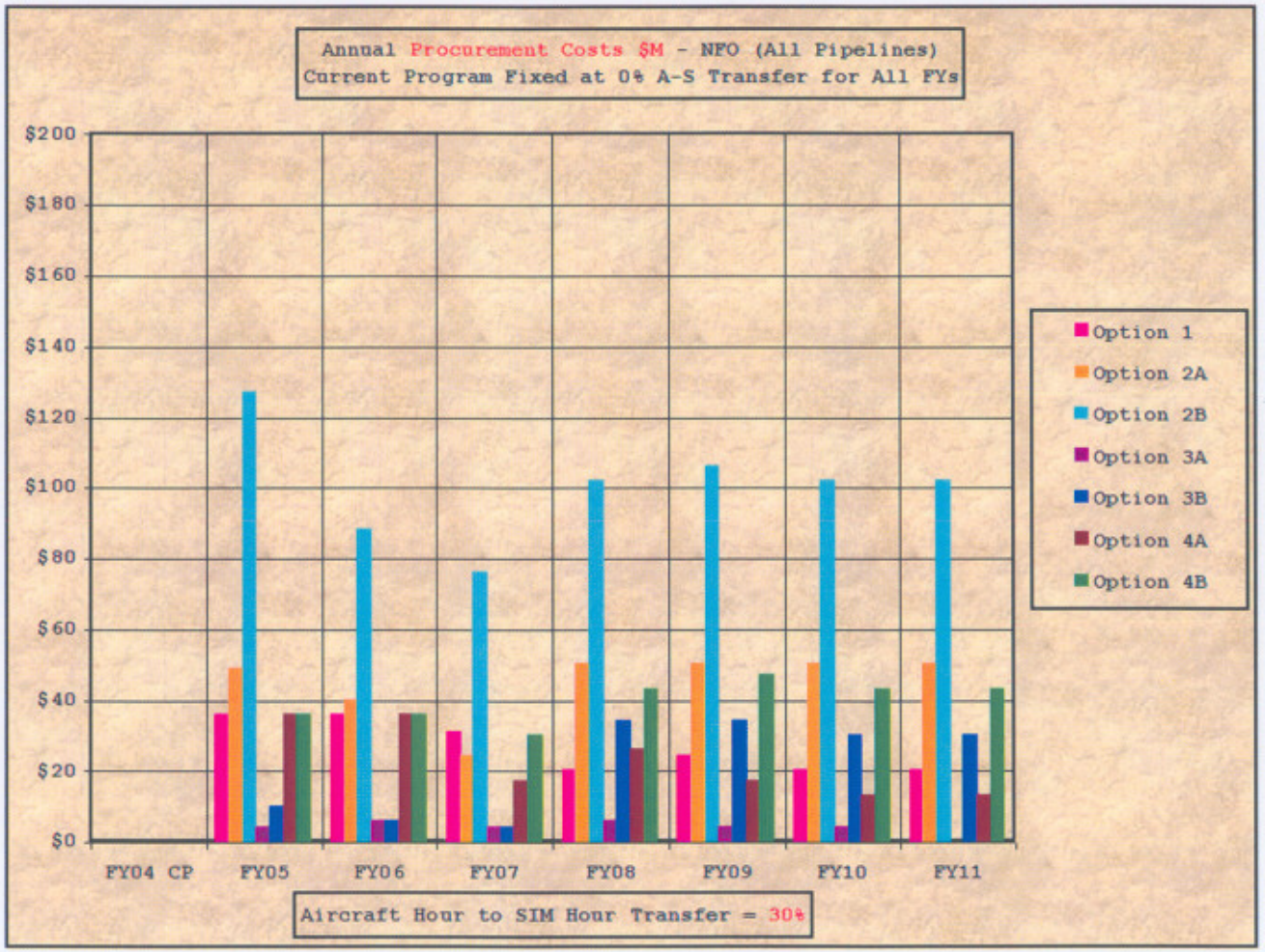

Figure 4.19 Annul Procurement Costs – 30% A-S Transfer

Cumulative Combined Costs – 45% A-S Transfer.

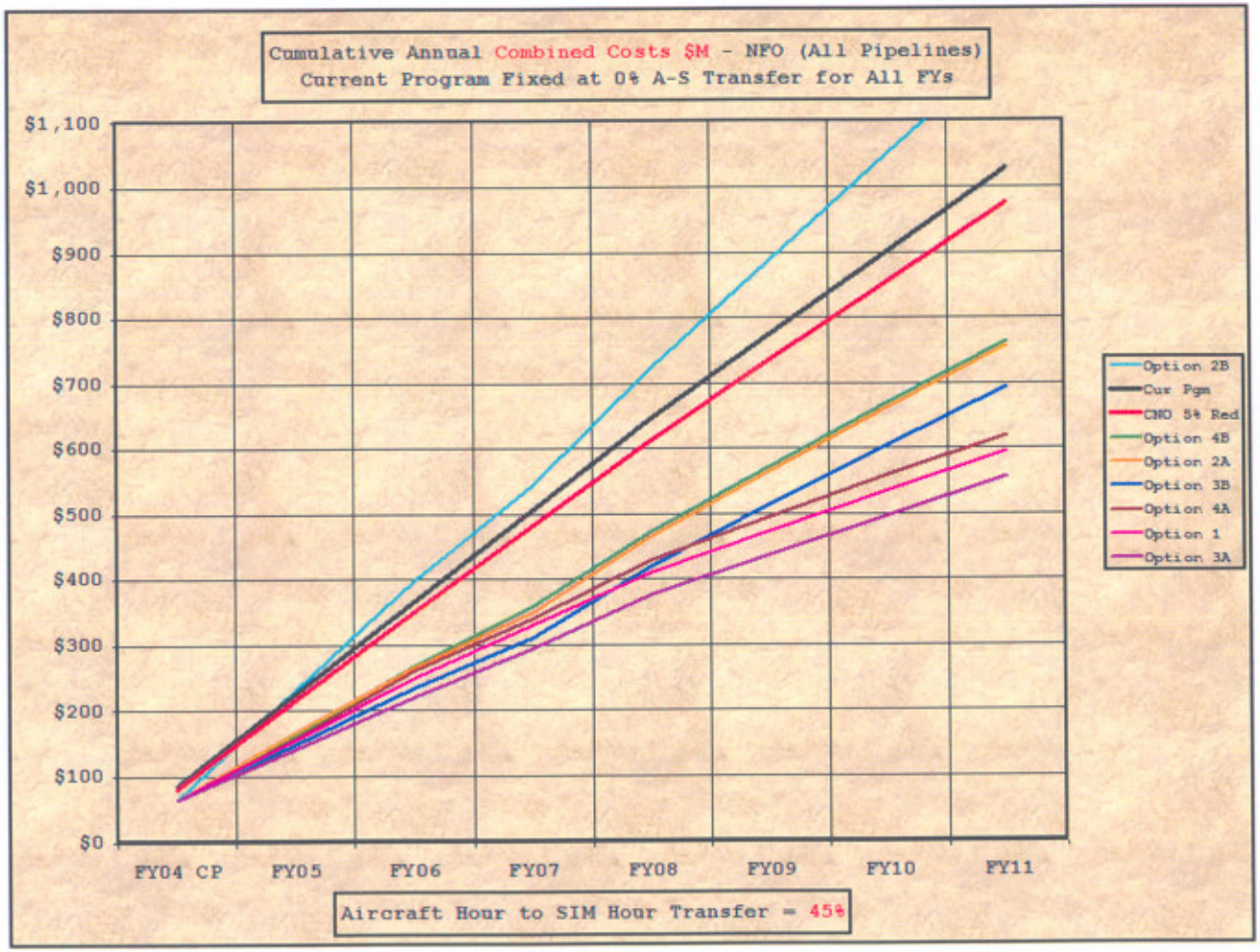

Figure 4.20 Cumulative Combined Costs – 45% A-S Transfer

ROI at 45% A-S Transfer

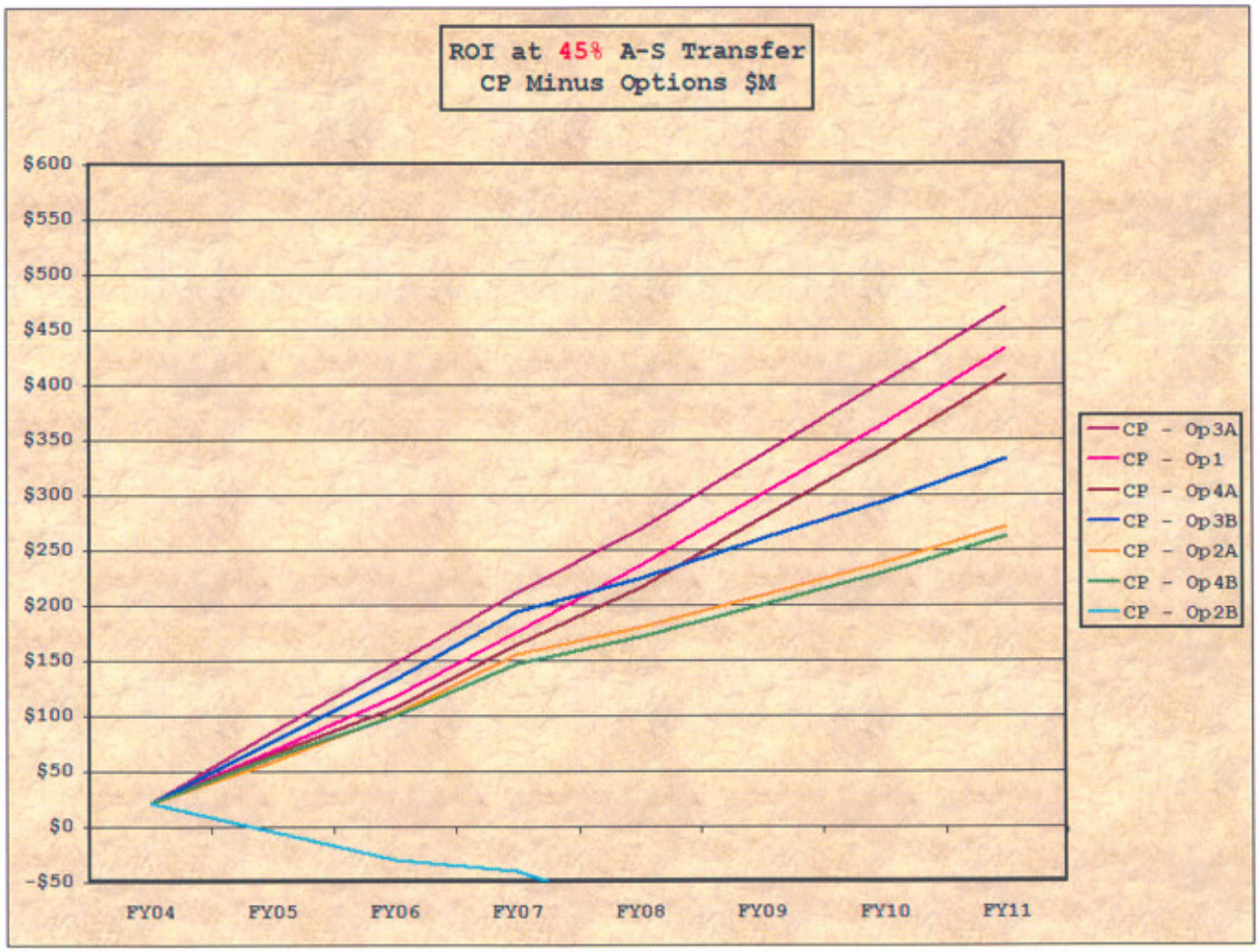

Figure 4.21 ROI at 45% A-S Transfer

Cumulative O&M Costs – 45% A-S Transfer.

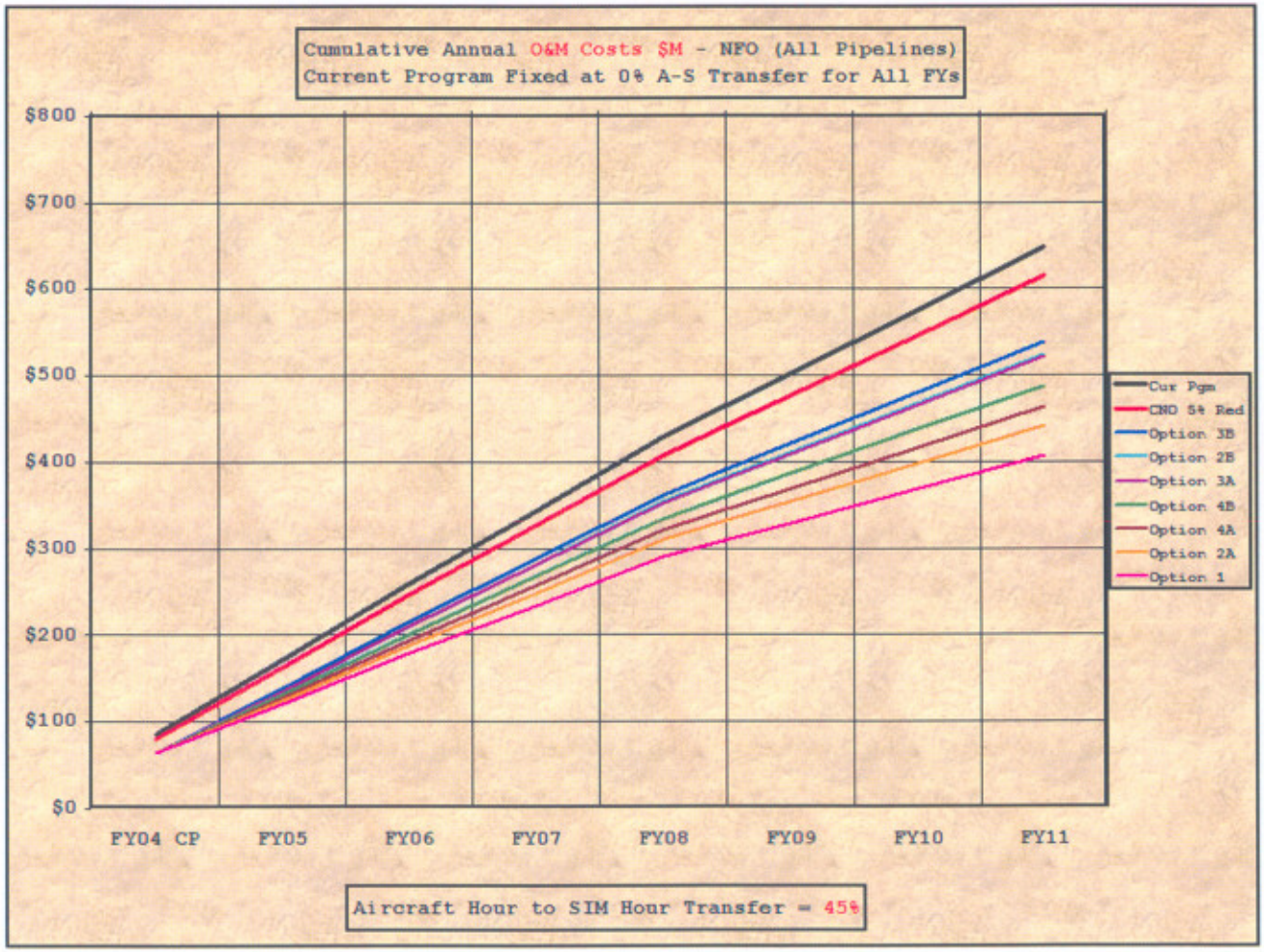

Figure 4.22 Cumulative O&M Costs – 45% A-S Transfer

Annual Procurement Costs – 45% A-S Transfer.

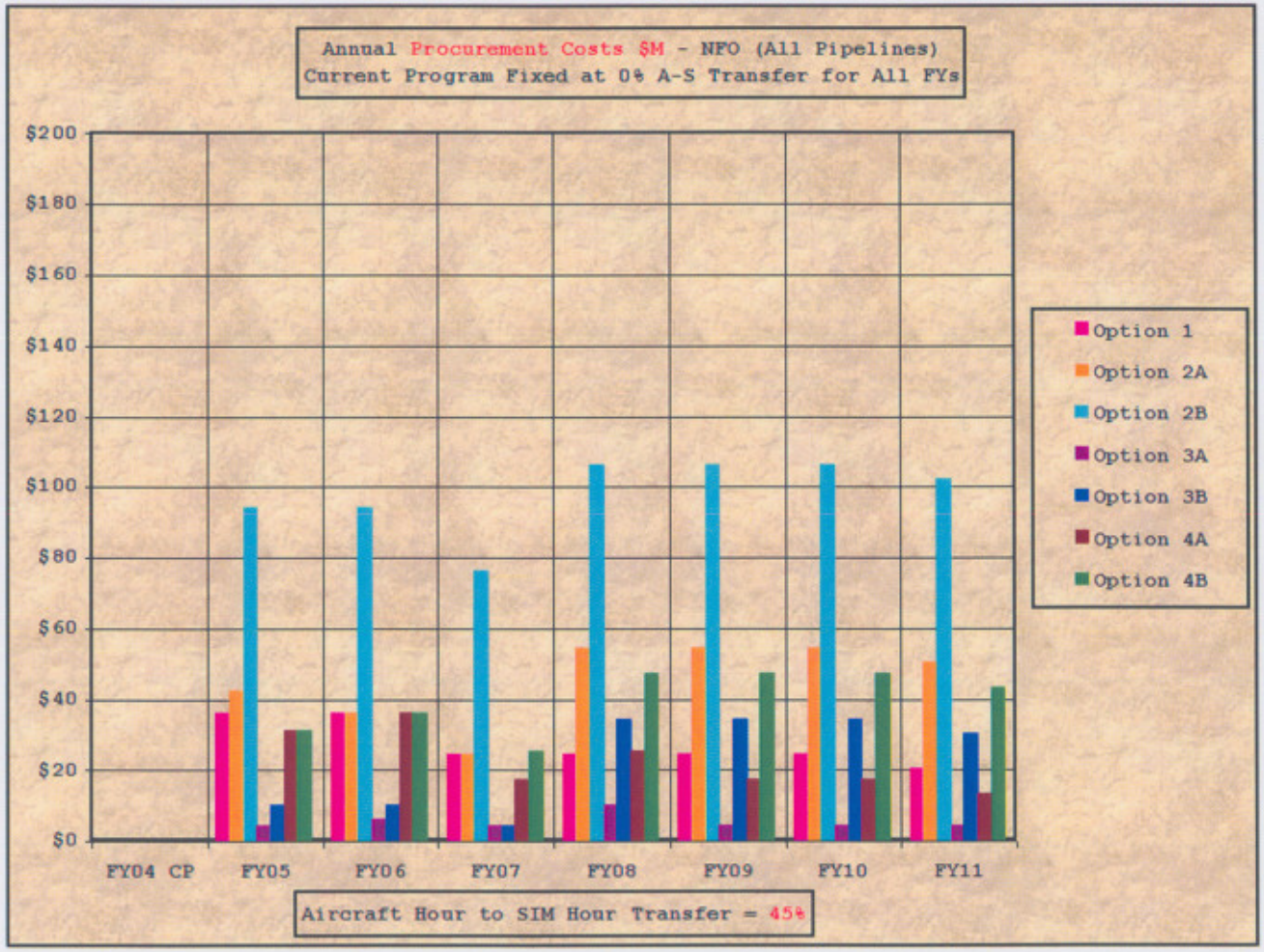

Figure 4.23 Annual Procurement Costs – 45% A-S Transfer

Cumulative Combined Costs – 60% A-S Transfer.

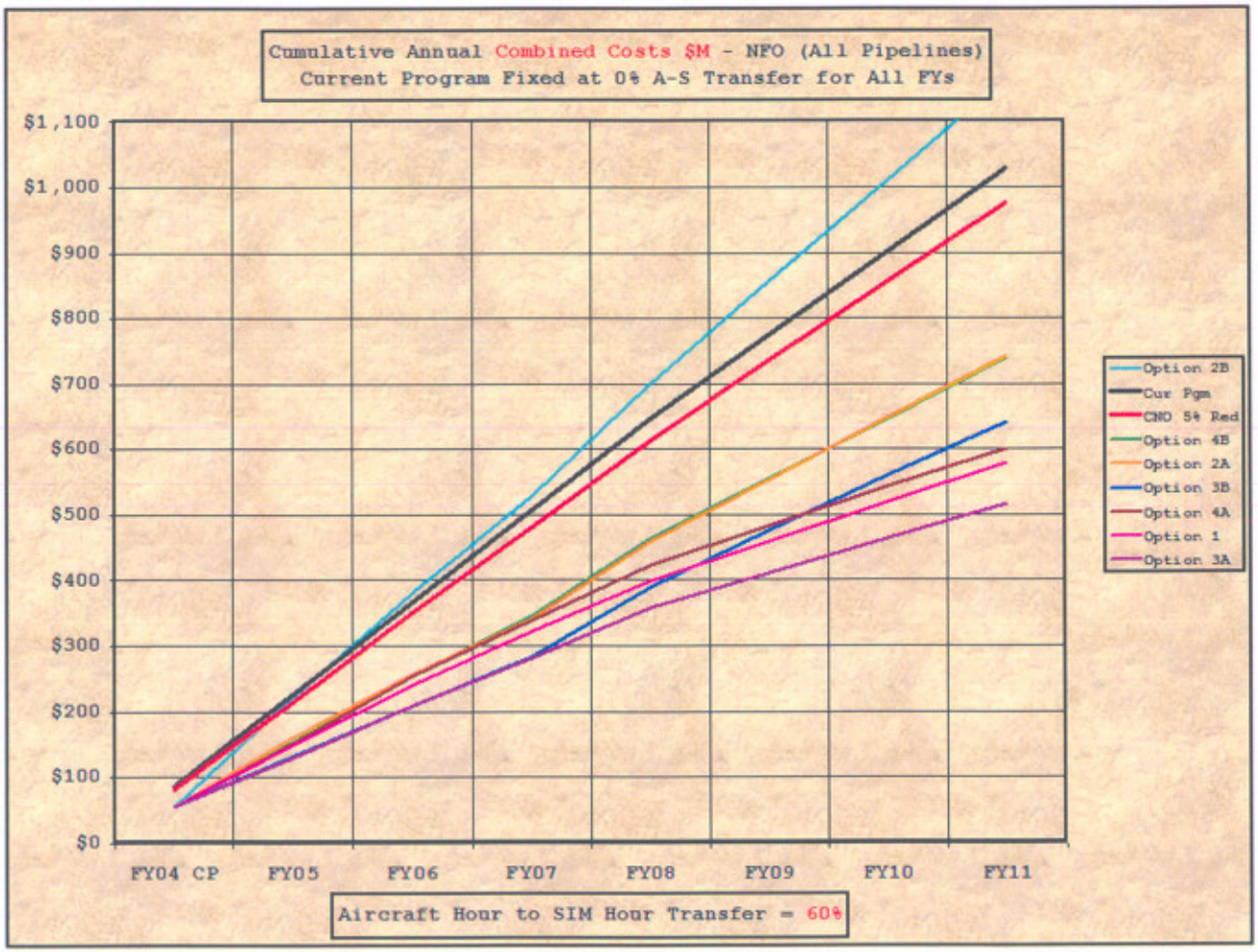

Figure 4.24 Cumulative Combined Costs – 60% A-S Transfer

ROI at 60% A-S Transfer

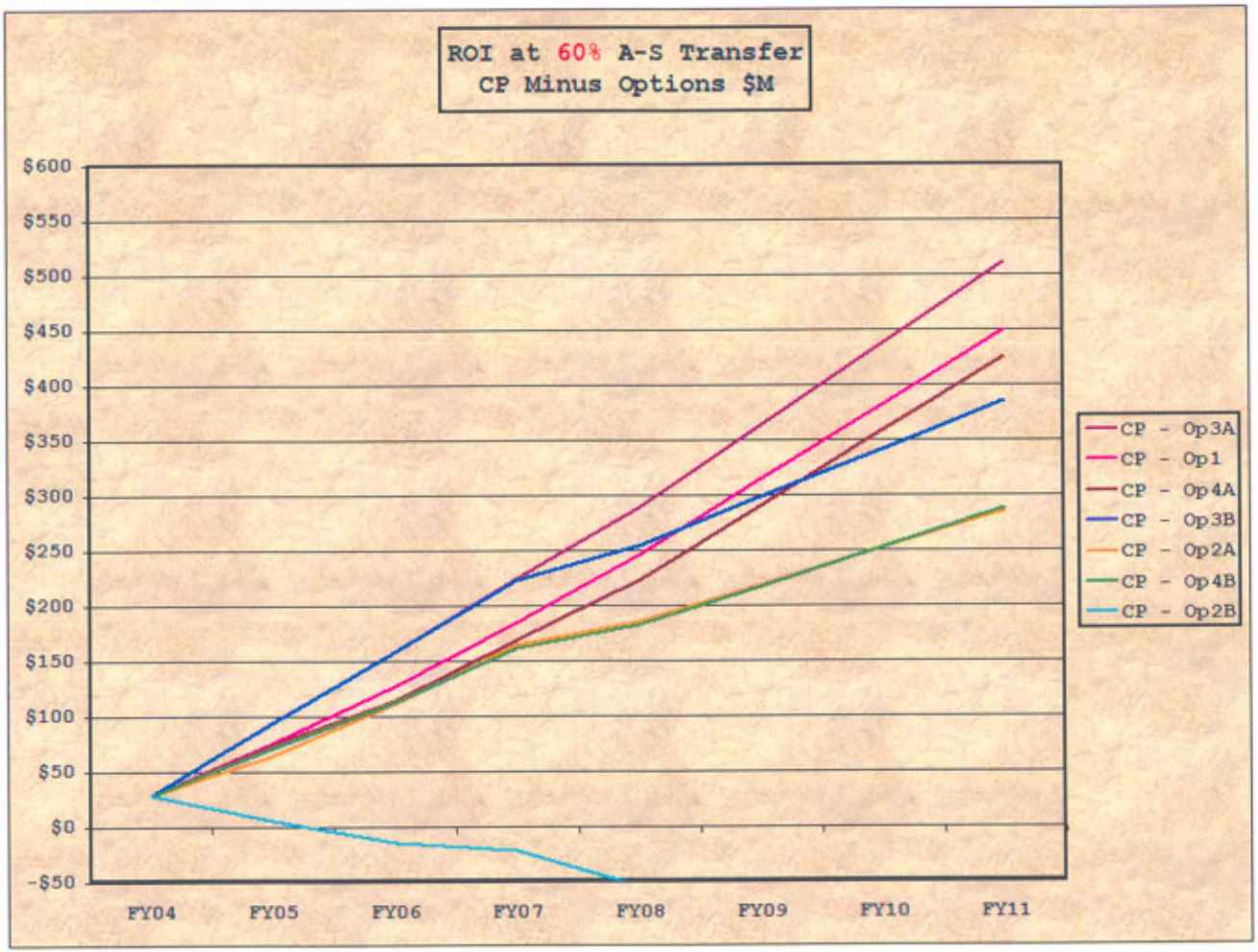

Figure 4.25 ROI at 60% A-S Transfer

Cumulative O&M Costs – 60% A-S Transfer.

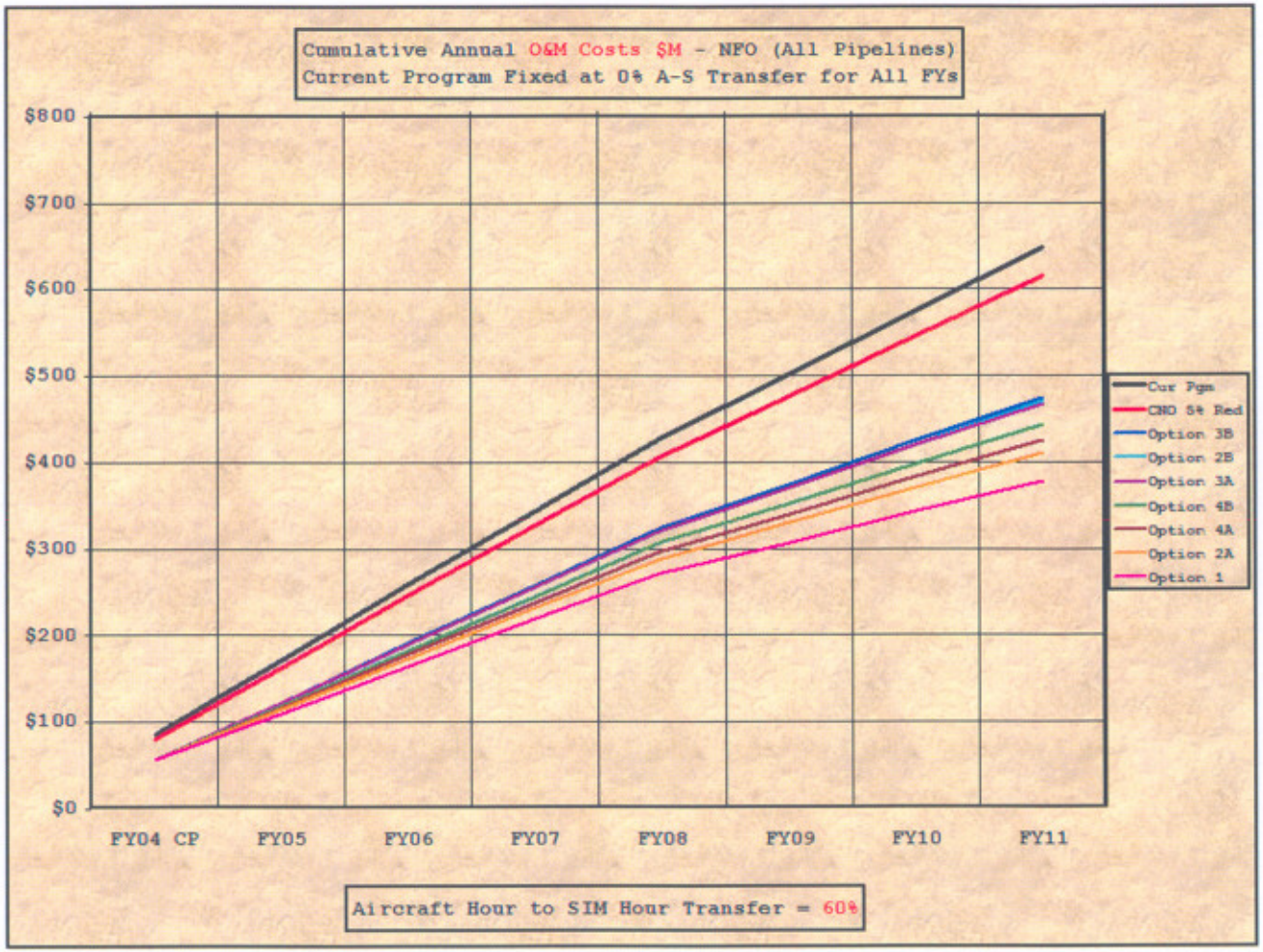

Figure 4.26 Cumulative O&M Costs – 60% A-S Transfer

Annual Procurement Costs – 60% A-S Transfer.

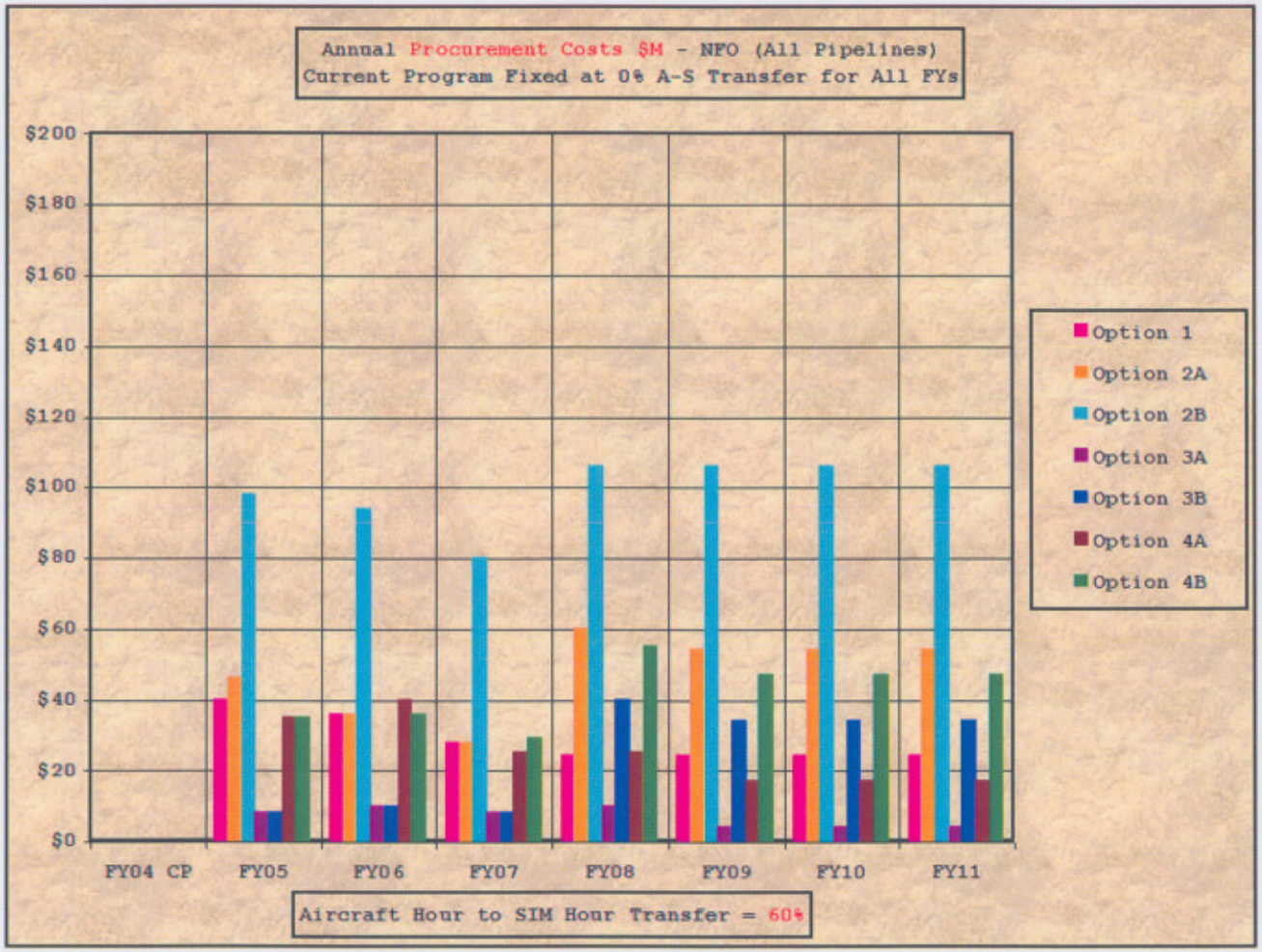

Figure 4.27 Annul Procurement Costs – 60% A-S Transfer

Cumulative Combined Costs – 75% A-S Transfer.

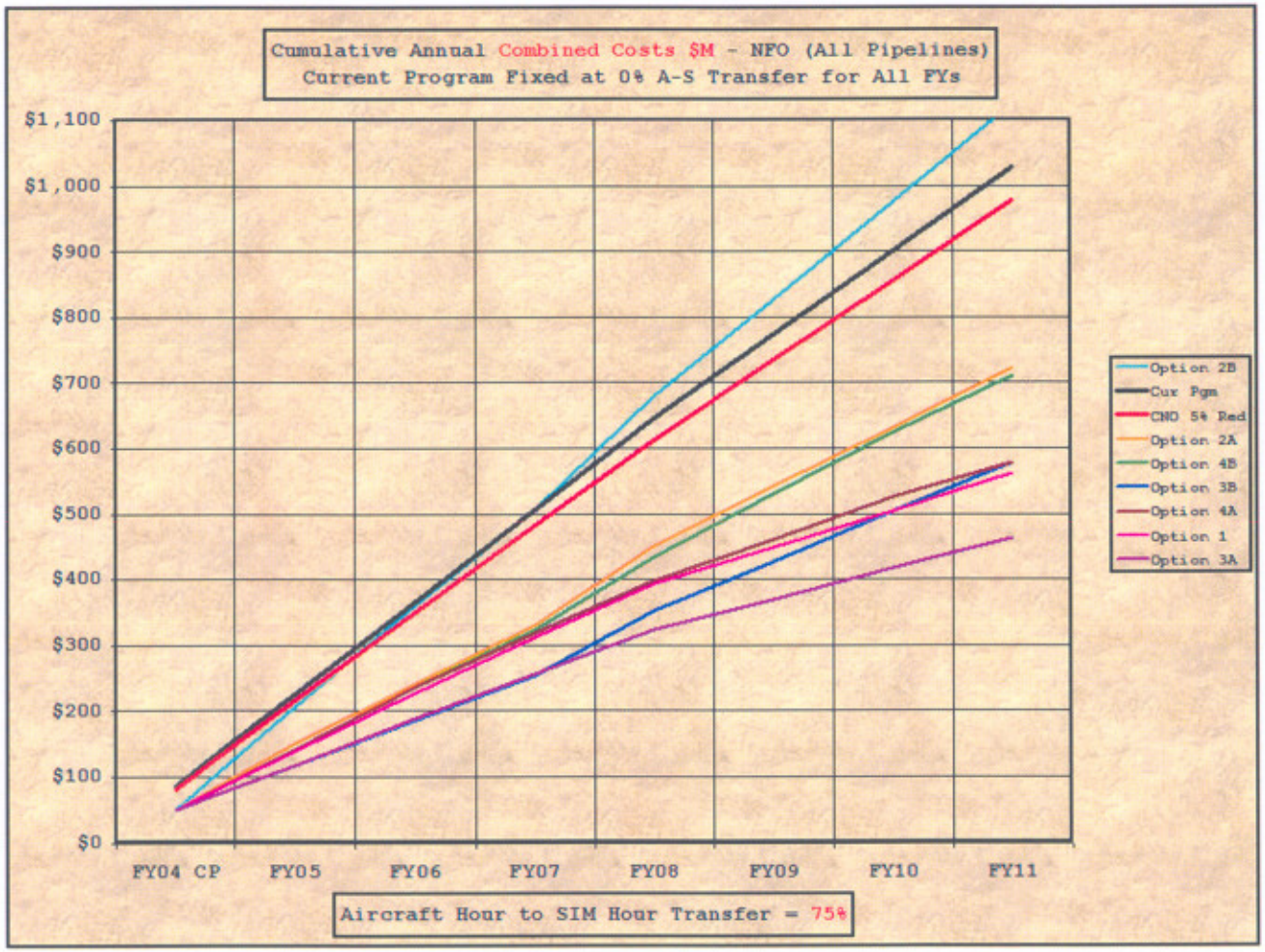

Figure 4.28 Cumulative Combined Costs – 75% A-S Transfer

ROI at 75% A-S Transfer

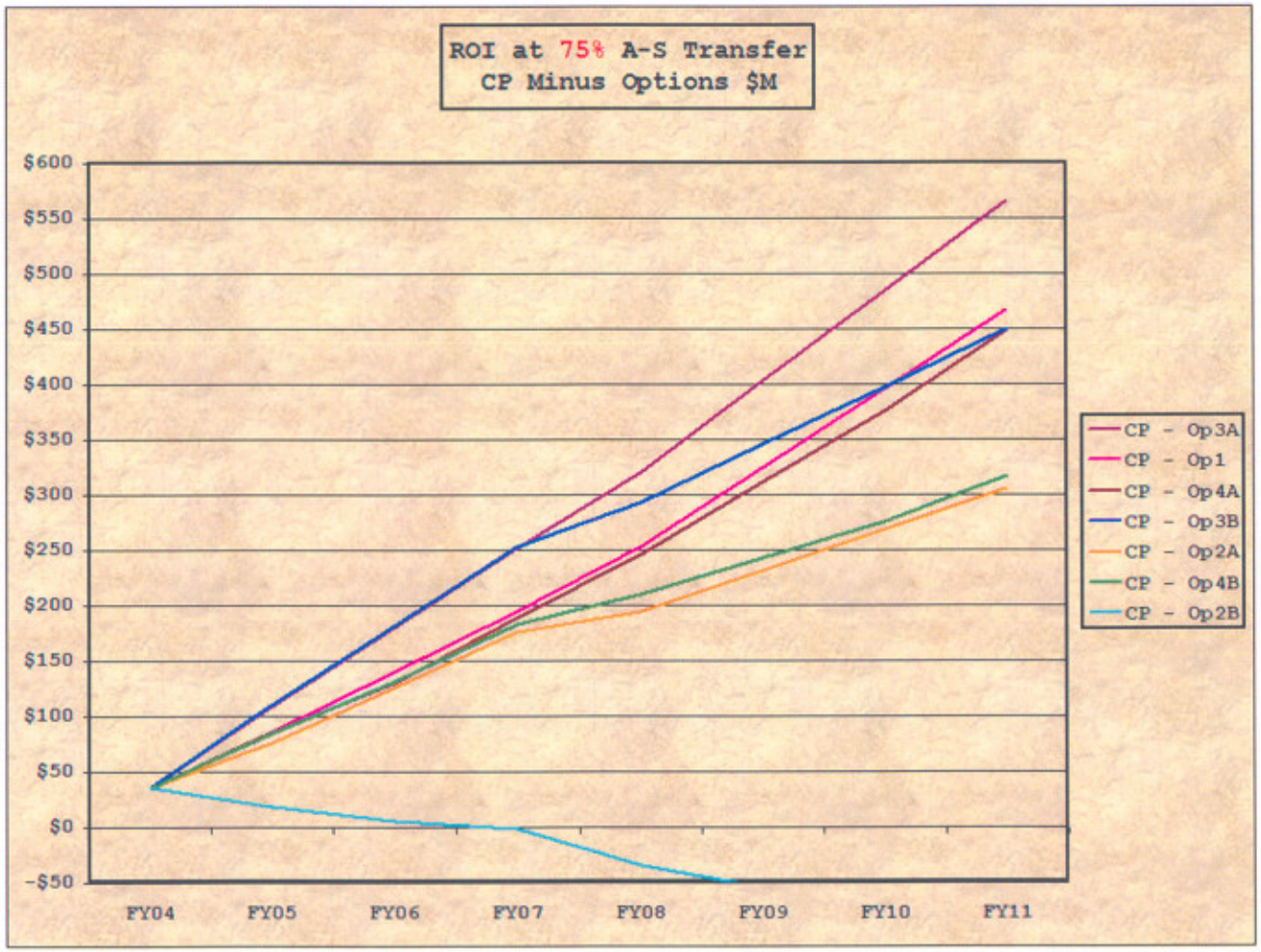

Figure 4.29 ROI at 75% A-S Transfer

Cumulative O&M Costs – 75% A-S Transfer.

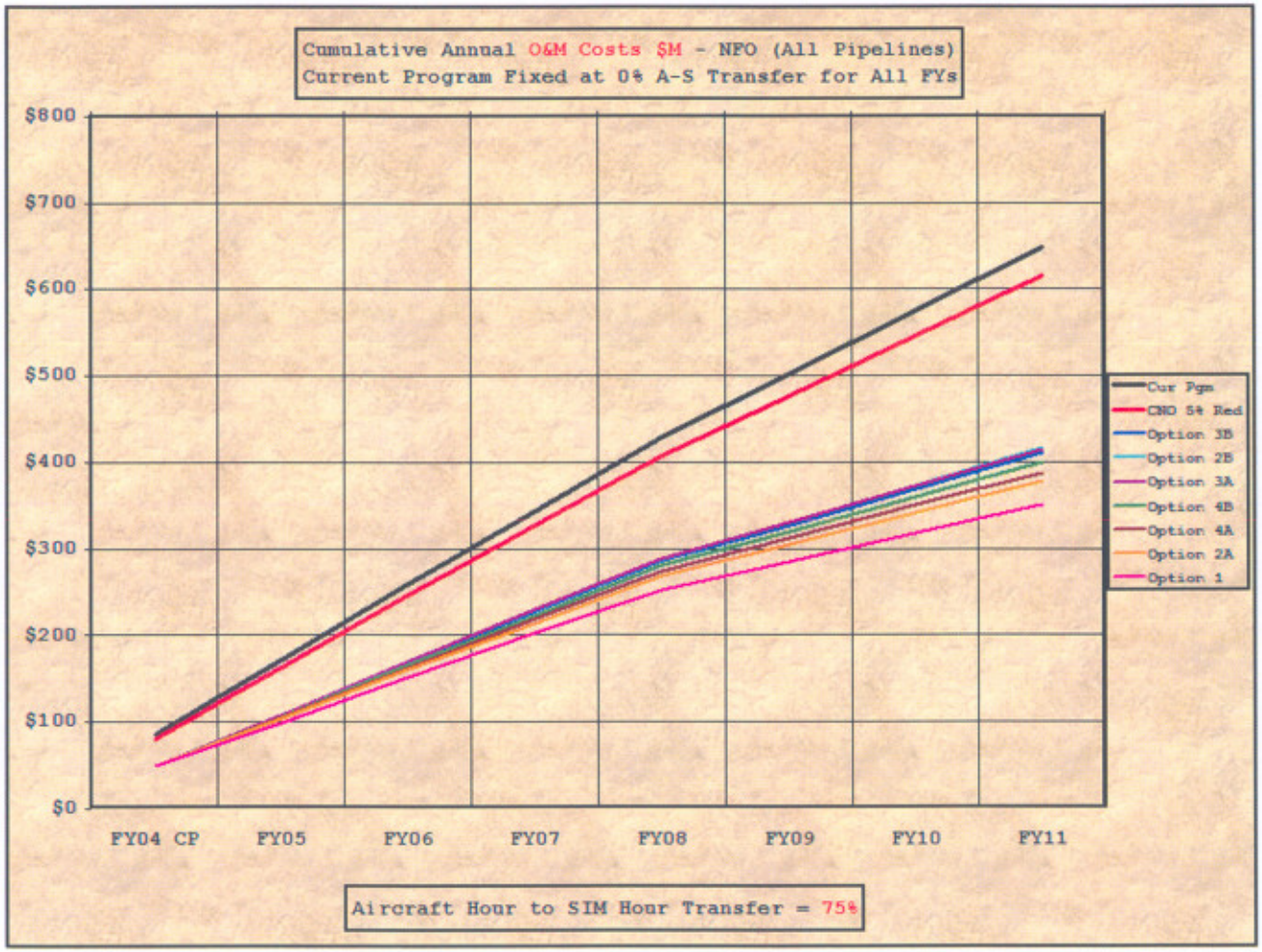

Figure 4.30 Cumulative O&M Costs – 75% A-S Transfer

Annual Procurement Costs – 75% A-S Transfer.

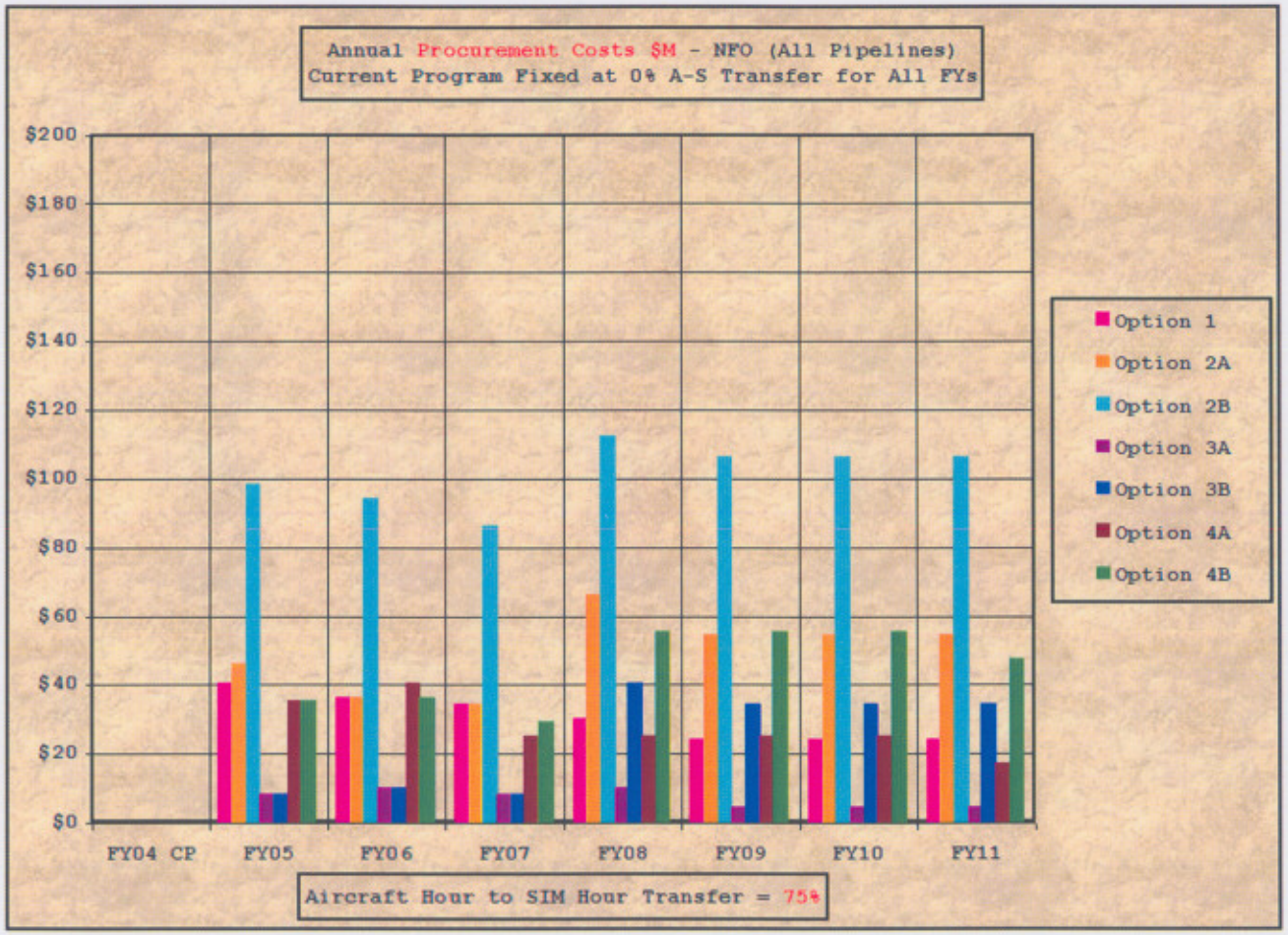

Figure 4.31 Annual Procurement Costs – 75% A-S Transfer

5.0 APPENDICES

Appendix A – Job Task Inventory Literature Review Source Documents

- CNATRA Instruction 1542.54M, 23 Feb 2004, Primary and Intermediate Multi-Service NFO/AF WSO T-34C Training System Curriculum
- CNATRA Instruction 1542.155A, 22 Apr 2004, Primary and Intermediate (T-6A) Multi-Service NFO/AF WSO Training System (MNTS) Curriculum
- CNATRA Instruction 1542.132B, 25 Mar 2002, Advanced Navel Flight Officer (NFO)/Air Force Navigator (NAV) Core Training Curriculum
- CNATRA Instruction 1542.121D, 08 Feb 2002, Advanced Navel Flight Officer (NFO)Strike/Fighter (S/F) Training Curriculum
- CNATRA Instruction 1542.122C, 08 Jan 2002, Advanced Navel Flight Officer (NFO)Strike (STK) Training Curriculum
- (Rough Draft) CNATRA Instruction 1542.148, (file created 30 Mar 04) Multi-Service Navigator Training System (MNTS) Advanced Navel Flight Officer (NFO)/Air Force Navigator (NAV) Core Training Curriculum
- (Excel Spreadsheet) WSO Task Tally Combined 562563, (file created 16 Jul 02)
- (Legacy) CNATRA Instruction 1542.54K, 23 Jan 2001, Primary Student Navel Flight Officer/Navigator Training Curriculum
- (Legacy) CNATRA Instruction 1542.131B, 24 Jan 2001, Intermediate Navel Flight Officer (NFO)/Navigator (AF NAV) Training Curriculum

Appendix B – Difficulty-Importance-Frequency Methodology

In order for the institution to apply their training resources to the training of appropriate critical tasks, the DIF Model was used to decide on the difficulty of each task in terms of learning and performing, the importance of the task to the mission or job, and the frequency the task is performed.

During the first subject matter panel of experts meetings convened at Training Air Wing Six on 22 and 23 Jun 04, the DIF model was applied to the JTI to determine whether a task is train, over-train, or minimally/no train. This process allows for the selection of the most critical tasks to be trained in the institution. During that process, the joint panel of USN, USAF, and USMC SME's had the final word on any conclusion in the DIF process. The Systems Approach to Training definitions are shown in Table B.1. By following the DIF Model, tasks are rated in areas of difficulty, importance, and frequency with points for each of the criteria and levels, as shown in Table B.2. After the scoring is completed it is tracked through the expanded DIF Model decision tree (Figure B.1) to arrive at a specific recommendation.

T	**Train**	The student must be able to demonstrate proficiency in performing the task at the speed required on the job.
OT	**Over Train**	The student must be trained so as to instantly react and perform automatically.
MT	**Minimal/No Train**	No formal training or minimal training is required.

Table B.1 DIF Ratings

		DIFFICULTY
3	**VERY DIFFICULT**	Ability to perform gets better with practice, but task does not get any easier and a job aid is not readily available. Task has unique activities and a job aid is not available. Task has a lot of concurrent activities and a job aid is not available.
2	**MODERATELY DIFFICULT**	Task requires considerable concentration and a job aid is available. Task requires considerable decision -making and a job aid is available. Task requires outside assistance or expertise. Task requires constant practice or performance to maintain proficiency and a job aid is not available.
1	**NOT DIFFICULT**	Task requires some practice to maintain proficiency and job aid is available. Task gets easier with practice and job aid is available. Task requires some concentrated effort and job aid is available. Task requires some decision -making and job aid is available.

		IMPORTANCE
3	**HIGH IMPORTANCE**	Cost of task performance failure is very high. Task failure may lead to failure of mission. Poor performance will cause unacceptable, high damage (money, manpower, time). Task failure will hamper a unit's success in a function or a mission.
1	**LOW IMPORTANCE**	No harm done. Mission not affected. Unit functions still performed.
		FREQUENCY
3	**VERY FREQUENT**	Performed during every flight. Minimum performance- once per 30 days.
2	**MODERATELY FREQUENT**	Performed at least once per quarter.
1	**INFREQUENT**	Performed semi-annually. Perform when the need arises: Emergency Procedures Hazardous Weather Procedures.

Table B.2 DIF Criteria

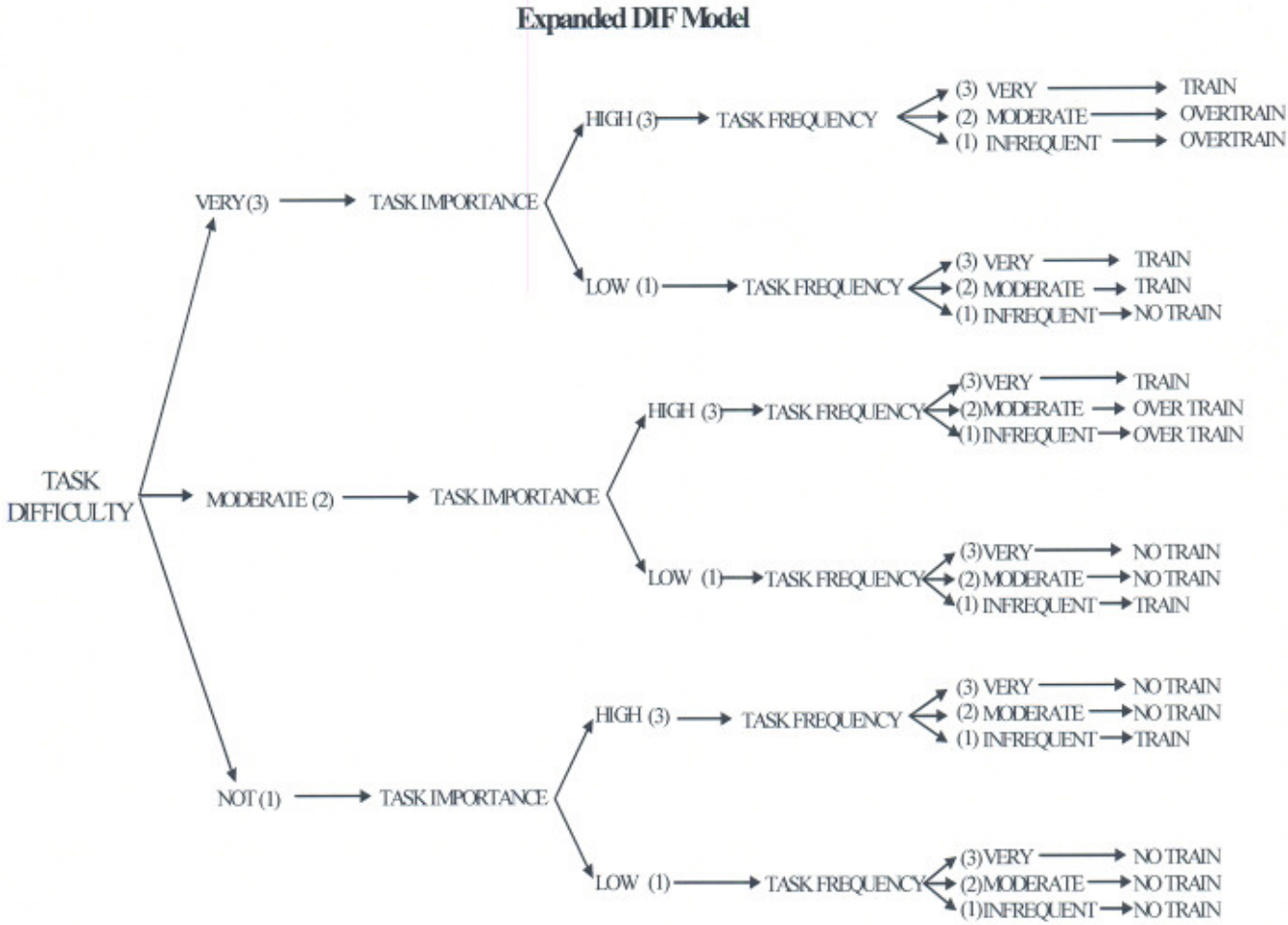

Figure B.1 DIF Model Decision Tree

Appendix C – Media Analysis Methodology

Media selection is not a science. It is a determination of whether or not a specific media provides an adequate level of human interaction to meet the learning objective, while reflecting the job task environment. The results of media selection are a set of recommendations, not a prescription.

The goal of media selection is to consider each learning objective and build a medium that will best communicate and transfer the desired competency to the student. Proper media ensures that information is presented to the student by the most efficient and cost-effective means possible.

Media analysis of the JTI was not performed at the task level because selection of training methods and media can't always be considered separately at the task level. No single medium is the most appropriate for every training situation or task. For example, a student might begin a course of study with IMI that introduces the subject, provides the knowledge, and ensures the student comprehends the knowledge provided. The next event in the training strategy might be a simulator, training device, or part task trainer that would allow the student to practice applying the skill learned. The final step would then be integrating these new skills with other skills while operating in the complex, dynamic, and stressful environment of an aircraft.
Media have various characteristics that make them either suitable or unsuitable for particular training situations.

General Guidelines

General guidelines for selecting media are:

- Select media that do not conflict with the specific training environment
- Select media that effectively supports the learning objectives at the appropriate learning levels
- Select media that supports the training strategy
- Select media that allow individualization of training when appropriate
- Select media with time and dollar resources in mind
- Select media that are efficient and cost-effective

Considerations in the Media Selection

The media must be practical, affordable, and supportable. Therefore, ATC made the following assumptions:

- Actual equipment (the aircraft) and simulations are the most costly
- Instructor-led Computer Aided Instruction (CAI) and self-paced IMI are the least costly

- Level II IMI would be used if the additional fidelity/interactivity of Level III IMI was not required
- The appropriate level of fidelity for training media/devices would be funded
- Both existing and emerging training technology should be considered

The media considered was:

- Level III IMI
- Instructor/CAI
- Simulations
- Aircraft

IMI

IMI is least expensive of the four mediums considered, Instructor/CAI is more expensive than IMI. When weighing the applicability of Instructor/CAI and IMI to the objectives, the selection criteria shown in Table C.1 was applied:

Self-paced Interactive Multimedia Instruction (IMI) is best suited for:	Stable content that does not change often. Content that is important for all students to learn the same way. Teaching straightforward concepts and relationships. Teaching knowledge-only objectives, and/or the knowledge portion of performance tasks. Material that human instructors tend to "over teach." Training performance objectives for systems operations tasks that can be replicated on a computer, e.g., VDTs, CDU, switchology, etc.
Instructor/Computer Aided Instruction (CAI) is best suited for:	Large group must be taught the same thing at the same time. Content that changes frequently. Content that involves a variety of techniques. Material with complex interrelationships of concepts and/or many "if-then" types of decisions. Critical content that will not be reinforced later in the training program. Lessons that include additional training aids and/or hands-on exercises in class.

Table C.1Media Definitions

The criteria for Level II and Level III IMI are shown in Table ISD-Media-2. The main difference between Level II and Level III IMI interactivity is the ability of a student to make decisions within the IMI instruction, not just navigational choices using buttons or menus. In true Level III IMI, the student is allowed to learn the material by making decisions within the instruction. The decisions will trigger "branching" to customized feedback and/or cues for additional decisions and responses.

The media analysis for this study does not differentiate between these two IMI levels, as that level of granularity is beyond the scope of this study, which is to provide possible alternative solutions to training integration challenges. For the recommendations in this study it is assumed all IMI lessons would require the more expensive Level III funding. Before actual IMI funding decisions are made, further analysis would be required to make specific recommendations as to which level would be appropriate for each training objective.

Level III IMI	Level II IMI
Level III IMI will enable the student to see relationships between facts and interpret information.	Level II IMI will enable the student to recall information.
Combines audio, video, text, graphics, and animation.	Combines audio, video, text, graphics, and animation.
Is capable of providing complex branching paths based on student selections or response.	Is capable of providing drill and practice.
Provides feedback to student's responses.	Provides feedback to student's responses.
Is capable of presenting or emulating complex procedures with explanations of equipment operation.	Emulates simple equipment operation in response to student action.
Successful in teaching procedures, discrimination, and problem-solving.	Successful in teaching facts, rules and procedures.
Has the capability for student participation in emulation of psychomotor performance and for limited real-time simulation of performance in the operational setting.	Gives the student stimuli to be ready to take a particular action.
	Capable of instructing a complex physical skill by copying a demonstration.
Level III is more costly to develop than Level II.	Level II is less costly to develop than Level III.

Table C.2 IMI Level II and III Comparison

Simulation

As with IMI, the media analysis for this study does not differentiate between the many levels of simulation, which can range from high-end desk-top trainers (Level IV IMI), to Part-Task Trainers, and on up to full motion FAA certified Level D flight simulators. For the scope of this study, it was considered sufficient to simply identify training objectives that could, given sufficient resources, be trained by the appropriate level of simulation. The training technology assessment recommendations made in this study are based on the media recommendations made in the JTI, and have been weighted appropriately for the level of simulation fidelity anticipated by the panel of flight training and simulation subject matter experts who prepared the recommendations. Before actual simulator funding decisions are made, further analysis would be required to make specific recommendations as to the appropriate level of fidelity would be appropriate for each training objective.

The criteria considered in selecting simulations to train a task is as follows:

- Capable of real-time simulation of performance in the operational setting

- Capable of computer evaluation of student performance and intellectual skills by computer-based predictive and performance test items
- The student is required to learn to group similar items according to their distinct characteristics
- The student is required to synthesize lower levels of knowledge for the resolution of problems
- The Student is required to perform a complex physical skill with confidence and proficiency
- The Student is required to create a new complex physical skill to accommodate a new situation
- The Student is required to track, make compensatory movements based on feedback
- The Student is required to learn and demonstrate the ability to perceive the normal, abnormal, and emergency cues associated with the performance of an operational procedure. Situational Awareness of operation cues
- The Student is required to learn and demonstrate mental preparedness to encode operational cues as indicators of normal, abnormal and emergency conditions associated with the performance of an operational procedure

Media Selection Process

Each task was considered using the following scale:

Goal: Efficient and Effective Training.

Definition: The student is trained to standard/and to the expected proficiency level in the minimum amount of time and at the lowest cost.

Legend:
Least efficient and effective training method = 3
More efficient and effective training method = 2
Most efficient and effective training method = 1

EXAMPLES

EXAMPLE: IMI

Example of an IMI being selected as the most efficient and effective training method.

Objective: Identify aircraft mission computer/flight management system operating procedures.

Level III IMI	1
Instructor/CAI	2
Simulator	3
Aircraft	3

Recommended Media: Level III IMI.

Rationale: The majority of the tasks in operating a mission computer/flight management system deal with facts, rules, and procedural learning on operating the equipment and navigating the system layers. The student can learn these skills from manipulating an interactive emulation of the equipment in a Level III IMI. An IMI is also capable of teaching a student to have readiness to take a particular action such as troubleshooting the system if there is an error. An Instructor/CAI could explain/demonstrate how to work the equipment, but the option is more expensive and lacks the ability for the student to learn at their own pace, as well as to review and practice on their own at a later date. Simulation and the aircraft are inappropriate at this rudimentary level of learning due to the cost, and to the lack of availability for additional self study/practice.

EXAMPLE INSTRUCTOR WITH CAI

Example of an instructor with CAI being selected as the most efficient and effective training method.

Objective: Identify CRM principles and practices.

Level III IMI	2
Instructor/CAI	1
Simulation	3
Aircraft	3

Recommended Media: Instructor/CAI

Rationale: The instructor/CAI methodology is most effective and efficient because of the enabling objectives. The student is required to learn such things as effective communications, leadership, decision-making, mission analysis, and assertiveness. The instructor will bring valuable experience, interaction, examples, and scenarios which can be based on student experience to the teaching of these "soft" skills. A Level III IMI could be produced to emulate some of the decision processes and problem solving capabilities, but not really to the extent that is needed to attain the objective. Simulation and the aircraft could be used to teach the objective, however they are not cost effective.

EXAMPLE: SIMULATION

Example of simulation being selected as the most efficient and effective training method.

Objective: Navigate using ground-based radio aids using a VOR/DME.

Level III IMI	3
Instructor/CAI	3
Simulation	1
Aircraft	2

Recommended Media: Simulation

Rationale: The simulation provides the student with real-time simulation of performance in a wide variety of operational settings and locations. The Level III IMI and Instructor/CAI were rated the least effective and efficient because of the complexity of the task, and the difficulty in reproducing the wide variety of situations encountered. The aircraft was rated more effective and efficient than the IMI and Instructor/CAI, but is not considered cost effective, and is limited in the variety of locations, malfunctions, and operational scenarios that could be presented.

EXAMPLE: AIRCRAFT

Example of the aircraft being selected as the most efficient and effective training method.

Objective: Operate aircraft and systems in a high G environment.

Level III IMI	3
Instructor/CAI	3
Simulation	2
Aircraft	1

Recommended Media: Aircraft

Rationale: Although IMI or Instructor/CAI could train the individual tasks of operating the aircraft and systems, neither media can sufficiently tie the multiple simultaneous competencies required together to provide the necessary level of fidelity, and certainly cannot provide a high G environment. Simulation is a good choice for summing the tasks, but including realistic G-simulation in a full-fidelity aircraft training device is very costly. Since the students needs to learn to perform their complex set of duties while under frequent and varying G loads, the aircraft was chosen as the most efficient and effective training method.

Appendix D – Leveraging Synthetic Experience, by Dr. Tony Kerns

Leveraging Synthetic Experience for Mission Efficiency and Effectiveness

By Dr. Tony Kern, Lt Col, USAF (Retired)

Introduction

One certain way to liven up a dull happy hour at any flight base Officers' Club is to bring up the word *simulator.* Aviators of all experience levels like to fly. For many, the exhilaration of flight was a major factor in why they chose their respective careers. Therefore it is important from the outset to clearly articulate that flight simulation is only a piece of the training and performance puzzle, a means to a more efficient and effective end – mission accomplishment. This white paper looks at several aspects of the simulation decision process and advocates *redistribution* rather than *replacement* of flight hours with simulation – and only then when there are compelling reasons beyond mere cost savings.

In a 1974 study on flight simulation published in the *Air University Review,* Major General Oliver Lewis asked the reader to contemplate the following scenario:

> The intercom came on: "Good morning, ladies and gentlemen, this is your captain speaking. Welcome aboard Easy Airways' DC-10 flight to San Antonio. Be assured that the flight crew is highly experienced and professionally competent. As captain, I have logged a total of three hours on the DC-10. Relax and enjoy your trip."
>
> No airline in its right mind would ever announce to its passengers that the pilot could claim only three hours' experience in the airplane. The point is that many of them could!

General Lewis' comments were written over three decades ago. Since that time, the evolution of simulation has produced devices that are fully capable of training many aircrew members to fully qualified status before they ever set foot in the aircraft. Quantum leaps in computing power and advances in visual imagery and Geo-spatial Information Systems (GIS) have created synthetic training environments almost undetectable from reality. While the standardized mission of the airlines makes a nearly complete turnover of flight training to simulation an attractive and cost effective training solution, the military mission's complexities demand a balance and blended mix of simulation, traditional classroom instruction, computer based instruction, and flight training to achieve mission ready status.

Blended Learning

Simulations provide a learning environment for which even the most abstract concept can be represented realistically, however, simulations do have significant drawbacks. Simulations do not provide the user with the opportunity to ask questions or receive individualized help from their instructors. Blended learning combines the best aspects of simulations, online learning, and face-to-face instruction – including flight instruction - to achieve the right mix of training elements. The blended learning approach capitalizes on the strengths of all different learning domains, while countering the weaknesses of each

area.[1] As the technology of simulation has advanced, questions have slowly shifted from what you *can* do with a simulator, to what you *should* do.

Army Warrant Officer Michael Durant, whose battered face was on the cover of every newspaper in America following the shoot down of his Blackhawk helicopter in Mogadishu in 1993, commented to *National Defense Magazine* on the value and limits of advanced simulation capabilities for tactical combat operations. "There is clearly a place where simulation is effective and there is a place where it is not. The key is to apply these tools for the right task and the right proficiency level, because it makes the time spent in the actual aircraft much more valuable."[2]

A Brief History of Flight Simulation[3]

Flight simulators have been utilized for enhancing flight training almost since the beginning of manned flight itself. Two of the earliest examples of flight trainers, or simulators, were in use in England in 1910. One was called the "Sanders Teacher," the other the "Eardly-Billing Oscillator." Both were replicas of early aircraft and were mounted on a base that allowed the trainer to move, in a limited manner, in pitch, roll, and yaw. The Sanders Teacher was described, in part, as follows:

> Those wishing to take up aviation either as a recreation or a profession find many drawbacks at the commencement of their undertaking, but one of the most formidable, especially to those not blessed with a long purse, is the risk of smashing the machine while endeavoring to learn how to control and fly it.
>
> Even the most apt pupil is certain to find himself in difficulties at some time or another during his probation, and owing to lack of skill the machine is necessarily sacrificed to save his life, or at least to prevent a serious accident. The invention, therefore, of a device which will enable the novice to obtain a clear conception of the workings of the control of an aeroplane, and of the conditions existent in the air, without any risk personally or otherwise, is to be welcomed without a doubt. . . ."[1]

That was 94 years ago, yet some people still have difficulty accepting it, especially if they think it will result in less flying time.

During and after World War I, aircraft trainers continued to be developed for the purpose of ground-based flight instruction and training safety. A trainer developed in France in 1917 included such features as control feel, response, assumed speed, engine noise, rudder-aileron crossover, and a simple visual approach. The advent of instrument or

---

1 Shirts, R. G. (2002). *Ten secrets of successful simulations.* http://www.stsintl.com/articles/tensecrets.html

2 Tiron, Roxana "Mogadishu Hero Says Army Aviators Need More Training" *National Defense Magazine.* November 2002.

3 This section is quoted liberally and adapted from Lewis, Oliver W. Major General, USAF. "Simulation – The New Approach". *Air University Review,* March-April 1974.

"blind flying" required the use of simulators as training in the aircraft was both dangerous and uneconomical. A watershed was reached in 1929, when Edwin A. Link built his first flight trainer.

By the beginning of World War II, Link trainers were extensively used in commercial and military aviation training. Data on the effectiveness of these trainers are lacking; however, their contributions to military and civilian aviation training were apparently acceptable as they were purchased in large numbers and used extensively for many years.

Since World War II, flight simulators have progressed from the simple mechanical machine built by Link to sophisticated, computerized trainers that nearly duplicate the aircraft they represent and the environment in which they operate. As complexity increased, so did cost. Consequently, training value of simulators, heretofore accepted by the military, was seriously questioned.

Economic Considerations

Cost effectiveness, while not paramount in the training decision process, must be considered. In an effort to quantify cost savings from simulation, numerous studies have been conducted to determine how much of what is learned in simulators is actually transferred to the real aircraft. In general, researchers have found that simulator training costs about one-tenth of the investment of actual field training exercises.[4] Figure 1 illustrates data collected from the military as to the relative costs between flight hour and simulator hour.

Figure 1. Relative Cost of Simulated Versus Actual Flight Hour[5]

Airframe	Cost/Actual Fight Hour	Cost/Simulated Flight Hour	Ratio
F-16	$5000	$500	10/1
FA-18A	$3955	$217	18/1
P-3C	$2903	$119	24/1
S-3A	$4360	$143	30/1
SH-60B	$1724	$118	15/1
CH-47	$3000	$435	7/1
		Average Ratio:	17/1

Of course figures like these only tell part of the story. Leave it Brigadier General Chuck Yeager to cut to the chase. "Simulators are getting much better, (and) airplanes are

4 Orlansky, J., Taylor, H. L, Levine, D.B., & Honig, J. G. (1997). *The cost and efectiveness of the multi-service distributed training testbed (MDT2) for training close air support* (IDA Paper P-3284). Alexandria, VA: Institute for Defense Analysis.

5 National Training Systems Association Study. Found at http://www.trainingsystems.org/ These figures may be outdated since there was no date on the study, but the ratios are likely representative of current return on investments.

becoming extremely expensive. You cream an F-22 and you've tossed 125 million bucks down the tubes, and that's a lot of money."[6] Add in the costs of an accident investigation and lost lives and careers, and the true costs become nearly immeasurable, which brings us to the issue of safety and risk management.

Risk Management and Safety

Over the past decade, all branches of the military have embraced risk management as a means of improving both safety and mission effectiveness. Consider the insurance industry equation:

Risk = Severity x Probability of Occurrence x Exposure

It becomes immediately obvious that simulations can significantly reduce the final two multipliers in this equation. In the military, it is often necessary to train pilots for emergencies and other dangerous real world experiences. Training in simulators offers a virtually risk-free environment while still providing a realistic experience for the user. Furthermore, simulator training is often self-paced, allowing users to train on areas of individual weakness when they are ready, rather then when the pilot and equipment are available. One of the reasons flight simulators have become so valuable is because of their ability to inject failures and adverse conditions, as well as to train crew coordination under stress without compromising safety.

In Warrant Officer Durant's opinion, this is the real value of simulators. "Those kinds of capabilities you can't create in real (flight) training conditions. In simulators, you can fail an engine 50 times. You can shoot the aircraft on takeoff and see how the crew reacts."[7]

Risk management through probability and exposure reduction. Many high risk activities can be rehearsed dozens of times in the simulator before they are ever attempted in the actual aircraft. When accomplished in concert with a rigorous academic and emergency procedures training process, a trainee can often transfer this synthetic experience directly into the aircraft and be successful in far less time and with far less risk than previously possible.

6 *Flying Safety* interviews Brigadier General Chuck Yeager, aviation pioneer. Found at http: //afsafety. af.mil/magazine/htdocs/septmag97/spg22.htm

7 Tiron, Roxana "Mogadishu Hero Says Army Aviators Need More Training" *National Defense Magazine.* November 2002.

Mission Focus

High fidelity simulation allows commanders and training experts to redistribute available flight hours into critical mission areas. With less flight time expended on basic procedural training, a greater proportion of total available flying hours are available for mission related flight activities. In this sense, military organizations gain increased operational capability without increased cost. Additionally, some aircraft coded and required for training support can be returned to operational units, which has the added advantage of increasing the number of aircraft available for direct mission use within existing budgetary constraints.

Modern computerized simulation and the evolution of connectivity have allowed truly interactive mission simulations to take place across distances by linking geographically separated units. So called "linked simulation exercises" have not yet been widely adopted but have the potential to allow for full scale mission rehearsals and interoperability training exercises. The realism is completed by accessing existing geospatial databases - which can accurately replicate almost any topographical location in the world. Even greater advances are on the near horizon.

In short, by fully integrating simulators to the initial training and mission preparation toolbox, commanders can fuel the engine of continuous improvement, moving up the "performance ladder[8]" (see below) towards greater effectiveness, efficiency and precision in pursuit of mission accomplishment.

Figure 2. The Performance Ladder

[8] Kern, Tony. *Redefining Airmanship.* McGraw-Hill. 1997.

Measuring Effectiveness in Military Training

Although economics are obviously important, there are many other factors that must be considered when training military personnel being trained to go up against a thinking human enemy armed with advanced radar systems, missiles and guns. According to research document published by the National Training Systems Association, one figure of merit for simulator training effectiveness is "Transfer Effectiveness Ratio (TER), which is the ratio of actual equipment training time saved as a function of time spent training on a simulation. Large values of this ratio indicate that simulations train relatively well in comparison to operating actual equipment, and small values indicate that simulations train poorly relative to actual equipment. TER comparisons for military flight simulators from the literature suggest that the majority (59%) of tasks trained have TERs greater than 0.33. This means that for every three hours spent in the simulator, one hour of actual flight time could be eliminated for 54% of the tasks.[9]

Leveraging Technological Advances through Instructional System Design

Following his in-depth study of the efficacy of simulators and their potential for the USAF, General Lewis came to the conclusion that

> Credit for these advances in training has generally been ascribed to the quantum jumps made in simulator technology. While this cannot be discounted, *more credit is due to the quantum jumps in the way simulators are used and the technology of learning or instructing.* (emphasis added)[10]

Issues of training effectiveness, obsolescence and upgrades of hardware, software compatibility with the actual aircraft and others must be worked through and planned for in advance to take advantage of the savings that are available from a redistribution of flight to simulation. *Return on Investment is largely a function of planning and execution of the blended learning system as a whole.* The decision to move to simulation must be made with an eye towards the complete instructional system design of your program.

Let us end where we began, at the Officer's Club happy hour, where the discussion on simulators has taken a surprising and positive turn. Upon the realization that increased use of simulation means more flight hours dedicated to preparing for the mission and less on the basics, the would-be Chuck Yeagers smile and nod approvingly. Following a lively discussion on the state of simulator technology, economics, risk management and instructional design, the small group of aviators find themselves in agreement on how to drive the organization to the next level of mission readiness. But they also agree the real task will be convincing others.

---

9 "Why use simulation?" National Training Systems Association Study. Found at http://www.trainingsystems.org/.

10 Lewis, Oliver W. Major General, USAF. "Simulation – The New Approach". *Air University Review,* March-April 1974

About the Author Dr. Tony Kern

Tony Kern is a Senior Partner and Chief Learning Officer with Convergent Knowledge Solutions, LLC – a human performance improvement company. He recently served as the National Aviation Director for the U. S. Forest Service where he directed the largest non-military government aviation program in the world in support of wildland firefighting operations. He was formerly the Director of Military History at the USAF Academy and is an internationally recognized lecturer on human performance, training and safety. Tony is the author of five books on pilot performance, including *Redefining Airmanship, Flight Discipline,* and *Darker Shades of Blue: The Rogue Pilot.* Tony is a retired Command Pilot with the U. S. Air Force, where he was an instructor pilot and flight examiner in the B-1B bomber and served as the Chair of the Air Force Human Factors Steering Group, among other assignments. He is the recipient of numerous awards including the 2002 *Aviation Week and Space Technology* "Laurel Award" for safety and the 2003 *Flight Safety Foundation* "Distinguished Service Award" for Aviation Program Leadership. He is a frequent guest on talk radio and TV, including segments on the Discovery Channel, NBC Nightly News and *48 Hours with Dan Rather.* Lt Col Kern holds Masters Degrees in Public Administration and Military History as well as the Doctorate in Higher Education, specializing in human factors training design. He enjoys hunting, fishing, boating and flying. He lives with his wife and two teenage sons in Stafford, Virginia.

Appendix E – Glossary

Definitions are from MIL-HDBK-29612-4A unless otherwise noted.

Computer Aided Instruction (CAI). The use of computers to support the delivery of instructor-led instruction (to include drill and practice, remediation tool, resource tool, etc.). CAI exploits computer technology to provide for the storage and retrieval of information for both the instructor and student.

Cockpit Procedures Trainer (CPT). For the purpose of this study, the term Cockpit Procedures Trainer (CPT) is used to describe any simulation device that fully replicates the aircraft cockpit but does not incorporate either visual or motion capability. Examples of this type device are the T-6A UDT and the T-2C OFT simulation devices currently being utilized at NAS Pensacola.

Customer's Critical Requirements (CCR). Elements of a process that significantly offset the output of that process. Identifying these elements is vital to determining the value to the customer and how to make improvements that can dramatically reduce cost and enhance performance and quality.

Difficulty-Importance-Frequency (DIF) model. One of several models available for use in selecting tasks for training and training sites. Using this model, tasks are identified as critical based on the difficulty, importance, and frequency of job task performance.

Enabling Learning Objective (ELO). A statement in behavioral terms of what is expected of the student in demonstrating mastery at the knowledge and skill level necessary for achievement of a Terminal Learning Objective (TLO) or another ELO.

Interactive Multimedia Instruction (IMI). IMI is a term applied to a group of predominantly interactive, electronically-delivered training and training support products. IMI products include instructional software and software management tools used in support of instructional programs.

Individual task analysis. The process used to identify the individual task performance specifications. They describe how the task is actually performed, under what conditions it is performed, and how well the individual must perform it. They are the task performance details needed to establish the individual training strategy and to design and develop follow on training.

Instructional Systems Development (ISD). A process for the analysis, design, development, implementation, evaluation, revision, and operation of a collection of interrelated training elements. A logical process for effectively and efficiently determining what, where, when, and how tasks should be taught. A process for effectively and efficiently achieving a required outcome based on documented needs. A process in which performance requirements are explicitly defined from an analysis which occurs in a training development effort; includes a subsequent specification of performance requirements in terms of behavior objectives; is followed by the development of criterion tests which match job performance; and, with the appropriate curriculum development efforts supporting training on specified objectives. The entire process undergoes extensive evaluation to ensure the validity of the process.

Integrated Master Task List (non MIL-HDBK-29612-4A definition). A generic term used to describe a master task list that has been annotated with additional items, such as dividing tasks by training pipeline, and/or showing additional analysis such as DIF or Media. Also known as an "annotated task list." See also the definition for "Master Task List (MTL)".

Job analysis. The basic method used to obtain facts about a job, involving observation of workers, conversations with those who know the job, analysis questionnaires completed by job incumbents, or study of documents involved in performance of the job.

Job Task Inventory (JTI). Results of information gathering in job analysis. Lists of duties and tasks, varying in refinement from basic input data to duties and tasks that constitute the job performed by incumbents within a rating/Military Occupational Skill (MOS)/Air Force Specialty Code. Critical tasks for the job are derived from this inventory. Also called "task inventory" or "total task inventory".

Levels of interactivity. A two-way communication in which stimuli/response is direct and continual. Interactivity describes the degree of student involvement/interactivity in the instructional activity. There are four levels of interactivity, they are:

- Level I - Passive. The student acts solely as a receiver of information.
- Level II - Limited participation. The student makes simple responses to instructional cues.
- Level III -Complex participation. The student makes a variety of responses using varied techniques in response to instructional cues.
- Level IV - Real-time participation. The student is directly involved in a life-like set of complex cues and responses.

Master Task List (MTL) (non MIL-HDBK-29612-4A definition). A generic term used to describe a listing of tasks, and possibly those items contributing to the attainment or definition of the listed tasks. Content of the listing is contextual to the desired outcome of the product to be created or analysis being performed. The level of the tasks (e.g., collective, individual, training, etc.) is also contextual to the desired outcome.

Metaskills. Cognitive strategies that an individual applies to the processing of new information in a novel situation (a scenario not previously experienced). These skills include chunking or organizing new information, recalling relevant schemas, adding the new information to the old schemas, and creating new schemas. Also defined by Spears (1983) as the complex skill of adapting, monitoring, and correcting the use of individual skills in complex performances that integrate all learning processes.

Proficiency. Ability to perform a specific behavior (e.g., task, learning objective) to the established performance standard in order to demonstrate mastery of the behavior.
Schemas. An organization of information. Schemas may take the form of scripts (a kind of story or scenario that organizes information) or frames (a structure that looks like a table or matrix into which information fits).

Simulator (SIM). For the purpose of this study, the term simulator (SIM in the alternatives) refers to any simulation device that incorporates a visual capability at a minimum, up to the limits of available technology as a maximum.

Systems Approach to Training (SAT). A training development process. It is a disciplined, logical approach to making collective, individual, and self-development training decisions. It determines whether or not training is needed; what is trained; who gets the training; how, how well, and where the training is presented; and the training support/resources required to produce, distribute, implement, and evaluate those products. The SAT involves all five training related phases: analysis, design, development, implementation, and evaluation. Also see the definition for "Instructional Systems Development (ISD)".

Task. A single unit of specific work behavior, with clear beginning and ending points, that is directly observable or otherwise measurable. A task is performed for its own sake, that is, it is not dependent upon other tasks, although it may fall in a sequence with other tasks in a mission, duty, or job.

Task analysis (Service). A process of reviewing actual job content and context to identify the elements of a task by analyzing mission/job conditions, standards, performance steps, required skills and knowledge, safety and environmental factors, references, equipment, and job performance measures.

Task description. Textual information presented in column, outline, decision table, or timeline format that describes the required job behavior at the highest level of generality. Intended to provide an overview of the total performance.
Task performance steps. The required unit/individual actions that must be performed to accomplish the critical task. Each step must be specific and detailed and contain only one action or unit of work.

Task selection board. A group of subject matter experts who evaluate task performance data. The board makes recommendations to the approving authority those individual tasks which they determine to be critical.

Task selection model. A model used to apply statistically valid task selection models to identify critical individual tasks.

Terminal Learning Objective (TLO). A learning objective at the highest level of learning (i.e., Knowledge, Skills, and Attitudes (KSA)) appropriate to the human performance requirements a student will accomplish when successfully completing instruction.
Training Situation Analysis (TSA). A document used to verify the effectiveness of a training system to meet existing training needs and to survey training programs and technologies for applicability to new training needs.

Training task analysis. The process of examining each unique unit of work from the job task analysis to derive descriptive information (e.g., procedural steps, elements, task conditions, standards, other information) used in the design, development and testing of training products.

Appendix F – NFO/CSO Job Task Inventory

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV	
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																															
4	METEOROLOGY																																								
5	x						x			Navigate the Aircraft to Avoid Icing Conditions						1	3	1	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
6	x						x			Navigate the Aircraft to Avoid Turbulence						1	3	1	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
7	x						x			Navigate the Aircraft to Avoid Thunderstorms and Tropical Storms						1	3	1	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
8	x						x			Navigate the Aircraft to Avoid Windshear and Microbursts						1	3	1	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
9											Evaluate observed and forecast meteorological conditions to avoid weather hazards and enhance mission accomplishment.	2	1	3	3	IMI																												
10											Identify the lower layers of the atmosphere and its composition.	2	1	3	3	IMI																												
11											State the primary flight hazards and weather elements, including hypoxia and the rules for oxygen use IAW applicable directives.	2	1	3	3	IMI																												
12											Identify basic characteristics of pressure systems, levels of the atmosphere, and winds.	2	1	3	3	IMI																												
13											Identify temperature and moisture impact on aircraft performance.	2	1	3	3	IMI																												
14											Identify selected parameters used to compute atmospheric temperature effects.	2	1	3	3	IMI																												
15											Compute atmospheric temperature parameters effect on aircraft altimetry including density altitude.	2	1	3	3	IMI																												
16											Identify parameters used with atmospheric pressure, and its effects on aircraft altimetry.	2	1	3	3	IMI																												
17											State the basic concepts of large and small scale wind systems.	2	1	3	3	IMI																												
18											Describe the relationship between atmospheric temperature and moisture content and its effects on flight.	2	1	3	3	IMI																												
19											Identify major cloud types and associated flight characteristics.	2	1	3	3	IMI																												
20											Identify terminology, definitions, rates, and requirements associated with stability/instability of the atmosphere.	2	1	3	3	IMI																												

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV	
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																															
21											Identify the classifications and conditions of air masses.	2	1	3	3	IMI																											
22											Identify frontal weather systems and associated weather patterns.	2	1	3	3	IMI																											
23											State the fundamentals of thunderstorm development.	2	1	3	3	IMI																											
24											State the proper flight techniques for safe flight through or in the vicinity of thunderstorms.	2	1	3	3	IMI																											
25											Identify the causes of turbulence and associated terminology.	2	1	3	3	IMI																											
26											Identify the hazards of flight associated with Thunderstorms, Turbulence, and Icing.	2	1	3	3	IMI																											
27											Identify the hazards of flight associated with microbursts and wind shear.	2	1	3	3	IMI																											
28											Identify fogs and low ceiling clouds.	2	1	3	3	IMI																											
29											Identify the saturation process, effects of wind, and how the various types form and dissipate.	2	1	3	3	IMI																											
30											Identify the differences between and obscuration and partial obscuration.	2	1	3	3	IMI																											
31											Identify tropical and tornado weather phenomena and the associated warnings.	2	1	3	3	IMI																											
32	x	x					x			Perform Preflight Weather Planning							1	3	1	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x			
33											Identify the five parts of a DD175-1, Flight Weather Briefing Form and the sources of weather information required to fill in the form.	2	1	3	3	IMI																											
34											Obtain a weather brief resulting in a completed DD-175-1.	2	1	3	3	IMI																											
35											Interpret a weather brief.	2	1	3	3	IMI																											
36											Identify displayed data shown on station model plots, surface analysis charts, and surface prognostic charts.	2	1	3	3	IMI																											
37											Identify displayed data on radar summary and weather depiction charts.	2	1	3	3	IMI																											
38											Identify displayed data on severe weather watches and area forecasts.	2	1	3	3	IMI																											

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
39											Identify displayed data on in-flight weather advisories and pilot reports.	2	1	3	3	IMI																											
40											Identify displayed data on winds-aloft prognostic charts, constant-pressure charts, and winds-aloft forecasts.	2	1	3	3	IMI																													
41											Identify displayed data on aviation weather reports.	2	1	3	3	IMI																													
42											Identify displayed data on terminal forecasts.	2	1	3	3	IMI																													
43											Identify displayed data shown on a horizontal weather depiction.	2	1	3	3	IMI																													
44											Identify procedures for obtaining weather from off-base location.	2	1	3	3	IMI																													
45											Select appropriate alternate airfields IAW standing instructions.	2	1	3	3	IMI																													
46	x	x					x			Update Enroute Weather Data							2	3	1	OT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
47	x	x					x			Update Destination Weather Data							2	3	1	OT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
48											Utilize Pilot to Metro Services (PMSV) for weather updates.	1	3	3	2	INSTR-LED																													
49											Utilize aviation weather services to update forecast of en route weather.	3	1	2	3	IMI																													
50											Utilize aviation weather services to update forecast of destination weather.	3	1	2	3	IMI																													
51											Utilize ATIS/PMSV to update destination weather conditions.	3	1	2	3	IMI																													
52											Utilize FSS to open, change, and close flight plans.	1	3	3	2	INSTR-LED																													
53											Interpret meteorological conditions for aviation hazards avoidance.	3	1	2	3	IMI																													
54											Direct flight course and destination deviation to avoid or minimize hazardous meteorological conditions.	3	1	2	3	IMI																													
55																																									
56	FLIGHT POLICY																																								
57	x	x					x			Conduct flight operations IAW Naval Air Training and Operating Procedures Standardization (NATOPS)/AF Dash One Flight Policies and Procedures							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF			Model	Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN																							
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title										E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
58											Identify the scope of the NATOPS/Dash One program.	2	1	3	3	IMI																											
59											Identify the parts of the NATOPS/Dash One manual.	2	1	3	3	IMI																											
60											Identify the sections of the NATOPS Pocket/ CL-1 Checklist.	2	1	3	3	IMI																											
61	x	x					x			Conduct flight operations IAW OPNAVINST 3710.7 series/applicable AF directives Flight Policies and Procedures						1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
62											Identify specified flight policies and procedures in OPNAVINST 3710.7 series/applicable AF directives.	2	1	3	3	IMI																											
63											Apply flight policies and procedures provided in OPNAVINST 3710.7 series/applicable AF directives.	3	2	1	2	SIM																											
64	x	x					x			Conduct flight operations IAW FAA Regulations Part 91 Flight Policies and Procedures						1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
65											Apply flight policies and procedures set forth in FAA Regulations Part 91.	3	2	1	2	SIM																											
66																																								
67	MISSION/FLIGHT PLANNING																																							
68	x	x	x				x	x		Perform General Mission Planning Procedures						1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x			
69											Assemble required materials and equipment, using issued training publications IAW current directives.	1	2	3	3	INSTR-LED																											
70											Perform mission planning to include takeoff, climb, enroute, descent, approach, and landing data.	1	2	3	3	INSTR-LED																											
71											Plan alternate course of action.	1	2	3	3	INSTR-LED																											
72											Prepare Flight Log/DD 175.	2	1	3	3	IMI																											
73											Accomplish appropriate planning for particular mission.	1	2	3	3	INSTR-LED																											
74											Adjust mission's tactical admin based on real-world/ weather concerns.	2	1	3	3	IMI																											
75											Identify ATO structure.	2	1	3	3	IMI																											
76											Identify timetable of the ATO, SPINs.	2	1	3	3	IMI																											

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF		Model		Pipeline																				
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
77											Extract call signs, comm plan, no-fly zones, MRR, SAR data, kill-box (container), TOTs, Targets, and Bullseyes.	2	1	3	3	IMI																													
78											Identify Navy green messages.	2	1	3	3	IMI																													
79											Plan a mission as part of a crew/flight effort.	1	2	3	3	INSTR-LED																													
80											Plan different types of missions. (i.e., ISR, STK, Maritime, Global Transit,...)	1	2	3	3	INSTR-LED																													
81											Interpret applicable NOTAM data.	2	1	3	3	IMI																													
82											Coordinate scheduling of IR, VR, AR, routes with appropriate scheduling agencies.	2	1	3	3	IMI																													
83	x						x			Obtain Required Information from FLIP Publications							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
84											Utilize in-flight publications and charts.	2	1	3	3	IMI																													
85											Identify basics of manual mission planning.	2	1	3	3	IMI																													
86											Apply information in FLIP General Planning.	2	1	3	3	IMI																													
87											Apply information in FLIP Area Planning 1, 1A and 1B.	2	1	3	3	IMI																													
88											Apply information in the FLIP IFR En Route Supplement.	2	1	3	3	IMI																													
89											Apply information in FLIP Flight Information Handbook.	2	1	3	3	IMI																													
90											Apply information on FLIP IFR En Route High Altitude Chart.	2	1	3	3	IMI																													
91											Apply information on FLIP En Route Low Altitude and Area Charts.	2	1	3	3	IMI																													
92											Apply information on FLIP Standard Instrument Departure.	2	1	3	3	IMI																													
93											Apply information in FLIP Terminal Instrument Approach Procedures.	2	1	3	3	IMI																													
94											Complete a Jet Log/Flight Log to estimate time en route.	2	1	3	3	IMI																													
95											Complete a DD-175/DD Form 1801 using FLIP and Jet Log information.	2	1	3	3	IMI																													
96											Prepare charts/electronic log.	2	1	3	3	IMI																													
97											Define terminology (sunrise, sunset, EENT, lunar Illumination, thermal crossover)	2	1	3	3	IMI																													

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF		Model		Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
98											Apply BAM information during planning.	2	1	3	3	IMI																												
99											Apply AHAS information during planning.	2	1	3	3	IMI																												
100											Apply BASH information during planning.	2	1	3	3	IMI																												
101											Identify aircraft specific load and weight and balance considerations during mission and flight planning.	2	1	3	3	IMI																												
102											Identify basic navigation terminology (lat/long/UTC/bulls-eye).	2	1	3	3	IMI																												
103											Identify departure procedures.	2	1	3	3	IMI																												
104											Identify arrival procedures.	2	1	3	3	IMI																												
105											Determine landing base restrictions and limitations of flight mission.	2	1	3	3	IMI																												
106											Determine appropriate route for mission based on intense study of weather.	2	1	3	3	IMI																												
107	x	x	x	x	x	x	x	x	x	Employ ORM Concepts During Mission Planning							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
108											Apply the concepts of ORM into all aspects of mission planning.	1	2	3	3	INSTR-LED																												
109											Apply ORM Concepts into charting and coordinate systems to include types of charts available and their appropriateness for mission/aircraft specifics.	1	2	3	3	INSTR-LED																												
110	x						x			Apply Geodesy Considerations During Mission Planning							1	3	1	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
111											Identify chart projections.	2	1	3	3	IMI																												
112											Identify the differences and uses of each type of chart (GNC, JNC, ONC, JOG), and their suitability for common mission types.	2	1	3	3	IMI																												
113											Identify UTM to lat/long conversion.	2	1	3	3	IMI																												
114											Identify GRID.	2	1	3	3	IMI																												
115											Identify datum concept (i.e. WGS-84).	2	1	3	3	IMI																												
116											Identify relationship of imagery to charts and use in target study.	2	1	3	3	IMI																												
117											Identify strengths and weaknesses of imagery.	2	1	3	3	IMI																												
118	x	x					x	x		Perform Computer Aided Flight Planning							2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
119											Construct charts manually.	2	1	3	3	IMI																												

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																															
120											Identify computerized flight planning systems.	2	1	3	3	IMI																											
121											Identify software in use by AF/Navy CFPS/PFPS/(JUMPS in future).	2	1	3	3	IMI																											
122											Identify different flight planning systems. (CFPS, Falcon View, IMOMs, AFMSS)	2	1	3	3	IMI																											
123											Operate flight planning systems and software.	1	2	3	3	INSTR-LED																											
124	x						x			Apply Fuel Planning Considerations During Mission Planning							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
125											Identify types of fuel.	2	1	3	3	IMI																											
126											Identify the correlation of fuel load and aircraft performance.	2	1	3	3	IMI																											
127											Determine the different fuel burn rates and alternate requirements with varied speeds, altitudes, weights.	2	1	3	3	IMI																											
128											Determine the differences between high and low level fuel planning.	2	1	3	3	IMI																											
129											Plan fuel and alternate requirements based on mission profile.	2	1	3	3	IMI																											
130											Determine emergency and minimum fuel.	2	1	3	3	IMI																											
131											Perform graph and tabular fuel planning procedures.	2	1	3	3	IMI																											
132											Determine mission completion feasibility based upon fuel requirements, ensuring adequate fuel reserves are available as set forth in applicable directives.	2	1	3	3	IMI																											
133		x	x	x	x	x			x	Perform Visual/Low Level Mission Planning Procedures							1	3	2	MT	x	x	x	x	x	x					x	x	x	x	x	x	x			
134											Identify the tactical advantage and utility of low level operations as it pertains to a given threat or mission profile considerations.	2	1	3	3	IMI																											
135											Identify effects of terrain masking on low-level route planning.	2	1	3	3	IMI																											
136		x	x	x	x	x			x	Prepare Maps/Charts for Low-Level Mission							1	3	2	MT	x	x	x	x	x	x					x	x	x	x	x	x	x			
137											Prepare low-level charts IAW Chart Update Manual and annotated IAW current local directives.	1	2	3	3	INSTR-LED																											

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																				
2							Panel NAV																																			
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
138											Perform route analysis and target study, given mission profile to include applicable threats, route abort altitudes, leg abort altitudes, geo-political stand-offs and bullseyes, leg minimum altitudes, egress plan, entry and exit procedures, altimeter procedures and terrain avoidance.	1	2	3	3	INSTR-LED																														
139											Prepare low-level flight plans, given a low-level or computer flight plan, mission orders, aircraft performance information, DR equipment, weather info, access to FLIP, NOTAMs, applicable directives, and local training publications IAW current directives.	1	2	3	3	INSTR-LED																														
140											Prepare low-level navigation charts, mission orders, DR equipment and access to FLIP, local training publications, and Chart Updating Manual, Annotated IAW current directives.	1	2	3	3	INSTR-LED																														
141											Prepare and strip appropriate charts.	1	2	3	3	INSTR-LED																														
142											Prepare low-level route and flight to a weapons delivery.	1	2	3	3	INSTR-LED																														
143	x	x	x	x	x				x	Plan a Low-Level Flight using Visual Flight Rules (VFR)							1	3	2	MT	x	x	x	x	x	x						x	x	x	x	x	x	x			
144											Prepare a jet log.	2	1	3	3	IMI																												
145											Prepare a DD-175.	2	1	3	3	IMI																												
146											Apply DD-175-1 information.	2	1	3	3	IMI																												
147											Prepare a visual navigation chart.	1	2	3	3	INSTR-LED																														
148											Prepare low-level/air refueling flight plan.	1	2	3	3	INSTR-LED																														
149											Obtain low-level/air refueling chart.	1	2	3	3	INSTR-LED																														
150											Select the proper altitude and route to and from low-level route.	1	2	3	3	INSTR-LED																														
151	x	x					x			Plan an Instrument Flight Rules (IFR) Mission							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x			
152											Extract data from FLIP.	2	1	3	3	IMI																												
153											Extract data from NATOPS.	2	1	3	3	IMI																												

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																				
2							Panel NAV																																			
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
154											Prepare a jet log.	2	1	3	3	IMI																										
155											Prepare a DD-175.	2	1	3	3	IMI																										
156											Apply DD-175-1 information.	2	1	3	3	IMI																										
157											Select the proper routing from appropriate charts.	1	2	3	3	INSTR-LED																										
158		x	x	x	x	x			x	Perform Tactical Mission Planning Procedures							2	3	2	OT	x	x	x	x	x	x		x		x	x	x	x	x	x	x	x	x			
159											Plan an integrated tactical low-level mission.	1	2	3	3	INSTR-LED																										
160											Prepare flight plan. (waypoints, IP, TGT, Fuel plan, and threat rings)	1	2	3	3	INSTR-LED																										
161											Recognize stand offs/international boundaries.	2	1	3	3	IMI																										
162											Identify restricted airspace.	2	1	3	3	IMI																										
163		x	x	x	x	x			x	Plan a High-Lo-High AIRNAV, Radar NAV and Visual NAV Combined Mission							2	3	2	OT	x	x	x	x	x	x					x	x	x	x	x	x	x	x			
164											Extract data from FLIP.	2	1	3	3	IMI																										
165											Prepare a strip chart.	1	2	3	3	INSTR-LED																										
166											Prepare a jet log.	2	1	3	3	IMI																										
167											Prepare a DD-175.	2	1	3	3	IMI																										
168											Apply DD-175-1 information.	2	1	3	3	IMI																										
169			x	x	x		x			Plan an Airborne Radar Navigation Mission							2	1	1	T		x	x	x	x	x				x		x	x	x	x	x	x			
170											Perform route analysis and target study based on a mission profile.	1	2	3	3	INSTR-LED																										
171											Identify importance of IP to objective tasks.	2	1	3	3	IMI																										
172											Identify Ingress/Egress procedures.	2	1	3	3	IMI																										
173									x	Perform Drop Zone Study							2	3	2	OT														x	x	x						
174											Identify route analysis.	1	2	3	3	INSTR-LED																										
175											Identify drop zone study.	1	2	3	3	INSTR-LED																										
176			x	x	x	x			x	Perform High-Level Tactical Mission Planning Procedures							2	3	2	OT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x			

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
177											Prepare high-level navigation charts, given charts, mission orders, DR equipment and access to FLIP, local training publications, and annotated IAW current directives to include SUA, high terrain, threats, and geo-political stand-offs with points plotted within specifications.	1	2	3	3	INSTR-LED																														
178											Prepare high-level flight plans, given a high-level or computer flight plan, mission orders, aircraft performance information, DR equipment, weather info, access to FLIP, NOTAMs, applicable directives, and local training publications, IAW current directives.	1	2	3	3	INSTR-LED																														
179											Prepare high-level navigation charts.	1	2	3	3	INSTR-LED																														
180											Prepare high-level flight plans.	1	2	3	3	INSTR-LED																														
181	x	x	x	x	x	x	x	x	x	Conduct the Mission Flight Briefing							2	3	3	T	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x			
182											Identify proper briefing techniques/procedures.	1	2	3	3	INSTR-LED																														
183											Monitor the mission flight briefing.	1	2	3	3	INSTR-LED																														
184											Conduct the mission flight briefing in preparation for the mission.	1	2	3	3	INSTR-LED																														
185											Conduct the mission flight briefing, given briefing guidelines, mission orders, completed flight plan and chart, IAW current briefing guidelines.	1	2	3	3	INSTR-LED																														
186											Identify standard training rules.	2	1	3	3	IMI																														
187											Brief standard training rules.	1	2	3	3	INSTR-LED																														
188	x	x	x	x	x	x	x	x	x	Conduct the Mission Flight Debriefing							2	3	3	T	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x			
189											Identify different types of debriefs.	1	2	3	3	INSTR-LED																														
190											Monitor the mission flight debriefing.	1	2	3	3	INSTR-LED																														
191								x		Perform Global Operations Mission Planning							1	3	3	MT				x			x	x	x	x	x	x	x	x	x	x	x			
192											Identify GATM procedures.	2	1	3	3	IMI																														

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																				
2							Panel NAV																																			
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
193											Prepare DD Form 175 given a completed navigator's flight plan and FLIP, IAW FLIP General Planning.	2	1	3	3	IMI																												
194											Prepare DD Form 1801 given a completed navigator's flight plan and FLIP, IAW FLIP General Planning.	2	1	3	3	IMI																												
195											Determine the requirements of an international flight mission.	2	1	3	3	IMI																												
196											Determine landing base restrictions and limitations of flight mission, given an Airfield Suitability and Restrictions Report and mission profile.	2	1	3	3	IMI																												
197											Identify basic requirements for airspace compliance.	2	1	3	3	IMI																												
198											Determine the requirements of an international flight mission, given a Foreign Clearance Guide and international flight profile.	2	1	3	3	IMI																												
199											Identify requirements for diplomatic clearances.	2	1	3	3	IMI																												
200											Identify hazards of flying outside the CONUS to include, due regard, ALTRAV, slot times, foreign IFF procedures, transition altitudes, GATM, millibars, and language barriers.	2	1	3	3	IMI																												
201	x						x			Plan Night Operations							1	3	1	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
202											Identify the procedural and physiological differences associated with night operations.	2	1	3	3	IMI																												
203																																									
204	AIRCRAFT CONDITION																																								
205	x						x			Perform appropriate records review to determine aircraft suitability for flight							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
206											Evaluate information (VIDS/MAFs, Aircraft Inspection and Acceptance Record, etc.) contained in aircraft discrepancy book to determine aircraft documented suitability for flight	1	2	3	3	INSTR-LED																												
207	x						x			Perform Proper Utilization of Personal Protective Equipment							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN																					
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title										E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
208											Identify personal protective equipment	2	1	3	3	IMI																											
209											Perform proper utilization of personal protective equipment	1	2	3	3	INSTR-LED																											
210	x						x			Perform Personal Protective Equipment Preflight Inspection						1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
211											Identify personal protective equipment preflight inspection	2	1	3	3	IMI																											
212											Perform personal protective equipment preflight inspection	1	2	3	3	INSTR-LED																											
213	x						x			Perform Aircraft Preflight Inspection						1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x			
214											Perform aircraft preflight inspection	1	2	3	3	INSTR-LED																											
215	x						x			Perform Aircraft Post Flight Inspection						1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x			
216											Perform aircraft post flight inspection	1	2	3	3	INSTR-LED																											
217											Identify aircraft preflight inspection checklist items	2	1	3	3	IMI																											
218											Identify post flight inspection checklist items	2	1	3	3	IMI																											
219	x						x			Perform Pre-takeoff Procedures						1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
220											Determine pre-takeoff status of the aircraft systems	3	3	1	2	SIM																											
221											Identify pre-takeoff procedures.	2	1	3	3	IMI																											
222											Determine pre-takeoff status of the navigation systems	3	3	1	2	SIM																											
223											Identify pre-takeoff status of the navigation systems	2	1	3	3	IMI																											
224	x						x			Monitor the Completion of Maintenance Action Forms (MAFs)/Aircraft Forms						1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x			
225											Monitor the Completion of Maintenance Action Forms (MAFs)/ aircraft forms	1	2	3	3	INSTR-LED																											
226	x						x			Complete an aircraft Flight Information Record						1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x			
227											Complete WINFLIR / Yellow Sheet Form (Naval aircraft)	1	2	3	3	INSTR-LED																											
228											Complete After Landing SFTO Form 781 (Air Force aircraft)	1	2	3	3	INSTR-LED																											
229																																								
230	COMMUNICATION																																							

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV	
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																														
231	x						x			Operate the Aircraft Radio(s) (UHF/VHF)							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
232											Identify the procedures to operate the primary radio.	2	1	3	3	IMI																										
233											Monitor the primary radio.	3	3	1	2	SIM																										
234	x	x	x	x	x	x	x	x	x	Communicate Flight Related Information In Flight using Aircraft Communications Systems							3	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
235											Communicate via two-way radio using standard military and FAA terminology with appropriate agencies and aircrew during: ground operations, departure, en route, formation flight, and arrival.	3	3	1	2	SIM																										
236											Make required calls while maintaining radio/ICS discipline.	3	3	1	2	SIM																										
237	x	x	x	x	x	x	x	x	x	Communicate Mission Specific Information In Flight using Aircraft Communications Systems							3	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
238											Identify Air Traffic Control, HF position reporting, MRSAT, and Tactical Terminology and their associated uses.	2	1	3	3	IMI																										
239											Identify the procedures to operate mission/aircraft communication equipment during various flight regimes.	2	1	3	3	IMI																										
240											Identify verbal communication procedures.	2	1	3	3	IMI																										
241											Identify aviation & aircraft platform specific voice systems terminology.	2	1	3	3	IMI																										
242											Monitor multiple communication and navigation systems.	3	3	1	2	SIM																										
243											Identify advanced mission planning sources. (SIPRNET, JWICS, and GCCS)	2	1	3	3	IMI																										
244											Record ATC clearances.	3	3	1	2	SIM																										
245											Communicate in an airborne aircraft using the VHF/UHF radio, hand signals, ICS using standard Navy, USAF, and FAA terminology.	3	3	2	1	ACFT																										
246											Make all operations area calls.	3	3	1	2	SIM																										
247											Make all air refueling calls.	3	3	1	2	SIM																										

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																															
248			x	x	x	x			x	Build Air Picture SA based on Broadcast and Tactical Bullseye Communications						3	3	3	T	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x			
249											Monitor multiple communication systems.	3	3	1	2	SIM																											
250											Identify strike package roles and responsibilities.	2	1	3	3	IMI																											
251	x	x	x	x	x	x		x	x	Operate the Communication Nets							3	3	3	T	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x			
252											Monitor multiple communication nets.	3	3	1	2	SIM																											
253											Prioritize multiple communication nets.	3	3	1	2	SIM																											
254	x	x	x	x	x	x	x	x	x	Operate the Intercom System (ICS)							3	3	3	T	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x			
255											Identify ICS procedures.	2	1	3	3	IMI																											
256											Monitor the interphone.	3	3	1	2	SIM																											
257											Identify communications format, phraseology, and terminology.	2	1	3	3	IMI																											
258											Utilize timely and descriptive communications to build crew situational awareness.	3	3	2	1	ACFT																											
259											Utilize directive communications to maneuver the aircraft.	3	3	1	2	SIM																											
260											Utilize airmanship skills to direct the pilot through acrobatic procedures.	3	3	1	2	SIM																											
261											Utilize clear and concise communications with embarked crew members using the ICS without interfering with incoming radio transmissions.	3	3	1	2	SIM																											
262	x	x								Communicate Using Proper Visual Signals							1	3	2	MT	x	x	x	x	x	x											x	x		x			
263											Identify visual signals used to communicate with wingman.	2	1	3	3	IMI																											
264											Utilize visual signals to communicate with wingman or aircraft ground handling personnel.	3	3	2	1	ACFT																											
265				x	x	x		x		Operate the Identification Friend or Foe (IFF/SIF) System							1	3	2	MT	x	x	x	x	x	x		x		x	x	x	x	x	x	x	x	x	x			
266											Utilize integrated multiple navigation/ communication systems to ensure mission accomplishment.	3	2	1	2	SIM																											
267											Identify IFF components and their functions.	2	1	3	3	IMI																											
268											Identify use of IFF modes 1, 2, 3C, 4.	2	1	3	3	IMI																											
269											Identify other IFF systems.	2	1	3	3	IMI																											

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - NIC	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																																
270											Identify ADIZ Penetration procedures.	2	1	3	3	IMI																											
271				x	x	x		x		Operate the Data Link Systems							1	3	2	MT			x	x	x	x				x	x					x	x	x	x			
272											Identify data link systems characteristics and uses. (JTIDS, IDM, MIDS, TIBS, TRAP, TADIL A/C/D, FDL, Global Track, Network-centric warfare, link architecture terminology and concepts, CT2 – Link 11, 16, OTCIXS)	2	1	3	3	IMI																																
273											Identify common symbology of TIBS and JTIDS.	2	1	3	3	IMI																																
274											Identify TCT/Mission updates.	2	1	3	3	IMI																																
275											Identify future systems.	2	1	3	3	IMI																																
276				x	x	x			x	Perform Encrypted/Secure Communications							1	3	2	MT										x	x	x				x	x	x	x			
277											Identify use and control of cryptologic materials.	2	1	3	3	IMI																																
278											Identify SATCOM principles. (voice/data/imagery & wideband operations [Voice/Data/Imagery, Wideband, DAMA – Demand Assigned Multiple Access, TDMA, and non-TDMA])	2	1	3	3	IMI																																
279											Identify authentication procedures.	2	1	3	3	IMI																																
280											Identify advanced authentication procedures. (tables, TOD, etc.)	2	1	3	3	IMI																																
281											Identify concepts and theory of COMSEC/EMCON.	2	1	3	3	IMI																																
282											Identify COMSEC/EMCON procedures.	2	1	3	3	IMI																																
283											Identify basic theory of HAVEQUICK 1, 2 and operational application.	2	1	3	3	IMI																																
284											Identify concept and theory of secure voice communications.	2	1	3	3	IMI																																
285											Identify encrypted/secure communication concepts, systems, and types.	2	1	3	3	IMI																																
286											Identify the differences between secure voice and encrypted communications. (jam resistant)	2	1	3	3	IMI																																
287											Apply COMSEC/EMCON procedures.	3	3	1	2	SIM																																
288				x	x				x	Perform Tactical Comm-out/Radio Silence Procedures							1	3	2	MT										x	x	x	x	x	x	x	x	x			

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV		
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																																
289											Identify proper use radios during comm-out and silent operations procedures.	2	1	3	3	IMI																												
290											Identify uses, ranges, and limitations (LOS, OTH) of UHF/VHF/HF.	2	1	3	3	IMI																												
291											Identify HF global communications during comm-out and silent operations procedures.	2	1	3	3	IMI																												
292											Utilize proper verbology on the radio during comm-out and silent operations procedures.	3	3	1	2	SIM																												
293											Prioritize communications during comm-out and silent operations procedures.	3	3	1	2	SIM																												
294											Monitor multiple radios during comm-out and silent operations procedures.	3	3	1	2	SIM																												
295				x	x				x	Perform COMM Brevity Procedures							1	3	2	MT	x	x	x	x	x	x			x	x	x	x	x	x	x	x	x	x				
296											Utilize brevity words during comm-out and silent operations procedures.	3	3	1	2	SIM																												
297											Utilize proper switchology (wafer wars) during comm-out and silent operations procedures.	3	3	1	2	SIM																												
298											Identify communications frequency ranges during comm-out and silent operations procedures.	2	1	3	3	IMI																												
299						x			x	Operate the Satellite Communications (SATCOM) System							1	3	1	T											x	x				x	x	x				
300											Identify SATCOM applications.	2	1	3	3	IMI																												
301											Identify DAMA, narrow and wide band.	2	1	3	3	IMI																												
302											Identify characteristics of common SATCOM functions of radio types. (HF, UHF, VHF, AM, FM)	2	1	3	3	IMI																												
303																																									
304	AIRMANSHIP																																								
305	x						x			Maintain SA in a High Stress Environment (Environmental, Mental, and Physical)							2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				
306											Maintain SA in a high G environment.	3	3	2	1	ACFT																												
307											Maintain SA in actual environmental conditions (hot and cold weather).	3	3	2	1	ACFT																												

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																				
2							Panel NAV																																			
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
308											Maintain SA in a high workload/responsibility environment.	3	3	2	1	ACFT																											
309											Maintain SA wearing personal protective equipment required for tactical aircraft operations.	3	3	2	1	ACFT																											
310	x						x			Apply Basic Airmanship in a High Stress Environment (Environmental, Mental, and Physical)							2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
311											Utilize basic airmanship skills in a high G environment.	3	3	2	1	ACFT																											
312											Utilize basic airmanship skills in actual environmental conditions (hot and cold weather).	3	3	2	1	ACFT																											
313											Utilize basic airmanship skills in a high workload/responsibility environment.	3	3	2	1	ACFT																											
314	x						x			Apply Scan Techniques in a High Stress Environment (Environmental, Mental, and Physical)							2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
315											Employ effective scan techniques in a high G environment.	3	3	2	1	ACFT																											
316											Employ effective scan techniques in actual environmental conditions (hot and cold weather).	3	3	2	1	ACFT																											
317											Employ effective scan techniques in a high workload/responsibility environment.	3	3	2	1	ACFT																											
318											Utilize analogue/MFD gauge instrument scan techniques.	3	3	2	1	ACFT																											
319											Utilize HUD scan techniques.	3	3	2	1	ACFT																											
320	x						x			Operate Aircraft and Systems in a High Stress Environment (Environmental, Mental, and Physical)							2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
321											Operate aircraft and systems in a high G environment.	3	3	2	1	ACFT																											
322											Operate aircraft and systems in actual environmental conditions (hot and cold weather).	3	3	2	1	ACFT																											
323											Operate aircraft and systems in a high workload/responsibility environment.	3	3	2	1	ACFT																											
324										GENERAL																																

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																				
2							Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																														
325	x						x			Interpret aircraft performance, control, and navigation instrument indications						1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
326											Monitor aircraft performance, control, and navigation instrument indications to ensure safe aircraft operation.	3	3	1	2	SIM																											
327	x									Operate the Aircraft within Prescribed Operating Limitations and Capabilities						1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
328											Identify aircraft operating limitations and capabilities.	2	1	3	3	IMI																											
329											Manipulate the three primary flight controls.	3	3	1	2	SIM																											
330											Properly trim the aircraft.	3	3	1	2	SIM																											
331											Coordinate positive control of aircraft and transfer of control.	3	3	1	2	SIM																											
332	x					x	x			Perform Aircraft Checklists						1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
333											Identify applicable checklist.	2	1	3	3	IMI																											
334											Execute checklists as required.	3	3	1	2	SIM																											
335										GROUND OPERATIONS																																
336	x						x			Perform Aircraft Start-up/Preflight Procedures						1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x			
337											Prepare aircraft for flight.	3	3	1	2	SIM																											
338											Identify aircraft start-up/preflight procedures.	2	1	3	3	IMI																											
339		x					x			Monitor Engine Start Procedures						1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x			
340											Alert pilot to hazards effecting engine start.	3	3	1	2	SIM																											
341											Direct ground operations during engine start and taxi.	3	3	1	2	SIM																											
342											Perform engine start procedures.	3	3	1	2	SIM																											
343		x								Monitor Ground Taxi Operations						1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x			
344											Perform ground taxi operations.	3	3	1	2	SIM																											
345											Move aircraft from parking area to runway.	3	3	1	2	SIM																											
346											Assist in ground operations to include alerting the crew to hazards affecting engine start and ensuring adherence to taxi clearance.	3	3	1	2	SIM																											
347											Avoid potential taxi hazards.	3	3	1	2	SIM																											
348											Provide backup for pilot between parking area to runway.	3	3	1	2	SIM																											
349	x						x			Conduct Departure Briefing						1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																				
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																															
350											Identify departure briefing procedures.	2	1	3	3	IMI																											
351											Monitor departure briefing.	3	3	1	2	SIM																											
352	x						x			Monitor Engine Shutdown Procedures							1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x			
353											Identify engine shutdown procedures.	2	1	3	3	IMI																											
354											Perform engine shutdown procedures.	3	3	1	2	SIM																											
355	x						x			Perform Aircraft Shutdown/Postflight Procedures							1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x			
356											Identify aircraft shutdown/postflight procedures.	2	1	3	3	IMI																											
357											Perform aircraft shutdown/postflight procedures.	3	3	1	2	SIM																											
358										TAKEOFF AND DEPARTURE																																
359	x						x			Monitor the Conditions for Aborted Takeoff							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
360											Identify abort takeoff procedures. appraise aircraft systems and energy level	2	1	3	3	IMI																											
361											Evaluate aircraft systems and energy level.	3	3	1	2	SIM																											
362											Perform takeoff procedures.	3	3	1	2	SIM																											
363	x						x			Monitor Flight Transitions							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
364											Identify takeoff and transition to climb procedures.	2	1	3	3	IMI																											
365											Perform takeoff procedures, starting with clearance for takeoff and ending with landing gear retraction.	3	3	1	2	SIM																											
366											Direct takeoff and departure.	3	3	1	2	SIM																											
367											Monitor takeoff and departure.	3	3	1	2	SIM																											
368											Maintain terrain avoidance.	3	3	1	2	SIM																											
369											Perform flight transitions.	3	3	1	2	SIM																											
370	x						x			Monitor Departure Pattern Procedures using Instrument Flight Rules (IFR)							1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x			
371											Identify IFR departure procedures.	2	1	3	3	IMI																											
372											Perform IFR departure procedures.	3	3	1	2	SIM																											
373	x						x			Monitor Departure Pattern Procedures using Visual Flight Rules (VFR)							1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x			
374											Identify VFR departure procedures.	2	1	3	3	IMI																											
375											Perform VFR departure procedures.	3	3	1	2	SIM																											

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																														
376										IN-FLIGHT																															
377	x						x			Perform Instrument Scan							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
378											Monitor attitude and power setting for specified visual and instrument maneuvers.	3	3	1	2	SIM																												
379											Monitor aircraft's airspeed, altitude, rate of climb or descent, attitude, fuel consumption and systems operation throughout duration of flight.	3	3	1	2	SIM																												
380											Coordinate with crew to ensure aircraft is flying intended flight path to successfully complete mission.	3	3	1	2	SIM																												
381											Coordinate correcting aircraft to intended flight path with pilot.	3	3	1	2	SIM																												
382	x						x			Perform Visual Flight Rules (VFR) Scan							1	3	3	MT	x	x	x	x	x	x		x	x		x	x	x	x	x	x	x	x	x	x	x	x
383											Maintain aircraft control using VFR scan.	3	3	1	2	SIM																												
384											Maintain internal and external visual scan patterns while evaluating aircraft systems performance and geographical position.	3	3	1	2	SIM																												
385											Detect aircraft in visual range.	3	3	1	2	SIM																												
386											Report aircraft in visual range.	3	3	1	2	SIM																												
387											Avoid all aircraft in visual range.	3	3	1	2	SIM																												
388	x						x			Monitor Flight Transition							1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
389											Identify procedures to transition to and from a climb, descent, level flight.	2	1	3	3	IMI																												
390											Direct appropriate aircraft flight profiles, with emphasis on airspeed, for maintaining and changing altitude.	3	3	1	2	SIM																												
391	x						x			Perform Procedures Necessary to Maneuver/Position the Aircraft in Flight							2	3	3	T	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x
392											Manipulate the three primary flight controls.	3	3	1	2	SIM																												
393											Properly trim the aircraft.	3	3	1	2	SIM																												
394											Maintain spatial orientation through the use of visual and instrument scan.	3	3	1	2	SIM																												
395											Monitor specified flight maneuvers.	3	3	1	2	SIM																												
396											Perform specified flight maneuvers.	3	3	1	2	SIM																												

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - NIC	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
397											Reduce airspeed while maintaining altitude.	3	3	1	2	SIM																												
398											Slow aircraft for configuration.	3	3	1	2	SIM																												
399											Perform a turn pattern.	3	3	1	2	SIM																												
400											Perform S-1 or S-3 turn pattern per the NATOPS.	3	3	1	2	SIM																												
401											Perform constant angle of bank turns.	3	3	1	2	SIM																												
402											Perform one-half standard rate turns.	3	3	1	2	SIM																												
403											Perform standard rate turns.	3	3	1	2	SIM																												
404											Perform a transition from normal cruise to a penetration descent.	3	3	1	2	SIM																												
405											Perform a penetration descent IAW NATOPS.	3	3	1	2	SIM																												
406											Perform a transition from penetration descent to normal cruise.	3	3	1	2	SIM																												
407											Use a descent (planned or unplanned) to affect timing to the entry point.	3	3	1	2	SIM																												
408											Identify in-flight precision aerobatic maneuver entry parameters.	2	1	3	3	IMI																												
409											Perform Precision Acrobatics	3	3	1	2	SIM																												
410	x						x			Direct Unusual Attitude Recovery Procedures							2	3	3	T	x	x	x	x	x	x					x	x	x	x	x	x	x	x			
411											Identify corrections to unusual aircraft attitudes modifying attitude and power for a controlled transition to the original flight path.	2	1	3	3	IMI																												
412											Identify unusual attitude recovery procedures.	2	1	3	3	IMI																												
413											Perform unusual attitude recovery procedures.	3	3	1	2	SIM																												
414	x						x			Direct Stall and Stall Recovery Procedures							2	3	3	T	x	x	x	x	x	x					x	x	x	x	x	x	x	x			
415											Identify aircraft departure characteristics.	2	1	3	3	IMI																												
416											Identify aircraft stall and stall recovery procedures.	2	1	3	3	IMI																												
417											Perform aircraft stall and stall recovery procedures.	3	3	1	2	SIM																												
418	x						x			Direct Power Off Stall (POS)							1	3	3	MT	x	x	x	x	x	x					x	x	x	x	x	x	x	x			
419											Identify power off stall procedure.	2	1	3	3	IMI																												
420											Perform power off stall procedures.	3	3	1	2	SIM																												

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																															
421	x						x			Perform Anti-G Straining Maneuver (AGSM)						1	3	2	MT	x	x	x	x	x	x				x	x	x	x	x	x	x	x			
422											Identify proper anti-G straining maneuver procedures.	1	2	3	3	INSTR-LED																										
423											Perform proper anti-G straining maneuver.	3	3	2	1	ACFT																										
424				x	x					Record Airborne Tactical Employment/Engagement Notes						1	1	3	MT	x	x	x	x	x	x		x			x	x	x	x	x	x	x	x			
425											Identify note taking techniques.	2	1	3	3	IMI																										
426											Perform airborne note taking.	3	3	1	2	SIM																										
427																																								
428										APPROACH AND LANDING																																
429	x									Monitor Entry Pattern Procedures using Visual Flight Rules (VFR)						1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x			
430											Identify Visual Flight Rules (VFR) departure pattern procedures.	2	1	3	3	IMI																										
431											Identify Visual Flight Rules (VFR) entry pattern procedures.	2	1	3	3	IMI																										
432											Identify Visual Flight Rules (VFR) traffic pattern procedures.	2	1	3	3	IMI																										
433											Perform Entry Pattern Procedures using Visual Flight Rules (VFR).	3	3	1	2	SIM																										
434	x						x			Monitor Normal Approach Procedures						1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x			
435											Perform normal approach/landing per the FTI. [From crossing runway threshold until: Touch and go – commencing crosswind turn. Full stop – aircraft at taxi speed.]	3	3	1	2	SIM																										
436											Detect glide slope errors.	3	3	1	2	SIM																										
437											Correct glide slope errors.	3	3	1	2	SIM																										
438											Identify attitude and power requirements for desired aircraft performance.	2	1	3	3	IMI																										
439	x						x			Monitor Landing Pattern Procedures						1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x			
440											Identify landing pattern procedures. [If from initial: From rolling out on downwind to final. If from takeoff, touch and go, or waveoff: Commencing the crosswind turn to final.]	2	1	3	3	IMI																										
441											Perform responsibilities associated with landing.	3	3	1	2	SIM																										

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF		Model		Pipeline																				
2							Panel NAV																																			
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
442											Perform landing pattern procedures.	3	3	1	2	SIM																													
443	x									Direct Waveoff Procedures							1	3	3	MT	x	x	x	x	x	x	x	x			x	x	x	x	x	x	x	x			
444											Initiate a landing wave-off.	3	3	1	2	SIM																													
445											Acknowledge a landing wave-off.	3	3	1	2	SIM																													
446											Perform waveoff procedures.	3	3	1	2	SIM																													
447	x						x			Monitor Landing Roll-out Procedures							1	3	3	MT	x	x	x	x	x	x	x	x			x	x	x	x	x	x	x	x			
448											Monitor landing roll-out and deceleration.	3	3	1	2	SIM																													
449																																									
450										AIRCRAFT AND SYSTEMS OPERATION																																		
451	x	x				x	x			Operate the Aircraft in All-Weather Conditions							2	3	3	T	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x			
452											Identify the aircraft servicing procedures.	2	1	3	3	IMI																													
453											Identify the all-weather operating procedures.	2	1	3	3	IMI																													
454	x	x				x	x			Operate the Aircraft Systems							1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x			
455											Recall aircraft general description, systems, and operating limitations.	2	1	3	3	IMI																													
456											Identify the major components and operation of aircraft propulsion, electrical, hydraulic, oxygen and fuel systems.	2	1	3	3	IMI																													
457	x	x				x	x			Operate the Aircraft Mission Computer/Flight Management System							1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x			
458											Identify the correct nomenclature, purpose, characteristics, functions, operating limitations, and location of the aircraft mission computer/flight management system, system components, and installed equipment.	2	1	3	3	IMI																													
459											Operate the aircraft mission computer/flight management system.	2	2	1	3	SIM																													
460											Identify aircraft mission computer/flight management system operating procedures.	2	1	3	3	IMI																													
461											Identify mission computer/flight management system capabilities.	2	1	3	3	IMI																													

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
462	x									Operate the Aircraft Flight Control System							1	3	3	MT	x	x	x	x	x	x	x	x			x	x	x	x	x	x	x	x	x			
463											Identify the aircraft flight control system.	2	1	3	3	IMI																											
464	x	x								Monitor Operation of the Engine System							1	3	3	MT	x	x	x	x	x	x	x	x			x	x	x	x	x	x	x	x	x			
465											Identify the correct nomenclature, purpose, characteristics, functions, operating limitations, and location of the engine system, system components, and installed equipment.	2	1	3	3	IMI																											
466											Operate the engine system.	2	2	1	3	SIM																											
467											Identify engine system operating procedures.	2	1	3	3	IMI																											
468	x	x								Monitor Operation of the Electrical System							1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x			
469											Operate the electrical system.	3	2	1	2	SIM																											
470											Identify electrical system operating procedures.	2	1	3	3	IMI																											
471											Identify the correct nomenclature, purpose, characteristics, functions, operating limitations, and location of the electrical system, system components, and installed equipment.	2	1	3	3	IMI																											
472	x	x								Monitor Operation of the Hydraulic System(s)							1	3	3	MT	x	x	x	x	x	x	x				x	x	x	x	x	x	x	x			
473											Operate the hydraulic system.	3	2	1	2	SIM																											
474											Identify hydraulic system operating procedures.	2	1	3	3	IMI																											
475											Identify the correct nomenclature, purpose, characteristics, functions, operating limitations, and location of the hydraulic system, system components, and installed equipment.	2	1	3	3	IMI																											
476	x	x								Operate the Oxygen System							1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x			
477											Operate the oxygen system.	3	2	1	2	SIM																											
478											Identify oxygen system operating procedures.	2	1	3	3	IMI																											

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																															
479											Identify the correct nomenclature, purpose, characteristics, functions, operating limitations, and location of the oxygen system, system components, and installed equipment.	2	1	3	3	IMI																															
480	x	x								Monitor Operation of the Fuel System							1	3	3	MT	x	x	x	x	x	x	x	x			x	x	x	x	x	x	x	x	x			
481											Operate the fuel system.	3	3	1	2	SIM																														
482											Identify fuel system.	2	1	3	3	IMI																														
483											Identify the correct nomenclature, purpose, characteristics, functions, operating limitations, and location of the fuel system, system components, and installed equipment.	2	1	3	3	IMI																															
484	x	x	x				x			Operate Navigation Equipment							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
485											Operate the navigation equipment.	3	3	1	2	SIM																														
486											Identify navigation equipment.	2	1	3	3	IMI																														
487											Identify the correct nomenclature, purpose, characteristics, functions, operating limitations, and location of the navigation systems, system components, and installed equipment.	2	1	3	3	IMI																															
488	x						x			Operate Communication Equipment							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
489											Operate the communication equipment.	3	3	1	2	SIM																														
490											Identify communications equipment.	2	1	3	3	IMI																														
491											Identify the correct nomenclature, purpose, characteristics, functions, operating limitations, and location of the communications systems, system components, and installed equipment.	2	1	3	3	IMI																															
492	x						x			Monitor the Flight Instrument Panel							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
493											Operate the flight instruments.	3	3	1	2	SIM																														
494											Identify flight instruments operating procedures.	2	1	3	3	IMI																														
495											Identify equipment installed in the flight instrument panel.	2	1	3	3	IMI																														
496											Identify compass systems using theory and application to include variation, turn rate calculations, and instrument accuracy.	2	1	3	3	IMI																														

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - NIC	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
497											Identify the aircraft Flight director equipment.	2	1	3	3	IMI																												
498											Identify airspeed indicators. (TAS, IAS, EAS, GS, etc.)	2	1	3	3	IMI																												
499											Compute a TAS given altitude, SAT, and IAS.	2	1	3	3	IMI																												
500											Identify basic flight instruments. (compass, HIS, VSI, AOA, altimeter, radar altimeter)	2	1	3	3	IMI																												
501	x					x	x			Operate Air/Ground Avoidance Systems							1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x			
502											Identify Air/Ground Avoidance Systems.	2	1	3	3	IMI																												
503											Operate the GCAS air/ground avoidance system.	2	2	1	3	SIM																												
504											Identify GCAS air/ground avoidance system, to include theory, principles, and limitations.	2	1	3	3	IMI																												
505											Operate the TCAS air/ground avoidance system.	2	2	1	3	SIM																												
506											Identify TCAS air/ground avoidance system, to include theory, principles, and limitations.	2	1	3	3	IMI																												
507											Operate the radar altimeter.	2	2	1	3	SIM																												
508											Identify radar altimeter using the air/ground avoidance system.	2	1	3	3	IMI																												
509											Operate the pressure altimeter.	2	2	1	3	SIM																												
510											Identify pressure altimeter using the air/ground avoidance system.	2	1	3	3	IMI																												
511	x									Perform Aircraft Servicing Procedures							1	3	1	T	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x			
512											Identify the aircraft servicing procedures.	2	1	3	3	IMI																												
513											Monitor aircraft servicing procedures.	3	3	3	1	ACFT																												
514	x						x			Perform Aircraft Performance Data Calculations							1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x			
515											Extract aircraft performance data from charts.	1	2	3	3	INSTR-LED																												
516																																									
517	FUEL REQUIREMENT AND ENROUTE TIME CALCULATIONS																																								
518	x	x	x	x	x		x	x	x	Perform Fuel Requirement Calculations							1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x			

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																				
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																														
519	x	x	x	x	x		x	x	x	Perform Enroute Time Calculations							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
520											Identify the purpose of fuel management.	2	1	3	3	IMI																									
521											Perform fuel management by noting flight planned fuel.	3	3	1	2	SIM																									
522											Update destination Initial Approach Fix estimated fuel remaining and mission completion feasibility at each navigational checkpoint factoring in the effects of forecast and observed meteorological conditions.	3	3	1	2	SIM																									
523											Determine alternate destination based upon estimated fuel requirements, and observed and forecast meteorological conditions.	3	3	1	2	SIM																									
524											Complete revised course, fuel decisions, and ETAs within specifications.	3	3	1	2	SIM																									
525											Calculate estimated time of arrival at each navigational checkpoint.	3	3	1	2	SIM																									
526											Apply enroute time corrections.	3	3	1	2	SIM																									
527											Calculate estimated fuel remaining at destination initial approach fix (IAF).	3	3	1	2	SIM																									
528											Apply fuel calculation corrections.	3	3	1	2	SIM																									
529											Update estimated time of arrival at destination at each navigational checkpoint and after each ground speed check.	3	3	1	2	SIM																									
530											Maintain fuel awareness throughout the flight.	3	3	1	2	SIM																									
531											Monitor fuel consumption for all formation members.	3	3	1	2	SIM																									
532											Plan the mission to hit the route entry point on briefed real-world time.	2	1	3	3	IMI																									
533											Execute the mission to hit the route entry point on briefed real-world time.	3	3	1	2	SIM																									
534											Ensure all landings are made with adequate fuel reserves.	3	3	1	2	SIM																									
535	x	x	x				x	x	x	Perform Ground Speed Calculations							2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
536											Determine ground speed to turnpoints and destination.	3	3	1	2	SIM																												
537											Determine ground speed using distance-over-time calculations.	3	3	1	2	SIM																												
538											Determine required standard speed corrections IAW FTI.	3	3	1	2	SIM																												
539											Apply standard speed corrections IAW FTI.	3	3	1	2	SIM																												
540	x	x	x	x	x		x	x	x	Perform In-Flight Mission Replanning							2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
541											Direct appropriate destination deviation if sufficient fuel, based on ETE and fuel consumption computations, is unavailable.	3	3	1	2	SIM																												
542											Direct inflight mission replanning to ensure aircraft arrival over a high-level control point.	3	3	1	2	SIM																												
543											Execute Change of flight plan (DRAFT) with ATC in flight, as required.	3	3	1	2	SIM																												
544																																								
545																																								
546										NAVIGATION																																
547										GENERAL																																
548	x	x	x	x	x	x	x			Navigate the Aircraft using Dead Reckoning (DR) Procedures							2	3	2	OT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
549											Identify time and heading components of Dead Reckoning (DR) navigation.	2	1	3	3	IMI																												
550											Estimate aircraft position and track as crewmember with chart flight plan, DA/GS, ground plot and DR.	3	3	1	2	SIM																												
551	x	x					x			Navigate the Aircraft to Maintain a Specified Course							2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
552											Identify the procedures to operate a Whiz Wheel.	2	1	3	3	IMI																												
553											Identify navigational radio aids characteristics.	2	1	3	3	IMI																												
554											Identify a NAVAID.	2	1	3	3	IMI																												
555											Determine aircraft position using navaids, nav computers charts, and flight plan.	3	3	1	2	SIM																												

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
556											Evaluate the accuracy of navigational equipment using system crosschecks.	3	3	1	2	SIM																												
557											Monitor the aircraft to maintain desired track airspeed time and altitude.	3	3	1	2	SIM																												
558											Direct the pilot to maintain desired track airspeed time and altitude.	3	3	1	2	SIM																												
559											Monitor the aircraft position and altitude.	3	3	1	2	SIM																												
560											Direct the pilot to maintain aircraft position and altitude with timely corrections.	3	3	1	2	SIM																												
561											Determine aircraft position in relation to the intended course.	3	3	1	2	SIM																												
562											Determine amount and duration of heading correction to return aircraft to the intended course.	3	3	1	2	SIM																												
563											Maintain specified en route course.	3	3	1	2	SIM																												
564	x	x	x				x			Perform Wind Analysis							2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
565											Identify wind analysis procedures.	2	1	3	3	IMI																												
566											Determine wind direction and speed using course trend and ground speed analysis.	3	3	1	2	SIM																												
567	x	x	x				x			Perform flight parameter adjustments to compensate for computed winds							2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
568											Adjust preflight planned headings, airspeeds or estimated time in route (ETE) to compensate for the effects of wind.	3	3	1	2	SIM																												
569	x	x	x	x	x			x	x	Perform Entry Point Acquisition							2	3	3	T	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x			
570											Identify entry point acquisition procedures.	2	1	3	3	IMI																												
571											Utilize radar, visual cues, and navigational aids to identify the route entry point.	3	3	1	2	SIM																												
572	x	x					x	x		Navigate the Aircraft during Departure Procedures							2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
573											Identify the procedures to navigate the aircraft during departure procedures.	2	1	3	3	IMI																												
574											Monitor departure procedures.	3	3	1	2	SIM																												
575											Direct departure procedures.	3	3	1	2	SIM																												

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																				
2							Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN																							
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title										E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
576											Apply in-flight leadership to direct departures navigation.	3	3	1	2	SIM																												
577	x	x	x	x	x		x	x		Navigate the Aircraft during Enroute Procedures							2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
578											Identify the procedures to navigate the aircraft during enroute procedures.	2	1	3	3	IMI																												
579											Identify Global Air Traffic Management (GATM).	2	1	3	3	IMI																												
580											Monitor enroute procedures.	3	3	1	2	SIM																												
581											Direct enroute procedures.	3	3	1	2	SIM																												
582											Apply in-flight leadership to direct enroute navigation.	3	3	1	2	SIM																												
583											Remain within confines of designated MOA or working area.	3	3	1	2	SIM																												
584											Visually navigate and remain within prescribed working area.	3	3	1	2	SIM																												
585	x	x					x	x		Navigate the Aircraft during Terminal Procedures							2	3	3	T	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x			
586											Identify the procedures to navigate the aircraft during terminal procedures.	2	1	3	3	IMI																												
587											Monitor terminal procedures.	3	3	1	2	SIM																												
588											Direct terminal procedures.	3	3	1	2	SIM																												
589											Apply in-flight leadership to direct terminal navigation.	3	3	1	2	SIM																												
590	x	x					x	x		Navigate the Aircraft during Approach Procedures							2	3	3	T	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x			
591											Identify the procedures to navigate the aircraft during approach procedures.	2	1	3	3	IMI																												
592											Monitor an approach, maintaining terrain avoidance.	3	3	1	2	SIM																												
593											Direct an approach, maintaining terrain avoidance.	3	3	1	2	SIM																												
594											Apply in-flight leadership to direct approach navigation.	3	3	1	2	SIM																												
595	x	x					x			Conduct Approach Briefing							1	3	3	MT	x	x	x	x	x	x		x		x	x	x	x	x	x	x	x	x			
596											Identify the procedures to conduct an approach briefing.	2	1	3	3	IMI																												
597											Identify the procedures to monitor an approach briefing.	2	1	3	3	IMI																												
598											Monitor approach briefing.	3	3	1	2	SIM																												
599											Conduct an approach briefing.	3	3	1	2	SIM																												
600									x	Direct Airborne Radar Approach							1	3	1	T		x	x									x	x	x	x	x	x	x			

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV		
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																																
601											Direct airborne radar approach.	3	3	1	2	SIM																												
602											Compute final approach timing.	3	3	1	2	SIM																												
603											Monitor visual patterns.	3	3	1	2	SIM																												
604							x			Perform Present Position Update Procedures							1	3	1	T	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x			
605											Identify external fixing procedures.	2	1	3	3	IMI																												
606											Validate the navigation solution.	3	3	1	2	SIM																												
607								x		Operate Navigational Systems in Degraded Mode							2	3	1	OT	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x			
608											Identify mental dead reckoning procedures.	2	1	3	3	IMI																												
609											Identify use of navigational equipment and their integration.	2	1	3	3	IMI																												
610											Identify the procedures to operate in partial full navigation systems degraded mode.	2	1	3	3	IMI																												
611											Operate partial full navigation systems degraded mode.	3	3	1	2	SIM																												
612	x	x					x			Troubleshoot Navigation Equipment							1	3	1	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
613											Identify how to troubleshoot navigational equipment.	2	1	3	3	IMI																												
614											Identify alternate navigational operations during equipment malfunctions.	2	1	3	3	IMI																												
615											Perform procedures to troubleshoot navigation equipment.	3	3	1	2	SIM																												
616	x				x			x		Perform Air Refueling (AR) Procedures							2	3	1	OT	x	x	x	x	x	x	x		x	x	x		x	x	x	x	x	x			
617											Identify air refueling procedures.	2	1	3	3	SIM																												
618											Identify air refueling equipment. (Booms, Drogues, receivers)	2	1	3	3	SIM																												
619											Identify common terms associated with air refueling procedures.	2	1	3	3	SIM																												
620											Identify EMCON AR procedures.	2	1	3	3	SIM																												
621											Identify rendezvous procedures.	2	1	3	3	SIM																												
622											Identify air refueling track design and operation.	2	1	3	3	SIM																												
623											Identify air refueling timing and course control techniques.	2	1	3	3	SIM																												
624											Identify air refueling ancillary systems.	2	1	3	3	SIM																												
625											Identify the major elements of the release problem.	2	1	3	3	SIM																												
626											Compute turn/range offset.	3	3	1	2	SIM																												
627											Direct point parallel procedures.	3	3	1	2	SIM																												

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																															
628											Direct rendezvous procedures.	3	3	1	2	SIM																											
629	x	x	x	x	x		x			Perform Turnpoint Procedures to Maintain Navigational Situational Awareness						2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
630											Identify turnpoint procedures.	2	1	3	3	IMI																											
631											Identify communication during turnpoint procedures.	2	1	3	3	IMI																											
632											Perform the 2-minute prior, mark-on-top and wings level call at each turnpoint.	3	3	1	2	SIM																											
633										GROUND MAPPING RADAR																																
634			x	x	x	x	x		x	Operate the Air-to-Ground Radar System for Tactical Mission Employment						2	3	3	T		x	x	x	x	x				x	x	x	x	x	x	x	x	x	x			
635											Identify transmission characteristics affecting pulsed radar systems.	2	1	3	3	IMI																											
636											Identify radar signature, EMCON and hazards.	2	1	3	3	IMI																											
637											Identify definitions of radar attributes and characteristics.	2	1	3	3	IMI																											
638											Identify radar errors, updates, and limitations.	2	1	3	3	IMI																											
639											Identify radar scans.	2	1	3	3	IMI																											
640											Identify radar types.	2	1	3	3	IMI																											
641											Identify integration of radar systems.	2	1	3	3	IMI																											
642											Identify radar passive detection in a hostile environment.	2	1	3	3	IMI																											
643											Identify EM spectrum characteristics.	2	1	3	3	IMI																											
644											Identify radar tuning and fixing.	2	1	3	3	IMI																											
645											Identify terrain avoidance using radar procedures.	2	1	3	3	IMI																											
646											Identify radar malfunctions and corrective actions.	2	1	3	3	IMI																											
647											Identify RSI.	2	1	3	3	IMI																											
648											Identify radar usage environments.	2	1	3	3	IMI																											
649											Initialize ground mapping radar systems.	3	3	1	2	SIM																											
650											Determine ground mapping radar operability and suitability for mapping use.	3	3	1	2	SIM																											
651											Identify purpose of radar controls.	2	1	3	3	IMI																											
652											Identify radar controls.	2	1	3	3	IMI																											

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV		
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																																
653											Identify the imagery displayed in each mode and submode.	2	1	3	3	IMI																												
654											Perform procedures to operate air-to-ground radar system modes and submodes.	3	3	1	2	SIM																												
655			x	x	x				x	Plan an Airborne Radar Point Targeting Mission																																
656											Identify the conduct of a radar navigation flight mission.	2	1	3	3	IMI	2	3	3	T		x	x	x								x	x	x	x	x	x	x					
657											Identify the procedures to plan an airborne radar mapping mission.	1	2	3	3	INSTR-LED																												
658			x	x	x				x	Perform Radar Prediction Procedures																																
659											Identify radar prediction procedures.	1	2	3	3	INSTR-LED	1	3	2	MT		x	x	x	x	x						x	x	x	x	x	x	x					
660			x	x	x				x	Perform an Airborne Radar Point Targeting Mission																																
661											Identify the procedures to construct radar predictions using a Tactical Pilotage Chart (TPC).	1	2	3	3	INSTR-LED	2	3	3	T		x	x	x								x	x	x	x	x	x	x					
662											Execute an airborne radar point targeting mission.	3	3	1	2	SIM																												
663			x	x	x				x	Perform an Airborne Radar Navigation Mission																																
664											Identify airborne radar navigation mission procedures.	2	1	3	3	IMI	2	1	1	T		x	x	x	x	x						x	x	x	x	x	x	x					
665											Manipulate the aircraft ground mapping radar to obtain a usable radarscope for navigation.	3	3	1	2	SIM																												
666											Interpret ground mapping radar display for navigational information.	3	3	1	2	SIM																												
667											Determine position in relation to a specified course using displayed radar information. (Navigation Situation Analysis)	3	3	1	2	SIM																												
668											Determine aircraft position using radar checkpoints.	3	3	1	2	SIM																												
669											Apply computed wind to flight recommendations to maintain specified course and time.	3	3	1	2	SIM																												
670											Monitor the flight to ensure aircraft maintains specified course in the preflight planned amount of time. (course control/time on target)	3	3	1	2	SIM																												

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																														
671											Maintain specified course and preflight planned time en route by correcting heading and speed using radar display interpretations.	3	3	1	2	SIM																												
672										IFR/RADIO/GPS																																
673	x	x					x			Perform Mission under Instrument Flight Rules (IFR)							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
674											Identify IFR mission procedures.	2	1	3	3	IMI																												
675											Identify IFR rules.	2	1	3	3	IMI																												
676											Monitor IFR mission.	3	3	1	2	SIM																												
677											Direct IFR mission.	3	3	1	2	SIM																												
678	x	x					x			Navigate an ILS/ACLS/CILS Approach							1	3	3	MT	x	x	x	x	x	x	x		x	x	x	x	x	x	x		x	x			
679											Identify the procedures to navigate an ILS/ACLS/CILS approach.	2	1	3	3	IMI																												
680											Monitor an ILS/ACLS/CILS approach.	3	3	1	2	SIM																												
681											Direct an ILS/ACLS/CILS approach.	3	3	1	2	SIM																												
682	x	x					x			Navigate a PAR Approach							1	3	3	MT	x	x	x	x	x	x	x		x	x	x	x	x	x	x		x	x			
683											Identify the procedures to navigate a PAR approach.	2	1	3	3	IMI																												
684											Monitor a PAR approach.	3	3	1	2	SIM																												
685											Direct a PAR approach.	3	3	1	2	SIM																												
686									x	Navigate an Airborne Radar Approach (ARA) Approach							1	3	3	MT		x	x	x					x			x	x	x	x		x	x			
687											Identify the procedures to navigate an ARA approach.	2	1	3	3	IMI																												
688											Monitor an ARA approach.	3	3	1	2	SIM																												
689											Direct an ARA approach.	3	3	1	2	SIM																												
690	x	x					x			Navigate a Visual Approach							1	3	3	MT	x	x	x	x	x	x			x		x	x	x	x	x		x	x			
691											Identify the procedures to navigate a visual approach.	2	1	3	3	IMI																												
692											Monitor a visual approach.	3	3	1	2	SIM																												
693											Direct a visual approach.	3	3	1	2	SIM																												
694	x						x			Navigate a Standard Instrument Departure (SID)							1	3	2	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
695											Identify standard instrument departure procedures.	2	1	3	3	IMI																												
696											Identify compliance procedures during SIDs, approaches, and Air Traffic Control (ATC) clearances.	2	1	3	3	IMI																												
697											Navigate to maintain assigned and published altitudes.	3	3	1	2	SIM																												
698	x	x					x			Perform VOR/TACAN Navigation Procedures							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x			

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
699											Identify functions and indications of ground-based radio aids using a VOR/DME.	2	1	3	3	IMI																												
700											Identify functions and indications of ground-based radio aids using a TACAN.	2	1	3	3	IMI																														
701											Identify the procedures to intercept a radial and track inbound or outbound from a TACAN station.	2	1	3	3	IMI																														
702											Identify an intersection using NAVAID(s).	3	3	1	2	SIM																														
703											Identify station passage.	3	3	1	2	SIM																														
704											Maintain aircraft's track on an radial or airway.	3	3	1	2	SIM																														
705											Execute instrument navigation turn point calls for each checkpoint.	3	3	1	2	SIM																														
706											Identify aircraft position relative to an operable Tactical Air Navigation (TACAN)/VOR station.	3	3	1	2	SIM																														
707											Estimate aircraft position and track during a high-level mission.	3	3	1	2	SIM																														
708											Navigate using ground-based radio aids using a VOR/DME.	3	3	1	2	SIM																														
709											Navigate using ground-based radio aids using a TACAN.	3	3	1	2	SIM																														
710	x	x					x			Direct a VOR/TACAN Navigation Mission							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
711											Monitor the aircraft to maintain desired track, airspeed, time and altitude during a high-level mission.	3	3	1	2	SIM																														
712											Direct the aircraft to maintain desired track, airspeed, time and altitude during a high-level mission	3	3	1	2	SIM																														
713											Establish the aircraft inbound to the station.	3	3	1	2	SIM																														
714											Perform airspeed and heading checks during a high-level mission.	3	3	1	2	SIM																														
715											Execute TACAN point-to-point navigation.	3	3	1	2	SIM																														
716											Proceed direct to an assigned fix using VOR/DME or TACAN point-to-point procedures.	3	3	1	2	SIM																														
717											Execute a TACAN point-to-point.	3	3	1	2	SIM																														
718	x	x					x			Perform Global Positioning System (GPS) Navigation Procedures							1	3	3	MT	x	x	x	x	x	x	x	x		x	x	x	x	x	x		x	x			

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
719											Identify functions and indications of satellite-based navaids using GPS.	2	1	3	3	IMI																												
720											Identify the procedures to intercept a radial and track inbound or outbound from a GPS fix.	2	1	3	3	IMI																												
721											Identify an intersection using GPS.	3	3	1	2	SIM																												
722											Identify station passage.	3	3	1	2	SIM																												
723											Maintain aircraft's track on an radial or airway.	3	3	1	2	SIM																												
724											Execute instrument navigation turn point calls for each checkpoint.	3	3	1	2	SIM																												
725											Navigate using GPS.	3	3	1	2	SIM																												
726	x	x					x			Direct a GPS Navigation Mission							1	3	3	MT	x	x	x	x	x	x		x		x	x	x	x	x	x		x	x			
727											Monitor the aircraft to maintain desired track, airspeed, time and altitude during a high-level mission.	3	3	1	2	SIM																												
728											Direct the aircraft to maintain desired track, airspeed, time and altitude during a high-level mission	3	3	1	2	SIM																												
729											Establish the aircraft inbound to the fix.	3	3	1	2	SIM																												
730											Perform airspeed and heading checks during a high-level mission.	3	3	1	2	SIM																												
731											Execute GPS point-to-point navigation.	3	3	1	2	SIM																												
732											Proceed direct to an assigned fix using GPS point-to-point procedures.	3	3	1	2	SIM																												
733	x	x					x			Perform Holding Procedures							1	3	1	T	x	x	x	x	x	x	x		x	x	x	x	x	x	x					
734											Identify the procedures to enter a holding pattern.	2	1	3	3	IMI																												
735											Monitor the entrance into a holding pattern.	3	3	1	2	SIM																												
736											Identify the procedures to execute holding procedures.	2	1	3	3	IMI																												
737											Monitor holding procedures.	3	3	1	2	SIM																												
738	x	x					x			Perform VOR/DME Arcing Procedures							1	3	1	T	x	x	x	x	x	x	x		x	x	x	x	x	x	x					
739											Identify the procedures to direct VOR/DME arcing.	2	1	3	3	IMI																												
740											Monitor VOR/DME arcing.	3	3	1	2	SIM																												
741											Identify the procedures to direct arc-to-radial intercepts.	2	1	3	3	IMI																												
742											Monitor arc-to-radial intercepts.	3	3	1	2	SIM																												

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																				
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																															
743											Identify the procedures to direct radial-to-arc intercepts.	2	1	3	3	IMI																											
744											Monitor radial-to-arc intercepts.	3	3	1	2	SIM																											
745	x	x					x			Perform TACAN Arcing Procedures							1	3	1	T	x	x	x	x	x	x	x		x	x	x	x	x	x			x	x			
746											Identify the procedures to direct TACAN arcing.	2	1	3	3	IMI																											
747											Identify the procedures to intercept and fly a TACAN arc.	2	1	3	3	IMI																											
748											Monitor TACAN arcing.	3	3	1	2	SIM																											
749											Identify the procedures to direct arc-to-radial intercepts.	2	1	3	3	IMI																											
750											Monitor arc-to-radial intercepts.	3	3	1	2	SIM																											
751											Identify the procedures to direct radial-to-arc intercepts.	2	1	3	3	IMI																											
752											Monitor radial-to-arc intercepts.	3	3	1	2	SIM																											
753	x	x								Perform GPS Arcing Procedures							1	3	1	T	x		x	x	x	x	x			x			x	x	x			x	x			
754											Identify the procedures to direct GPS arcing.	2	1	3	3	IMI																											
755											Monitor GPS arcing.	3	3	1	2	SIM																											
756											Identify the procedures to direct arc-to-radial intercepts.	2	1	3	3	IMI																											
757											Monitor arc-to-radial intercepts.	3	3	1	2	SIM																											
758											Identify the procedures to direct radial-to-arc intercepts.	2	1	3	3	IMI																											
759											Monitor radial-to-arc intercepts.	3	3	1	2	SIM																											
760	x	x					x			Direct a VOR/TACAN Approach							1	3	1	T	x	x	x	x	x	x	x		x	x	x	x	x	x	x		x	x			
761											Identify the procedures to direct a VOR/TACAN approach.	2	1	3	3	IMI																											
762											Monitor a VOR/TACAN approach.	3	3	1	2	SIM																											
763	x	x					x			Direct a Localizer Approach							1	3	1	T	x	x	x	x	x	x	x		x	x	x	x	x	x	x		x	x			
764											Identify the procedures to direct a localizer approach.	2	1	3	3	IMI																											
765											Monitor a localizer approach.	3	3	1	2	SIM																											
766	x	x					x			Direct an ILS /ACLS/ICLS Approach							1	3	1	T	x	x	x	x	x	x	x		x	x	x	x	x	x	x		x	x			
767											Identify the procedures to direct an ILS/ACLS/ICLS approach.	2	1	3	3	IMI																											
768											Monitor an ILS/ACLS/ICLS approach.	3	3	1	2	SIM																											
769	x	x					x			Direct a Circling Approach							1	3	1	T	x	x	x	x	x	x	x		x	x	x	x	x	x	x		x	x			
770											Identify the procedures to direct a circling approach.	2	1	3	3	IMI																											
771											Monitor a circling approach.	3	3	1	2	SIM																											
772	x	x								Direct a Ground Control Approach (GCA)							1	3	1	T	x	x	x	x	x	x	x			x	x	x	x	x	x		x	x			
773											Identify the procedures to direct a ground control approach.	2	1	3	3	IMI																											

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
774											Identify the procedures to execute a radio instrument and ground controlled approach (GCA).	2	1	3	3	IMI																											
775											Monitor a radio instrument and ground controlled approach (GCA).	3	3	1	2	SIM																											
776											Identify the procedures to direct a published instrument approach.	2	1	3	3	IMI																											
777											Monitor a published instrument approach.	3	3	1	2	SIM																											
778											Identify the procedures to direct a published visual approach.	2	1	3	3	IMI																											
779											Monitor a published visual approach.	3	3	1	2	SIM																											
780											Identify the procedures to direct a published course rules approach.	2	1	3	3	IMI																											
781											Monitor a published course rules approach.	3	3	1	2	SIM																											
782											Identify the procedures to comply with radar vectors to TACAN final.	2	1	3	3	IMI																											
783											Determine position relative to glideslope.	3	3	1	2	SIM																											
784	x	x					x			Direct a Missed Approach							1	3	1	T	x	x	x	x	x	x	x		x	x	x	x	x	x	x		x	x			
785											Identify the procedures to direct a missed approach.	2	1	3	3	IMI																											
786											Monitor a missed approach.	3	3	1	2	SIM																											
787											Perform a missed approach.	3	3	1	2	SIM																											
788	x	x								Direct Global Positioning System (GPS) Holding							1	3	1	T	x	x	x	x	x	x	x			x		x	x	x	x		x	x			
789											Identify GPS holding procedures.	2	1	3	3	IMI																											
790											Monitor GPS holding.	3	3	1	2	SIM																											
791	x	x								Direct a Global Positioning System (GPS) Approach							1	3	1	T	x	x	x	x	x	x	x			x		x	x	x	x		x	x			
792											Identify GPS approach procedures.	2	1	3	3	IMI																											
793											Monitor GPS approach.	3	3	1	2	SIM																											
794	x	x								Operate the Global Positioning System (GPS)							1	3	3	MT	x	x	x	x	x	x	x			x	x	x	x	x	x		x	x			
795											Identify GPS concepts and operations. (figure of merit, circular error, limitations and strengths)	2	1	3	3	IMI																											
796											Identify GPS signal strength. (tight vs. loose coupling, open/closed loop updating)	2	1	3	3	IMI																											
797											Identify GPS theory. (satellites and encryption)	2	1	3	3	IMI																											
798											Identify GPS connectivity with aircraft systems.	2	1	3	3	IMI																											

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
799											Identify GPS integration with mission systems.	2	1	3	3	IMI																											
800											Identify GLONASS.	2	1	3	3	IMI																											
801			x				x			Operate the Inertial Navigation System (INS)							1	3	3	MT	x	x	x	x	x	x		x	x	x	x	x	x	x	x		x	x			
802											Identify INS theory. (ring laser-gyros, standard kalmann filtering, waypoints)	2	1	3	3	IMI																											
803											Identify INS capabilities and limitations.	2	1	3	3	IMI																											
804											Identify INS operations and functionality	2	1	3	3	IMI																											
805											Identify errors in INS equipment.	2	1	3	3	IMI																											
806											Identify information from INS during navigation.	2	1	3	3	IMI																											
807											Identify INS navigation procedures.	2	1	3	3	IMI																											
808											Initialize inertial navigation system (INS).	3	3	1	2	SIM																											
809											Utilize inertial navigation equipment to direct the aircraft and obtain SA.	3	3	1	2	SIM																											
810											Utilize information from INS during navigation.	3	3	1	2	SIM																											
811											Utilize checklists during INS procedures.	3	3	1	2	SIM																											
812											Validate INS accuracy.	3	3	1	2	SIM																											
813										VISUAL/VFR																																	
814		x	x	x	x				x	Navigate a Tactical Low-Level Mission							1	3	2	MT	x	x	x	x	x	x						x	x	x	x		x	x			
815											Identify all natural and man-made hazards.	3	3	1	2	SIM																											
816											Identify turnpoints on a visual low-level route.	3	3	1	2	SIM																											
817											Identify visual checkpoints (intermediate checkpoints) to determine aircraft position.	3	3	1	2	SIM																											
818											Recommend procedures to intercept and fly a specified visual low-level course.	3	3	1	2	SIM																											
819											Direct a day visual low-level nav, pilotage, map reading, watch, chart, and window procedures.	3	3	1	2	SIM																											
820											Direct aircraft along low-level route to maintain desired track, altitude and time to turnpoints and target.	3	3	1	2	SIM																											
821											Maintain low-level route altitude.	3	3	1	2	SIM																											

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
822											Execute an integrated tactical low-level mission.	3	3	1	2	SIM																													
823		x	x	x	x				x	Perform Visual Navigation (VNAV) Turnpoint Procedures							1	3	2	MT	x	x	x	x	x	x						x	x	x	x		x	x			
824											Identify VNAV turnpoint calls procedures.	2	1	3	3	IMI																													
825											Execute VNAV turnpoint calls.	3	3	1	2	SIM																													
826											Identify VNAV intermediate checkpoint calls procedures.	2	1	3	3	IMI																													
827											Execute VNAV intermediate checkpoint calls.	3	3	1	2	SIM																													
828											Identify VNAV hazard calls procedures.	2	1	3	3	IMI																													
829											Execute VNAV hazard calls.	3	3	1	2	SIM																													
830		x	x	x	x				x	Perform Visual Navigation Time Control Techniques							1	3	2	MT	x	x	x	x	x	x						x	x	x	x		x	x			
831											Identify air-speed adjustments to arrive on target on time on a visual low-level course.	2	1	3	3	IMI																													
832											Recommend air-speed adjustments to arrive on target on time on a visual low-level course.	3	3	1	2	SIM																													
833											Prioritize mission tasks to navigate an aircraft visually to meet TOT.	3	3	1	2	SIM																													
834											Navigate using time control techniques.	3	3	1	2	SIM																													
835	x	x					x	x		Visually Navigate to the Landing Field							1	3	3	MT	x	x	x	x	x	x					x	x	x	x	x		x	x			
836											Locate the landing field.	3	3	1	2	SIM																													
837											Enter the landing pattern.	3	3	1	2	SIM																													
838	x	x					x	x		Direct Visual Flying Rules (VFR) Entry Procedures							1	3	2	MT	x	x	x	x	x	x						x	x	x	x		x	x			
839											Identify airport lighting aids, approach lighting systems visual glideslope indicators.	2	1	3	3	IMI																													
840											Execute VFR entry pattern procedures.	3	3	1	2	SIM																													
841											Execute Overhead/Carrier Break VFR entry pattern procedures.	3	3	1	2	SIM																													
842	x	x					x	x		Direct Visual Flying Rules (VFR) Traffic Pattern Procedures							1	3	2	MT	x	x	x	x	x	x						x	x	x	x		x	x			
843											Identify airport lighting aids, approach lighting systems visual glideslope indicators.	2	1	3	3	IMI																													
844											Execute VFR traffic pattern procedures.	3	3	1	2	SIM																													

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
845											Execute Overhead/Carrier Break VFR traffic pattern procedures.	3	3	1	2	SIM																													
846		x						x		Navigate the Aircraft Visually during Night Operations							2	3	2	OT		x	x	x	x	x			x		x	x	x	x	x			x			
847											Identify NVG Contour.	2	1	3	3	IMI																													
848											Identify FLIR capabilities and limitations.	2	1	3	3	IMI																													
849											Identify NVG and FLIR theory and limitations.	2	1	3	3	IMI																													
850											Navigate visually during Night/NVG Contour/FLIR.	3	3	1	2	SIM																													
851											Monitor visual navigation equipment.	3	3	1	2	SIM																													
852											Apply NVG and FLIR theory and limitations.	3	3	1	2	SIM																													
853										REAL WORLD TIMING																																	
854			x	x	x				x	Navigate the Aircraft to Meet Mission Directed Timing Requirements							1	3	2	MT	x	x	x	x	x	x			x	x	x	x	x	x	x		x	x			
855											Prepare plan to meet mission directed timing requirements.	1	2	3	3	INSTR-LED																													
856											Execute plan to meet mission directed timing requirements.	3	3	1	2	SIM																													
857																																									
858										FORMATION FLIGHT																																	
859		x		x	x					Perform Formation Flight Maneuver Duties							2	3	1	OT	x	x	x	x	x	x					x		x		x		x	x			
860											Identify standard formation maneuvers.	2	1	3	3	IMI																													
861											Demonstrate in-flight leadership during formation maneuvers.	3	3	1	2	SIM																													
862											Describe aircraft flight characteristics.	2	1	3	3	IMI																													
863											Identify Parade Position.	2	1	3	3	IMI																													
864											Identify Cruise Position.	2	1	3	3	IMI																													
865											Identify tactical wing.	2	1	3	3	IMI																													
866											Describe defensive combat spread position used during enroute medium/high level formation position to reduce wingman fatigue and improve clearing.	2	1	3	3	IMI																													

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
867											Describe offensive combat spread position used during enroute medium/high level formation position to reduce wingman fatigue and improve clearing.	2	1	3	3	IMI																														
868											Monitor aircraft flight characteristics.	3	3	1	2	SIM																														
869											Maintain visual/radar contact with all formation members.	3	3	1	2	SIM																														
870											Maintain tally on all bandits in the engagement. (Tactical)	3	3	1	2	SIM																														
871											Maintain visual scan for any traffic/ obstacles that are potential conflicts.	3	3	1	2	SIM																														
872		x		x	x					Direct Formation Coordination Procedures							2	3	1	OT	x	x	x	x	x	x					x		x		x		x	x			
873											Identify formation coordination procedures.	2	1	3	3	IMI																														
874											Monitor formation coordination procedures.	3	3	1	2	SIM																														
875		x		x	x					Direct Formation Taxi & Marshal Procedures							2	3	1	OT	x	x	x	x	x	x					x		x		x		x	x			
876											Identify formation taxi and marshal procedures.	2	1	3	3	IMI																														
877											Monitor formation taxi and marshal procedures.	3	3	1	2	SIM																														
878		x		x	x					Direct Formation Takeoff Procedures							2	3	1	OT	x	x	x	x	x	x					x		x		x		x	x			
879											Identify formation section, interval takeoff procedures.	2	1	3	3	IMI																														
880											Monitor formation section, interval takeoff procedures.	3	3	1	2	SIM																														
881											Identify takeoff in parade formation procedures.	2	1	3	3	IMI																														
882											Monitor takeoff in parade formation procedures.	3	3	1	2	SIM																														
883		x		x	x					Direct Formation Cruise Procedures							2	3	1	OT	x	x	x	x	x	x					x		x		x		x	x			
884											Identify formation cruise maneuvers.	2	1	3	3	IMI																														
885											Monitor formation cruise maneuvers.	3	3	1	2	SIM																														
886		x		x	x					Perform Formation Communication Procedures							2	3	1	OT	x	x	x	x	x	x					x	x	x		x		x	x			
887											Identify wingman communication procedures.	2	1	3	3	IMI																														

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
888											Utilize hand signal communications during formation.	3	3	2	1	ACFT																											
889											Utilize standard Air Force/Navy and Marine Corps aircraft section radio communication procedures.	3	3	1	2	SIM																											
890				x	x					Perform Formation In-Flight Area Management Procedures							2	3	1	OT	x	x	x	x	x	x					x		x		x		x	x			
891		x		x	x					Perform Formation In-Flight Planning Procedures							2	3	1	OT	x	x	x	x	x	x					x		x		x		x	x			
892											Identify current and required position.	3	3	1	2	SIM																											
893											Plan a sequence of maneuvers or actions.	3	3	1	2	SIM																											
894											Execute a sequence of maneuvers or actions.	3	3	1	2	SIM																											
895		x		x	x					Monitor Formation Fuel Status							1	3	1	T	x	x	x	x	x	x					x		x		x		x	x			
896											Monitor formation fuel status.	3	3	1	2	SIM																											
897		x		x	x					Direct Enroute Formation Procedures							1	3	1	T	x	x	x	x	x	x					x		x		x		x	x			
898											Identify enroute formations.	2	1	3	3	IMI																											
899											Monitor enroute formations.	3	3	1	2	SIM																											
900		x		x	x					Direct Formation Parade/Route Sequence Procedures							1	3	1	T	x	x	x	x	x	x					x		x		x		x	x			
901											Identify parade sequence procedures.	2	1	3	3	IMI																											
902											Monitor parade sequence procedures.	3	3	1	2	SIM																											
903		x		x	x					Direct Formation Breakup and Rendezvous Procedures							2	3	1	OT	x	x	x	x	x	x				x	x		x		x		x	x			
904											Identify breakup and rendezvous procedures.	2	1	3	3	IMI																											
905											Monitor breakup and rendezvous procedures.	3	3	1	2	SIM																											
906											Initiate the reform of the formation.	3	3	1	2	SIM																											
907											Identify TACAN rendezvous procedures IAW and local standards.	2	1	3	3	IMI																											
908											Identify underrun procedures.	2	1	3	3	IMI																											
909											Monitor underrun procedures.	3	3	1	2	SIM																											
910		x		x	x					Direct Lead Change Procedures							1	3	1	T	x	x	x	x	x	x					x		x		x		x	x			
911											Identify lead change procedures.	2	1	3	3	IMI																											
912											Monitor lead change procedures.	3	3	1	2	SIM																											
913		x		x	x					Direct Lost Wingman/Sight Procedures							2	3	1	OT	x	x	x	x	x	x					x		x		x		x	x			

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																				
2							Panel NAV																																			
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
914											Identify lost wingman/sight procedures.	2	1	3	3	IMI																											
915											Monitor lost wingman/sight procedures.	3	3	1	2	SIM																											
916		x		x	x					Direct Cruise Maneuvering Procedures							1	3	1	T	x	x	x	x	x	x					x		x		x		x	x			
917											Identify cruise maneuvering profile procedures.	2	1	3	3	IMI																											
918											Monitor cruise maneuvering profile procedures.	3	3	1	2	SIM																											
919		x		x	x					Direct Formation Tactical Turn Maneuvers							2	3	1	OT	x	x	x	x	x	x					x		x		x		x	x			
920											Identify formation tactical turn procedures.	2	1	3	3	IMI																											
921											Monitor formation tactical turn procedures.	3	3	1	2	SIM																											
922		x		x	x					Direct Rejoin to Parade Formation Maneuvers							1	3	1	T	x	x	x	x	x	x					x		x		x		x	x			
923											Identify reform to parade procedures.	2	1	3	3	IMI																											
924											Monitor reform to parade procedures.	3	3	1	2	SIM																											
925				x	x					Navigate Aircraft Section through Visual Low-Level Procedures							2	3	1	OT	x	x	x	x	x	x					x		x		x		x	x			
926											Perform duties of a lead navigator on an aircraft section visual low-level navigation flight.	3	3	1	2	SIM																											
927											Maintain visual orientation with wingman/lead, terrain, and course.	3	3	1	2	SIM																											
928											Report hazards to flight to section.	3	3	1	2	SIM																											
929											Direct the section while maintaining tactical section integrity, course, and ETE.	3	3	1	2	SIM																											
930		x		x	x					Perform Formation Chart/Terrain Correlation Procedures							2	3	1	OT	x	x	x	x	x	x					x		x		x		x	x			
931											Maintain SA and position on flight planned route as required by correlating the terrain to charts.	3	3	1	2	SIM																											
932		x		x	x					Direct Range Entry/Exit Procedures							1	3	1	T	x	x	x	x	x	x					x		x		x		x	x			
933											Identify division range entry/exit procedures.	2	1	3	3	IMI																											
934											Monitor division range entry/exit procedures.	3	3	1	2	SIM																											
935				x	x					Direct Formation Range Procedures							2	3	1	OT	x	x	x	x	x	x					x		x		x		x	x			

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																			
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
936											Identify formation range procedures.	2	1	3	3	IMI																											
937											Monitor formation range procedures.	3	3	1	2	SIM																											
938				x	x					Direct Section Target Attack Procedures							2	3	1	OT	x	x	x	x	x	x				x							x		x	x			
939											Identify section target attack procedures.	2	1	3	3	IMI																											
940											Monitor section target attack procedures.	3	3	1	2	SIM																											
941				x	x					Direct Division Range High Pattern Attack Procedures							2	1	1	T	x	x	x	x	x	x				x							x		x	x			
942											Identify division range high pattern attack procedures.	2	1	3	3	IMI																											
943											Monitor division range high pattern attack procedures.	3	3	1	2	SIM																											
944				x	x					Direct Division Range Low Pattern Attack Procedures							2	1	1	T	x	x	x	x	x	x				x							x		x	x			
945											Identify division range low pattern attack procedures.	2	1	3	3	IMI																											
946											Monitor division range low pattern attack procedures.	3	3	1	2	SIM																											
947		x		x	x					Direct Formation Approach Procedures							2	3	1	OT	x	x	x	x	x	x				x		x		x			x		x	x			
948											Identify instrument approach procedures.	2	1	3	3	IMI																											
949											Monitor instrument approach procedures.	3	3	1	2	SIM																											
950											Identify visual straight-in approach procedures.	2	1	3	3	IMI																											
951											Monitor visual straight-in approach procedures.	3	3	1	2	SIM																											
952											Identify designated TACAN instrument approach procedures.	2	1	3	3	IMI																											
953											Monitor designated TACAN instrument approach procedures.	3	3	1	2	SIM																											
954											Identify PAR or ASR approach procedures.	2	1	3	3	IMI																											
955											Monitor PAR or ASR approach procedures.	3	3	1	2	SIM																											
956				x	x					Direct Formation Recovery Procedures							2	1	1	T	x	x	x	x	x	x				x		x		x			x		x	x			
957											Identify return-to-base (RTB) procedures.	2	1	3	3	IMI																											

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV		
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																																
958											Monitor return-to-base (RTB) procedures.	3	3	1	2	SIM																														
959																																										
960										ADVANCED TACTICAL MANEUVERING																																		
961				x	x					Perform In-Flight Maneuver Sequence Planning							2	3	1	OT		x	x	x	x	x						x	x	x	x		x	x				
962											Identify procedures to plot in-flight to avoid/react to threats to complete mission.	2	1	3	3	IMI																														
963											Identify in-flight maneuver sequence planning.	2	1	3	3	IMI																														
964											Execute in-flight maneuver sequence planning.	3	3	1	2	SIM																														
965											Identify current and required positions.	3	3	1	2	SIM																														
966				x	x					Perform Visual Scan Procedures to Maintain Situational Awareness							2	3	3	T		x	x	x	x	x						x	x	x	x			x	x				
967				x	x					Perform Instrument Scan Procedures to Maintain Situational Awareness							2	3	3	T		x	x	x	x	x						x	x	x	x	x		x	x				
968											Maintain spatial orientation through aircraft instrument and external visual scan with reference to the following: Terrain, Altitude, Airspeed, Attitude, Hard Deck, Soft Deck, Element Deconfliction and Bogey.	3	3	2	1	ACFT																														
969				x	x					Perform Acquisition of Enemy Aircraft Procedures							3	3	1	OT		x	x	x	x	x							x	x	x	x	x	x	x				
970											Apply tactical lookout doctrine.	3	3	1	2	SIM																														
971											Maintain visual contact with bogey aircraft.	3	3	1	2	SIM																														
972											Report bogey's position, attitude, overtake, maneuver, and threat to pilot.	3	3	1	2	SIM																														
973											Identify position relative to a bogey aircraft.	3	3	1	2	SIM																														
974											Recommend appropriate maneuver in offensive and defensive situations against a bogey aircraft.	3	3	1	2	SIM																														

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																														
975											Direct pilot to perform appropriate maneuver to avoid descending through hard deck and breaking imaginary bubble around bogey.	3	3	1	2	SIM																												
976				x	x					Perform Offensive Advanced Tactical Maneuvers							3	3	1	OT		x	x	x	x	x									x	x	x	x			
977				x	x					Perform Defensive Advanced Tactical Maneuvers							3	3	1	OT		x	x	x	x	x							x	x	x	x	x	x			
978				x	x					Perform Neutral Advanced Tactical Maneuvers							2	3	1	OT		x	x	x	x	x									x	x	x	x			
979											Describe ATM.	2	1	3	3	IMI																										
980											Identify ATM performed by pilot.	3	3	1	2	SIM																										
981											Maneuver a section of aircraft to the center of an operating area using engaging turns while maintaining section integrity and lookout doctrine.	3	3	1	2	SIM																										
982											Report appropriately "visual" and "six clear".	3	3	1	2	SIM																										
983											Report bogey position to section.	3	3	1	2	SIM																										
984				x	x					Direct Formation High/Low Yo-Yo Maneuvers							2	3	1	OT		x	x	x	x	x													x			
985											Identify formation high/low yo-yo maneuver procedures.	2	1	3	3	IMI																										
986											Monitor formation high/low yo-yo maneuver procedures.	3	3	1	2	SIM																										
987				x	x					Direct Formation Pursuit Curves Maneuvers							2	3	1	OT		x	x	x	x	x													x			
988											Identify formation pursuit curves maneuver procedures	2	1	3	3	IMI																										
989											Monitor formation pursuit curves maneuver procedures	3	3	1	2	SIM																										
990				x	x					Direct Formation Flat Scissors Maneuvers							3	3	1	OT		x	x	x	x	x													x			
991											Identify formation flat scissors maneuver procedures.	2	1	3	3	IMI																										
992											Monitor formation flat scissors maneuver procedures.	3	3	1	2	SIM																										
993				x	x					Direct Formation Snapshot Drill Maneuvers							3	3	1	OT		x	x	x	x	x													x			
994											Identify formation snap shot drill maneuver procedures.	2	1	3	3	IMI																										
995											Monitor formation snap shot drill maneuver procedures.	3	3	1	2	SIM																										

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
996				x	x					Direct Formation Rolling Scissors Maneuvers							3	3	1	OT		x	x	x	x	x													x			
997											Identify formation rolling scissors maneuver procedures.	2	1	3	3	IMI																											
998											Monitor formation rolling scissors maneuver procedures.	3	3	1	2	SIM																											
999				x	x					Direct Formation Offensive Perch Sets Maneuvers from a Position of Advantage							3	3	1	OT		x	x	x	x	x															x			
1000											Identify formation offensive perch sets maneuver procedures.	2	1	3	3	IMI																											
1001											Monitor formation offensive perch sets maneuver procedures.	3	3	1	2	SIM																											
1002				x	x					Direct Formation Defensive Perch Sets Maneuvers from a Position of Disadvantage							3	3	1	OT		x	x	x	x	x															x			
1003											Identify formation defensive perch sets maneuver procedures.	2	1	3	3	IMI																											
1004											Monitor formation defensive perch sets maneuver procedures.	3	3	1	2	SIM																											
1005				x	x					Direct 1V1 Engagement Maneuvers from a Neutral Position							3	3	1	OT		x	x	x	x	x													x	x			
1006											Identify 1V1 engagement maneuver procedures.	2	1	3	3	IMI																											
1007											Monitor 1V1 engagement maneuver procedures.	3	3	1	2	SIM																											
1008				x	x					Conduct a 1V1 Engagement Maneuvers Board Debrief							1	1	3	MT		x	x	x	x	x													x			
1009											Identify 1V1 engagement maneuver board debrief.	2	1	3	3	IMI																											
1010											Monitor 1V1 engagement maneuver board debrief.	3	3	1	2	SIM																											
1011	AIR-TO-AIR RADAR OPERATION																																								
1012					x	x				Operate Airborne Intercept Radar							2	3	3	T		x	x	x								x					x	x			
1013											Identify air-to-air radar theory.	2	1	3	3	IMI																											
1014											Identify purpose and types of air-to-air radar systems. (Types: pulsed and pulsed Doppler)	2	1	3	3	IMI																											
1015											Initialize airborne intercept radar.	3	2	1	3	SIM																											
1016											Determine airborne intercept radar operability and suitability.	3	2	1	3	SIM																											
1017											Adjust radar display controls for most discernible target display.	3	2	1	3	SIM																											

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
1018											Select appropriate radar mode and antenna sector scan to enhance earliest target detection.	3	2	1	3	SIM																												
1019											Utilize antenna elevation search pattern to enhance earliest target detection.	3	2	1	3	SIM																												
1020											Determine bogey altitude, using radar and GCI information.	3	2	1	3	SIM																												
1021											Operate air-to-air radar (position keeping, intercepts, rendezvous).	3	3	1	2	SIM																												
1022											Identify multiple intercept geometry.	2	1	3	3	IMI																												
1023					x	x				Perform Air-to-Air Intercept Mission							3	3	3	T		x	x	x														x	x			
1024											Analyze displayed radar information.	3	2	1	3	SIM																												
1025											Differentiate assigned target from other displayed radar information; to include multi bogey presentation.	3	2	1	3	SIM																												
1026											Correlate Ground Control Intercept (GCI) target information with displayed radar information.	3	2	1	3	SIM																												
1027											Confirm target using radar displayed and GCI information.	3	2	1	3	SIM																												
1028											Achieve and maintain best radar display (spotlight) target.	3	2	1	3	SIM																												
1029											Maintain target spotlight until initiation of automatic radar track.	3	2	1	3	SIM																												
1030											Obtain automatic radar track of target.	3	2	1	3	SIM																												
1031											Analyze radar display to ascertain proper automatic track on proper target.	3	2	1	3	SIM																												
1032											Analyze radar's search or automatic track display. (Angles Off, Range, Altitude, Overtake)	3	2	1	3	SIM																												
1033											Execute GCI-only intercept.	3	2	1	3	SIM																												
1034											Direct displacement turn in order to manage lateral separation for counterturn.	3	3	1	2	SIM																												
1035											Direct counterturn to arrive in bogey's RQ.	3	3	1	2	SIM																												
1036											Recognize and compensate bogey jinks in heading.	3	3	1	2	SIM																												

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																															
1037											Maintain positional and tactical advantage by recognizing hot bogeys in a merge/front quarter (FQ) Fox-2 maneuver.	3	3	1	2	SIM																															
1038											Establish AIM-9 missile firing position in a rear quarter (RQ) drift control maneuver.	3	3	1	2	SIM																															
1039											Determine fighter's geometric position relative to bogey for tactical situational awareness.	3	3	1	2	SIM																															
1040					x	x				Perform Attack-Reattack Intercept Mission							2	3	3	T		x	x	x															x			
1041											Identify attack-reattack intercepts procedures using GCI information and airborne radar information in search and track modes.	2	1	3	3	IMI																															
1042											Perform attack-reattack intercepts procedures using GCI information and airborne radar information in search and track modes.	3	3	1	2	SIM																															
1043					x	x				Perform Unknown Target Heading Intercept Mission							1	3	3	MT				x																			
1044											Identify intercept procedures against a target of unknown heading using airborne radar information in search and track mode.	2	1	3	3	IMI																															
1045											Perform intercept procedures against a target of unknown heading using airborne radar information in search and track mode.	3	3	1	2	SIM																															
1046					x	x				Perform Conversion Intercept Mission							2	3	3	T		x	x	x															x			
1047											Identify conversion intercept procedures to achieve a specified TA between 0° - 45° or 0 – 45,000' lateral separation from target's flight path using airborne radar information in search and track modes.	2	1	3	3	IMI																															

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																			
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
1048											Perform conversion intercept procedures to achieve a specified TA between 0° - 45° or 0 – 45,000' lateral separation from target's flight path using airborne radar information in search and track modes.	3	3	1	2	SIM																														
1049					x	x				Perform Target Jinking Mission							2	3	3	T		x	x	x																x			
1050											Identify intercept procedures against a target jinking using airborne radar information in search and track modes.	2	1	3	3	IMI																												
1051											Perform intercept procedures against a target jinking using airborne radar information in search and track modes.	3	3	1	2	SIM																												
1052											Adjust for bogey jinks in heading/altitude/speed.	3	3	1	2	SIM																												
1053					x	x				Perform Advanced Intercept Mission							2	3	3	T		x	x	x																x			
1054											Identify advanced intercepts using GCI information and airborne radar information in search and track modes.	2	1	3	3	IMI																												
1055											Perform advanced intercepts using GCI information and airborne radar information in search and track modes.	3	3	1	2	SIM																												
1056					x	x				Perform Self Escort Strike Mission							2	3	3	T		x	x	x																x			
1057											Identify self escort strike mission procedures.	2	1	3	3	IMI																												
1058											Perform self escort strike mission procedures.	3	3	1	2	SIM																												
1059																																									
1060										WEAPONS EMPLOYMENT																																	
1061				x	x	x				Perform Weapon Systems Employment Procedures							2	3	2	OT	x	x	x	x	x	x							x	x	x	x	x	x	x			
1062											Identify basic weapons terminology and concepts (U.S., Allied and Adversary weapons).	2	1	3	3	IMI																												
1063											Identify types of weapons (air to air, air to ground, mines, stand-off, and nuclear).	2	1	3	3	IMI																												
1064											Identify basic ballistics (Glide, range, wind-effect, and drag).	2	1	3	3	IMI																												

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																															
1065											Identify basic weapons effects of blast, frag, penetration, and combined weapons.	2	1	3	3	IMI																												
1066											Identify basic fuzing technology (proximity, impact, time, IR).	2	1	3	3	IMI																												
1067											Identify components of a missile/bomb (body, fuse, tail, fins).	2	1	3	3	IMI																												
1068											Identify components of a gun (20mm, 30mm, 105 howitzer) .	2	1	3	3	IMI																												
1069											Identify guidance techniques of weapons.	2	1	3	3	IMI																												
1070											Identify fusing techniques of weapons.	2	1	3	3	IMI																												
1071											Identify weapons performance, limitations, employment, and terminology.	2	1	3	3	IMI																												
1072											Identify air-to-air weapons employment (Guidance & fuzing, Notional Valid shot, and WEZ) WEZ-Weapons Engagement Zone.	2	1	3	3	IMI																												
1073											Identify air-to-ground weapons employment (Guidance & fuzing, Valid delivery parameter, and WEZ).	2	1	3	3	IMI																												
1074											Identify air-to-air weapons employment (Guns, Gunsights, and WEZ).	2	1	3	3	IMI																												
1075											Identify basic weaponeering delivery parameters and limitations.	2	1	3	3	IMI																												
1076											Identify the different effects on the target (functional kill, mobility kill) .	2	1	3	3	IMI																												
1077											Identify delivery procedures, profiles, ranges and employment.	2	1	3	3	IMI																												
1078				x	x	x				Operate Non-Radar Sensor Systems							2	3	2	OT	x	x	x	x	x	x						x	x	x	x	x	x	x			
1079											Identify Offensive Weapons Systems.	3	3	1	2	SIM																												
1080											Operate FLIR/LLTV system.	3	3	1	2	SIM																												
1081											Operate NVG offensive system.	3	3	1	2	SIM																												
1082											Identify offensive weapon system types.	2	1	3	3	IMI																												
1083											Identify offensive systems delivery procedures/profiles.	2	1	3	3	IMI																												
1084											Identify offensive system and ranges and employment.	2	1	3	3	IMI																												
1085				x	x	x			x	Perform Air-to-Ground Weapons Delivery Procedures							2	3	2	OT		x	x	x	x	x						x	x	x	x	x	x	x			

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - NIC	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
1086											Communicate with target range control agency.	3	3	1	2	SIM																											
1087											Identify target acquisition procedures.	2	1	3	3	IMI																											
1088											Provide initial dive angle, altitude, and airspeed calls to the pilot on the ICS.	3	3	1	2	SIM																											
1089											Identify when the pilot descends below briefed delivery parameters.	3	3	1	2	SIM																											
1090											Maintain sight of other aircraft in the weapons pattern.	3	3	1	2	SIM																											
1091											Communicate with other aircraft in the weapons pattern.	3	3	1	2	SIM																											
1092											Identify Air-to-Ground Weapons Delivery Procedures.	2	1	3	3	IMI																											
1093											Identify offensive systems in air-to-ground characteristics (Dumb, PGM, CBU, Stand-off, Directed Energy, Inertial Munitions).	2	1	3	3	IMI																											
1094											Employ offensive systems simulated air-to-ground ordinance.	3	3	1	2	SIM																											
1095											Employ offensive systems simulated air-to-ground ordinance.	3	3	1	2	SIM																											
1096				x	x	x			x	Operate Defensive Weapon Systems							2	3	2	OT		x	x	x	x	x			x			x	x	x	x	x	x	x			
1097											Employ chaff, flares, decoys, and IR jamming.	3	3	1	2	SIM																											
1098											Identify defensive systems radar warning receiver.	2	1	3	3	IMI																											
1099											Identify defensive systems infrared warning receiver and IR counter measures.	2	1	3	3	IMI																											
1100										ADVANCED																															
1101				x	x	x				Plan Weapon Systems Employment							2	3	2	OT	x	x	x	x	x	x						x		x	x	x	x	x			
1102											Identify weapon systems delivery basic parameters and limitations.	2	1	3	3	IMI																											
1103											Identify facts and principles of Torpedoes MK-46, MK-50.	2	1	3	3	IMI																											
1104											Identify facts and principles of Mines.	2	1	3	3	IMI																											
1105											Identify facts and principles of MK-80 Series Bombs (500, 1000, 2000 lb).	2	1	3	3	IMI																											
1106											Identify facts and principles of CBU's.	2	1	3	3	IMI																											
1107											Identify facts and principles of Harpoon.	2	1	3	3	IMI																											

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV	
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																															
1108											Identify facts and principles of SLAM-ER.	2	1	3	3	IMI																										
1109											Identify facts and principles of Maverick.	2	1	3	3	IMI																										
1110											Identify facts and principles of HARM.	2	1	3	3	IMI																										
1111											Identify facts and principles of JDAM.	2	1	3	3	IMI																										
1112											Identify facts and principles of JSOW.	2	1	3	3	IMI																										
1113											Identify facts and principles of LGB.	2	1	3	3	IMI																										
1114											Identify facts and principles of Air to Air Missiles.	2	1	3	3	IMI																										
1115											Identify facts and principles of Atomic.	2	1	3	3	IMI																										
1116											Identify facts and principles of BLU.	2	1	3	3	IMI																										
1117											Identify facts and principles of Thermobaric.	2	1	3	3	IMI																										
1118											Identify basics of directed energy weapons.	2	1	3	3	IMI																										
1119											Identify purpose of Buoys.	2	1	3	3	IMI																										
1120											Identify the purpose of SSQ-36, 53, 57, 62, 110.	2	1	3	3	IMI																										
1121											Identify the purpose of Bathythermal, Ambient Noise.	2	1	3	3	IMI																										
1122											Identify effect of Strike package composition to weaponeering and weapons selection.	2	1	3	3	IMI																										
1123											Identify ATO requirements and considerations (ciphering) to strike planning.	2	1	3	3	IMI																										
1124											Identify strike planning composition.	2	1	3	3	IMI																										
1125											Identify tactics and strategy of stand-off weapons.	2	1	3	3	IMI																										
1126						x			x	Perform Airdrop Procedures							2	3	2	OT												x	x	x						
1127											Identify airdrop procedures.	2	1	3	3	IMI																										
1128											Identify airdrop types (BLU-82, troops, supply).	2	1	3	3	IMI																										
1129																																								
1130	MISSION COMMANDER RESPONSIBILITIES																																							
1131	x	x	x	x	x	x	x	x	x	Perform Mission Commander Duties							2	3	3	T	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x			

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																															
1132											Identify mission commander responsibilities in all aspects of planning and execution.	2	1	3	3	IMI																											
1133											Direct aircraft to achieve mission objectives.	3	3	1	2	SIM																											
1134											Direct crew to achieve mission objectives.	3	3	1	2	SIM																											
1135											Identify safety of flight contingencies and solutions to pilot and crew members.	3	3	1	2	SIM																											
1136											Recommend mission deviation or abort for unplanned or discrepancies in aircraft.	3	3	1	2	SIM																											
1137											Recommend mission deviation or abort for unplanned or discrepancies with personnel.	3	3	1	2	SIM																											
1138											Recommend mission deviation or abort for unplanned or discrepancies in flight planning.	3	3	1	2	SIM																											
1139											Recommend mission deviation or abort for unplanned weather conditions.	3	3	1	2	SIM																											
1140											Recommend mission deviation or abort for unplanned or discrepancies in hazardous conditions.	3	3	1	2	SIM																											
1141											Direct flight course deviation to avoid or minimize hazardous meteorological conditions.	3	3	1	2	SIM																											
1142											Direct flight destination deviation to avoid or minimize hazardous meteorological conditions.	3	3	1	2	SIM																											
1143											Calculate adequate fuel reserve for landing.	3	3	1	2	SIM																											
1144											Direct destination deviation based on ETE and fuel consumption is inadequate.	3	3	1	2	SIM																											
1145																																									
1146	SAFETY																																								
1147	x						x			Apply Naval Aviation Safety Program Procedures							1	3	3	MT	x	x	x	x	x	x	x	x		x												

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - NIC	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
1148											Identify the functions, organization, and procedures of the Naval Aviation Safety program as defined in applicable governing directives.	2	1	3	3	IMI																													
1149	x						x			Apply Air Force Aviation Safety Program Procedures							1	3	3	MT							x			x	x	x	x	x	x	x	x	x			
1150											Identify the functions, organization, and procedures of the Air Force Safety program as defined in applicable governing directives.	2	1	3	3	IMI																													
1151	x						x			Apply Flight Safety Reports Regulations							1	3	1	T	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x			
1152											Identify applicable flight safety reports regulations, limited use, and privileged information and their use.	2	1	3	3	IMI																													
1153	x	x	x	x	x	x	x	x	x	Perform Safety Hazards Avoidance Procedures							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
1154											Identify specific flight operations safety hazards.	2	1	3	3	IMI																													
1155											Identify flight operations hazards avoidance procedures.	2	1	3	3	IMI																													
1156											Monitor flight operations hazards avoidance procedures.	3	3	1	2	SIM																													
1157	x						x			Perform Flight Safety Procedures for MidAir Collision Avoidance (MACA) Operation							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
1158											Identify flight safety procedures for MACA.	2	1	3	3	IMI																													
1159											Monitor flight safety procedures for MACA.	3	3	1	2	SIM																													
1160	x						x			Perform Flight Safety Procedures for Bird, Animal Strike Hazard (BASH) Operation							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
1161											Identify flight safety procedures for BASH.	2	1	3	3	IMI																													
1162											Monitor flight safety procedures for BASH.	3	3	1	2	SIM																													
1163	x	x	x	x	x		x	x	x	Monitor Aircraft Operation Parameters as Safety Observer							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
1164											Identify safe aircraft operating parameters.	2	1	3	3	IMI																													
1165											Monitor safe aircraft operating parameters.	3	3	1	2	SIM																													
1166	x	x	x	x	x					Employ ORM Principles and Practices throughout Mission							1	3	3	MT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
1167											Identify ORM principles and practices.	1	2	3	3	INSTR-LED																											
1168											Apply ORM throughout mission from planning through debrief.	3	3	1	2	SIM																											
1169	x	x	x	x	x					Employ Crew Resource Management (CRM) Skills throughout Mission							2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
1170											Identify CRM principles and practices.	1	2	3	3	INSTR-LED																											
1171											Apply CRM throughout mission from planning through debrief.	3	3	1	2	SIM																											
1172	x	x	x	x	x					Demonstrate Effective Leadership Skills throughout Mission							2	3	3	T	x	x	x	x	x	x	x	x	x	xx	x	x	x	x	x	x	x	x			
1173											Identify leadership skills.	1	2	3	3	INSTR-LED																											
1174											Demonstrate leadership skills.	3	3	1	2	SIM																											
1175											Identify crew/flight member skills.	1	2	3	3	INSTR-LED																											
1176											Demonstrate crew/flight member skills.	3	3	1	2	SIM																											
1177											Recognize and reverse hazardous crewmember attitudes.	3	3	1	2	SIM																											
1178	x	x	x	x	x					Demonstrate Effective Communication Skills throughout Mission							2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
1179											Identify effective communications techniques.	1	2	3	3	INSTR-LED																											
1180											Communicate effectively between crewmembers.	3	3	1	2	SIM																											
1181	x	x	x	x	x					Demonstrate Effective Decision Making Skills throughout Mission							2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
1182											Identify effective decision making skills.	1	2	3	3	INSTR-LED																											
1183											Evaluate all data before making a final decision.	3	3	1	2	SIM																											
1184											Assess risk and determine appropriate decisions.	3	3	1	2	SIM																											
1185											State rationale for decisions made.	3	3	1	2	SIM																											
1186	x	x	x	x	x					Demonstrate Effective Mission Analysis Skills throughout Mission							2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
1187											Identify effective mission analysis skills.	1	2	3	3	INSTR-LED																											
1188											Analyze problems and proposed solutions.	3	3	1	2	SIM																											

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
1189											Evaluate safety of flight during mission.	3	3	1	2	SIM																												
1190	x	x	x	x	x					Demonstrate Effective Adaptability/Flexibility Skills throughout Mission							2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
1191											Identify effective adaptability/flexibility skills.	1	2	3	3	INSTR-LED																												
1192											Identify contingencies and alternatives.	3	3	1	2	SIM																												
1193											Utilize available crew and cockpit resources to minimize workload and enhance situational awareness.	3	3	1	2	SIM																												
1194	x	x	x	x	x					Demonstrate Effective Assertiveness Skills throughout Mission							2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
1195											Identify effective assertiveness skills.	1	2	3	3	INSTR-LED																												
1196											Maintain positive and effective attitude throughout the mission.	3	3	1	2	SIM																												
1197											Maintain a proper level of assertiveness.	3	3	1	2	SIM																												
1198											Demonstrate acceptable behavior under stress.	3	3	1	2	SIM																												
1199											Ensure compliance on all checklists for crew positions.	3	3	1	2	SIM																												
1200	x	x	x	x	x					Demonstrate Effective Situational Awareness (SA) Skills throughout Mission							2	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
1201											Identify effective SA skills.	1	2	3	3	INSTR-LED																												
1202											Comply with the SOP and NATOPS while maintaining situational awareness sufficient for flight safety and mission accomplishment.	3	3	1	2	SIM																												
1203											Anticipate tasks to be accomplished during assessment of self and aircraft.	3	3	1	2	SIM																												
1204											Execute tasks to be accomplished during assessment of self and aircraft.	3	3	1	2	SIM																												
1205											Assess self and aircraft in relation to the dynamic environment of flight, threats, and mission.	3	3	1	2	SIM																												

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV	
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																															
1206											Anticipate events that may result in a loss of SA.	3	3	1	2	SIM																											
1207											Maintain SA to accomplish mission objectives.	3	3	1	2	SIM																											
1208											Identify loss of SA.	3	3	1	2	SIM																											
1209											Defend against loss of SA.	3	3	1	2	SIM																											
1210											Reestablish SA after loss.	3	3	1	2	SIM																											
1211											Determine decreased SA and understand strategies to regain SA.	3	3	1	2	SIM																											
1212											Implement strategies to regain SA.	3	3	1	2	SIM																											
1213	x	x	x	x	x	x	x	x	x	Coordinate Crew Duties and Responsibilities							2	3	3	T	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x			
1214											Identify crew roles, duties, responsibilities, and expectations.	1	2	3	3	INSTR-LED																											
1215											Coordinate operational control of aircraft systems.	3	3	1	2	SIM																											
1216	x	x	x	x	x	x	x	x	x	Perform In-Flight Duties using Task Management Skills							2	3	3	T	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x			
1217											Identify task management skills.	1	2	3	3	INSTR-LED																											
1218											Perform required in-flight duties as NFO.	3	3	1	2	SIM																											
1219											Prioritize multiple tasks.	3	3	1	2	SIM																											
1220											Utilize all available resources to manage workload.	3	3	1	2	SIM																											
1221											Accomplish critical tasks without detriment to mission safety.	3	3	1	2	SIM																											
1222											Use standard operating procedures.	3	3	1	2	SIM																											
1223										EMERGENCY PROCEDURES																																	
1224	x	x	x	x	x	x	x	x	x	Respond to Aircraft Emergencies and Malfunctions							3	3	3	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
1225											Maintain an in-depth knowledge of NATOPS/Dash One, SOP, and appropriate directives.	1	2	3	3	INSTR-LED																											
1226											Perform aircraft emergency procedures.	3	3	1	2	SIM																											
1227											React to immediate action emergency procedures.	3	3	1	2	SIM																											
1228											Apply applicable emergency procedures knowledge.	3	3	1	2	SIM																											
1229	x	x	x	x	x	x	x	x	x	Perform Emergency Procedure Checklists							2	3	1	OT	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x			
1230											Apply proper checklist discipline in an emergency situation.	3	3	1	2	SIM																											

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																															
1231											Perform emergency procedure checklists.	3	3	1	2	SIM																											
1232											Coordinate aircraft operation with pilot.	3	3	1	2	SIM																											
1233	x	x	x	x	x	x	x	x	x	Respond to Out of Control Flight/Spin Conditions							2	3	1	OT	x	x	x	x	x	x	x	x			x	x	x	x	x	x	x	x			
1234											Identify out-of-control flight and upright spin.	2	1	3	3	IMI																											
1235											Perform out-of-control flight/spin recovery procedures.	3	3	1	2	SIM																											
1236	x	x								Perform NORDO Procedures							1	3	1	T	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
1237											Identify NORDO procedures.	2	1	3	3	IMI																											
1238											Perform NORDO procedures.	3	3	1	2	SIM																											
1239											Identify aldis lamp procedures.	2	1	3	3	IMI																											
1240																																								
1241	TOTAL FORCE EMPLOYMENT																																							
1242				x	x	x			x	Plan Total Force Employment Missions							1	3	1	T	x			x	x					x	x	x	x	x	x	x	x			
1243											Identify basic concepts of total force employment.	2	1	3	3	IMI																											
1244											Describe the roles, missions, and organization of the Department of Defense and component services.	2	1	3	3	IMI																											
1245											Integrate aircraft packaging to meet mission objectives. (Include SAR, Airlift, Strike, OCA/DCA, ISR, Tanker, Littoral, Joint Service, Combined Force Contributions, Tactical Deception, SEAD. DEAD, Space Operations)	1	2	3	3	INSTR-LED																													
1246				x	x	x			x	Perform Total Force Employment Missions							1	3	1	T										x	x		x	x							
1247											Integrate Intel resources personnel and sources during mission.	2	1	3	3	IMI																											
1248											Identify missions, characteristics, and employment of Army weapons systems. (Include GFAC, TAC-P, ALOs, LNOs and US air defense systems)	2	1	3	3	IMI																											
1249											Identify missions, characteristics, and employment of Navy/USMC weapons systems. (Include GFAC, TAC-P, ALOs, LNOs and US air defense systems)	2	1	3	3	IMI																											

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																															
1250											Identify missions, characteristics, and employment of space systems.	2	1	3	3	IMI																										
1251						x				Perform Information Warfare Procedures							1	3	1	T	x			x	x					x	x	x	x	x	x	x	x			
1252						x				Operate Computer Network Operations (CNO) Systems							1	3	1	T	x			x	x					x	x	x			x	x	x	x			
1253											Identify basic concepts of information warfare procedures.	2	1	3	3	IMI																										
1254											Identify basic CNO systems.	2	1	3	3	IMI																										
1255											Identify terms, characteristics, and concepts of Information Operations and Information Warfare.	2	1	3	3	IMI																										
1256											Identify integration of CNO and EW concepts.	2	1	3	3	IMI																										
1257											Identify integration of stealth, low observable, UAVs and EW concepts.	2	1	3	3	IMI																										
1258											Identify integration of UAV operations concepts.	2	1	3	3	IMI																										
1259						x				Integrate Unmanned Aerial Vehicle (UAV) Missions							1	1	1	MT										x				x	x							
1260											Identify roles and types of UAV mission.	2	1	3	3	IMI																										
1261											Identify strengths and weaknesses of UAV missions.	2	1	3	3	IMI																										
1262											Identify UAV operational considerations.	2	1	3	3	IMI																										
1263						x				Integrate Space Operations Procedures							1	3	1	T										x											
1264											Identify capabilities, limitations, roles and functions of on-orbit space systems.	2	1	3	3	IMI																										
1265											Identify capabilities, limitations, roles and functions of space launch systems.	2	1	3	3	IMI																										
1266						x				Perform Tactical Deception Procedures							1	1	1	MT				x	x					x	x	x	x	x	x	x	x	x			
1267											Identify basic concepts of tactical deception procedures.	2	1	3	3	IMI																										
1268											Identify the purpose of tactical deception.	2	1	3	3	IMI																										
1269											Identify tactical deception methods and functions.	2	1	3	3	IMI																										
1270																																									
1271	ELECTRONIC WARFARE																																								

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	Panel NAV					INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
3							P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title																															
1272						x		x		Operate the Aircraft in an Electronic Warfare (EW) Environment							2	3	3	T		x		x						x	x	x	x	x	x	x	x	x			
1273											Identify definitions of common electronic warfare terms.	2	1	3	3	IMI																										
1274											Identify the characteristics of electromagnetic energy & the electromagnetic spectrum.	2	1	3	3	IMI																										
1275											Identify the function and characteristics of electronic components.	2	1	3	3	IMI																										
1276											Identify the functions and characteristics of transmitters and receivers and their components.	2	1	3	3	IMI																										
1277											Identify the characteristics and applications of communication systems.	2	1	3	3	IMI																										
1278											Identify the function and characteristics of pulse modulated signals and equipment.	2	1	3	3	IMI																										
1279											Identify the radar terms, parameters, and characteristics.	2	1	3	3	IMI																										
1280											Identify the antenna types, characteristics, radiation patterns and their uses.	2	1	3	3	IMI																										
1281											Identify characteristics of radar scan types and their uses.	2	1	3	3	IMI																										
1282											Identify the characteristics of selected radar tracking methods.	2	1	3	3	IMI																										
1283											Identify the characteristics of direct threat radars.	2	1	3	3	IMI																										
1284											Identify the characteristics of IFF systems and their signals.	2	1	3	3	IMI																										
1285											Identify the characteristics of advanced multimode radars.	2	1	3	3	IMI																										
1286											Identify the characteristics of specialized radars.	2	1	3	3	IMI																										
1287											Identify the characteristics, principles of operation, and applications of selected electro-optical (EO) devices.	2	1	3	3	IMI																										
1288											Identify the characteristics and application(s) of common jamming techniques.	2	1	3	3	IMI																										

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
1289											Identify the characteristics and application(s) of radar, EO, IR, C2W, and laser protection techniques.	2	1	3	3	IMI																											
1290											Identify the NATO names and designations of air defense systems.	2	1	3	3	IMI																											
1291											Identify the signal parameters, characteristics, and capabilities of air defense systems.	2	1	3	3	IMI																											
1292											Identify signals associated with air defense systems, using a generic ES system.	2	1	3	3	IMI																											
1293											Identify roles and functions of signals associated with air defense systems.	2	1	3	3	IMI																											
1294											Identify hostile EW capabilities and employment.	2	1	3	3	IMI																											
1295											Identify the characteristics and effects of directed energy weapons. (lasers, RF, etc)	2	1	3	3	IMI																											
1296						x		x		Perform Electronic Threat Defensive Procedures							2	3	3	T		x		x						x	x	x	x	x	x	x	x	x			
1297											Identify the characteristics and application(s) of detection techniques employed by aircraft defensive suites.	2	1	3	3	IMI																											
1298											Identify characteristics of selected detection systems used in aircraft defensive suites.	2	1	3	3	IMI																											
1299											Identify representative penetration aircraft's detection systems, using a generic aircraft defensive suite training system.	2	1	3	3	IMI																											
1300											Identify characteristics and application(s) of physical deception for aircraft defensive systems.	2	1	3	3	IMI																											
1301						x		x		Perform Electronic Threat Offensive Procedures							2	3	3	T				x						x	x	x	x	x	x	x	x	x			
1302											Identify characteristics and application(s) of self-protection jamming techniques.	2	1	3	3	IMI																											
1303											Identify characteristics of selected self-protection jamming systems.	2	1	3	3	IMI																											

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
1304											Identify characteristics and effects of directed energy weapons. (lasers, RF, etc)	2	1	3	3	IMI																											
1305											Identify characteristics of selected physical deception systems.	2	1	3	3	IMI																											
1306											Identify a representative aircraft's self-protection jamming systems.	2	1	3	3	IMI																											
1307											Identify a representative aircraft's expendables.	2	1	3	3	IMI																											
1308											Identify self-protection techniques unique to the penetration mission.	2	1	3	3	IMI																											
1309											Identify mission planning requirements for conducting missions in hostile areas.	2	1	3	3	IMI																											
1310						x		x		Perform Intelligence Surveillance / Reconnaissance Procedures							2	3	3	T				x						x	x	x	x	x	x	x	x	x			
1311						x		x		Perform Electronic Surveillance							2	3	3	T				x						x	x	x	x	x	x	x	x	x			
1312											Identify the functions of the intelligence community as it relates to ELINT collection.	2	1	3	3	IMI																											
1313											Identify the ELINT tasking cycle and tasking authorities for ES assets.	2	1	3	3	IMI																											
1314											Identify the roles, capabilities, and connectivity of ES assets.	2	1	3	3	IMI																											
1315											Identify the functions of EW resources.	2	1	3	3	IMI																											
1316											Identify the functions of ELINT documents.	2	1	3	3	IMI																											
1317											Identify the flow of ES data dissemination.	2	1	3	3	IMI																											
1318											Identify the basics of parametric measurement.	2	1	3	3	IMI																											
1319											Identify the ES mission planning documents and procedures.	2	1	3	3	IMI																											
1320											Identify the parameters of radar signals.	2	1	3	3	IMI																											
1321											Identify the receivers in the reconnaissance suite.	2	1	3	3	IMI																											
1322											Identify the receivers in the reconnaissance suite of the T25.	2	1	3	3	IMI																											
1323											Identify the procedures to disseminate ES data.	3	1	3	3	IMI																											
1324											Complete ES mission requirements.	2	1	3	3	IMI																											
1325											Record an Electronic Order of Battle.	2	1	3	3	IMI																											

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AC
1												Media Analysis					DIF Model				Pipeline																					
2								Panel NAV																																			
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
1326											Maintain an Electronic Order of Battle.	3	3	1	2	SIM																												
1327						x		x		Perform Self Protection Procedures							2	3	3	T				x			x			x	x	x	x	x	x	x	x	x			
1328											Identify the characteristics and application(s) of detection methods.	2	1	3	3	IMI																												
1329											Identify the characteristics of selected detection systems.	2	1	3	3	IMI																												
1330											Identify the T25 penetration suite detection systems.	2	1	3	3	IMI																												
1331											Identify the characteristics and application(s) of jamming techniques.	2	1	3	3	IMI																												
1332											Identify the characteristics of selected jamming systems.	2	1	3	3	IMI																												
1333											Identify the characteristics and application(s) of physical deception.	2	1	3	3	IMI																												
1334											Identify the characteristics of selected physical deception systems.	2	1	3	3	IMI																												
1335											Identify the T25 penetration suite jamming systems.	2	1	3	3	IMI																												
1336											Identify the T25 penetration suite expendables.	2	1	3	3	IMI																												
1337											Identify the self protection techniques unique to the penetration mission.	2	1	3	3	IMI																												
1338											Identify mission planning requirements unique to the penetration mission.	2	1	3	3	IMI																												
1339						x		x		Perform Electronic Attack Procedures							2	3	3	T				x							x	x		x	x	x	x	x			
1340											Identify terms, characteristics, and concepts of information operations and information warfare.	2	1	3	3	IMI																												
1341											Identify EW integrated reprogramming functions and mechanisms.	2	1	3	3	IMI																												
1342											Identify integration of Low Observable (LO) technology and EW.	2	1	3	3	IMI																												
1343											Identify integration of Computer Network Operations (CNO) and EW.	2	1	3	3	IMI																												
1344											Identify the roles, missions, and organizations of the Department of Defense (DoD) component services.	2	1	3	3	IMI																												

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																					
2							Panel NAV																																				
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
1345											Identify the missions, characteristics, and employment of Army and Navy assets.	2	1	3	3	IMI																												
1346											Identify the terms, characteristics, and concepts of information warfare.	2	1	3	3	IMI																														
1347											Identify navigation warfare targets, techniques and countermeasures.	2	1	3	3	IMI																														
1348											Identify EW integrated reprogramming functions and mechanisms.	2	1	3	3	IMI																														
1349											Identify hostile EW capabilities and employment.	2	1	3	3	IMI																														
1350											Identify the characteristics and effects of directed energy systems.	2	1	3	3	IMI																														
1351											Identify statements concerning the integration of stealth and EW.	2	1	3	3	IMI																														
1352											Identify an integrated package of aircraft to meet mission objectives.	2	1	3	3	IMI																														
1353						x		x		Perform Radar Signal Interpretation Procedures							2	3	3	T				x						x	x	x		x		x	x	x			
1354											Identify ELINT notations (ELNOTs) for priority radars.	2	1	3	3	IMI																														
1355											Identify components of a typical ES reconnaissance suite.	2	1	3	3	IMI																														
1356											Identify capabilities of a typical ES reconnaissance suite.	2	1	3	3	IMI																														
1357											Identify the determining signal parameters.	2	1	3	3	IMI																														
1358						x		x		Plan SEAD/DEAD Missions							2	3	3	T				x						x	x			x	x	x	x	x			
1359						x		x		Perform SEAD/DEAD Missions							2	3	3	T				x						x	x			x	x	x	x	x			
1360											Identify the Concepts of Suppression of Enemy Air Defenses (SEAD), to include Destruction of Enemy Air Defenses (DEAD).	2	1	3	3	IMI																														
1361											Identify the missions, equipment, and employment of SEAD aircraft.	2	1	3	3	IMI																														
1362											Identify planning considerations for using SEAD assets to protect a strike package.	2	1	3	3	IMI																														
1363											Identify the jammers and expendable systems in the SEAD suite of the T25 SECT.	2	1	3	3	IMI																														
1364											Identify target radar signals.	2	1	3	3	IMI																														

NFO/CSO Job Task Inventory (JTI)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1												Media Analysis					DIF Model				Pipeline																				
2							Panel NAV																																			
3	Primary	Intermediate	ADV - N/C	ADV - S	ADV - S/F	EW	P	I	A	Recommended Task Title	Recommended Enabling Learning Objective Title	INSTRUCTOR-LED	IMI LEVEL III	SIMULATOR	AIRCRAFT	RECOMMENDATION	DIFFICULTY	IMPORTANCE	FREQUENCY	TRAIN	E-2C	F/A-18D	F/A-18F	Intl Fighter	S-3	EA-6B	E-6	P-3	E-3	E-8	KC-135	C-130	HC/MC/AC/EC-130 NAV	MC/AC/EC-130 EWO	B-52 NAV	B-52 EWO	B-1	F-15E	RC/OC/WC-135 NAV	RC/OC/WC-135 EWO	UAV
1365											Identify the proper procedures to be accomplished during each SEAD mission phase.	2	1	3	3	IMI																											
1366											Identify the SEAD mission planning procedures.	2	1	3	3	IMI																											
1367											Employ SEAD tactics.	2	1	3	3	IMI																											
1368											Complete SEAD mission requirements.	2	1	3	3	IMI																											
1369						x		x		Perform the Assigned Mission in an IADS Environment							2	3	3	T				x						x	x	x	x	x	x	x	x	x			
1370											Identify NATO names and/or common designations of air defense systems.	2	1	3	3	IMI																											
1371											Identify ELINT parameters, characteristics, and capabilities of air defense systems.	2	1	3	3	IMI																											
1372											Identify the characteristics and capabilities of an air defense system.	2	1	3	3	IMI																											
1373											Identify the ELINT parameters.	2	1	3	3	IMI																											
1374											Identify the ELINT parameters and associated air defense system types.	2	1	3	3	IMI																											
1375											Identify a notional or real Integrated Air Defense System (IADS).	2	1	3	3	IMI																											
1376											Identify components of the ADS reconnaissance suite.	2	1	3	3	IMI																											
1377											Identify operating the ADS reconnaissance suite.	2	1	3	3	IMI																											
1378											Identify the performing signal analysis.	2	1	3	3	IMI																											
1379											Identify the signals associated with air defense systems.	2	1	3	3	IMI																											
1380											Identify the roles and functions of signals associated with air defense systems.	2	1	3	3	IMI																											
1381											Identify the characteristics and capabilities of an Integrated Air Defense System (IADS).	2	1	3	3	IMI																											
1382											Identify key strengths, weaknesses, and characteristics of an Integrated Air Defense System (IADS).	2	1	3	3	IMI																											