Initial Report

# UMFO TRAINING SITUATION ANALYSIS

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Prepared For:

NAWC
Training Systems Division
NAVAL AIR WARFARE CENTER

3251 Progress Dive
Orlando, FL 32826-3224

Prepared By:

JIL
INFORMATION SYSTEMS

3251 Progress Drive
Orlando, FL 32826

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# OVERVIEW of MAJOR RECOMMENDATIONS

The following recommendations should be considered as a package, not as individual stand-alone options. This initial report provides an abbreviated rationale and justification. The final deliverables will amplify the comments and include additional documentation.

1. Contract an instructional design team composed of an instructional designer and subject matter expert (former NFO instructor) for one base and two option years.
2. Retain a multi-place training aircraft at TRAWING 6.
3. Replace the eight Familiarization flights in Primary phase with five Familiarization/ Situational Awareness flights.
4. Overhaul the 2B-47 to an ANAV/VNAV/SA simulator with voice recognition software, three-screen visuals and the capability to collect data on SA-related behaviors.
5. Install communications commercial off-the-shelf software into the computer lab.
6. Replace two T-34C ANAV flights with two ANAV simulator events.
7. Add three VNAV simulator events.
8. Add a digital video recording and playback system to 15 T-39 aircraft.
9. Upgrade four electronic classrooms to I-AEC standards.
10. Replace 171.5 hours of classroom instruction with interactive courseware or computer-based training.
11. Add 34.5 hours of computer-aided instruction to instructor-led lessons.

**Major Costs at a Glance**

- 15 ANAV/VNAV/SA Simulators: $2,380K
- 15 digital video recording/playback systems: $1,260K
- 171.5 hours of new/revised ICW & CBT: Maximum of $798K (with no instructor billets deleted)
- Upgrade four Electronic Classrooms to I-AEC standards: $537K
- Instructional Design Team (one year): $275K
- 34.5 hours of CAI: $138K

**Total: $5,388K**

**Cost Reductions**

| | |
|---|---|
| • 4.5 T-34C flight hours x 550 Primary students | 2475 |
| • 4.0 T-34C flight hours x 416 Intermediate students | 1664 |
| **Total** | **4139** |

# INTRODUCTION

## Situation Awareness

The need for Situation Awareness (SA) by military flight officers (MFO) now, and increasingly so in the immediate future, evolved as a driving and unifying factor of this study. The competencies of graduating MFOs judged to be weakest in a survey of FRS and Training Wing Six instructors were human factors skills: Communications, Co-piloting skills, Situation Awareness and Crew Coordination. The four skills were found to be highly correlated statistically and practically. SA as discussed in this report has a great deal of overlap with the other human factors skills above. An analysis of the potential demands upon MFOs in the year2006 found that multi-tasking and information overload would emerge as the chief threats to performance, requiring an even greater degree of SA skills.

Because Training Wing Six had few objectives or assessment instruments for training and testing SA, the JIL team collaborated with research psychologists from NAWCTSD and the University of Central Florida to investigate SA-related behaviors as applied to the UMFO program. The results will be reported in the end of project deliverables of this contract. SA objectives were written for an amended list of behaviors and inserted into Integreator, the media analysis tool used in this project.

During in-process review two (IPR-2), the JIL team was specifically tasked with considering each objective in the curriculum on the merit of its required behavior, independent of context, during the media analysis. When the objectives are approached in this manner, only those requiring vestibular stimulation of the senses must be learned while airborne: the acrobatics in the Primary phase and tactical maneuvering in the Advanced phase.

When SA is considered, however, a second critical need for flight hours becomes readily apparent. The MFO must perform the required individual behaviors within a multi-tasking, time-constraining and stress-inducing environment. This context mandates airborne training and assessment. This is in keeping with the results of the FRS survey. When asked which of the MFO competencies must be learned in the air, 70 percent of the respondents selected SA. We believe that emerging advances in human factors research and in technology can provide effective prerequisite training on the deck.

The media analysis included an evaluation of every MFO behavior required by every flight in the curriculum. The final report will include a set of tables that assign an objective to each of these behaviors. It allows analysis of the development of skills across the curriculum, including SA. The recommendations of this Training Situation Analysis weigh heavily the concerns of the Fleet and those raised by the SA task analysis for enhancing the development of SA-related skills in UMFO students.

### Considerations

There are several factors that should be considered when judging the merit of the recommendations. First, this report contends that the student is best served by substituting a simulator for eight and one-half hours of flight time. As stated above, we know that flight time is critical to the development of SA. We recognize that there is some number of MFO flight hours that constitute a critical mass for developing FRS-ready graduates. It is impossible to accurately predict that number, made all the more difficult when considering the receiving aircraft communities. We believe that we have made responsible and well reasoned substitutions that build, not reduce, SA.

Second, we believe that the recommendations are fiscally sound. It is anticipated that the five-year cost savings on operating costs alone will pay for the simulators. The impact on the maintenance contract and reduction in aircraft inventory should support the other recommended changes.

Third, the media analysis recommends the development and use of both computer-aided instruction (CAI) for instructor-led courses and interactive courseware (ICW) for individualized learning. The benefits are reduced cost and flexibility to manage "white space." We DO NOT recommend this strategy unless the recommendation for the ISD team described in this report is also adopted (Appendix pages 31-32). There are already hundreds of thousands of dollars invested in media that is unused. We do not want to add to that problem.

Finally, we feel that wherever computerized instruction is used, a review with an instructor led question and answer period should precede testing. We feel that all testing should be converted to ICW to allow for automated data management and flexible testing techniques.

## MEDIA ANALYSIS

### Recommendations

The recommendations are keyed to the line items of Table I (pages 1-8) and Table 7 (pages 25-30) in the Appendix. Table 1 is pulled directly out of the Section I, Training Summary of each of the respective CNATRA Master Curriculum Guides. This enables a quick assessment of the impact of a given recommendation on the present curriculum

### PRIMARY PHASE

**I-1. Delete three T-34C Familiarization flights from the Primary curriculum.** Actually, we recommend that all eight of the present Familiarization flights be replaced by five Familiarization/SA flights. The present flights teach the student to fly the T-34 aircraft up to, but not including solo flight. They were added to enhance the development of SA. We feel that SA would be better served by providing the student with better simulation prior to the first flights than what is presently available on the 2B-47. Research has found that conducting

training in a stressful target environment early in the learning process can be detrimental to learning complex skills. Then, provide flights that promote skills proven to be related to building SA in MFOs. The SA task analysis conducted by this study enables us to identify these skills. The flights would still provide the required acrobatics exposure and the simulator would enable both simulated stick time and collection of SA-related data.
**Savings: Indeterminate.**

**I-2. Modify the 2B-47 simulator.** Pages 20-23 of the Appendix contain a description of the recommended simulator and a ROM of the cost provided by ECC. The simulator would address the fleet concerns with weak communication skills through the use of speech recognition software. It would provide opportunities for the student to practice flying the Fam flight routes and would collect SA data on response times, point-to-point navigation, etc. Fifteen simulators would accommodate large classes in two shifts and still provide access for the ANAV and VNAV events recommended below. This device would help students to begin to develop "individual" SA skills and provide instructors with early identification of those needing remediation.
**Purchase Cost: $2,379,670.00**

**I-3. Provide a COTS Communications trainer in the Learning Resource Center (LRC).** During IPR-2, a suggested COTS trainer was demonstrated. This would provide ongoing opportunities for the student to practice communication skills early in the curriculum. The ability to listen to one's own calls in comparison to an expert is seen as a real advantage.
**Purchase Cost: $5000.00**

**I-4. Add Communications ICW.** This program would replace the existing instructor-led course. If the COTS above is modified to address military protocols, the time would be decreased to 3 hours.
**Purchase Cost: $34,650.00**
**Annual Savings: $5920.20**

**I-5 Develop ICW for the Instrument Navigation course; use existing COTS.** This course content is well suited for ICW. It could use low-cost, interactive graphics that would be far more effective than the present course. The RIOT trainer would still be used in conjunction with this course.
**Purchase Cost: $66,000.00**
**Annual Savings: $18,790.20**

**I-6. Delete three Airways Nav Prep simulator events.** This recommendation is not as radical as it may seem. The events only exist to reintroduce the student to the 2B-47 after having made eight Fam flights that did not exercise the skills they had been learning on the simulator. The sessions are actually open labs, where students are free to attend or not.
**Annual Savings: None**

**I-7. Develop ICW for the Meteorology lesson.** This is another course that lends itself well to ICW and provides academic flexibility for students who may lose a flight due to weather, maintenance, etc.
**Purchase Cost: $40,000.00**
**Annual Savings: $10,296.00**

**I-8. Develop ICW for the Flight Planning lesson.** By using ICW, the student can be tested in a variety of ways that do not lock the instructor into a multiple-choice testing environment.
**Purchase Cost: $64,000.00**
**Annual Savings: $14,414.40**

**I-9. Develop CBT for the T-34C NATOPS lesson.** This course is list as CBT (computer-based training) rather than ICW because much of it can be developed as inexpensive level-1 interactivity courseware.
**Purchase Cost: $103,350.00**
**Annual Savings: $19,305.00**

**I-10. Add a university course in Info Mgt via interactive TV.** The network-based warfare battlespace demands that MFOs become skilled information managers. Due to the rapidly changing technical environment, the students need a continuously updated, cutting edge course. The interactive television site can be used for teleconferences as well—perhaps with FRS sites.
**Purchase Cost: $56,000.00**
**Annual Costs: $58,100.00**

## INTERMEDIATE PHASE

**II-1. Delete two T-34C ANAV flights.** The opportunity to practice complex skills in a multi-tasking environment is critical and the need for a number of ANAV flights in the
curriculum is well justified. However, transfer of skills is best served in a context with multiple practice events by providing a wide range of contexts. Two flights would be replaced with simulated events with very different missions, but using the same ANAV skills. This would also allow the Wing to collect SA data on the students as they progress into the Intermediate phase. Understanding of the development of SA skills across the curriculum is essential to making real progress in enhancing the training effectiveness.
**Savings: Indeterminate**

**II-2. Delete one Operational Flight Trainer event.** This is Module 18 in the Intermediate curriculum. Four INAV simulator events and 14 lectures (ACT/CRM and Visual Navigation) have intervened since the four ANAV flights in Primary. Lockheed-Martin instructors consider this a reintroduction to the simulator. By taking the action described in II-3 below, this event is not required.

**Annual Savings: $34,070.40**

**II-3. Rewrite the INAV 1-4 simulator events as Intermediate OFTs.** This simulator event has very weak correlations to the target aircraft behaviors and to other simulator events (Appendix, page 9). The flight profiles were rewritten three years ago, and according to the Lockheed-Martin Assistant Site Manager, no longer match the profiles flown. He recommends rewriting them as OFT events, a reasonable solution.
**No anticipated costs to be incurred.**

**II-4. Add two ANAV simulator events.** These events replace the two flights cut above. The events would be flown with an NFO and student, one-on-one, as opposed to the classroom concept used in Primary.
**Annual Cost: $68,140.80**

**II-5. Add three VNAV simulator events.** The UMFO program currently has no visual simulator. The negative impact on training is compounded by the rural environment in which flight training is conducted in Pensacola; it is difficult to recognize many of landmarks. In addition to the benefits for VNAV flight preparation, a survey of instructors found that they felt that SA training would be greatly enhanced by adding a visual simulator (Appendix, page 24).
**Annual Cost: $102,211.20**

**II-6. Add CAI graphics for instructor use in the Visual Navigation lesson. Move the lectures closer to the VNAV simulator events and flights.** The graphics can be inexpensively repurposed from the VNAV simulator. The lectures should just precede the simulator and flight events.
**Purchase Cost: $36,000.00**

**II-7. Convert the T-1A NATOPS course to CBT.** The course received low marks on the survey. We feel that instructor contact is not required for this course.
**Purchase Cost: $116,600.00**
**Annual Savings: $19,094.40**

## ADVANCED CORE

**III-1. Add additional T-39 instruments to the GMRTS simulator.** This has been requested by instructors to add some realism to the simulator. The Master Caution Panel and selected instruments could be added inexpensively in-house by NAWCTSD.
**This would be a low-cost initiative undertaken by existing contract.**

**III-2. Convert T-39 NATOPS to CBT.** Same rationale as for T-34 and T-1A NATOPS.

**Purchase Cost: $143,100.00**
**Annual Savings: $32,221.80**

**III-3. Convert T-39 Flight Preparation to ICW.** The course content is stable and lends itself well to ICW.
**Purchase Cost: $113,400.00**
**Annual Savings: $21,481.20**

**III-4. Add CAI to the Low Level and Radar Planning lesson.** The Radar Planning curriculum received low marks from the FRSs. Quality graphics and animations will enhance the effectiveness.
**Purchase Cost: $28,000.00**
**III-5. Add CAI to the Low Level and Radar Navigation lesson.** Similar to III-4.
**Purchase Cost: $28,000.00**

**III-6. Convert the Turnpoint Procedures course to ICW.** The content is very procedural and the students already have prerequisite skills in these procedures.
**Purchase Cost: $44,100.00**
**Annual Savings: $8353.80**

**III-7. Add CAI and COTS to the Aircraft Carrier (CV) Procedures lesson.** This course received the lowest score on the FRS survey and many negative comments. Students have difficulty in perceiving the "stack" and the whole CV operating environment. Adding 3-D animations and quality graphics will help immensely. Also, we recommend the purchase of a computer game of making CV launches and arrested landings. (The NAWCTSD Instructional Gaming engineers have this for action.)
**Purchase Cost: $2500.00**

**III-8. Convert Instrument Ground School to ICW.** As discussed in the Instrument Navigation lesson in Primary, ICW is used to good advantage in this type of lesson.
**Purchase Cost: $81,900.00**
**Annual Savings: $15,514.20**

**III-9 Convert the Strike Phase exam to ICW.** The rationale was presented earlier.
**Purchase Cost: $12,600.00**
**Annual Savings: $1591.20**

## ADVANCED STRIKE

**IV-1 Add CAI to the Radar Terrain Interpretation lesson.** The instructor needs quality graphics to be most effective in presenting this information.
**Purchase Cost: $12,000.00**

**IV-2 Convert Composite Strike Planning to ICW.** The BDHI problems, mathematical analyses and color maps would be best presented in ICW.
**Purchase Cost: $18,900.00**
**Annual Savings: $3159.00**

## ADVANCED STRIKE FIGHTER

**V-1 Add CAI to the Air Intercept Radar lesson.** The three-dimensional space in which the lesson is presented requires 3-D graphic animations to adequately present the concepts.
**Purchase Cost: $10,000.00**

**V-2 Add CAI to the Fighter Environment lesson.** The rationale is the same as for V-1 above.
**Purchase Cost: $24,000.00**

**V-3 Convert the Intercepts examination to ICW.** The rationale was presented earlier.
**Purchase Cost: $12,600.00**
**Annual Savings: $655.20**

## ADVANCED TACTICAL MANEUVERING

**VI-1 Add CAI to the ATM lesson.** As with the airborne intercept lessons, 3-D animations are critical to this subject matter.
**Purchase Cost: $40,000.00**

**VI-2 Convert the Final Phase exam to ICW.** The rationale was presented earlier.
**Purchase Cost: $12,600.00**
**Annual Savings: $748.80**

## SUMMARY

The curriculum changes recommended above were designed to enhance the development of Situation Awareness, while adding continuity to the flow of information. The project instructional designer worked very closely with a team member who is an NFO instructor with a large number of flight hours.

What was not taken into consideration were the myriad of considerations that a commanding officer faces in the current aviation environment such as recruitment, retention and morale. These are important factors that remain to be addressed by the government in making decisions concerning the recommendations of this study.

However this set of recommendations is perceived, it is clear to the JIL team that the instructional staff of TRAWING Six needs instructional design support. There are a number of issues surrounding the curriculum that should be addressed. Merely informing the instructors of what changes are required is insufficient. The need and deserve professional assistance in developing quality instructional materials.

In beginning this study, the JIL team was concerned about the impact of outdated instructor guides on the standardization of the curriculum. After interacting with TW6 instructors for the past year, the team recognizes the importance of beginning lesson rewrite efforts with the current PowerPoint presentations developed by conscientious instructors with recent fleet experience. Any effort to develop instructional materials in an off-site vacuum are doomed to fail. It will take a great deal of interaction with the instructors to develop ICW and CAI that hits the mark and will be used in the classrooms and computer lab.

## Table 1. Media Analysis Synopsis by Current Curriculum

### I. PRIMARY

**RECOMMENDATIONS**

#### FLIGHT TRAINING

| STAGE | SYMBOL | EVENTS | HRS | TOTAL HOURS | | |
|---|---|---|---|---|---|---|
| T-34C Familiarization | FAM | 8 **(5)** | | 2.0* | 14.5 **(10)** | **DELETE 3 FLIGHTS** (I-1) |
| T-34C Airways Navigation | ANAV | 4 | 2 | 8.0 | | |
| TOTALS | | 12 **(9)** | | 22.5 **(18)** | | |

* FAM 1, 2, and 7 are 1.5 hours vice 2.0.

#### SIMULATORS/TRAINERS

| STAGE | SYMBOL | EVENTS | HOURS | TOTAL HOURS | |
|---|---|---|---|---|---|
| 2B37 Cockpit Proc Trainer | CPT | 3 | 1.5 | 4.5 | |
| 2B37 Instrument Nav Sim | OFT | 4 | 1.5 | 6.0 | |
| **2B47 Inst. Nav Trainer**** | **XX** | 8 | 2.0* | 15.0 | **MODIFY SIMULATOR** (I-2) |
| **COTS Comm Practice** | **CP** | **2** | **1.5** | **3.0** | **ADD** (I-3) |
| TOTALS | | 15 **(17)** | | 25.5 **(28.5)** | |

* TP 0 is 1.0 hours vice 2.0; ** **Modified Communications/Navigation/Visual/Situation Awareness Simulator**

#### FLIGHT SUPPORT

| SUBJECT | SYMBOL | PERIODS | TOT HRS | PRESENT MEDIA | **RECOMMENDED MEDIA (by exception)** |
|---|---|---|---|---|---|
| Safety | SAF | 1 | 1.0 | EC/CAI | |

CR = Classroom; EC = Electronic Classroom; CAI = Computer Assisted Instruction; ICW = Interactive Courseware; CBT = Computer-Based Training; COTS = Commercial-Off-The-Shelf software; Sim = Simulator; PP = PowerPoint.

| | | | | | |
|---|---|---|---|---|---|
| Communications | COMM | 3 | 5.5 | EC/PP | **5.5 HRS ICW/COTS** (I-4) |
| Instrument Nav | BINAV | 10 | 16.5 | CR/COTS | **ICW/COTS** (I-5) |
| Familiarization Prep | FAMP | 6 | 10.0 | EC/PP/ICW | |
| Air Crew Coord | ACT | 1 **(2)** | 3.0 **(5)** | EC/PP/Videos | |
| Airways Nav Prep | ANP | 3 **(0)** | 4.5 **(0)** | Sim | **DELETE 3 SIMS** (I-6) |
| Bailout Training | BOT | 1 | 3.0 | Bailout Trainer | |
| T-34C Fam | FAM-0 | 1 | 3.0 | Static T-34 | |
| Radio Instrument Nav Practice | RIOT | 3 | 3.0 | ICW Lab | |
| Totals | | 27 **(25)** | 49.5 **(47)** | | |

ACADEMIC

| SUBJECT | SYMBOL | PERIODS | TOT HRS | PRESENT MEDIA | RECOMMENDED MEDIA (by exception) |
|---|---|---|---|---|---|
| Meteorology | MET | 5 | 10.0 | EC/PP | **ICW** (I-7) |
| Flight Info Pubs | FLIP | 9 | 14.0 | ICW (anticipated) | |
| Flight Planning | FPLN | 6 | 16.0 | EC/PP | **ICW** (I-8) |
| T-34C Aircraft Sys | NAMO | 1 | 16.0 | CR/Panel Trainer | |
| T-34C NATOPS | NATOPS | 9 | 19.5 | EC/PP | **19.5 HRS OF CBT** (I-9) |
| **Info Management** | **INFO** | **7** | **14.0** | | **UNIVERSITY (INTERACTIVE TV)** |
| TOTALS | | 30 | 75.5 **(89.5)** | | |

ADMINISTRATIVE

| SUBJECT | SYMBOL | PERIODS | TOTAL HOURS |
|---|---|---|---|
| Student Check-In | ADM | 15 | 13.1 |
| Simulator Indoctrination | ADM | 1 | 1.0 |
| Primary Grad and Checkout | ADM | 1 | 0.5 |
| TOTALS | | 17 | 14.6 |

CR = Classroom; EC = Electronic Classroom; CAI = Computer Assisted Instruction; ICW = Interactive Courseware; CBT = Computer-Based Training; COTS = Commercial-Off-The-Shelf software; Sim = Simulator; PP = PowerPoint.

## II. INTERMEDIATE

### T-34C FLIGHT TRAINING

| STAGE | SYMBOL | EVENTS | HRS | TOTAL HOURS | RECOMMENDATIONS |
|---|---|---|---|---|---|
| T-34C ANAV/VNAV Chk | AVX | 1 | 2.0 | 2.0 | |
| T-34C Visual Nav | VNAV | 4 | 2.0 | 8.0 | |
| T-34C Formation | FORM | 2 | 2.0 | 4.0 | |
| T-34C Airways Nav | ANAV | 11 **(9)** | 2.0 | 22.0 **(18)** | **DELETE 2 FLIGHTS** (II-1) |
| TOTALS | | 18 **(16)** | | 36.0 **(32)** | |

### T-1A FLIGHT TRAINING

| STAGE | SYMBOL | EVENTS | HRS | TOTAL HOURS |
|---|---|---|---|---|
| T-1A Airways Nav | ANAV | 4 | 1.5* | 7.6 |
| T-1A Low Level (Vis Nav) | VNAV | 3 | 1.1 | 3.3 |
| T-1A ANAV/VNAV. Check | AVX | 1 | 2.4 | 2.4 |
| TOTALS | | 8 | | 13.3 |

* ANAV 18 & 19 are 2.3 hours vice 1.5.

### SIMULATORS

| STAGE | SYMBOL | EVENTS | HRS | TOTAL HOURS | |
|---|---|---|---|---|---|
| 2B37 Op Flight Trainer | OFT | 1 **(0)** | 1.5 | 1.5 **(0)** | **DELETE 1 SIM EVENT** (II-2) |
| 2B37 Instrument Nav. Sim | INAV | 4 | 1.5 | 6.0 | **REWRITE TO OFT's** (II-3) |
| **XXX ANAV Simulator** | **AAA** | **2** | **1.5** | **3.0** | **ADD 2 ANAV SIM EVENTS** (II-4) |
| **XXX VNAV Simulator** | **VVV** | **3** | **1.5** | **4.5** | **ADD 3 VNAV SIM EVENTS** (II-5) |
| TOTALS | | 5 **(9)** | | 7.5 **(13.5)** | |

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## FLIGHT SUPPORT

| SUBJECT | SYMBOL | PERIODS | HRS | PRESENT MEDIA | RECOMMENDED MEDIA (by exception) |
|---|---|---|---|---|---|
| Instrument Nav Prep | INP | 1 | 3.0 | EC/PP | |
| Aircrew Coordination | ACT | 6 | 4.5 | EC/PP/Videos | |
| Intermediate Airways NAV Preparation | IANP | 1 | 1.0 | EC/PP | |
| Form Preparation | FMP | 1 | 2.0 | EC/PP | |
| TOTALS | | 9 | 10.5 | | |

## ACADEMIC

| SUBJECT | SYMBOL | PERIODS | HRS | PRESENT MEDIA | RECOMMENDED MEDIA (by exception) |
|---|---|---|---|---|---|
| Visual Navigation | VN | 9 | 20.0 | EC/PP | **EC/CAI; MOVE TO LATER TIME** (II-6) |
| T-1A NATOPS | NATOPS | 13 | 22.0 | EC/PP | **22 HRS OF CBT** (II-7) |
| T-1A Flight Preparation | FP | 4 | 9.0 | EC/PP | |
| TOTALS | | 26 | 51.0 | | |

## ADMINISTRATIVE

| SUBJECT | SYMBOL | PERIODS | HOURS |
|---|---|---|---|
| Graduation, Winging, Check-out | ADM | 1 | 2.0 |
| **TOTALS** | | **1** | **2.0** |

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## III. ADVANCED CORE

**RECOMMENDATIONS**

### FLIGHT TRAINING

| STAGE | SYMBOL | TOTAL FLIGHTS | TOTAL HOURS |
|---|---|---|---|
| T-39N Low-Level | LL | 3 | 3.0 |
| T-39N Radar Nav | RN | 4 | 4.4 |
| T-39N Airways Nav | AN | 3 | 6.9 |
| T-39N Strike | STK | 3 | 7.2 |
| TOTALS | | 13 | *21.5 |

### SIMULATOR TRAINING

| STAGE | SYMBOL | EVENTS | HOURS | |
|---|---|---|---|---|
| Radar Synthetic Trainer | RST | 5 | 10.0 | **ADD INSTRUMENTS** (III-1) |
| TOTALS | | 5 | 10.0 | |

### FLIGHT SUPPORT/ACADEMICS/ADMIN

| STAGE | SYMBOL | HOURS | PRESENT MEDIA | **RECOMMENDED MEDIA (by exception)** |
|---|---|---|---|---|
| Welcome Aboard/Check-in | ADM | 7.0 | CR | |
| NATOPS and Safety | NS | 27.0 | EC/PP | **27 HRS OF CBT** (III-2) |
| T-39N Flight Preparation | PREP | 18.0 | EC/PP | **ICW** (III-3) |
| Low-Level and Radar Plan | LL/RP | 7.0 | EC/PP | **ADD CAI** (III-4) |
| Low-Level and Radar Nav | LL/RN | 7.0 | EC/PP | **ADD CAI** (III-5) |
| Turnpoint Procedures | TPP | 7.0 | EC/PP | **ICW** (III-6) |
| Radar Systems | RS | 16.0 | ICW (anticipated) | |
| Acft Carrier (CV) Proc | CVP | 4.0 | EC/PP | **ADD CAI & COTS** (III-7) |
| Strike Seminar | SS | 5.0 | EC/PP | |
| Fleet Brief | FB | 3.0 | EC/PP | |
| Instrument Ground School | IGS | 13.0 | EC/PP | **ICW** (III-8) |
| Strike Phase Review/Exam | SPX | 5.0 | EC/PP | **2 HRS OF ICW TESTING** (III-9) |
| TOTALS | | 119.0 | | |

CR = Classroom; EC = Electronic Classroom; CAI = Computer Assisted Instruction; ICW = Interactive Courseware; CBT = Computer-Based Training; COTS = Commercial-Off-The-Shelf software; Sim = Simulator; PP = PowerPoint.

## IV. ADVANCED STRIKE

**RECOMMENDATIONS**

### FLIGHT TRAINING

| STAGE | SYMBOL | TOTAL FLIGHTS | TOTAL HOURS |
|---|---|---|---|
| T-39N Composite Strike | COMP | 4 | 9.8 |
| TOTALS | | 4 | 9.8 |

### SIMULATOR TRAINING

| STAGE | SYMBOL | EVENTS | HOURS |
|---|---|---|---|
| Composite Synth Trner | CST | 4 | 8.0 |
| TOTALS | | 4 | 8.0 |

### FLIGHT SUPPORT/ACADEMICS/ADMIN

| STAGE | SYMBOL | HOURS | PRESENT MEDIA | **RECOMMENDED MEDIA (by exception)** |
|---|---|---|---|---|
| Check-in and Admin Time | ADMIN | 1.5 | | |
| Radar Terrain Interpretation | RS | 3.0 | EC/PP | **ADD 3 HRS CAI** (IV-1) |
| Composite Strike Planning | CSP | 3.0 | EC/PP | **3 HRS OF ICW** (IV-2) |
| TOTALS | | 7.5 | | |

CR = Classroom; EC = Electronic Classroom; CAI = Computer Assisted Instruction; ICW = Interactive Courseware; CBT = Computer-Based Training; COTS = Commercial-Off-The-Shelf software; Sim = Simulator; PP = PowerPoint.

## V. ADVANCED STRIKE FIGHTER

**RECOMMENDATIONS**

### FLIGHT TRAINING

| STAGE | SYMBOL | FLIGHTS | HOURS |
|---|---|---|---|
| T-39N Atck-Reatck Inter | FR | 4 | 4.4 |
| T-39N Conversion Inter | FC | 4 | 5.2 |
| T-39N Multiple Approach | AP | 1 | 2.0 |
| T-39N Unknown Intercepts | FU | 1 | 1.3 |
| T-39N Advanced Intercepts | FA | 3 | 3.9 |
| TOTALS | | 13 | 16.8 |

### SIMULATOR TRAINING

| STAGE | SYMBOL | EVENTS | HOURS |
|---|---|---|---|
| AIRT Pursuit Intercepts | SP | 5 | 7.5 |
| AIRT Attack-Reattack | SR | 3 | 4.5 |
| AIRT Unknown Inter | SU | 2 | 3.0 |
| AIRT Conversion Inter | SC | 5 | 7.5 |
| AIRT Advanced Intercepts | SA | 3 | 4.5 |
| AIRT Demonstration | DST | 4 | 6.0 |
| TOTALS | | 22 | 33.0 |

### FLIGHT SUPPORT/ACADEMICS/ADMIN

| STAGE | SYMBOL | HOURS | PRESENT MEDIA | **RECOMMENDED MEDIA (by exception)** |
|---|---|---|---|---|
| Intercept Procedures | IP | 40.5 | EC/CAI (anticipated) | |
| Air Intercept Radar | AIR | 2.5 | EC/PP | **ADD CAI** (V-1) |
| Fighter Environment | FE | 6.0 | EC/PP | **ADD CAI** (V-2) |
| Intercepts Rev/Exam | EBIX | 4.0 | EC/PP | **2 HRS OF ICW TESTING** (V-3) |
| Professional Training | PT | 4.0 | EC/PP | |
| TOTALS | | 57.0 | | |

CR = Classroom; EC = Electronic Classroom; CAI = Computer Assisted Instruction; ICW = Interactive Courseware; CBT = Computer-Based Training; COTS = Commercial-Off-The-Shelf software; Sim = Simulator; PP = PowerPoint.

## VI. ADVANCED TACTICAL MANEUVERING

### FLIGHT TRAINING

| STAGE | SYMBOL | TOTAL FLIGHTS | HRS PER FLIGHT | TOTAL HOURS |
|---|---|---|---|---|
| Familiarization | D | 3 | 1.7* | 4.9 |
| Tactical Low Level | TLL | 3 | 1.4 | 4.2 |
| AdvTact Maneuvering | ATM | 6 | 1.3 | 7.8 |
| TOTALS | | 12 | | 16.9 |

* D-1 is 1.5 hours.

### SIMULATOR TRAINING

| STAGE | SYMBOL | TOTAL EVENTS | HRS PER FLIGHT | TOTAL HOURS |
|---|---|---|---|---|
| Basic Instruments | BIS | 3 | 1.5 | 4.5 |
| Radio Instruments | RIS | 3 | 1.5 | 4.5 |
| Emergency Procedures | EPS | 2 | 1.5 | 3.0 |
| Carrier Procedures | CVS | 1 | 1.5 | 1.5 |
| TOTALS | | 9 | | 13.5 |

### FLIGHT SUPPORT/ACADEMICS/ADMIN

| EVENTS | SYMBOL | HOURS | PRESENT MEDIA | **RECOMMENDED MEDIA (by exception)** |
|---|---|---|---|---|
| Delayed Jet Water Surv | DJET | 24.0 | | |
| NATOPS and Safety | NS | 26.0 | EC/PP | |
| Adv Tact Maneuvering | ATML | 10.0 | EC/PP | **EC/CAI** (VI-1) |
| T-2C Emergency Proc | EPL | 2.0 | EC/PP | |
| Basic Instrument Proc | BIPL | 5.7 | EC/PP | |
| Low-Level Procedures | LLP | 1.0 | EC/PP | |
| Section Low-Level Tactics | SLLT | 3.0 | EC/PP | |
| Final Phase Review/Exam | FX | 3.0 | EC/PP | **2 HRS OF ICW TESTING** (VI-2) |
| Critique and Graduation | CG | 4.5 | | |
| TOTALS | | 79.2 | | |

CR = Classroom; EC = Electronic Classroom; CAI = Computer Assisted Instruction; ICW = Interactive Courseware; CBT = Computer-Based Training; COTS = Commercial-Off-The-Shelf software; Sim = Simulator; PP = PowerPoint.

# Table 2. Primary & Intermediate Simulator/Flight/Academic Grade Correlations

**Primary/Intermediate Grades, VT-10--Correlations**

| | | CPT123 | IGACAD | IGFLT | INAVSIM | IT1ANAV | IT34ANAV | P2B47 | PGACAD | PGFLT | POFT | PT34ANAV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pearson Correlation | CPT123 | 1.000 | .390** | .571** | .181** | .416** | .359** | -.042 | .549** | .638** | .466** | .379** |
| | IGACAD | .390** | 1.000 | .405** | .186** | .339** | .307** | -.085 | .544** | .300** | .395* | .460** |
| | IGFLT | .571** | .405** | 1.000 | .205** | .707** | .744** | .026 | .457** | .634** | .096 | .525** |
| | INAVSIM | .181** | .186** | .205** | 1.000 | .327** | .229** | .070 | .060 | .178** | -.122 | .072 |
| | IT1ANAV | .416** | .339** | .707** | .327** | 1.000 | .580** | -.029 | .336** | .430** | -.090 | .115 |
| | IT34ANAV | .359** | .307** | .744** | .229** | .580** | 1.000 | .024 | .224** | .378** | -.109 | .071 |
| | P2B47 | -.042 | -.085 | .026 | .070 | -.029 | .024 | 1.000 | -.043 | -.005 | -.019 | -.074 |
| | PGACAD | .549** | .544** | .457** | .060 | .336** | .224** | -.043 | 1.000 | .531** | .340** | .430** |
| | PGFLT | .638** | .300** | .634** | .178** | .430** | .378** | -.005 | .531** | 1.000 | .438** | .682** |
| | POFT | .466** | .395* | .096 | -.122 | -.090 | -.109 | -.019 | .340** | .438** | 1.000 | .385** |
| | PT34ANAV | .379** | .460** | .525** | .072 | .115 | .071 | -.074 | .430** | .682** | .385** | 1.000 |
| Sig. (2-tailed) | CPT123 | . | .000 | .000 | .003 | .000 | .000 | .248 | .000 | .000 | .000 | .000 |
| | IGACAD | .000 | . | .000 | .006 | .000 | .000 | .082 | .000 | .000 | .012 | .002 |
| | IGFLT | .000 | .000 | . | .002 | .000 | .000 | .597 | .000 | .000 | .562 | .000 |
| | INAVSIM | .003 | .006 | .002 | . | .000 | .000 | .290 | .339 | .004 | .326 | .555 |
| | IT1ANAV | .000 | .000 | .000 | .000 | . | .000 | .663 | .000 | .000 | .482 | .362 |
| | IT34ANAV | .000 | .000 | .000 | .000 | .000 | . | .716 | .000 | .000 | .389 | .570 |
| | P2B47 | .248 | .082 | .597 | .290 | .663 | .716 | . | .246 | .887 | .822 | .386 |
| | PGACAD | .000 | .000 | .000 | .339 | .000 | .000 | .246 | . | .000 | .000 | .000 |
| | PGFLT | .000 | .000 | .000 | .004 | .000 | .000 | .887 | .000 | . | .000 | .000 |
| | POFT | .000 | .012 | .562 | .326 | .482 | .389 | .822 | .000 | .000 | . | .000 |
| | PT34ANAV | .000 | .002 | .000 | .555 | .362 | .570 | .386 | .000 | .000 | .000 | . |
| N | CPT123 | 840 | 431 | 444 | 260 | 250 | 258 | 741 | 840 | 840 | 195 | 198 |
| | IGACAD | 431 | 431 | 428 | 218 | 218 | 217 | 416 | 431 | 431 | 40 | 43 |
| | IGFLT | 444 | 428 | 444 | 224 | 218 | 224 | 423 | 444 | 444 | 39 | 42 |
| | INAVSIM | 260 | 218 | 224 | 260 | 250 | 257 | 233 | 260 | 260 | 67 | 69 |
| | IT1ANAV | 250 | 218 | 218 | 250 | 250 | 249 | 226 | 250 | 250 | 63 | 65 |
| | IT34ANAV | 258 | 217 | 224 | 257 | 249 | 258 | 232 | 258 | 258 | 65 | 67 |
| | P2B47 | 741 | 416 | 423 | 233 | 226 | 232 | 864 | 741 | 741 | 136 | 139 |
| | PGACAD | 840 | 431 | 444 | 260 | 250 | 258 | 741 | 840 | 840 | 195 | 198 |
| | PGFLT | 840 | 431 | 444 | 260 | 250 | 258 | 741 | 840 | 840 | 195 | 198 |
| | POFT | 195 | 40 | 39 | 67 | 63 | 65 | 136 | 195 | 195 | 195 | 194 |
| | PT34ANAV | 198 | 43 | 42 | 69 | 65 | 67 | 139 | 198 | 198 | 194 | 198 |

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations--Advanced Core:

| | |
|---|---|
| **LEGEND** | **Primary & Intermediate Phase. Mean grades for:** |
| **CPT 1,2,3:** | Three Cockpit Procedures Training events (2B-37 or 2C-42 simulators) |
| **IGACAD:** | Intermediate Phase academics |
| **IGFLT:** | All flights in the Intermediate Phase |
| **INAVSIM:** | Four simulator events on the 2B-37 or 2C-42 simulators |
| **IT1ANAV:** | Airways Navigation flights on the T-1A aircraft in Intermediate Phase |
| **IT34ANAV:** | Airways Navigation flights on the T-34C aircraft in Intermediate Phase |
| **P2B47:** | Simulator events conducted on the 2B-47 in Primary Phase |
| **PGACAD:** | Primary Phase academics |
| **PGFLT:** | All flights in Primary Phase |
| **POFT:** | Four simulator events in preparation for Primary Phase ANAV flights |
| **PT34ANAV:** | Airways Navigation flights on the T-34C aircraft in Primary Phase |

## Table 3. Advanced Core Simulator/Flight Grade Correlations

**Correlations--Advanced Core**

| | | AN | LOWLVL | RN | RST | STK |
|---|---|---|---|---|---|---|
| Pearson Correlation | AN | 1.000 | .168* | .222** | .207** | .347** |
| | LOWLVL | .168* | 1.000 | .172* | .336** | .317** |
| | RN | .222** | .172* | 1.000 | .292** | .267** |
| | RST | .207** | .336** | .292** | 1.000 | .361** |
| | STK | .347** | .317** | .267** | .361** | 1.000 |
| Sig. (2-tailed) | AN | . | .015 | .001 | .003 | .000 |
| | LOWLVL | .015 | . | .013 | .000 | .000 |
| | RN | .001 | .013 | . | .000 | .000 |
| | RST | .003 | .000 | .000 | . | .000 |
| | STK | .000 | .000 | .000 | .000 | . |
| N | AN | 211 | 211 | 210 | 211 | 211 |
| | LOWLVL | 211 | 211 | 210 | 211 | 211 |
| | RN | 210 | 210 | 210 | 210 | 210 |
| | RST | 211 | 211 | 210 | 211 | 211 |
| | STK | 211 | 211 | 210 | 211 | 211 |

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

**Legend: Advanced Core Phase. Mean grades for:**

| | |
|---|---|
| **AN:** | Airways Navigation flights |
| **LL:** | Low Level flights |
| **RN:** | Radar Navigation flights |
| **STK:** | Strike flights |
| **RST:** | Radar Synthetic Trainer (GMRTS) |

## Table 4 . Advanced Strike Simulator/Flight Grade Correlations

**Strike Grades--Correlations**

| | | COMP | CST |
|---|---|---|---|
| Pearson Correlation | COMP | 1.000 | .382** |
| | CST | .382** | 1.000 |
| Sig. (2-tailed) | COMP | . | .000 |
| | CST | .000 | . |
| N | COMP | 215 | 214 |
| | CST | 214 | 214 |

**. Correlation is significant at the 0.01 level (2-tailed).

**Legend: Advanced Strike Phase.**
**Mean grades for:**
**COMP:** Composite flights
**CST:** Composite Synthetic Trainer (GMRTS)

## Table 5 . Advanced Strike/Fighter Simulator/Flight Grade Correlations
## Table 6 . Advanced Tactical Maneuvering Simulator/Flight Grade Correlations

**Strike Fighter Grades--Correlations**

| | | AP | FA | FC | FR | FU | SA | SC | SP | SR | SU |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pearson Correlation | AP | 1.000 | .006 | .234** | .101 | .059 | .100 | .092 | .080 | .136 | .200* |
| | FA | .006 | 1.000 | .262** | .253** | .086 | .135 | .188* | .147 | .171* | .209** |
| | FC | .234** | .262** | 1.000 | .280** | .193* | .169* | .266** | .183* | .249** | .333** |
| | FR | .101 | .253** | .280** | 1.000 | .197* | .281** | .230** | .316** | .277** | .404** |
| | FU | .059 | .086 | .193* | .197* | 1.000 | .076 | .092 | .205** | .091 | .129 |
| | SA | .100 | .135 | .169* | .281** | .076 | 1.000 | .341** | .230** | .197* | .154* |
| | SC | .092 | .188* | .266** | .230** | .092 | .341** | 1.000 | .385** | .372** | .209** |
| | SP | .080 | .147 | .183* | .316** | .205** | .230** | .385** | 1.000 | .316** | .246** |
| | SR | .136 | .171* | .249** | .277** | .091 | .197* | .372** | .316** | 1.000 | .237** |
| | SU | .200* | .209** | .333** | .404** | .129 | .154* | .209** | .246** | .237** | 1.000 |
| Sig. (2-tailed) | AP | . | .945 | .004 | .217 | .473 | .221 | .259 | .327 | .094 | .014 |
| | FA | .945 | . | .001 | .001 | .270 | .079 | .015 | .059 | .027 | .007 |
| | FC | .004 | .001 | . | .000 | .012 | .028 | .000 | .017 | .001 | .000 |
| | FR | .217 | .001 | .000 | . | .011 | .000 | .003 | .000 | .000 | .000 |
| | FU | .473 | .270 | .012 | .011 | . | .324 | .233 | .008 | .238 | .097 |
| | SA | .221 | .079 | .028 | .000 | .324 | . | .000 | .003 | .010 | .047 |
| | SC | .259 | .015 | .000 | .003 | .233 | .000 | . | .000 | .000 | .007 |
| | SP | .327 | .059 | .017 | .000 | .008 | .003 | .000 | . | .000 | .001 |
| | SR | .094 | .027 | .001 | .000 | .238 | .010 | .000 | .000 | . | .002 |
| | SU | .014 | .007 | .000 | .000 | .097 | .047 | .007 | .001 | .002 | . |
| N | AP | 154 | 153 | 152 | 152 | 152 | 152 | 152 | 151 | 152 | 151 |
| | FA | 153 | 174 | 169 | 168 | 168 | 169 | 168 | 167 | 168 | 167 |
| | FC | 152 | 169 | 171 | 170 | 169 | 170 | 170 | 169 | 170 | 168 |
| | FR | 152 | 168 | 170 | 170 | 168 | 169 | 170 | 169 | 170 | 167 |
| | FU | 152 | 168 | 169 | 168 | 169 | 169 | 168 | 167 | 168 | 167 |
| | SA | 152 | 169 | 170 | 169 | 169 | 170 | 169 | 168 | 169 | 168 |
| | SC | 152 | 168 | 170 | 170 | 168 | 169 | 170 | 169 | 170 | 167 |
| | SP | 151 | 167 | 169 | 169 | 167 | 168 | 169 | 169 | 169 | 166 |
| | SR | 152 | 168 | 170 | 170 | 168 | 169 | 170 | 169 | 171 | 168 |
| | SU | 151 | 167 | 168 | 167 | 167 | 168 | 167 | 166 | 168 | 171 |

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

**Legend: Advanced Core Phase.**
**Mean grades for:**
**AP:** Multiple Approach flights
**FA:** Advanced Intercept flights
**FC:** Conversion Intercept flights
**FR:** Attack-Reattack flights
**FU:** Unknown Intercept flights
**SA:** Advanced Intercept sim
**SC:** Conversion Intercept sim
**SP:** Pursuit Intercept sim
**SR:** Attack-Reattack sim
**SU:** Unknown Intercept sim

**Correlations--Advanced Tactical Maneuvering**

| | | ATM | BIS | CV | EP | FAM | RIS | TL_W |
|---|---|---|---|---|---|---|---|---|
| Pearson Correlation | ATM | 1.000 | .218* | .117 | -.003 | .214* | .249* | .223* |
| | BIS | .218* | 1.000 | .061 | .393** | .205* | .058 | .214* |
| | CV | .117 | .061 | 1.000 | .308** | .133 | .168 | -.065 |
| | EP | -.003 | .393** | .308** | 1.000 | .111 | .321** | .112 |
| | FAM | .214* | .205* | .133 | .111 | 1.000 | .076 | .094 |
| | RIS | .249* | .058 | .168 | .321** | .076 | 1.000 | .160 |
| | TL_W | .223* | .214* | -.065 | .112 | .094 | .160 | 1.000 |
| Sig. (2-tailed) | ATM | . | .037 | .259 | .980 | .038 | .013 | .027 |
| | BIS | .037 | . | .555 | .000 | .045 | .555 | .043 |
| | CV | .259 | .555 | . | .002 | .197 | .089 | .534 |
| | EP | .980 | .000 | .002 | . | .283 | .001 | .285 |
| | FAM | .038 | .045 | .197 | .283 | . | .454 | .365 |
| | RIS | .013 | .555 | .089 | .001 | .454 | . | .114 |
| | TL_W | .027 | .043 | .534 | .285 | .365 | .114 | . |
| N | ATM | 102 | 92 | 95 | 94 | 95 | 99 | 99 |
| | BIS | 92 | 108 | 96 | 94 | 96 | 106 | 90 |
| | CV | 95 | 96 | 106 | 103 | 96 | 104 | 94 |
| | EP | 94 | 94 | 103 | 104 | 95 | 102 | 93 |
| | FAM | 95 | 96 | 96 | 95 | 102 | 99 | 95 |
| | RIS | 99 | 106 | 104 | 102 | 99 | 115 | 98 |
| | TL_W | 99 | 90 | 94 | 93 | 95 | 98 | 101 |

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

**Legend: Advanced Core Phase. Mean grades for:**
**ATM:** Advanced Tactical Maneuvering flights
**BIS:** Basic Instruments simulator events
**CV:** Carrier Procedures simulator events
**EP:** Emergency Procedures simulator events
**FAM:** Familiarization flights
**RIS:** Radio Instrument simulator events
**TLL:** Tactical Low Level (TL_W) flights

# Basic Flight Trainer Aircraft Requirements for UMFO Training

Min of 2 place
Low wing
Single engine
Dual controls
Air conditioning
AOA system
Encoder Altimeter
Elapsed time clock
O2 system
Aerobatics capable
+4.5 to -1 g capable
min of 280 KIAS
min ceiling of 25K
2 V/UHF radio's
Radar altimeter
GPS equipped
TACAN
ILS capable
Integrated simulator system
    Visual
    Cockpit mock up
    Systems
Fuel profiles

# Multi-place Trainer Aircraft Requirements for UMFO Training

Twin Jet (turbo fan)
Thrust to weight = 1/3 at normal operating weight
Capable of .8 mach at alt. and 355 KIAS at sea level
Min service ceiling of 45K
+4 to -1 G
swept wing
Pressurized cockpit
Auxiliary air conditioning
Anti/De-icing capability
Min Runway Length no greater than 6000 ft
AOA system
Radar altimeter (up to 2500ft)
GPS equipped
ILS capable
TACAN
Windshield bird proofing
2 V/UHF radios
A/A and A/G switchable radar
Life raft
Walk around O2 bottle
Cockpit layout Pilot Stud
Inst
Stud Stud
C Inst
Instrumentation/radar repeaters in rear
Sims visual
cockpit mock up
radar
systems

Fuel profile mins
1. 3 hr. high alt flight at max range
2. 1 hr. max range profile to enter 45 min. low level route at 500 ft agl and 300 KTAS then climb out and proceed to destination 30 min away.
3. Climb to 10k at 300 KIAS for 15 min. descend to low level 500 ft/300 KTAS for 90 min. then climb to 10K 300 KIAS for 25 min. to destination.

### Replacement Considerations

1. Install an onboard computer to collect SA-related data.
2. Install a digital recording system for debriefing.

# High Performance Jet Trainer Aircraft Requirements for UMFO Training

1. Sustained 300 KIAS at sea level
2. Sustained climb/cruise
   A. 300 KTAS (med/high alt)
   B. 3K fpm climb from 10 to 16K
3. "G"
   A. Instantaneous 6 G's at alt between 10 and 18K
   B. Sustainable 4.5 to 6 G's between 10 and 18K
4. Fuel profiles:
   A. Take off climb to 10k for 20 min then 30 min at 500 ft agl and 300 KTAS followed by climb to 10K for 20 RTB flight.
   B. 2 hr. high alt flight at max range.
5. Power plant able to maintain max power setting for extended time periods.

**Five Profiles for UMFO Training**
**Currently in Place**
**(A narrative by Lt. J. Zayas, TW-6 T-2 Representative)**

JUL 99

**From:** LT Johnny Zayas, Trawing-6 T-2 Rep.
**To:** Mr. Joe Sheehan

**Subj:** VT-86 ATM Phase description (FAM, WEPS, ATM).

1. **FAM STAGE-** Fam's 1,2, and 3X are standard air navigation practice hops. Their purpose is to introduce T-2 systems, specifics (flight gear, mask, G's, etc.) and instrument scan to the prospective NFO. The hops are flown locally, two-cycle out and in, or as weekend cross-countries.

When we're cleared for take-off, IP applies full power and the student goes through the Run-up checks. Once ready, the IP releases the brakes and accelerates toward rotation speed. At 100 kts IP rotates, brings gear up and waits for 13 5kts to bring flaps up. The climb-out to 18K takes roughly about 4min., more if a higher cruising altitude was planned for. Between 21K to 30K is what we fly. Ground speeds at those altitudes vary between 300-450kts. Enroute, we talk about emergencies, fuel states, SA, and game plan at destination field. Navigation is limited to TACAN and radar vectors only. Unusual attitudes are done in at least two out of the three hops. These consist

of the IP putting the a/c in an extremis situation (extreme nose high/low) and having the student talk us through the recovery. Descents into target fields can be gradual/enroute or idle with speed brakes extended (4-5K feet/min rate of descent). We can shoot TACAN, PAR, ASR, Circling, and Visual approaches. Below 10K we stick to the 250kt FAA limit but, at roughly 4 miles per minute, the miles still click on by. This makes students think about turning, descending, and configuring at further distances than a slower platform. The faster things happen, the more ahead of the a/c they need to be. We also introduce VFR/carrier approaches.

2. **WEPS STAGE-** Weapons 1,2, and 3 introduce the student to the world of low-level, fairly high speed, navigation and weapons pattern/delivery profiles. Wep 1/2 are section low levels with intermediate targets to attack along the way. We launch out of NPA toward the entry point some 60 miles (10 min) to the west, descend down to 1500' and commence the route. About a minute into the route we descend down to 500'AGL, maintaining 300kts, and proceed with the low-level executing tac-turns and pop attacks. The tac-turns are 2-4G turns. The pops are done by pulling up (3-4G) to 20 degrees nose up until 2K, then overbanking down toward the ground (2-3 G) and intercepting a 10 degree dive for a simulated attack. At 1.4K we simulate pickle ordnance, pull up, and get back on route, timing, and altitude. During the route, simulated fuel emergencies, along with course and time corrections are a few of the things they're responsible for. Exiting the route we proceed to Navy Meridian, Ms. or back to NPA depending on the route. Maintaining SA with wingman position, fuel remaining, and route positioning are the big points of this stage. In one of the hops we shoot a section approach for practice.

3. **ATM STAGE-** ATM's 1-6X introduce the student to maximizing the T-2's performance and employment in I versus I engagements (IV I).

In ATM- I we go out, as sections, and demonstrate the performance of the mighty Buckeye. After launching out of NPA we head south to one of the W-155A areas. The entry points are at 12K and 30 miles. It usually takes us between 5-6 minutes to get there.

After demonstrating a set of Tac-turns (five separate hard turns at 2-3G's), we split into singles for the performance demo. In the demo, we show acceleration between 200kts to 300kts in 1G and 0G flight. At 0G (unloaded) the jet accelerates faster, which is good. We do 12 and 15 unit (AOA) turns (360 degrees) and show how much time it takes for each (23.5G's) to complete. Next we demo G available at 200 and 300kts. The IP steadies at the airspeed and abruptly plants the stick in their lap (200kts = 3G's and 250kts = 4.5G's). From there, we slow down to about 150kts and 15 units AOA and demo slow flying in the airplane. We slow to about 80-100kts 24-28 units AOA and talk about buffet, effects of AOA to controllability, and why rudder is the key control surface when slow. We demo departures also. The adverse yaw departure is done from a slow state (120kts) and we reverse out turn with stick only vice rudder. The airplane initially turns in the direction requested, but it then abruptly swaps ends in the opposite direction. Lesson learned is to minimize stick inputs at slow airspeeds. From there we move on to Steep and Break turn stalls. Both are essentially the same in that we demo how an airplane can stall even at high speeds if AOA isn't controlled. IP banks the aircraft at 250-300kts and pulls 3-4G's while AOA climbs to a dangerously high number. The jet will start to buffet heavily (stalled) and to recover, the IP reduces stick pressure (AOA), flying out of stalled flight. Next we set up a zero airspeed departure. The IP starts at 300-350kts, pulls nose up (45G's) until pure vertical. As airspeed bleeds below 100kts, the students go over the out-of-control procedures and call for recovery once the aircraft accelerates past 150kts. Depending on

time/fuel, some IP's will spin the students. We climb to 23K and spin a few times. Once all that is complete, we join-up again to demo a TACAN rendezvous. We are usually about 10 minutes apart and it roughly takes 5 minutes to get joined up. Next we demo high/low yo-yo, barrel rolls, and lead/lag principles. These maneuvers take about 3-4G's to perform and we kick them off at 15-16K. After, if there's enough gas, we do a demo fight (engagement) mainly for G awareness. Once all items are complete, we descend down to 7K (2-4K rate of descent) and RTB. We take radar vectors until we have the Course Rules entry point in sight and proceed visually for the break. The flight home takes about 15 minutes.

In ATM-2 we build upon what was learned in ATM- 1. Students are responsible for running a set of Tac-turns each. There are 5 turns and they vary between 2-3G's each at 12K. Once the turns are complete, we move on to perch set-ups to demo barrel rolls, high/low yo-yo's, overshoots. These 4 set ups are done with the defensive aircraft at 14K and the offensive aircraft at 15.5K. The offensive aircraft rolls in from above and executes an attack demonstrating these maneuvers. G's vary between 3-5G's, altitude displaced is between 1500-2500' and some abrupt maneuvering is required in order to set the presentation properly. The last two set ups end up in a flat scissors and rolling scissors purely for demo purposes. Next we move on to First Move Options, these are abeam set ups at 16K, 250kts. "Fights on" is called, the jets turn toward each other and strive to make a neutral 500' pass (merge). From there we demo some of the principles of ACM and why they work. These are fairly short and G's get up to 5-5.8G's. These abeam set ups commence at 16K, but altitudes seen vary between 20K to 10K as vertical maneuvering takes place. The T-2 is limited to no 6G hits, so we fly 5.5-5.8G's through the turns. Once the First Move Options are done, we do two demo fights, which are longer

and more aggressive than the First Move Options were. G's, altitudes displaced, and dynamics are the same as described above. With both fights complete, we RTB using the same procedures described in ATM- 1.

In ATM-3, the students are introduced to the four Defenses while building upon lessons learned in ATM-2. The launch, area check-in, and tac-turns are standard. Next we introduce the four defenses (D's). These are set up similar to the ATM-2 maneuvers. The defensive aircraft starts at 14K, offensive perched at 15.5K, and offensive jet demos the four D's (high/low yo-yo, high/low speed overshoots). As the defensive student sees a D, they call for specific procedures to fight against the offensive aircraft. Once the defensive student sees the D's, we swap roles and execute them again for the new student. G's, airspeeds, altitudes displaced, and dynamics are just like the ones seen on ATM-2. Next come the abeam setups. We do four engagements with the IP varying the amount of input (help) as the fights progress. G's, airspeeds, altitudes displaced, and dynamics are just like the ones seen in ATM-2 (during engagements). With all four fights complete, we RTB using the same procedures described in ATM-1.

In ATM-4,5, & 6X, the students are no longer introduced to new material. These three hops are done to build upon the lessons (strength/weaknesses') seen during the prior ATM's. The launch, area check-in, and tac-turns are standard. Instead of doing four D's for each of the students, we do two for each and press on to the fights. We do four engagements on each hop, with the 6X including some student versus student fights. IP's perform exactly what they call for during the fight. G's, airspeeds, altitudes displaced, and dynamics are just like the ones seen on prior ATM's. With all four fights complete, we RTB using the same procedures described in prior ATM's.

By far, ATM is the most challenging phase both mentally and physically. With the dynamics of the fights, G's pulled while having to react properly, and fast tempo allowed by the T-2 (airspeeds/altitudes), the students need to stay ahead of the aircraft to be successful.

## ANAV/VNAV/SA Simulator for the Undergraduate Military Flight Officer (UMFO) Program

This simulator would be a mock-up of a T-34 cockpit. The student would be seated in the cockpit and an instructor would be seated just outside the cockpit. Both would have access to an operable control stick/throttle. The simulator would be loaded with Microsoft Flight Simulator xx. Changes to altitude, course, winds, etc. could be made real-time by the instructor, in addition to simulated malfunctions and emergencies. The simulator would exercise pre-loaded flight profiles in both IFR and VFR conditions. The simulators could also be controlled simultaneously by one instructor in a classroom-lab situation similar to the present 2B-47 configuration.

The simulator would be driven by the latest generation of personal computer with ample capacity for dealing with memory-intensive graphics. The ground terrain graphics would be satellite images that include the Southeastern United States. The simulator would include three 2 1 " high-resolution monitors for a 270-degree field of vision. The cockpit layout would include actual T-34 control boxes including (not limited to) UHF, VHS, ICS, IFF, TACAN and VOR. The engine instruments would be simulated The flight controls would be limited to the control stick/throttles. The simulator would be equipped with voice recognition software that would assess the accuracy of UHF communication protocols and collect data relating to the accuracy and timeliness of the two-minute prior, mark-on-top and wings level calls and visual recognition of turn points and check points. Data would also be collected concerning the accuracy of course and time corrections by the student Other data to be collected will be ascertained in development of the first (prototype) simulator.

## A Description and ROM for the ANAV/VNAV/SA Simulator Provided by ECC International Corporation

| | Active Glass | Cockpit Artwork | Active 3D |
|---|---|---|---|
| 1. Forward Electronic Command Panel | | X | |
| 2. Forward Oxygen Regulator Panel | | X | |
| 3. UHF Radio | | | X |
| 4. TACAN Radio | | | X |
| 5. VOR Radio | | | X |
| 6. RNAV Panel | | | X |
| 7. DME Indicator Panel | | | X |
| 8. Audio Control Panel | | | X |
| 9. Transponder Panel | | | X |
| 10. Forward Avionics Command Panel | | | X |
| 11. Interior Light Panel | | | X |
| 12. Miscellaneous Switch Panel | | X | |
| 13. Forward Circuit Breaker Panel | | X | |
| 14. Landing Gear Control Panel | | X | |
| 15. Compass Panel | | | X |
| 16. Fuel Shutoff | | X | |
| 17. Flaps Switch | | X | |
| 18. Environmental Controls | | X | |
| 19. Power Control Lever | | | X |
| 20. Test Panel | | X | |
| 21. Fire Warning Test | | | X |
| 22. Starter Ignition Control Panel | | | X |
| 23. Parking Brake | | X | |
| 24. Engine Air | | X | |
| 25. Alternate Static | | X | |
| 26. Emergency Landing Gear Handle | | X | |
| 27. Trim Controls | | X | |
| 28. Rudder Pedals | | | X |
| 29. Control Stick | | | X |
| 30. Magnetic Bearing Reference | X | | |
| 31. VOR/ILS Indicator | X | | |
| 32. Radio Magnetic Indicator (RMI) | X | | |
| 33. Accelerometer | X | | |
| 34. Turn and Slip Indicator | X | | |
| 35. Altimeter | X | | |
| 36. Vertical Speed Indicator | X | | |
| 37. Fuel Flow Indicator | X | | |

| | |
|---|---|
| 38. Oil Temp Indicator | X |
| 39. Oil Pressure Indicator | X |
| 40. Turbine Tachometer | X |
| 41. Attitude Indicator | X |
| 42. Airspeed Indicator | X |
| 43. Torquemeter | X |
| 44. AOA Indicator | X |
| 45. ITT Indicator | X |
| 46. Propeller Tachometer | X |
| 47. Flap Position Indicator | X |
| 48. Clock/Stop Watch | X |

## System Components

Cockpit

Fiberglass structure.
Simplified seat
Side panels.

Front instrument panel would consist of a 2I" touch-screen monitor.
Headset with microphone`.

3-channel visual system.
Single high-performance PC.

Instructor Station

Desk, chair.
2 1 " touch-screen monitor.
Single medium performance PC.

## Software Component Options

1. MS Flight Simulator "Core". MS Flight Simulator continues to gain strong support in the training community. MS is currently providing software development kits that support Flight Simulator customizations. In addition, growing lists of third-party suppliers are available to support updates and modifications. The assumption is that by 2006, the capability of Flight Simulator will surpass any "stove pipe" implementations that currently exist.

2. TJDIS "Core". UDIS is a "stove pipe" implementation. Support and maintenance of UDIS is seriously in question. The assumption is that by 2006 UDTS will not be supportable.

3. Device 2B47 Aviation Communication/Navigation Trainer "Core". This existing trainer framework appears to satisfy the majority of the functional

requirements associated with the navigator trainer curriculum. IOS functionality requirements appear to be satisfied by this device.

4. The lowest cost option appears to be the integration of the MS Flight Simulator "Core" with the Device 2B47 "Core" components.

5. MS Flight Simulator would provide all flight instrumentation, models, and visual scenery. MS Flight Simulator would be modified to support interfacing to the existing 2B47 instructor station.

## ROM Cost

Software

Panel Modifications: 3 LM
Integration with controls: 3 LM

Integration with Visual System: 4 LM
Integration with IOS to include ICS: 3 LM
Test and Integration: 3 LM
Total: 16 LM

Hardware (Parts and labor)

Fiberglass shell $5000
Modified GFE control panels: $15000
Front instrumentation panel installation: $3000
Seat: $1 000
Control Stick/Rudder Pedals/Power Lever: $ 1 0000
PC that includes a 3-channel visual system: $5000
IOS PC: $3000
Installation and checkout: 4LM

## Total

Hardware: $42,000 + ((4L@@85) = $55,000) = $97,000
Software: 16LM @$120/H = $307,200

**Prototype** Development Estimate (Software and Hardware):
307,200 + 97,000 = $467,000 x 1.35 = **$545,670**
**For an additional 39 copies**: ($97,000 x 1.35 = 131,000) x 39 = **$5,100,000**

## Benefits of a Visual Simulator for SA

| *SA Skill | Present | Plus Visual |
|---|---|---|
| 1. Spatial Awareness | 3.13 | 4.25 |
| 2. Takes Timely Action | 3.50 | 3.75 |
| 3. Uses Available Info | 2.63 | 3.63 |
| 4. Scan | 2.38 | 3.75 |
| 5. Anticipates Consequences | 3.00 | 3.63 |
| Mean | 2.93 | 3.80 |

*(* the 5 most critical skills)*
*(#4 & 5: two of the three most difficult skills)*

| | | |
|---|---|---|
| Total across all 16 SA skills: | 2.89 | 3.58 (a 23.9% increase) |

## Table 7. Cost Analysis by Table 1 (pages 1-8) Recommendations

### I. PRIMARY

**Recommendation I-1: Delete 3 Flights**
Aircraft operating and maintenance costs are confidential and proprietary information and unavailable to contractors. This report is unable to determine costs savings. However, given that there are 550 students annually, and that each flight is 1.5 hours duration, it is anticipated this will represent 1650 fewer flights, and 2475 fewer flight instructor hours, in addition to preparation, briefing, and debriefing times.
Savings: Indeterminate.

**Recommendation I-2: Modify Simulator**
Modifications of 2B47 simulators to include voice recognition capabilities, three-screen visuals, and a SA data capture systems. Prototype cost development is $545,670.00. Additional 14 units would cost $131,000.00 each..
Purchase Cost: $2,379,670.00

**Recommendation I-3: Add COTS Comm Practice**
This would involve adding COTS communications software to the Learning Resource Center (LRC). Jeppeson Flite-Pro or COMM-1 (Multimedia Software, Inc.) software can be added to each station for $100.00 per station (50 stations).
Purchase Cost: $5000.00

**Recommendation I-4: Add ICW (Level 2)**
This would replace formal classroom instruction with interactive courseware.
5.5 hours of Level II ICW: 5.5 X $6300 = $34,650.00
5.5 hours instructor time plus preparation and evaluation: 11.5 X 23.40 X 22 classes = $5920.20
Purchase Cost: $34,650.00
Annual Savings: $5920.20

**Recommendation I-5: Add ICW/COTS**
This would replace formal classroom instruction with interactive courseware.
16.5 hours of ICW: 16.5 X $4000.00=$66,000.00
16.5 hours instructor time plus preparation and evaluation: 36.5 X 23.40 X 22 classes = $18.790.20
Purchase Cost: $66,000.00
Annual Savings: $18,790.20

**Recommendation I-6: Delete 3 SIMS**
These events are for students to use as they see necessary. No instructor time is used, therefore, no savings are realized.
Annual Savings: None

**Recommendation I-7: Add ICW**
This would replace formal classroom instruction with interactive courseware.
10 hours of ICW: 10 X $4000 = $40,000.00
10 hours instructor time plus preparation and evaluation: 20 X 23.40 X 22 classes = $10,296.00
Purchase Cost: $40,000.00
Annual Savings: $10,296.00

**Recommendation I-8: Add ICW**
This would replace formal classroom instruction with interactive courseware.
16 hours of ICW: 16 X $4000 = $64,000.00
16 hours instructor time plus preparation and evaluation: 28 X 23.40 X 22 classes = $14,414.40
Purchase Cost: $64,000.00
Annual Savings: $14,414.40

**Recommendation I-9: Add 19.5 Hours of CBT**
This would replace formal classroom instruction with interactive courseware.
19.5 hours of CBT: 19.5 X $5300 = $103,350.00
19.5 hours instructor time plus preparation and evaluation: 37.5 X 23.40 X 22 classes = $19,305.00
Purchase Cost: $103,350.00
Annual Savings: $19,305.00

**Recommendation I-10: Add a 3SH Graduate University Course**
This would be a joint venture with a university, through their continuing education and/or special courses division. The university would supply their own interactive TV equipment. Students can apply for graduate credit by paying the differential in costs. Purchase of a VTEL LC5000 Dual monitor videoconferencing unit, with installation, would cost $56,000.00. Annual costs would include an ISDN telephone line ($1600.00/year) and maintenance ($1500.00). Anticipated tuition would be $100 per student.
Purchase Cost: $56,000.00
Annual Costs: $58,100.00

## II. INTERMEDIATE

**Recommendation II-1: Delete 2 Flights**
Aircraft operating and maintenance costs are confidential and proprietary information and unavailable to contractors. This report is unable to determine costs savings. However, given that there are 416 students annually, and that each flight is 2 hours duration, it is anticipated this will represent 832 fewer flights, and 1664 fewer flight instructor hours, in addition to preparation, briefing, and debriefing times.
Savings: Indeterminate

**Recommendation II-2: Delete SIM Event**
The main effect would be to release instructor time, at 3.5 hours X 23.40 X 416 students = $34,070.40.
Annual Savings: $34,070.40

**Recommendation II-3: Rewrite the INAV 1-4 Simulator Events**
No anticipated costs to be incurred.

**Recommendation II-4: Add 2 ANAV SIM Events**
The main effect would be to increase instructor time, at 7 hours X 23.40 X 416 students = $68,140.80.
Annual Cost: $68,140.80

**Recommendation II-5: Add 3 VNAV SIM Events**
The main effect would be to increase instructor time, at 10.5 hours X 23.40 X 416 students = $102,211.20.
Annual Cost: $102,211.20

**Recommendation II-6: Add EC/CAI**
This would replace formal classroom instruction with interactive courseware.
9 hours of CBT: 9 X $4000 = $36,000.00
Purchase Cost: $36,000.00

**Recommendation II-7: Add 22 Hours of Level I ICW**
This would replace formal classroom instruction with interactive courseware.
22 hours of CBT: 22 X $5300 = $116,600.00
22 hours instructor time plus preparation and evaluation: 48 X 23.40 X 17 classes = $19,094.40
Purchase Cost: $116,600.00
Annual Savings: $19,094.40

## III. ADVANCED CORE

**Recommendation III-1: Add Instruments**
This would be a low-cost initiative undertaken by existing contract.

**Recommendation III-2: Add 27 Hours of CBT**
This would replace formal classroom instruction with interactive courseware.
27 hours of CBT: 27 X $5300 = $143,100.00
27 hours instructor time plus preparation and evaluation: 81 X 23.40 X 17 classes = $32,221.80
Purchase Cost: $143,100.00
Annual Savings: $32,221.80

**Recommendation III-3: Add 18 Hours of Level II ICW**
This would replace formal classroom instruction with interactive courseware.
18 hours of ICW: 18 X $6300 = $113,400.00

18 hours instructor time plus preparation and evaluation: 54 X 23.40 X 17 classes = $21,481.20
Purchase Cost: $113,400.00
Annual Savings: $21,481.20

**Recommendation III-4: Add CAI**
This would replace formal classroom instruction with interactive courseware.
7 hours of CAI: 7 X $4000 = $28,000.00
Purchase Cost: $28,000.00

**Recommendation III-5: Add CAI**
This would replace formal classroom instruction with interactive courseware.
7 hours of CAI: 7 X $4000 = $28,000.00
Purchase Cost: $28,000.00

**Recommendation III-6: Add Level II ICW**
This would replace formal classroom instruction with interactive courseware.
7 hours of ICW: 7 X $6300 = $44,100.00
7 hours instructor time plus preparation and evaluation: 21 X 23.40 X 17 classes = $8353.80
Purchase Cost: $44,100.00
Annual Savings: $8353.80

**Recommendation III-7: Add CAI and COTS**
Commercially available software is available, at approximately $50.00 per copy. This could be loaded on the 50 units at the LRC.
Purchase Cost: $2500.00

**Recommendation III-8: Add Level II ICW**
This would replace formal classroom instruction with interactive courseware.
13 hours of ICW: 13 X $6300 = $81,900.00
13 hours instructor time plus preparation and evaluation: 39 X 23.40 X 17 classes = $15,514.20
Purchase Cost: $81,900.00
Annual Savings: $15,514.20

**Recommendation III-9: 2 Hours of ICW Testing**
This would replace formal classroom testing with interactive evaluative courseware.
2 hours of ICW: 2 X $6300 = $12,600.00
2 hours instructor time plus preparation and evaluation: 4 X 23.40 X 17 classes = $1591.20
Purchase Cost: $12,600.00
Annual Savings: $1591.20

## IV. ADVANCED STRIKE

### Recommendation IV-1: Add CAI

This would replace formal classroom instruction with interactive courseware.
3 hours of CAI: 3 X $4000 = $12,000.00
Purchase Cost: $12,000.00

### Recommendation IV-2: Add Level II ICW

This would replace formal classroom instruction with interactive courseware.
3 hours of ICW: 3 X $6300 = $18,900.00
3 hours instructor time plus preparation and evaluation: 9 X 23.40 X 15 classes = $3159.00
Purchase Cost: $18,900.00
Annual Savings: $3159.00

## V. ADVANCED STRIKE FIGHTER

### Recommendation V-1: Add CAI

This would replace formal classroom instruction with interactive courseware.
2.5 hours of CAI: 2.5 X $4000 = $10,000.00
Purchase Cost: $10,000.00

### Recommendation V-2: Add CAI

This would replace formal classroom instruction with interactive courseware.
6 hours of CAI: 6 X $4000 = $24,000.00
Purchase Cost: $24,000.00

### Recommendation V-3: 2 Hours of ICW Testing

This would replace formal classroom testing with interactive evaluative courseware.
2 hours of ICW: 2 X $6300 = $12,600.00
2 hours instructor time plus preparation and evaluation: 4 X 23.40 X 7 classes = $655.20
Purchase Cost: $12,600.00
Annual Savings: $655.20

## VI. ADVANCED TACTICAL MANEUVERING

### Recommendation VI-1: EC/CAI

This would replace formal classroom testing with interactive courseware.
10 hours of CAI: 10 X $4000 = $40,000.00
Purchase Cost: $40,000.00

### Recommendation VI-2: 2 Hours of ICW Testing

This would replace formal classroom testing with interactive evaluative courseware.
2 hours of CAI: 2 X $6300 = $12,600.00
2 hours instructor time plus preparation and evaluation: 4 X 23.40 X 8 classes = $748.80

Purchase Cost: $12,600.00
Annual Savings: $748.80

## Assumptions for Calculations

### 1. Military Instructors:

The average instructor would be an O-3 with 8 years time in service. Annual salary is calculated as follows:

| | | |
|---|---|---|
| Base pay | $3363.60 | |
| BAS | 157.26 | |
| BAH (average) | 691.50 | |
| Total monthly salary | $4212.36 | |
| Yearly salary | | $50,548.32 |
| Training days/year | 240 | |
| Hours/day | 9 | |
| Hours/year | 2160 | |
| Cost/hour | | $23.40 |

### 2. Class Sizes/Numbers

Based on average class size of 25 students per instructor (except for simulator, flight, and CBT labs) for classroom time, the following class numbers are assumed:

| | | |
|---|---|---|
| Primary: | 550 students | 22 classes |
| Intermediate | 416 students | 17 classes |
| ATDS | 373 students | 15 classes |
| STK/FTR | 175 students | 7 classes |
| STK | 198 students | 8 classes |

### 3. Class Time for Instructors

For each class event, each instructor will have one hour preparation time, and one hour evaluation time added to the time spent in class.

### 4. ICW/CBT Costs

| | |
|---|---|
| CAI | $4000/hr |
| Level I ICW | $5300/hr |
| Level II ICW | $6300/hr |
| Level III ICW | $9000/hr |

## ISD Team

The ISD team would be comprised of a instructional designer and subject matter expert located onsite for maximum interaction with instructors. It is recommended that the ISD team be contracted firm fixed-price for a three year period. First year cost would be $238,400.68, plus a 15% ROM factor of $35,760 for a total of $274,160.78. Subsequent years will be adjusted for inflation, based on the government adjustment factors (currently 3.9 percent per annum through FY06).

## Electronic Classroom

It is recommended that the four existing electronic classrooms be upgraded to I-AEC standards. These classrooms would provide enhanced CAI capabilities and instructor/student interface for capturing responses. The total cost for the four new classrooms would be $536,853.35, which includes installation, facilities modifications, and integration of current software and COM support.

## Video Recording System

It is recommended that video recording systems be installed into 15 T-39 aircraft to record student/instructor interactions and responses, out-of-cockpit video, and selected instruments. This system employs the latest image demultiplexing techniques developed by DERA Malvern. The system includes 3 playback units. The costs involved are $60,000.00 per recording system, and $120,000.00 for each ground playback system. Total costs: $1,260,000.00.

ROM price based on the following **Airborne components**:

- Three color CCD cameras with electronic automatic exposure control and lenses for internal and external views.
- Eight channel video multiplexer with one radar scan converter. Selector switch programmed with up to eight customer selected multiplexing sequences, Inputs may include : Video cameras, Radar, RHWR, TV TABS, MFDS, 1553 and audio channels
- Digital Airborne Video Tape Recorder to record the multiplexed output from the multiplexer and the 1553 data. The recorder will have two hours recording capability without changing tapes.

All components of the above system are fully qualified to MIL standards 810 for use
on fast jets. The system will operate on the NTSC television standard. No provision has been made for installation costs. It is assumed that all of the inputs to be recorded can be synchronized without the requirement for buffering.

MAVAS Demultiplexing picture-in-picture **ground station** comprising:

- 19 inch processor rack housing a rugged industrial standard Pentium PC with a minimum of 512 MB memory, high performance graphics processor card, keyboard, digital tape replay machine and sound system.
- One or two 21 inch monitors or 18.1 inch TFT screens.

The MAVAS will be loaded with software to provide demultiplexing of the video sources and picture-in-picture display and will offer the following additional facilities :

1. Complete on-screen control of video/audio playback.
2. Rapid search to event marks.
3. Real time PAN and Zoom control.
4. Print screen output.
5. Copy of demultiplexed display to another VCR for playback on standard machines.
6. Comprehensive software tools including target scaling and mensuration, auto calculations, G calculations, reversionary bombing calculations as well as all the standard image enhancement tools.

# A PROPOSAL for an INSTRUCTIONAL DESIGN TEAM

## Problem

There are several shortfalls in the present Undergraduate Military Flight Officer (UMFO) curriculum that have developed over a period of years. The prognosis, given the present infrastructure at Training Wing Six, is not good. The structure, sequencing and integration of the training lacks a systematic, holistic approach. Higher level learning outcomes have not been identified and implemented. Instructors have not been trained in higher level instructional strategies.

Added to these design issues are the pressures of a mounting backlog of interactive courseware (ICW) and computer-aided instruction (CAI) to be evaluated, repaired and incorporated into the curriculum. The ICW and CAI that has been developed in support of the curriculum was produced without an adequate task analysis, and accepted by Training Wing Six without the advantage of a dedicated instructional designer. Changes were made to the phase curricula piecemeal, with no unifying direction from an instructional designer. Consequently, these problems will not be resolved, and others will continue to surface.

## Discussion

The problems listed above have not gone unnoticed. CNATRA code N3121 has repeatedly recommended that the vacant GS-11 billet for an Educational Specialist be filled. CTW-6 has repeatedly requested that the billet be upgraded to a GS-12 and filled.

It is important to note, however, that the magnitude of the changes recommended by this study during the first year alone are far too much for one instructional designer to handle. The GS-12, assuming the position is filled, needs an assist from a full-time instructional designer. These tasks include:

1. interface with contractors developing the INAV/VNAV/SA simulator;
2. develop an SA curriculum across all instructional phases;
3. supervise the evaluation of currently contracted computer-based coursework and storyboards;

4. work with instructors to evaluate existing, unused ICW and CAI;
5. begin updating and integrating lessons guides into the curriculum; and
6. begin converting academic examinations to ICW.

Additionally, before instructors can get any relief from developing and teaching academic classes, the replacement ICW must be developed. The wing needs an NFO instructor assigned full-time to assist the instructors in evaluating the instructional content of storyboards, ICW "check disks" and existing, unused courseware to help work through the backlog.

**Recommendation**

Training Wing Six needs a dedicated instructional design team for at least one year. The team would consist of an Instructional Designer with an advanced degree in Instructional Design or Instructional Technology and a Subject Matter Expert with recent experience as an MFO instructor. The team would work directly for the Academic Officer.

# PRIORITY for IMPLEMENTATION of RECOMMENDATIONS

## Hardware/Software Procurement

**Year One**

1. Design/build prototype 2B-47 replacement ANAV/VNAV/SA simulator as described on page 20.
2. Purchase and install two video recording systems in T-39Ns and one ground-based playback unit as described above to begin collecting data.
3. Procure and implement COTS communication software.

**Year Two**

1. Install production model simulators.
2. Install 13 more video recording systems and two playback units.

## Software/Curriculum Development

**Year One**

Contract an ISD Team to assist with the Design/Re-work ICW/CAI/CBT effort
for the UMFO curriculum. The lesson priorities are as follows:

| Course | Instructional Hours |
|---|---|
| 1. Develop objectives for FAM/SA flights | 10.0 |
| 2. Develop instruction from SA objectives | ( ) |
| 3. COMM (I-4) | 5.5 |
| 4. T-34 NATOPS (I-9) | 19.5 |
| 5. BINAV (I-5) | 16.5 |
| 6. VNAV (II-5) | 20.0 |
| 7. CVP (III-7) | 4.0 |
| 8. Metro (I-7) | 10.0 |
| **Total:** | 85.5 |

**Year Two**

| Course | Instructional Hours |
|---|---|
| 1. FPLN (I-8) | 16.0 |
| 2. T-1 NATOPS (II-6) | 22.0 |
| 3. LL/RP (III-4) | 7.0 |
| 4. LL/RN (III-5) | 7.0 |
| 5. T-39 NATOPS (III-2) | 27.0 |
| **Total:** | 79.0 |

**Year Three**

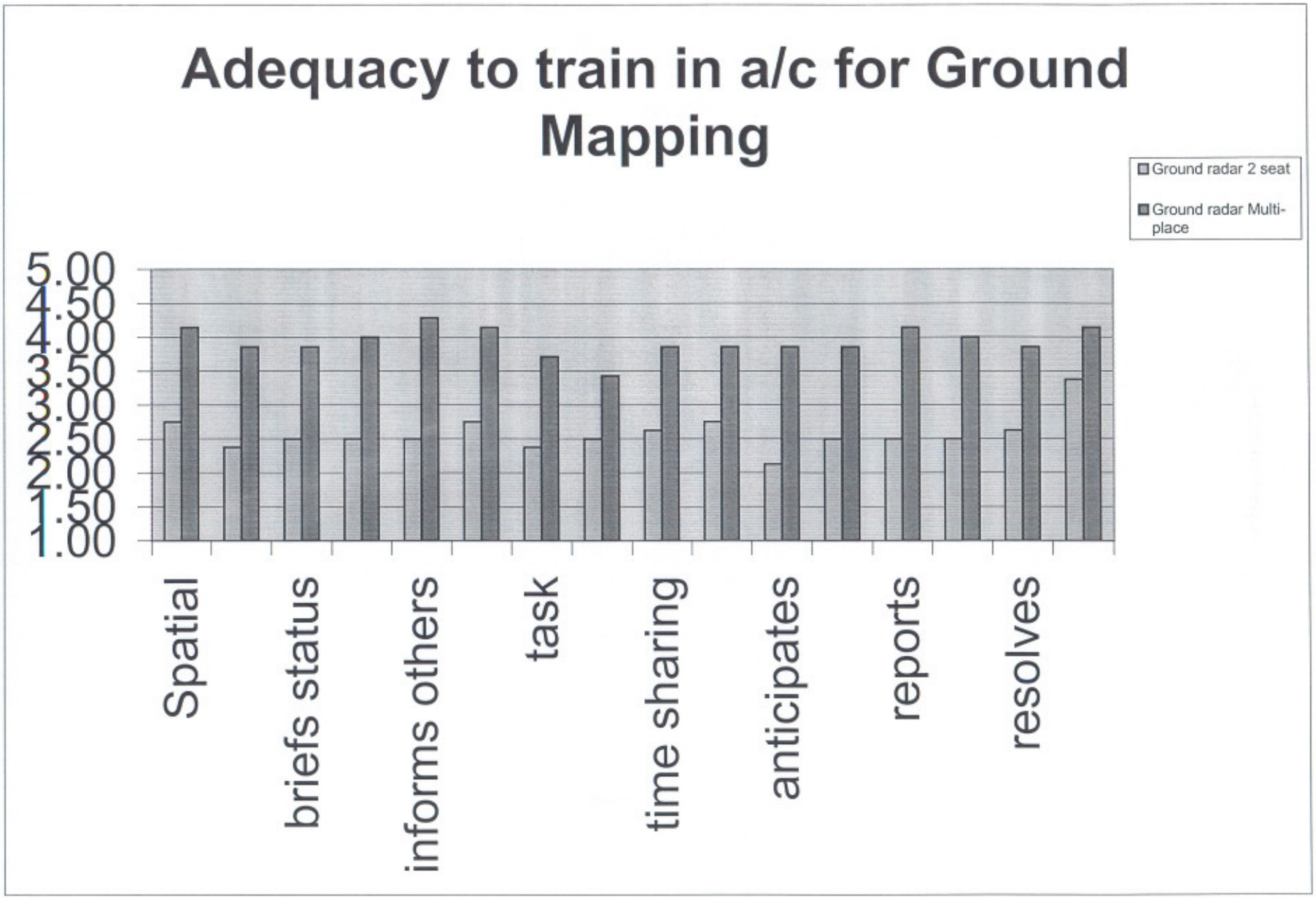
| Course | Instructional Hours |
|---|---|
| 1. T-39 Prep (III-3) | 18.0 |
| 2. TPP (III-6) | 7.0 |
| 3. SPX (III-9) | 5.0 |
| 4. IGS (III-8) | 13.0 |
| 5. RS (IV-1) | 3.0 |
| 6. CSP (IV-2) | 3.0 |
| 7. AIR (V-1) | 2.5 |
| 8. FE (V-2) | 6.0 |
| 9. EBIX (V-3) | 2.0 |
| 10. ATML (VI-1) | 10.0 |
| 11. FX (VI-2) | 2.0 |
| **Total:** | 71.5 |

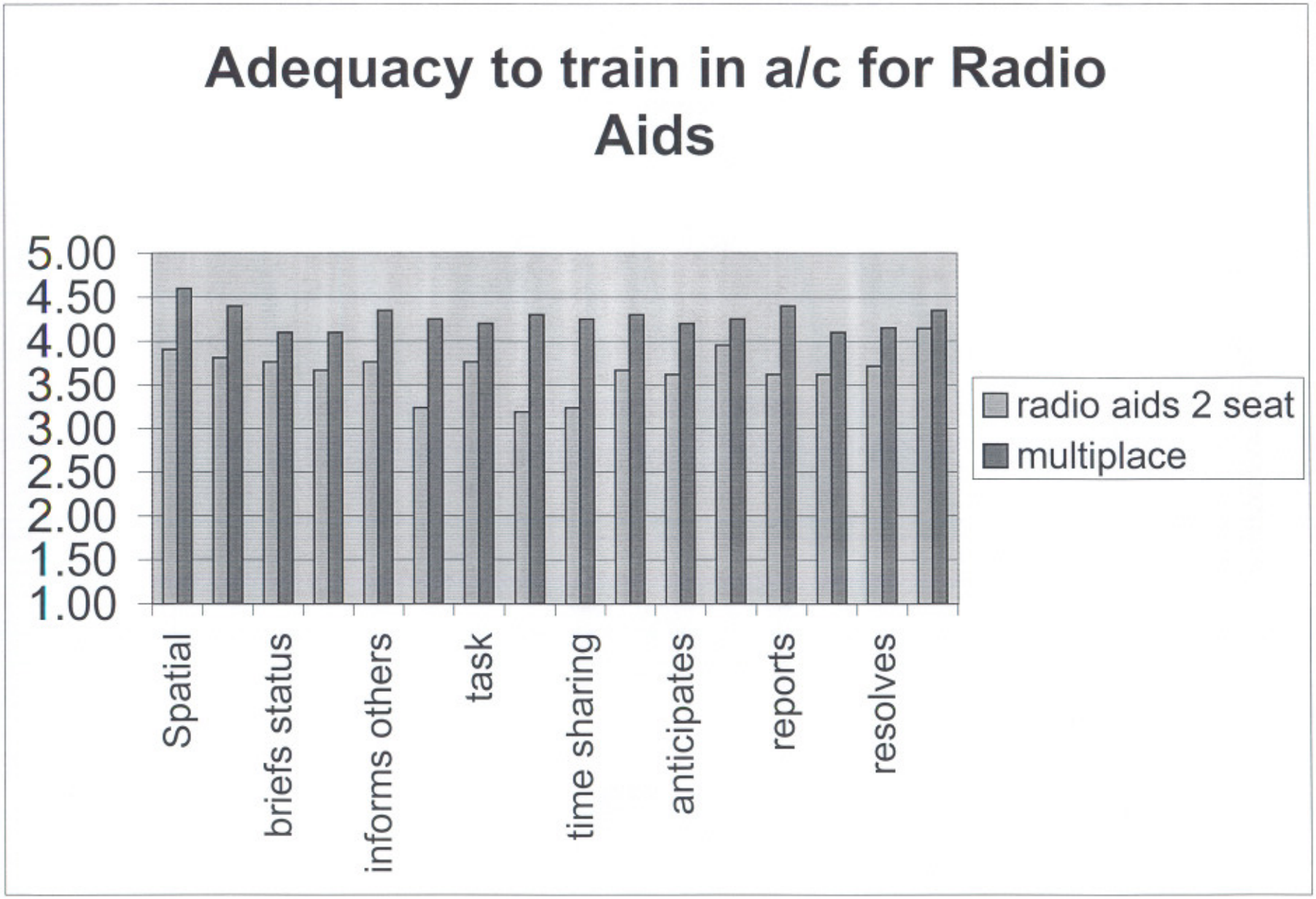
| | Difficulty to Perform |
|---|---|
| Spatial awareness | 3.25 |
| uses info sources | 2.90 |
| briefs status | 2.25 |
| provides info | 3.30 |
| informs others of action | 2.15 |
| cross checks | 3.40 |
| task knowledge | 2.80 |
| backup | 3.50 |
| time sharing | 4.45 |
| scan | 3.89 |
| anticipates consequences | 4.40 |
| takes action | 3.15 |
| reports problems | 2.45 |
| locates source of prob | 3.45 |
| resolves discrepancies | 3.40 |
| standard comms | 3.25 |

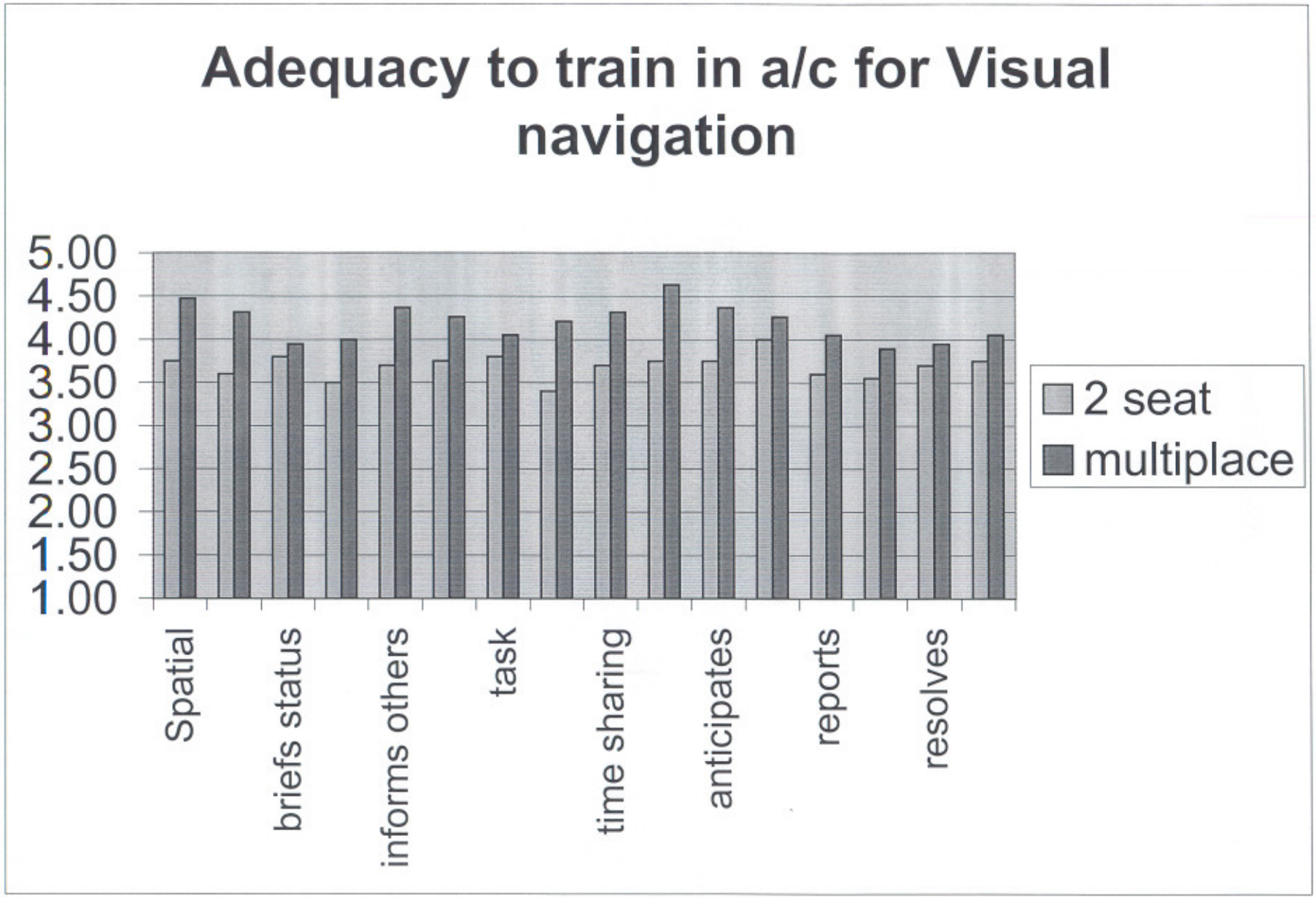
| | Criticality to Training Goal | | | | | |
|---|---|---|---|---|---|---|
| | Ground Mapping Radar | Radio Aids Nav | Comm | Safety | Vis nav | |
| Spatial awareness | 4.63 | 4.86 | 3.43 | 4.57 | 4.95 | 22.43 |
| uses info sources | 3.38 | 4.00 | 3.76 | 4.05 | 4.30 | 19.48 |
| briefs status | 2.88 | 2.95 | 2.95 | 3.19 | 3.25 | 15.22 |
| provides info | 2.88 | 3.14 | 3.33 | 3.52 | 4.00 | 16.88 |
| informs others of action | 2.38 | 3.24 | 3.81 | 4.05 | 3.45 | 16.92 |
| cross checks | 3.25 | 3.38 | 3.10 | 4.19 | 4.00 | 17.92 |
| task knowledge | 2.88 | 3.19 | 3.05 | 3.95 | 3.95 | 17.02 |
| backup | 1.75 | 2.57 | 3.24 | 3.76 | 3.05 | 14.37 |
| time sharing | 3.75 | 3.71 | 3.62 | 3.90 | 4.15 | 19.14 |
| scan | 4.00 | 3.67 | 2.52 | 4.25 | 4.80 | 19.24 |
| anticipates consequences | 3.88 | 3.67 | 2.95 | 4.38 | 4.35 | 19.23 |
| takes action | 3.88 | 3.86 | 3.52 | 4.24 | 4.35 | 19.84 |
| reports problems | 2.75 | 3.14 | 3.81 | 4.48 | 3.65 | 17.83 |
| locates source of prob | 3.50 | 3.14 | 2.90 | 4.29 | 3.65 | 17.48 |
| resolves discrepancies | 4.13 | 3.86 | 3.10 | 4.10 | 3.85 | 19.02 |
| standard comms | 2.50 | 2.76 | 4.52 | 3.19 | 2.90 | 15.88 |
| | 3.27 | 3.45 | 3.35 | 4.01 | 3.92 | |

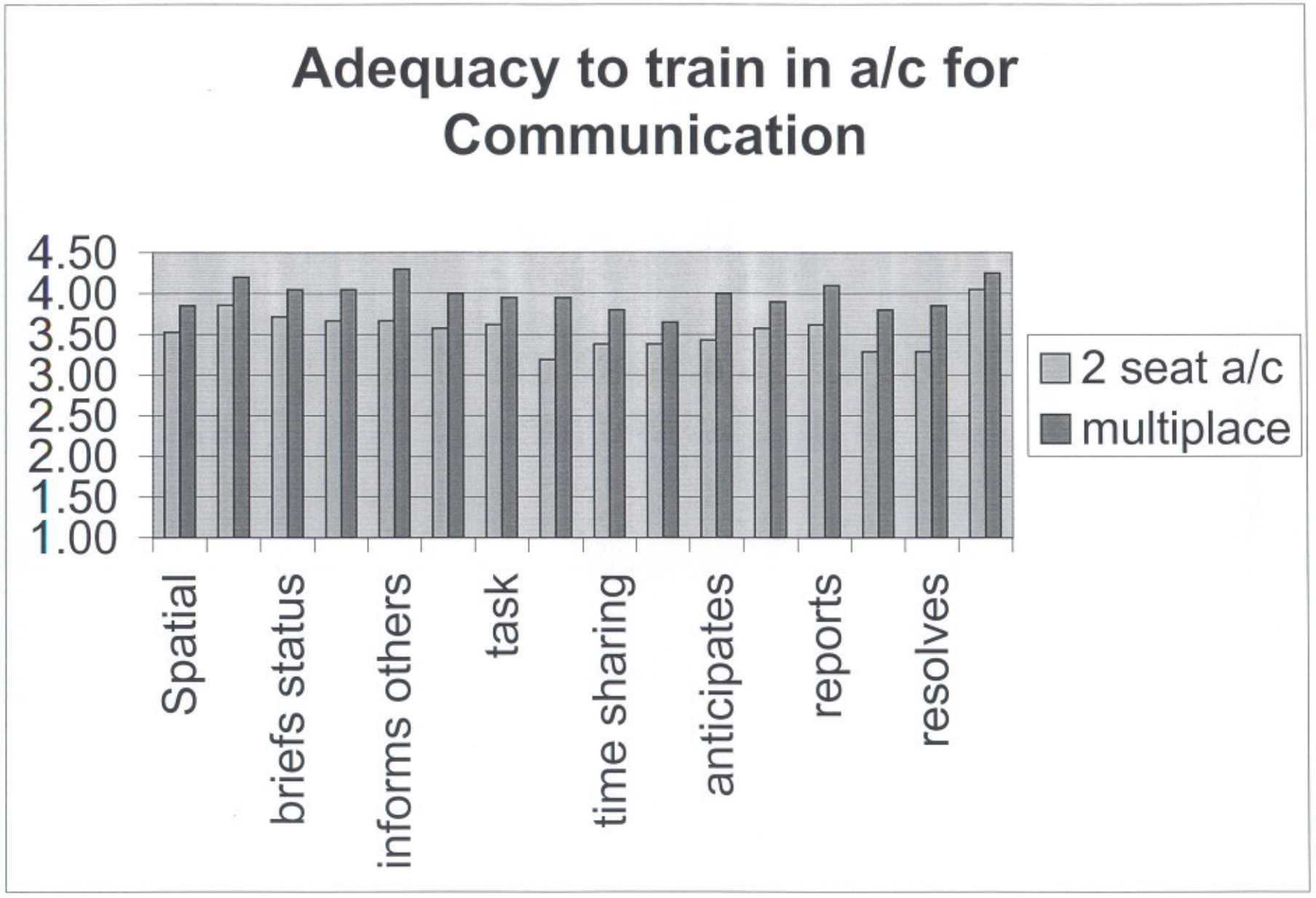
| Adequacy to train SA skill in the aircraft | Ground radar | | radio aids nav | | comm | | safety | | vis nav | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2 seat | Multi-place | 2 seat | Multi-place | 2 seat | Multi-place | 2 seat | Multi-place | 2 seat | Multi-place |
| Spatial awareness | 2.75 | 4.14 | 3.90 | 4.60 | 3.52 | 3.85 | 3.95 | 4.50 | 3.75 | 4.47 |
| uses info sources | 2.38 | 3.86 | 3.81 | 4.40 | 3.86 | 4.20 | 3.86 | 4.45 | 3.60 | 4.32 |
| briefs status | 2.50 | 3.86 | 3.76 | 4.10 | 3.71 | 4.05 | 3.52 | 3.65 | 3.80 | 3.95 |
| provides info | 2.50 | 4.00 | 3.67 | 4.10 | 3.67 | 4.05 | 3.33 | 3.75 | 3.50 | 4.00 |
| informs others of action | 2.50 | 4.29 | 3.76 | 4.35 | 3.67 | 4.30 | 3.67 | 4.20 | 3.70 | 4.37 |
| cross checks | 2.75 | 4.14 | 3.24 | 4.25 | 3.57 | 4.00 | 3.57 | 4.25 | 3.75 | 4.26 |
| task knowledge | 2.38 | 3.71 | 3.76 | 4.20 | 3.62 | 3.95 | 4.00 | 4.10 | 3.80 | 4.05 |
| backup | 2.50 | 3.43 | 3.19 | 4.30 | 3.19 | 3.95 | 3.57 | 4.25 | 3.40 | 4.21 |
| time sharing | 2.63 | 3.86 | 3.24 | 4.25 | 3.38 | 3.80 | 3.62 | 4.00 | 3.70 | 4.32 |
| scan | 2.75 | 3.86 | 3.67 | 4.30 | 3.38 | 3.65 | 3.81 | 4.30 | 3.75 | 4.63 |
| anticipates consequences | 2.13 | 3.86 | 3.62 | 4.20 | 3.43 | 4.00 | 4.00 | 4.35 | 3.75 | 4.37 |
| takes action | 2.50 | 3.86 | 3.95 | 4.25 | 3.57 | 3.90 | 4.10 | 4.45 | 4.00 | 4.26 |
| reports problems | 2.50 | 4.14 | 3.62 | 4.40 | 3.62 | 4.10 | 3.76 | 4.25 | 3.60 | 4.05 |
| locates source of prob | 2.50 | 4.00 | 3.62 | 4.10 | 3.29 | 3.80 | 3.52 | 4.05 | 3.55 | 3.89 |
| resolves discrepancies | 2.63 | 3.86 | 3.71 | 4.15 | 3.29 | 3.85 | 3.71 | 4.00 | 3.70 | 3.95 |
| standard comms | 3.38 | 4.14 | 4.14 | 4.35 | 4.05 | 4.25 | 3.48 | 3.85 | 3.75 | 4.05 |
| | 41.25 | 63.00 | 58.67 | 68.30 | 56.81 | 63.70 | 59.48 | 66.40 | 59.10 | 67.16 |

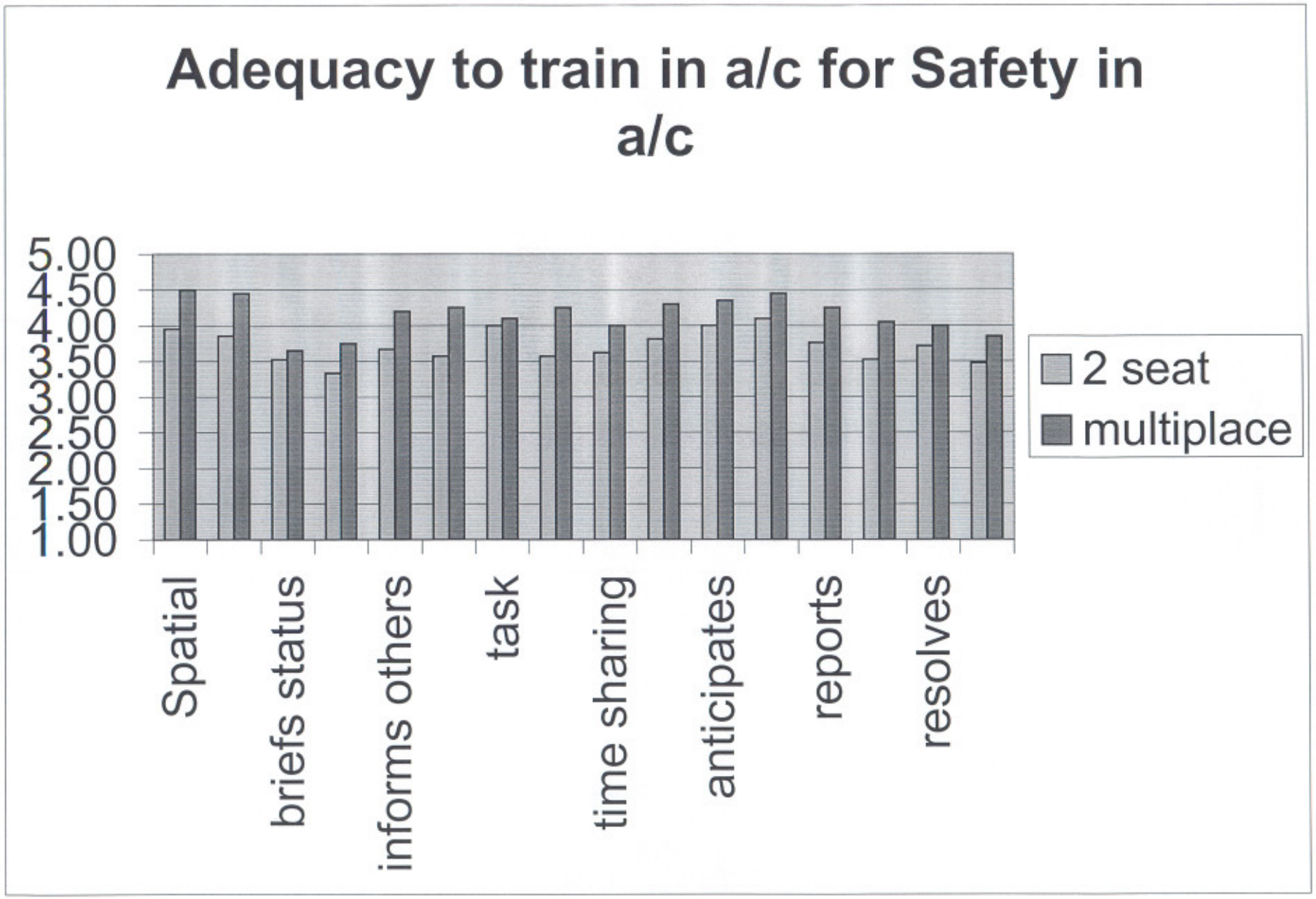
| Adequacy to train SA skill in the simulator | Ground radar | | radio aids nav | | comm | | safety | | vis nav | |
|---|---|---|---|---|---|---|---|---|---|---|
| | no visual | visual | no visual | visual | no visual | visual | no visual | visual | no visual | visual |
| Spatial awareness | 3.13 | 4.25 | 3.52 | 3.81 | 2.86 | 3.38 | 3.10 | 3.95 | 1.45 | 4.20 |
| uses info sources | 2.63 | 3.63 | 3.00 | 3.70 | 3.05 | 3.52 | 3.05 | 3.81 | 1.60 | 4.00 |
| briefs status | 3.50 | 3.88 | 3.33 | 3.62 | 3.19 | 3.33 | 3.05 | 3.33 | 2.35 | 4.05 |
| provides info | 3.50 | 3.88 | 3.19 | 3.67 | 3.00 | 3.48 | 2.95 | 3.48 | 1.90 | 3.80 |
| informs others of action | 3.25 | 3.88 | 3.48 | 3.57 | 3.14 | 3.38 | 3.14 | 3.48 | 2.40 | 3.75 |
| cross checks | 3.00 | 4.00 | 3.43 | 4.10 | 3.10 | 3.52 | 3.05 | 3.81 | 1.85 | 3.85 |
| task knowledge | 3.50 | 4.00 | 3.81 | 3.90 | 3.10 | 3.19 | 3.67 | 3.86 | 2.10 | 4.00 |
| backup | 2.63 | 3.13 | 3.14 | 3.43 | 2.90 | 3.29 | 2.95 | 3.24 | 2.25 | 3.75 |
| time sharing | 3.00 | 3.88 | 3.14 | 3.48 | 2.95 | 3.14 | 2.81 | 3.33 | 1.90 | 3.65 |
| scan | 2.38 | 3.75 | 2.67 | 3.90 | 2.76 | 3.38 | 2.67 | 3.71 | 1.50 | 4.10 |
| anticipates consequences | 3.00 | 3.63 | 3.19 | 3.62 | 3.00 | 3.29 | 3.19 | 3.57 | 1.95 | 3.85 |
| takes action | 3.50 | 3.75 | 3.57 | 3.67 | 3.10 | 3.14 | 3.57 | 4.05 | 1.90 | 3.80 |
| reports problems | 2.88 | 3.38 | 3.19 | 3.71 | 3.10 | 3.52 | 3.10 | 3.71 | 2.00 | 3.75 |
| locates source of prob | 3.13 | 3.75 | 3.10 | 3.52 | 3.00 | 3.33 | 3.19 | 3.76 | 1.95 | 3.70 |
| resolves discrepancies | 3.13 | 3.63 | 3.48 | 3.67 | 3.00 | 3.38 | 3.05 | 3.52 | 2.05 | 3.80 |
| standard comms | 3.00 | 3.50 | 3.19 | 3.62 | 3.52 | 3.76 | 2.86 | 3.33 | 2.40 | 3.60 |
| | 49.13 | 59.88 | 52.43 | 58.99 | 48.76 | 54.05 | 49.38 | 57.95 | 31.55 | 61.65 |

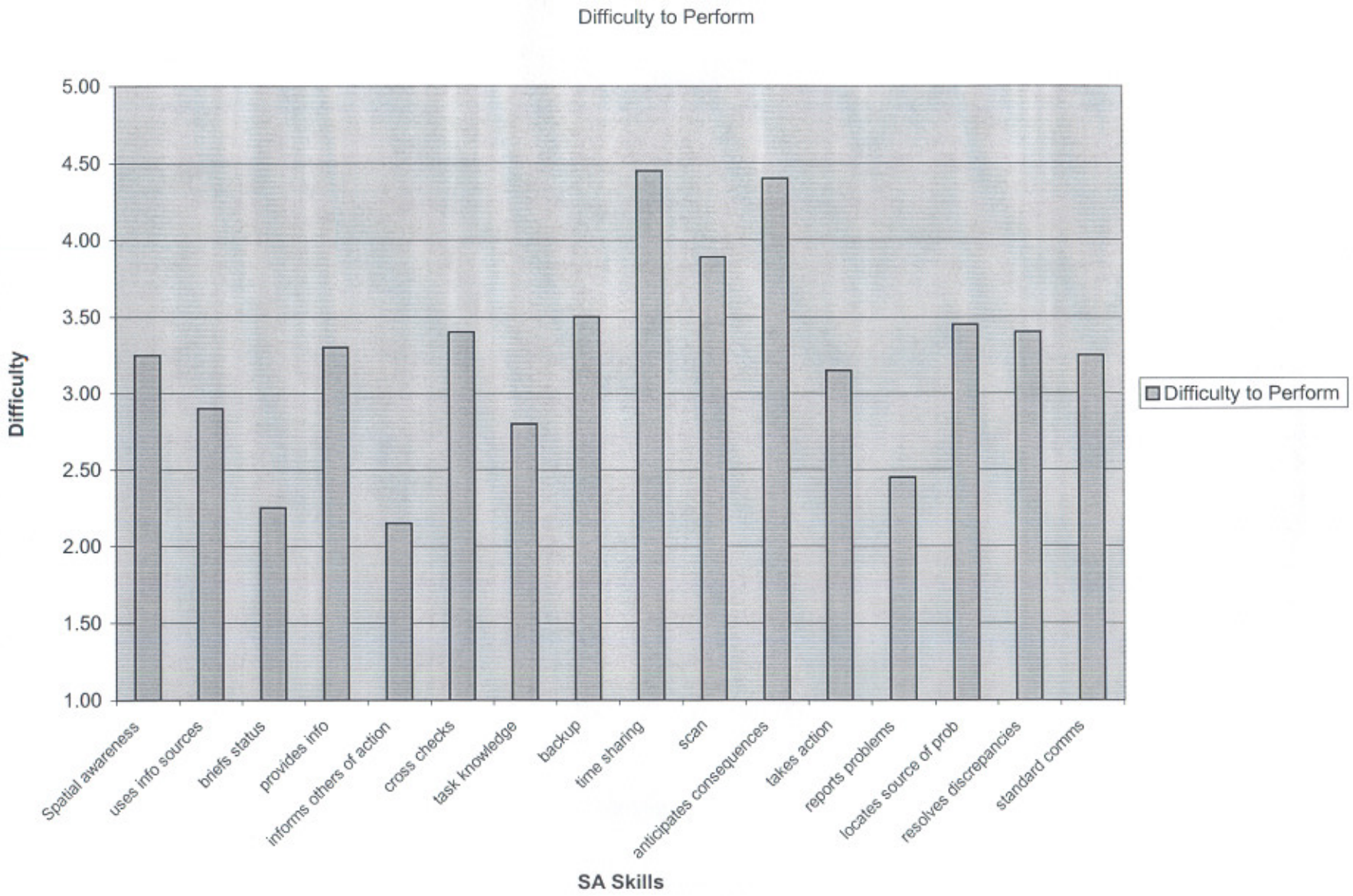

Adequacy to train in a/c for Ground Mapping
Ground radar 2 seat
Ground radar Multi-place
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
Spatial
briefs status
informs others
task
time sharing
anticipates
reports
resolves

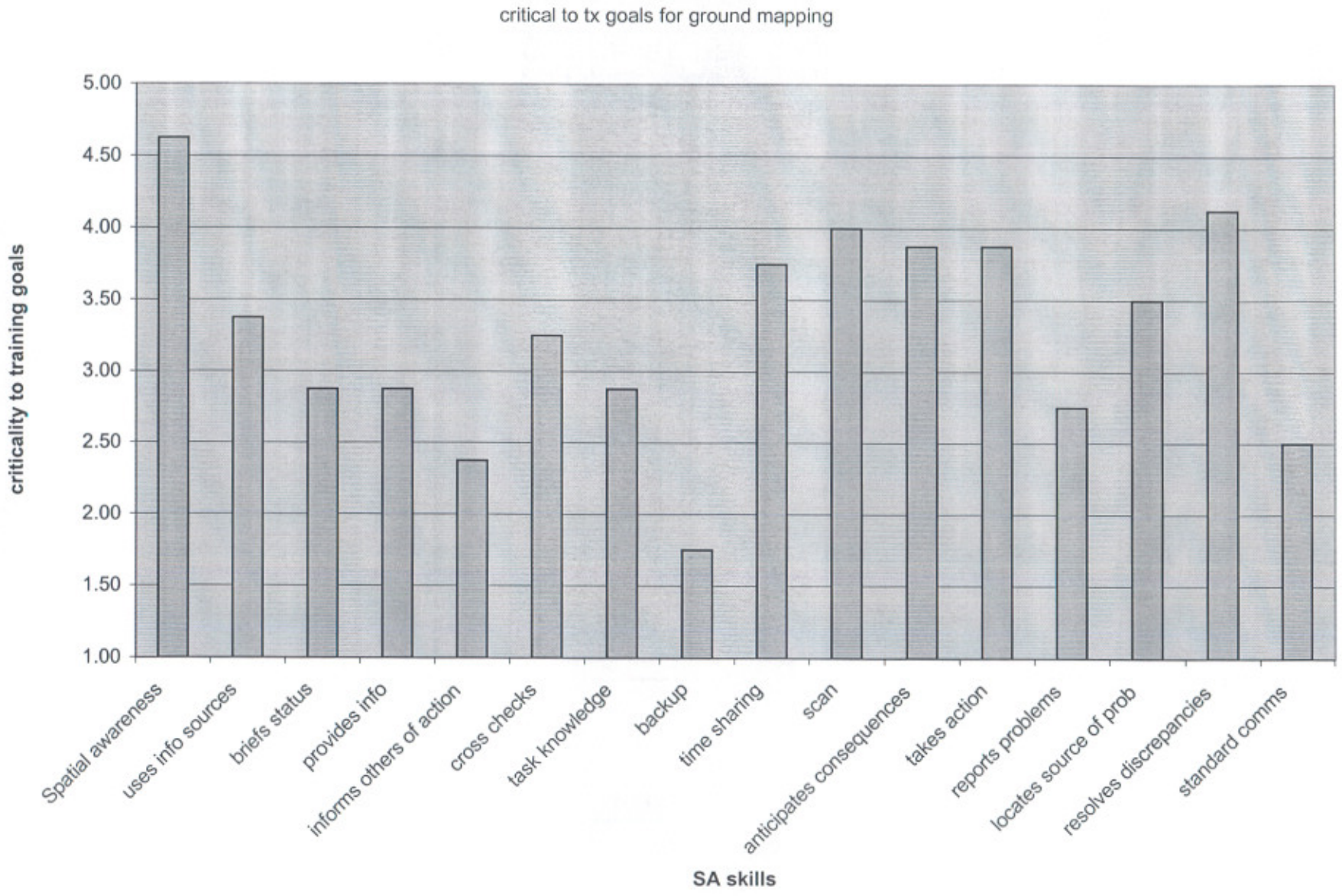

Adequacy to train in a/c for Radio Aids
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
Spatial
briefs status
informs others
task
time sharing
anticipates
reports
resolves
radio aids 2 seat
multiplace

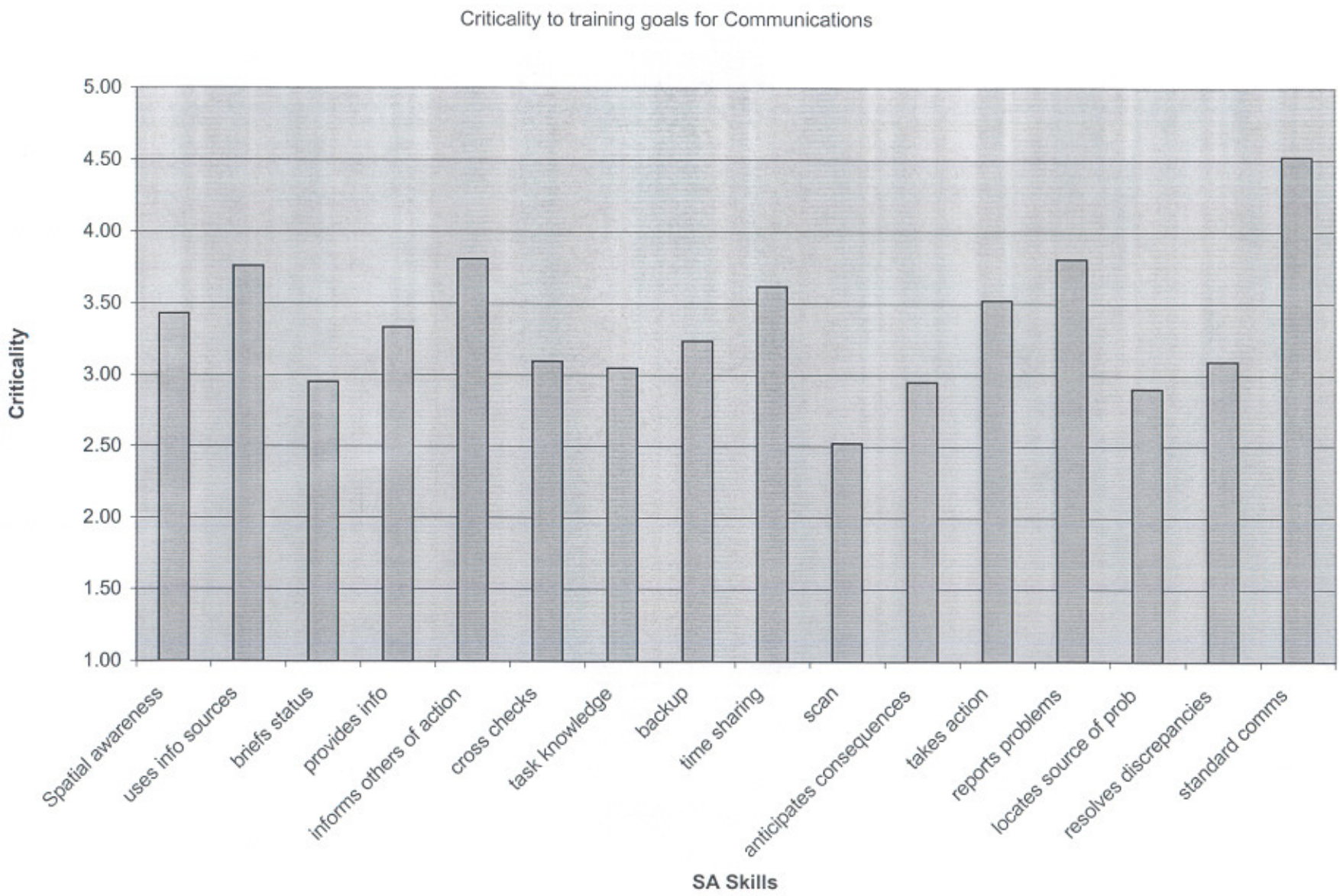

Adequacy to train in a/c for Visual navigation
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
Spatial
briefs status
informs others
task
time sharing
anticipates
reports
resolves
2 seat
multiplace

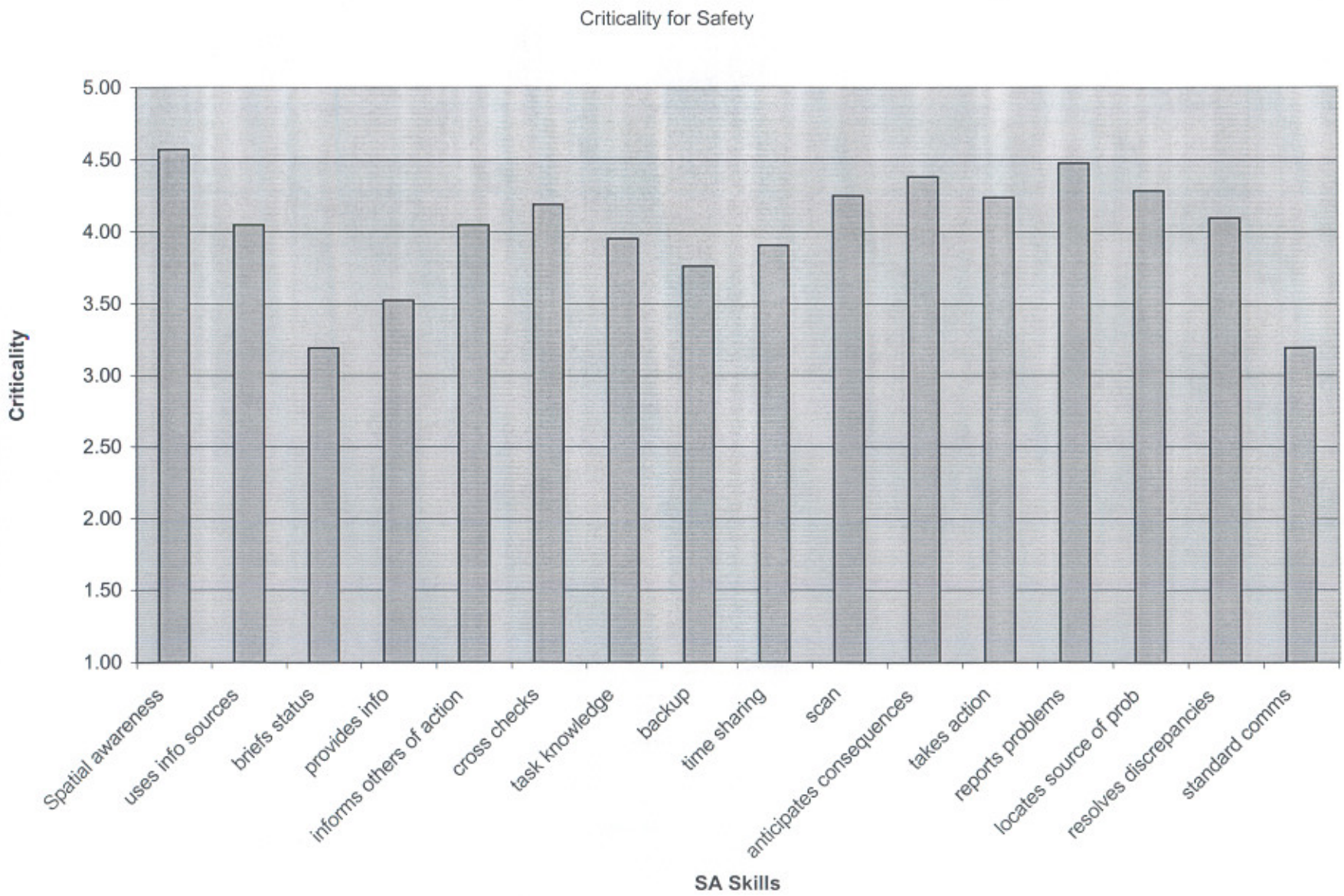

Adequacy to train in a/c for Communication
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
Spatial
briefs status
informs others
task
time sharing
anticipates
reports
resolves
2 seat a/c
multiplace

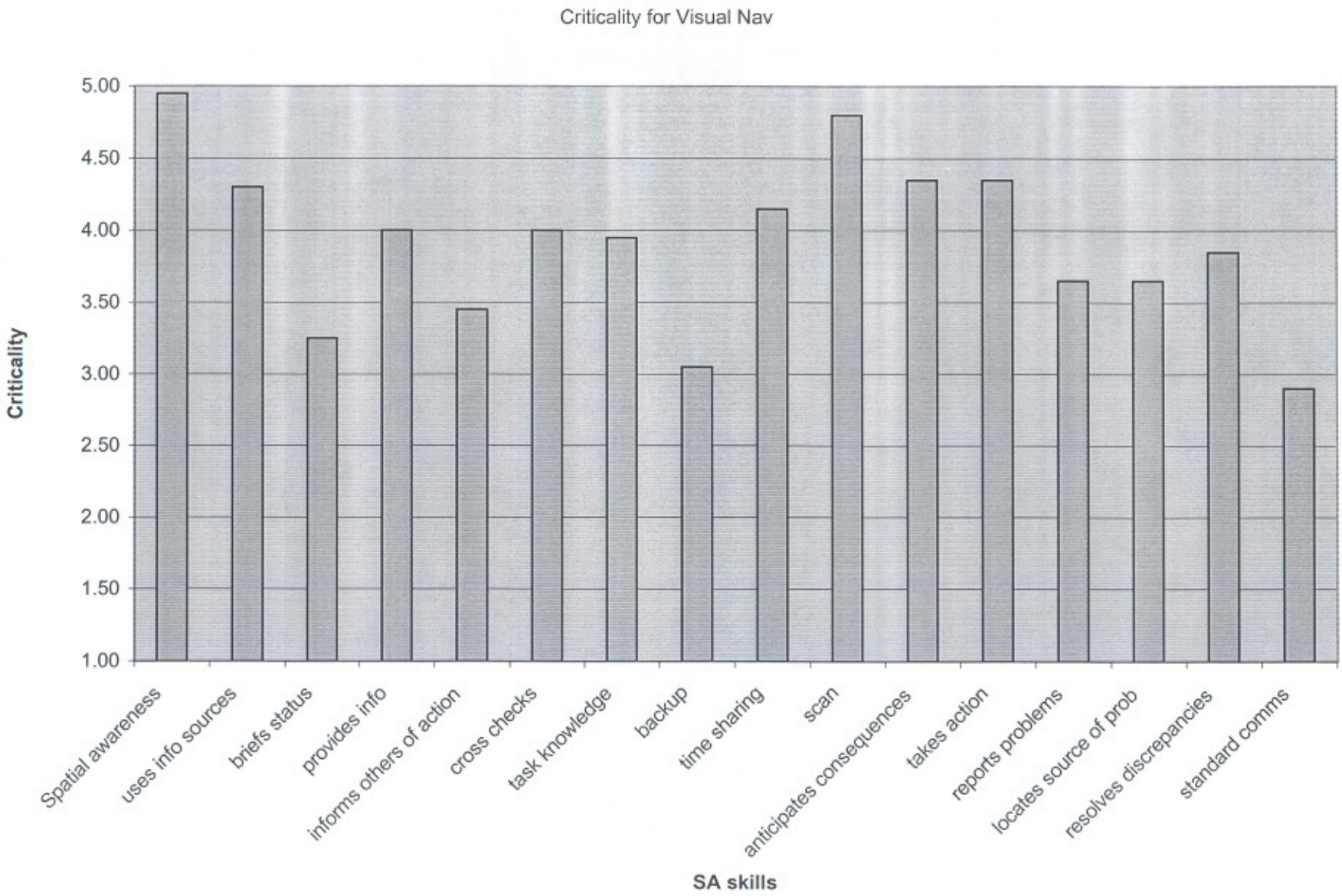

Adequacy to train in a/c for Safety in a/c
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
Spatial
briefs status
informs others
task
time sharing
anticipates
reports
resolves
2 seat
multiplace

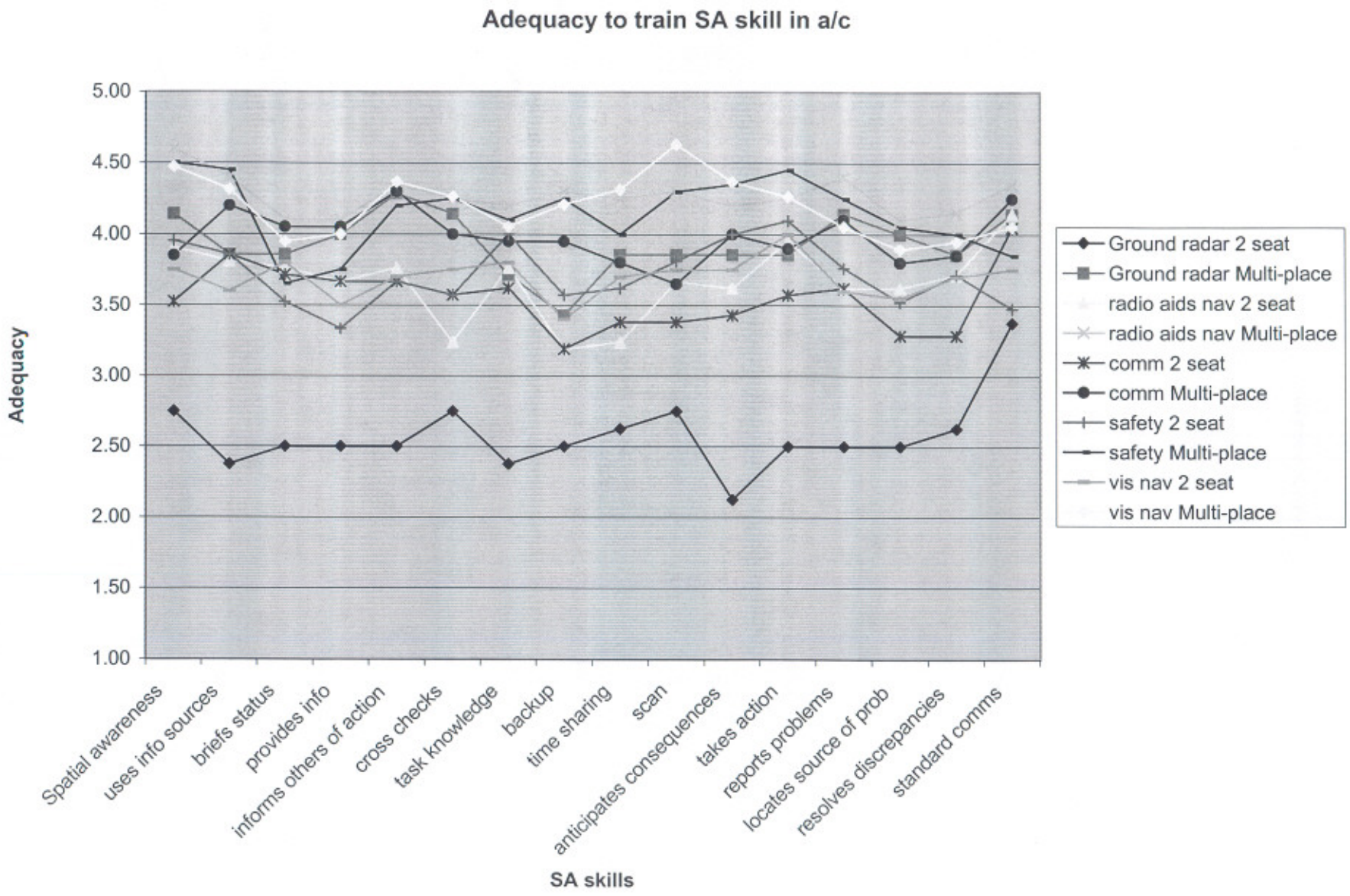

Difficulty to Perform
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
Difficulty
Spatial awareness
uses info sources
briefs status
provides info
informs others of action
cross checks
task knowledge
backup
time sharing
scan
anticipates consequences
takes action
reports problems
locates source of prob
resolves discrepancies
standard comms
SA Skills
Difficulty to Perform

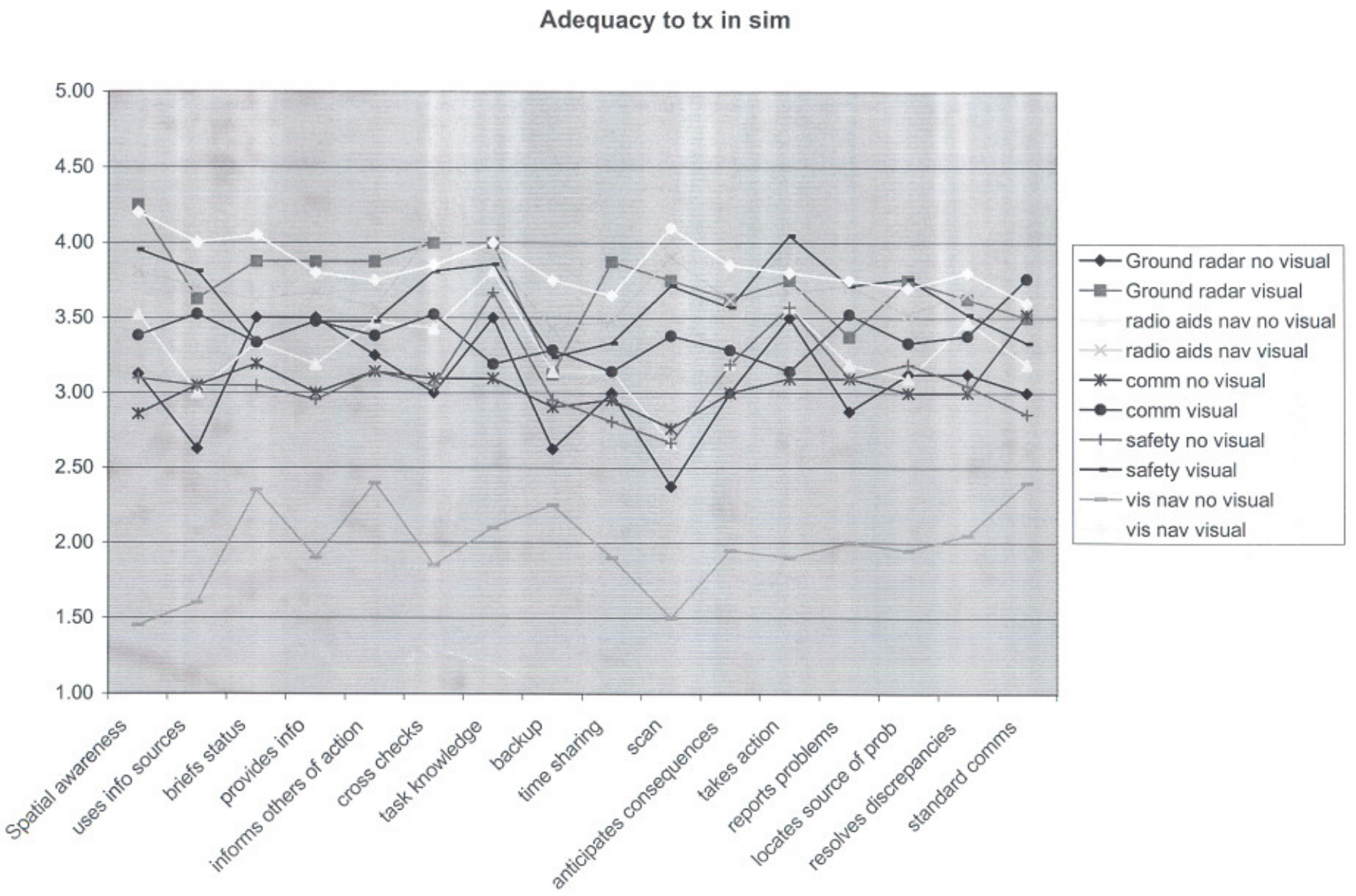

critical to tx goals for ground mapping
criticality to training goals
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
Spatial awareness
uses info sources
briefs status
provides info
informs others of action
cross checks
task knowledge
backup
time sharing
scan
anticipates consequences
takes action
reports problems
locates source of prob
resolves discrepancies
standard comms
SA skills


Criticality to training goals for Communications
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
Criticality
Spatial awareness
uses info sources
briefs status
provides info
informs others of action
cross checks
task knowledge
backup
time sharing
scan
anticipates consequences
takes action
reports problems
locates source of prob
resolves discrepancies
standard comms
SA Skills


Criticality for Safety
Criticality
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
Spatial awareness
uses info sources
briefs status
provides info
informs others of action
cross checks
task knowledge
backup
time sharing
scan
anticipates consequences
takes action
reports problems
locates source of prob
resolves discrepancies
standard comms
SA Skills


Criticality for Visual Nav
Criticality
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
Spatial awareness
uses info sources
briefs status
provides info
informs others of action
cross checks
task knowledge
backup
time sharing
scan
anticipates consequences
takes action
reports problems
locates source of prob
resolves discrepancies
standard comms
SA skills


Adequacy to train SA skill in a/c
Adequacy
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
Spatial awareness
uses info sources
briefs status
provides info
informs others of action
cross checks
task knowledge
backup
time sharing
scan
anticipates consequences
takes action
reports problems
locates source of prob
resolves discrepancies
standard comms
SA skills
Ground radar 2 seat
Ground radar Multi-place
radio aids nav 2 seat
radio aids nav Multi-place
comm 2 seat
comm Multi-place
safety 2 seat
safety Multi-place
vis nav 2 seat
vis nav Multi-place


Adequacy to tx in sim
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
Spatial awareness
uses info sources
briefs status
provides info
informs others of action
cross checks
task knowledge
backup
time sharing
scan
anticipates consequences
takes action
reports problems
locates source of prob
resolves discrepancies
standard comms
Ground radar no visual
Ground radar visual
radio aids nav no visual
radio aids nav visual
comm no visual
comm visual
safety no visual
safety visual
vis nav no visual
vis nav visual

# Training Situation Document for the Undergraduate Military Flight Officer (UMFO) Training Situation Analysis (TSA)

**Contract Number: N61339-98-D-0005**

**Delivery Order Number: D001**

**CDRL A001 and A002**

**Prepared For:**

**Naval Air Warfare Center Training Systems Division**

**12350 Research Parkway**

**Orlando, FL 32826-3224**

**Prepared By:**

**JIL Information Systems, Inc.**

**3251 Progress Drive, Suite B**

**Orlando, FL 32826**

**30 September 1999**

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|---|---|---|---|---|---|
| **Page No.** | **Change In Effect** | **Page No.** | **Change In Effect** | **Page No.** | **Change In Effect** |
| | | | | | |

## Letter of Promulgation

This letter promulgates the Training Situation Document for the Undergraduate Military Flight Officer (UMFO) Program. It is a record of the survey conducted to determine future training requirements for the UMFO to the year 2006 and the ability of existing training events to satisfy present training objectives.

This publication addresses the training program learning analysis. That includes: a listing of the mission statement, course objectives, the terminal learning objectives, the enabling learning objectives and the knowledge, skills and attitudes necessary to support the learning objectives.

The Training Situation Document for the UMFO Program is a record of the survey conducted to determine future training requirements for the UMFO in the year 2006 and the ability of existing training events to satisfy the present training objectives. This publication addresses the training program situational analysis. That includes: reasons for the study, situation assessment, impact statements, description of analytical methods and procedures, a literature review, description of information sources and data collection, the training technology, associated training equipment, initial and life cycle costs, description of solutions and alternatives, recommendations and a summary of recommendations. This report also provides the training deficiencies of the existing program and recommendations for training and media selection for the UMFO Program to the year 2006. The survey is conducted in accordance with the development standards of MIL-PRF-29612.

The procedures and documents provided follow an instructional systems development method. Each is interrelated to the others. Considerable research has been accomplished to assure that the data provided is representative of the actual UMFO Training Program and future training requirements.

Corrections and comments concerning this publication are invited and should be addressed to the Naval Air Warfare Center, Training Systems Division (TSD 4971).

## Change Record

| Number and Description of Change | Entered By | Date |
|---|---|---|
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| | | |

## Foreword/Preface

The UMFO training system is operated and managed by the Naval Aviation TW-6, NAS Pensacola, FL. TW-6 provides UMFO training to U.S. Navy, U.S. Air Force, and Foreign Military Officers. The UMFO Program is unique in preparing MFO for a variety of aircraft flight duties. The training is designed to provide commissioned officers with the skills and knowledge required safely aviating, navigating, communicating, managing aircraft systems, and aircraft in visual contact and in instrument conditions. Mission changes within the Fleet, along with emergent technology, will have a direct impact on future MFO training requirements. This Training Situation Analysis is being conducted to identify these changes so a plan to meet future MFO training needs may be implemented.

The Training Situation Document is a written document of the analysis conducted for Primary, Intermediate and Advanced MFO Training.

The document reports the tasks required to conduct the analyses, the analysis assessments and provides the results. The analysis determined alternative training media and associated costs in the UMFO training system. The analysis identified what knowledge and skills will be required by the MFO upon graduation from TW-6 in year 2006. Aircraft and Systems technology were reviewed to determine operational requirements of year 2006. Emphasis is placed on investigating the use of the T6 aircraft as part of the training mix for VT-4, VT-10, and VT-86.

Additionally, the P-3 pipeline for advanced training was reviewed. Interface with the Fleet Replacement Squadrons /Fleet Response Units, Chief of Naval Operations, and Naval Air Systems Command was conducted to identify any future mission changes that would impact training requirements within TW-6. No new Aircraft and System parameters were identified for the future to the year 2006 for which learning objectives could be written but existing learning objectives were reviewed (limited to TW-6 managed curriculum). A media analysis was performed to produce the optimum and alternative Training System. Justification, with a Rough Order of Magnitude (ROM) is provided for those Training Systems.

This Training Situation Analysis, including supporting studies, was conducted with the following assumptions:

- The A-6 is no longer part of the Naval aircraft inventory.
- Two model updates are in process, the F/A-18E (single seat) and F/A-18F (Dual Seat).
- Navigator training is no longer conducted by TW-6 for the Heavy Navigator Platform (KC-135, C-130, AC-130, MC-130, and C-141) or the EWO Platform (B-52, AC-130, EC-130, MC-130, and RC-135).
- The T6 (JPATS) is planned to replace the T-34C. The CT39G are being removed from storage and reworked to replace the T1A.
- Naval Aircraft missions to review include the: F-14A; B, D; F/A-18D, F; P-3; EP-3; E-6A; E-2C; S-3B and EA-6B.

- Air force mission requirements are addressed at a macro level.
- Aircrew Coordination Training, Cockpit Resource Management, Operational Risk Management and Emergency Procedures are considered.

## Definitions

| | |
|---|---|
| **Aircrew Coordination** | Identification and practice of team coordination among an aircraft crew |
| **Crew Resource Management** | See Aircrew Coordination |
| **Curriculum Manager** | Person or team responsible for developing standard curriculum and managing input to control training flow |
| **Enabling Objective** | Objective that describes expected student behavior from training |
| **Instructional Media** | Ways of communicating the information and skills to be learned, i.e., written materials, films, lectures, Computer Based Training and more |
| **Instructional Systems Development** | Process to produce training through Systematic development |
| **Learning Analysis** | Identification of knowledge, skills, and attitudes to produce learning objectives and learning events to teach those objectives |
| **Learning Event** | Events structured to provide student learning |
| **Media Selection** | Selection of media to support learning objectives |
| **Situational Awareness** | The perception of elements in the environment within a volume of time and space, the comprehension of their meaning, and projection of their status in the near future |
| **Standards** | Student behavioral requirements established for training |
| **Task Analysis** | Analysis of tasks to perform work functions from which training objectives are prepared |
| **Aircraft Training** | Aircraft used in the Training Command such as theT-34, T-39 and T-2 |
| **Training Systems** | Media and equipment designed to use in a training program |
| **Terminal Objective** | Objective that describes expected outcome of training |

# Description of the Application of the Training Data Product

## Composition

The Training Situation Document for the UMFO Program is a record of the survey conducted to determine future training requirements for the UMFO in the year 2006 and the ability of existing training events to satisfy the present training objectives.

This publication addresses the training program situational analysis. It includes: reasons for the study, situation assessment, impact statements, description of analytical methods and procedures, a literature review, description of information sources and data collection, the training technology, associated training equipment, initial and life cycle costs, description of solutions and alternatives, recommendations and a summary of recommendations.

This report also provides the training deficiencies of the existing program and recommendations for training and media selection for the UMFO Program to the year 2006. The survey is conducted in accordance with the development standards of MIL-PRF-29612.

## Function/Use

The Training Situation Document is designed to allow the government the opportunity to determine the status of the existing UMFO Program and correct any deficiencies identified.

The contractor analyzed (through statistical survey) the future UMFO tasking for graduates who continue to the Fleet Replacement Squadrons for further training. The deficiencies in the existing training are carefully noted with a variety of suggested training solutions/improvements.

In addition, the document provides the necessary data to determine the future training requirements for the UMFO to the year 2006. Included is a listing of the most cost effective training media to enhance existing and future training.

## Equipment Requirements

The Training Situation Document provides background and survey data regarding the existing and future training requirements for the UMFO training program. The training systems (equipment) required ranges from classroom aids to the use of training aircraft. Each is a media selection that meets programmed training attributes, presentation preference and cost effectiveness. Every selection is the best available training tool for the training objective.

# Executive Summary

This Training Situation Analysis is a review of the UMFO to verify the efficiency of the training system to meet existing training needs and to survey training programs and technologies for applicability to new future training needs for the UMFO.

The UMFO training system is operated and managed by the Naval Aviation TW-6, NAS Pensacola, FL. TW-6 provides UMFO training to U.S. Navy, U.S. Air Force, and Foreign Military Officers. MFO training is designed to provide commissioned officers with the skills and knowledge required to safely aviate, navigate, communicate, and manage aircraft systems and aircraft in visual contact and in instrument conditions. While mission changes within the Fleet, along with emergent technology, will have some impact on future MFO training requirements, the most critical deficiencies are in the existing training. This Training Situation Analysis, identifies those deficiencies, based upon statistical analysis, and reports on recommended solutions. In addition, a media analysis selects the most cost-effective training tools for both present and future training requirements.

Aircraft and Systems technology was reviewed to determine operational requirements of year 2006. Emphasis is on investigating the use of the T6 aircraft as part of the training mix for VT-4, VT-10, and VT-86. Additionally, the P-3 pipeline for advanced training was reviewed. Interface with the FRS/FRUs, OPNAV, and NAVAIR was conducted to identify any future mission changes that would impact training requirements within TW-6. While minimal changes in future Aircraft and System parameters were identified it was the existing learning objectives that demonstrated the greatest need for improvement. A media analysis was performed to produce the optimum and alternative Training System. Justification, with a Rough Order of Magnitude (ROM), is provided for these Training Systems.

This Training Situation Analysis, including supporting studies, was conducted with the following assumptions.

- The A-6 is no longer part of the Naval aircraft inventory.
- Two model updates are in process, the F/A-18E (single seat) and F/A-18F (Dual Seat).
- Navigator training is no longer conducted by TW-6 for the Heavy Navigator Platform
- (KC-135, C-130, AC-130, MC-130, and C-141) or the EWO Platform (B-52, AC-130, EC-130, MC-130, RC-135).
- The T6 (JPATS) is planned to replace the T-34C. The CT39G are being removed from storage and reworked to replace the T1A.
- Naval Aircraft missions to review include the: F-14A; B, D; F/A-18D, F; P-3; EP-3; E-6A; E-2C; S-3B and EA-6B.
- Air force mission requirements are addressed at a macro level.

- Aircrew Coordination Training, Cockpit Resource Management, and Emergency Procedures are considered.

The analysis of existing training uncovered a number of deficiencies. Those are noted and recommended solutions provided. The survey of OPNAV/NAVAIR CLASS DESKS revealed little in training changes due to changes in aircraft technology or MFO mission assignments. However, it is evident that emerging technology, particularly in the communications and computer field, will impact MFO training in the year 2006 and beyond. This report provides a variety of solutions and recommendations to improve the training to meet those needs.

The need for Situation Awareness (SA) by military flight officers (MFO) now, and increasingly so in the immediate future, evolved as a driving and unifying factor of this study. The competencies of graduating MFOs judged to be weakest in a survey of FRS and TW-6 instructors were human factors skills: Communications, Co-piloting skills, Situation Awareness and Crew Coordination. The four skills are highly correlated statistically and practically. SA as discussed in this report has a great deal of overlap with the other human factors skills above. An analysis of the potential demands upon MFOs in the year 2006 found that multi-tasking and information overload would emerge as the chief threats to performance, requiring an even greater degree of SA skills.

Because TW-6 had few objectives or assessment instruments for training and testing SA, the JIL team collaborated with research psychologists from the Naval Air Warfare Center, Training Systems Division (NAWCTSD) and the University of Central Florida to investigate SA-related behaviors as applied to the UMFO program. The results will be reported in the end of project deliverables of this contract. SA objectives were written for an amended list of behaviors and inserted into Integreator, the media analysis tool used in this project.

During the in-process review number two (IPR-2), the JIL team was specifically tasked with considering each objective in the curriculum on the merit of its required behavior, independent of context, during the media analysis. When the objectives are approached in this manner, only those requiring vestibular stimulation of the senses must be learned while airborne: the acrobatics in the Primary phase and tactical maneuvering in the Advanced phase.

When SA is considered, however, a second critical need for flight hours becomes readily apparent. The MFO must perform the required individual behaviors within a multi-tasking, time-constraining and stress-inducing environment. This context mandates airborne training and assessment. This is in keeping with the results of the FRS survey. When asked which of the MFO competencies must be learned in the air, 70 percent of the respondents selected SA. We believe that emerging advances in human factors research and in technology can provide effective prerequisite training on the deck.

The media analysis included an evaluation of every MFO behavior required by every flight in the curriculum. The final report will include a set of tables that assign an objective to each of these behaviors. It allows analysis of the development of skills across the curriculum, including SA. The recommendations of this Training Situation Analysis weigh heavily the concerns of the Fleet and those raised by the SA task analysis for enhancing the development of SA-related skills in UMFO students.

The report contends that the student is best served by substituting a simulator for eight and one-half hours of flight time. As stated above, we know that flight time is critical to the development of SA.

We recognize that there is some number of MFO flight hours that constitute a critical mass for developing FRS-ready graduates. It is impossible to accurately predict that number, made all the more difficult when considering the receiving aircraft communities. We believe that we have made responsible and well-reasoned substitutions that build, not reduce, SA.

The media analysis recommends the development and use of both computer-aided instruction (CAI) for instructor-led courses and interactive courseware (ICW) for individualized learning. The benefits are reduced cost and flexibility to manage "white space." This strategy would be greatly enhanced by adopting the recommendation for an ISD Team at TW-6. unless the recommendation for the ISD team described in this report. There are already hundreds of thousands of dollars invested in media that is unused. We do not want to add to that problem.

We feel that wherever computerized instruction is used, a review with an instructor led question and answer period should proceed testing. We feel that all testing should be converted to ICW to allow for automated data management and flexible testing techniques.

Finally, we believe that retention of the military instructors at the present manning level is very important to the program. Although annual savings are provided in some instances where ICW should replace instructor time, those costs are provided only as an indication of possible savings in the event instructor manning declines because of retention or recruiting problems. The instructor billets remain critical because of their influence upon the student. It is important that they continue to be available for one-on-one instruction and for instruction in the simulators and in the air. Having instructors available to provide subject matter expertise in the development phase of the ICW in also critical and lack of that availability is much of the reason previously developed ICW is unused. Time spent preparing lectures and in the classroom takes away from all of these activities. It would be wise for the Training Wing to maintain its level of manning for instructors. This is particularly true for the period where the recommendations from this study are implemented.

**CDRL A001**

**TRAINING SITUATION DOCUMENT**

# 1 Introduction

## 1.1 Purpose and Expected Application of Data

The purpose of the Training Situation Analysis was to:

- Identify the knowledge and skills required by the MFO of the year 2006;
- Provide an evaluation of the existing objectives and curriculum; and
- Conduct a media analysis to propose an optimum and alternate training system.

## 1.2 Results Compiled From Analysis

The results include identification of learning objectives (LO) that do not match the learning outcomes involved or level of complexity; curriculum content not addressed by LOs; LOs not met by the curriculum; and new LOs that address Situation Awareness and emergent MFO competencies. Additionally, an analysis of the validity of the current objectives, effectiveness of the curriculum and proficiency of the graduates was provided. The analysis identified four Human Factors competencies as requiring additional training. Finally, the results provided a primary and alternate training system with justification.

## 1.3 Use of the Analyses

The expected applications of the data follow:

- This analysis will be used to construct a Plan of Action with Milestones for budget allotment for training equipment.
- The recommended curricula will be used to restructure the affected training.
- The priorities assigned to the development of interactive courseware and computer-aided instruction will be used to schedule the development or revision and maintenance of software.
- The Situation Awareness (SA) objectives will be used to develop instruction and assessment of the SA skills.
- The media-by-mode matrix may be used to prescribe the optimum instructional delivery technique for a given medium and strategy.

### 1.4 Description of Training Capabilities and System Requirements

Description of Training Capabilities and System Requirements identified from this analysis will influence the eventual design, development, and operation of the training system.

## 2 Training Situation Analysis Data

### Analysis Performed

Description of the analysis performed to verify the efficiency of the training system to meet existing training needs and to survey training programs for applicability to new training needs.

### 2.1.1. Existing Situation

Training Program Mission Statement

The present UMFO training program exists to "*plan for, supervise, support and conduct flight training of quality student Naval Flight Officers, undergraduate Navigators, and International Military Students to satisfy service requirements*".

2.1.1.2. General Description

TW-6 presently trains Navy, Marine Corp, Air Force, and Foreign National students. The curriculum is a phased training system where the students progress from basic aviation and co-piloting duties to more complex tactical skills. In each of the three phases, Primary, Intermediate, and Advanced, the students receive classroom, simulator, and in-flight training. After successful completion of the primary phase approximately 25% of the students leave TW-6 for follow on Navigation training at Randolph Air Force Base. The remainder proceed to the intermediate phase. Following completion of the intermediate phase, again approximately 20% of the remaining students leave CTW-6 for follow on training, while the remainder advance to one of two pipelines, Strike or Strike/Fighter, in the advanced phase at VT-86.

2.1.1.3. Curriculum by Phase

**PRIMARY PHASE (VT-4/VT-10)**

Primary UMFO training is conducted at VT-4 and VT-10 and teaches the student the basic skills needed to safely operate and manage aircraft systems, navigate and communicate in military aircraft, in both instrument and visual conditions. Specific emphasis is placed on basic crew coordination skills, prioritization in the cockpit, scan, and early development of Situational Awareness (SA). Primary consists of two major components. The first, familiarization, in its present form, is designed to teach the UMFO basic piloting skills up to, but not including, solo flight. The second component is basic instrument navigation and introduces the student to the fundamentals of instrument navigation in simulators and the T-34C. Table 2-1 summarizes the academics, simulators and flights for primary phase training.

**Table 2-1 Primary Training Summary**

**FLIGHT TRAINING**

| STAGE | EVENTS | HOURS |
|---|---|---|
| T-34 Familiarization | 8 | 14.5 |
| T-43 Airways Navigation | 4 | 8.0 |
| **TOTALS** | 12 | 22.5 |

**SIMULATORS/TRAINERS**

| STAGE | EVENTS | HOURS |
|---|---|---|
| 2B47 Instrument Navigation Trainer | 8 | 15.0 |
| 2B37 Cockpit Procedure Trainer | 3 | 4.5 |
| 2B37 Instrument Navigation Simulator | 4 | 6.0 |
| **TOTALS** | 15 | 25.5 |

**FLIGHT SUPPORT**

| SUBJECT | EVENTS | HOURS |
|---|---|---|
| Safety | 2 | 1.5 |
| Communications | 3 | 5.5 |
| Instrument Navigation | 10 | 19.5 |
| Familiarization Preparation | 6 | 10.0 |
| Air Crew Coordination | 1 | 3.0 |
| Airways Navigation Preparations | 3 | 4.0 |
| Bailout Training | 1 | 3.0 |
| T-34 Familiarization | 1 | 3.0 |
| **TOTALS** | 27 | 49.5 |

## ACADEMICS

| SUBJECT | EVENTS | HOURS |
|---|---|---|
| Meteorology | 5 | 10.0 |
| Flight Information Publications | 9 | 14.0 |
| Flight Planning | 6 | 16.0 |
| T-34C Aircraft Systems | 1 | 16.0 |
| T-34C NATOPS | 9 | 19.5 |
| **TOTALS** | 30 | 75.5 |

## ADMINISTRATIVE

| SUBJECT | EVENTS | HOURS |
|---|---|---|
| Student Check-In | 15 | 13.1 |
| Simulator Indoc | 1 | 1.0 |
| Primary Graduation and Check Out | 1 | .5 |
| **TOTALS** | 17 | 14.6 |

## INTERMEDIATE PHASE (VT-4/VT-10)

The intermediate phase is designed to build upon the skills learned in primary and to introduce the UMFO to low level visual navigation, formation flying, and the high altitude navigation structure. In the T-34C the student flies visual and instrument navigation and formation flights. The phase then introduces the student to the high altitude structure and more visual navigation in the multi-place/high speed T-1 or T-39 with a dedicated NFO/NAV instructor. Upon completion the students advance to E-2 training (outside CTW-6) or to the advanced phase of training at VT-86. Table 2-2 summarizes the Intermediate academics, simulators, and flights.

**Table 2-2 Intermediate Training Summary**

**T-34C FLIGHT TRAINING**

| STAGE | EVENTS | HOURS |
|---|---|---|
| T-34C Airways Visual Nav. Check | 1 | 2.0 |
| T-34C Visual Navigation | 4 | 8.0 |
| T-34C Formation | 2 | 4.0 |
| T-34C Airways Navigation | 11 | 22.0 |
| **TOTALS** | 18 | 36.0 |

**T-1A/T-39 FLIGHT TRAINING**

| STAGE | EVENTS | HOURS |
|---|---|---|
| T-1A/T-39 Airways Navigation | 4 | 7.6 |
| T-1A/T-39 Low Level (Visual Nav.) | 3 | 3.3 |
| T-1A/T-39 Airways/Vis. Nav. | 1 | 2.4 |
| **TOTALS** | 8 | 13.3 |

## SIMULATORS

| STAGE | EVENTS | HOURS |
|---|---|---|
| 2B37 Operational Flight Trainer | 1 | 1.5 |
| 2B37 Instrument Nav Simulator | 4 | 6.0 |
| **TOTALS** | 5 | 7.5 |

## FLIGHT SUPPORT

| SUBJECT | EVENTS | HOURS |
|---|---|---|
| Instrument Navigation Preparation | 1 | 3.0 |
| Aircrew Coordination | 6 | 4.5 |
| Intermediate Airways Nav Preparation | 1 | 1.0 |
| Form Preparation | 1 | 2.0 |
| **TOTALS** | 9 | 10.5 |

## ACADEMIC

| SUBJECT | EVENTS | HOURS |
|---|---|---|
| Visual Navigation | 9 | 20.0 |
| T-1A NATOPS | 13 | 22.0 |
| T-1A Flight Preparation | 4 | 9.0 |
| **TOTALS** | 26 | 51.0 |

## ADMINISTRATIVE

| SUBJECT | EVENTS | HOURS |
|---|---|---|
| Graduation, Winging, Check-Out | 1 | 2.0 |
| **TOTALS** | 1 | 2.0 |

### ADVANCED PHASE (VT-86)

The advanced phase of training is broken into four separate phases. All students who enter VT-86 for advanced training begin with the Core Curriculum. The Core Curriculum consists of Airways Navigation, Low Level Visual Navigation, Radar Navigation, and Strike (Visual and Radar Nav) flights, and introduces the student to air-to-ground radar theory with supporting academics, radar simulators, and flights. Upon completion of the advanced core curriculum the students proceed either to the Strike phase or to the Strike/Fighter phase. The strike phase is more advanced training in low level and radar navigation and is structured to refine crew coordination/cockpit resource management skills, task prioritization, scan, and flexibility in multi-mission environment. In the strike/fighter phase, future Weapon Systems Operators (WSOs) and Radar Intercept Officers (RIOs) learn airborne intercept procedures. After completing Strike or Strike/Fighter training the UMFO's finish their training at VT-86 with the Advanced Tactical Maneuvering curriculum which introduces the student to the dynamics of High-Speed/High 'G' Air Combat Maneuvering in the T-2C. Table 2-3 outlines the training curriculum by phase in VT-86.

**Table 2-3 Advanced Training Summary**

**CORE CURRICULUM**

**FLIGHT TRAINING**

| STAGE | EVENTS | HOURS |
|---|---|---|
| T-39N Low-Level | 3 | 3.0 |
| T-39N Radar Navigation | 4 | 4.4 |
| T-39N Airways Navigation | 3 | 6.9 |
| T-39N Strike | 3 | 7.2 |
| **TOTALS** | 13 | 21.5 |

**SIMULATOR TRAINING**

| STAGE | EVENTS | HOURS |
|---|---|---|
| Radar Synthetic Trainer | 5 | 10.0 |
| **TOTALS** | 5 | 10.0 |

**FLIGHT SUPPORT/ACADEMICS/ADMIN**

| STAGE | HOURS |
|---|---|
| Welcome Aboard/Check-In | 7.0 |
| NATOPS and Safety | 27.0 |
| T-39N Flight Preparation | 18.0 |
| Low-Level and Radar Planning | 7.0 |
| Low-Level and Radar Navigation | 7.0 |
| Turnpoint Procedures | 7.0 |

| | |
|---|---|
| Radar Systems | 16.0 |
| Aircraft Carrier (CV) Procedures | 4.0 |
| Strike Seminar | 5.0 |
| USN/USMC/USAF Fleet Brief | 3.0 |
| Instrument Ground School | 13.0 |
| Strike Phase Review/Exam | 5.0 |
| **TOTALS** | 119.0 |

## STRIKE CURRICULUM

### FLIGHT TRAINING

| STAGE | EVENTS | HOURS |
|---|---|---|
| T-39N Composite Strike | 4 | 9.8 |
| **TOTALS** | 4 | 9.8 |

### SIMULATOR TRAINING

| STAGE | EVENTS | HOURS |
|---|---|---|
| Composite Synthetic Trainer | 4 | 8.0 |
| **TOTALS** | 4 | 8.0 |

### FLIGHT SUPPORT/ACADEMICS/ADMIN

| STAGE | HOURS |
|---|---|
| Check-In and Administration Time | 1.5 |
| Radar Terrain Interpretation | 3.0 |
| Composite Strike Planning | 3.0 |
| **TOTALS** | 7.5 |

## STRIKE/FIGHTER CURRICULUM

### FLIGHT TRAINING

| STAGE | EVENTS | HOURS |
|---|---|---|
| T-39N Attack-Reattack Intercepts | 4 | 4.4 |
| T-39N Conversion Intercepts | 4 | 5.2 |
| T-39N Multiple Approach | 1 | 2.0 |
| T-39N Unknown Intercepts | 1 | 1.3 |
| T-39N Advanced Intercepts | 3 | 3.9 |
| **TOTALS** | 13 | 16.8 |

### SIMULATOR TRAINING

| STAGE | EVENTS | HOURS |
|---|---|---|
| AIRT Pursuit Intercepts | 5 | 7.5 |
| AIRT Attack-Reattack | 3 | 4.5 |
| AIRT Unknown Intercepts | 2 | 3.0 |
| AIRT Conversion Intercepts | 5 | 7.5 |
| AIRT Advanced Intercepts | 3 | 4.5 |
| AIRT Demonstration | 4 | 4.0 |
| **TOTALS** | 22 | 31.0 |

## FLIGHT SUPPORT/ACADEMICS/ADMIN

| STAGE | EVENTS | HOURS |
|---|---|---|
| Intercept Procedures | | 40.5 |
| Air Intercept Radar | | 2.5 |
| Fighter Environment | | 6.0 |
| End of Basic Intercepts Review/Exam | | 4.0 |
| **TOTAL** | | 53.0 |

## ADVANCED TACTICAL MANEUVERING CURRICULUM

### FLIGHT TRAINING

| STAGE | EVENTS | HOURS |
|---|---|---|
| Familiarization | 3 | 4.9 |
| Tactical Low Level | 3 | 4.2 |
| Advanced Tactical Maneuvering | 6 | 7.8 |
| **TOTALS** | 12 | 16.9 |

### SIMULATOR TRAINING

| STAGE | EVENTS | HOURS |
|---|---|---|
| Basic Instruments | 3 | 4.5 |
| Radio Instruments | 3 | 4.5 |
| Emergency Procedures | 2 | 3.0 |
| Carrier Procedures | 1 | 1.5 |
| **TOTALS** | 9 | 13.5 |

**FLIGHT SUPPORT/ACADEMICS/ADMIN**

| STAGE | EVENTS | HOURS |
|---|---|---|
| Delayed Jet Water Survival | | 24.0 |
| NATOPS and Safety | | 26.0 |
| Advanced Tactical Maneuvering | | 10.0 |
| T-2C Emergency Procedures | | 2.0 |
| Basic Instrument Procedures | | 5.7 |
| Low-Level Procedures | | 1.0 |
| Section Low-Level Tactics | | 3.0 |
| Final Phase Review/Exam | | 3.0 |
| Critique and Graduation | | 4.5 |
| **TOTALS** | | 79.2 |

2.1.1.4. Academic, Synthetic, Operational Equipment, and Practical Job Training Instructional Units

Each phase with subsections describing academic, synthetic, operational equipment, and practical job training instructional units.

2.1.1.5. Training Situation Assessment

Two surveys were administered in September and October, 1998. A JIL team member made personal visits to OPNAV and class desks at NAVAIR for the following aircraft F/A-18, F-14, EA-6B, S-3B, EP-3, P-3, E-2C and E-6A. This survey sought 1) the MFO and aircraft inventory through 2006; and 2) technological or operational updates to aircraft platforms and NFO missions through 2006. The survey instrument and significant inputs are found in Appendix A; they will not be discussed in the body of this report. The results were provided to the FRSs to help in determining emerging training requirements as part of a second survey.

The OPNAV/NAVAIR survey concluded that there were no new aircraft or systems to be considered through 2006 when assessing MFO tasking. However, increased demands for information processing within a Network Centric Warfare battle space (a multi-tasking, time constrained environment) will require a new level of situation awareness on the part of MFOs.

An issue unrelated to the rest of the operational communities was raised by the P-3/EP-3 desk. An excerpt will be found in the appendix listed above. The thrust of the concerns was the perception that the training at Randolph AFB is "inadequate" and should be relocated to VP-30 at NAS Jacksonville.

In the survey addressed below, VP-30 commented that they recommend dropping all phases at Randolph except Introduction to Navigation, Fundamentals of Navigation, Weather Avoidance and Worldwide Operations. The general comments received on the surveys recommended more Aviation Navigational time vice piloting skills and emphasis on Instrument/Global Positioning Satellite as opposed to radar and celestial navigation.

The second survey was conducted at TW-6 and the FRSs. A 20-page document was constructed by the JIL team and edited by TW-6 curriculum managers (Appendix A). It was hand-carried and personally administered by Mr. Dan Chopp, a retired Navy Captain (NFO) and former squadron commanding officer. He spent two days in Pensacola in preparation for personal visits to the FRSs. The survey sought answers to the following questions:

- How valid is each of the current training objectives?
- How effective is the present curriculum in meeting those objectives?
- How proficient are MFOs when they get their wings?
- What changes (if any) should be made to the present training?
- What knowledge, skills and attitudes will MFOs need in the next decade, in light of emerging technology and changing mission profiles?

128 instructors and students responded to survey. The number of participants by community was as follows:

| | |
|---|---|
| TW-6 | 23 |
| E-6A | 9 |
| VP | 10 |
| VMF/VFA | 24 |
| VS 7 | 7 |
| VAQ | 15 |
| VQ | 15 |
| VF | 12 |
| VAW | 13 |
| | **Total 128** |

The survey generated over 15,000 data points that were analyzed in SPSS, a statistical software package. In the interest of brevity, only significant findings of the survey will be addressed. A general overview is presented first to orient the reader for the more detailed information to follow.

**How valid is each of the current training objectives?**

All of the TW-6 terminal objectives were presented and the respondents were asked to rate them on a scale of 1-5. Terminal objectives are non fine-grained, but it was not feasible to ask the squadrons to rate the 75 pages of specific objectives. An overview of the results is presented below in Figure 2.1.

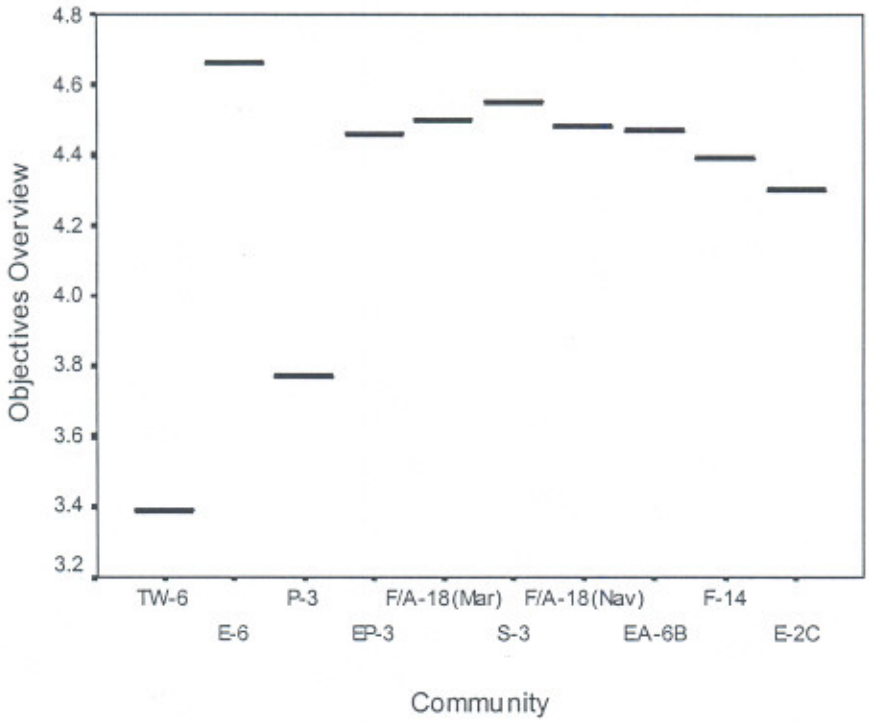


**Figure 2-1 - Overview of Objectives by Community**

TW - 6 was consistently its own chief critic. The FRSs were bunched near the high end of the graph with one exception. The P-3 community had several issues that dealt with training at Randolph AFB. In that they draw students directly from Primary their comments were limited to that phase (the other phases received no appreciably low scores from other communities). The P-3 instructors and students surveyed rated Meteorology and Flight Publications/Notice to Airmen low. Both are recommended for conversion to Interactive Coursework. They rated Aircrew Coordination and Safety objectives low, as well. The human factors curriculum is weak, and the source of much of the thrust of the recommendations of this study. Their comments on the Safety objective were echoed by the Wing: Students in the Primary phase cannot be expected to evaluate their environment for safety hazards without error. Also, there were only two enabling objectives, both recall objectives. Memorizing the instructions doesn't prepare one to evaluate them. The suggested, revised curriculum restructures the objectives with 17 enabling objectives that deal with Safety, culled from other locations in the Primary curriculum.

**How effective is the present curriculum in meeting those objectives?**

The discussion will begin again with an overview, and then the lowest scores will be discussed. The actual analysis of the data involved developing descriptive statistics for each phase of instruction and considering every score individually. The graphic below enables a look at the mean score across all phases and each instructional event (Figure 2.2).

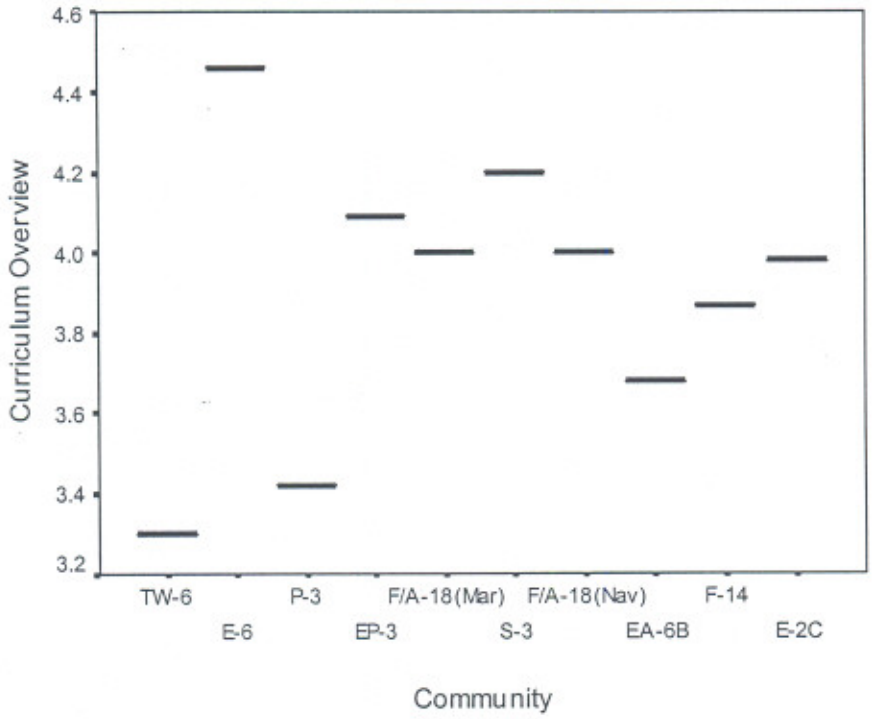


**Figure 2-2 - Overview of Curriculum by Community**

In general, this graphic resembles the graph of the Objectives scores. However, all of the scores here are lower and the EA-6B community has given much lower marks to the curriculum than they did the objectives.

The lowest scores for instruction were:

- CV Procedures (Strike/ATM) 2.92
- GMRT/Comp Strk Planning 3.46
- T-34 Form Flts/Prep 3.53
- T-1A NATOPS/Flt Prep 3.63
  and
- Aircrew Coordination 3.58*

(*adjusted for level of experience).

Carrier-based procedures were the lowest-rated scores in the curriculum, receiving less than "adequate" marks from all FRSs but the Hornets. The curriculm is very weak in carrier operations. There is one event on the Ground Mapping Radar Trainer (GMRT), which is totally unsatisfactory for that purpose. There is a classroom lecture, but with no computer-aided instruction to allow the instructor to display the "stack" and arrested landings in three dimensions.

The GMRT simulator events received low marks from the EA-6B community due to low fidelity of the trainer and their feelings that the mission profiles that are flown do are not sufficiently similar to Prowler tasking. The onsite NAWCTSD engineers are able to add instrumentation to the simulator that would add to fidelity. On a practical note, skill in tuning the simulator radar does not transfer well to the aircraft system. Another issue is the geographical database. Unofficial liason with NAWCTSD engineers indicates that an update of the Digital Radar Landmass System, depending on the resolution selected, would cost in the neighborhood of $500K for each of the four simulators.

Students may be better prepared for the T-34 Formation flights with the implementation of the visual simulator just prior to the Visual Navigation (VNAV) and Form flights. This report recommends converting the T-1 NATOPS to CBT.

Aircrew Coordination did not show up among the lowest curriculum scores until all scores were correlated with flight experience. The statistics show that as respondent flight experience increased, the respective scores awarded to the present curriculum decreased. That is, the most experienced instructors rated the present training the lowest.

**How proficient are MFOs when they get their wings?**

The survey included 12 MFO competencies that were gleaned from the curriculum and screened by the TW6 curriculum managers. They were considered to identify a large percentage of what an MFO needs to know and be able to do upon graduation. The scores assigned by the respondents follow in Table 2-4.

**Table 2-4 - Descriptive Statistics: MFO Proficiency**

| | N | Min | Max | Mean |
|---|---|---|---|---|
| Communications | 106 | 1.00 | 5.00 | 3.30 |
| Co-pilot Duties | 91 | 2.00 | 5.00 | 3.32 |
| Situation Awareness | 107 | 1.00 | 5.00 | 3.36 |
| Crew Coordination | 106 | 1.00 | 5.00 | 3.43 |
| Safety | 107 | 1.00 | 5.00 | 3.66 |
| Pt to Pt Navigation | 101 | 2.00 | 5.00 | 3.68 |
| Visual Navigation | 91 | 2.00 | 5.00 | 3.73 |
| Ground Map Radar | 71 | 2.00 | 5.00 | 3.75 |
| Flight Policy | 104 | 2.00 | 5.00 | 3.77 |
| Air-Air Radar | 47 | 2.00 | 5.00 | 3.83 |
| Mission Plan/Prep | 106 | 2.00 | 5.00 | 3.87 |
| Instrument Nav | 104 | 2.00 | 5.00 | 3.89 |

| **Mean Scores** | |
|---|---|
| TW6 | 3.39 |
| F-14 | 3.44 |
| EP-3 | 3.53 |
| EA-6B | 3.54 |
| P-3 | 3.55 |
| S-3 | 3.67 |
| F/A-18D | 3.74 |
| E-6 | 3.94 |
| E-2C | 3.96 |
| F/A-18C | NA |

It should be noted that the P-3 and EP-3 communities are rating MFOs who completed only the Primary phase and the E-2 community only the Primary and Intermediate phases.

The four competencies rated lowest could all be considered human factors skills. The four were lower than the remaining eight skills by a full standard deviation. That fact is presented graphically below.

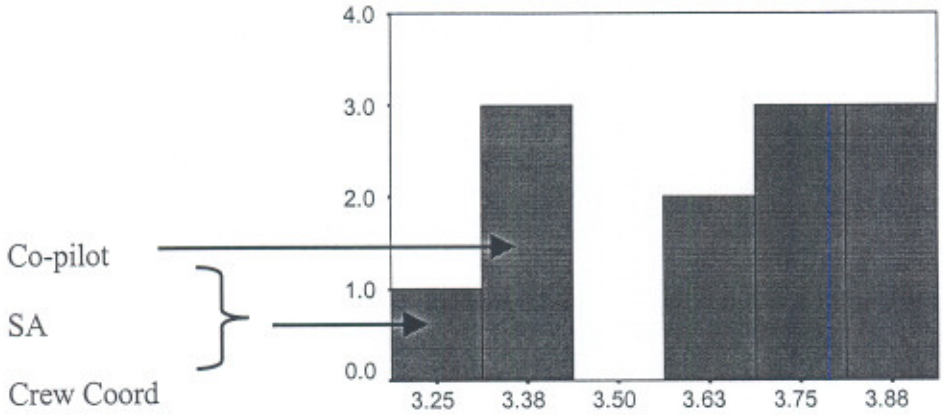


**Figure 2-3 – Descriptive Statistics: MFO Proficiencies**

Because these four competencies were felt to be closely related, correlations were run. The four constructs are moderately correlated with a high degree of statistical significance.

**Table 2-5 – Human Factors Correlations**

| | Mean | Correlation | | | |
|---|---|---|---|---|---|
| | | Comm | C0-p | SA | CC |
| Communications | 3.30 | _____ | .587 | .624 | .404 |
| Co-pilot Duties | 3.32 | .587 | ____ | .577 | .498 |
| Situation Awareness | 3.36 | .624 | .577 | ___ | .608 |
| Crew Coordination | 3.43 | .404 | .498 | .608 | ___ |

*all statistically significant at the .01 level

Due to the degree of relatedness among these skills, enhancing MFO proficiency in one of the skills will positively influence the other three. Because the Fleet rated these competencies as the most problematic, they became a guiding force in the TSA.

## Flight Time/Stick Time

Two issues emerged from the TSA that were not directly addressed. One was the total number of flight hours in the curriculum. The second was the use of aircraft control (stick time) in the curriculum.

**Flight Time.** There were 19 comments that recommended increasing flight time. Three were made by students in the maritime pipeline who do not complete the UMFO program. Most instructor comments were made by those who had completed the 90 flight hour syllabus. Nonetheless, it is safe to say that Fleet instructors would desire more, not less, flight time.

**Stick Time.** Comments gleaned from the survey were mixed on the merit of front seat time for UMFOs. The results concerning stick time are summarized below.

| *Decrease/Delete* | *Present Curriculum Effective* | *Increase* |
|---|---|---|
| 4 students | 1 student | 4 students |
| 2 instructor pilots | 3 NFO instructors | 3 NFO instructors |
| 5 NFO instructors | | |

2.1.1.6 Performance Measurement Method and Application

In general, comments seeking to retain or increase flight hours focused on the benefit to situation awareness. Those making negative comments concerning stick time indicated that it detracted from their ability to learn NFO skills.

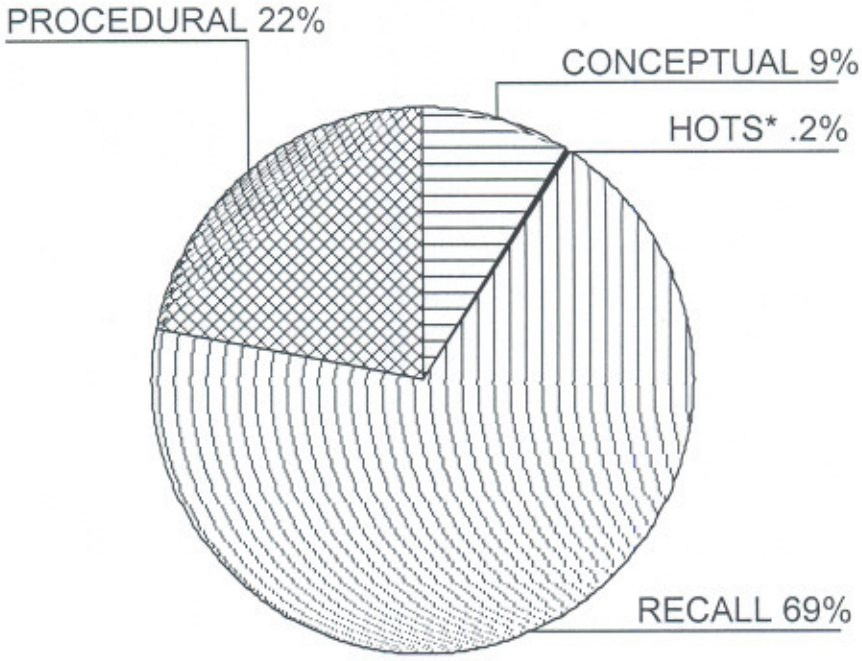


**Figure 2-4 - Learning Outcomes Assessed by Academic Examination Questions**

(*HOTS: Higher Order Thinking Skills)

The instructional content of the syllabus is declarative knowledge, and one would expect to find a preponderance of recall questions at the outset of the curriculum. However, as a student progresses through the phases, the emphasis should shift toward outcomes that support the situated problem solving and decision making that are desired in the graduates. This study recommends that ICW be used for administering tests. One of the strengths of Authorware (the authoring language used in the current ICW) is that it affords the instructional designer the capability to use more powerful testing techniques than static multiple choice. It will also perform academic administrative functions.

**Table 2-6 Academic Tests - Learning Outcomes Tested**

| TEST | # Qs | # TRUE/ FALSE | # MULTIPLE CHOICE | # RECALL | # PROCE-DURAL | #CONCEPTS | # HIGHER ORDER THINKING SKILLS |
|---|---|---|---|---|---|---|---|
| Meteorology | 50 | 13 | 37 | 27 | 1 | 22 | 0 |
| FLIP | 50 | 8 | 42 | 30 | 4 | 16 | 0 |
| INAV/Flight Planning | 50* | 7 | 33 | 15 | 29 | 5 | 1 |
| T-34 NATOPS | 50 | 11 | 39 | 50 | 0 | 0 | 0 |
| T-34 Systems | 50 | 0 | 50 | 50 | 0 | 0 | 0 |
| T-1 NATOPS | 50 | 5 | 45 | 46 | 4 | 0 | 0 |
| vNAV | 50* | 1 | 40 | 29 | 21 | 0 | 0 |
| Adv Ground School | 30** | 5 | 25 | 16 | 14 | 0 | 0 |
| Adv Strike | 66 | 13 | 53 | 49 | 17 | 0 | 0 |
| Adv Final | 50 | 10 | 40 | 29 | 19 | 2 | 0 |
| Totals | 496 | 73 | 404 | 69% | 22% | 9% | .2% |

* The remaining questions are fill-ins.

** This is an open-book test. The student completes a DD-175 prior to answering the 30 questions.

Notes:

- The recall category includes visual recognition questions, as well as declarative information.
- Procedural questions dealt with the application of rules, as in point-to-point navigation.

- Conceptual questions were almost exclusively identification of the instance of a concept. An example would be "What are the weather conditions over Denver?" The student must identify the conceptual symbols at that location.

- Higher order thinking skills include problem solving, analysis, synthesis and other more sophisticated processes.

## 3 Reason for Study

This Training Situation Analysis was conducted to analyze and assess the current curriculum and determine alternative training strategies and media with associated costs in the UMFO Program conducted at TW-6. The study identified what knowledge and skills will be required by the Military Flight Officer upon graduation from TW-6 in year 2006. Learning objectives and events for Aircraft and System parameters for existing training were reviewed (limited to TW-6 managed curriculum) to determine possible deficiencies and recommendations for improvement. A technology assessment determined the training systems adequacy and computer systems IT-21 compliance. A media analysis identified the optimum and alternative training system appropriate for training objectives, to include justification, with a Rough Order of Magnitude (ROM), to assure the most cost effective selection.

### 3.1 Principal Result

A survey of OPNAV and NAVAIR class desks was conducted to identify aircraft technological advances or mission changes that would affect MFO performance to year 2006. The report identifies those areas where impact is expected. Fleet Replacement Squadrons (FRSs) that train MFOs were surveyed concerning the validity of TW-6 objectives, effectiveness of the curriculum and proficiency of the graduates. The results indicated that while the basic training for the MFO is good there are areas that need improvement. The survey documents and the results are reported in detail.

The survey identified the greatest need for improvement of the training is in the area of human factors. MFOs arrive at the FRS poorly equipped in situational awareness, the ability to handle co-pilot duties, to conduct radio communications and apply aircrew coordination. Because of the low ratings assigned, a task analysis was conducted for situational awareness in order to develop useful objectives the Training Wing could use to build curriculum. The objectives were also written for use in the media analysis to assure valid media selection for that training area.

All training systems employed by TW-6 were reviewed to determine the ability of individual systems to produce training transfer. Deficiencies were noted particularly in poor utilization of available ICW and in the fidelity of some of the training simulators. The training analysis identified some deficiencies in the measurement of student achievement and in the conduct of learning events.

The review of future technology requirements that will affect the MFO's performance of duties between now and the year 2006 identified an expected significant increase in the complexity and number of tasks to be performed because of technology advances. The same technology must be employed by the training wing to prepare the MFO. A number of recommendations to improve training technology are provided.

In order to conduct a valid media analysis and provide an adequate media selection a number of the training objectives were re-written. In addition, each of the objectives that stated the need for flight as a condition for performance was reviewed to validate that requirement. Media models were developed using Integreator Professional software. Media selection included an optimum and alternative choice for training media and justification and recommendation for the selection based upon cost considerations.

### 3.2 Main Assumptions

The Training Situation Analysis was conducted using the following assumptions:

- The A-6 will be taken out of the Naval aircraft inventory.
- Two model updates are in process; the F/A-18E (single seat) and F/A-18F (Dual Seat).
- Navigator training will no longer be conducted by TW-6 for the Heavy Navigator Platform (KC-135, C-130, AC-130, MC-130, and C-141) or the EWO Platform (B-52, AC-130, EC-130, MC-130, RC-135).
- The T6 (JPATS) is planned to replace the T-34C. The CT39G are being removed from storage and reworked to replace the T1A.
- Naval Aircraft missions to review include the: F-14A, B, D, F/A-18D, F, G, P-3, EP-3, E-6A, E-2C, F/A-18D, S-3B and EA-6B.
- Air force mission requirements will be addressed at a macro level.
- Aircrew Coordination, Cockpit Management, and Emergency Procedures will be considered.

### 3.3 Major Restrictions

*The major restriction in the conduct of this Training Situation Analysis was the lack of an existing Task analysis upon which the objectives could be validated.* A number of objectives are inadequate to describe the level of learning outcomes. In order to produce a meaningful media analysis a number of the objectives had to be re-written using reverse engineering from the existing learning events.

An important training subject, situational awareness, was identified early in the analysis as a deficiency both from the perspective of adequate objectives and learning events. To overcome this shortfall and develop objectives concerning situational awareness that could be used to complete an adequate media analysis, a task analysis was conducted related to situational awareness only. Research Psychologists from NAWCTSD were consulted and assisted with the identification of behavioral traits that apply to situational awareness required of the MFO. Flight profiles were developed and flown to produce data from which situational awareness objectives could be written. Newly developed objectives were used in the media analysis to identify the best media to train for situational awareness. In addition, existing objectives were reviewed across the curriculum to identify situational awareness attributes in preparation for the media analysis.

A third obstacle concerns the lack of consistent, cohesive direction within the learning hierarchy. Course material does not build upon itself progressing from the most simple (fact and concept learning)

to the more complicated (analysis and problem solving). In a number of instances, the curriculum places a student in a learning situation ill prepared to learn. In other situations, very expensive training resources are being employed to practice or test simple concepts. These deficiencies are the result of the lack of instructional design and development personnel to prescribe informed curriculum choices.

### 3.4 Scope of Study

The entire training program was reviewed to determine if the present objectives are adequate and if the learning events are appropriate to satisfy the objectives. A survey of OPNAV and NAVAIR class desks was conducted to identify new aircraft technology that would affect performance required by the MFO upon graduation from TW-6 in year 2006. Emphasis was placed on investigating the use of the T6 aircraft as part of the training mix for VT-4, VT-10, and VT-86. Learning technology was reviewed to determine advances that could be added to the training program to improve learning efficiency. While no aircraft technology advances appear to affect MFO training between the present and the year 2006 a number of educational advances are reported. A task analysis for situational awareness training, a major subject area, was conducted from which training objectives were written and entered into the media selection software. A number of other existing objectives were re-written using reverse engineering of the learning events to assure a valid media selection. A media analysis was performed to produce an optimum and alternative training system selection along with a justification and a Rough Order of Magnitude (ROM), to assure the most cost effective training systems selection.

### 3.5 Study Objectives

- Determine aircraft technology advances that will affect MFO performance to the year 2006
- Determine training shortfalls of students leaving TW-6
- Determine required training changes to account for aircraft technology advances to year 2006
- Review all training objectives to determine adequacy
- Review all learning events to determine ability to satisfy objectives
- Conduct training technology assessment of TW-6 for training and computer systems and verify adequacy and IT-21 compliance
- Review curriculum to determine course adequacy and training flow
- Conduct a media analysis to select the optimum and alternative media to include cost effective consideration.

### 3.6 Basic Methodological Approach

The basic approach to the training situation analysis was two fold. First, in order to determine the technology changes that might impact the performance of the MFO to year 2006, two surveys were conducted.

- A survey of OPNAV and NAVAIR class desks for the following aircraft: F-14, F/A-18, P-3, EP-3, E-6A, E-2C, S-3B and EA-6B was conducted. The survey sought data concerning any aircraft or mission technology advances planned to year 2006 that would affect MFO performance.

- A survey of FRSs for the following aircraft: F-14, F/A-18, P-3, EP-3, E-6A, E-2C, S-3B and EA-6B. The survey sought data about any known training shortfalls for MFO students arriving at the FRS and opinions regarding the TW-6 curriculum based upon fleet and FRS experience. Both instructors and students were polled.

Second, in order to determine the state of training at TW-6 and to conduct a media analysis to select the optimum training systems the following occurred:

The training objectives and learning events were reviewed to determine if they were adequate and does the learning satisfy the objectives. Because of inadequate objectives throughout the existing training, it was necessary to reverse engineer some in order to obtain adequate objectives for the media analysis. In the case of situational awareness training, a critical training area and one identified as deficient by survey, a task analysis was conducted to enable preparation of usable objectives for the media analysis.

The training devices and systems used at TW-6 were reviewed for adequacy, functionality and fidelity. The computer systems were reviewed to determine if they are compliant with IT-21 requirements.

The curriculum was reviewed to determine if the flow of courseware prepared the student in a step-by-step process progressing from the simple (facts and concepts) to the more difficult performance (analysis and problem solving). Student measurement systems were reviewed to determine adequacy and applicability to the objectives. Use of instructor guides and student guides was reviewed for adequacy.

A media analysis was conducted to select the optimum and alternative media. Integreator Professional software was employed and media models developed including training attributes, modes of presentation and a variety of media selections. The terminal and enabling objectives from the TW-6 Program were entered and the media selections recorded. Media selections were compared by cost and selection recommendations accompanied by justifications were reported.

### 3.7 Study Sponsor

This Training Situation Analysis is sponsored by Naval Air Systems Command, PMA-205 and contracted by the Naval Air Warfare Center, Training Systems Division

### 3.8 Study Proponents

The proponents for this study are:

- Naval Air Systems Command

- Naval Air Warfare Center, Training Systems Division

- Chief of Naval Air Training

- TW-6
- Training Squadron Four
- Training Squadron Ten
- Training Squadron Eighty-Six

### 3.9 Agency Performing Study

The JIL Information Systems Team conducted this study.

### 3.10 Study Sources

The sources for this study are:

- Chief of Naval Operations
- Naval Air Systems Command
- Bureau of Medicine and Surgery
- Naval Air Warfare Center, Training Systems Division
- Chief of Naval Air Training
- TW-6
- Training Squadron Four
- Training Squadron Ten
- Training Squadron Eighty-Six
- Naval Aviation Schools Command
- Training Wing Five
- Commercial Educational Literature
- Commercial Aviation System Manufactures

# 4 Situation Analysis

Five situation statements and their impact are considered below:

## 4.1 Situation Statement

The situation statement shall describe single or multiple situations/events/occurrence (s), which are having either positive or negative effects upon the resources of a particular organization. The situation statement shall also include a lessons learned narrative.

## 4.2 Student Throughput

Refer to Figure 2.3 at the end of this section.) In Fiscal Year 1995 CTW-6 began training Air Force Navigators. The increase in student load necessitated the increase in aircraft assets. The T-1 was added to the UMFO curriculum in the Intermediate phase. In the early 1990's the number of training aircraft types in the curriculum was reduced from four to three, but with the introduction of the T-1, this number was again raised to four.

While literature shows some benefits for skill transference when multiple and varied training systems are employed, this benefit is outweighed by the increase in the ground training required to teach T-1 systems and procedures. In FY00 the number of Air Force students will be reduced by two thirds with a corresponding reduction in T-1 assets. This further effects the curriculum flow in that some students will be trained in four types of aircraft while others will be trained in three.

## 4.3 Addition of Piloting Skills

The most significant change incorporated subsequent to the Training Development study of 1991 was the addition of piloting skills to the Primary curriculum. The front end of the curriculum was found to be weak in flight time. Feedback from the Fleet requested that situation awareness (SA) training be instituted. The perception was that adding piloting skills would enhance SA development.

SA research was just getting off the ground in 1991. There was little empirical evidence available at the time. Measurable behaviors indicative of SA expertise had not been validated nor were there efficient instruments for such measurements. That increased flight time increases SA was a truism; how to go about maximizing the benefits of SA flights was less obvious.

The lessons learned have been the result of a decade of SA research by NAWC and other entities. A set of behaviors that can be correlated to SA development has been empirically validated. An objectives-driven engine has been developed for constructing mission profiles for SA enhancing simulator events. Feedback from instructors and students has been collected. It appears that SA can be more effectively facilitated than through providing piloting skills.

The major impact of teaching piloting skills early in the Primary curriculum is pedagogic and therefore has little impact on the resources identified below.

## 4.4 Incorporation of Interactive Courseware (ICW)

The efforts of TW-6, the contract managing activity and the contractors involved failed to produce ICW that was suitable as replacement for classroom instruction.

Lessons learned include the need for an ICW Integration Officer collateral duty with a good deal of visibility. When storyboards or on-screen instructional products are delivered to the Wing, they must be reviewed within the stated window by a qualified instructor with a vested interest in the product. Courseware cannot be created in a vacuum. An initial visit with the instructors followed by deliverables months later will not work. A team approach is needed, where TW6 is more involved in the design and development process.

### 4.5 Incorporation of the JPATS Instructional Management System

The impact of conversion to the JPATS aircraft has, of course, major impact across the spectrum of training resources. What is of interest to this study is the implementation of the JPATS training administration software in advance of the simulators and aircraft.

The conversion of ICW and computer-aided instruction (CAI) into Authorware must be completed prior to the start-up date in 2003 for the information system. There is no point in converting courseware if the navigation will change substantially during revision. Therefore, a plan must be in place to identify, prioritize, fund and accomplish the required changes and design and development of new courseware.

### 4.6 Multi-place Training Aircraft Resources

Ten T-1A's augmented the aircraft inventory to support the Air Force student throughput introduced above. With the recent decision to delete the Air Force panel navigators from the TW6 pipeline, four of the T-1A's are scheduled to leave the inventory.

The 17 T-39N's onboard are configured with the F-16 radar system. The aircraft are relatively expensive to fly and maintain. The need for rewinging is a major concern. Nine T-39G's are being procured for TW6 to fly non-radar events, including five from the desert; two are presently onboard. The aircraft had to undergo modification to adjust the center of gravity to accommodate flight with six crewmembers and observers. Presently, T-39N's from VT-86 are being used to meet VT-4 and VT-10 T-39 commitments.

Various short- and long-term solutions are presently being considered for a multi-place aircraft for the TW6 inventory.

### 4.7 Impact Statements

The impact statements shall include a full description of the specific resources deficiencies/excesses caused by the situation. (It is possible that one situation may impact one or more of the following resources or that multiple situations may affect only one of the following resources.) The impact statements shall identify those resource areas that have been affected by the situation

### 4.8 Impact of Fluctuating Student Throughput.

*Personnel*

Instructors

With continual changes in training equipment the Instructors time is taken up having to revise or create new curriculum for each new aircraft. This directly impacts morale and strains the instructors workload, decreasing the time available for student training. While the exact effect of these fluctuations in student load cannot be measured it is unwise to make cuts in instructor manning based on lulls, but rather use the instructors to help tweak the curriculum already in place.

Support Personnel

Fluctuating numbers and types of aircraft also negatively impacts support personnel. It becomes very difficult to plan for work load and personnel manning when the number of assets for a particular contractor is unsure. A steady, pre-determined number of aircraft is essential to ensure the most effective use of support assets.

Training Equipment

As stated earlier the fluctuating student load has been met with fluctuating aircraft assets, which have necessitated changing the UMFO curriculum. It is counter productive to training to make continual changes in aircraft to meet student loads. A smoother through put of students would allow a more consistent mix of training equipment and allow for a less volatile curriculum.

Training Material.

Recent, large fluctuations in student load have required significant changes in training equipment and the resultant changes in training material. With the curriculum in a constant state of flux it is difficult for the instructors to maintain standardized instruction or training material.

### 4.9 Impact of Incorporating Piloting Skills

The modification of Familiarization Flights to train piloting skills had little net effect on the TW-6 resources.

### 4.10 Impact of Unusable ICW

Personnel.

If ICW is to be integrated into the TW6 curriculum, considerable instructor man hours will be required. Service as subject matter experts (SMEs) for contractors revising and developing courseware is enormously important to the success of the initiative. To ensure standardization and coordination across the curriculum, the effort should be supervised by the TW6 Academic Officer for all three squadrons. The ISD government service position will be another key to success. The impact of not installing ICW is that instructors are not available for mentoring and work on improving the curriculum. Full manning of authorized instructor billets during the next several years is crucial to move the curriculum forward. The manning levels below are September, 1999 numbers and apply to many of the situation statements in this section. Instructor NFO manning levels for both the T-1A and T-39 aircraft are a matter of concern.

**Table 4-0-1 - TW-6 Instructor Pilot (IP) and Instructor NFO's (INFO) Manning**

| Billet | Allowance | Onboard | Onboard + IUT |
|---|---|---|---|
| TW6 Aviators | 16 | 21 | 21 |
| Squadron T-34 IP | 79 | 77 | 88 |
| Squadron T-1 IP | 18 | *6 | *6 |
| Squadron T-1 INFO | 42 | 34 | 35 |
| Sqn T-39 INFO | 68 | 47 | 54 (6 PG's Nov 99) |
| Squadron T-2 IP | 13 | 12 | 13 |

*The reduction in the numbers of T-1 IP's is due to the fact that the piloting duties will shift to a civilian contract in October, 1999. Contractor pilots are presently undergoing certification.

Instructional Facilities.

The impact of not successfully integrating is that the result has been that the courseware sits on a shelf and the computers in the CBT laboratory sit idle most of the time.

### 4.11 Impact of Adopting the JPATS Instructional Management System.

Personnel.

All instructors and administrative personnel will need to learn to use the new system. Instructor hours will be required before this initiative to serve as SMEs in the revision and development of present and newly designed computer courseware.

Training Material.

All of the ICW and CAI must be converted to Authorware before the new system is adopted.

### 4.12 Impact of the Aging T-39 Assets

Training Equipment.

The high costs of maintaining the aging inventory of T-39 aircraft is an immediate concern that is presently being studied by the Navy at several levels. The process for long-range plans for a replacement aircraft should begin with a meaningful task analysis of the tasks and mission profiles needed in the UMFO curriculum. The NFO Task List is of no help in prescribing the required flight parameters of a multi-place aircraft.

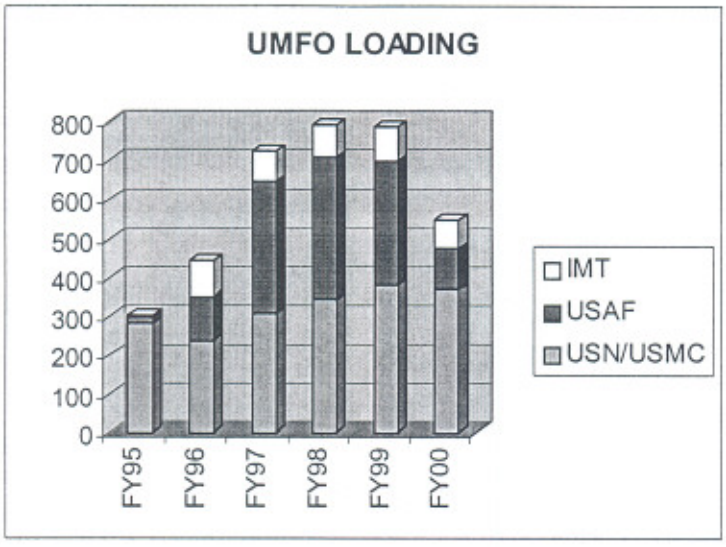


**Figure 4-1 - Student Throughput**

### 4.12 Analytical Methods and Procedures

**Note:** Detailed methods and procedures for the Media Analysis are reported under CDRLs A004 and A005. Detailed methods and procedures for the Instructional Performance Requirements are reported under CDRL A003.

### 4.13 Description Methods, Procedures, Data Compilation, and Analytical Tools

Description of the methods, procedures, data compilation, and analytical tools used to accomplish this analysis and derive the system requirements for the training system.

### 4.14 Methods, Procedure, and Rationale

The development methods, procedures, and rationale of the survey/questionnaire instrument were as follows. The instruments may be found in Appendix A.

- The line items were drawn directly from the curriculum, and the instrument was critiqued by the phase manager instructors for content validity.
- The purpose of each section of the survey was printed on the front page
- The same rating scale was used throughout, and was presented at the top of each page.
- The instrument was personally administered by the same subject matter expert (SME) to every surveyed individual for reliability. It was, in effect, a structured interview.
- The survey took on face validity by virtue of the fact that a well-respected retired Navy Captain, himself an NFO, administered it.

- The site visit by the SME was preceded by a message from the TW-6 Commodore, emphasizing its importance to the NFO community.

### 4.15 Statistical Software

SPSS Professional Edition was used for the statistical analysis of the data collected by the survey instruments. After the data was entered, it was checked for accuracy in two independent evaluations; errors were corrected. The data set provided over 15,000 data points—a rich source of information. The results may be found in Appendix A.

- The data was entered in a format that enabled maximum exploration of subsets and trends. For example, the data set can be sorted by aircraft community, pilot/MFO, amount of experience, etc.

- The first step was the use of descriptive statistics—the graphic display of the data set to provide an overview of the data, and an opportunity to identify abnormalities and trends. It is necessary to ensure, by constructing a scatterplot, that there are no non-linear relationships in the data (e.g., exponential, sinusoidal), since correlational analysis is limited to linear relationships.

- Correlational analyses were conducted on a number of sets and subsets of variables. Since correlations are linear relationships with no predictive power, theories drawn from cognitive science, instructional design and the literature review were applied to the results for interpretation.

- T-tests and Analysis of Variance (ANOVA) were used when it was necessary to determine the statistical significance of the difference between the means of groups within the data set.

### 4-16 Methodology for Identifying Learning Outcomes

Integreator Professional Edition was used to design and develop the media analysis. The methodology was adapted from a recent taxonomy that incorporates higher-level thinking skills and structured knowledge (Jonassen & Tessmer, 1997/1997). The other media attributes were selected for the UMFO training context. The mix of attributes was selected, tested and refined in an effort to maximize the ability of the selection matrix to discriminate among the wide range of media options available.

### 4-17 Flow Diagrams

Diagrams with a description of each discrete event/step of the process. (See Figure 4.2)

### 4-18 Discussion of discrete steps

- Literature review. An annotated bibliography for the literature reviews conducted under this contract may be found in section xx of this CDRL. Empirical studies were heavily relied upon to assure that the TSA was conducted with the best available research-based learning theories. The major academic databases were consulted.

- Learning analysis. A learning analysis differs from a task analysis in that it seeks to answer the question: How should the knowledge, skills and attitudes (KSA) be presented to maximize learning? It cannot transcend the quality of the prerequisite job task analysis that produced the list of KSAs. The UMFO training program is in critical need of behavioral and cognitive task analyses.

## FLOW DIAGRAM

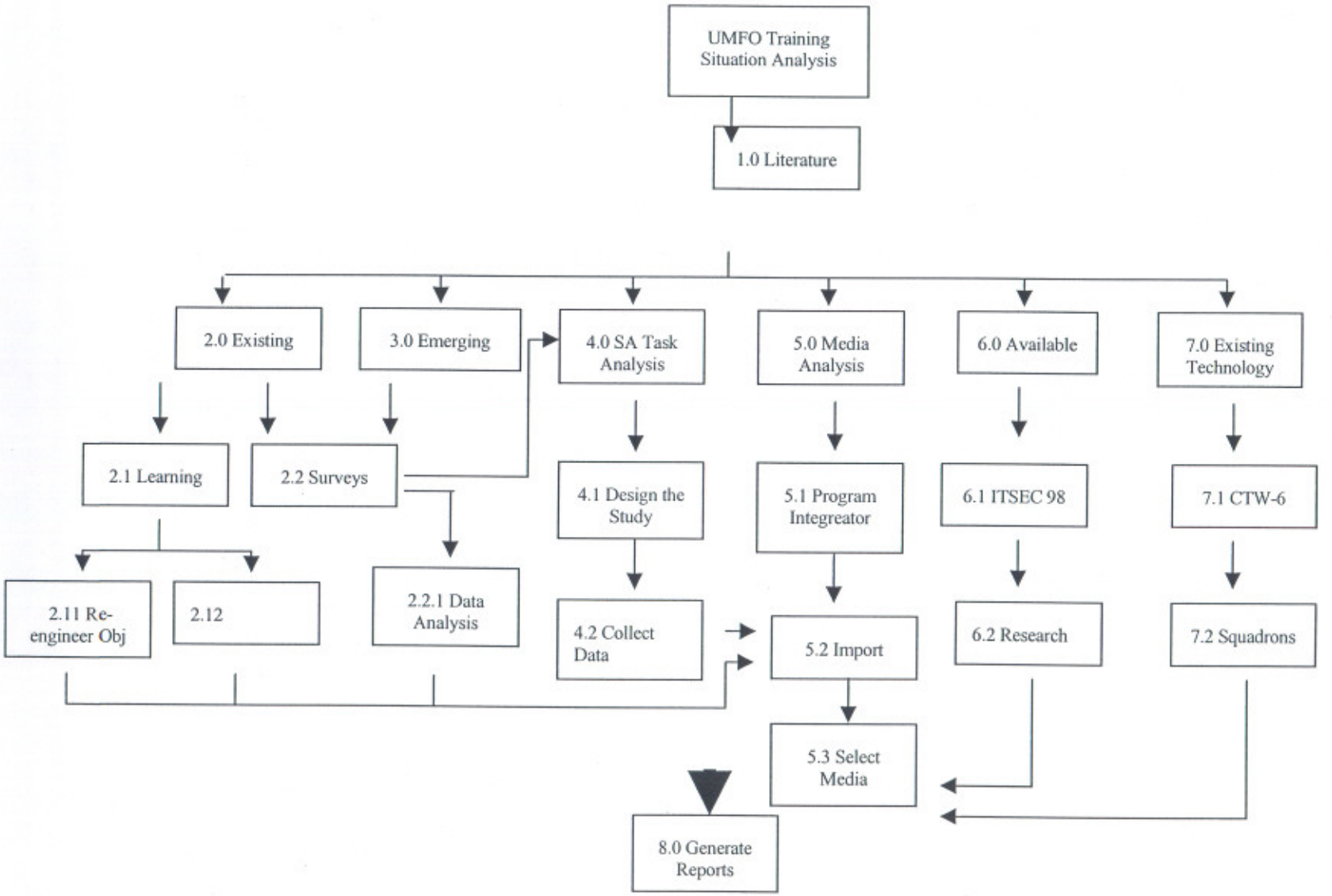


**Figure 4.2 – Flow Diagram – Training Situation Analysis**

- Re-engineer objectives. The present enabling objectives are inadequate for use in driving the curriculum or assessing student learning. Neither are they specific enough to facilitate a media analysis. It was necessary to construct enabling objectives based on the instructional content of the lessons.

- Learning hierarchy analysis. The optimum sequence for learning is often not the same as the sequence in which complex tasks are performed. This step sought the optimum training sequence.

- Design and conduct surveys.

Two surveys were developed. One was targeted the cognizant class desks and model managers at OPNAV and NAVAIR. Its purposes included obtaining information concerning:

- Inventory of aircraft and MFOs by year;

- Projected changes in aircraft and system technology through 2006; and

- Anticipated changes in MFO tasking due to new mission profiles.

A second survey of MFO instructors and students was conducted at TW-6 and all of the NFO Fleet Replacement Squadrons. It addressed the:

- Validity of the present curriculum objectives

- Effectiveness of the curriculum in meeting those objectives; and

- Proficiency of the graduates on 12 representational competencies.

**Perform analysis of the data.** The SPSS Professional Edition software suite was used in the analysis of the data. A qualitative analysis of written comments was performed by a recent MFO instructor and an instructional designer.

- Evaluate emerging MFO requirements. The survey respondents above were asked to comment on emergent MFO competencies. The OPNAV/NAVAIR survey results were made available to the TW-6 and FRS participants. The results were compiled and reported.

- Situation Awareness (SA) task analysis. The SA objectives were insufficient in number, specificity and infusion throughout the curriculum to perform a definitive analysis of the media required to learn SA competencies.

- Design the study

- Collect the data

- Perform the media analysis
- Program Integreator Professional - The most recent, comprehensive learning taxonomy was used to identify learning outcomes and instructional delivery modes. The list of media and attributes was tailored to the CTW-6 context. The media were weighted on each attribute and programmed into the software.
- Import the objectives. The objectives (original, modified and newly developed) were pulled into the Integreator software. Each was matched with its required learning outcomes and attributes.
- Perform media selection. Media selection was conducted by using the previously programmed algorithm. In some instances, the instructional designer chose to override the recommended media and/or instructional delivery mode due to mitigating factors. These instances are reported in the media selection results.
- Analyze the current and projected technology
- Attend ITSEC 98. - The program manager, project manager and lead instructional designer attended the ITSEC 98 conference in Orlando, FL. All of the pertinent exhibits were visited, and a full schedule of sessions were attended
- Conduct research on the state-of-the-art.
- Evaluate existing technology at TW-6 commands.
- Evaluate CTW-6 resources. All resources were evaluated by quantity and compliance with IT 21 standards. The onsite survey included electronic classrooms, the CBT laboratory and all office spaces.
- Evaluate squadron resources - All squadron resources were evaluated by quantity and compliance with IT 21 standards
- Draft and brief the required reports - All reports required by the SOW and respective CDRLS were generated. Ongoing progress was reported on a monthly basis and in the In-progress Reviews.

### 4.19 Assumptions

Assumptions made during the course of the analytical process shall be described and rationale provided.

- Accurate Survey Data
- Operational aircraft inventories, aircraft systems, mission profiles and UMFO manning levels as gathered by the OPNAV/NAVAIR survey.
- Network-centric warfare.

- The battlespace environment envisioned by Adm. Cebrowski (N6) and others will continue to be developed at an accelerating pace. One outcome will be increased demand on the cognitive loading on MFOs.

- Progress in information technology.

- The current explosion in IT advances will reverberate throughout the time covered by this report. MFOs will need to be equipped to deal with increasingly sophisticated databases and applications.

- Instructional technology innovations.

- The recent advances in the understanding of knowledge structure, elicitation and assessment will bear fruit in the next decade. Web-based training will become the norm for the military.

- Statistical technique assumptions.

- The test were conducted with the assumption of normal distributions with equal variance.

- Statistical technique assumptions.

- The test were conduction with the assumption of normal distributions with equal variance.

- Continued shift to COTS simulation in the industry.

- The industry will continue to follow the early lead by Microsoft, Silicon Graphics, Corypheus and others. The shift will mean substantial savings for consumers of simulation.

### 4-20 Literature Review


- Benson, A J (1965) *Spatial Disorientation in Flight* In J.A.Gillies (Ed.) *A textbook of Aviation Physiology* Pergamon Press: New York/London

- Briggs, L J, Campeau, P L, Gagne, R M and May, M A (1966) *Instructional Media* American Institutes for Research: Pittsburgh, Pennsylvania, USA

- Davidson, J.E. & Sternberg, R.J. (1998). Smart problem solving: How metacognition helps. In D.J. Hacker, J. Dunlosky, & A.C. Graesser (Eds.), *Metacognition in educational theory and practice* (pp. 47-68). Mahwah, NJ: Erlbaum.

- Gagne, R M and Briggs, L J (1974) *Principles of Instructional Design* Holt, Rinehart and Winston: New York. Romiszowski, A J (1981) *Designing Instructional Systems* Nichols Publishing: New York.


Findings:

- Metacognition is necessary for effective problem solving.

- Cueing training can enhance selective encoding in information-laden environments.
- Metacognitive skills developed in other domains may be insufficient.
- Multiple scenarios are required for maximum transfer of skills.
- The use of mental models can help to discriminate the structure of different problems.

**Ford, J.K., Smith, E.M., Weissban, D.A., Gully, S.M., & Salas, E. (1998).**

Relationships of goal orientation, metacognitive activity, and practice strategies with learning outcomes and transfer. *Journal of Applied Psychology, 2*, 218-233.

Findings:

- Transfer of performance skills is predicated upon similar information processing, not "identical elements".
- Metacognition is significantly related to knowledge and skill acquisition and perceptions of self-efficacy.

**Frederiksen, J.R. & White, B.Y. (1989).**

An approach to training based upon principled task decomposition. *Acta Psycholigica 71*, 89-146.

Findings

Within a context of complex task training of concurrent and coordinate use of perceptual and motor skills and conceptual and strategic knowledge, training in skill components can be superior to whole-task training. Advantages included:

- Higher levels of performance on the whole task;
- Reduced liabilities for lower ability students; and
- Development of generic skills and heuristics provided better transfer of skills.

**Jonassen, D.H., Tessmer, M., & Hannum, W.H. (1999).**

*Task analysis methods for instructional design.* Mahwah, NJ: Erlbaum.

Sections:

- Job, Procedural and Skill Analysis Methods
- Instructional and Guided Learning Analysis Methods
- Cognitive Task Analysis Methods

- Knowledge Elicitation Techniques

**King, A. (1990).**

Enhancing peer interaction and learning in the classroom through reciprocal questioning. *American Educational Research Journal* 27(4), 664-687.

Findings:

Students using guided reciprocal peer questioning procedures as compared with a traditional discussion approach:

- Asked more critical thinking (vs. recall) questions;
- Gave more explanations (vs. low-level elaboration responses); and
- Demonstrated higher achievement.

**Muniz, E., Stout, E.J., Bowers, C.A., & Salas, E. (1988, April).**

*A methodology for measuring team situational awareness: Situational awareness linked indicators adapted to novel tasks (SALIENT).* Paper presented at the NATO conference, Edinburgh, Scotland.

Information:

- A research-based list of behavioral indicators of team SA
- A methodology developing a scenario with specific, observable responses
- Development of an observation form to collect SA data

**Pirolli, P. & Recker, M. (1994).**

Learning strategies and transfer in the domain of programming. *Cognition and Instruction, 12*(3), 235-275.

Conclusions:

Metacognition facilitates cognitive skill acquisition because it includes:

- Higher degrees of monitoring states of knowledge;
- More self-generated explanation of goals and strategies; and
- Greater attention to the instructional structure.

**Ryder, J.M. (1993).**

Integrating cognitive task analysis into instructional system development. *Educational Technology, Research & Development*, *41*(2), 75-96.

Discussion:

The Integrated Task Analysis Model consists of:

- Three analysis stages: progression cycles of data collection, analysis and decision making
- Three components of expertise: skills, knowledge and mental models.

**Salas, E., Prince, C., Bowers, C.A., Stout, R.J., Oser, R.L., & Cannon-Bowers, J.A. (in press).**

A methodology for enhancing crew resource management training. *Human Factors.*

Conclusion and Contributions:

A systematic methodology for developing CRM training can result in better performance in the cockpit.

The methodology included:

- Identification of skills to be trained;
- Development of performance measures;
- Application of instructional design principles; and
- Evaluation of the training delivery.

**Stout, R.J., Cannon-Bowers, J.A., & Salas, E. (in press).**

Team situational awareness (SA): Cue-recognition training. To appear in M. McNeese (Ed.).

Hypotheses:

With active system prompting and instructor-guided practice, team members will form:

- Common explanations of the meaning of task cues;
- Compatible assessments of the situation at hand;
- Common expectations of additional task and information requirements;
- Accurate predictions of team member behavior; and
- Appropriate and expected task strategies.

**Thurman, R.A. (1993).**

Instructional simulation from a cognitive psychology viewpoint. *Educational Technology, Research & Development*, *41*(4), 75-89.

Applications for Instructional Design:

- The degree of fidelity of simulations should be progressive, and in synch with the present cognitive goal.
- Opportunities for using metacognition should be built into simulations.
- Automaticity of cognitive processes is essential for learning intricate, complex tasks.

Suggestions include:

- Isolate automatic components using "principled task decomposition"
- Make consistencies in the task overt by using cueing
- Strive initially for stress-free conditions
- Only increase the complexity or stress level after automaticity is well under way.

## 4.20 Summary

### 4.20.1 Overview of Major Recommendations

- The following recommendations should be considered as a package, not as individual stand-alone options.
- Contract an instructional design team composed of an instructional designer and subject matter expert (former NFO instructor) for one base and two option years.
- Retain a multi-place training aircraft at TW-6.
- Replace the eight Familiarization flights in Primary phase with five Familiarization/ Situational Awareness flights.
- Overhaul the 2B-47 to an ANAV/VNAV/SA simulator with voice recognition software, three-screen visuals and the capability to collect data on SA-related behaviors.
- Install communications commercial off-the-shelf software into the computer lab.
- Replace two T-34C ANAV flights with two ANAV simulator events.
- Add three VNAV simulator events.
- Add a digital video recording and playback system to 15 T-39 aircraft.

- Upgrade four electronic classrooms to I-AEC standards.
- Replace 171.5 hours of classroom instruction with interactive courseware or computer-based training.
- Add 34.5 hours of computer-aided instruction to instructor-led lessons.
- A synopsis of the media analysis for the current curriculum with detailed recommendations is contained in Appendix A.

### 4.20.2 Cost Data

Major Costs at a Glance:

| | |
|---|---|
| 15 ANAV/VNAV/SA Simulators: | $2,380K |
| 15 digital video recording/playback systems: | $1,260K |
| 171.5 hours of new/revised ICW & CBT: Maximum of | $962K |
| (with no instructor billets deleted) | |
| Upgrade four Electronic Classrooms to I-AEC standards: | $537K |
| Instructional Design Team (one year): | $275K |
| 34.5 hours of CAI: | $138K |

*Total: $5,552K*

Cost Reductions:

| | |
|---|---|
| 4.5 T-34C flight hours x 550 Primary students | 2475 |
| 4.0 T-34C flight hours x 416 Intermediate students | 1664 |

***Total: 4139 Flt Hours***

## 4.20.3 Media analysis - Recommendations with costs

The recommendations are keyed to the line items of the Media Analysis Synopsis Appendix A, which provides a synopsis of the media selection, and the detailed costs of the recommendations. The Media Analysis Synopsis is taken directly out of the Section I, Training Summary of each of the respective CNATRA Master Curriculum Guides. This enables a quick assessment of the impact of a given recommendation on the present curriculum

## *Primary Phase*

1. **Delete three T-34C Familiarization flights from the Primary curriculum**

   Actually, we recommend that all eight of the present Familiarization flights be replaced by five Familiarization/SA flights. The present flights teach the student to fly the T-34 aircraft up to, but not including solo flight. They were added to enhance the development of SA. We feel that SA would be better served by providing the student with better simulation prior to the first flights than what is presently available on the 2B-47. Research has found that conducting training in a stressful target environment early in the learning process can be detrimental to learning complex skills. Then, provide flights that promote skills proven to be related to building SA in MFOs. The SA task analysis conducted by this study enables us to identify these skills. The flights would still provide the required acrobatics exposure and the simulator would enable both simulated stick time and collection of SA-related data.

   **Savings: Indeterminate**

2. **Modify the 2B-47 Simulator.**

   Pages 20-23 of the Appendix contain a description of the recommended simulator and a ROM of the cost provided by ECC. The simulator would address the fleet concerns with weak communication skills through the use of speech recognition software. It would provide opportunities for the student to practice flying the Fam flight routes and would collect SA data on response times, point-to-point navigation, etc. Fifteen simulators would accommodate large classes in two shifts and still provide access for the ANAV and VNAV events recommended below. This device would help students to begin to develop "individual" SA skills and provide instructors with early identification of those needing remediation.

   **Purchase Cost: $2,379,670.00**

3. **Provide a COTS Communications trainer in the Learning Resource Center (LRC)**

   During IPR-2, a suggested COTS trainer was demonstrated. This would provide ongoing opportunities for the student to practice communication skills early in the curriculum. The ability to listen to one's own calls in comparison to an expert is seen as a real advantage.

   **Purchase Cost: $5000.00**

4. **Add Communications ICW**

   This program would replace the existing instructor-led course. If the COTS above is modified to address military protocols, the time would be decreased to 3 hours.

   **Purchase Cost: $34,650.00**

**Annual Savings: $5,920.20**

5. **Develop ICW for the Instrument Navigation Course; use Existing COTS**

   This course content is well suited for ICW. It could use low-cost, interactive graphics that would be far more effective than the present course. The RIOT trainer would still be used in conjunction with this course.

   **Purchase Cost: $103,950.00**

   **Annual Savings: $18,790.20**

6. **Delete Three Airways Nav Prep Simulator Events**

   This recommendation is not as radical as it may seem. The events only exist to reintroduce the student to the 2B-47 after having made eight Fam flights that did not exercise the skills they had been learning on the simulator. The sessions are actually open labs, where students are free to attend or not.

   **Annual Savings: None**

7. **Develop ICW for the Meteorology Lesson**

   This is another course that lends itself well to ICW and provides academic flexibility for students who may lose a flight due to weather, maintenance, etc.

   **Purchase Cost: $63,000.00**

   **Annual Savings: $10,296.00**

8. **Develop ICW for the Flight Planning Lesson.**

   By using ICW, the student can be tested in a variety of ways that do not lock the instructor into a multiple-choice testing environment.

   **Purchase Cost: $100,800.00**

   **Annual Savings: $14,414.40**

9. **Develop CBT for the T-34C NATOPS Lesson.**

   This course is listed as CBT (computer-based training) rather than ICW because much of it can be developed as inexpensive level-1 interactivity courseware.

   **Purchase Cost: $103,350.00**

   **Annual Savings: $19,305.00**

10. **Add a university course in Information Management via interactive TV.**

The network-based warfare battlespace demands that MFOs become skilled information managers. Due to the rapidly changing technical environment, the students need a continuously updated, cutting edge course. The interactive television site can be used for teleconferences as well—perhaps with FRS sites.

**Purchase Cost: $56,000.00**

**Annual Costs: $58,100.00**

## Interactive Television

## (Distance Education)

The purpose of this alternative instruction is to provide the TW-6 students with a method of receiving a post-graduate collegiate course via interactive television. The instructors could be based at a university, and through interactive TV, provide instruction to the TW-6 students on a scheduled basis. The nature of the course would allow for interactive lectures, with supplementary work through an Internet chatroom.

The length of the Basic training unit at TW-6 is approximately 16 weeks, with a new class beginning every two weeks. The interactive TV course would provide seven 2-hour interactive lectures, according to the following schedule:

Incoming Group

| Week | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| 1 | NEW | | | | | | | |
| 2 | M1 | | W2 | T2 | M2 | R1 | W1 | T1 |
| 3 | | NEW | | | | | | |
| 4 | T1 | M1 | | W2 | T2 | M2 | R1 | W1 |
| 5 | | | NEW | | | | | |
| 6 | W1 | T1 | M1 | | W2 | T2 | M2 | R1 |
| 7 | | | | NEW | | | | |
| 8 | R1 | W1 | T1 | M1 | | W2 | T2 | M2 |
| 9 | | | | | NEW | | | |
| 10 | M2 | R1 | W1 | T1 | M1 | | W2 | T2 |
| 11 | | | | | | NEW | | |
| 12 | T2 | M2 | R1 | W1 | T1 | M1 | | W2 |
| 13 | | | | | | | NEW | |
| 14 | W2 | T2 | M2 | R1 | W1 | T1 | M1 | |
| 15 | | | | | | | | NEW |
| 16 | | W2 | T2 | M2 | R1 | W1 | T1 | M1 |
| 17 | NEW | | | | | | | |
| 18 | M1 | | W2 | T2 | M2 | R1 | W1 | T1 |
| 19 | | NEW | | | | | | |
| 20 | T1 | M1 | | W2 | T2 | M2 | R1 | W1 |
| 21 | | | NEW | | | | | |
| 22 | W1 | T1 | M1 | | W2 | T2 | M2 | R1 |
| 23 | | | | NEW | | | | |
| 24 | R1 | W1 | T1 | M1 | | W2 | T2 | M2 |

The instructor schedule would be continuous, according to the following proposed schedule:

| | Monday | Tuesday | Wednesday | Thursday |
|---|---|---|---|---|
| 1600-1800 | M1 | T1 | W1 | R1 |
| 1800-2000 | M2 | T2 | W2 | |

As an example, this would mean that at one point in time, the schedule would have the following groups scheduled for that particular week:

| | Monday | Tuesday | Wednesday | Thursday |
|---|---|---|---|---|
| 1600-1800 | G | F | E | D |
| 1800-2000 | C | B | A | |

The proposed syllabus could be as follows. Each class would be a two-hour segment:

| Module | Subject | Supplementary |
|---|---|---|
| M1 | Introduction; goals | Sign up for chatroom |
| T1 | Lecture; discussion | Assignment 1 for chatroom |
| W1 | Lecture; discussion | Assignment 2 for chatroom |
| R1 | Mid-course evaluation | |
| M2 | Lecture; discussion | Assignment 3 for chatroom |
| T2 | Lecture; discussion | Assignment 4 for chatroom |
| W2 | Evaluation | |

This would provide 14 full credit hours, with a probable extra 18 hours spent on-line. This could qualify for a three semester hour course, most likely.

- Costs for this program would depend on how many interactive televisions are needed, directly related to how many classrooms are needed. The state-of-the-art manufacturers are VTEL and Tandenburg. They have supplied the Navy with many units, and are popular with Telemedicine providers, due to their high quality resolution. A low-end would cost $17, 995 (retail), a medium-range unit would cost $31,995 (retail), and a high-end unit would cost approximately $65,000.

- Other considerations that should be made are whether TW-6 should bear the full cost of this. If the university will receive compensation by the students, TW-6, or split, should the university also share the costs? Also, who should provide and maintain the Internet server? Who should pay for the ISDN telephone line (or token ring)?

## *Intermediate Phase*

1. **Delete two T-34C ANAV flights.**

   The opportunity to practice complex skills in a multi-tasking environment is critical and the need for a number of ANAV flights in the curriculum is well justified. However, transfer of skills is best served in a context with multiple practice events by providing a wide range of contexts. Two flights would be replaced with simulated events with very different missions, but using the same ANAV skills. This would also allow the Wing to collect SA data on the students as they progress into the Intermediate phase. Understanding of the development of SA skills across the curriculum is essential to making real progress in enhancing the training effectiveness.

   **Savings: Indeterminate**

2. **Delete one Operational Flight Trainer event.**

   This is Module 18 in the Intermediate curriculum. Four INAV simulator events and 14 lectures (ACT/CRM and Visual Navigation) have intervened since the four ANAV flights in Primary. Lockheed-Martin instructors consider this a reintroduction to the simulator. By taking the action described in II-3 below, this event is not required.

   **Annual Savings: $34,070.40**

3. **Rewrite the INAV 1-4 simulator events as Intermediate OFTs.**

   This simulator event has very weak correlations to the target aircraft behaviors and to other simulator events (Appendix, page 9). The flight profiles were rewritten three years ago, and according to the Lockheed-Martin Assistant Site Manager, no longer match the profiles flown. He recommends rewriting them as OFT events, a reasonable solution.

   **No anticipated costs to be incurred.**

4. **Add two ANAV simulator events.**

   These events replace the two flights cut above. The events would be flown with an NFO and student, one-on-one, as opposed to the classroom concept used in Primary.

   **Annual Cost: $68,140.80**

5. **Add three VNAV simulator events.**

   The UMFO program currently has no visual simulator. The negative impact on training is compounded by the rural environment in which flight training is conducted in Pensacola; it is difficult to recognize many of the landmarks. In addition to the benefits for VNAV flight preparation, a survey of instructors found that they felt that SA training would be greatly enhanced by adding a visual simulator (Appendix, page 24).

**Annual Cost: $102,211.20**

**6. Add CAI graphics for instructor use in the Visual Navigation lesson. Move the lectures closer to the VNAV simulator events and flights.**

The graphics can be inexpensively re-purposed from the VNAV simulator. The lectures should just precede the simulator and flight events.

**Purchase Cost: $36,000.00**

**7. Convert the T-1A NATOPS course to CBT.**

The course received low marks on the survey. We feel that instructor contact is not required for this course.

**Purchase Cost: $116,600.00**

**Annual Savings: $19,094.40**

## *Advanced Core*

**1. Add additional T-39 instruments to the GMRTS simulator.**

This has been requested by instructors to add some realism to the simulator. The Master Caution Panel and selected instruments could be added inexpensively in-house by NAWCTSD.

**This would be a low-cost initiative undertaken by existing contract.**

**2. Convert T-39 NATOPS to CBT.**

Same rationale as for T-34 and T-1A NATOPS.

**Purchase Cost: $143,100.00**

**Annual Savings: $32,221.80**

**3. Convert T-39 Flight Preparation to ICW.**

The course content is stable and lends itself well to ICW.

**Purchase Cost: $113,400.00**

**4. Add CAI to the Low Level and Radar Planning lesson.**

The Radar Planning curriculum received low marks from the FRSs. Quality graphics and animations will enhance the effectiveness.

**Purchase Cost: $28,000.00**

5. **Add CAI to the Low Level and Radar Navigation lesson.**

   Similar to III-4.

   **Purchase Cost: $28,000.00**

6. **Convert the Turnpoint Procedures course to ICW.**

   The content is very procedural and the students already have prerequisite skills in these procedures.

   **Purchase Cost: $44,100.00**

   **Annual Savings: $8353.80**

7. **Add CAI and COTS to the Aircraft Carrier (CV) Procedures lesson.**

   This course received the lowest score on the FRS survey and many negative comments. Students have difficulty in perceiving the "stack" and the whole CV operating environment. Adding 3-D animations and quality graphics will help immensely. Also, we recommend the purchase of a computer game of making CV launches and arrested landings. (The NAWCTSD Instructional Gaming engineers have this for action.)

   **Purchase Cost: $2500.00**

8. **Convert Instrument Ground School to ICW.**

   As discussed in the Instrument Navigation lesson in Primary, ICW is used to good advantage in this type of lesson.

   **Purchase Cost: $81,900.00**

9 **Convert the Strike Phase exam to ICW.**

   The rationale was presented earlier.

   **Purchase Cost: $12,600.00**

   **Annual Savings: $1591.20**

## *Advanced Strike*

1. **Add CAI to the Radar Terrain Interpretation lesson.**

   The instructor needs quality graphics to be most effective in presenting this information.

   **Purchase Cost: $12,000.00**

2. **Convert Composite Strike Planning to ICW.**

   The BDHI problems, mathematical analyses and color maps would be best presented in ICW.

   **Purchase Cost: $18,900.00**

## *Advanced Strike Fighter*

1. **Add CAI to the Air Intercept Radar lesson.**

   The three-dimensional space in which the lesson is presented requires 3-D graphic animations to adequately present the concepts.

   **Purchase Cost: $10,000.00**

2. **Add CAI to the Fighter Environment lesson.**

   The rationale is the same as for V-1 above.

   **Purchase Cost: $24,000.00**

3. **Convert the Intercepts examination to ICW.**

   The rationale was presented earlier.

   **Purchase Cost: $12,600.00**

   **Annual Savings: $655.20**

## *Advanced Tactical Maneuvering*

1. **Add CAI to the ATM lesson.**

   As with the airborne intercept lessons, 3-D animations are critical to this subject matter.

   **Purchase Cost: $40,000.00**

2. **Convert the Final Phase exam to ICW.**

   The rationale was presented earlier.

   **Purchase Cost: $12,600.00**

   **Annual Savings: $748.80**

### Justification

The need for Situation Awareness (SA) MFOs now, and increasingly so in the immediate future, evolved as a driving and unifying factor of this study. The competencies of graduating MFOs judged to be weakest in a survey of FRS and TW-6 instructors were human factors skills: Communications, Co-piloting skills, Situation Awareness and Crew Coordination. The four skills are highly correlated statistically and practically. SA as discussed in this report has a great deal of overlap with the other human factors skills above. An analysis of the potential demands upon MFOs in the year2006 found that multi-tasking and information overload would emerge as the chief threats to performance, requiring an even greater degree of SA skills.

Because TW-6 had few objectives or assessment instruments for training and testing SA, the JIL team collaborated with research psychologists from NAWCTSD and the University of Central Florida to investigate SA-related behaviors as applied to the UMFO program. SA objectives were written for an amended list of behaviors and inserted into Integreator, the media analysis tool used in this project.

During the in-process review number two (IPR-2), the JIL team was specifically tasked with considering each objective in the curriculum on the merit of its required behavior, independent of context, during the media analysis. When the objectives are approached in this manner, only those requiring vestibular stimulation of the senses must be learned while airborne: the acrobatics in the Primary phase and tactical maneuvering in the Advanced phase.

When SA is considered, however, a second critical need for flight hours becomes readily apparent. The MFO must perform the required individual behaviors within a multi-tasking, time-constraining and stress-inducing environment. This context mandates airborne training and assessment. This is in keeping with the results of the FRS survey. When asked which of the MFO competencies must be

learned in the air, 70 percent of the respondents selected SA. We believe that emerging advances in human factors research and in technology can provide effective prerequisite training on the deck.

The media analysis included an evaluation of every MFO behavior required by every flight in the curriculum. The final report will include a set of tables that assign an objective to each of these behaviors. It allows analysis of the development of skills across the curriculum, including SA. The recommendations of this Training Situation Analysis weigh heavily the concerns of the Fleet and those raised by the SA task analysis for enhancing the development of SA-related skills in UMFO students.

**Table 2-7- Benefits of a Visual Simulator for SA**

| *SA Skill | Present | Plus Visual |
|---|---|---|
| 1. Spatial Awareness | 3.13 | 4.25 |
| 2. Takes Timely Action | 3.50 | 3.75 |
| 3. Uses Available Info | 2.63 | 3.63 |
| 4. Scan | 2.38 | 3.75 |
| 5. Anticipates Consequences | 3.00 | 3.63 |
| Mean | 2.93 | 3.80 |

*(* the 5 most critical skills)*

*(#4 & 5: two of the three most difficult skills)*

Total across all 16 SA skills: 2.89
3.58 (a 23.9% increase)

There are several factors that should be considered when judging the merit of the recommendations. First, this report contends that the student is best served by substituting a simulator for eight and one-half hours of flight time. As stated above, we know that flight time is critical to the development of SA. We recognize that there is some number of MFO flight hours that constitute a critical mass for developing FRS-ready graduates. It is impossible to accurately predict that number, made all the more difficult when considering the receiving aircraft communities. We believe that we have made responsible and well-reasoned substitutions that build, not reduce, SA.

Second, we believe that the recommendations are fiscally sound. It is anticipated that the five-year cost savings on operating costs alone will pay for the simulators. The impact on the maintenance contract and reduction in aircraft inventory should support the other recommended changes.

Third, the media analysis recommends the development and use of both computer-aided instruction (CAI) for instructor-led courses and interactive courseware (ICW) for individualized learning. The

benefits are reduced cost and flexibility to manage "white space." We DO NOT recommend this strategy unless the recommendation for the ISD team described in this report is also adopted (Appendix A). There are already hundreds of thousands of dollars invested in media that is unused. We do not want to add to that problem.

Fourth, we feel that wherever computerized instruction is used, a review with an instructor led question and answer period should precede testing. We feel that all testing should be converted to ICW to allow for automated data management and flexible testing techniques.

Finally, we believe that retention of the military instructors at the present manning level is very important to the program. Although annual savings are provided in some instances where ICW should replace instructor time, those costs are provided only as an indication of possible savings in the event instructor manning declines because of retention or recruiting problems. The instructor billets remain critical because of their influence upon the student. It is important that they continue to be available for one-on-one instruction and for instruction in the simulators and in the air. Having instructors available to provide subject matter expertise in the development phase of the ICW in also critical and lack of that availability is much of the reason previously developed ICW is unused. Time spent preparing lectures and in the classroom takes away from all of these activities. It would be wise for the Training Wing to maintain its level of manning for instructors particularly during the implementation of the recommendations from this study.

**Description of the Ramifications**

The TW-6 curriculum while providing good training for MFO students lacks well planned learning progression. The student often moves on to higher level learning situation without the benefit of adequate preparation. This is especially true in the area of human factors skills. As indicated by a survey conducted as part of this analysis the poorest performance by MFO graduates is in the human factors area. The survey also revealed that future MFO job performance through year 2006 is contingent upon above average situational awareness skills. This is the result of performance complexity increasing with the growing number of and increased difficulty of tasks to be performed.

Improvement of situational awareness is a critical issue. The present MFO student is graduating without adequate skills and the existing training curriculum will only leave the graduate less and less prepared as time goes on. The recommendations of this study are designed to change the curriculum by increasing the student's didactic preparation in situational awareness and also provide the opportunity to practice and refine those skills, on the ground, in a simulator and in the air.

Like most military training programs TW-6 works hard to provide the best training possible for their students but like most they lack the necessary instructional expertise to do it. Training technology has improved as quickly as aircraft technology but the Training Wing has been unable to keep up. One primary reason is the lack of instructional designers to guide instructors in the new training techniques. Because progression is so rapid, it is critical that they be given immediate relief.

For these reasons, it is our belief that failure to implement any of the recommendations of this analysis will cause the Training Wing to fall farther behind in their ability to prepare the MFO for the high technology and increase task complexity of the future.

**CDRL A002**

**TRAINING SITUATION DOCUMENT**

# 5 Associated Training Equipment.

## 5.1 Learning Objectives

Information on technology used to provide training for existing systems, which are similar to an emerging system for which training must be developed.

## 5.2 Implementation of ICW

TRAWING 5 has a technology infusion program for the implementation, administration and maintenance of interactive courseware (ICW) similar to the one at TW-6. The efforts there have been effective. To date, five courses have been replaced, not augmented, by ICW. The utilization of the learning resource center at TRAWING 5 is over 100%; that is, the ICW lessons are used exclusive of classroom presentation and students additionally use the programs for personal study outside of curriculum requirements. TW-6 has recently initiated a program to incorporate some of the TRAWING 5 best practices to their program.

Impediments to the efficient implementation of ICW at TW6

- The TW6 ISD billet has not been filled during the process.
- Instructors, though expert in aeronautical content, lack the background in instructional technology to adequately assess instructional materials.
- Review of instructional materials by the Navy has not been accomplished within established timeframes.
- There was insufficient instructor input during the development process.
- The ICW delivered under the above set of circumstances could not be used in place of instructor-led classes.
- Instructor and student expectations of the effectiveness of ICW at TW-6 has been low.

## 5.3 TW-6 initiatives presently in progress

- The ISD billet is in the process of being requested.
- The Academic Officer at Griffith Hall has been assigned as coordinator for instruction at all three squadrons.
- An instructional developer is on-site conducting revision and maintenance (R & M) on existing courseware.

### 5.4 Action still required

- Develop a training program that approaches the training goals systematically, rather than the present piecemeal approach.
- Establish clear-cut criteria for the identification and prioritization of ICW development and revision.
- Develop a workable plan for how to involve instructors in the development and analysis process, given their other assignments.

### 5.5 Implementation of an SA Simulator

There are presently only prototypes of simulators expressly built around the development of SA skills. No parallel system presently exists.

### 5.6 State-of-the-Art-Assessment

#### 5.6.1 Literature Review.

**A comprehensive review of the literature was conducted to determine the current state of research in situational awareness.**

#### 5.6.2 ITSEC

**JIL team members attended related presentations and visited applicable displays at the 1998 Inter-service/Industry Training, Simulation and Education Conference.**

#### 5.6.3 NAMRL

The JIL team considered a number of recommendations and prototypes in assessing the available technology. Team members flew the prototype being investigated by NAMRL. We discussed the measurement of SA-related behaviors, graphic databases, hardware and the configuration of a simulator for use in the UMFO program.

#### 5.6.4 ECC

The JIL team discussed SA behavior simulation and measurement on-site at TW6.

We discussed the context of SA within the UMFO curriculum and the challenges of collecting SA data in the air and on the deck. ECC provided a description of a recommended configuration for an SA simulator for Primary and Intermediate phases along with a ROM of the cost of development (Appendix A).

#### 5.6.5 SBIR Program

Phase II of a Small Business Innovative Research project was concluded in August, 1999. JIL team members assessed the effectiveness of the SA simulation software on-site at TW6. The ISD engine at the heart of the software is training objectives driven. It allows the instructor to build performance-based mission scenarios using Windows menus.

Behaviors validated as being correlated with SA development in UMFOs can be called up singly or in sets of skills to be trained and measured on a given mission. The flight plan constructed by the student can be imported directly, as can area maps, etc. The program allows student performance measures to be electronically transferred to the student's academic file.

### 5.6.6 IT-21 Assessment

**Table 5-5 Current Installed Equipment, Griffith Hall, and Proposed IT -21 Compliant Counterpart**

| I4E14 Computer Equipment | QTY | IT-21 Minimum Standard | Recommended Replacement |
|---|---|---|---|
| DX-4 100mhz, 16mb RAM, 1GB HD, 2MB Video Card, 3.5 Floppy Drive, 10mbps Network Interface Card (NIC), Keyboard and Mouse | 36 | 200mhz Pentium© Pro, 64mb EDO RAM, 3GB HD, 8X IDE CD-ROM, Dual PCMCIA/PC Card Reader, PCI Video W/2MB RAM, SoundBlaster (Compatible) Audio Card w/speakers, 100mbps NIC | 233mhz Pentium© II, 64mb EDO RAM, 3GB HD, 40X IDE CD-ROM, Dual PCMCIA/PC Card Reader, PCI Video W/8MB RAM, SoundBlaster (Compatible) Audio Card w/speakers, 100mbps NIC |
| Pentium© 133mhz, 32mb RAM, 2.5GB HD, 2MB Video Card, 3.5 Floppy Drive, 10mbps Network Interface Card (NIC), Keyboard and Mouse | 9 | (Same as above) | (Same as above) |
| Pentium© Workstation, 16MB RAM, 160MB HD, 2MB Video Card, 3.5 Floppy Drive, 10mbps Network Interface Card (NIC), Keyboard and Mouse | 1 | (Same as above) | (Same as above) |
| 486DX-2, 8MB RAM, 125MB HD, 2MB Video Card, 3.5 Floppy Drive, 10mbps Network Interface Card (NIC), Keyboard and Mouse | 7 | (Same as above) | (Same as above) |
| Pentium© 133mhz, 16MB RAM, 2.5GB HD, 2MB Video Card, CD-ROM, 3.5 Floppy Drive, 10mbps Network Interface Card (NIC), Keyboard and Mouse | 3 | (Same as above) | (Same as above) |
| Pentium© Workstation, 32MB RAM, 4.0GB HD, 2MB Video Card, Iomega JAZ Drive, CD-ROM, 3.5 Floppy Drive, 10mbps Network Interface Card (NIC), Keyboard and Mouse | 1 | (Same as above) | (Same as above) |

| I4E14 Computer Equipment | QTY | IT-21 Minimum Standard | Recommended Replacement |
|---|---|---|---|
| DX-2 66mhz, 16MB RAM, 400MB Hard Disk, Video Card, CD-ROM, 3.5 Floppy Drive, 10mbps Network Interface Card (NIC), Keyboard and Mouse | 1 | 200mhz Pentium© Pro, 64mb EDO RAM, 3GB HD, 8X IDE CD-ROM, Dual PCMCIA/PC Card Reader, PCI Video W/2MB RAM, SoundBlaster (Compatible) Audio Card w/speakers, 100mbps NIC | 233mhz Pentium© II, 64mb EDO RAM, 3GB HD, 40X IDE CD-ROM, Dual PCMCIA/PC Card Reader, PCI Video W/8MB RAM, SoundBlaster (Compatible) Audio Card w/speakers, 100mbps NIC |
| Pentium© 90mhz Server, 80MB RAM, 8.0GB RAID HD Array, RAID SCSI Controller, CD-ROM, Video Card, 3.5 Floppy Drive, 10mbps Network Interface Card (NIC), Keyboard and Mouse | 2 | Dual 166mhz Pentium© Pro, 512 Secondary Cache Memory, 256MB RAM, Two 4GB SCSI HD, One 6GB DAT Drive, 6X SCSI CD-ROM, Dual PCMCIA/PC Card Reader, 2 DPT SCSI III Caching Controllers (Smartcache 4), 17 inch Monitor (1280X1024), Mouse, Keyboard, Two Cabletron CPU Compatible ATM NIC Cards, Dual Power Supply Case (Hot Swappable) | Dual 233mhz Pentium© II, 1MB L2 Cache, 256MB RAM, One 6GB DAT Drive, 40X SCSI CD-ROM, Two 6.5GB SCSI HD, Dual PCMCIA/PC Card Reader, 2 DPT SCSI III Caching Controllers (Smartcache 4), 17 inch Monitor (1280X1024), Mouse, Keyboard, Two Cabletron CPU Compatible ATM NIC Cards, Dual Power Supply Case (Hot Swappable) |
| 10BaseT Hub | 3 | 100BaseT Fast Ethernet Hub | 100BaseT Fast Ethernet Hub |

The minimum requirements listed above for IT-21 compliance are *bare* minimums. The instruction specifically states that due to the rate at which technology progresses, these minimums will change. The proposed Replacements reflect these changes. Pentium© II processors are now the standard in Desktop PC's. It is recommended that these machines be procured with the 233mhz processor on a Motherboard that supports the 400mhz processor and beyond. This insures equipment can be obtained at a lower cost initially, and may be economically upgraded at a later time when more processor speed is required.

The increasing complexity of CBT material requires more resources than utilized before. For this reason, it is recommended that the Video Card posses no less than 8MB RAM. This will cut down the time which the Processor is utilized in rendering Graphic Material.

Currently, The Network has no provisions for Fast Ethernet and will need to be upgraded. To do this, the three hubs that are in place will have to be upgraded to 100BaseT units in order to provide the necessary throughput from the Servers to the Workstations.

Fifty-Eight Workstations are currently utilizing Windows 95 as the Operating System (OS). IT-21 specifies Windows NT Workstation version 4.0 Both Servers are running Novell NetWare 3.12 which is not DII COE compliant. An upgrade to Windows NT Server 4.0 is recommended.

5.6.6.1 VT-4, VT-10, and VT-86 Computer Systems

This is a survey of the computer systems and equipment located at VT-4, VT-10, and VT-86. The technology survey was conducted to determine if the computer systems comply with the set standards Navy Technology.

The survey was conducted utilizing the Department of the Navy's Information Technology for the 21st Century (IT-21) guidelines. Both the DoD Joint Technical Architecture and Defense Information Infrastructure Common Operating Environment (DII COE) have provided the impetus to establish minimum Navy AIS standards. These guidelines require all non-standard Network Operating Systems (NOS) and Email Products to be replaced no later than December 1999. IT-21 provisions also state funds to maintain NOS's, applications, and/or upgrades to existing equipment, which is not compliant with IT-21 shall be the absolute minimum.

Windows NT Server and Workstation 4.0 are DII COE compliant. No other operating systems are recommended or supported. Office 97 has been designated as the Standard Fleet Office software along with Microsoft Exchange as the standard e-mail solution. Networks must also support connectivity to an ATM backbone with at least 100mbs-throughput capability from the Desktop Computer. Analysis of computer hardware in the UMFO training program reveals they are fully IT-21 compliant and capable of meeting the standards set forth. Below is a table reflecting the current installed equipment:

**Table 5-6. Current Installed Equipment, VT-4, VT-10 and VT-86 and proposed IT-21 Compliant Counterpart**

| UMFO Computer Equipment | QTY | IT-21 Minimum Standard | Recommended Replacement |
|---|---|---|---|
| Pentium II® 300mhz, 64mb RAM, 4gb HD, 4mb Video Card, 3.5 Floppy Drive, 24x CDROM, 100mbps Network Interface Card (NIC), Keyboard and Mouse | 84 | 200mhz Pentium© Pro, 64mb EDO RAM, 3GB HD, 8X IDE CD-ROM, Dual PCMCIA/PC Card Reader, PCI Video W/2MB RAM, SoundBlaster (Compatible) Audio Card w/speakers, 100mbps NIC | (None) |
| Pentium II® 400mhz, 128mb RAM, 10gb HD, 8mb Video Card, 3.5 Floppy, 32x CDROM, 100mbps NIC, Keyboard and Mouse | 83 | (Same as above) | (None) |

Although all 167 workstations meet IT-21 *hardware* specifications, the installed Operating System (Windows 95) is not DII COE compliant. An upgrade to Windows NT Workstation V.4 SP5 is recommended.

The Network Backbone meets DII COE specifications through the use of 100MB hubs. The Servers utilize Pentium II® 300 and 400 processors in conjunction with 10/100MBps Network Interface Cards. The installed Operating System is Windows NT Server version 4.0 Service Pack 4. No upgrade is recommended.

## 6 Associated Training Equipment.

### Simulation Features and Learning Objectives.

Appendix xx contains a description of the major simulators and trainers used in the curriculum. The discussion below will address the learning objectives targeted by each device and the relative effectiveness of the device in providing effective training for those objectives.

### 1. 2B-47 Instrument Navigation Trainer.

**TP 0-7**

Practice:

- Communication
- Flight instrument usage/scan
- Course control
- Instrument departure and approach
- Time estimates
- TACAN point-to-point
- DD-175
- Jet Log/fuel estimates
- Communications procedures
- Turn point procedures

**Evaluation.** The 2B-47 is an adequate trainer for point-to-point procedures. The rudimentary skills involved are also practiced on the Radio Instrument Operational Trainer (RIOT). The trainer is less adequate for flight simulation events, due to the low level of fidelity. A serious shortcoming is the relative value as a communications trainer. The lack of correlation of grades achieved on the 2B-47 with the grades achieved from all other sources in the curriculum is a major concern.

**2. 2B-37/2C-42 Instrument Navigation Simulator/Cockpit Procedures Trainer.**

**CPT 1-3 Cockpit Procedures:**

Practice:

- All normal checklists
- Previously introduced emergency procedures
- Communications procedures

**Evaluation.** The skills practiced on the CPT events have a strong transfer to all training flights. The checklists and emergency procedures on the instructors station are not current with the NATOPS, but that does not pose a major problem. The correlations between the CPTs and academic, simulator and flight event are moderately strong. Both the 2B-37 and 2C-42 are adequate for training the above tasks, especially when preceded by an overhauled 2B-47 for communications training. There are very useful scripts that have been developed for checklists and communications protocols.

**3. Primary OFT 1-4 Basic Navigation Simulation**

Practice:

- NFO responsibilities
- Crew coordination communications
- Jet log
- DD-175
- Equipment operation
- Scan
- Communication procedures
- Departure
- Altitude selection
- En route course control
- Turn point procedures
- Time estimates
- Fuel management analysis

- Point-to-point navigation
- Metro/ATIS evaluation
- Missed approach procedures

**Evaluation.** OFT grades on the 2B-37 have a respectable .438 correlation (probability of a merely chance relationship [p] = .000). The simulator lacks Naval Aircraft Collision Warning System (NACWS), Global Positioning System (GPS) and Very High Frequency (VHF) capabilities; GPS is scheduled for addition. Although the technology is dated and the equipment is old, the simulator should continue to provide adequate simulation for T-34 flight.

**4. Intermediate INAV 1-4 Instrument Navigation**

Practice:

- Straight & level
- Constant angle of bank turns
- Constant airspeed climbs/descents
- Constant rate climbs/descents
- S-1 pattern
- GCA maneuver
- Radial tracking
- Direct to station
- SID (arcing)
- GCA
- Turn point procedures
- Missed approach
- Communications procedures
- Jet log
- DD-175
- Equipment operation

- Communications procedures

**Evaluation.** The four INAV flight profiles were actually written for the Familiarization flights. These simulator events are now of limited value in the curriculum. The events should be rewritten to OFT mission profiles compatible with the Intermediate ANAV curriculum.

**5. Intermediate OFT 5 Operational Flight Trainer**

Review:

- Scan
- Departure
- Altitude selection/compliance
- En route course control
- Turn point procedures
- Time estimates
- Fuel management analysis
- Point-to-point navigation
- Metro/ATIS information
- Holding
- Approach
- NFO responsibilities
- Crew coordination communications

**Evaluation.** The NFO Responsibilities skills are not well defined anywhere in the curriculum. The 2B-37, like all other simulators and trainers in the UMFO program, has no capability to measure or evaluate SA-related skills. OFT 5 will become unnecessary if the INAV events are rewritten as recommended.

**5. Ground Mapping Radar Trainer (GMRT).**

**Core RST 0-4 Radar Synthetic Trainer**

Practice:

- Preflight planning
- Nav situation analysis
- Course corrections
- Speed corrections
- Emergencies
- Departure
- Approach
- Headwork
- Radar controls & operation
- Checkpoint utilization
- Scope/chart correlation
- Wind analysis & application
- Turnpoint procedures

Introduce:

- CV departure
- CV approach

**6. Strike CST 1-4 Composite Strike Trainer**

- Practice:
- DR awareness
- Terrain interpretation
- Target acquisition

- Preflight planning
- Flight briefing
- Situation awareness

Review:

- Scope presentation/interpretation
- Course analysis
- Timing
- Wind considerations
- Departure
- Approach
- Instrument scan/lookout doctrine
- Basic airmanship
- Knowledge of aircraft/emergencies
- Communication
- Crew coordination
- Headwork

**Evaluation.** The correlations with Low Level Flights are .336 (p=.000), with Radar Navigation Flights .292 (p=.000) and Composite Flights .382 (p=.000). The CV events do not at all meet the needs of the Fleet for CV Operations, as recorded by the FRS/TW6 survey. The problems with the GMRT trainer are the dated technology and lack of fidelity with the aircraft and radar system. The lack of a full set of instruments makes it impossible for instructors to simulate in-flight emergencies with any realism. The difference in the tuning of the radar trainer with the airborne system causes transfer of skill problems. Geographical features of the Southeast (added bridges, the spread of towns, etc.) has caused the simulated landscape to lack fidelity with the actual landscape. The estimated cost of an upgrade to the database is about $500K for each of the four stations. NAWCTSD is researching the addition of instruments for the simulator. Maintenance costs for the GMRT and AIRT is high: approximately $500K a year. It would seem that the update to the database would be excessively costly. The maintenance contract should be reviewed for alternatives.

**7. Airborne Intercept Radar Trainer (AIRT).**

Review:

- Flight briefing
- Search technique
- Spotlight/lock-on
- Scope interpretation
- Target aspect control
- Target altitude analysis/correction
- Situation analysis
- Displacement turn
- Counterturn
- Rear quarter drift control
- Speed control
- Descriptive commentary
- Directive commentary
- Headwork

**8. Strike Fighter SR 1-3 Attack-Reattack**

Review:

- Flight briefing
- Search technique
- Spotlight/lock-on
- Target aspect control
- Target altitude analysis/correction

- Situation analysis
- Lead control
- Displacement turn
- Counterturn
- Rear quarter drift control
- Speed control
- Descriptive commentary
- Directive commentary
- Headwork

Practice:

- Spatial picture

**9. Strike Fighter SU 1-2 Unknown Intercepts**

Review:

- Flight briefing
- Search technique
- Spotlight/lock-on
- Unknown procedures
- Target aspect control
- Target altitude analysis/correction
- Situation analysis
- Spatial picture
- Lead control
- Displacement turn
- Counterturn

- Rear quarter drift control

Speed control

- Descriptive commentary
- Directive commentary
- Headwork

**10. Strike Fighter SC 1-5 Conversion Intercepts**

Practice:

- Fleet conversion procedures/game plan
- Spatial picture

Review:

- Flight briefing
- Search technique
- Spotlight/lock-on
- Conversion procedures
- Reconversion procedures
- Target aspect control
- Target altitude analysis/correction
- Situation analysis
- Spatial picture
- Lead control
- Displacement turn
- Counterturn
- Rear quarter drift control
- Speed control

- Descriptive commentary
- Directive commentary
- Headwork

**11. Strike Fighter SA 1-3 Advanced Intercepts**

Review:

- Flight briefing
- Search technique
- Spotlight/lock-on
- Advanced procedures
- Spatial picture
- Target aspect control
- Target altitude analysis/correction
- Situation analysis
- Lead control
- Displacement turn
- Counterturn
- Rear quarter drift control
- Speed control
- Descriptive commentary
- Directive commentary
- Headwork

**12. 2F-101 Operational Flight Trainer.**

**ATM BIS 1-3 Basic Instruments**

Introduce:

- Blindfold cockpit test
- Battery start
- APU start
- MRT checks

Practice:

- Preflight planning
- Aircraft knowledge
- Instrument takeoff
- Level speed changes from/to landing configuration
- Instrument scan
- Constant angle of bank turns
- Unusual attitudes
- Climb/calibration turns
- Turn pattern
- Constant rate climbs/descents
- Timed turns one-half standard rate
- Checklists
- Communications
- AOA/airspeed check

Review:

- Headwork

**Evaluation.** This discussion will address student prerequisites, AIRT strengths, AIRT weaknesses, correlations with related flight grades and recommendations.

- Students typically have a weak grasp on the spatial relationships involved in air-to-air engagements. There is no CAI for classroom use that presents quality 3-D animations to help orient the students. Many also have trouble with the geometry involved, perhaps for similar reasons.

- The AIRT is considered to be adequate for teaching the basics of airborne radar. The squadron Stage Manager feels that a more sophisticated trainer with more instruments and controls would be a detriment to training. He finds the students to be challenged by the present set of training requirements.

- Besides the obvious outdated technology, there are several concerns with the AIRT. The radar failures and faults that have been programmed in are unrealistic. Additionally, there is only a very limited capability to program multiple scenarios in addition to those already in place. The errors typically encountered in the air, including those due to aircraft drift and inaccuracies in instruments are not reflected in the trainer. A major problem has been availability. There is usually a waiting line for getting access to the AIRT trainers. NAWC engineers have a plan in work for making the GMRT trainers AIRT/GMRT trainers. NAWC is also adapting the AIRT software for limited use on a PC.

- The correlations of simulator events (see Appendix A) reveals that the Unknown Intercept and Advanced Intercept simulator events have little relationship with the respective flights they are designed for. The Stage Manager feels that the unrealistically error-free simulated environment is one problem with these flights.

- NAWC engineers should be fully supported in their efforts to shift some of the load from the AIRT trainers to the GMRT and PCs. Routine upgrades like new monitors and keyboards should be made for the trainers. A digital video recording system should be installed on the T-39 aircraft or its replacement. This will facilitate incorporating the visual engagements into CAI to enhance spatial orientation. This would also enable the use of 3-D graphic generation.

**13. ATM RIS 1-3 Radio Instruments**

Practice:

- Preflight planning
- Aircraft knowledge
- NORDO
- Communications
- Cross country clearance
- ITO/departure
- Instrument scan
- Fuel management
- Change of flight plan
- Radial intercepts

- TACAN arcing
- TACAN point to point
- Holding
- TACAN approach
- PAR/ASR
- Missed approach
- Checklists

Review:

- Headwork

**14. ATM EP 1-2 Emergency Procedures**

Introduce:

- Hung start
- Wet start
- Hot start
- Engine roll back after start
- No oil pressure on start
- MRT check malfunction
- Take off abort (low/high speed)
- Unsafe gear up
- Fuel transfer failure
- Canopy light in-flight
- Runaway elevator trim
- Flap malfunctions (asymmetrical/cycling)

- Generator failure (single and dual)
- Battery thermal runaway
- Inverter failure
- Engine failure on takeoff
- Dual engine failure on takeoff
- Hydraulic boost failure
- Engine fire inflight
- Oil pressure malfunctions
- Cockpit pressurization failure
- Dual engine failure in-flight
- Single engine failure in-flight
- Airstart (normal and abbreviated)
- Speedbrake emergency retraction
- Wing flap control linkage failure
- Emergency landing gear extension
- Landing gear malfunction/emergency landing
- Hot brakes

Practice:

- Preflight planning
- Aircraft knowledge
- Checklists
- Start malfunctions
- Abort

Review:

Headwork

**15. ATM CVS Carrier Procedures**

Introduce:

- CV deck procedures
- Catapult emergencies
- Case I, II, III departures
- Check-in with strike
- Marshal/holding
- CV approaches CCA
- Emergencies
- Divert/BINGO

Practice:

- Preflight planning
- Aircraft knowledge
- Checklists

Review:

- Headwork

**16. Evaluation.** The 2F101 has been an effective trainer over the years for familiarization to the T-2 aircraft. It is severely limited to familiarization in basic skills that must now be transferred to the T-2 platform by the UMFO. The one CV Procedures flight is inadequate for preparing students for the FRSs, as documented by a survey conducted by this study. The ATM maneuvers at the heart of this phase cannot be trained on the 2F101. Adding a visual capability to the dated technology on a simulator that is scheduled for immanent retirement is impractical.

17. Performance Measurement Capability. The measurement of performance is extremely important to the MFO community. The FRS/TW6 training community identified human factor skills as the most deficient competencies in newly winged MFOs. That poses a very real problem for the training staff. These skills are constructs that cannot be directly measured. The magnitude of these skills must be inferred from skills that are directly measurable and that have been shown empirically to be closely related to the constructs. Until very recently, these correlated, measurable behaviors had not been validated for situational awareness, the most important and perhaps most elusive of the human factors

behaviors. During the SA Task Analysis in this study, a major step in that direction was made. Sixteen SA-related behaviors were validated by researchers and instructors as being closely associated with the development of SA in MFOs.

The measurement capabilities of the simulators and trainers now in place are well known to the training community. This section will address the relative capability of the devices to provide practice, measure and provide feedback in the development of SA skills.

**Table 6-1 - Simulator SA Performance Measurement Capability**

| Device | SA Measurement Capability |
|---|---|
| **2B-47** | SA training needs to begin in Primary and build throughout the curriculum. This device lacks the fidelity required by beginning students to receive the most benefit from SA training. Communication skills must receive early and constant training to correct deficiencies reported by the Fleet and TW6, a capability clearly lacking in this trainer. The cockpit configuration, existing technology and physical layout of the<br><br>2B-47 make it a logical candidate for upgrading to a simulator capable of meeting the needs of Primary and Intermediate students. |
| **2B-37/**<br><br>**2C-42** | These devices have the fidelity lacking in the 2B-47, but their dated technology makes it impractical to upgrade them for meaningful SA training. |
| **GMRT** | The Ground Mapping Radar Trainer uses an unwieldy UNIX operating system and dated technology. Unlike the 2B-47` 2B-37 and 2C-42, the GMRT does not track turnpoint procedures and other skills that are fundamental to SA development. |
| **AIRT** | In addition to the comments on the GMRT, the Airborne Intercept Radar Trainer is already scheduled to maximum utilization from students. Any addition to the time of training events would further aggravate the situation. Additionally, the Stage Manager indicates that any addition to the AIRT would be difficult for students to deal with. |
| **2F101** | The technology undergirding this device makes it impractical for consideration. Also, the device is limited to the T-2 aircraft at the end of the syllabus—far too late to initiate SA development training. |

# Instructional Performance Requirements Document for the Undergraduate Military Flight Officer (UMFO) Training Situation Analysis (TSA)

**Contract Number: N61339-98-D-0005**

**Delivery Order Number: D001**

**CDRL A003**

**Prepared For:**

**Naval Air Warfare Center Training Systems Division**

**Orlando, FL 32826-3224**

**Prepared By:**

**JIL Information Systems, Inc.**

**3251 Progress Drive, Suite B**

**Orlando, FL 32826**

**30 September 1999**

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# Letter of Promulgation

This letter promulgates the Instructional Performance Requirements Document for the Undergraduate Military Flight Officer (UMFO) Program. It is a record of the Learning Analysis performed for the existing training conducted at TW-6.

This publication addresses the training program learning analysis. That includes: a listing of the mission statement, course objectives, the terminal learning objectives, the enabling learning objectives and the leaning outcomes necessary to support the learning objectives.

As directed by the government, this learning analysis accepts the existing learning objectives as valid and reviews the learning events of the training program to determine their applicability to the objectives. *It should be noted that the training program has not had a task analysis completed within the past 10 years and that this learning analysis identified significant reasons to conduct an up-to-date task analysis for the entire UMFO Training Program.*

The procedures and documents provided follow an instructional systems development method. Each is interrelated to the others. Considerable research has been conducted to assure that the data provided is representative of the actual UMFO Training Program and future training requirements

Corrections and comments concerning these publications are invited and should be addressed to the Naval Air Warfare Center, Training Systems Division (TSD 4971).

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# Foreword/Preface

The UMFO training system is operated and managed by the Naval Aviation TW-6, NAS Pensacola, FL. TW-6 provides UNFO training to U.S. Navy, U.S. Air Force, and Foreign Military Officers. The UMFO is unique in preparing MFOs for a variety of aircraft flight duties. The training is designed to provide commissioned officers with the skills and knowledge required to safely aviate, navigate, communicate, and manage aircraft systems and aircraft in visual contact and in instrument conditions. Mission changes within the Fleet and emergent technology, will have a direct impact on future MFO training requirements. This Training Situation Analysis was conducted to identify these changes so a plan to meet future MFO training needs may be implemented.

The Instructional Performance Requirements Document is a written analysis of the learning occurring during the UMFO Training. The document reports the tasks required to conduct the analysis, the analysis assessments and provides the results. The analysis determined that there are learning events in the existing training which are not covered by a given enabling objective. The flow of the training lacks progression from the least to more difficult tasks and there are instances where there is inadequate preparation for the more difficult tasks and negative learning results.

The learning analysis identified areas of the existing training program, that require immediate improvement or changes to meet requirements of future training. A number of deficiencies were noted in the use of technology advancements on the part of the student. Numerous recommendations are provided which will aid present and future training.

Because it has been 10+ years since a task analysis has been conducted for the UMFO Training Program, many technology advances are unaccounted for in the training program. It is strongly recommended that a program task analysis be completed as soon as possible but at least one year prior to the JAPATS transition.

## Definitions

| | |
|---|---|
| **Aircrew Coordination** | Identification and practice of team coordination among an Aircraft crew |
| **Crew Resource Management** | See Aircrew Coordination |
| **Curriculum Manager** | Person or team responsible for developing standard curriculum and managing input to control training flow |
| **Enabling Objective** | Objective that describes expected student behavior from training |
| **Instructional Media** | Ways of communicating the information and skills to be learned, i.e., written materials, films, lectures, Computer Based Training and more |
| **Instructional Systems Development** | Process to produce training through Systematic development |
| **Learning Analysis** | Identification of knowledge, skills, and attitudes to produce learning objectives and Learning events to teach those objectives |
| **Learning Event** | Events structured to provide student learning |
| **Media Selection** | Selection of media to support learning objectives |
| **Situational Awareness** | The perception of elements in the environment |
| | Within a volume of time and space, the comprehension of their meaning, and projection of their status in the near future |
| **Standards** | Student behavioral requirements established for training |
| **Task Analysis** | Analysis of tasks to perform work functions from which training objectives are prepared |
| **Aircraft Training** | Aircraft used in the Training Command such as theT-34, T-39 and T-2 |
| **Training Systems** | Media and equipment designed to use in a training program |
| **Terminal Objective** | Objective that describes expected outcome of training |

# Description of the Application of the Training Data Product

## 1. Composition

The Instructional Performance Requirements Document for UMFO Program is a record of the learning analysis conducted for the existing training.

This publication addresses the training program learning analysis. That includes: a listing of the mission statement, course objectives, the terminal learning objectives, the enabling learning objectives and the leaning outcomes necessary to support the learning objectives.

The learning analysis reviewed all the training tasks identified for the Primary, Intermediate and Advanced training as well as the terminal and enabling objectives. The learning events presently scheduled throughout the program are compared to the objectives to determine if they adequately train to the requirements. This report provides a listing of the training deficiencies of the existing program and program improvement recommendations.

## 2. Function/Use

The Instructional Performance Requirements Document is designed to provide the government the comparison of the training objectives to the learning events of the existing UMFO Flight Training Program. The data allows for identification and correction of any deficiencies.

The contractor identified a number of training areas for which adequate enabling objectives do not exist. It was difficult to compare learning events to non-existent objectives. To ease this problem the existing learning events were used to apply reverse engineering and write useful objectives that were employed in the media selection. Because of the lack of adequate objectives throughout sections of the training and curriculum management the government should strongly consider conducting a program task analysis to determine present training requirements and rewrite adequate training objectives to meet those requirements.

## Executive Summary

This Instructional Performance Requirements Document was produced as part of the Training Situation Analysis for the UMFO. The analysis was conducted to verify the effectiveness of the training system to meet existing training needs and to survey training programs and technologies for applicability to future training needs for the UMFO.

The UMFO training system is operated and managed by the Naval Aviation TW-6, NAS Pensacola, FL. TW-6 provides UMFO training to U.S. Navy, U.S. Air Force, and Foreign Military Officers. MFO training is designed to provide commissioned officers with the skills and knowledge required to safely aviate, navigate, communicate, manage aircraft systems and aircraft in visual contact and in instrument conditions. While mission changes within the Fleet, along with emergent technology, will have some impact on future MFO training requirements, the most critical deficiencies are in the existing training. This Training Situation Analysis, identifies those deficiencies, based upon statistical analysis, and reports on recommended solutions. In addition, a media analysis (reported elsewhere) selects the most cost-effective training tools for both present and future training requirements.

Aircraft and Systems technology were reviewed to determine operational requirements of year 2006. Interface with the FRS/FRUs, OPNAV, and NAVAIR was conducted to identify any future mission changes that would impact training requirements within TW-6. Minimal changes in future Aircraft and System parameters were identified. The existing learning objectives, however, require considerable work to be of any use. A complete task analysis, both behavioral and cognitive, is needed to develop valid and powerful objectives.

The learning analysis reviewed all the training tasks identified for the Primary, Intermediate and advanced training as well as the terminal and enabling objectives. The learning events presently scheduled throughout the program are compared to the objectives to determine if they adequately train to the requirements. This report provides a listing of the training deficiencies of the existing program and program improvement recommendations.

Because of the lack of adequate objectives throughout sections of the training and curriculum management, the government should strongly consider conducting a program task analysis to determine present training requirements and write adequate training objectives to meet those requirements.

This report provides a hierarchy of the objectives form the existing training along with the software in which they were developed. The heirarchy allows the reader a scan of course objectives and the opportunity to compare learning events. It also identifies areas of training weakness.

**CDRL A003**

**TRAINING SITUATION DOCUMENT**

# 1 Introduction

## 1.1 Purpose, Scope, and Intended Use

Purpose and Scope:

The Instructional Performance Requirements Document for UMFO Program is a record of the learning analysis conducted for the existing training as a part of the Training Situation Analysis.

The learning analysis conducted at TW-6 reviewed all the training terminal and enabling objectives for the primary, intermediate and advanced training. The learning events of the training program were compared to the objectives to determine if they adequately train to the objective requirements. The report provides a listing of the training deficiencies for the existing program and recommendations for program improvement.

The learning analysis found that the existing training program requires closer management of the curriculum and a need to develop a more effective training progression from the simple learning outcomes (memorizing facts) to the more difficult (problem identification and solving). Better preparation of the student for the most skilled tasks will not only benefit learning, but reduce training time and result in better performance during the use of high cost media (simulators and aircraft) making training more cost effective. The curriculum is a compilation of data assembled by subject matter experts without central administrative control. While much of the information is good for training it is not possible to identify shortcomings or overlap of data. Assignment of a curriculum manager should solve that concern.

The training systems (equipment) required to conduct MFO training range from classroom aids to the use of training aircraft. Media selection was hampered because of the deficiencies in the identified training tasks and some of the learning objectives prepared from those tasks. The major area of concern was the human factor competencies. It was necessary to prepare new objectives for this training area and new curriculum will need to be developed. Reverse engineering was employed to revise some learning objectives from existing learning events in order to conduct a full media analysis.

Intended Use:

The Instructional Performance Requirements Document is designed to provide the government a comparison of the training objectives to the learning events of the existing UMFO Flight Training Program. The goal is determination of the adequacy of the learning event to satisfy the objective requirements. The data gained provides identification of training deficiencies. In addition, correlations of student grades achieved on the present training devices to other academic and performance measures were analyzed. That data enables the government to determine which training devices are effective. Conduct of the learning analysis is made more difficult because of the lack of adequate objectives throughout sections of the training and a lack of program task

analysis from which the objectives were written.

## 1.2 Background Information

The learning analysis was commissioned to determine the adequacy of the present TW-6 learning events to satisfy the training objectives. The analysis was also conducted to determine the future training requirements for the MFO to the year 2006.

The learning analysis of the UMFO Program began with a written survey of the Fleet Replacement Squadrons (FRSs) that employ MFOs and TW-6 instructors to determine the proficiency of graduates and perceived training deficiencies. The survey resulted in 128 responses that outlined the areas of training that required additional investigation. Details of the questions asked, the answers and the results of the statistical analysis are written elsewhere in this report. In addition, OPNAV and NAVAIR class desks for all models of the F/A-18, F-14, P-3, EP-s, E-6A, E-2C, S-3B and EA-6B were polled to identify technology advances that would affect the job performance of the MFO through the year 2006.

The survey of the FRSs and the Training Wing identified four human factor skills that were considered to be the areas of poorest performance by TW-6 graduates. They are situational awareness, communications, aircrew-coordination and co-pilot duties. Because the objectives for these subjects were inadequate, the contractor requested and the government approved the conduct of a subject specific task analysis for situational awareness (SA). The purpose was the preparation of useful objectives from which a meaningful curriculum could be developed to improve this critical performance area and to obtain objectives for the media analysis. Human factors experts from NAWCTSD, who have been researching SA for over seven years, provided a set of behaviors that may represent a significant portion of what is meant by the SA construct. Those behaviors were field tested in the T-39 aircraft at TW-6 and the results of those tests provided behavioral measures for SA in the MFO student. SA objectives were written using the results of the study. Using those objectives and reviews of existing training, the contractor developed recommendations to modify the curriculum flow to improve the SA of MFO students at TW-6.

Interviews with CNATRA personnel, during this study, indicate that the introduction of the JAPATS (T-6) curriculum is scheduled to occur at TW-6 by the year 2003. There are not apparent plans to make changes to the existing curriculum to accommodate that introduction. If that is so, any necessary changes to the present curriculum will need to be prepared and implemented prior to 2003.

The learning hierarchy and flow diagrams for the training program were developed to provide an easy to use view of the entire training curriculum without wading through pages of objectives. It also provides an opportunity to compare one part of the curriculum with another and to observe learning event progression.

# 2 Learning Objective Hierarchies and Flow Diagrams.

## 2.1 Learning Objectives

The flow chart of the TW6 terminal and enabling objectives is Appendix B. The chart diagrams direct and collateral relationships. The symbology and color coding enable the user to easily identify the vertical and horizontal relationships, performance criterion, and which objectives are presently ill-defined. The use of Inspration® software with hypertext navigation enables the user to view the parent/child relationships among the objectives, bringing clarity and simplicity to the document.

## 2.2 Primary and Intermediate Curriculum

The Primary (Figure 2.1 and 2.2) and Intermediate (Figure 2.3 and 2.4) curricula are flow charted below. Recommendations for changes and justification are provided.

### 2.2.1 Current Primary Curriculum

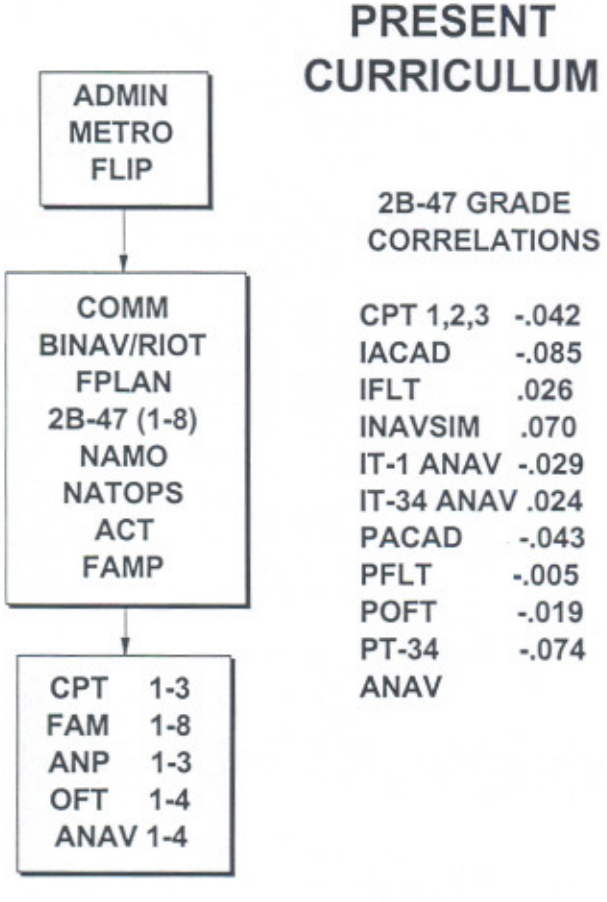


**Figure 2.1 – Present Primary Curriculum**

- Fam flights 1-8 have some value as familiarization and SA building. However, the students are focused on stick performance, not MFO-related skills. Before MFOs are taught team SA skills (learning piloting skills, for example), they need to develop personal SA skills. At present, the students are not prepared to receive maximum benefit from team training at the front end of Primary.

- The lack of 2B-47 trainer correlations is addressed elsewhere. The subject is addressed here to substantiate the unpreparedness of students for training in piloting skills at this point in the curriculum. Also, there is very limited communications practice until CPT-1,2,3. Communications was listed as a problem area by FRS and TW6 instructors.

- Point-to-point navigation is not addressed again until ANP 1-3 (open lab to re-introduce students to enroute navigation and instrument approaches). The Fam Flights do not exercise this skill, so training on the 2B-47 is not immediately followed by an opportunity to practice.

- Aircrew Coordination Training (ACT) is actually a 90 minute PowerPoint/video presentation with no specific objectives and no test. Stick time was included in the curriculum to enhance SA, but little was done in the curriculum to prepare students.

### 2.2.2 Recommended Primary Curriculum.

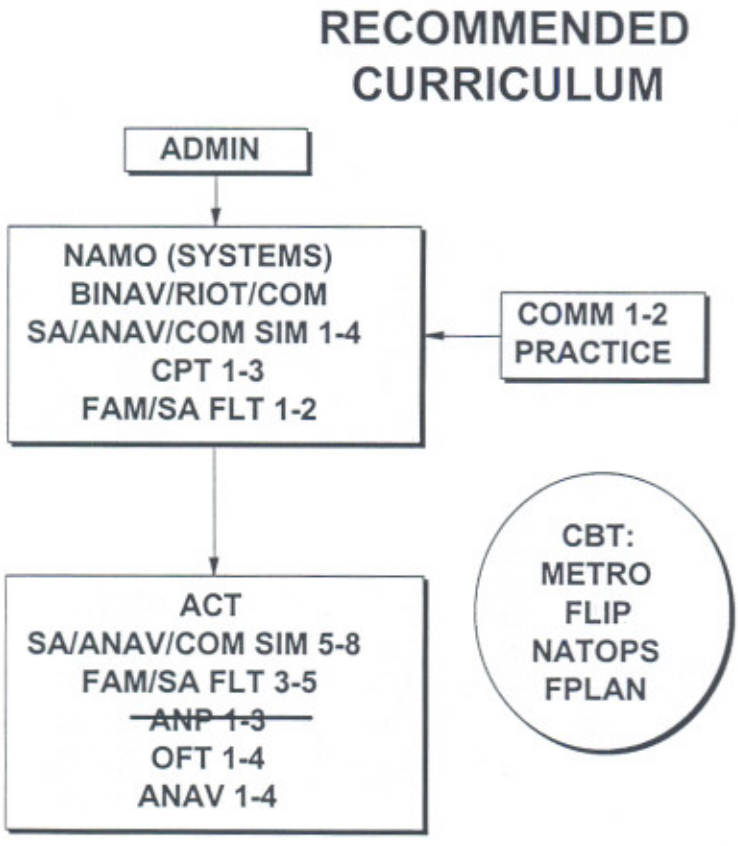


**Figure 2.2 Recommended Primary Curriculum**

- Upgrade the 2B-47 to an SA/ANAV/COM/VNAV simulator equipped with voice recognition software and an objective-driven instructional design engine.
- Skills required on the missions are tied directly to your objectives.
- Data is captured on whatever skills are selected by the instructor.
- All development screens are Windows based.
- The data can be loaded directly into a student academic file.
- Sim events 1-4 would be heavy on communications. Sim events 5-8 would be both remedial (based on the first two flights) and heavier on ANAV.
- COMM 1 and 2 are COTS airborne communications instructional CD-ROMs.
- Replace the 8 Fam flights with 5 Fam/SA flights. The acrobatics would be retained; the stick time would be dropped.
- Convert a substantial amount of ground school to ICW and make it part of the curriculum.
- Figure 2.2 provides a flow chart of the recommended Primary curriculum.

### 2.2.3. Present Intermediate Curriculum

- ACT is the same 90 minute presentation offered in Primary.
- VNAV lectures are presented far too early. They need to be shifted later in the curriculum to provide just-in-time training.
- OFT 5 is presently intended to re-introduce ANAV skills after a long intervention of classes. It would no longer be needed in the revised curriculum.
- 15 ANAV flights are flown in Intermediate. Complex skills require practice in the criterion context—an aircraft. However, the transfer of these skills to very different aircraft is best served by providing practice in different contexts. The simulator recommended by this study can provide varied contexts as constructed by the instructors. It could also capture SA data for ongoing evaluation.
- The VNAV flights are flown with no simulated practice and after a lengthy intervention since the lectures. The proposed simulator would provide the needed experience for students in preparing for the VNAV flights.
- INAV 1-4 simulator events have poor correlations with all grades. The present mission profiles for these events were developed for the Fam Flight syllabus, but are now out of sequence. These events should be rewritten into Intermediate OFT profiles.

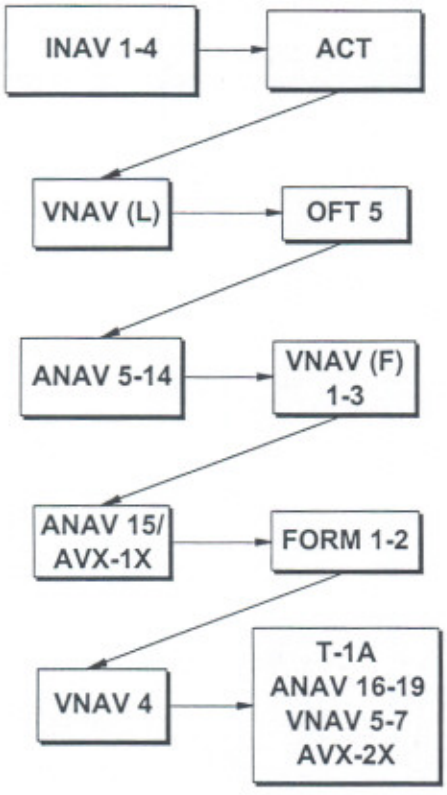


**Figure 2.3 - Present Intermediate Curriculum**

### 2.2.4 Recommended Intermediate Curriculum

- Rewrite INAV 1-4 to Intermediate OFTs.
- Delete the (now) unnecessary OFT 5.
- Delay the VNAV lectures until they are needed.
- Substitute two ANAV sims for two flights. The simulator will allow instructors to fly missions that are different from what is available in a T-34 at Pensacola. Because instructors can easily alter and fine-tune missions, the students won't be able to memorize them. Also, the simulator will allow the wing to continue collecting data (including SA data) on student performance. The simulator can be used for remediation of very specific skills as well.

- Add 3 VNAV simulator events. VNAV is a complex skill, all the more difficult in our rural Southern environment. The simulator will be loaded with a satellite geographical database. Again, we are able to collect student data.

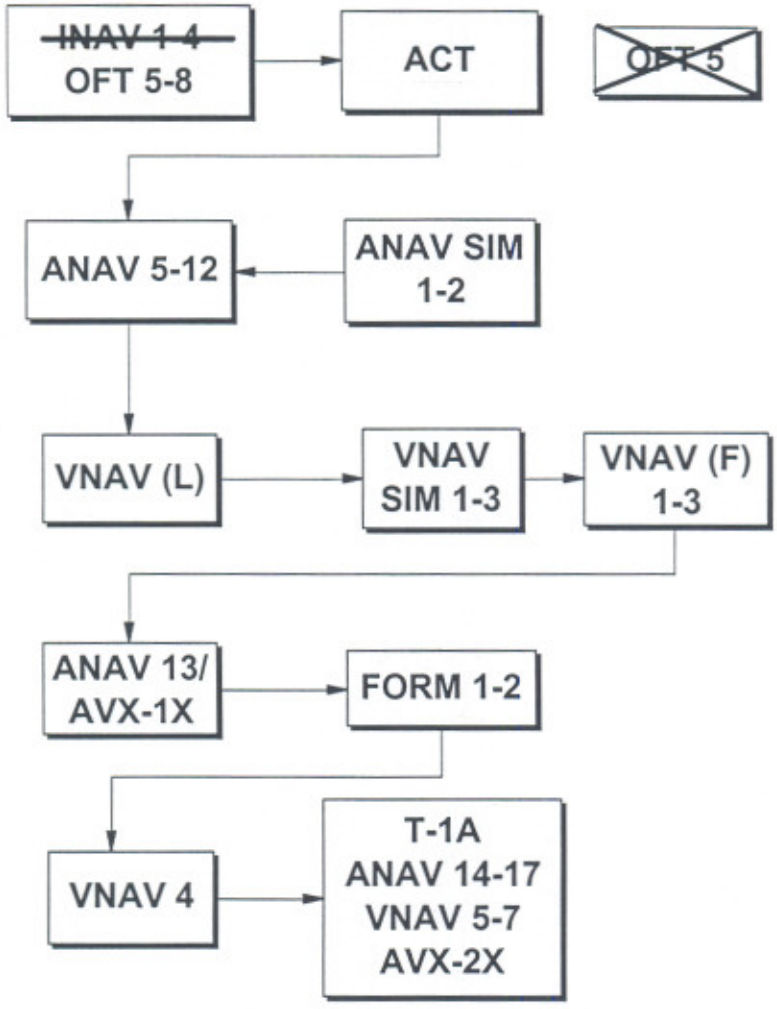


**Figure 2.4 - Recommended Intermediate Curriculum**

# 3 Learning Analysis Summary

## 3.1 Mission Statement

Plan for, supervise, support and conduct flight training of quality student Naval Flight Officers, undergraduate Navigators, and International Military Students to satisfy service requirements

## 3.2 Course Objectives

### 3.2.1 Primary Phase (VT-4/VT-10)

Primary UMFO training is conducted at VT-4 and VT-10 and teaches the student the basic skills needed to safely operate and manage aircraft systems, navigate and communicate in military aircraft, in both instrument and visual conditions. Specific emphasis is placed on basic crew coordination skills, prioritization in the cockpit, scan, and early development of Situational Awareness (SA). Primary consists of two major components. The first, familiarization, in its present form, is designed to teach the UMFO basic piloting skills up to, but not including, solo flight. The second component is basic instrument navigation and introduces the student to the fundamentals of instrument navigation in simulators and the T-34C.

### 3.2.2 Intermediate Phase (VT-4/VT-10)

The intermediate phase is designed to build upon the skills learned in primary and to introduce the UMFO to low level visual navigation, formation flying, and the high altitude navigation structure. In the T-34C the student flies visual and instrument navigation and formation flights. The phase then introduces the student to the high altitude structure and more visual navigation in the multi-place/high speed T-1 or T-39 with a dedicated NFO/NAV instructor. Upon completion the students advance to E-2 training (outside CTW-6) or to the advanced phase of training at VT-86.

### 3.2.3 Advanced Phase (VT-86)

The advanced phase of training is broken into four separate phases. All students who enter VT-86 for advanced training begin with the Core Curriculum. The Core Curriculum consists of Airways Navigation, Low Level Visual Navigation, Radar Navigation, and Strike (Visual and Radar Nav) flights, and introduces the student to air-to-ground radar theory with supporting academics, radar simulators, and flights. Upon completion of the advanced core curriculum the students proceed either to the Strike phase or to the Strike/Fighter phase. The strike phase is more advanced training in low level and radar navigation and is structured to refine crew coordination/cockpit resource management skills, task prioritization, scan, and flexibility in multi-mission environment. In the strike/fighter phase, future Weapon Systems Operators (WSOs) and Radar Intercept Officers (RIOs) learn airborne intercept procedures. After completing Strike or Strike/Fighter training the UMFO's finish their training at VT-86 with the Advanced Tactical Maneuvering curriculum which introduces the student to the dynamics of High-Speed/High 'G' Air Combat Maneuvering in the T-2C.

## 3.3 Terminal and Enabling Objectives.

The current TW-6 objectives are contained in Appendix B. This TSA reengineered some of the objectives to incorporate sufficient information for the Media Analysis, reconfigured the objectives

to a more logical structure standardized across the curriculum and added a complete set of situational awareness objectives. The restructured objectives are contained in Appendix B. Tables that display all of the (new) objectives exercised by each training flight are contained in Appendix C.

## 3.4 Knowledge, Skills, and Attitudes

The KSA required for each learning objective are addressed in the Attributes selected for each objective in Integreator, the media selection tool. The following is an example of the process taken from the Primary curriculum.

**Enabling Objective 1.B.5** Execute a radio instrument approach, with the assistance of a flight instructor, within ±5° of course, 100' above to 0' below MDA; 0' below on DH.

**Learning Outcomes:**

- Apply a rule or principal
- Execute a procedure
- Audio: UHF/ICS Communications
- Tactile feel of controls

**Task Execution Context**

- Aircraft instruments required
- Mission required
- Multi-tasking
- Time-constrained context

**Evaluation and Feedback**

**Instructor evaluation:**

**Media Selection results**—Media:

- Prop Aircraft; Media
- Systems Simulator; Presentation Mode: Coaching

Both application of a set of learned rules and a standardized procedure are contained in the learning objective. Audio stimuli and responses are required, as are the tactile senses in using the controls. Aircraft instruments are required for the task. A mission, actual or simulated, is required. The context for task accomplishment demands a multi-tasking, time-constrained environment in which to develop the skill. The performance must be evaluated by an instructor.

The media selection algorithm selected a prop aircraft (presently a T-34, ultimately a T-6) as the primary medium and a systems simulator (presently the 2B-47, ultimately the recommended Comm/Nav/SA simulator) as alternate. Both media are recommended for this objective by this study in the recommended syllabus. Coaching the presentation mode for both media.

# Instructional Media Requirements Document for the Undergraduate Military Flight Officer (UMFO) Training Situation Analysis (TSA)

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Orlando, FL 32826-3224

Prepared By:

JIL Information Systems, Inc.

3251 Progress Drive, Suite B

Orlando, FL 32826

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## Letter of Promulgation

This letter promulgates the Instructional Media Requirements Document for the UMFO. Program. It is a record of the media requirements identified for present and future training for the UMFO to the year 2006.

This publication addresses the media selection process for the UMFO program and provides the results of the selection. Included elements are the hardware and software specifications for the media selection model; the media selection analysis data; the instructional media requirements source data; charting of the total media resources required; justification for the selected media; and recommendations with alternatives for the training media. The media selection is conducted in accordance with the development standards of PRF-29612.

The media selection model was constructed for the UMFO Program incorporating its unique training attributes and types of media. In addition, sets of training presentation modes were added to the selection criteria to recommend the best instructional use of each media selected. The media selection models were developed in Integreator Professional software, a powerful selection tool. Terminal and Enabling Objectives from the training program were entered into the selection model and the best and alternative media selected. All the media selections include a cost criterion. This document reports the most cost effective media distribution that meets the requirements of the training program.

Because a number of the training objectives were inadequate and not up-to-date, they could not be used to produce an accurate media selection. The program training events were reviewed and a reverse engineering process was used to produce useable objectives from those learning events. The newly written objectives have contributed to a good media selection.

Corrections and comments concerning these publications are invited and should be addressed to the Naval Air Warfare Center, Training Systems Division (TSD 4971).

## Change Record

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## Foreword/Preface

The UMFO training system is operated and managed by the Naval Aviation TW-6, NAS Pensacola, FL. TW-6 provides UNFO training to U.S. Navy, U.S. Air Force, and Foreign Military Officers. The UMFO Program is unique in preparing MFO for a variety of aircraft flight duties. The training is designed to provide commissioned officers with the skills and knowledge required to safely aviate, navigate, communicate, and manage aircraft systems and aircraft in visual contact and in instrument conditions. Mission changes within the Fleet and emergent technology will have a direct impact on future MFO training requirements. This Training Situation Analysis, along with associated studies, was conducted to identify those changes to meet future MFO training needs may be implemented.

The Instructional Media Requirements Document is a written document of the media analysis conducted for Primary, Intermediate and Advanced Military Flight Officer Training.

This document reports the tasks required to conduct the analysis, the analysis assessments and a discussion of the results. The analysis determined required training media and associated costs for the UMFO training system. Integrator Professional media selection software was utilized to conduct the analysis. A selection model was constructed with training attributes matched to learning objectives. In addition, instructional presentation modes were added to specify a particular use of the media. The learning objectives were taken from the existing training program or, where objectives were not adequate, prepared from the existing learning events. Learning objectives were entered; the software selected a first and alternative media for each of the objectives. Media types range from classroom to multi-place aircraft.

This media selection was conducted with the following assumptions:

- Navigator training is no longer conducted by TW-6 for the Heavy Navigator Platform (KC-135, C-130, AC-130, MC-130, and C-141) or the EWO Platform (B-52, AC-130, EC-130, MC-130, RC-135).
- The T-6 (JPATS) is planned to replace the T-34C. The CT-39G are being removed from storage and reworked to replace the T-1A.
- Aircrew Coordination, Cockpit Management, and Emergency Procedures were considered.
- The current airways structure will remain in place through 2006.

The objectives prepared for the media selection were constructed from existing objectives, lesson contents, and instructor interviews. They were developed as the best alternative to no objectives or inadequate objectives. All were produced without benefit of a task analysis of the training except those for Situational Awareness

## Definitions

| | |
|---|---|
| **Aircrew Coordination** | Identification and practice of team coordination among an Aircraft crew |
| **Crew Resource Management** | See Aircrew Coordination |
| **Curriculum Manager** | Person or team responsible for developing standard curriculum and managing input to control training flow |
| **Enabling Objective** | Objective that describes expected student behavior from training |
| **Instructional Media** | Ways of communicating the information and skills to be learned, i.e., written materials, films, lectures, Computer Based Training and more |
| **Instructional Systems Development** | Process to produce training through Systematic development |
| **Learning Analysis** | IDENTIFICATION OF KNOWLEDGE, SKILLS, AND ATTITUDES TO PRODUCE LEARNING OBJECTIVES AND LEARNING EVENTS TO TEACH THOSE OBJECTIVES |
| **Learning Event** | Events structured to provide student learning |
| **Media Selection** | Selection of media to support learning objectives |
| **Situational Awareness** | The perception of elements in the environment |
| | Within a volume of time and space, the comprehension of their meaning, and projection of their status in the near future |
| **Standards** | Student behavioral requirements established for training |
| **Task Analysis** | Analysis of tasks to perform work functions from which training objectives are prepared |
| **Aircraft Training** | Aircraft used in the Training Command such as theT-34, T-39 and T-2 |
| **Training Systems** | Media and equipment designed to use in a training program |
| **Terminal Objective** | Objective that describes expected outcome of training |

# Description of the Application of the Training Data Product

## Composition

The Instructional Media Requirements Document (IMRD) for the UMFO Program is a record of the media requirements of the UMFO program for the present to the year 2006. This publication addresses the media selection process for the UMFO program and states the results of the selection. Included are the hardware and software specifications for the media selection model; the media selection analysis data; the instructional media requirements source data; charting of the total media resources required; justification for the selected media; and recommendations with alternatives for the training media. The media selection is conducted in accordance with the development standards of MIL-PRF-29612.

## Function/Use

The IMRD is designed to demonstrate to the government the methods used to determine the media requirements of the existing UMFO Program and provide a primary and alternate media selection for each of the program terminal and enabling objectives. Media attributes and instructional presentation modes were entered into the media selection algorithm. Upon selecting the desired attributes for accomplishing the objective, the user is presented a prime and alternative medium and mode. The algorithm accommodates all present and future objectives.

## Equipment Requirements

The IMRD provides the selection data for a variety of training equipment. The required equipment ranges from classroom aids to the use of training aircraft. Each selection is the best available training tool for the training objective. Each is selected as the most cost-effective medium to train to the objective.

# Executive Summary

This IMRD was produced as part of the Training Situation Analysis (TSA) for the UMFO. The analysis was conducted to verify the effectiveness of the training system to meet existing training needs and to survey training programs and technologies for applicability to future training needs for the UMFO.

The UMFO training system is operated and managed by the Naval Aviation TW-6, NAS Pensacola, FL. TW-6 provides UMFO training to U.S. Navy, U.S. Air Force, and Foreign Military Officers. MFO training is designed to provide commissioned officers with the skills and knowledge required to safely aviate, navigate, communicate, manage aircraft systems and aircraft in visual contact and in instrument conditions. While mission changes within the Fleet, along with emergent technology, will have some impact on future MFO training requirements, the most critical deficiencies are in the existing training. This TSA, identifies those deficiencies, based upon statistical analysis, and reports on recommended solutions. In addition, a media analysis (reported elsewhere) selects the most cost-effective training tools for both present and future training requirements.

Aircraft and Systems technology were reviewed to determine operational requirements of year 2006. Interface with the FRS/FRUs, OPNAV, and NAVAIR was conducted to identify any future mission changes that would impact training requirements within TW-6. Minimal changes in future Aircraft and System parameters were identified. The existing learning objectives, however, require considerable work to be of any use. A complete task analysis, both behavioral and cognitive, is needed to develop valid and powerful objectives.

The media analysis was performed to produce the optimum and alternative Training System. Justification, with a Rough Order of Magnitude (ROM), and is provided for these Training Systems. The methods of how it was conducted and the results of the media analysis are reported in this IMRD.

The instructional designers chose Integreator Professional software to conduct the media analysis. The software is a powerful tool for media selection and can also be used for conduct of a task analysis and development of learning objectives. The designers developed a listing of training attributes and presentation modes to which the learning objectives were applied. The input of those objectives to the media selection algorithm produced a primary and alternate media selection for each of the objectives. Some objectives were written from the learning events (reverse engineered) because adequate objectives were not available.

The survey of Fleet Replacement Squadrons identified Situational Awareness as one of the most critical deficiencies for students transitioning from the training command. Because the objectives for that training were inadequate, the contractor conducted a task analysis of that human factor to produce objectives that would permit a valid media analysis. The Media Analysis produced a list of the most cost-effective training tools with an alternative selection for each. The media selection is effective for existing training through the year 2006.

**CDRL A004**

**INSTRUCTIONAL MEDIA REQUIREMENTS DOCUMENT**

# 1 Introduction

Media selection is a major part of the TSA. Instructional designers developed a media selection model specifically tailored for the MFO program. It was designed to provide both a primary and alternative media selection for each of the learning objectives. The selection was based upon the sensory stimulus requirements of each of the objectives and further conditioned by identifying the most appropriate method of presentation along with an alternative.

Integreator Professional software, a powerful media selection tool, was used for the media selection. The hardware and software specifications are provided along with the licensing requirements for Integreator and the Seagate Crystal reports.

The background of the TW-6 operating systems is written in detail. The analysis data for the media selection included consideration of the resources and constraints that impacted the selection process. Of special note, is the lack of a previous completed task analysis that could be used as a guide to compare the learning objectives and assure that the training being conducted is appropriate. It is critical that the government consider conducting a task analysis for the UMFO program at the earliest date. This is especially true because of the future introduction of the T-6 aircraft and the corresponding training curriculum.

There are a number of existing training shortfalls both in the cognitive and skills areas of the existing training. The instructional designers have prepared several solutions for those shortfalls, employing the latest of instructional development techniques.

# 2 Media Selection Model Specification Data.

## 2.1 Model Data

This section describes the procedures to be used to identify primary and alternate media for each Learning Objective (LO).

### 2.1.1 Methodology for Identifying the Sensory Stimulus Requirements of the Learning Objectives

In the normal process of instructional systems development, the basis of each media selection procedure is an analysis stage where the instructional designer identifies the content of the lesson and the appropriate information the learner should receive. The learner must react to the information and must do something with it; there must be a response. Analysis also identifies the appropriate learning activities, whether practical, overt activities or internalized, covert activities.

This analysis is a starting point for the media selection process. The media used for instruction must be capable of presenting all the information, supplying all the instructional stimuli that the lesson content requires, and second, the media should also help the learner to engage in the appropriate learning activities.

As the instructional designer reviews the learning content, he or she will categorize the learning dependent upon the knowledge, skills or attitudes required. Each learning event then becomes one in a series of progressive steps to gaining the information. As these decisions are made, objectives to define the learning are written and specific learning events established.

We define "media" as the carriers of messages, from some transmitting source (which may be a human being or an inanimate object), to the receiver of the message (which in our case is the learner). These carriers of information interact with the learner through the senses. The learner may be called upon to use any of his or her senses to receive information, including the often over looked kinesthetic sense, which is the sense of muscular coordination. Quite often messages are received by a combination of senses in order to render the desired communications complete. These sensory receivers are a major consideration when development learning objectives. If the senses are unable to receive the messages which are being taught learning will not occur, no matter how competent the teaching content.

**Table 2-1 - Most Appropriate Sensory Channels for Communicating Information**

| | |
|---|---|
| Vision<br>Sound | Most common used, often in combination (audiovisual) for all types of learning tasks |
| Touch<br>Kinesthetic | Less commonly used but important in learning perceptual and psychomotor skills |
| Smell<br>Taste | As the learning objectives are developed, consideration must be given to the best way of transmitting this learning to the student. In other words what is the best media selection? |

As the learning objectives are developed, consideration must be given to the best way of transmitting this learning to the student. In other words, what is the best media selection?

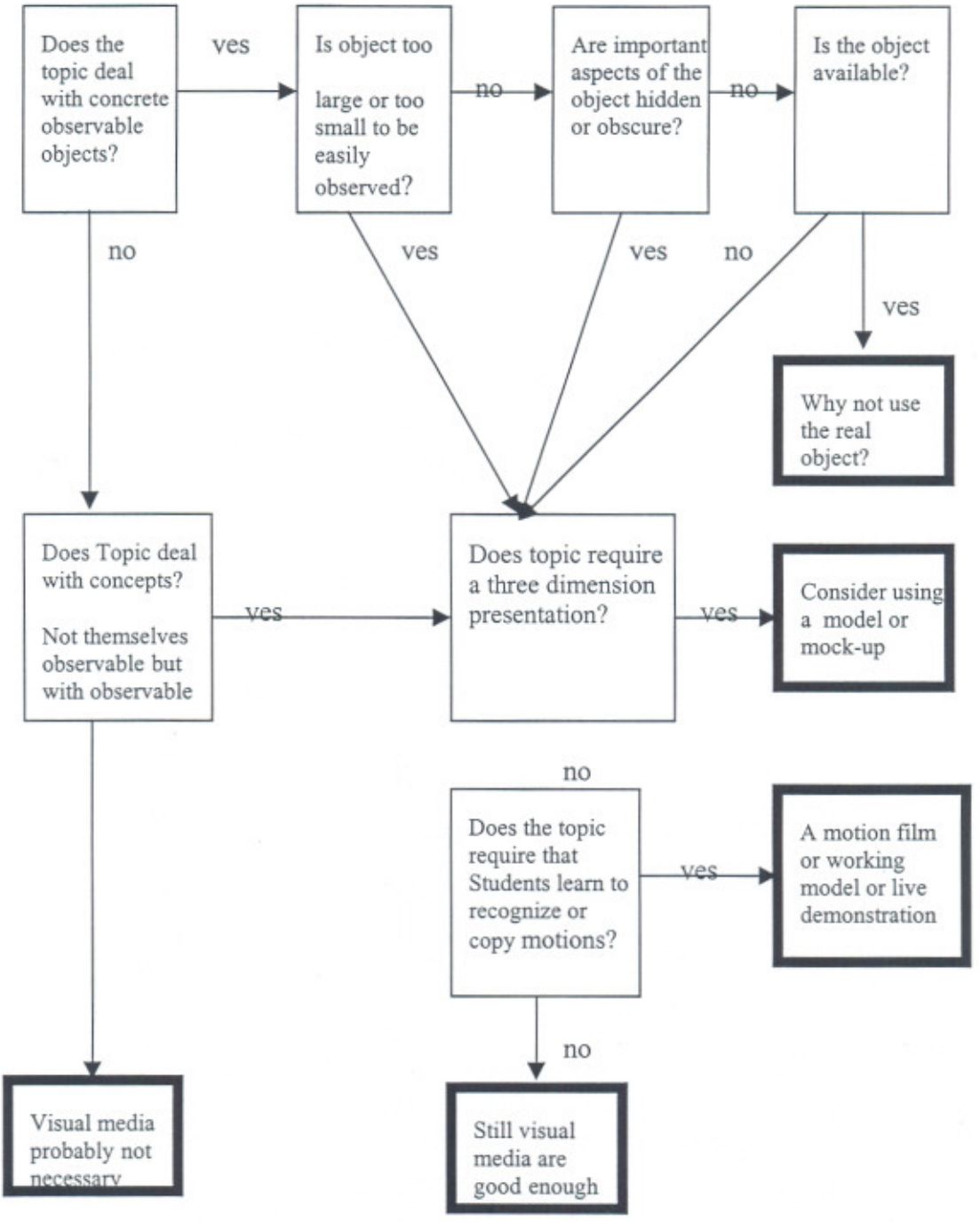


**Figure 2.1 - Decisions for selecting visual media**

Figure 2.1 is a flowchart to demonstrate an analysis of tasks that have a visual stimulus content. A series of questions help to identify the proper sensory media for visual and contributes to identifying the sensory conditions for each objective using a visual stimulus. The majority of learners are "visual learners" so naturally this sense is the one employed most often for training.

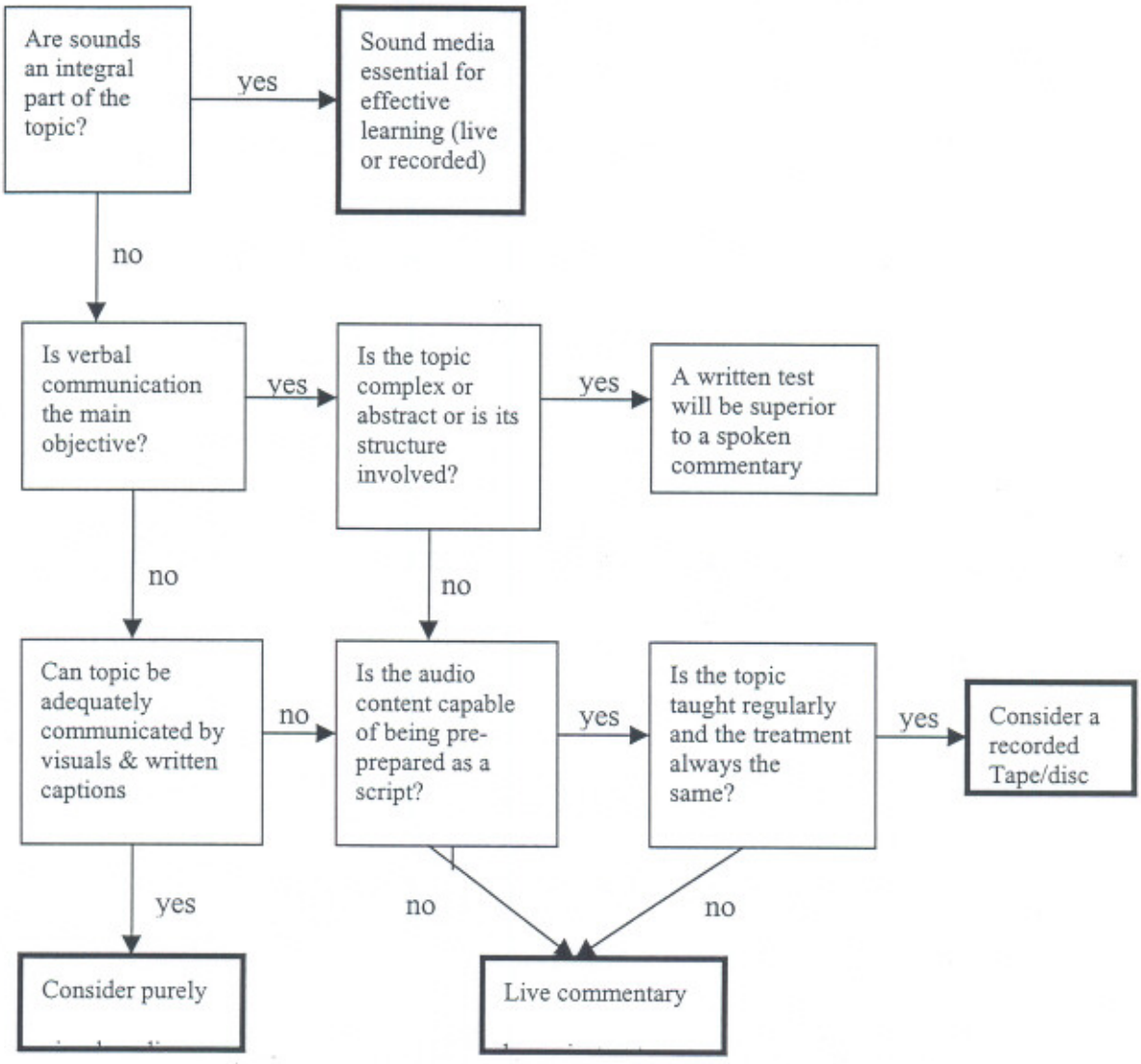


**Figure 2.2 - Flowchart for selecting verbal and sound media**

Figure 2.2 is a similar flowchart for selecting verbal and sound media. It is more an application to the analysis of topics, in order to decide whether the verbal information to be communicated should be presented live or packaged, and, in the latter case, whether written or recorded audio media should be preferred. Note that this chart also considers when audio is an essential part of the information to be communicated.

Although there are a wide variety of sensory channels to be considered for communicating visual and audio are the most common. However, in the world of aviation there are sensory stimulants not found in the normal environment of everyday life. These will be discussed in detail later.

The learning content for the UMFO training program was reviewed to identify the types of stimuli that the content should present to the learner, and hence the sensory channels that are essential

characteristics of appropriate media. We also considered the content's structure, learning difficulty, etc, in order to form an opinion regarding what extent of instructor control we should plan for the presentation. Highly structured, difficult to learn, often variable or debatable content requires greater instructor control over the presentation than does descriptive and factual, easy to learn, unchanging and unchallengeable content.

In addition, learner factors were considered for the planned instruction. The media selection qualifying attributes are covered in great detail elsewhere in this report. Because we are dealing with a fairly uniform and highly motivated student in the training pipeline limited consideration is necessary to account for individual learning styles and stimulus. Uniform prerequisites to be a part of this training also contribute to a standard for student learning factors.

It should be noted that in this TSA, for the UMFO training program, the learning objectives are being accepted as written for the existing training. Minor additions have been made to a number of the objectives to assure that they can be applied to produce an adequate media selection using the Integreator Professional software selection tool. The exception, are those objectives covering Situational Awareness that have been prepared from the limited task analysis conducted by the JIL team. Although the majority of the learning objectives have not been rewritten, they have been reviewed to determine the appropriate sensory stimulus and recommendations regarding their adequacy and applicability to learning events

Having reviewed a variety of sensory stimuli for learning in consideration for the media selection a final area unique to this training environment was considered. In aviation the learning is not only exposed to the normal sensory inputs the rest of the world experiences but also the effects of leaving the 1G environment. The effects are not only to the visual and audio systems but now also to the inner ear (vestibular system). That is the human sense mechanism that provides input to the body to determine spatial alignment. On Earth, visual and other tactile senses generally override it but once airborne it becomes a major source of orientation or disorientation.

Vestibular problems sometimes encountered by flight personnel in aviation and aerospace missions are very similar to symptoms reported by patients with vestibular disorders of sudden onset. Disorientation (vertigo, dizziness, tumbling sensation), nausea and vomiting, episodes of blurred and unstable vision, and impaired motor control (dis-equilibrium) are effects which can occur singly and in various combinations as a result of either exceptional environmental stimuli or episodic vestibular disorders or both. In the aviation environment, the symptoms may be normal reactions to misleading or inadequate stimuli, but they may be coupled with the requirements for controlling a high performance aircraft in three-dimensional space. In pathological states, the symptoms result from disordered transduction or central processing of head accelerations and this is likely to be coupled with requirements for control of head and body motion. In either case, the origin of the aberrant reactions lies in inadequate or misleading information about the state of motion and/or orientation of the body relative to the Earth, and ultimately constitutes a threat to survival.

In most cases the central adaptive process compensates disordered sensory inputs. In the aerospace environment, unusual linear and angular accelerations occur frequently. The occurrence of a single, exceptional linear or angular acceleration component can induce disorientation or vertigo, but more typically, one must consider combinations of stimuli to appreciate troublesome situations. To comprehend the functional significance of the unusual stimuli combinations, it is helpful first to

appreciate the coding of normal vestibular messages that occur in natural movement (i.e. movement not involving vestibular transport).

In an aviator, spatial disorientation usually refers to the inaccurate perception of the attitude or motion of the aircraft relative to the coordinate system constituted by the Earth's surface and gravitational vertical, and it can endanger flight safety. Spatial disorientation has been estimated to account for four to ten percent of the major military aircraft accidents and even higher percentages of fatal accidents.

A pilot may be considerably disoriented, but may be unaware of it. Control actions, based upon perceptual misinformation, may place the pilot at risk. When the action is taken, the response of the aircraft may prompt an instrument check that ordinarily will lead to proper corrective action. An important exception may occur when the conflict between an immediate false perception of aircraft orientation and instrument information provokes an excessive emotional reaction; then the pilot remains at risk. On the other hand there are many maneuvers that induce disorientation, but the pilot is so aware of its occurrence that he may not be disturbed at all.

Aircraft maneuvers may involve both unnatural turns and unusual changes in the direction and magnitude of resultant linear force vectors. Moreover, the seated pilot does not necessarily continually update orientation assessment as one does automatically while walking or running. Thus, both the pattern of vestibular stimulation and the response to it differ from those encountered in natural movement.

Many of the disorienting conditions described here would be considerably ameliorated or overcome by good visual reference to the Earth's surface. The single most important cause of pilot disorientation is the absence of adequate visual reference to the Earth because of darkness or adverse weather conditions. Certain flying conditions can introduce visual information that may be either directly disorienting or misinterpreted. However the crucial factor in the human response is that, without good visual reference to the Earth's surface, the remaining sensory data on spatial orientation are not sufficiently reliable to permit safe piloting of the aircraft. Many instances of pilot disorientation are less attributable to some overwhelming misleading vestibular response than to some subtle perceptional inconsistency or even perceptual insensitivity to the acceleration environment.

**How to prevent disorientation**:

1) Remain convinced that you cannot fly by the "seat of the pants".

2) Do not allow control of the aircraft to be based at any time on "seat of the pants" sensations, even when temporally deprived of visual cues

3) Do not unnecessarily mix flying by instruments with flying by external visual cues.

4) Aim to make an early transition to instruments when flying in poor visibility. Once established, stay on instruments until use of external cues is clearly practical.

5) Maintain high proficiency and practice in flying under IFR conditions.

6) Avoid unnecessary maneuvers of aircraft or head movements that are known to induce disorientation.

7) Be particularly vigilant in high-risk situations; such as at night or in foul weather, in order to maintain intellectual command of the orientation and position of the aircraft.

8) Do not fly with upper respiratory tract infection, when under the influence of drugs or alcohol, or when mentally or physically debilitated.

9) Remember, experience does not make you immune.

**How to cope with disorientation:**

**A.** Persistent minor disorientation (e.g. the leans) may be dispelled by making a positive effort to redirect attention to other aspects of the flying task; a quick shake of the head, provided the aircraft is straight and level, is effective for some pilots.

**When suddenly confronted with strong illusory sensations or when experiencing difficulties in establishing orientation and control of the aircraft, follow these procedures:**

(a) Get onto the instruments; check and crosscheck. Insure good instrument illumination.

(b) Maintain instrument reference. Control the aircraft in order to make the instruments display the desired flight configuration. Do not attempt to mix flight by external visual references with instrument flight until visual cues are clearly practical

(c) Maintain correct instrument scan; do not omit altimeter.

(d) Use advance headwork on necessary control actions in those maneuvers that typically produce confusion (e.g. inverted position in barrel roll).

(e) Seek help if severe disorientation persists. Hand over to the copilot (if present), call ground controller and other aircraft, check altimeter.

(f) If control cannot be regained, abandon aircraft.

While this may appear to be an excess treatment of a single sensory stimulus, it is an extremely important consideration in the preparation of aviation training learning objectives and their subsequent media selection. Each learning situation must be developed in the light of its use in the air rather than on the ground. Every task conducted in the air and trained for here at the Training Wing will be affected by the human ability to perform in an orientated manner. Therefore, each learning objective must be scrutinized to assure that all the sensory stimulus affects are considered. A task to adjust UHF radio frequencies is an easy training objective on the ground or even in the air straight and level. Add a no visibility situation and a banked turn (angular acceleration) and performance is significantly degraded.

In preparing the media selection careful consideration has been given to what would be the sensory stimulus most effective to transmit the learning content to the student and what conditions must appear in the objectives to assure that occurs. At the same tine equal consideration was give the sensory of the media required to satisfy the learning objective. It is evident that four sensory stimuli affect the UMFO program learner. They are visual, audio, tactile and vestibular. Each of these senses plays a roll in the learning process, especially where that learning involves the flight environment. Each was carefully considered in the media selection process.

### 2.1.2 Method of Identifying The Sensory Stimulus of the Media

The sensory stimulus of the media must match the sensory stimulus of the learning objective in order for appropriate transmission of information to occur. There are a variety of media types that will produce the same or similar sensory stimulus. Selection depends upon which is considered the best to transmit the learning content and other factors including economic considerations. One can seldom go very deep into the detail of instructional design without coming across economic, practical or human (including social and political) constraints that are 'outside our sphere of influence'. Economic consideration was a part of our media selection criteria and will be discussed in detail elsewhere in this report.

A media list was established which would provide sense response to the visual, audio, vestibular and kinesthetic sense stimuli identified in the learning objective population. The kinesthetic sense is also termed proprioceptive or tactile in aviation jargon. It refers to the muscle sense where it touches an external object and provides orientation reference for body positioning. The media selection ranges from the classroom slides to a multi-place aircraft. Considerable detail regarding the types of media, the training attributes and the method of presentation are provided.

The training attributes include expected learning outcomes, training context (highly stable student population, etc.) and task execution context (including learning skills that can only be transferred in the air). The attributes are entered in the Integreator Professional software selection tool along with the types of media. In addition, a third matrix was developed listing method of presentation to qualify the media selected. The instructional designers developed and programmed a model for the media selection that allows each of the objectives to be entered and applied against both the training attributes and method of presentation. The software model selects both the primary and alternative media best suited to maximum learning transfer.

The visual and audio selection steps similar to those outlined in tables 2-1 and 2-2 are accounted for in the media selection model programming. In addition, the tactile and vestibular sense stimuli are also considered. The programmed selection model provides a balance of the sense stimuli required for each learning objective resulting in the best media selection. The selection is tempered by cost. However, there are some learning objectives, which mandate the most expensive media (an aircraft) because no other viable substitute will produce the desired learning transfer.

### 2.1.3 Hardware And Software Specifications

The hardware and software requirements for the use of the Integreator Professional media selection tool are as follows:

- An IBM Personal Computer (or compatible) with a minimum 486 processor.
- A VGA monitor.
- A minimum of 8MB of available memory (16MB recommended) for Windows 3.1 or Windows 95; 16 MB for Windows NT.
- A hard disk with a minimum of 15 MB available disk space for installation.
- Microsoft Windows 3.1, Microsoft Windows 95, Microsoft Windows NT or Microsoft Windows for Workgroups 3.1.
- Integreator 3.11 for Windows (Professional Edition, supplied), a training analysis, design and decision support software.
- Seagate Crystal Reports 6.0 (supplied), a custom report generator.

### 2.1.4 Software

2.1.4.1 Integreator Professional License Agreement

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*5eagate Software*

*1095 West Pender Street, 4th Floor*

*Vancouver, BC Canada V6E 4M6*

*Tel.- 604-681-3435 Fax.- 604-681-2934*

*Web 5ite: httpllwwwseagatesoftware.com*

*E-mail.- sales@img.seagatesoftware.com*

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### 2.1.5 Media Selection Flow Chart

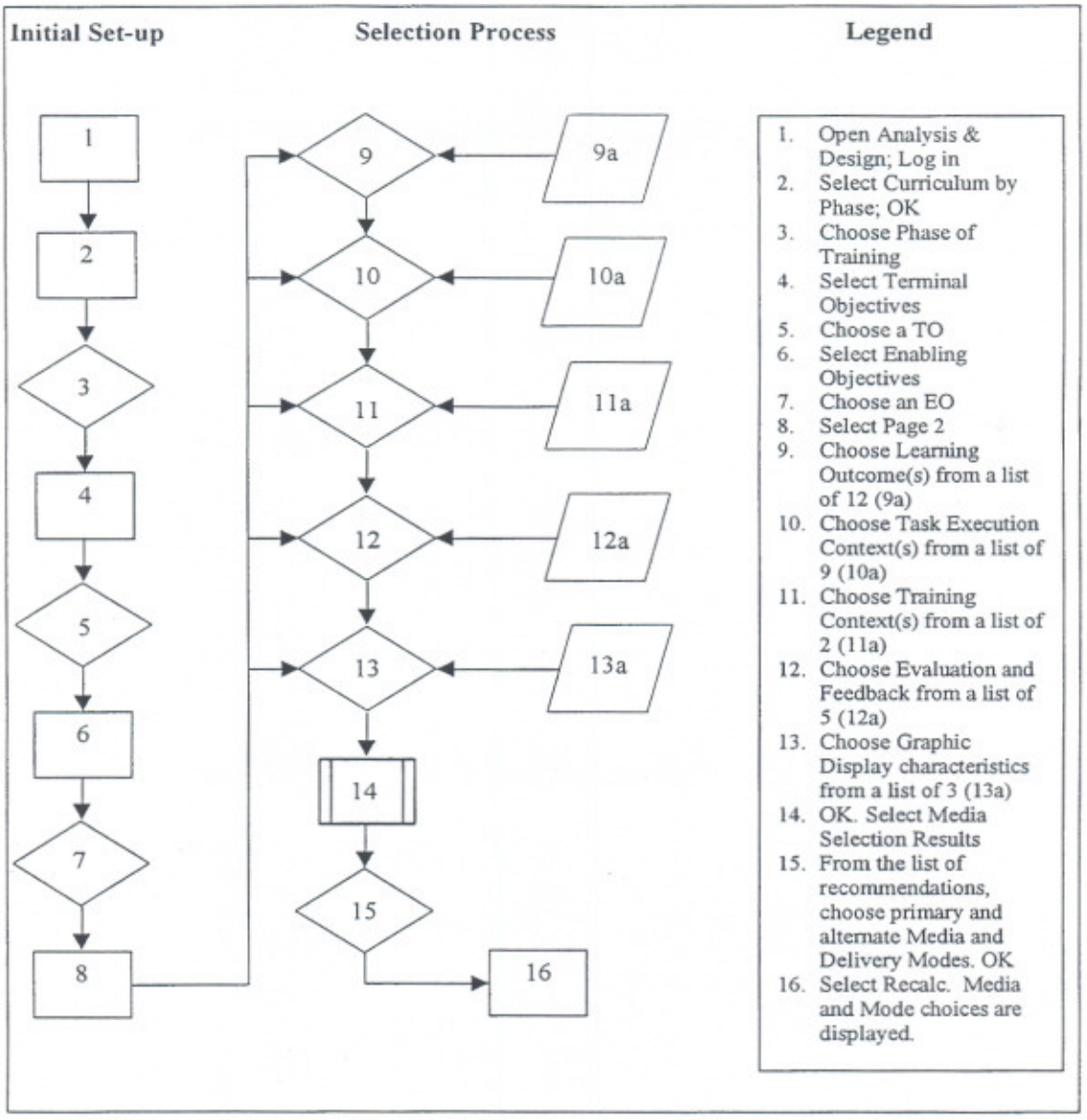


**Figure 2.3 - Media Selection Flow Chart**

## 2.2 Media Selection Models

The components of the media selection process: media attributes, media choices and instructional delivery modes follow. The media selection model is incorporated into the Integreator program on a desk as CDROM and will be forwarded via separate correspondence. That CD and all accompanying documentation will be provided to NAWCTSD with this report.

### 2.2.1 Media Attributes

2.2.1.1 Learning outcomes.

- Acquire a concept
- Apply a rule or principle
- Audio: UHF/ICS Communications
- Demonstrate motivation
- Execute a procedure
- Motor: sense of motion
- Practice a skill
- Recall a fact
- Solve a problem
- Structure knowledge
- Tactile: feel of controls
- Visual: scan TACAIR

*2.2.1.2* Task Execution Context.

- Aircraft instruments req'd
- Group interaction
- High-G, high speed
- Mission required
- Multi-tasking
- One-on-one interaction
- Radar required
- Time-constrained environment
- Unsafe airborne

2.2.1.3 Training Context

- Distributed student
- Highly stable content

2.2.1.4 Evaluation & Feedback.

- Automated evaluation
- Instructor Evaluation
- Peer evaluation
- Personalized feedback
- Self evaluation

2.2.1.5 Graphic Display.

- Animation/video clips
- High Interactivity required
- Text/drawings/diagrams

**2.2.2 List and Description of Media.**

- ICW2
- COTS software application
- ICW 2-3. Self-paced IMI with text and graphics/video/ audio.
- Electronic Classroom. Classroom plus projected, computer-generated graphics and animation; automated tracking of administrative training functions
- Interactive TV. Teleconferencing; distance learning
- Panel Trainer. Systems/component trainer with low fidelity and no functional instruments
- Static Cockpit. Knobology; component location
- Systems Trainer. Simulation of aircraft systems
- Visual Simulator. Cockpit simulation, plus video simulation of the airspace and satellite geographics

- Radar Simulator. Systems sim with air-to-air or satellite geographics
- Motion Simulator. Cockpit trainer with simulation of aircraft motion
- Prop Aircraft, 2-seat. Includes turbo-prop, etc.
- Multi-place Jet Aircraft. May be configured with radar
- Tactical Aircraft

### 2.2.3 Instructional Delivery Modes.

- Present facts and concepts
- Demonstrate procedures, rules and principles
- Coach performance
- Provide conceptual exercise
- Provide psychomotor exercise
- Model behaviors and attitudes
- Self-paced

**CDRL A005**

**INSTRUCTIONAL MEDIA REQUIREMENTS DOCUMENT**

# 1. Media Selection Analysis Data.

## 1.1 Instructional Media Requirements Source Data.

### 1.1.1. Historical Background.

The UMFO training system is operated and managed by the Naval Aviation TW-6, NAS Pensacola, FL. TW-6 provides UMFO training to U.S. Navy, U.S. Air Force, and foreign military officers. Primary and Intermediate Student Military Flight Officer (MFO) training is designed to provide commissioned officers with the skills and knowledge required to safely aviate, navigate, communicate, manage aircraft systems and aircraft in visual contact and in instrument conditions. Mission changes within the Fleet, along with emergent technology, will have a direct impact on future MFO training requirements. This TSA, along with associated studies, was conducted to identify changes in order to plan to meet future training needs. Prior to the present study there have been six TSAs conducted at TW-6 since 1975. Training Wing personnel believe that UMFO training as it exists today is stagnant. Each of the TSA's has been conducted with no prior Task Analysis. While the Allen Corporation's contract included a task listing it is outdated and a task analysis is needed to better define the training.

In this decade, there have been two major changes/events. In 1992 TW-6 implemented the "Super UMFO" in the primary stage of flight training. That is, UMFO's are provided limited piloting skills. The first eight flights in the primary phase are "stick time" flights, which require the UMFO to actually fly basic procedures in the T-34C. This inclusion of limited pilot training was brought about by "a perception in the fleet" that pilot training would enhance UMFO Situational Awareness (SA). Weakness in situational awareness skills has been a constant complaint of fleet FRS's. The second major event was the introduction of Air Force students in 1995. With the introduction of Air Force students the wing also began using the T-1 for the Intermediate phase of training. The introduction of the T-1 brought the number of types of aircraft that UMFO students are trained in from three to four (the types of aircraft used for student training dropped from 4 to 3 in 1991). While there is some benefit derived form varied training situations and devices for skill transference this benefit is outweighed by the increase in time to train and the amount of information the new student must absorb when learning systems and procedures for each new type aircraft they fly.

In 1999 the decision was made by the Air Force to stop sending their "Panel Navigators" to Pensacola for training. This reduced by two-thirds the number of Air Force UMFO's completing training at TW-6 and was accompanied by a reduction of T-1's available for training. With the reduction of T-1's TW-6 procured additional T-39's for Intermediate Training. This, in turn, creates a "split" training path. All navy UMFO's will be trained in T-39 aircraft through Intermediate while all other UMFO's will continue training in the T-1. When graduating to VT-86 all students will be trained in the T-39. This will mean that some students will fly, and learn, four types of training aircraft, while others will see only three.

### 1.1.2. Description of the Operating System

The operating system is presented is CDRL A001. The instructional, simulator and flight units of instruction are listed with present and recommended media. The single largest issue concerning media is the update of the 2B-47 simulator to a more effective and versatile instructional tool. Much of the rest of this section will be devoted to a discussion of the proposed simulator.

### 1.1.3. Scope, Magnitude, and Constraints

This TSA addressed the knowledge and skills that will be required of the MFO in year 2006. The processes encompassed by the study included:

- OPNAV/NAVAIR survey,
- FRS/TW6 survey,
- Classroom/simulator observations
- Analysis instructional materials
- Correlational analyses of student grades
- Analysis of academic examinations
- Learning hierarchy analysis, and
- SA task analysis.

The only major constraints were the time and budget; the project was completed on time and within budget. The databases used by the wing and each squadron is not standardized. None of the databases observed were capable of isolating single grades on flights or simulator events. This impeded fine-grained analysis of instructional effectiveness. The constraints placed on the media analysis are addressed below.

### 1.1.4. Resources and Constraints Impacting Media Selection.

The two chief constraints to the Media Analysis were the lack of a task analysis for UMFO training and the requirement to analyze the objectives independent of their context. The only NFO task list available was mission oriented and most of the tasks applied only to fleet aircraft and graduate MFO tasks. Further, the JIL team was instructed not to consider verbiage in the objectives that would mandate the use of an aircraft to satisfy the objective. Because most of the objectives contained vague condition statements, implications that might have been drawn concerning the intended conditions were not to be considered.

The condition statements for the ATM phase were the most problematic. The training is presently conducted in a jet aircraft for which the JIL team was given mission profiles. However, there is some question as to the validity of the need for a jet aircraft to perform these

tactical maneuvers. The JIL team task was to validate the objectives. The question is how valid is this objective? This presupposes that one knows what performance is required.

Contextless performance statements might be acceptable if we were dealing with only semantic or procedural skills. However, the situational awareness to apply the complex skills involved in the UMFO curriculum in the aircraft require the use of skills that cannot be directly measured. They are implied through the measurement of behaviors empirically found to undergird them. It is instructionally unsound to conduct a media analysis for complex skills and sophisticated constructs in a vacuum.

The JIL team cannot tell the Navy what the conditions for performance of the objectives should be on the basis of this study. Hence, the Media Analysis was constructed with the flexibility to recommend either a tactical jet or a tactical prop aircraft for the ATM phase, as determined by condition statements yet to be defined by the Navy.

## 2. Instructional Delivery System Selection.

For ease of use by the reader, the summarized results of the media analysis were listed in CDRL A001 under Recommendations. The comprehensive results on an objective-by-objective basis are available in the Media Analysis in Appendix B.

## 3 Justification For The Proposed Media.

The need to train in SA is addressed throughout this study. SA was grouped with other human factors skills at the bottom of MFO proficiencies as rated by the Fleet; SA was the proficiency rated lowest by TW6 instructors. The proposed simulator is built around an objectives-driven ISD engine that allows instructors to build and store realistic mission profiles. The simulator then collects requested data on behaviors empirically shown to relate to SA.

The need for a visual simulator has long been discussed at TW6. Data from a survey of 16 instructors at TW6 produced the graph below in figure 3-1.

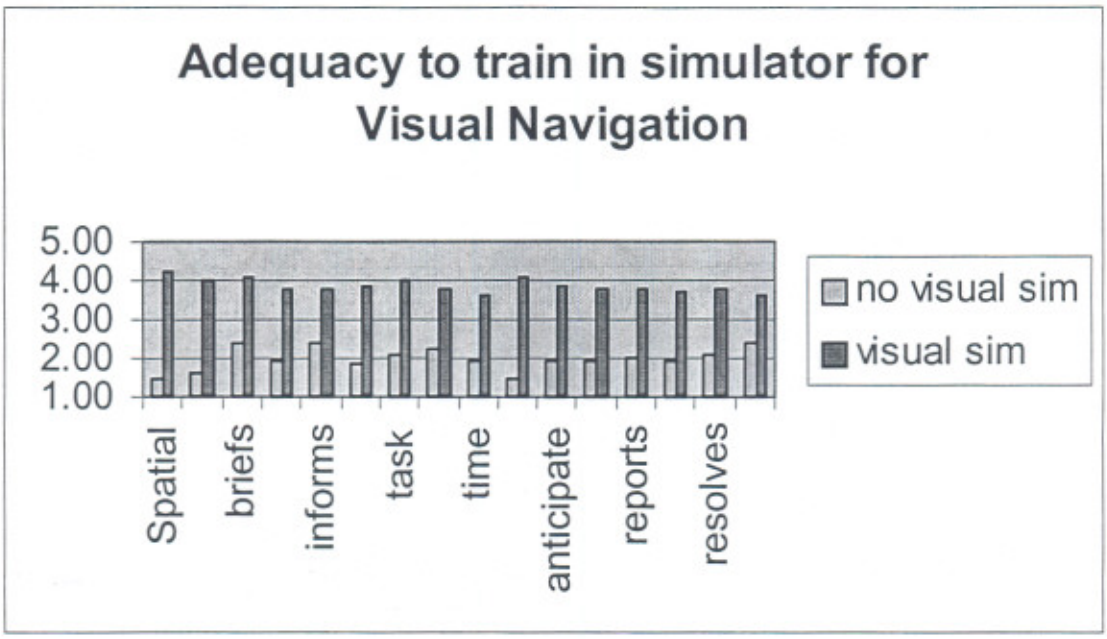


**Figure 3-1 - Adequacy of Simulators to Train SA with and without Visual Capability**

The 16 SA behaviors used in the research effort are listed below. Obviously, the instructors felt that a visual capability would greatly enhance learning SA skills. A discussion of the potential benefits follows the list. A spreadsheet with all the data may be found in Appendix B.

**SA-related Behaviors:**

- Demonstrates awareness of location in space.
- Uses all available information sources.
- Briefs status.
- Provides information in advance.
- Informs others of actions taken.
- Cross check information.
- Demonstrates knowledge of tasks.
- Provides and requests backup.
- Exhibits skilled time sharing among tasks.
- Scans internal and external environment for abnormal problem situations.

- Anticipates consequences of actions, decisions, and potential problem situations.
- Takes action at the appropriate time.
- Reports problems.
- Locates potential source of problems.
- Resolves discrepancies.
- Adheres to standard communication format.

**Table 3-1 - Benefits of Incorporating Visual Simulation for SA**

| SA Skill | Present | Plus Visual |
|---|---|---|
| 1. Spatial Awareness | 3.13 | 4.25 |
| 2. Takes Timely Action | 3.50 | 3.75 |
| 3. Uses Available Info | 2.63 | 3.63 |
| 4. Scan | 2.38 | 3.75 |
| 5. Anticipates Consequences | 3.00 | 3.63 |
| ***(* the 5 most critical skills)*** | **Mean 2.93** | **3.80** |
| ***(#4 & 5: two of the three most difficult skills)*** | | |
| **Total across all 16 SA skills:** | **2.89** | **3.58** |
| | **+23.9%** | |

Table 3-1 lists the five SA skills rated by instructors as most critical for MFOs. Additionally, numbers four and five are two of the three most difficult SA skills for students to learn. The benefits of adding a visual capability as perceived by instructors were impressive.

## 3.1 Purpose and Function of the Proposed Simulator.

The purpose of the Communication/Navigation/Situational Awareness simulator would be to 1) strengthen the relationship between instrument navigation training and the rest of the curriculum; 2) increase the communications skills of students and graduates; and 3) provide early training and remediation in situation awareness skills. It would function as the heart of Primary Phase practical application on the deck. A description of the proposed simulator, along with a detailed requirements list and a ROM estimate are located in Appendix C.

## 3.2 Unique Knowledge, Skills, and Attitudes Required for the Proposed Simulator.

The KSA that will be required by the students in using the proposed simulator are only unique in the sense that they are not presently dealt with by the curriculum. Appendix B lists the enabling objectives developed for this study. The objectives found in section D of each phase, Cockpit Resource Management, deal with Situational Awareness. The learning outcomes and instructional strategies that are addressed in accomplishing these objectives are the subject of this section. The Literature Review (CDRL A001, Section 4.4) lists sample references for the research drawn upon.

### 3.2.1. Cue-recognition training.

Research has shown the importance of the ability to discriminate relevant features, cues and patterns for the development of concept acquisition, problem solving and complex decision making. The team SA behaviors that are the terminal objectives of this training include

- Common explanations of the meaning of task cues;
- Compatible assessments of the situation at hand;
- Common expectations of additional task and information requirements;
- Accurate predictions of team member behavior; and
- Appropriate and expected task strategies (Stout, Cannon-Bowers, & Salas, in press).

An immediate advantage is expected in learning the required scan of instruments, a skill rated by instructors as both critical and difficult for students to learn.

### 3.2.2. Mental Models.

The introduction of knowledge structures will enable students to begin developing mental models of the cockpit and external environment. Expert pilots and MFOs have automatized and chunked complex tasks to the extent that much of their knowledge is now tacit. Instructors rated the ability to predict the consequnces of actions as the single most difficult SA skill. Mental models have been found to be critical in developing problem solving prediction skills (Sheehan, 1999). The SA task analysis conducted in this study elicited expert mental model representations to aid in constructing a curriculum to address SA. Figure 3.2 is a Pathfinder Network elicited from JIL subject matter expert, CDR. C. Gurney (USNR) during the study.

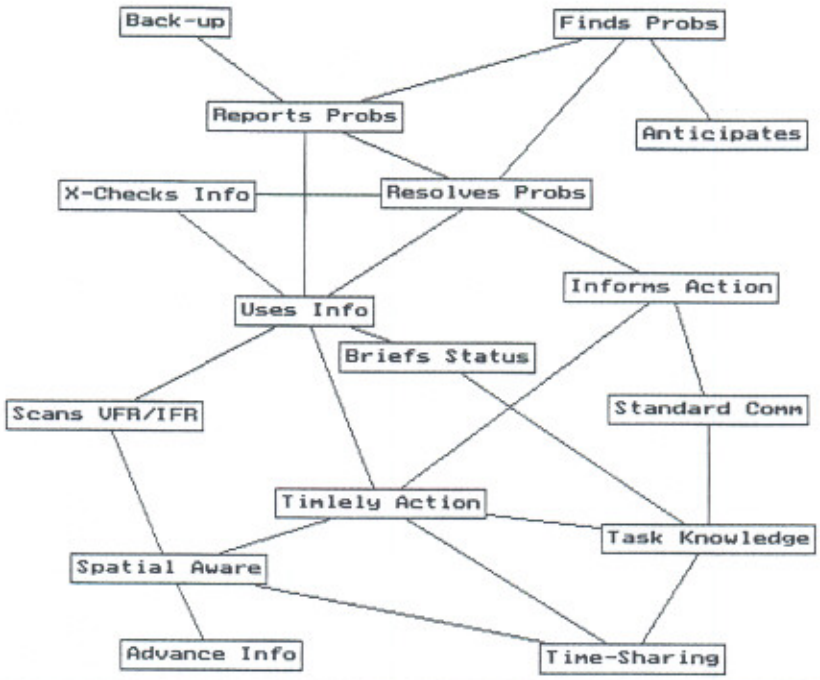


**Figure 3.2 - Pathfinder Network of SA Behaviors**

### 3.2.3. Metacognitive skills

The ability to accurately assess one's own performance and identify appropriate corrective modifications—are necessary for complex problem solving. Metacognitive skills enable the learner to

- Strategically encode the nature of the problem and form a mental model or representation of its elements
- Select appropriate plans and strategies for reaching the goal
- Identify and conquer obstacles that impede progress (Hacker, Dunlosky, & Graesser, 1998).

Metacognitive skills are also necessary for effective transfer of skills—enormously important in the present context. Metacognition can be introduced in the classroom and practiced on this simulator and in the air.

## 3.3 Existing Applicable Training Systems Shortfalls

A description of the proposed simulator may be found in Appendix C. The need for a simulator, early in the Primary Phase, that would address the need for Airways Navigation, Communications and Situational Awareness (SA) training was established through several sources of information. The table below lists the correlations of student grades on the current simulator (2B-47) with their grades on other simulators, flights and academic examinations. Clearly, the 2B-47 grades are not predictive of any subsequent academic or practical performance.

**Table 3-1 2B-47 Grade Correlation's**

| | |
|---|---|
| CPT 1,2,3 | -.042 |
| IACAD | -.085 |
| IFLT | .026 |
| INAVSIM | .070 |
| IT-1 ANAV | -.029 |
| IT-34 ANAV | .024 |
| PACAD | -.043 |
| PFLT | -.005 |
| POFT | -.019 |
| PT-34 ANAV | -.074 |

Students currently receive no hands-on training in Communications, the lowest rated MFO graduate proficiency, until late in the phase during the Cockpit Procedures Trainer events on the 2C-42 or 2B-37. The voice recognition feature of the proposed simulator make it valuable and practical in a class context, for remediation and individual practice.

The present training system has no means for collecting objective data upon which to base SA grades. There will always be a need for subjectivity on the part of the instructor in taking a holistic approach to a flight in assigning a grade for "headwork" or SA. The JIL team does not imply that a machine could assign such a grade. However, the SA simulator recommended herein can offer measurements of valid SA behaviors that can help the instructor to identify SA shortcomings on the deck, prior to flight. This should enable meaningful remediation that will cause the subsequent flight time to be maximally beneficial for the student.

## 3.4 Rationale

It is obviously cost prohibitive to try to train the skills listed above in the aircraft. SA is also difficult to measure in the air. The 2B-47 does not have the capability to train some of the skills identified; for others it has proven to be inadequate.

## 3.5 Significant Events and Source Documents.

- TW6/FRS Survey.

- MFO program graduates received low marks in SA. Unsolicited comments from instructors and students in the FRS's expressed dissatisfaction with the instruction they received on the 2B-47.

- Initial Meeting with NAWCTSD.

- During the ITSEC conference in December, 1998, the JIL team met with representatives from NAWCTSD to discuss a joint effort in researching SA training simulation.

- 50% IPR.

- At IPR 1, JIL requested and received tentative approval for a three- month extension to research SA behaviors for the purpose of writing SA training objectives.

- SA Data Collection.

- A team consisting of representatives from NAWCTSD, University of Central Florida and JIL collected SA data from June 20 through June 24, 1999. The research included 12 flights in T-39N aircraft, surveys, card sorting exercises and Pathfinder Network elicitations.

- Grade Correlations. When grades from the VT-10 database were correlated (over 800 Primary phase students), the 2B-47 correlations above emerged.

- SBIR Field Study.

- NAWCTSD conducted a field trial of the software for an objectives-driven SA simulator at TW6 In August, 1999.

# Table 2. Primary & Intermediate Simulator/Flight/Academic Grade Correlations

**Primary/Intermediate Grades, VT-10--Correlations**

| | | CPT123 | IGACAD | IGFLT | INAVSIM | IT1ANAV | IT34ANAV | P2B47 | PGACAD | PGFLT | POFT | PT34ANAV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pearson Correlation | CPT123 | 1.000 | .390** | .571** | .181** | .416** | .359** | -.042 | .549** | .638** | .466** | .379** |
| | IGACAD | .390** | 1.000 | .405** | .186** | .339** | .307** | -.085 | .544** | .300** | .395* | .460** |
| | IGFLT | .571** | .405** | 1.000 | .205** | .707** | .744** | .026 | .457** | .634** | .096 | .525** |
| | INAVSIM | .181** | .186** | .205** | 1.000 | .327** | .229** | .070 | .060 | .178** | -.122 | .072 |
| | IT1ANAV | .416** | .339** | .707** | .327** | 1.000 | .580** | -.029 | .336** | .430** | -.090 | .115 |
| | IT34ANAV | .359** | .307** | .744** | .229** | .580** | 1.000 | .024 | .224** | .378** | -.109 | .071 |
| | P2B47 | -.042 | -.085 | .026 | .070 | -.029 | .024 | 1.000 | -.043 | -.005 | -.019 | -.074 |
| | PGACAD | .549** | .544** | .457** | .060 | .336** | .224** | -.043 | 1.000 | .531** | .340** | .430** |
| | PGFLT | .638** | .300** | .634** | .178** | .430** | .378** | -.005 | .531** | 1.000 | .438** | .682** |
| | POFT | .466** | .395* | .096 | -.122 | -.090 | -.109 | -.019 | .340** | .438** | 1.000 | .385** |
| | PT34ANAV | .379** | .460** | .525** | .072 | .115 | .071 | -.074 | .430** | .682** | .385** | 1.000 |
| Sig. (2-tailed) | CPT123 | . | .000 | .000 | .003 | .000 | .000 | .248 | .000 | .000 | .000 | .000 |
| | IGACAD | .000 | . | .000 | .006 | .000 | .000 | .082 | .000 | .000 | .012 | .002 |
| | IGFLT | .000 | .000 | . | .002 | .000 | .000 | .597 | .000 | .000 | .562 | .000 |
| | INAVSIM | .003 | .006 | .002 | . | .000 | .000 | .290 | .339 | .004 | .326 | .555 |
| | IT1ANAV | .000 | .000 | .000 | .000 | . | .000 | .663 | .000 | .000 | .482 | .362 |
| | IT34ANAV | .000 | .000 | .000 | .000 | .000 | . | .716 | .000 | .000 | .389 | .570 |
| | P2B47 | .248 | .082 | .597 | .290 | .663 | .716 | . | .246 | .887 | .822 | .386 |
| | PGACAD | .000 | .000 | .000 | .339 | .000 | .000 | .246 | . | .000 | .000 | .000 |
| | PGFLT | .000 | .000 | .000 | .004 | .000 | .000 | .887 | .000 | . | .000 | .000 |
| | POFT | .000 | .012 | .562 | .326 | .482 | .389 | .822 | .000 | .000 | . | .000 |
| | PT34ANAV | .000 | .002 | .000 | .555 | .362 | .570 | .386 | .000 | .000 | .000 | . |
| N | CPT123 | 840 | 431 | 444 | 260 | 250 | 258 | 741 | 840 | 840 | 195 | 198 |
| | IGACAD | 431 | 431 | 428 | 218 | 218 | 217 | 416 | 431 | 431 | 40 | 43 |
| | IGFLT | 444 | 428 | 444 | 224 | 218 | 224 | 423 | 444 | 444 | 39 | 42 |
| | INAVSIM | 260 | 218 | 224 | 260 | 250 | 257 | 233 | 260 | 260 | 67 | 69 |
| | IT1ANAV | 250 | 218 | 218 | 250 | 250 | 249 | 226 | 250 | 250 | 63 | 65 |
| | IT34ANAV | 258 | 217 | 224 | 257 | 249 | 258 | 232 | 258 | 258 | 65 | 67 |
| | P2B47 | 741 | 416 | 423 | 233 | 226 | 232 | 864 | 741 | 741 | 136 | 139 |
| | PGACAD | 840 | 431 | 444 | 260 | 250 | 258 | 741 | 840 | 840 | 195 | 198 |
| | PGFLT | 840 | 431 | 444 | 260 | 250 | 258 | 741 | 840 | 840 | 195 | 198 |
| | POFT | 195 | 40 | 39 | 67 | 63 | 65 | 136 | 195 | 195 | 195 | 194 |
| | PT34ANAV | 198 | 43 | 42 | 69 | 65 | 67 | 139 | 198 | 198 | 194 | 198 |

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

| | |
|---|---|
| **LEGEND** | **Primary & Intermediate Phase. Mean grades for:** |
| **CPT 1,2,3:** | Three Cockpit Procedures Training events (2B-37 or 2C-42 simulators) |
| **IGACAD:** | Intermediate Phase academics |
| **IGFLT:** | All flights in the Intermediate Phase |
| **INAVSIM:** | Four simulator events on the 2B-37 or 2C-42 simulators |
| **IT1ANAV:** | Airways Navigation flights on the T-1A aircraft in Intermediate Phase |
| **IT34ANAV:** | Airways Navigation flights on the T-34C aircraft in Intermediate Phase |
| **P2B47:** | Simulator events conducted on the 2B-47 in Primary Phase |
| **PGACAD:** | Primary Phase academics |
| **PGFLT:** | All flights in Primary Phase |
| **POFT:** | Four simulator events in preparation for Primary Phase ANAV flights |
| **PT34ANAV:** | Airways Navigation flights on the T-34C aircraft in Primary Phase |

## Table 3. Advanced Core Simulator/Flight Grade Correlations

**Correlations--Advanced Core**

| | | AN | LOWLVL | RN | RST | STK |
|---|---|---|---|---|---|---|
| Pearson Correlation | AN | 1.000 | .168* | .222** | .207** | .347** |
| | LOWLVL | .168* | 1.000 | .172* | .336** | .317** |
| | RN | .222** | .172* | 1.000 | .292** | .267** |
| | RST | .207** | .336** | .292** | 1.000 | .361** |
| | STK | .347** | .317** | .267** | .361** | 1.000 |
| Sig. (2-tailed) | AN | . | .015 | .001 | .003 | .000 |
| | LOWLVL | .015 | . | .013 | .000 | .000 |
| | RN | .001 | .013 | . | .000 | .000 |
| | RST | .003 | .000 | .000 | . | .000 |
| | STK | .000 | .000 | .000 | .000 | . |
| N | AN | 211 | 211 | 210 | 211 | 211 |
| | LOWLVL | 211 | 211 | 210 | 211 | 211 |
| | RN | 210 | 210 | 210 | 210 | 210 |
| | RST | 211 | 211 | 210 | 211 | 211 |
| | STK | 211 | 211 | 210 | 211 | 211 |

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

| | |
|---|---|
| **Legend: Advanced Core Phase. Mean grades for:** | |
| **AN:** | Airways Navigation flights |
| **LL:** | Low Level flights |
| **RN:** | Radar Navigation flights |
| **STK:** | Strike flights |
| **RST:** | Radar Synthetic Trainer (GMRTS) |

## Table 4 . Advanced Strike Simulator/Flight Grade Correlations

**Strike Grades--Correlations**

| | | COMP | CST |
|---|---|---|---|
| Pearson Correlation | COMP | 1.000 | .382** |
| | CST | .382** | 1.000 |
| Sig. (2-tailed) | COMP | . | .000 |
| | CST | .000 | . |
| N | COMP | 215 | 214 |
| | CST | 214 | 214 |

**. Correlation is significant at the 0.01 level (2-tailed).

**Legend: Advanced Strike Phase.**
**Mean grades for:**
**COMP:** Composite flights
**CST:** Composite Synthetic Trainer (GMRTS)

## Table 5 . Advanced Strike/Fighter Simulator/Flight Grade Correlations

**Strike Fighter Grades--Correlations**

| | | AP | FA | FC | FR | FU | SA | SC | SP | SR | SU |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pearson Correlation | AP | 1.000 | .006 | .234** | .101 | .059 | .100 | .092 | .080 | .136 | .200* |
| | FA | .006 | 1.000 | .262** | .253** | .086 | .135 | .188* | .147 | .171* | .209** |
| | FC | .234** | .262** | 1.000 | .280** | .193* | .169* | .266** | .183* | .249** | .333** |
| | FR | .101 | .253** | .280** | 1.000 | .197* | .281** | .230** | .316** | .277** | .404** |
| | FU | .059 | .086 | .193* | .197* | 1.000 | .076 | .092 | .205** | .091 | .129 |
| | SA | .100 | .135 | .169* | .281** | .076 | 1.000 | .341** | .230** | .197* | .154* |
| | SC | .092 | .188* | .266** | .230** | .092 | .341** | 1.000 | .385** | .372** | .209** |
| | SP | .080 | .147 | .183* | .316** | .205** | .230** | .385** | 1.000 | .316** | .246** |
| | SR | .136 | .171* | .249** | .277** | .091 | .197* | .372** | .316** | 1.000 | .237** |
| | SU | .200* | .209** | .333** | .404** | .129 | .154* | .209** | .246** | .237** | 1.000 |
| Sig. (2-tailed) | AP | . | .945 | .004 | .217 | .473 | .221 | .259 | .327 | .094 | .014 |
| | FA | .945 | . | .001 | .001 | .270 | .079 | .015 | .059 | .027 | .007 |
| | FC | .004 | .001 | . | .000 | .012 | .028 | .000 | .017 | .001 | .000 |
| | FR | .217 | .001 | .000 | . | .011 | .000 | .003 | .000 | .000 | .000 |
| | FU | .473 | .270 | .012 | .011 | . | .324 | .233 | .008 | .238 | .097 |
| | SA | .221 | .079 | .028 | .000 | .324 | . | .000 | .003 | .010 | .047 |
| | SC | .259 | .015 | .000 | .003 | .233 | .000 | . | .000 | .000 | .007 |
| | SP | .327 | .059 | .017 | .000 | .008 | .003 | .000 | . | .000 | .001 |
| | SR | .094 | .027 | .001 | .000 | .238 | .010 | .000 | .000 | . | .002 |
| | SU | .014 | .007 | .000 | .000 | .097 | .047 | .007 | .001 | .002 | . |
| N | AP | 154 | 153 | 152 | 152 | 152 | 152 | 152 | 151 | 152 | 151 |
| | FA | 153 | 174 | 169 | 168 | 168 | 169 | 168 | 167 | 168 | 167 |
| | FC | 152 | 169 | 171 | 170 | 169 | 170 | 170 | 169 | 170 | 168 |
| | FR | 152 | 168 | 170 | 170 | 168 | 169 | 170 | 169 | 170 | 167 |
| | FU | 152 | 168 | 169 | 168 | 169 | 169 | 168 | 167 | 168 | 167 |
| | SA | 152 | 169 | 170 | 169 | 169 | 170 | 169 | 168 | 169 | 168 |
| | SC | 152 | 168 | 170 | 170 | 168 | 169 | 170 | 169 | 170 | 167 |
| | SP | 151 | 167 | 169 | 169 | 167 | 168 | 169 | 169 | 169 | 166 |
| | SR | 152 | 168 | 170 | 170 | 168 | 169 | 170 | 169 | 171 | 168 |
| | SU | 151 | 167 | 168 | 167 | 167 | 168 | 167 | 166 | 168 | 171 |

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

**Legend: Advanced Core Phase.**
**Mean grades for:**
**AP:** Multiple Approach flights
**FA:** Advanced Intercept flights
**FC:** Conversion Intercept flights
**FR:** Attack-Reattack flights
**FU:** Unknown Intercept flights
**SA:** Advanced Intercept sim
**SC:** Conversion Intercept sim
**SP:** Pursuit Intercept sim
**SR:** Attack-Reattack sim
**SU:** Unknown Intercept sim

# Table 6 . Advanced Tactical Maneuvering Simulator/Flight Grade Correlations

**Correlations--Advanced Tactical Maneuvering**

| | | ATM | BIS | CV | EP | FAM | RIS | TL_W |
|---|---|---|---|---|---|---|---|---|
| Pearson Correlation | ATM | 1.000 | .218* | .117 | -.003 | .214* | .249* | .223* |
| | BIS | .218* | 1.000 | .061 | .393** | .205* | .058 | .214* |
| | CV | .117 | .061 | 1.000 | .308** | .133 | .168 | -.065 |
| | EP | -.003 | .393** | .308** | 1.000 | .111 | .321** | .112 |
| | FAM | .214* | .205* | .133 | .111 | 1.000 | .076 | .094 |
| | RIS | .249* | .058 | .168 | .321** | .076 | 1.000 | .160 |
| | TL_W | .223* | .214* | -.065 | .112 | .094 | .160 | 1.000 |
| Sig. (2-tailed) | ATM | . | .037 | .259 | .980 | .038 | .013 | .027 |
| | BIS | .037 | . | .555 | .000 | .045 | .555 | .043 |
| | CV | .259 | .555 | . | .002 | .197 | .089 | .534 |
| | EP | .980 | .000 | .002 | . | .283 | .001 | .285 |
| | FAM | .038 | .045 | .197 | .283 | . | .454 | .365 |
| | RIS | .013 | .555 | .089 | .001 | .454 | . | .114 |
| | TL_W | .027 | .043 | .534 | .285 | .365 | .114 | . |
| N | ATM | 102 | 92 | 95 | 94 | 95 | 99 | 99 |
| | BIS | 92 | 108 | 96 | 94 | 96 | 106 | 90 |
| | CV | 95 | 96 | 106 | 103 | 96 | 104 | 94 |
| | EP | 94 | 94 | 103 | 104 | 95 | 102 | 93 |
| | FAM | 95 | 96 | 96 | 95 | 102 | 99 | 95 |
| | RIS | 99 | 106 | 104 | 102 | 99 | 115 | 98 |
| | TL_W | 99 | 90 | 94 | 93 | 95 | 98 | 101 |

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

**Legend: Advanced Core Phase. Mean grades for:**

**ATM:** Advanced Tactical Maneuvering flights
**BIS:** Basic Instruments simulator events
**CV:** Carrier Procedures simulator events
**EP:** Emergency Procedures simulator events
**FAM:** Familiarization flights
**RIS:** Radio Instrument simulator events
**TLL:** Tactical Low Level (TL_W) flights

# Cost Analysis by Recommendations

## I. PRIMARY

**Recommendation I-1: Delete 3 Flights**
Aircraft operating and maintenance costs are confidential and proprietary information and unavailable to contractors. This report is unable to determine costs savings. However, given that there are 550 students annually, and that each flight is 1.5 hours duration, it is anticipated this will represent 1650 fewer flights, and 2475 fewer flight instructor hours, in addition to preparation, briefing, and debriefing times.
Savings: Indeterminate.

**Recommendation I-2: Modify Simulator**
Modifications of 2B47 simulators to include voice recognition capabilities, three-screen visuals, and a SA data capture systems. Prototype cost development is $545,670.00. Additional 14 units would cost $131,000.00 each..
Purchase Cost: $2,379,670.00

**Recommendation I-3: Add COTS Comm Practice**
This would involve adding COTS communications software to the Learning Resource Center (LRC). Jeppeson Flite-Pro or COMM-1 (Multimedia Software, Inc.) software can be added to each station for $100.00 per station (50 stations).
Purchase Cost: $5000.00

**Recommendation I-4: Add ICW (Level 2)**
This would replace formal classroom instruction with interactive courseware.
5.5 hours of Level II ICW: 5.5 X $6300 = $34,650.00
5.5 hours instructor time plus preparation and evaluation: 11.5 X 23.40 X 22 classes = $5920.20
Purchase Cost: $34,650.00
Annual Savings: $5920.20

**Recommendation I-5: Add ICW/COTS**
This would replace formal classroom instruction with interactive courseware.
16.5 hours of ICW: 16.5 X $4000.00=$66,000.00
16.5 hours instructor time plus preparation and evaluation: 36.5 X 23.40 X 22 classes = $18.790.20
Purchase Cost: $66,000.00

Annual Savings: $18,790.20

**Recommendation I-6: Delete 3 SIMS**
These events are for students to use as they see necessary. No instructor time is used, therefore, no savings are realized.
Annual Savings: None

**Recommendation I-7: Add ICW**
This would replace formal classroom instruction with interactive courseware.
10 hours of ICW: 10 X $4000 = $40,000.00
10 hours instructor time plus preparation and evaluation: 20 X 23.40 X 22 classes = $10,296.00
Purchase Cost: $40,000.00
Annual Savings: $10,296.00

**Recommendation I-8: Add ICW**
This would replace formal classroom instruction with interactive courseware.
16 hours of ICW: 16 X $4000 = $64,000.00
16 hours instructor time plus preparation and evaluation: 28 X 23.40 X 22 classes = $14,414.40
Purchase Cost: $64,000.00
Annual Savings: $14,414.40

**Recommendation I-9: Add 19.5 Hours of CBT**
This would replace formal classroom instruction with interactive courseware.
19.5 hours of CBT: 19.5 X $5300 = $103,350.00
19.5 hours instructor time plus preparation and evaluation: 37.5 X 23.40 X 22 classes = $19,305.00
Purchase Cost: $103,350.00
Annual Savings: $19,305.00

**Recommendation I-10: Add a 3SH Graduate University Course**
This would be a joint venture with a university, through their continuing education and/or special courses division. The university would supply their own interactive TV equipment. Students can apply for graduate credit by paying the differential in costs. Purchase

of a VTEL LC5000 Dual monitor videoconferencing unit, with installation, would cost $56,000.00. Annual costs would include an ISDN telephone line ($1600.00/year) and maintenance ($1500.00). Anticipated tuition would be $100 per student.
Purchase Cost: $56,000.00
Annual Costs: $58,100.00

## II. Intermediate

**Recommendation II-1: Delete 2 Flights**
Aircraft operating and maintenance costs are confidential and proprietary information and unavailable to contractors. This report is unable to determine costs savings. However, given that there are 416 students annually, and that each flight is 2 hours duration, it is anticipated this will represent 832 fewer flights, and 1664 fewer flight instructor hours, in addition to preparation, briefing, and debriefing times.
Savings: Indeterminate

**Recommendation II-2: Delete SIM Event**
The main effect would be to release instructor time, at 3.5 hours X 23.40 X 416 students = $34,070.40.
Annual Savings: $34,070.40

**Recommendation II-3: Rewrite the INAV 1-4 Simulator Events**
No anticipated costs to be incurred.

**Recommendation II-4: Add 2 ANAV SIM Events**
The main effect would be to increase instructor time, at 7 hours X 23.40 X 416 students = $68,140.80.
Annual Cost: $68,140.80

**Recommendation II-5: Add 3 VNAV SIM Events**
The main effect would be to increase instructor time, at 10.5 hours X 23.40 X 416 students = $102,211.20.
Annual Cost: $102,211.20

**Recommendation II-6: Add EC/CAI**
This would replace formal classroom instruction with interactive courseware.
9 hours of CBT: 9 X $4000 = $36,000.00

Purchase Cost: $36,000.00

**Recommendation II-7: Add 22 Hours of Level I ICW**
This would replace formal classroom instruction with interactive courseware.
22 hours of CBT: 22 X $5300 = $116,600.00
22 hours instructor time plus preparation and evaluation: 48 X 23.40 X 17 classes = $19,094.40
Purchase Cost: $116,600.00
Annual Savings: $19,094.40

## III. ADVANCED CORE

**Recommendation III-1: Add Instruments**
This would be a low-cost initiative undertaken by existing contract.

**Recommendation III-2: Add 27 Hours of CBT**
This would replace formal classroom instruction with interactive courseware.
27 hours of CBT: 27 X $5300 = $143,100.00
27 hours instructor time plus preparation and evaluation: 81 X 23.40 X 17 classes = $32,221.80
Purchase Cost: $143,100.00
Annual Savings: $32,221.80

**Recommendation III-3: Add 18 Hours of Level II ICW**
This would replace formal classroom instruction with interactive courseware.
18 hours of ICW: 18 X $6300 = $113,400.00
18 hours instructor time plus preparation and evaluation: 54 X 23.40 X 17 classes = $21,481.20
Purchase Cost: $113,400.00
Annual Savings: $21,481.20

**Recommendation III-4: Add CAI**
This would replace formal classroom instruction with interactive courseware.
7 hours of CAI: 7 X $4000 = $28,000.00
Purchase Cost: $28,000.00

**Recommendation III-5: Add CAI**
This would replace formal classroom instruction with interactive courseware.
7 hours of CAI: 7 X $4000 = $28,000.00
Purchase Cost: $28,000.00

**Recommendation III-6: Add Level II ICW**
This would replace formal classroom instruction with interactive courseware.
7 hours of ICW: 7 X $6300 = $44,100.00
7 hours instructor time plus preparation and evaluation: 21 X 23.40 X 17 classes = $8353.80
Purchase Cost: $44,100.00
Annual Savings: $8353.80

**Recommendation III-7: Add CAI and COTS**
Commercially available software is available, at approximately $50.00 per copy. This could be loaded on the 50 units at the LRC.
Purchase Cost: $2500.00

**Recommendation III-8: Add Level II ICW**
This would replace formal classroom instruction with interactive courseware.
13 hours of ICW: 13 X $6300 = $81,900.00
13 hours instructor time plus preparation and evaluation: 39 X 23.40 X 17 classes = $15,514.20
Purchase Cost: $81,900.00
Annual Savings: $15,514.20

**Recommendation III-9: 2 Hours of ICW Testing**
This would replace formal classroom testing with interactive evaluative courseware.
2 hours of ICW: 2 X $6300 = $12,600.00
2 hours instructor time plus preparation and evaluation: 4 X 23.40 X 17 classes = $1591.20
Purchase Cost: $12,600.00
Annual Savings: $1591.20

## IV. ADVANCED STRIKE

**Recommendation IV-1: Add CAI**

This would replace formal classroom instruction with interactive courseware.
3 hours of CAI: 3 X $4000 = $12,000.00
Purchase Cost: $12,000.00

**Recommendation IV-2: Add Level II ICW**
This would replace formal classroom instruction with interactive courseware.
3 hours of ICW: 3 X $6300 = $18,900.00
3 hours instructor time plus preparation and evaluation: 9 X 23.40 X 15 classes = $3159.00
Purchase Cost: $18,900.00
Annual Savings: $3159.00

## V. ADVANCED STRIKE FIGHTER

**Recommendation V-1: Add CAI**
This would replace formal classroom instruction with interactive courseware.
2.5 hours of CAI: 2.5 X $4000 = $10,000.00
Purchase Cost: $10,000.00

**Recommendation V-2: Add CAI**
This would replace formal classroom instruction with interactive courseware.
6 hours of CAI: 6 X $4000 = $24,000.00
Purchase Cost: $24,000.00

**Recommendation V-3: 2 Hours of ICW Testing**
This would replace formal classroom testing with interactive evaluative courseware.
2 hours of ICW: 2 X $6300 = $12,600.00
2 hours instructor time plus preparation and evaluation: 4 X 23.40 X 7 classes = $655.20
Purchase Cost: $12,600.00
Annual Savings: $655.20

## VI. ADVANCED TACTICAL MANEUVERING

**Recommendation VI-1: EC/CAI**

This would replace formal classroom testing with interactive courseware.
10 hours of CAI: 10 X $4000 = $40,000.00
Purchase Cost: $40,000.00

**Recommendation VI-2: 2 Hours of ICW Testing**
This would replace formal classroom testing with interactive evaluative courseware.
2 hours of CAI: 2 X $6300 = $12,600.00
2 hours instructor time plus preparation and evaluation: 4 X 23.40 X 8 classes = $748.80
Purchase Cost: $12,600.00
Annual Savings: $748.80

# FRS/Training Wing Six UMFO Survey

## I. Respondent Information

*The following information is requested to help us to identify trends in the data collected.*

A. Name _____ Branch _____ Rank _____

B. Squadron _____ Years/months onboard ___/___ NFO/NAV ☐ Pilot ☐

C. Month/year completed flight training _____/____ Flight Experience:

| | Aircraft | Years Experience | Billet(s) |
|---|---|---|---|
| 1. | _____ | _____ | _____ |
| 2. | _____ | _____ | _____ |
| 3. | _____ | _____ | _____ |
| 4. | _____ | _____ | _____ |

D. Enter any other comments that will help to profile your experience.

_____

_____

**The survey will ask you to answer the following questions:**

- How valid are each of the current training objectives?
- How effective is the present curriculum in meeting those objectives?
- How proficient are MFOs when they get their wings?
- What changes (if any) should be made to the present training?
- What knowledge, skills and attitudes will MFOs need in the next decade, in light of emerging technology and changing mission profiles?

| 1= in[illegible]ctive | 2= somewhat ineffective | 3= adequate | 4= [illegible]ly effective | 5= extremely effective | N/A= not applic[illegible] |
|---|---|---|---|---|---|

## II. How Valid Are the Current Training Objectives? (Is this what an MFO needs to know and do?)

**A. Rate the validity of the following Terminal Objectives, using the scale above.**

**1. PRIMARY PHASE CURRICULUM**

The Primary Naval Flight Officer/Navigator Training Curriculum is designed to teach basic aeronautical skills: situational awareness, mission planning, and communications. The trainer aircraft for this phase is the T-34C, a single-engine, two-place turboprop. Emphasis is on crew coordination, prioritization and scan. Upon satisfactory completion of this phase, the student will be able to perform the following terminal objectives:

| | Validity Ratings | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | N/A |
| A. Apply without error the policies and guidance of Squadron and Naval Aviation Safety Programs to identify, avoid and report hazards. | | | | | | |
| B. Maintain spatial orientation while controlling an aircraft through the use of visual and instrument scan in visual or instrument meteorological conditions with instructor assistance, during day and night shore based operations. | | | | | | |
| C. Navigate an aircraft via visual references and navigation instruments with the assistance of a flight instructor. | | | | | | |
| D. Communicate with appropriate facilities via two-way radio using standard naval aviation and Federal Aviation Administration terminology. | | | | | | |
| E. Comply with specified flight policies, guidance and procedures provided by OPNAVINST 3710.7Q, Naval Air Training and Operating Procedures Standardization (NATOPS), FAA regulations and command directives. | | | | | | |
| F. Use Flight Information Publications (FLIP), Notices to Airmen (NOTAMS) and other applicable flight information to plan and fly in the | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | N/A |

| 1= in. ctive | 2= somewhat ineffective | 3= adequate | 4= . ly effective | 5= extremely effective | N/A= not applica |
|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| Federal Aviation Administration's Air Traffic Control (ATC) system. | | | | | | |
| G. Use forecast and observed weather conditions, and knowledge of meteorology and meteorological theory and its effects on aircraft performance to plan and conduct safe and efficient flight operations. | | | | | | |
| H. Determine aircraft condition and readiness for flight during preflight and postflight. | | | | | | |
| I. Operate and assess an aircraft and its systems in accordance with NATOPS and flight training instructions (FTIs), reporting any anomaly to the instructor. | | | | | | |
| J. Apply crew coordination concepts and procedures during aircraft operations. | | | | | | |
| K. Demonstrate adequate preparation for flight and mission accomplishment. | | | | | | |
| **2. INTERMEDIATE PHASE CURRICULUM** The Intermediate Naval Flight Officer/Navigator Training Curriculum is designed to : 1) refine primary skills; 2) introduce formation procedures and low level navigation; 3) add to primary emphases flexibility in multi-mission planning and execution; 4) transition to high speed NAV with a dedicated MFO instructor. The aircraft used are the T-34C and the T-1A, a twin engine, multi-place turbo fan trainer. Upon satisfactory completion of this intermediate phase, the student will be able to perform the following Terminal Objectives. | 1 | 2 | 3 | 4 | 5 | N/A |
| A. Operate and assess an aircraft and its systems in accordance with NATOPS, limitations and FTIS, reporting any anomaly to the instructor. | | | | | | |
| B. Navigate an aircraft via visual references and navigation instruments with instructor assistance, and through coordination with a pilot. | 1 | 2 | 3 | 4 | 5 | N/A |

| 1= in[illegible]ctive | 2= somewhat ineffective | 3= adequate | 4= [illegible]ly effective | 5= extremely effective | N/A= not applic. |
|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| C. Compute and evaluate, factoring in the effects of meteorological conditions, fuel requirements and en route times. | | | | | | |
| D. Communicate with appropriate facilities and other aircraft. | | | | | | |
| E. Use Flight Information Publications (FLIPs), Notices to Airmen (NOTAMs), and other applicable flight information to plan and fly in the T-34C and T-lA in the Federal Aviation Administration's Air Traffic Control (ATC) system. | | | | | | |
| F. Determine T-34C and T-lA condition and readiness for flight during preflight and postflight. | | | | | | |
| G. Apply aircrew coordination concepts and procedures during aircraft operations. | | | | | | |
| H. Perform with instructor assistance specified aircraft maneuvers. | | | | | | |
| I. Direct, with instructor assistance, specified two-plane formation maneuvers. | | | | | | |
| J. Demonstrate adequate preparation for flight and mission accomplishment. | | | | | | |

### 3. ADVANCED STRIKE CORE CURICULUM

| | | | | | | |
|---|---|---|---|---|---|---|
| The Advanced NFO/AF NAV Core training places the major training emphasis upon performance in the airborne environment of visual and ground mapping radar navigation, radio instrument navigation, and strike mission planning and execution. The aircraft trainer used is the T-39N, a twin-engine turbo-jet. Upon satisfactory completion of this advanced phase, the student will be able to perform the following terminal objectives: | 1 | 2 | 3 | 4 | 5 | N/A |

| 1= in. .ctive | 2= somewhat ineffective | 3= adequate | 4= .. .ly effective | 5= extremely effective | N/A= not applic. |
|---|---|---|---|---|---|

A. Ground Mapping Radar Navigation. Effectively navigate using preflight planning data and a ground mapping radar system.

B. Radio Aids Navigation. Effectively navigate using preflight planning data and radio navigation aids.

C. Visual Navigation. Effectively navigate using preflight Planning data and visual reference to the ground.

D. Communicate. Communicate in an aircraft using the radio, hand signals, and the Intercockpit Communications System (ICS) using standard Navy and Federal Aviation Administration (FAA) terminology.

E. Aircraft Operation. Continually assess aircraft and aircraft systems operation and ensure operations are within limits and are maintained in accordance with Naval Air Training Operating Procedures Standardization (NATOPS).

## 4. ADVANCED STRIKE CURRICULUM

The Advanced NFO/AF' NAV Strike training is designed to refine previously introduced skills and train students in advanced air-to-surface radar operations over water, low land, and medium terrain environments. Upon satisfactory completion of this advanced phase, the student will be able to perform the following terminal objectives:

1 2 3 4 5 N/A

A. Ground Mapping Radar Navigation. Effectively navigate using preflight planning data and a ground mapping radar system.

1 2 3 4 5 N/A

B Radio Aids Navigation. Effectively navigate using preflight planning data and radio navigation aids.

| 1= in[illegible]ctive | 2= somewhat ineffective | 3= adequate | 4= [illegible]y effective | 5= extremely effective | N/A= not applica[illegible] |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| C. Visual Navigation. Effectively navigate using preflight planning data and visual reference to the ground. | | | | | |
| D. Communicate. Communicate in an aircraft using the radio, hand signals the Intercockpit Communications System (ICS) using standard Navy and Federal Aviation Administration (FAA) terminology. | | | | | |
| E. Aircraft Operation. Continually assess aircraft and aircraft systems operation and ensure operations are within limits and are maintained in accordance with Naval Air Training Operating Procedures Standardization (NATOPS). | | | | | |

## 5. ADVANCED STRIKE/FIGHTER CURRICULUM

The Advanced NFO/AF NAV S/F major training emphasis is placed upon performance in air-to-air intercepts and operation of tactical weapons skills to equip WSO/RIOs. The aircraft trainer is the T-39N. Upon satisfactory completion of this advanced phase, the student will be able to perform the following terminal objectives:

| | 1 | 2 | 3 | 4 | 5 | N/A |
|---|---|---|---|---|---|---|
| A. Air-To-Air Radar Operation. Operate an airborne intercept radar system in an air-to-air environment. | | | | | | |
| B. Intercept. Direct an air-to-air intercept of a simulated enemy (target/bogey) aircraft in an airborne environment. | | | | | | |
| C. Communication. Communicate in an aircraft using the radio, hand signals, and the ICS System (using standard Navy and FAA terminology). | | | | | | |
| D. Aircraft Operation. Continually assess aircraft and aircraft systems operation and ensure operations are within limits and are maintained in accordance with Naval Air Training and Operating Procedures Standardization | | | | | | |

| 1= in tive | 2= somewhat ineffective | 3= adequate | 4= y effective | 5= extremely effective | N/A= not applica |
|---|---|---|---|---|---|

(NATOPS).

## 6. ADVANCED TACTICAL MANEUVERING (ATM) CURRICULUM

The Advanced Tactical Maneuvering (ATM) training is designed to introduce students to the dynamics of high-speed/high "G" Air Combat Maneuvering in the T-2, a turbo-jet aircraft. Upon satisfactory completion of this advanced phase, the student will be able to perform the following terminal objectives:
**N/A**

| | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| A. Radio Aids Navigation. Effectively navigate using preflight planning data and radio navigation aids. | | | | | | |
| B. Visual Navigation. Effectively navigate using preflight planning data and visual reference to the ground. | | | | | | |
| C. Communicate. Communicate in an aircraft using the radio, hand signals the Intercockpit Communications System (ICS) using standard Navy and Federal Aviation Administration (FAA) terminology. | | | | | | |
| D. Aircraft Operation. Continually assess aircraft and aircraft systems operation and ensure operations are within limits and are maintained in accordance with NATOPS. | | | | | | |
| E. Advanced Tactical Maneuvering (ATM). Identify ATM and function as a crew member in a high "G" maneuvering flight environment. | | | | | | |

| 1= in. ctive | 2= somewhat ineffective | 3= adequate | 4= . ly effective | 5= extremely effective | N/A= not applica |
|---|---|---|---|---|---|

**B. For any objective above you rated as a "1" or "2", enter a sentence or two stating your reason(s).**

| Objective No. | Comments |
|---|---|
| | |

| 1= in[illegible]ctive | 2= somewhat ineffective | 3= adequate | 4= [illegible]ly effective | 5= extremely effective | N/A= not applic[illegible] |
|---|---|---|---|---|---|

## III. How Effective Is the Present Curriculum? (Will this training result in qualified MFOs?)

*Rate the effectiveness of each of the training events* ***by marking an "X"*** *in the respective block. Use the scale above.*

| Training Events | hours/events | 1 | 2 | 3 | 4 | 5 | N/A |
|---|---|---|---|---|---|---|---|
| **A. Primary Phase (69 training days)** | | | | | | | |
| **Flight time** **total** | **22.5/12** | | | | | | |
| 1. T-34C Familiarization Flights | 14.5/8 | | | | | | |
| 2. T-34C Airways Navigation Flights | 8.0/4 | | | | | | |
| **Simulators/Trainers** **total** | **25.5/15** | | | | | | |
| 3. Instrument (Comm/Nav) simulator 2B37; 2B47 | 21.0/12 | | | | | | |
| 4. Cockpit procedures/instrument navigation trainer 2B37 | 4.5/3 | | | | | | |
| **Flight Support/Academic** | | | | | | | |
| **Flight Support** **total** | **49.5/27** | | | | | | |
| 5. Safety | 1.5/2 | | | | | | |
| 6. Communications | 5.5/3 | | | | | | |
| 7. Instrument Navigation | 19.5/10 | | | | | | |
| 8. Familiarization Preparation | 10.0/6 | | | | | | |
| 9. Air Crew Coordination | 3.0/1 | | | | | | |
| 10. Airways Navigation Preparation | 4.0/3 | | | | | | |
| 11. Bailout Training | 3.0/1 | | | | | | |
| 12 .T-34C Familiarization | 3.0/1 | | | | | | |
| **Academic** **total** | **75.0/30** | | | | | | |
| 13. Meteorology | 10.0/5 | | | | | | |
| 14. Flight Information Publications | 14.0/9 | | | | | | |
| 15. Flight Planning | 16.0/6 | | | | | | |
| 16. T-34C Aircraft Systems | 16.0/1 | | | | | | |
| 17. T-34C NATOPS | 19.5/9 | | | | | | |

| 1= in. ctive | 2= somewhat ineffective | 3= adequate | 4= ly effective | 5= extremely effective | N/A= not applic. |
|---|---|---|---|---|---|

| B. Intermediate Phase (69 training days) | hours/events | 1 | 2 | 3 | 4 | 5 | N/A |
|---|---|---|---|---|---|---|---|
| **Flight time** total | **49.3/26** | | | | | | |
| 1. T-34C Airways Navigation Flights | 22.0/11 | | | | | | |
| 2. T-34C Visual Navigation Flights | 8.0/4 | | | | | | |
| 3. T-34C Airways/Visual Navigation Check Flight | 2.0/1 | | | | | | |
| 4. T-34C Formation Flights | 4.0/2 | | | | | | |
| 5. T-1A Airways Navigation Flights | 7.6/4 | | | | | | |
| 6. T-1A Airways/Visual Navigation Check Flight | 2.4/1 | | | | | | |
| 7. T-1A Low Level (Visual Navigation) Flights | 3.3/3 | | | | | | |
| **Simulators/Trainers** | | | | | | | |
| 8. Operational/Instrument navigation simulator 2B37/2C42 | **7.5/5** | | | | | | |
| **Flight Support/Academic** | | | | | | | |
| **Flight Support** total | **49.5/9** | | | | | | |
| 9. Instrument Navigation | 3.0/1 | | | | | | |
| 10. Aircrew Coordination | 4.5/6 | | | | | | |
| 11. Intermediate Airways Navigation Preparation | 1.0/1 | | | | | | |
| 12. Formation Preparation | 2.0/1 | | | | | | |
| **Academic** total | **51.0/26** | | | | | | |
| 13. Visual Navigation | 20.0/9 | | | | | | |
| 14. T-1A NATOPS | 22.0/13 | | | | | | |
| 15. T-1A Flight Preparation | 9.0/4 | | | | | | |

| | hours/events | 1 | 2 | 3 | 4 | 5 | N/A |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

| 1= in[illegible]ctive | 2= somewhat ineffective | 3= adequate | 4= [illegible]ly effective | 5= extremely effective | N/A= not applic[illegible] |
|---|---|---|---|---|---|

## C. Advanced Core Phase (51 training days)

| Flight Hours | total | 21.5/13 |
|---|---|---|
| 1. T-39N Airways Navigation Flights | | 6.9/3 |
| 2. Radar Navigation Flights | | 4.4/4 |
| 3. Low Level Flights | | 3.0/3 |
| 4. Strike Flights | | 7.2/3 |
| **Simulators/Trainers** | | |
| 5. Ground Mapping Radar Trainer (GMRT) | | **10.0/5** |
| **Flight Support/Academic** | | **107.0** |
| 6. NATOPS & Safety | | 27.0 |
| 7. T-39N Flight Preparation | | 18.0 |
| 8. Low-Level & Radar Planning | | 7.0 |
| 9. Low-Level & Radar Navigation | | 7.0 |
| 10.Turnpoint Procedures | | 7.0 |
| 11.Radar Systems | | 16.0 |
| 12.Aircraft Carrier Procedures | | 4.0 |
| 13.Strike Seminar | | 5.0 |
| 14.USN/USMC/USAF Fleet Brief | | 3.0 |
| 15.Instrument Ground School | | 13.0 |

## D. Advanced Strike Phase (14 training days)

| Flight Hours | |
|---|---|
| 1. T-39N Composite Strike Flights (mountain radar, threat reaction, etc.) | **9.8/4** |
| **Simulators/Trainers** | |
| 2. Ground Mapping Radar Trainer (mountain radar; terrain) | **8.0/4** |

| Flight support/Academic | hours/events | 1 | 2 | 3 | 4 | 5 | N/A |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

| 1= in. ctive | 2= somewhat ineffective | 3= adequate | 4= . ly effective | 5= extremely effective | N/A= not applica |
|---|---|---|---|---|---|

| | | |
|---|---|---|
| 3a. Flight support/Academic (Navy) | check to select ☐ | 6.0/ |
| 3b. Flight support/Academic (Air Force) | check to select ☐ | 9.0/ |

## E. Advanced Strike/Fighter (47 training days)

| Flight Hours | total | 16.8/13 |
|---|---|---|
| 1. T-39N Attack-Reattack Intercept Flights | 4.4/4 | |
| 2. T-39N Conversion Intercept Flights | | 5.2/4 |
| 3. T-39N Multiple Approach Flight | | 2.0/1 |
| 4. T-39N Unknown Intercept Flight | | 1.3/1 |
| 5. T-39N Advanced Intercept Flights | | 3.9/3 |

| Simulators/Trainers | |
|---|---|
| **Airborne Intercept Radar Trainer** | **33.0/22** |
| 6. Pursuit Intercepts | 7.5/5 |
| 7. Attack-Re-attack | 4.5/3 |
| 8. Conversion Intercepts | 7.5/5 |
| 9. Unknown Intercepts | 3.0/2 |
| 10. Advanced Intercepts | 4.5/3 |
| 11. Demonstration | 6.0/4 |

| | |
|---|---|
| **Flight support/Academic** | **53.0/** |
| 12. Intercept Procedures | 40.5 |
| 13. Air Intercept Radar | 2.5 |
| 14. Fighter Environment | 6.0 |
| 15. Professional Training | 4.0 |

| | hours/events | 1 | 2 | 3 | 4 | 5 | N/A |
|---|---|---|---|---|---|---|---|
| **F. Advanced Tactical Maneuvering (47 training days)** | | | | | | | |
| **Flight Hours** total | **16.9/12** | | | | | | |

| 1= in[illegible]ctive | 2= somewhat ineffective | 3= adequate | 4= [illegible]ly effective | 5= extremely effective | N/A= not applica[illegible] |
|---|---|---|---|---|---|

| | |
|---|---|
| 1. T-2C Familiarization Flights | 4.9/3 |
| 2. T-2C Tactical Low Level Flights | 4.2/3 |
| 3. T-2C Advanced Tactical Maneuvering Flights | 7.8/6 |
| **Simulators/Trainers** | |
| **T-2C Motion Trainer** | **13.5/9** |
| 4. Basic Instruments | 4.5/3 |
| 5. Radio Instruments | 4.5/3 |
| 6. Emergency Procedures | 3.0/2 |
| 7. Carrier Procedures | 1.5/1 |
| **Flight support/Academic** | **71.7/** |
| 8. Delayed Jet Water Survival | 24.0 |
| 9. NATOPS and Safety | 26.0 |
| 10. Advanced Tactical Maneuvering | 10.0 |
| 11. T-2 Emergency Procedures | 2.0 |
| 12. Basic Instrument Procedures | 5.7 |
| 13. Low-Level Procedures | 1.0 |
| 14. Section Low-Level Tactics | 3.0 |

| 1= in[illegible]ctive | 2= somewhat ineffective | 3= adequate | 4= [illegible]ly effective | 5= extremely effective | N/A= not applic[illegible] |
|---|---|---|---|---|---|

**B. For any training events above you rated as a "1" or "2", enter a sentence or two stating your reason(s).**

| Training Event No. | Comments |
|---|---|
| | |

| 1= in[illegible]ctive | 2= somewhat ineffective | 3= adequate | 4= [illegible]ly effective | 5= extremely effective | N/A= not applica[illegible] |
|---|---|---|---|---|---|

## IV. How Proficient Are MFOs When They Arrive at the FRS?

A. **Instructor/Staff**: Rate the relative competency in each area of the **average MFO** when received from flight training.
**Students**: Rate your own proficiency in each area. Use the scale above.

**Place an asterisk (*) next to any competency which can only be attained through actual flight hours (vice a simulator, etc).**

| | | | Proficiency Ratings | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Competency** | * | **Comments** | 1 | 2 | 3 | 4 | 5 | N/A |
| A. Safety | | | | | | | | |
| B. Point-to-Point Nav | | | | | | | | |
| C. Ground Mapping Radar | | | | | | | | |
| D. Instrument Nav | | | | | | | | |
| E. Visual Nav | | | | | | | | |
| F. Communications | | | | | | | | |
| G. Air-Air Radar | | | | | | | | |

**Place an asterisk (*) next to any competency which can only be attained through actual flight hours (vice a simulator, etc).**

| 1= in. .ctive | 2= somewhat ineffective | 3= adequate | 4= . .ly effective | 5= extremely effective | N/A= not applic. |
|---|---|---|---|---|---|

| Competency | * | Comments | Proficiency Ratings 1 | 2 | 3 | 4 | 5 | N/A |
|---|---|---|---|---|---|---|---|---|
| H. Co-pilot Duties | | | | | | | | |
| I. Situational Awareness | | | | | | | | |
| J. Crew Coordination | | | | | | | | |
| K. Adherence to flight policies & procedures | | | | | | | | |
| L. Mission Plan/Prep | | | | | | | | |
| M. Other (list) | | | | | | | | |

| 1= in[illegible]ctive | 2= somewhat ineffective | 3= adequate | 4= [illegible]ly effective | 5= extremely effective | N/A= not applic. |
|---|---|---|---|---|---|

**B. For any competencies above you rated as a "1" or "2", enter a sentence or two stating observed incompetencies.**

| Competency No. | Comments |
|---|---|
| | |

**V. If you could only make one change to the MFO curriculum, what would it be?**

_____

_____

_____

_____

_____

_____

_____

_____

_____

**VI. Training Changes Required Due To Emerging Technology and/or Changes to Mission Profiles** ***(What will MFOs have to do differently in 8-10 years, and how should training be changed to accommodate those tasks?)***

# Media Analysis Synopsis
# by Current Curriculum

## I. PRIMARY

### FLIGHT TRAINING

| STAGE | SYMBOL | EVENTS | HRS | TOTAL HOURS | RECOMMENDATIONS |
|---|---|---|---|---|---|
| T-34C Familiarization | FAM | 8 **(5)** | 2.0* | 14.5 **(10)** | **DELETE 3 FLIGHTS** (I-1) |
| T-34C Airways Navigation | ANAV | 4 | 2 | 8.0 | |
| TOTALS | | 12 **(9)** | | 22.5 **(18)** | |

* FAM 1, 2, and 7 are 1.5 hours vice 2.0.

### SIMULATORS/TRAINERS

| STAGE | SYMBOL | EVENTS | HOURS | TOTAL HOURS | |
|---|---|---|---|---|---|
| 2B37 Cockpit Proc Trainer | CPT | 3 | 1.5 | 4.5 | |
| 2B37 Instrument Nav Sim | OFT | 4 | 1.5 | 6.0 | |
| **2B47 Inst. Nav Trainer**** | **XX** | 8 | 2.0* | 15.0 | **MODIFY SIMULATOR** (I-2) |
| **COTS Comm Practice** | **CP** | **2** | **1.5** | **3.0** | **ADD** (I-3) |
| TOTALS | | 15 **(17)** | | 25.5 **(28.5)** | |

* TP 0 is 1.0 hours vice 2.0; ** **Modified Communications/Navigation/Visual/Situation Awareness Simulator**

### FLIGHT SUPPORT

| SUBJECT | SYMBOL | PERIODS | TOT HRS | PRESENT MEDIA | **RECOMMENDED MEDIA (by exception)** |
|---|---|---|---|---|---|
| Safety | SAF | 1 | 1.0 | EC/CAI | |

CR = Classroom; EC = Electronic Classroom; CAI = Computer Assisted Instruction; ICW = Interactive Courseware; CBT = Computer-Based Training; COTS = Commercial-Off-The-Shelf software; Sim = Simulator; PP = PowerPoint.

| | | | | | |
|---|---|---|---|---|---|
| Communications | COMM | 3 | 5.5 | EC/PP | **5.5 HRS ICW/COTS** (I-4) |
| Instrument Nav | BINAV | 10 | 16.5 | CR/COTS | **ICW/COTS** (I-5) |
| Familiarization Prep | FAMP | 6 | 10.0 | EC/PP/ICW | |
| Air Crew Coord | ACT | 1 **(2)** | 3.0 **(5)** | EC/PP/Videos | |
| Airways Nav Prep | ANP | 3 **(0)** | 4.5 **(0)** | Sim | **DELETE 3 SIMS** (I-6) |
| Bailout Training | BOT | 1 | 3.0 | Bailout Trainer | |
| T-34C Fam | FAM-0 | 1 | 3.0 | Static T-34 | |
| Radio Instrument Nav Practice | RIOT | 3 | 3.0 | ICW Lab | |
| Totals | | 27 **(25)** | 49.5 **(47)** | | |

ACADEMIC

| SUBJECT | SYMBOL | PERIODS | TOT HRS | PRESENT MEDIA | **RECOMMENDED MEDIA (by exception)** |
|---|---|---|---|---|---|
| Meteorology | MET | 5 | 10.0 | EC/PP | **ICW** (I-7) |
| Flight Info Pubs | FLIP | 9 | 14.0 | ICW (anticipated) | |
| Flight Planning | FPLN | 6 | 16.0 | EC/PP | **ICW** (I-8) |
| T-34C Aircraft Sys | NAMO | 1 | 16.0 | CR/Panel Trainer | |
| T-34C NATOPS | NATOPS | 9 | 19.5 | EC/PP | **19.5 HRS OF CBT** (I-9) |
| **Info Management** | **INFO** | **7** | **14.0** | | **UNIVERSITY (INTERACTIVE TV)** |
| TOTALS | | 30 | 75.5 **(89.5)** | | |

ADMINISTRATIVE

| SUBJECT | SYMBOL | PERIODS | TOTAL HOURS |
|---|---|---|---|
| Student Check-In | ADM | 15 | 13.1 |
| Simulator Indoctrination | ADM | 1 | 1.0 |
| Primary Grad and Checkout | ADM | 1 | 0.5 |

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| | | | |
|---|---|---|---|
| TOTALS | 17 | 14.6 | |

## II. INTERMEDIATE

**RECOMMENDATIONS**

T-34C FLIGHT TRAINING

| STAGE | SYMBOL | EVENTS | HRS | TOTAL HOURS | |
|---|---|---|---|---|---|
| T-34C ANAV/VNAV Chk | AVX | 1 | 2.0 | 2.0 | |
| T-34C Visual Nav | VNAV | 4 | 2.0 | 8.0 | |
| T-34C Formation | FORM | 2 | 2.0 | 4.0 | |
| T-34C Airways Nav | ANAV | 11 **(9)** | 2.0 | 22.0 **(18)** | **DELETE 2 FLIGHTS** (II-1) |
| TOTALS | | 18 **(16)** | | 36.0 **(32)** | |

T-1A FLIGHT TRAINING

| STAGE | SYMBOL | EVENTS | HRS | TOTAL HOURS |
|---|---|---|---|---|
| T-1A Airways Nav | ANAV | 4 | 1.5* | 7.6 |
| T-1A Low Level (Vis Nav) | VNAV | 3 | 1.1 | 3.3 |
| T-1A ANAV/VNAV. Check | AVX | 1 | 2.4 | 2.4 |
| TOTALS | | 8 | | 13.3 |

* ANAV 18 & 19 are 2.3 hours vice 1.5.

SIMULATORS

| STAGE | SYMBOL | EVENTS | HRS | TOTAL HOURS | |
|---|---|---|---|---|---|
| 2B37 Op Flight Trainer | OFT | 1 **(0)** | 1.5 | 1.5 **(0)** | **DELETE 1 SIM EVENT** (II-2) |
| 2B37 Instrument Nav. Sim | INAV | 4 | 1.5 | 6.0 | **REWRITE TO OFT's** (II-3) |
| **XXX ANAV Simulator** | **AAA** | **2** | **1.5** | **3.0** | **ADD 2 ANAV SIM EVENTS** (II-4) |
| **XXX VNAV Simulator** | **VVV** | **3** | **1.5** | **4.5** | **ADD 3 VNAV SIM EVENTS** (II-5) |

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| | | |
|---|---|---|
| TOTALS | 5 **(9)** | 7.5 **(13.5)** |

FLIGHT SUPPORT

| SUBJECT | SYMBOL | PERIODS | HRS | PRESENT MEDIA | **RECOMMENDED MEDIA (by exception)** |
|---|---|---|---|---|---|
| Instrument Nav Prep | INP | 1 | 3.0 | EC/PP | |
| Aircrew Coordination | ACT | 6 | 4.5 | EC/PP/Videos | |
| Intermediate Airways NAV Preparation | IANP | 1 | 1.0 | EC/PP | |
| Form Preparation | FMP | 1 | 2.0 | EC/PP | |
| TOTALS | | 9 | 10.5 | | |

ACADEMIC

| SUBJECT | SYMBOL | PERIODS | HRS | PRESENT MEDIA | **RECOMMENDED MEDIA (by exception)** |
|---|---|---|---|---|---|
| Visual Navigation | VN | 9 | 20.0 | EC/PP | **EC/CAI; MOVE TO LATER TIME** (II-6) |
| T-1A NATOPS | NATOPS | 13 | 22.0 | EC/PP | **22 HRS OF CBT** (II-7) |
| T-1A Flight Preparation | FP | 4 | 9.0 | EC/PP | |
| TOTALS | | 26 | 51.0 | | |

ADMINISTRATIVE

| SUBJECT | SYMBOL | PERIODS | HOURS |
|---|---|---|---|
| Graduation, Winging, Check-out | ADM | 1 | 2.0 |
| **TOTALS** | | **1** | **2.0** |

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## III. ADVANCED CORE

**RECOMMENDATIONS**

FLIGHT TRAINING

| STAGE | SYMBOL | TOTAL FLIGHTS | TOTAL HOURS |
|---|---|---|---|
| T-39N Low-Level | LL | 3 | 3.0 |
| T-39N Radar Nav | RN | 4 | 4.4 |
| T-39N Airways Nav | AN | 3 | 6.9 |
| T-39N Strike | STK | 3 | 7.2 |
| TOTALS | | 13 | *21.5 |

SIMULATOR TRAINING

| STAGE | SYMBOL | EVENTS | HOURS | |
|---|---|---|---|---|
| Radar Synthetic Trainer | RST | 5 | 10.0 | **ADD INSTRUMENTS** (III-1) |
| TOTALS | | 5 | 10.0 | |

FLIGHT SUPPORT/ACADEMICS/ADMIN

| STAGE | SYMBOL | HOURS | PRESENT MEDIA | **RECOMMENDED MEDIA (by exception)** |
|---|---|---|---|---|
| Welcome Aboard/Check-in | ADM | 7.0 | CR | |
| NATOPS and Safety | NS | 27.0 | EC/PP | **27 HRS OF CBT** (III-2) |
| T-39N Flight Preparation | PREP | 18.0 | EC/PP | **ICW** (III-3) |
| Low-Level and Radar Plan | LL/RP | 7.0 | EC/PP | **ADD CAI** (III-4) |
| Low-Level and Radar Nav | LL/RN | 7.0 | EC/PP | **ADD CAI** (III-5) |
| Turnpoint Procedures | TPP | 7.0 | EC/PP | **ICW** (III-6) |
| Radar Systems | RS | 16.0 | ICW (anticipated) | |

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## OPNAV/NAVAIR SURVEY EXCERPTS

### OPNAV

In addition to the two sets of comments below, the P-3, ES-3 and E2-C communities had comments that were less germane to the TW-6 curriculum. Other germane comments included concern for MFO information overload and operations within a joint theater scenario. The comments below are direct transcriptions from the survey.

#### General Comments: F/A-18 E/F/D

Basic NFO training needs to ensure that the graduates have mastered situational awareness of the technology so the FRS can begin to provide the training that will give the NFO situational awareness of the tactical picture.

You do not get experience without getting experience; there is no substitute for actual experience: flight time. The more flight time in whatever aircraft is most cost effective is better that less flight time.

Optimum training would include;

1. Train student to solo aircraft and become proficient at soloing. The student would also receive basic IFR theory and ground school.
2. Upgrade student to a more maneuverable, faster aircraft (T34C/T60 for the following training:
   a. Some flight time
   b. Participate/control dynamic maneuver
   c. VFR/IFR navigation
   d. Operate under "G" load
3. Learn advanced air skills in multi-place aircraft
   a. Intercepts
   b. GPS/moving map/approaches
   c. Air to Ground work
   d. Maneuver and perform skills at least at 3 up to 4 "G"s
   e. Use a visual system such as FLM

Additional thoughts:

- NFO's with a private pilot license is better than one without one (better situational awareness)
- To train the radar mission requires an aircraft with a speed of 500+ kts.
- Basic air skills can be accomplished in Cessna 152/172 aircraft - approach speeds can be close to military aircraft
- Advanced Tactical training can only be accomplished in military aircraft

Teach the basics of navigation before introducing GPS/Moving map so the student has a MI understanding of the theory. Teach GPS/Moving map before student gets to FRS so the student can concentrate on learning tactics.

Introduce both visual and GPS targeting training before the FRS

Introduce night vision goggles-just a show and tell session, to get the student time to thinking about how they will use the technology in the fleet.

TBN700 commercial aircraft would be good/cheap for use as a trainer Dual comm/nav is a must for basic training (T-34 is equipped).

**General Comments: EA-6B**

1. Basic NFO training should include the following:
   a. Visual and airways navigation to ensure, development of a good instrument/environment scan.
   b. ICAO and foreign airspace procedures
   c. Private pilot license for those going to jet aircraft
   d. Basic communication skills (phraseology and actually talking on the radio)
   f. Navigation basics to enable the NFO to function when all of the new technology instruments become unavailable on a mission.
   g. Operational risk management to give the NFO the background to be able to determine when it is prudent to say "no" to going on a mission.
   h. Student NFOs destined for jet aircraft should gtt additional training as follows:
      1) Embedded navigation solutions
      2) Degraded navigation solutions
      3) Section work
      4) Mission planning
      5) Moving maps
   i. Another school needs to be added fbr EA-6B NFOs before the RAG to teach standoff/defense electronic countermeasures (jamming/protection)
2. Currently it takes a NFO 1 year at the squadron to become proficient
3. A trainer is needed to provide practice/proficiency in basic mission planning.
4. NFOs learn more about their aircraft when they take it cross country and are responsible for the whole aircraft rather than taking it back to home base where there is a full support team to take care of the aircraft.
5. Pooling of students is detrimental to learning, Training needs to be condensed so students do not forget between learning experiences or flights.

## NAVAIR CLASS DESKS

### F-14

The NFO is not technically a co-pilot but does function in many capacities as a co-pilot. NFO's in these aircraft have full instrumentation and are the primary navigator, weapons system operator and communicator. The presence of the NFO with his instrumentation and scan allows the pilot to make approaches utilizing the approach minimums for dual piloted aircraft.

Their responsibilities include: 1. Navigation 2. Safety of flight 3. Mission commander 4. Sensor operator 5. Weapons expert. CTW-6 teaches these students dead reckoning, tacan navigation, point to points, airways nav, low level visual nav and radar navigation. Safety of flight is always the top priority, not just at CTW-6, but throughout NavAir. This is made crystal clear to the students before their first event and throughout the training syllabi. The wing prepares students to become Mission Commanders and Tactical Coordinators by checking performance under pressure and in a multiple task environment which requires task prioritization. The F- 1 4 Radar Intercept Officer's (RIO) job is centered around the very powerful air to air radar of the Tomcat. The strike core syllabus introduces the students to the radar in a air to ground mode the Strike Fighter syllabus focuses on the air to air intercept procedures. To become a weapons expert takes many hours of dedicated study. The RTU focuses on this by teaching one weapon at a time and actually flying with and dropping these weapons as teaching aids.

Mission profiles include: 1. Tactical and post strike recce 2. Air to air intercepts 3. Air to ground strike. CTW-6 does not train to specific missions. However, many of the tasks taught have a direct correlation to a mission, and will be done repeatedly throughout a NFO's career. Low level,, Radar Nav and air to air intercept procedures are the backbone upon which the FRS will build its tactical platform oriented instruction.

Avionics in use by the NFO in the F- 1 4 are: 1. Air to air radar 2. LANTERN (laser designation pod). The Strike fighter syllabus is built around teaching the Air to air radar and intercept procedures. The F- 1 4 is the only platform to carry the LANTHZN pod so it is left up to the F-14 FRS to teach. Besides the T-2 nor the T-39 have hard points to mount a LANTHZN pod. A CBT for LANTHZN could be developed for as self study course, but it would have to be classified. It could even be added into the CNATRA syllabus.

Comm and Nav in the F-14: 1. Secure comm 2. GPS 3. INS 4. Night Vision Goggles (NVGs). CTW-6 currently trains students in comms as a special interest area. The only action required for secure comms vice clear comms is the fl' of a switch and waiting for a tone then speak as normal.

GPS will be installed in all CTW-6 aircraft by the year 2000 to meet the requirement by the FAA. It will be integrated into the training, especially in the advanced stage, although it is not yet certain to what degree the system will be utilized in the syllabus. INS is not in any CTW-6 aircraft and there are no plans to purchase a system. It would be redundant with the GP S. The INS does all the navigating for NFO. Any training that could be done would be box specific and the navy has no one size fits all INS interface. In order to introduce Night Vision Goggles (NVGS) the cockpit lighting of the T-39 or T-2 would have to be completely reconfigured to be compatible with N-VGS. Again there is a lot of room available for self paced CBT. This could be either required by syllabus or "professional development".

Other: This community very much wants students trained in high "g7" fast-moving aircraft. SA and strong airmanship skills are also emphasized to create a strong team

concept between pilot and RIO. The expanding role of the Tomcat into the air to ground arena has created much concern over how to deal with crew coordination issues.

**E-2C**

The NFO is not responsible as a co-pilot. NFO's in this aircraft never see the flight deck. They are, however, trained under the super FO program which starts the students off in the front seat of a T-34 and basically follows a pilot training track to the point of soloing. The E-2 NFO is the only NFO to complete the Intermediate phase of flight training before being selected and sent directly to the FRS. There is a move afoot to put an NFO into the cockpit replacing the co-pilot.

Their responsibilities include: 1. Mission commander 4. Airborne data fusion/Battlefield management expert. The wing prepares students to become Mission Commanders and Tactical Coordinators by checking performance under pressure and in a multiple task environment which requires task prioritization. The E-2 provides the NFO with a "god's eye view" of the battlefield. The NFO must be a master communicator as well as a tactical expert and a technical systems specialist. The training received at Trawing 6 gives these individuals the exposure to what the tactical aircrew is experiencing.

Mission profiles include: 1. Take-off, proceed to station, orbit and return to base. The NFO can monitor the flight and navigation information. But this is considered the job of the co-pilot while the mission is the job of the NFO. This mission is peculiar to the E-2 and therefore is the responsibility of the FRS.

Avionics in use by the NFO in the E-2 are: 1. Air to air radar 2. Air to ground radar 3. Nose mounted Infra-Red 4. Data link gear. The radar or the E-2 is selectable between air to ground and air to air. The skills required are that of seeing a contact and assigning another aircraft to go inspect, or advising aircraft of other airborne traffic. Operation of data link gear is aircraft specific. A self study CBT could be developed for general Infra-Red knowledge, but it would have to be classified. There a place for self paced non requirement CBT. It would be called Professional Development.

Comm and Nav in the E-2: 1. Satcomm 2. HF comm 3. Secure comm 4. GPS. CTW-6 teaches only UHF comms. Comm is comm, however the boxes are different for each aircraft. Teaching Satcomm, HF comm and secure comm is not required, it only takes one demonstration with the actual aircraft radio CTW-6 currently trains students in comms as a special interest area. The only action required to speak in secure comms vice clear voice is the flip of a switch and waiting for a tone then speak as normal. The NFO in the E-2 really is not concerned about self navigation. GPS will be installed in all CTW-6 aircraft by the year 2000 to meet the requirement by the FAA. But will not be available for student instruction in the primary phase and very limited training in the intermediate phase.

**P-3/EP-3**

The NFO is not responsible as a co-pilot. NFO's in this aircraft never see the flight deck. They are, however, trained under the super FO program which starts the students off in

the front seat of a T-34 and basically follows the pilot training track to the point of soloing.

Their responsibilities include: 1. Navigation 2. Safety of flight and 3. Mission commander. CTW-6 Introduces them to the basics of dead reckoning, tacan navigation and point-to-points. Heavy table navigation training is conducted at Randolph AFB. Safety of flight is the top priority and it is made crystal clear to the students before they're first event. Mission Commander training occurs **in** the fleet squadron. It is a qualification that is completely aircraft specific and takes I to 2 years fleet time to qualify.

Mission profiles include: 1. Anti-surface and subsurface warfare 2. Littoral amphibious support 3. Mining 4. Overland surveillance 5. Maritime support 6. Counter drug interdiction. CTW-6 does not train to specific missions especially at this phase of training. The T-34 is the aircraft it's limitations must be considered. It is basic flight training and the student has more than he can handle just with Aviate, Navigate and Communicate. Mission profiles are the reason for the FRS.

Avionics in use by the NFO **in** the P-3 are: 1. Surface radar 2. Air to air radar 3. ISAR (Inverse Synthetic Appiture Radar) 4. Electro-optic sensors 5. IRDS (Infra-red Detection System). Again because these students only go through primary at CTW-6 and fly in the T-34 there is no radar training. Surface and air to air radar could be introduced in a post selection class and simulator tour. However this would not be part of the official syllabi. The ISAR requires special training in interpretation, because it will zoom in on a target and the operator can ID the class of ship, not just that it is a ship . This is taught at NATTC Cory Station. Electro-optic sensors and IRDS are general terms these exact systems may be classified and are taught at the FRS in conjunction with their integration with specific tactics.

Comm and Nav in the P-3: 1. Satcomm 2. BF comm 3. Secure comm 4. GPS 5. INS 6. JPALS 7.JMCIS. CTW-6 teaches UET comm. Comm is comm, however the boxes are different for each aircraft. Teaching satcomm, HF comm and secure comm is not required, it only takes one demonstration with the actual aircraft radio. The T-34 is not equipped with GPS or INS. There is no plan to introduce INS or GPS into the Primary phase , however The aircraft are currently being fitted with GPS. The thought is the students need to be able to navigate via the basics before moving on to the more advanced systems. This will allow the mission to be completed even with extreme system failures.

**Excerpt from the EP-3/ES-3 Desk (PMA-205-2H)**

There are broader issues, however, regarding the NFO training pipeline for theEP-3E aircrew. The EP-3F is tasked with collection and fusing near real time signals intelligence for relay to tactical aircraft in support of Battle Group Operations. In that role, the NFO - when qualified as a Senior Mission Evaluator - functions as the single point of data fusion and dissemination. To effectively support single and dual seat tactical aircraft, it is most important an NFO has a complete and thorough understanding of the task loading placed upon these tactical aircrew. To gain that understanding and familiarity, the current NFO

training pipeline for P-3TMS aircrew is inadequate. The winged NFO product of the TN/OJN pipeline is far more able to
understand and support the data timeliness needs of a tactical Naval aircraft than is a P3 pipeline NFO. Therefore, I believe we should fully investigate changing the EP-3E pipeline from the P-3 NFO training pipeline to the I'NlOj7Vpipeline (or a modified version thereof. We are ultimately training Mission Evaluators (not P-3 Navigators) for the EP-3E platform. That training should begin as early as possible-the primary/intermediate/advanced NFO training curriculum.

Separately, the current P-3 NFO pipeline includes the Air Force undergraduate navigator training program at Randolph AFB. This program has been repeatedly identified as inadequate. If we cannot reorient the EP-3E NFO pipeline to reflect the training for TN/OJN trainees, at a minimum, the Randolph AFB training should be relocated to VP-30 in NAS Jacksonville - in a tailored VQ EP-3E syllabus. The VT-10 syllabus should be increased to allow additional flight time/navigation training in the primary platform (T-34/JPATS) and the pipeline should include a limited flight syllabus in a VT-86 style 'fast mover" (T-2, TA-4 or T-45) for training in higher speed mission tasking/loading. Winging at JIP-30 would follow for advanced primary flight training.

Certainly with the advent of more advanced navigation tools in the EP-3E I P-3 platforms, the need for celestial navigation has been eliminated. It should be eliminated from all training pipelines. In reality the need for a navigator NFO is also obsolete. EP-3E NFOs should be trained in the flight syllabus for their ultimate role in mission evaluator. A broad understanding of tactical aircraft capabilities and mission loading, very thorough DR navigation procedures, full understanding of inertial and GPS navigation principles and practice, and the myriad other vital training that makes a Naval Flight Officer qualified to wear wings of gold are all necessary to produce the final end product required by the EP-3E platform.

As there is no FRS for the EP-3E, I strongly recommend your investigation be continued at two additional locations. Specifically, the VQ Single Site Training (SST) conducted by FASOTRA GRUPAC det Whidbey Island is the final training stop prior to fleet accession, Our NFOs however are not qualified in any position upon arrival at a fleet squadron. The bulk of their Navigator training occurs on the back of two operational squadrons VQ-1 and VQ-2. I recommend a visit to VQ-1 in Whidbey Island to validate the other requirements needed out of the training pipeline for NFOs in the EP-3E.

**E6-A**

The NFO is not responsible as a co-pilot. NFO's in this aircraft never see the flight deck. They are, however, trained under the super FO program which starts the students off in the front seat of a T-34 and basically follows the pilot training track to the point of soloing.

Their responsibilities include: 1. Navigation 2. Station keeping. CTW-6 Introduces them to the basics of dead reckoning, tacan navigation and point-to-points. Heavy table

navigation training, is conducted at Randolph AFB. Station keeping is a function of navigation, basically orbiting between two points.

Mission profiles include: 1. VLF (very low Frequency) relay (comms) 2. Airborne Command Post (comms) 3. Tactical Support. CTW-6 does not train to specific missions especially at this phase of training (primary). The T-34 limitations must be taken into consideration. It is basic flight training and the student has more than he can handle with only Aviate, Navigate and Communicate. Mission profiles are the reason for the FRS.

Avionics 'in use by the NFO in the E-6A are: 1. Air to air radar 2. Clear and secure comms 3. GPS 4. ESM (Electronic Surveillance Measuring) equipment. Again because these students only go through primary at CTW6 and fly in the T-34 there is no radar training. Air to air radar could be introduced as a post-selection class and simulator tour in conjunction with the P-3 selectees. However this could not be part of the official syllabi. GPS is being fitted into the T-34 to meet FAA requirements, however there is no plan to allow students in the primary phase to utilize it. CTW-6 currently trains students in comms as a special interest area. The only action required for secure comms vice clear voice is the flip of a switch, then for a tone and speak as normal. ESM is currently taught at Corry station.

S-3B

The NFO is not technically a co-pilot but does function in many capacities as a co-pilot. NFO's in these aircraft have fall instrumentation and are the primary navigator, weapons system operator and communicator. The presence of the NFO with his instrumentation and scan allows the pilot to make approaches utilizing the approach minimums for dual piloted aircraft.

Their responsibilities include: 1. Navigation 2. Safety of flight 3. Mission commander 4. Tactical Coordinator S. Weapons expert. CTW-6 teaches these students dead reckoning, tacan navigation, point-to-points, airways nav, low level visual nav and radar navigation. Safety of flight is always the top priority, not just at CTW-6, but throughout NavAir. This is made crystal clear to the students before their first event and throughout the training syllabi. The wing prepares students to become Mission Commanders and Tactical Coordinators by checking performance under pressure and in a mult' le task environment which requires task prioritization. To become a IP weapons expert takes many hours of dedicated study. The RTU focuses on this by teaching one weapon at a time and actually flying with and dropping these weapons as teaching aids.

Mission profiles include: 1. Precision surveillance 2. Aerial refueling 3. ,Anti surface and subsurface warfare 4. Precision strike targeting. CTW-6 does not train to specific missions. However, many of the tasks taught have a direct correlation to a mission, and will be done repeatedly throughout a NFO's career. Low level and Radar Nav will be utilized in conjunction with the tactics that the RTU teaches to accomplish these missions. Mission profiles are the reason for the FRS. Surveillance and refueling require holding between given points. Strike targeting may require low level or radar

navigation to get established, then the NFO must utilize aircraft specific equipment to complete the mission. Surface and subsurface warfare is tactically driven therefore taught, in the FRS.

Avionics in use by the NFO in the S-3B are: 1. Surface search radar (ISAR and SAR) 2. Electronic Surveillance Measuring (ESM) Equipment 3. Ground Proximity Warning System (GPWS). Air to ground radar is taught in Strike core. The actual operation of the SAR and ISAR radar is very similar to any other radar but the interpretation requires special training to correctly identify ships. This training is accomplished at NATTC Corry station. ESM requires specialized training currently taught at Corry station.

The S-3's GPWS is unique to the aircraft and therefore is not specifically addressed by the NFO curriculum. However, the T-1 has its own version of a GPWS where students at least gain some exposure to "bitching Betty".

Comm and Nav in the S-3B: 1. Secure comm 2. GPS 3. INS. CTW-6 currently trains students in comms as a special interest area. The only action required for secure comms vice clear comms is the flip of a switch and waiting for a tone and speak as normal. GPS will be installed in all CTW-6 aircraft by the year 2000 to meet the requirement by the FAA. It will be integrated into the training, especially in the advanced stage, although it is not yet certain to what degree the system will be utilized. INS is not in any CTW-6 aircraft and there are no plans to purchase a system. It would be redundant with the GPS. The INS does all the navigating for the NFO. Any training that could be done would be box specific and the navy has no one size fits all INS interface.

**F/A-18**

The NFO is not technically a co-pilot but does function in many capacities as a co-pi 'lot. NFO's in this aircraft have full instrumentation and are the primary navigator, weapons systems operator and communicator. The presence of the NFO with his instrumentation and scan allows the pilot to make approaches utilizing the approach minimums for dual piloted aircraft.

Their responsibilities include: 1. Navigation 2. Safety of flight 3. Mission commander 4. Sensor operator 5. Weapons expert. CTW-6 teaches these students dead reckoning, tacan navigation, point-to-points, airways nav, low level visual nav and radar navigation. Safety of flight is always the top priority, not just at CTW-6, but throughout NavAir. This is made crystal clear to the students before their first event and through out the training syllabus. The wing prepares students to become Mission Commanders and Tactical Coordinators by checking performance under pressure and in a multiple task environment which requires task prioritization. The F/A-1 8 is a very complex aircraft with many systems mostly centered around a very flexible air to air and air to ground radar. This is the focus of the Strike core and the Strike fighter syllabus. To become a weapons expert takes many hours of dedicated study. The RTU focuses on this by teaching one weapon at a time then actually flying with and dropping these weapons as teaching aids.

Mission profiles include: 1. Tactical recce 2. Forward air control 3. Tactical air control 4. Precision strike 5. Close air support. CTW-6 does not train to specific missions. However, many of the tasks taught have a direct correlation to a mission,- and will be done repeatedly throughout a NFO's career. Low level and Radar Nav will be utilized in conjunction with the tactics that the RTU teaches to accomplish these missions. Mission profiles are the reason for the FRS.

Avionics in use by the NFO in the F/A- 1 8 are: 1. Air to air radar 2. Air to ground radar 3. FLIR (Forward Looking Infra-Red) 4. Laser 5. Night vision goggles (NVGs). Air to ground radar is taught in Strike core. The Strike fighter syllabus is built around teaching the Air to air radar and intercept procedures. No other platform has FLIR or Laser capabilities so that is passed on to the RTU to teach. Besides the T-2 nor the T-39 have hard points to mount a FLIR or a Laser pod. A CBT Could be developed as a self study course, but it would have to be classified. In order to introduce

Night Vision Goggles (NVGS) the cockpit lighting of the T-39 or T-2 would have to be completely reconfigured to be compatible with NVGS. Again there is a lot of room available for self paced non-requirement CBT. It would be called Professional Development.

Comm and Nav in the F/A-1 8: 1. Secure comm 2. GPS 3. INS. CTW-6 currently trains students **in** comms as a special interest area. The only required action to utilize secure comms vice clear voice is the flip of a switch then waiting for a tone and speaking as normal. GPS will be installed in all CTW-6 aircraft by the year 2000 to meet the requirement by the FAA. It will be integrated into the training, especially in the advanced stage. Although it is not certain to what degree the system will be utilized for training. INS is not in any CTW-6 aircraft and there are no plans to purchase a system. It would be redundant with the GPS. The INS/GPS does all the navigating for the NFO. Any training that could be done would be box specific and the navy has no one size fits all INS/GPS interface.

Other: This community very much wants students trained in high "g7" fast-moving aircraft. SA and strong airmanship skills are also emphasized to create a strong team concept between pilot and WSO.

**EA-6B**

The NFO is not technically a co-pilot but does function in many capacities as a co-pi 'lot. NFO's in this aircraft have full instrumentation and are the primary navigator, weapons systems operator and communicator. The presence of the NFO with his instrumentation and scan allows the pilot to make approaches utilizing the approach minimums for dual piloted aircraft.

Their responsibilities include: 1. Navigation 2. Safety of flight 3. Mission commander 4. Sensor operator 5. Weapons expert. CTW-6 teaches these students dead reckoning, tacan navigation, point-to-points, airways nav, low level visual nav and radar navigation. Safety of flight is always the top priority, not just at CTW-6, but throughout NavAir.

This is made crystal clear to the students before their first event and through out the training syllabus. The wing prepares students to become Mission Commanders and Tactical Coordinators by checking performance under pressure and in a multiple task environment which requires task prioritization. The EA-6B is a very complex aircraft with many systems mostly centered around a very complex electronic surveillance and jamming system. Upon completion of the CTW-6 syllabus the students the spend 3 months at NATTC Cory Station to team electronic signal detection. To become a weapons expert takes many hours of dedicated study. The RTU focuses on this by teaching the HARM then actually flying with it while executing a variety of electronic exercises against actual signals received by the aircraft.

Mission profiles include: 1. Standoff HARM delivery 2. Escort jammer 3. Data link receiver. CTW-6 does not train to specific missions. However, many of the tasks taught have a direct correlation to a mission, and will be done repeatedly throughout a NFO's career. Low level and Radar Nav will be utilized **in** conjunction with the tactics that the RTU teaches to accomplish the escort jammer role. HARM delivery data link abilities are taught at the FRS with the a/c specific boxes.

Avionics in use by the NFO in the EA-6B are: 1. Air to ground radar 2. INS/GPS 3. Data links 4. Secure comms. Air to ground radar is taught in Strike core. All CTW-6 aircraft will be upgraded with a GPS system to meet FAA requirements by year 2000. The advanced phase will be teaching GPS approaches but it is still undecided how much more information the student will be allowed to get from the system. There is no intention to obtain INS for CTW-6 a/c, it would be redundant. However, if the wing could obtain

the software that the EA-6B wing uses to teach their INS/GPS and any other unclass system the studs could get a jump on reviewing the systems during their stash time after winging. It would be called Professional Development. CTW-6 currently trains students in comms as a special interest area. The only required action to utilize secure comms vice clear voice is the fl' of a IP switch then waiting for a tone and speaking as normal.

Other: This community very much wants students trained in high "g' fast moving aircraft. Thorough mission planning is also a concern with the addition of increasing abilities via data link, integrated comm jammer, increased jamming radar capabilities and HAVQUICK. Missions must be thoroughly planned in order to fully utilize the capabilities of the Prowler. SA and strong airmanship skills are also emphasized to create a strong team concept between pilot and ECMO. Pooling of students between the end of flight training and beginning the FRS is detrimental to good SA and strong airmanship skills.

# Military Flight Officer-Related Aircraft Configuration Survey

## OPNAV N889F5
## NAVAIR Class Desks

### I. Respondent Information

A. Name _____

B. Title and code _____

### II. Aircraft Inventory

A. List all MFO-related aircraft that will be in service. Enter the number of aircraft expected in the fleet each year.

| Aircraft | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|
| F-14A | | | | | | | | |
| F-14B | | | | | | | | |
| F-14D | | | | | | | | |
| F/A-18C | | | | | | | | |
| F/A-18E | | | | | | | | |
| F/A-18F | | | | | | | | |
| P-3 | | | | | | | | |
| EP-3 | | | | | | | | |
| E-6A | | | | | | | | |
| E-2C | | | | | | | | |
| S-3B | | | | | | | | |
| EA-6B | | | | | | | | |
| T-6 | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

B. Comments.

### III. MFO Manning

List the number of MFOs in each community by year.

**Number of MFOs**

| Aircraft | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|
| F-14A | | | | | | | | |
| F-14B | | | | | | | | |
| F-14D | | | | | | | | |
| F/A-18C | | | | | | | | |
| F/A-18E | | | | | | | | |
| F/A-18F | | | | | | | | |
| P-3 | | | | | | | | |
| EP-3 | | | | | | | | |
| E-6A | | | | | | | | |
| E-2C | | | | | | | | |
| S-3B | | | | | | | | |
| EA-6B | | | | | | | | |
| T-6 | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

Comments:

## IV. New/Modified Aircraft Configurations

A. Complete the following section for all **new aircraft** and **substantially modified aircraft** listed in IA. Use additional sheets as required.

1. Aircraft performance measures.
   a. Max speed _____
   b. MFO required to co-pilot? Yes ☐ No ☐
   c. MFO responsible for in-flight aircraft control? Yes☐ No☐
   d. What are aircrew coordination responsibilities of MFO?

2. Aircraft mission profiles. *Provide a brief description of the anticipated mission profiles for each aircraft.*

3. Technology considerations. *Of special interest are new systems that may require new or advanced skills on the part of MFOs. Please provide a brief description below, and details as a separate attachment.*

a. Avionics

1) Radar

2) Com/Nav

3) Other avionics systems

b. Flight Controls

c. Other Systems

4. High speed considerations.

5. Training systems acquisition. *List any training, simulators, trainers or instructional aids acquired with new platforms.*

B. Comments.

## V. Modifications of MFO Job Characteristics

Modification(s) of special interest are modified mission profiles that may require different job characteristics on the part of MFOs.

# INSTRUCTOR'S UTILIZATION HANDBOOK

DEVICE 2B37A

T-34C FLIGHT INSTRUMENT TRAINER

NFO CONFIGURATION

INSTRUCTOR'S UTILIZATION HANDBOOK

DEVICE 2B37A

T-34C FLIGHT INSTRUMENT TRAINER

NFO CONFIGURATION

## 1-1. PURPOSE OF THE TRAINER

a. Device 2B37 is a Flight Instrument Trainer (FIT) for the T-34C aircraft. It provides a means for training and evaluating pilots in familiarization, instrument flying, and normal and emergency procedures.

b. As a Flight Instrument Trainer (FIT), the device minimized in-flight training time while providing the necessary cockpit familiarization and ground training for pilots undergoing basic training or pilots transitioning to the T-34C aircraft. It may also be used by qualified T-34C pilots to develop and improve skills and techniques in instrument flying and normal and emergency procedures. In addition, training in important operating procedures which .would not normally be practiced in an operational aircraft can be accomplished using the trainer.

a. This handbook gives descriptive and procedural information relative to operational performance of the trainer. Its function is to aid training personnel in the proper use of the trainer, so that the full capabilities of the trainer may be realized.

b. The handbook is divided into eight sections. Section II, General Description, outlines the components of the trainer and describes the capabilities and limitations of the equipment. Section III, Operating Procedures, includes all necessary operating instructions for the trainer. Section IV, Terminal Objectives, lists the objectives the student should obtain through use of the trainer. Section V, Training Syllabus, outlines the training exercises of Section VI. Section VI, Training Exercises, presents exercises for use by the instructor in conducting student training. Section VII, Formulation of New Training Exercises, enables the instructor to formulate new or amend existing exercises. Section VIII, Reference and Text Materials, provides a composite listing of related publication materials.

## 2-1. GENERAL ARRANGEMENT

a. Figure 2-1 and 2-2 shows the general arrangement of the units comprising the T-34C Flight Instrument Trainer, Device 2B37.

b. The training system consists of four stations: trainee, instructor, computer, and hydraulic. The trainde station comprises two T-34C cockpit assemblies mounted on individual motion platforms and connected by an observation/boarding platform. The instructor station is made up of two instructor consoles which are located adjacent to the motion platforms to provide either instructor with over-the-shoulder monitoring of both cockpits and the boarding platform. The computer station is located behind the instructor consoles and contains the computers and peripheral equipollent for each trainer.

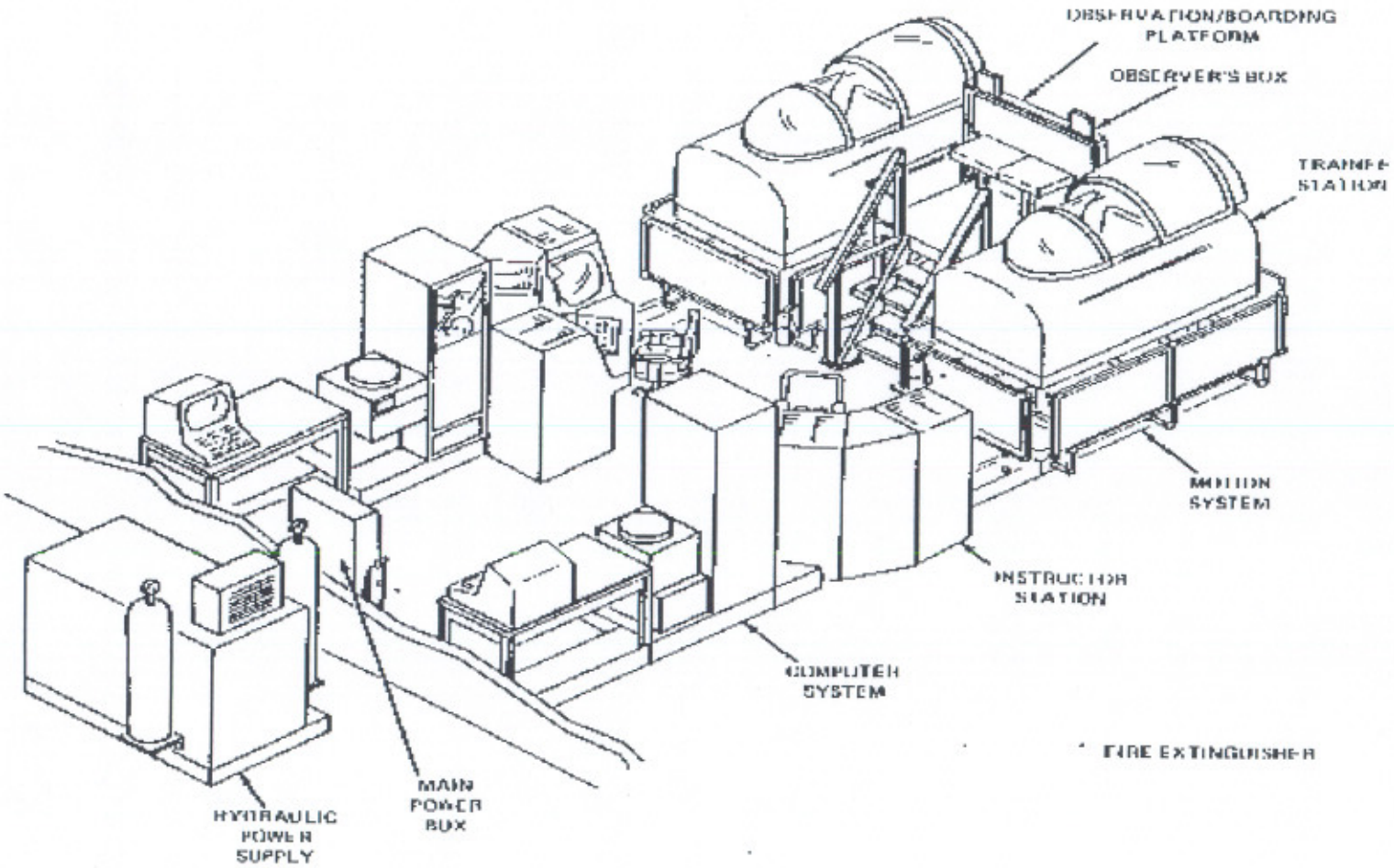


Figure 2-1. T-34C Flight Instrument Trainer

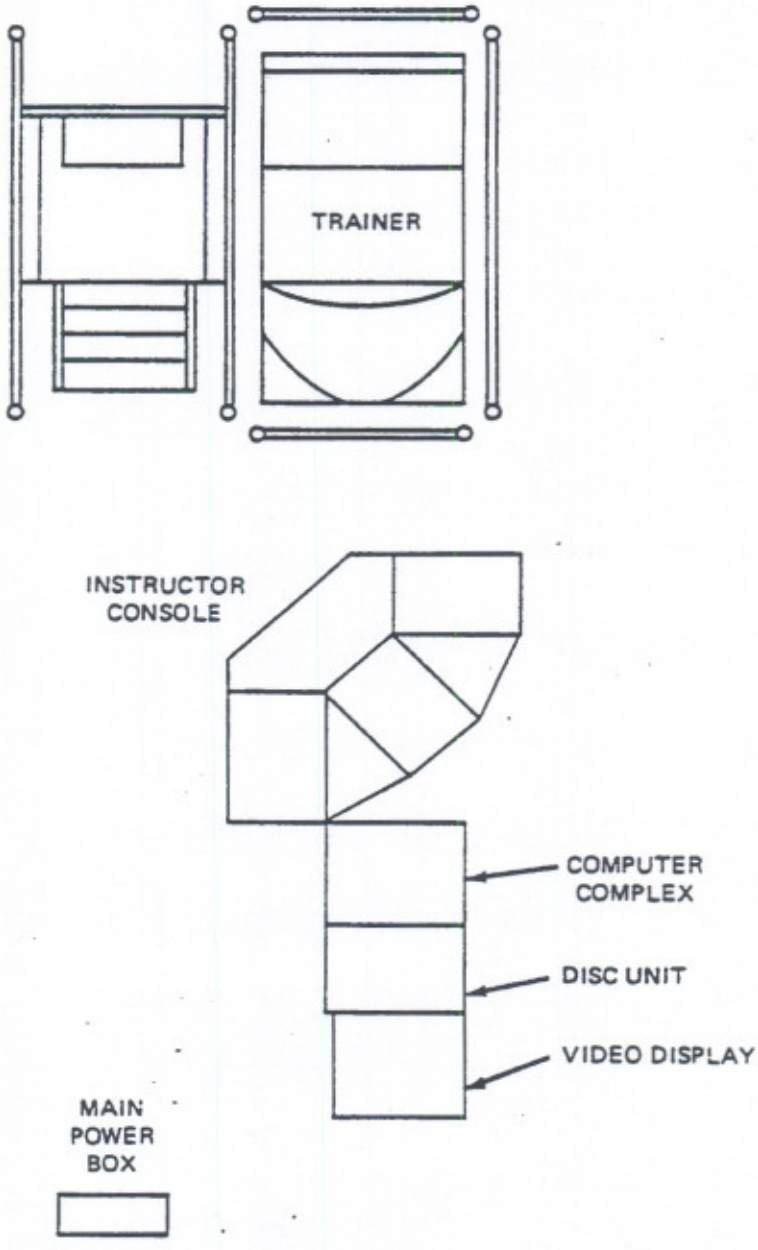


Figure 2-2. System Layout

## 2-3. TRAINEE STATION

a. The trainee station is an authentic reproduction of the cockpit of the T-34C aircraft. The cockpit structure depicts the lines of the actual aircraft at the cockpit and includes a translucent windshield and canopy. Maintenance panels located in the front and rear of the cockpit allow access to the control loading and electronic equipment, see figure 2-3.

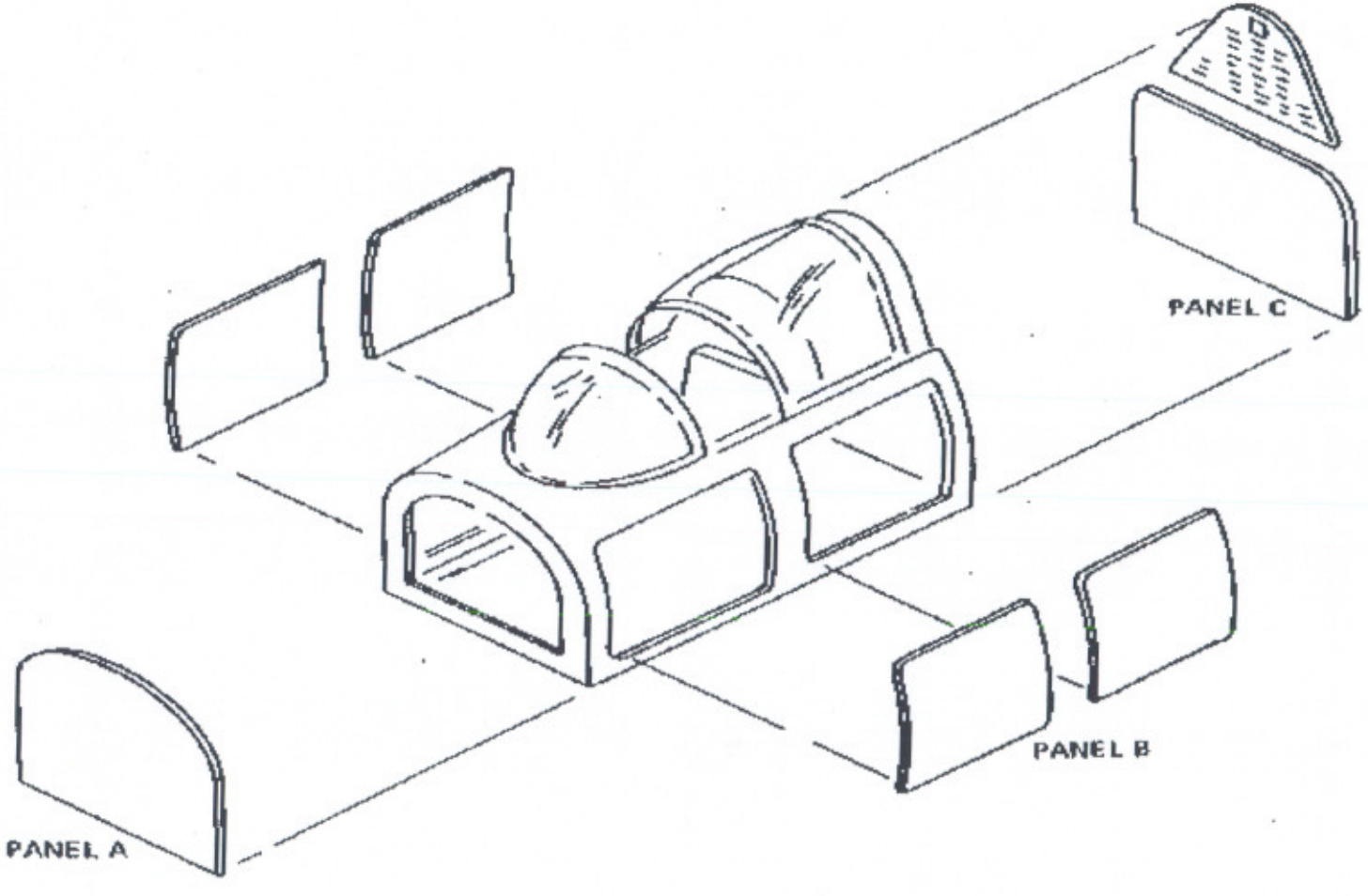


Figure 2-3. Maintenance Access Panels

b. The trainer instruments, indicators, controls, and cockpit lighting are actual or simulated aircraft equipment which operate just as in the operational aircraft. Figure 2-4 contains a list of cockpit instruments and controls. All instruments, indicators, switches, and controls are classified as Active, Partially Active, Functional, or Nonfunctional in table 3-1.

c. The active flight controls consist of the control stick, simulating control of both ailerons and elevators, and the rudder pedals, simulating control of the rudder and toe brake operation. The controls incorporate a hydromechanical mechanism that is computer controlled to provide control forces approximating those associated with all conditions of flight and ground operations.

d. In addition to the normal trainee controls and indicators in each cockpit, there is an EMERGENCY OFF switch mounted on the left side of the rear wall of the cockpit (behind the student's seat). This switch can be used as an auxiliary safety control when there is no operator present at the instructor console. Its function is the same as the one on the instructor control panel.

e. Another switch located on the rear wall of the cockpit (behind the student's seat) is provided for the instructor to deactivate the gear warning horn.

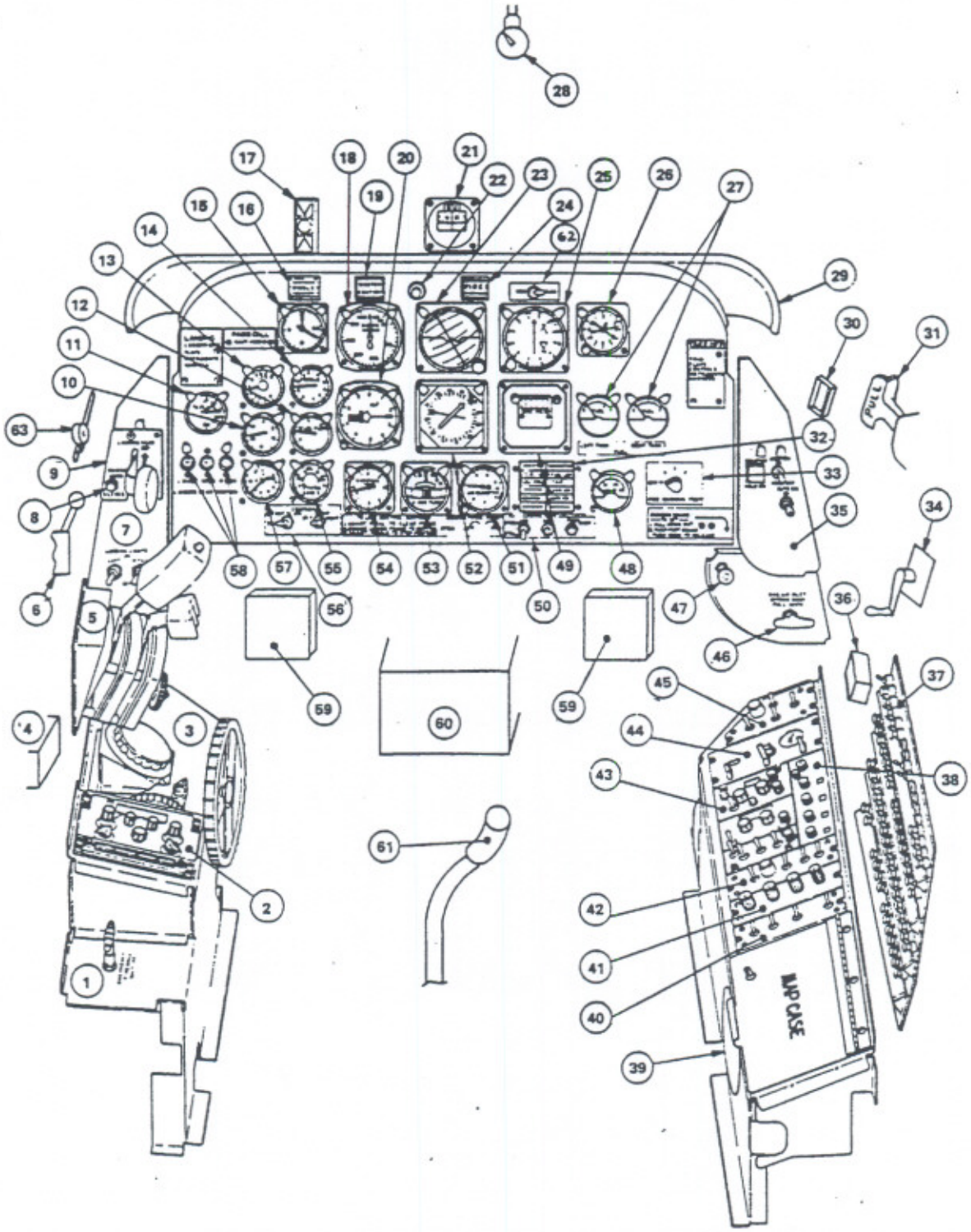


Figure 2-4. Cockpit Arrangement (Sheet 1 of 2)

LEGEND

1. EMERGENCY FIRE WALL SHUT OFF (FUEL)
2. UHF RADIO
3. TRIM TAB CONTROL
4. FLAP CONTROL
5. QUADRANT CONTROL
6. DEFOG CONTROL
7. LANDING LIGHTS
8. WARNING HORN
9. LANDING GEAR CONTROL HANDLE
10. PROPELLER TACHOMETER
11. FLAP POSITION INDICATOR
12. FUEL FLOW GAGE
13. INTERSTAGE TURBINE TEMPERATURE GAGE (ITT)
14. TORQUE
15. ANGLE OR ATTACK INDICATOR
16. WHEELS
17. AOA INDEXER INDICATOR
18. AIR SPEED INDICATOR
19. MASTER CAUTION LIGHT
20. ALTIMETER
21. STANDBY COMPASS
22. GYRO FAST ERECT SWITCH
23. ALTITUDE INDICATOR
24. FIRE LIGHT
25. COURSE DEVIATION METER
26. CLOCK
27. FUEL QUANTITY GAGES
28. OUTSIDE AIR TEMPERATURE INDICATOR
29. GLARE SHIELD
30. COMPASS CARD HOLDER
31. EMERGENCY CANOPY BLOW BACK HANDLE
32. ANNUNCIATOR PANEL
33. FIRE WARNING TEST SWITCH
34. EMERGENCY LANDING GEAR CRANK
35. ENGINE CONTROL PANEL
36. ASH TRAY
37. CIRCUIT BREAKER PANEL
38. TRANSPONDER CONTROL PANEL
39. MAP CASE
40. SWITCH CONTROL PANEL
41. LIGHTING CONTROL PANEL
42. AVIONICS CONTROL PANEL
43. MULTIFUNCTION CONTROL PANEL
44. OXYGEN REGULATOR
45. ELECTRICAL CONTROL COMMAND PANEL
46. PARKING BRAKE
47. ENGINE AIR INLET BYPASS DOOR
48. VOLT-AMMETER
49. DME INDICATOR
50. TEST SWITCH
51. ACCELEROMETER
52. RADIO MAGNETIC INDICATOR
53. TURN AND SLIP INDICATOR
54. VERTICAL SPEED INDICATOR
55. OIL TEMPERATURE AND PRESSURE GAGE
56. COMPASS-SLAVE SWITCHES
57. TURBINE TACHOMETER
58. LANDING GEAR POSITION INDICATORS
59. RUDDER PEDALS
60. AIR-CONDITIONER
61. CONTROL STICK
62. TACAN/VOR SWITCH
63. COCKPIT ENVIRONMENTAL CONTROL

Figure 2-4. Cockpit Arrangement (Sheet 2 of 2)

f. The communications system utilizes the basic aircraft audio system radio control panels, associated controls, and simulated uhf, VOR, and TACAN inputs. The simulated inputs consist of various ground station identification codes. The instructor may introduce malfunctions to this system by entering the correct communication malfunction index code at the instructor control panel.

g. The instructor may communicate with the student or observer in any one of three modes: uhf, interphone or override. The observer's communication with the student and instructor is limited to the override mode. The override mode gives the instructor or observer the capabilty to communicate directly with the student, bypassing all switching and control circuitry. All communications over this system may be monitored at the instructor or observer stations.

2-4. INSTRUCTOR STATION. This station is the central point of all trainer operations, see figure 2-5. It contains the instructor consoles which are used to initialize and run the training scenario. Also, the position of these consoles allows each instructor to observe student performance by either over-the-shoulder visual monitoring or by watching the flight performance crt display. A castered swivel arm chair is provided with each console.

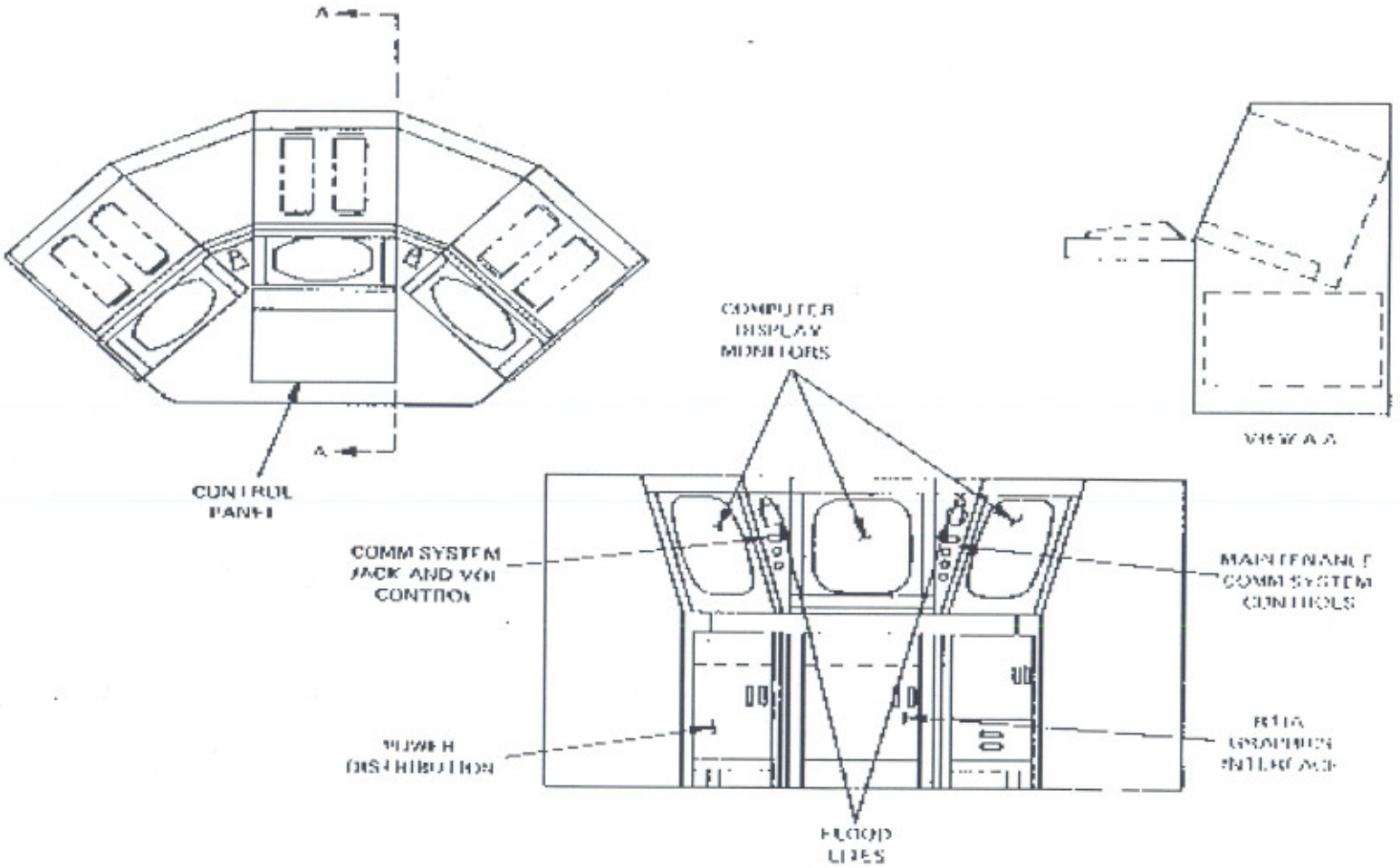


Figure 2-5. Instructor Station Configuration

c. The communications system controls are in two separate locations on the instructor console. They are located in the instructor control panel and in the wedge on the left-hand side of the console. This system gives the instructor the capability to communicate over the trainer communications system, see figure 2-8. The three switch-indicator buttons on the instructor control panel enable the instructor to communicate with the trainee or observer in any one of three modes; uhf, interphone, or override. The uhf and interphone modes simulate the duplicate modes in the actual aircraft. The override mode bypasses all the switching circuitry in the communications system and enables communication with the.trainee or observer, in case of a malfunction

| CHALLENGE | ACTION | REPLY |
|---|---|---|

**Upon entering the cockpit, complete ALL the ACTIONs required in the first FOUR PRESTART CHECKLIST items and *THEN* begin the checklist, *briefly* confirming their completion as you "Challenge" and "Reply" each of those four items.**

" ***PRESTART CHECKLIST*** "

| | | |
|---|---|---|
| 1. ***"Seat and Rudder Pedals"*** | Adjust seat height. Ensure that the seat locking pins are firmly engaged. Adjust the rudder pedals. | **"Adjusted"** |
| 2. ***"Parking Brake"*** | Pull out the parking brake and pump the brakes until brake pressure is firm. | ***"Set"*** |
| 3. ***"Parachute"*** | Ensure that the parachute is properly fastened and adjusted. | ***"Fastened and adjusted"*** |
| 4. ***"Restraint Harness"*** | A. Attach lap belts and shoulder harness to rotary buckle.<br>B. Move hips as far aft as possible into seat.<br>C. Place the rotary buckle below both LPA lobes (if used) and against abdomen.<br>D. Tighten the lap belts while holding the rotary buckle in place.<br>E. Lock the inertial reel and then tighten the shoulder harness.<br>F. Remove the slack remaining in the crotch adjustment strap while ensuring rotary buckle remains in its correct position. | ***"Fastened and adjusted"*** |



EXCERPT FROM THE "T-34C CHECKOUT GUIDE"

# AVIATION
# COMMUNICATION/NAVIGATION
# TRAINER
# DEVICE 2B47

## Section II. DESCRIPTION OF THE TRAINIING SYSTEM

### 2- 1 SYSTEM DESCRIPTION

This Aviation Communications/ Navigation Trainer, Device 2B47, is a computerized device that simulates controls and instruments similar to those found in the T-34C and T-IA aircraft.

This trainer uses new Commercial Off-The- Shelf (COTS) convuter equipment.

There are two Trainers associated with Device 2B47. Refer to Figure 2-1 for an overall view of one Trainer.

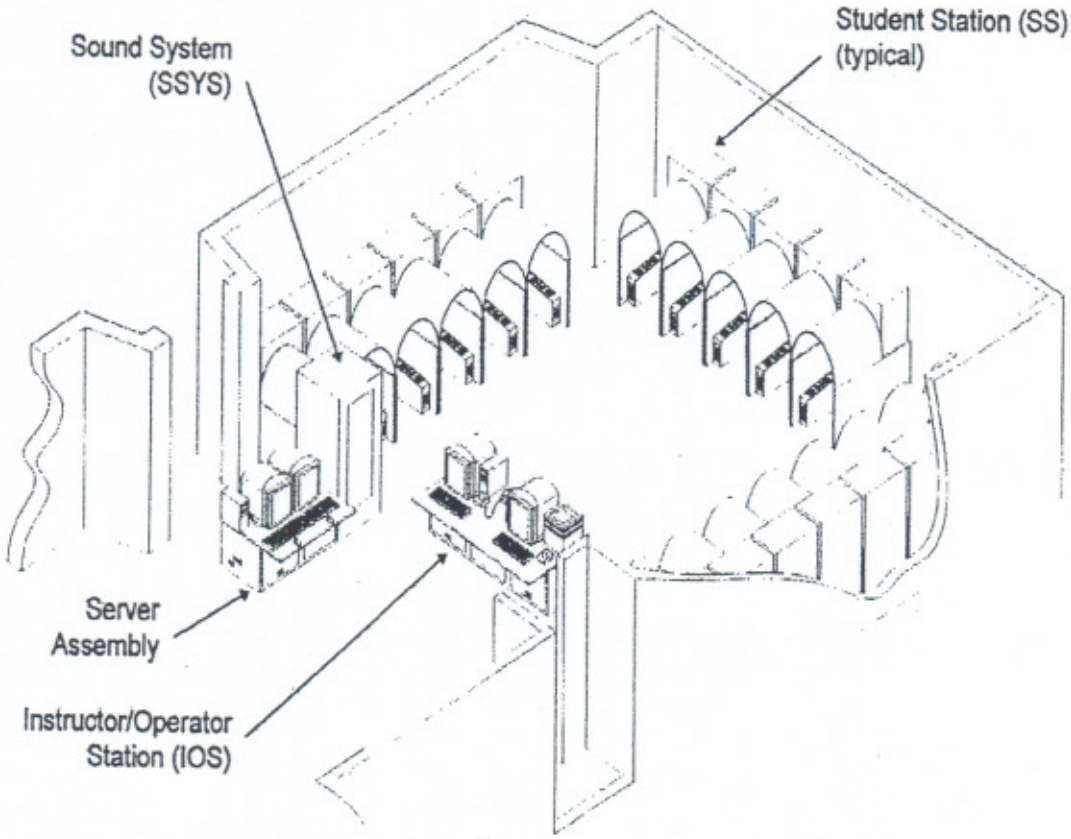


**Figure 2-1. Training Device 2B47 - Overall View of One Trainer**

### 2-1.1 Major Components of Training System

There are 25 personal computers associated with each trainer. Each trainer includes the following main components.

a. Instructor/Operator Station (IOS) (2 ea.)

b. Student Station (SS) (20 ea.)

c. Trainer Assembly

(1) Trainer Server (TS); (2) ICW Server

d. Sound System (SSYS)

### 2-1. 1.1 Instructor/Operator Station (IOS)

There are two identical IOSs (Figure 2-3) per trainer. The IOSs are situated side-by-side near the center of the room as shown in Figure 2-2. AD components for each station are identical; however, there is only one color printer available to either of the two IOSS. Each IOS includes: a personal convuter, a 2 1 -inch color monitor, a keyboard, a trackball and a headset.

From an IOS, each instructor coordinates the training of up to forty students. Through the headset and the Sound System, the instructor orally communicates with other instructors, individual students, student groups, or all students collectively.

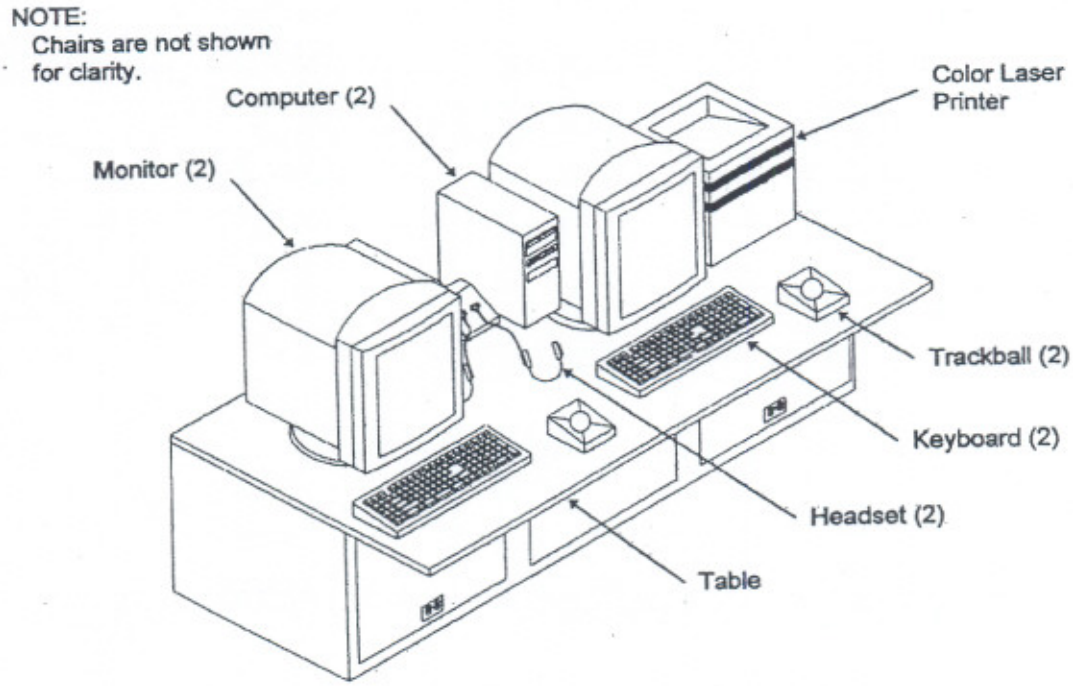


**Figure 2-3. IOS Components**

### 2-1.1.2 Student Station (SS)

Each Student Station (Figure 2-4) consists of-

a. A canopy, which covers the student area.

b. An equipment enclosure for housing components.

c. Two side panels for separating the student stations.

d. A sliding seat.

e. Two control consoles.

f. A personal computer.

g. A monitor.

h. A keyboard and trackball for inputting data.

i. A headset.

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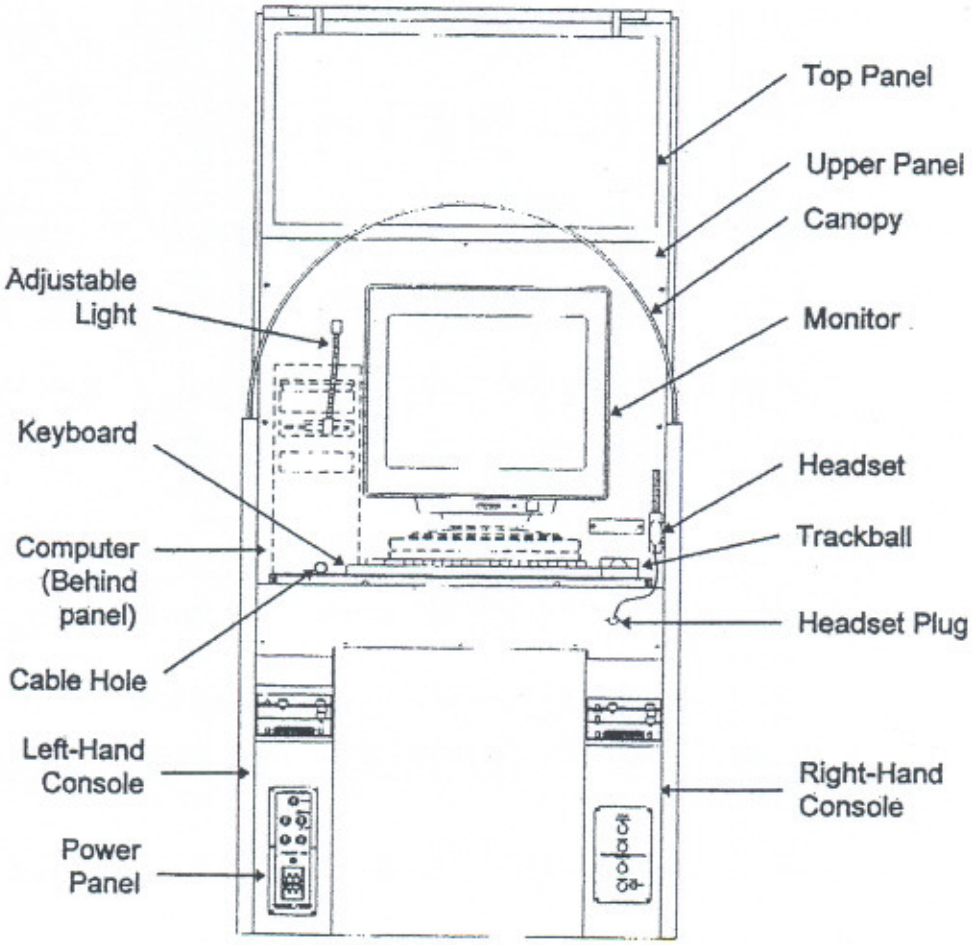



**Fig 2-4 SS Components - Seat Removed**

## 2-2. TRAINING SYSTEM CAPABI|LITIES

This training system provides task practice in airway navigation, flight task management, fuel and time computations and management, aircraft maneuvering, real-time position reporting, point-to-point navigation cauouts, and crew coordination practice. It also provides a diagnostics program for troubleshooting hardware problems and the necessary hardware **to** allow students to access an Interactive Courseware (ICW) program.

## 2-3. TRAINING SYSTEM LIMITATIONS

Device 2B47 has the following limitations:

a. There is no motion system. This device only simulates and displays aircraft gages, a readout panel and ffight/navigation data. It is not a ffight simulator.

b. There is no visual system providing a view external to the cockpit.

C. Navigation and ffight data are only modeled in simplistic ways.

d. There are no atmospheric models, such as air density, turbulence, etc.

e. The Sound System does not generate aural cues (gear-up warnings, low altitude warnings, engine sounds, etc.).

f There are no aircraft flight controls, such as, yoke and pedals.

## 2-4. MALFUNCTIONS

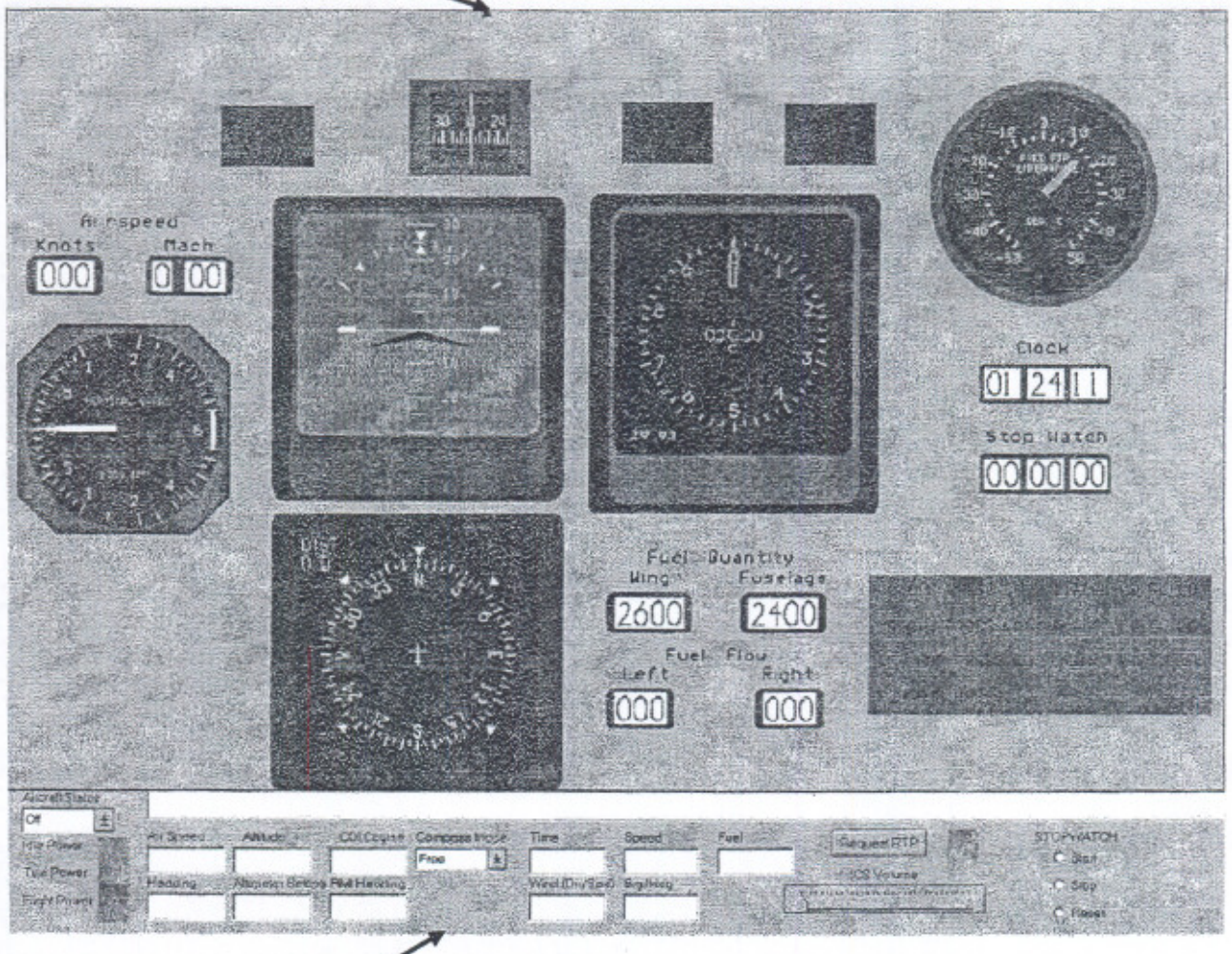
Malfunctions are enabled by the instructor and present training situations to students to simulate those sometimes found in actual aircraft. These malfunctions are totally controlled by the instructor.

A number of simulated malfimctions are controlled from the IOS for both the T-IA and T-34C Aircraft. Malfunctions unique to the T-IA are Loss of Cabin Pressure, Left/Right Hydraulic Pump Pressure Low, and Left/ Right Engine Oil Pressure Low. These are only selectable for SSs running a T-IA simulation. Selecting either a Left or Right Engine Fire malfimction during a T34C simulation will light the single Fire warning indicator. Selecting either of these malfunctions during a T-IA simulation will light the respective Fire warning indicators.

3-2.4.5.2 SS T-IA Instruments Screen Controls and Indicators

Figure 3-52 shows the screen that appears when the instructor issues an On-Line command to the SS for a T-IA mission or exercise. The top portion of the screen shows the simulated instruments for the aircraft and the lower portion shows the User Interface Panel. This screen is the only screen that the student will see during T-IA simulation training except for snapshots that can appear in a dialog box in front of this screen.

**T-IA Instrument Panel**



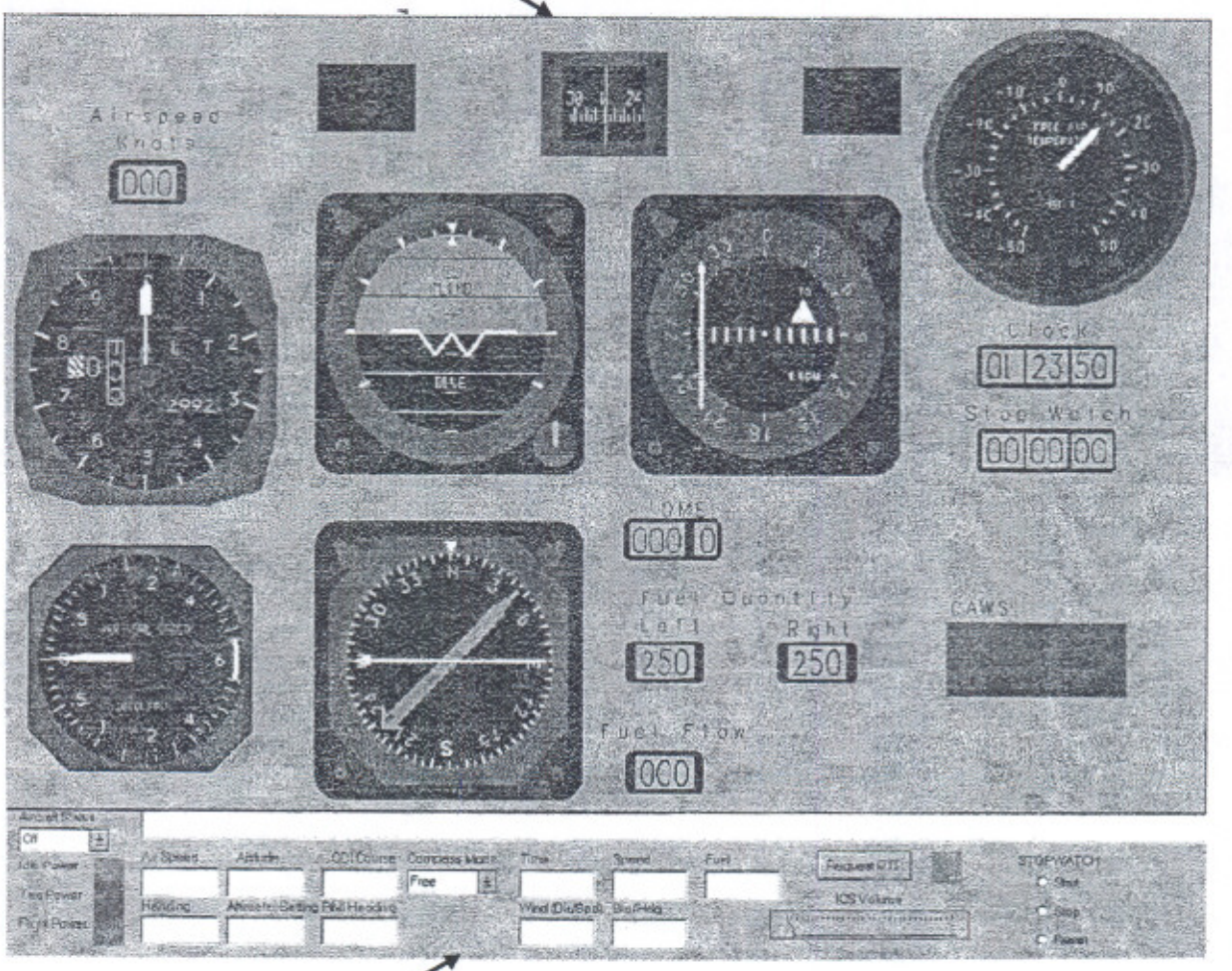

**User Interface Panel**

**Figure 3-52. SS T-1A Instruments Screen**

3-2.4.5.3 SS T-34C Instruments Screen Controls and Indicators

Figure 3-54 shows the screen that appears when the instructor issues an On-Line command to the SS for **a** T-34C mission/ exercise. The top portion of the screen shows the simulated instruments for the aircraft and the lower portion shows the User Interface Panel. This screen is the **only** screen that the student will see during T-34C simulation training except for snapshots that can appear in a dialog box in front of this screen.

**T-34C Instrument Panel**




**User Interface Panel**

**Figure 3-54. SS T-34C Instruments Screen**

# Section IV. LEARNING OBJECTIVES

## 4-1. INTRODUCTION

This section includes a list of simulator training objectives for Device 2B47 and the instructor learning objectives.

## 4-2. SIMULATOR TRAINING OBJECTIVES

General objectives of using the trainer are to provide Undergraduate Military Flight Officers a means of leaming the basic ffight and navigation tasks. This Trainer simulates the T-34C and T-IA aircraft. These tasks include:

a. Instrument and airway navigation.

b. Radio communications.

c. Fuel and time computations.

d. Aircraft maneuvering and ffight management.

e. Cockpit management.

f. Real-time position reporting.

g. Point-to-point navigation carouts.

h. Crew coordination practice.

Student training exercises are listed in Table 4- 1. These exercises facilitate learning the above training objectives. These exercises provide training in calculating Estimated Time of Arrival (ETA) and flying Standard Instrument Departure (SID), Point-to-Point (PT-PT) navigation, Dead Reckoning (DR) navigation, etc.

**Table 4-1. List of Student Training Exercises**

| No. | Exercise Title | Application | Objectives |
|---|---|---|---|
| 1 | Mission 1<br>Airway Navigation | T-34C | 1. Learn technical parameters of the mission.<br>2. To demonstrate student's ability to:<br>a. Navigate to a NAVAID via direct or airway navigation.<br>b. Maintain centerline on an airway or the most direct route on a direct leg without deviating more than 3 NM or 5 radials, whichever is less. |
| 2 | Mission 2<br>Airway Navigation | T-34C | 1. Same as Mission 1.<br>2. To demonstrate students ability to determine ground speed and ETA at each NAVAID. |

## 4-3. INSTRUCTOR LEARNING OBJECTIVES

The tables included in this paragraph list the learning objectives addressed in the Device 2B47 training course.

Table 4-2 lists the leaning objectives addressed in the instructor/operator training course. Upon completion of the course, instructors will be able to use Device 2B47 with maximum effeciency.

| No. | Exercise Title | Application | Objectives |
|---|---|---|---|
| 3 | Mission 3<br>PT-PT Navigation | T-34C | To demonstrate student's understanding and ability of PT-PT (Fix-Fix) Navigation by:<br>a. Calculating ETAs to each waypoint.<br>b. Navigating within 4 NM of desired PT. |
| 4 | Mission 4<br>PT-PT Navigation | T-34C | 1. Same as Mission 3.<br>2. To demonstrate student's ability to break down a preflighted wind to determine crab, ground speed, and ETAS. |
| 5 | Mission 5<br>PT-PT Navigation | T-34C | 1. Same as Mission 4.<br>2. To practice flying SID and Approach. |
| 6 | Mission 6<br>Airway Navigation | T-34C | 1. To demonstrate students ability to:<br>a. Navigate along a Flight Planned route via airways, direct, or PT-PT navigation.<br>b. Determine wind vector and ground speed to figure ETAs at each waypoint.<br>c. Fly SID and Penetration Approach. |
| 7 | Mission 6ET<br>Extra Time for DR<br>& Airway Navigation | T-34C | 1. Same as Mission 6.<br>2. To demonstrate students ability to:<br>a. Handle aircraft malfunctions.<br>b. Fly by DR procedures. |
| 8 | Mission 7<br>Airway Navigation | T-34C | Same as Mission 6. |
| 9 | Mission 8<br>T-34 Extra Time | T-34C | Provide extra training and simulation practice on weak skills identified by an instructor. |
| 10 | Mission 9<br>T-lA Extra Time | T-lA | Provide extra training and simulation practice on weak skills identified by an instructor. |
| 11-20 | Mission 10-20<br>PT-PT Navigation | T-lA | Point-to-point navigation practice. |
| 21 | Mission 20<br>PT-PT Navigation | T-34C | Point-to-point navigation practice. |

## 4-3 Instructor Learning Objectives

The tables included in this paragraph list the learning objectives addressed in the Device 2B47 training course.

Table 4-2 lists the learning objectives addressed in the instructor/operator training course. Upon completion of this course, instructors will be able to use Device 2B47 with maximum efficiency.

**Table 4-2. Instructor Learning Objectives**

| No. | Exercise Title | Objective |
|---|---|---|
| 1 | Trainer Familiarization | Name and locate all Unit@ within a Trainer.<br>Describe major components and basic functions of each Unit. |
| 2 | IOS Start-Up and Software Familiarization | Power up an log onto an IOS.<br>Identify features and areas of IOS User Interface Screen to include menus, dialog boxes, and pull-down menus. |
| 3 | SS Start-Up and Software Familiarization | Power up and log onto a SS.<br>Start an ICW training session. |
| 4 | Mission Start-Up at the IOS | Load a mission from the IOS to one, several, or all SSs.<br>Establish different groups of students.<br>Display departure map and explain performance measures.<br>Center on a student, Radial/ DME, and NAVAID.<br>I Display maps and zoom in and out on a map. |
| 5 | Maps and Student Performance Measures | Describe enroute map characteristics (corridor widths, PTP idiosyncrasies, etc.).<br>Evaluate student performance measures.<br>Describe approach map characteristics.<br>Send slapshot to SS and discuss value. |

| No. | Exercise Title | Objective |
|---|---|---|
| 6 | Communications | Establish a communications group in Trainer 1 only then across trainers.<br>Communicate using VHF and UHF radio frequencies and ICS.<br>Establish a PTP ICS communication with a SS.<br>From Trainer 1, communicate with other IOS and SS in Trainer 2.<br>Playback recorded audio. |
| 7 | Malfunctions | Enter and remove each malfunction from IOS.<br>Learn symptoms of each malfunctions.<br>Set up time/ event triggered malfunctions. |
| 8 | IOS Status Windows & Monitoring of SS | View and interpret Detailed Status Window for one or many SSs.<br>View and scroll through Summary Status Window.<br>Determine what SSs are assigned to a group.<br>Determine what mission is being run at a SS.<br>Modify selected parameters. |
| 9 | Student Station Functionality | Conduct a mission at a SS.<br>Use the student input area.<br>Use the control panels on the Right-Hand Console. |
| 10 | Review/ Mock Training Session | Initiate a training session at the IOS as an instructor and monitor student performance.<br>Use SS controls and fly a specified route as a student and change flight parameters (altitude, air speed, ETAS, etc.).<br>Send text messages from IOS to SS.<br>Control ICS/ simulated radio communications at an IOS as an instructor.<br>Insert malfunctions from an IOS to a SS mission. |
| 11 | Correction of Student Mistakes | Correct mistakes at the IOS made by a student at the SS.<br>Interpret student performance data.<br>Use replay function. |

| No. | Exercise Title | Objective |
|---|---|---|
| 12 | Printing of Student Records | Print mission maps with trail dots.<br>Print Detailed Status Window.<br>Demonstrate opening and printing Mission Event Log File.<br>Interpret Mission Event Log File.<br>Print in black and white and print in color. |
| 13 | Troubleshooting and Power Failure Recovery | Enter Diagnostics Mode.<br>Determine the current status of each SS, IOS, server, printer, and SSYS.<br>Recover from a power failure. |
| 14 | Ending a Mission and Daily Log Off | Change a SS from Mission Mode to Off-Line Mode from the IOS.<br>Perform daily log off of IOS.<br>Perform daily log off of SS. |
| 15 | Weekend/ Holiday Shutdown | Perform a Weekend/ Holidav shutdown of Trainer. |
| 16 | Changing Mission Parameters Before Running a Mission | Select a mission file and enter Edit Mode.<br>Change values and Exit and commit to open the mission with changed parameters. |

Table 4-3 lists the learning objectives addressed in the administrator training course. Upon completion of this course, administrators will be able to manage the training utilizing Device 2B47.

**Table 4-3. Administrator Learning Objectives**

| No. | Exercise Title | Objective |
|---|---|---|
| 1 | Administrator Functions (Part 1) | Become familiar with Training System Administrator's Guide (NAWCTSD P-7271-Sl) |
| 2 | Administrator Functions (Part 2) | Log-in to IOS using administrator username and password.<br>Use Notepad and create a new mission using existing data set files.<br>Update NAVAID information. |

*NTSC P-6857*

Preliminary
Technical Manual

# INSTRUCTOR'S UTILIZATION HANDBOOK FOR SIMULATION EQUIPMENT

# T-34C COCKPIT PROCEDURES TRAINER DEVICE 2C42

Manual Prepared by DUAL INCORPORATED
CONTRACT # N61339-91-C-0060

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# SECTION I
# INTRODUCTION

## 1.1 PURPOSE.

The T-34C Cockpit Procedures Trainer (CPT) Device 2C42, hereinafter referred to as the trainer, provides flight crew training for the T-34C aircraft. The system training capabilities include cockpit familiarization, engine operation, system performance, and both normal and emergency procedures.

## 1.2 MALFUNCTION INSERTION, STUDENT EVALUATION, AND INSTRUCTIONAL CAPABILITIES.

The following paragraphs describe malfunction insertion, student evaluation, and instructional capabilities.

1.2.1 Malfunction Insertion. Malfunctions are inserted by the instructor through choices presented on the instructor's display at the Instructor/Operator Station (IOS).

1.2.2 Student Evaluation. The student's proficiency is evaluated using the screens on the instructor's display at the Instructor/Operator Station.

1.2.3 Instructional Capability. The T-34C CPT is capable of providing required training in cockpit procedures with basic flight capabilities. The Student Station models the T-34C aircraft. All instruments, indicators, controls, gauges, lights, panels, switches, circuit breakers, and other items including non-functional mock-up items, are full-sized and located in the same relative position as in the actual aircraft. The main function of the T-34C CPT is to provide cockpit familiarization, and to enable the pilot to perform both ground and level-flight normal procedures and emergency checklist procedures in accordance with the NATOPS Flight Manual, NAVAIR 01-T34AAC-1.

## 1.3 HANDBOOK UTILIZATION.

This Instructor Utilization Handbook (IUH) provides descriptive and procedural information relating to the operational performance and capabilities of the trainer. The IUH's primary function is to aid instructional personnel in the proper use of the trainer, so that its full capabilities may be optimized.

# SECTION II
# GENERAL DESCRIPTION OF THE SIMULATION EQUIPMENT

## 2.1 INTRODUCTION.

This section provides general descriptions of the simulation systems and equipment. A general description of the equipment contained in each trainer area is provided in paragraph 2-2, and descriptions of simulation systems, trainer capabilities and limitations, malfunction simulation and operating parameters are provided in paragraphs 2-3 through 2-5. Personnel aspects and requirements are discussed in paragraph 2-6.

## 2.2 GENERAL DESCRIPTION.

Figure 2-1 shows the general arrangement of the units comprising the T-34C Cockpit Procedures Trainer (CPT), Device 2C42. The T-34C CPT consists of two stations: the instructor station and the student station. The instructor station is an instructor console which is located adjacent to the cockpit assembly to provide the instructor with the over-the-shoulder monitoring of both the cockpit and the boarding platform. The computer and Input/Output System are located inside the student station. The student station also includes a T-34C cockpit assembly and an observation/boarding platform. The main power junction box, located on the railing at the rear of the instructor station, controls all power to the trainer.

2.2.1 Instructor/Operator Station, Unit 1. The Instructor/Operator is comprised of a power distribution system, a desk, a computer monitor, a computer keyboard, an auxiliary control panel and an optional printer connection. All information being displayed on the monitor can be recorded by the printer. The CRT is mounted on a movable arm and swivel base. The Instructor/Operator Station (IOS), Unit 1, is shown in Figure 2-2 and the callouts are identified in Table 2-1.

2.2.1.1 Power Distribution Center. The power distribution system (Figure 2-2, Item 5) provides all electrical power to the trainer. It contains the relays, transformers, switches and circuit breakers required to supply input power to all the Device 2C42 major assemblies.

2.2.1.2 Instructor/Operator Station Monitor. The instructor/operator station monitor (Figure 2-2, Item 1) is a Panasonic model C1381I which provides an 80 character by 25 line display.

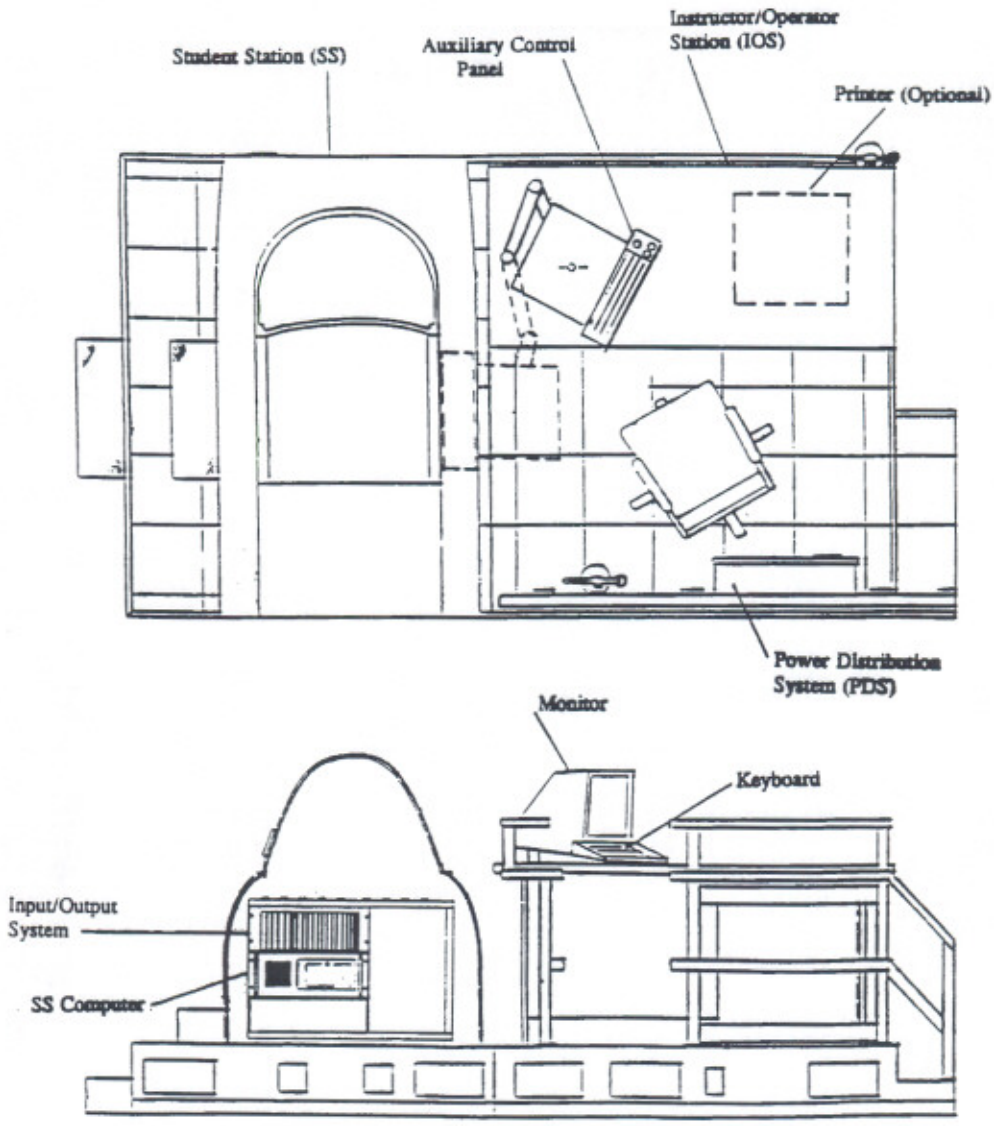



Figure 2-1. T-34C Cockpit Procedures Trainer, Device 2C42.

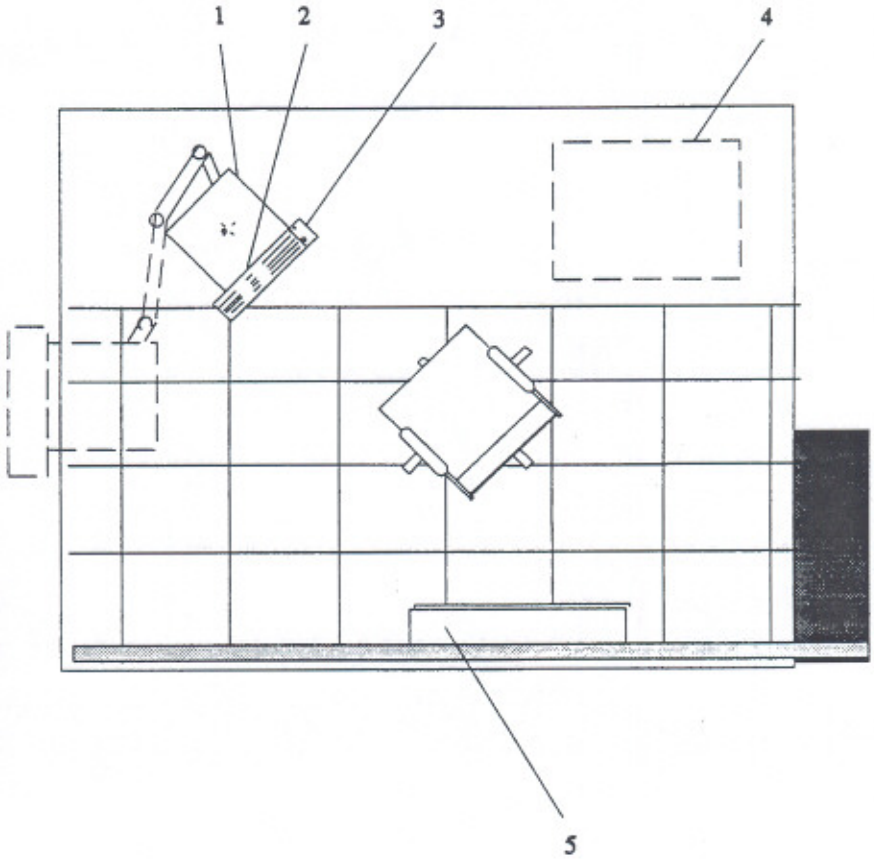



Figure 2-2. Instructor Operator Station (IOS), Unit 1.

2.2.1.3 Instructor/Operator Station Keyboard. The Instructor/Operator Station keyboard (Figure 2-2, Item 2) is manufactured by Fujitsu and incorporates 101 keys and tactile feedback.

2.2.1.4 Instructor/Operator Station Auxiliary Control Panel. The instructor/operator station auxiliary control panel (Figure 2-2, Item 3) provides the electrical attachments and controls required for operation of the instructor audio intercommunications system. The instructor headset with built-in push-to-talk switch plugs into the headset interface cable located at the rear of the unit. Volume for the intercom system may be varied by adjusting VOLUME control located on the auxiliary control panel. Two-way voice communication is initiated at the instructor station by depressing the instructor headset push-to-talk switch. The FANS switch, INSTRUCTOR OVERRIDE potentiometer and EMERGENCY STOP switch are also located on this panel. When activated, the EMERGENCY STOP switch removes all electrical power from the trainer.

2.2.15 Instructor/Operator Station Printer. A Hewlett Packard LaserJet III printer (Figure 2-2, Item 4) is available at the training site for attachment to the student station computer. This optional connection provides a method for obtaining printouts of the IOS monitor displays. The printer is completely self-contained and prints out 8 pages per minute in the text mode.

2.2.2 Student Station, Unit 2. The student station, unit 2, is comprised of an authentic reproduction of the cockpit interior of the T-34C aircraft, an electronics assembly and a communications system. The cockpit structure depicts the lines of the actual aircraft at the cockpit and includes an opaque windshield and canopy. Maintenance panels located in the front, on both sides, and in the rear of the student station allow access to the electronic equipment. The electronics assembly, located in the rear of the student station, houses the computer and input/output system equipment. The student communications system, located in the cockpit, is used to communicate with the instructor via an audio link with the instructor/operator station communications equipment. Figure 2-3 shows the student station and Table 2-2 identifies the callouts. The following paragraphs provide additional information on the student station.

2.2.2.1 Cockpit. The cockpit (Figure 2-3, Item 1) contains the instruments, gauges, panels, displays, and communications equipment to authentically simulate the cockpit of the T-34C aircraft.

2.2.2.2 Computer. The computer chassis (Figure 2-3, Item 3) is an Advantech model IPC 610. It is an 80386 computer with a clock speed of 4OMHz. The computer has both a 5 1/4" 1.2MB and a 3 1/2" 1.44MB floppy drive installed along with a 40MB hard drive, floppy and hard drive controllers, a Video Graphics Array (VGA) control, serial and parallel ports and an Input/Output Bus Converter (IOBC) card. The IOBC provides an interface between the computer and the Real Time Products (RTP) Input/Output System.

2.2.2.3 Input/Output System. The input/output system (Figure 2-3, Item 2) consists of an RTP model 7431/60 Universal Input/Output Controller (UIOC), located in the electronics assembly behind the simulated cockpit. The UIOC subsystem is a self-contained analog and digital I/O unit that accepts up to sixteen (16) standard analog, digital and relay 1/0 cards.

2.2.2.4 Communications System. The audio intercommunications system (Figure 2-3, Item 4) consists of a student headset with a separate TRANSM=R/INTERPHON'E push-to-talk switch located on the cockpit power control lever, and a volume (VOL) control on the cockpit audio control panel. Two-way voice communication is initiated at the student station by depressing the TRANSM=R/INTERPHONE momentary switch.

## 2.3 T-34C CPT CAPABILITEES AND LIMTATIONS.

The T-34C CPT is capable of providing required training in cockpit procedures with basic flight and navigation capabilities. The Student Station models the cockpit of the T34C aircraft. All indicators, controls, gauges, lights, panels, switches, circuit breakers, and other items are full sized and located in the same relative position as in the actual aircraft. The main function of the T-34C CPT is to provide cockpit familiarization, and to enable the air crew to perform both ground and level flight normal procedures and emergency checklist procedures in accordance with the NATOPS Flight Manual.

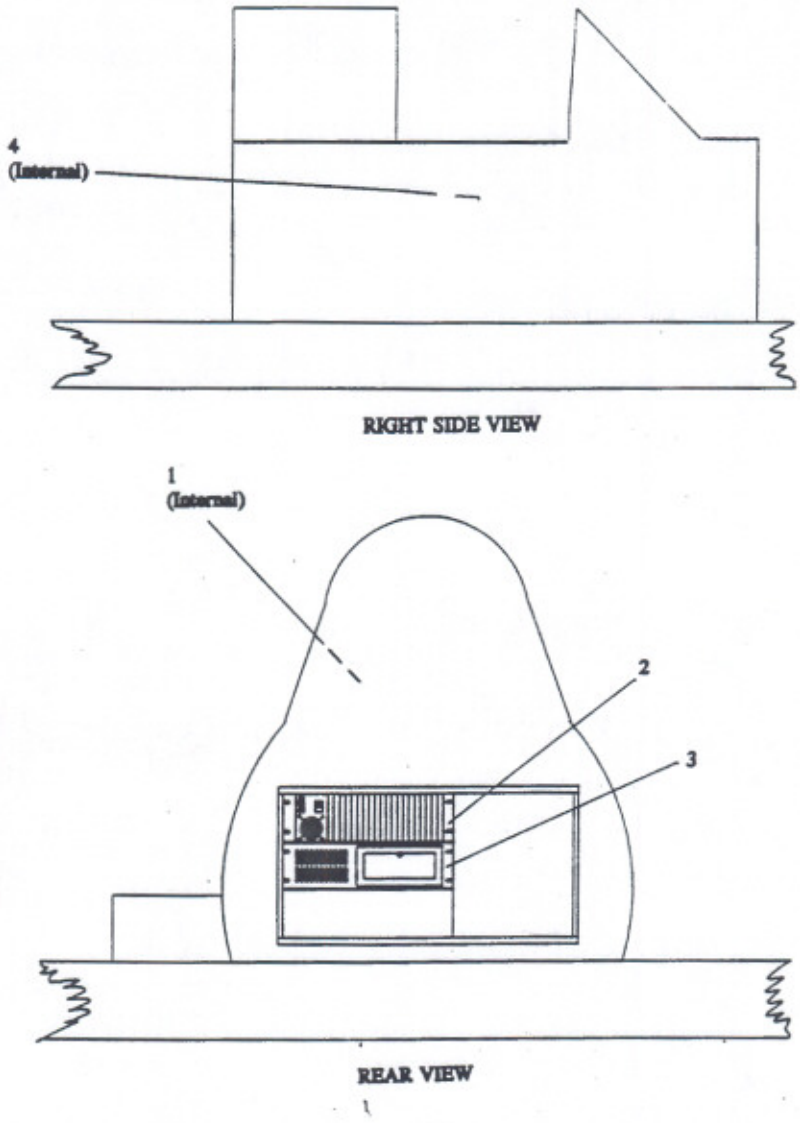



Figure 2-3. Student Station, Unit 2.

TECHNICAL MANUAL

# ORGANIZATION AND MAINTENANCE INSTRUCTIONS
# ORGANIZATIONAL MAINTENANCE

# GROUND MAPPING RADAR TRAINER (GMRT)
# P/N 63212-40200-10
# FOR THE
# UNDERGRADUATE NAVAL FLIGHT OFFICER (UNFO)
# TRAINING SYSTEMS PROGRAM

PREPARED BY

**AAI CORPORATION**

HUNT VALLEY, MAYLAND

FOR

**SABRELINER CORPORATION**

CHESTERFIELD, MISSOURI

**1 APRIL 1993**

## Section I. DESCRIPTION

### 1-1 PURPOSE AND SCOPE.

The Undergraduate Naval Flight Officer (UNFO) Ground Mapping Radar Trainer (GMRT), hereinafter referred to as the Trainer, is a computer classroom trainer that is used for instructing UNFOs destined for tactical aircrew assignments in the principles and concepts of radar ground navigation. The Trainer is a stand alone device that consists of an Instructor Station and two Student Stations. Instruction is accomplished with radar displays, aircraft instrumentation, and maneuvering of simulated aircraft through commands issued to the instructor or by student control in order to achieve and correct trajectory throughout the mission profile. The student radar display is a high resolution raster display that simulates the Westinghouse APG-66NT radar display used in the actual aircraft Student Station. The radar cathode ray tube (CRT) is driven by a digital radar landmass simulator (DRLMS) that simulates ground mapping modes of radar operation only. In addition, the Trainer provides radar control training, including warmup, testing and calibration procedures, and internal navigation system (INS) initialization procedures. The Trainer is capable of displaying the same threat warnings (including audio) as the aircraft and demonstrates the effects of chaff and electronic jamming. The Trainer provides student performance monitoring for each Trainer event with real-time presentation of training parameters provided to the Instructor Station and replay capability of the most recent 30 minutes of the mission for student debriefing purposes. The Trainer is shown on figure 1-1.

### 1-2 DESCRIPTION OF MAJOR ASSEMBLIES.

1-2.1 Equipment supplied. Table 1-1 lists the equipment supplied as part of the Trainer, and table 1-2 lists the commercial vendor equipment manuals supplied as part of the Trainer.

1-2.2 Equipment Required But Not Supplied. Table 1-3 lists the equipment that is required to operate, maintain, and repair the UNFO GMRT but that is not supplied as part of the Trainer.

1-2.3 Instructor Station. The Instructor Station (figure 1-2) controls training for two Student Stations. It consists of a desk-type work station that includes Instructor Monitor lAl, Instructor Keyboard lA2, Instructor Joystick lA5, 24-Pin Graphics Printer lA3, Multifunction Display Repeater lA4, Intercom Assembly lA6, and Power Control System lA9. The instructor monitor, keyboard, and Joystick allow the instructor to select independent training scenarios for each student station; run the scenarios while monitoring student responses; freeze the mission; quickly slew the Trainer aircraft latitude, longitude, and altitude; or replay the most recent 30 minutes of the training session. The Instructor Station can communicate with and control only one Student Station at a time. In order to facilitate training two students at the same time, the instructor has the option of turning flight control over to one of the Student Stations while the instructor concentrates on the other student. The multifunction display repeater allows the instructor to monitor the radar presentation that the student is using. The intercom assembly provides two intercom channels, one for each Student Station. The instructor may communicate with either Student Station or enable both channels simultaneously to establish a party line linking all three

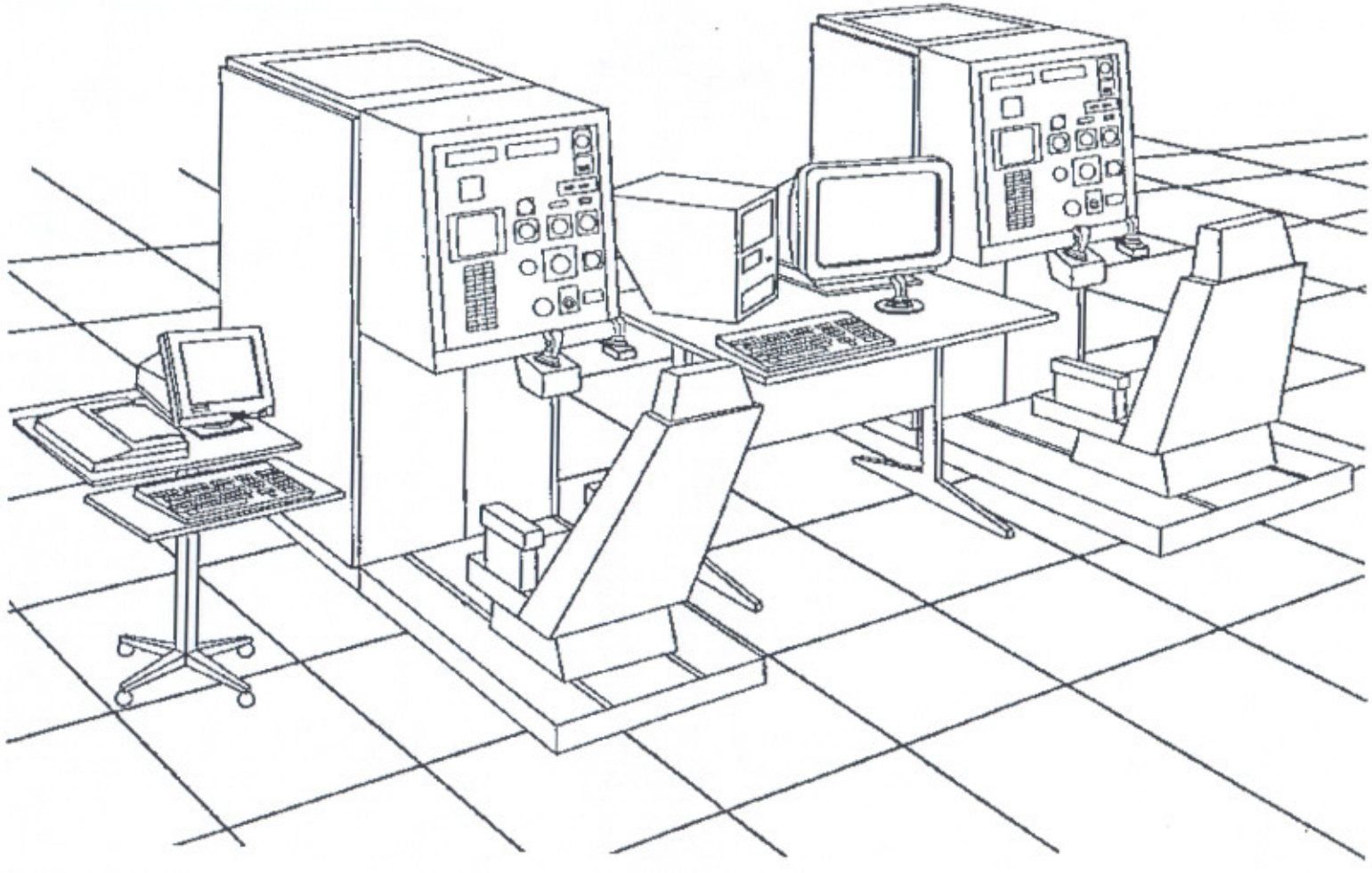


**Figure 1-1 Ground Mapping Radar Trainer**

Table 1-3. Equipment Required But Not Supplied

| Quantity | Short form nomenclature | Manufacturer code | Manufacturer part number |
|---|---|---|---|
| 1 | Extender cord | 45620 | VMEXB12D |
| 2 | Probe, oscilloscope | 80009 | 010-6056-03 |
| 1 | Oscilloscope cart | 80009 | K212 |
| 1 | Oscilloscope | 80009 | 2465B |
| 1 | Multimeter, digital | 50439 | HP3468A, OPTI |

stations. During a scenario, electronics within each Student Station digitize and store communications between the Instructor Station and Student Station. These stored communications are then played back when the instructor replays the scenario for student debriefing. The Diagnostic Unit (figure 1-3), which consists of 24-pin Graphics Printers lA3 and IA4, Monitor IA7, Keyboard lA8, and Data Switch A12, is located on a height-adjustable stand next to the Instructor Station work station. The 24-pin printer allows hard copy printouts of data 'layed on the instructor monitor. After the Trainer is powered up, the Diagnostic Unit is used by maintenance personnel to initialize training mode, enter extended diagnostic mode, or enter the maintenance menu where software maintenance can be selected or system shutdown can be accomplished. Training is suspended in both Student Stations while diagnostic testing is in process.

1-2.4 Student Staition, Units 2 and 3. The two Student Stations (figure 1-4) are referenced as Student Station A (Unit 2, left side of Instructor Station) and Student Station B (Unit 3, right side of Instructor Station). From the instructor and student points of view, both Student Stations operate identically. Both Student Stations contain the Trainer computer system (A2). This computer system sends and receives data to and from the Instructor Station through a two-channel automatic switching system and runs simulation scenarios. Both Student Stations contain a DRLMS (A3), which simulates the APG-66NT radar used in the Trainer aircraft and provides a simulated landmass return that is displayed on the Student Station radar multifunction display (AlAl). In addition to the multifunction display, the student has the following avionics panels to aid in training: Fuel Flow Totalizer AlMl, Fuel Indicator AlM2, Threat Warning Indicator AlM3, Angle of Attack Indicator AlM4, Radar Altimeter AlM5, Mach/Airspeed Indicator AlM6, Standby Attitude Indicator AlM7, Barometric Altimeter AlM8, Digital Clock AlM9, Horizontal Situation Indicator AlMlO, Vertical Velocity Indicator AlMll, Master Caution Indicator AlDS1, Radar Antenna Coarse Elevation AlRl, Caution Advisory Panel AlA2, Threat Audio Volume Control AlR2, and Headset Control Panel AlA3. Hand Control, Unit A8 is a right-handed, self-centering, displacement-type control stick that moves the cross-hair cursor on the radar multifunction display. Joystick A9, which is enabled by the instructor, allows the student to fly the simulated aircraft during a scenario.

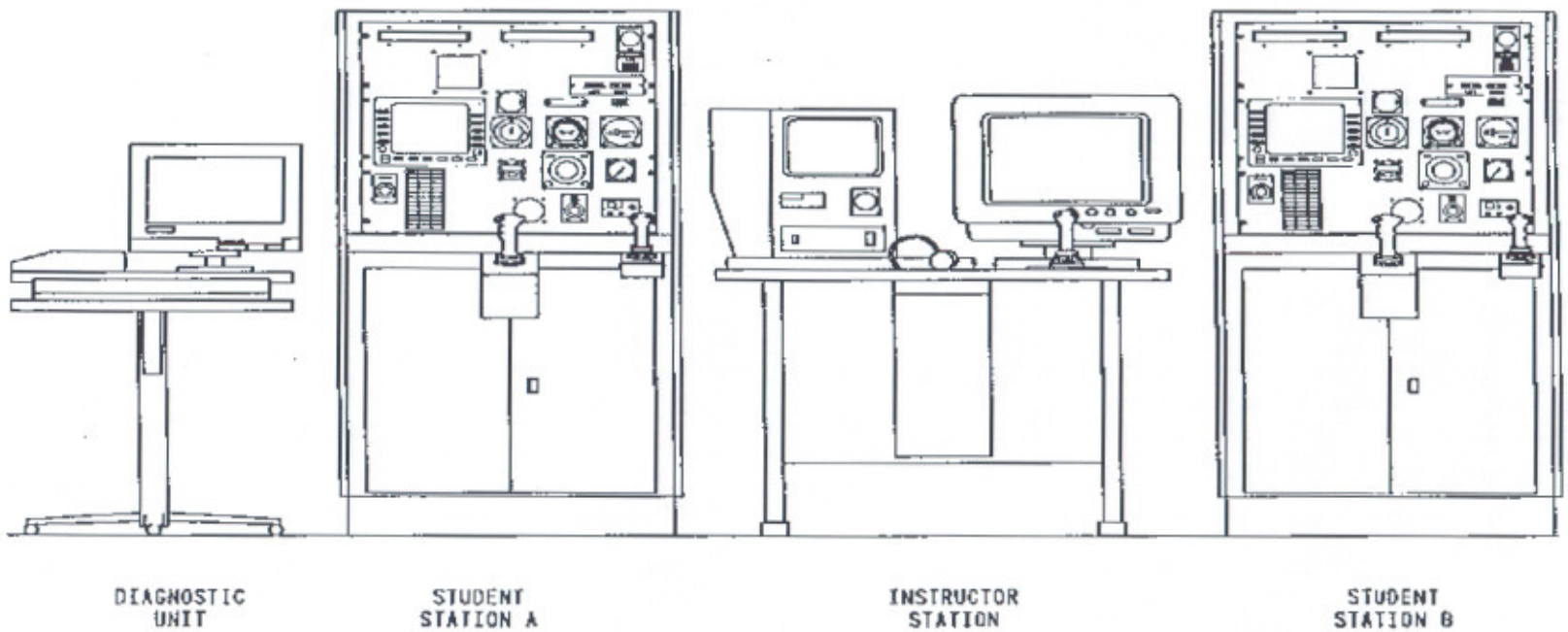
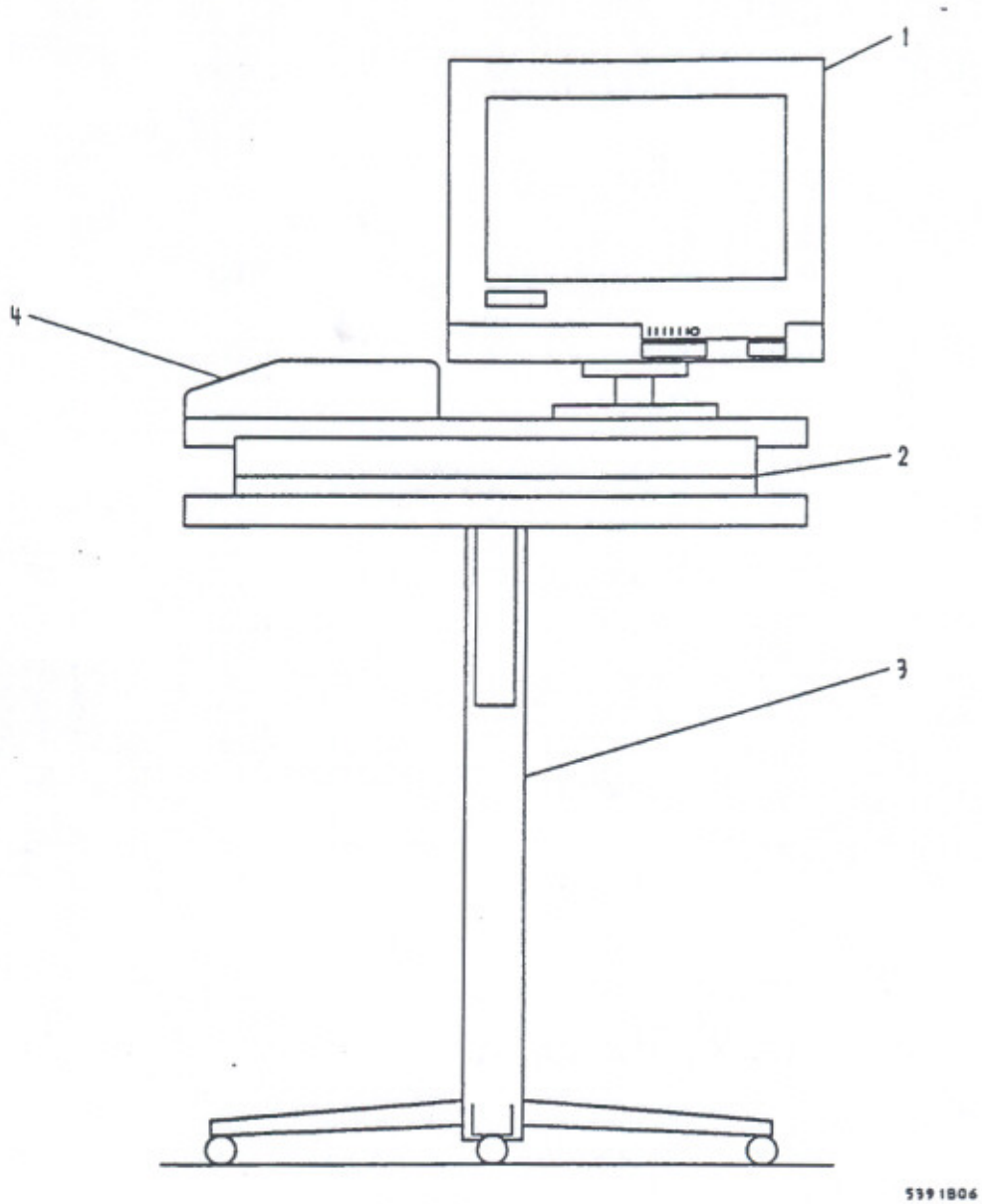



**Figure 1-2. Trainer Configuration**




1. MONITOR
2. KEYBOARD
3. STAND
4. DATA SWITCH

**Figure 1-3. Diagnostic Unit (Part of Unit 1)**

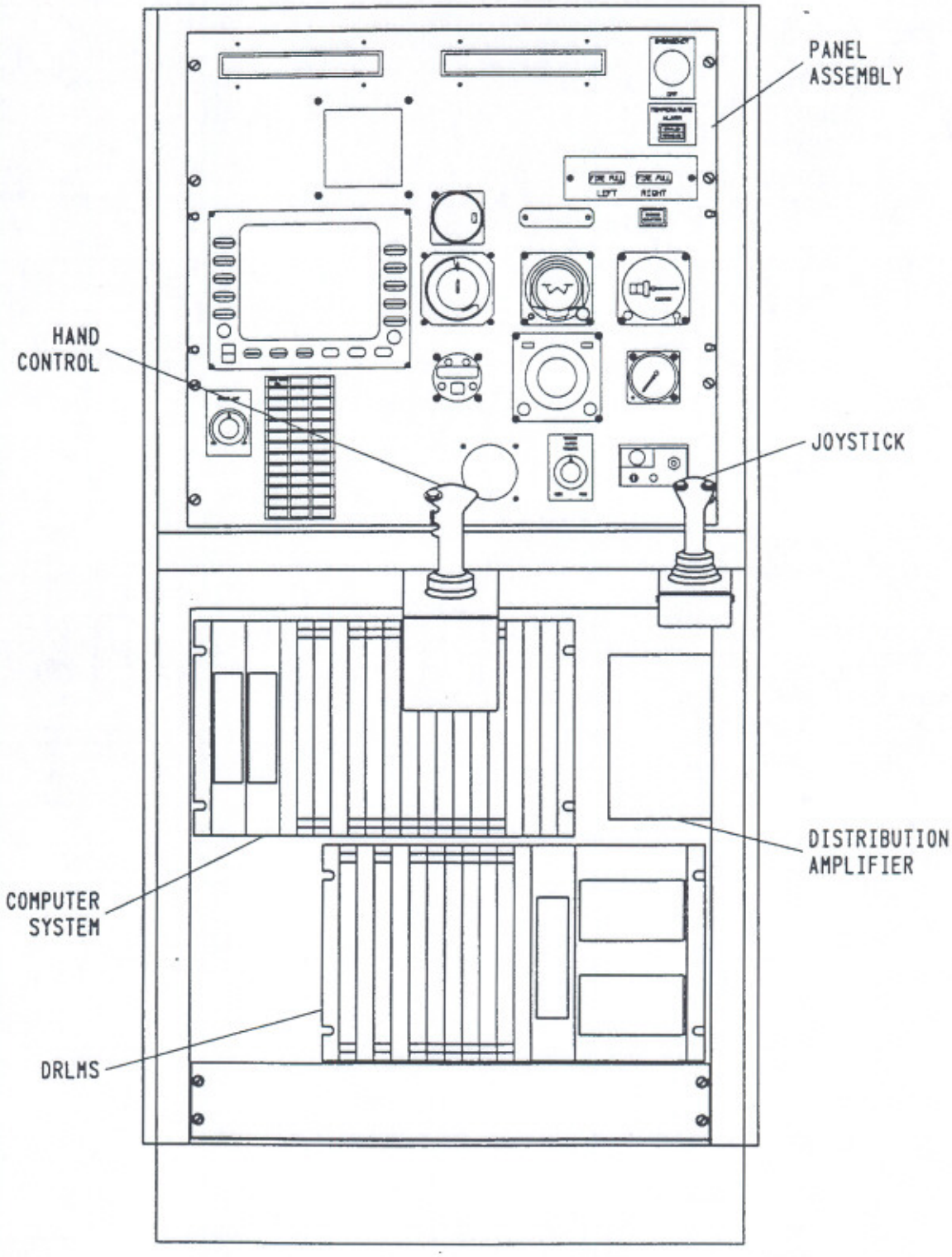



**Figure 1-4. Student Station, Unit 2 or 3**

## 1-3 TRAINER CAPABILITIES AND LIMITATIONS.

Table 1-4 lists the capabilities and limitations of the Trainer from a system level and functional viewpoint. The capabilities and limitations are categorized as follows: overall device, scenario initialization and control, Trainer aircraft control parameters, surface targets, instructor-controllable radar features, radar malfunctions, and threat simulation.

Table 1-4 Trainer Capabilities and Limitations

Overall Device

- One Instructor Station independently controls two Students Stations.

- Instructor Station dedicated to one Student Station at a time (selectable).

- Student Station duplicates appearance of Student Station on actual trainer aircraft (cabinet, instrument panel, seat).

- Dual channel intercom system allows instructor to communicate with each Student Station independently or with both stations simultaneously.

- Gaming area: Eastern United States from Mississippi River to Atlantic Ocean and from Gulf of Mexico to Great Lakes (1,250 nautical miles (rmi) x 1,250rmi)

- Twenty preprogrammed navigation routes available for scenario use.

- Up to 22 preprogrammed initial conditions (IC) sets available for scenario initialization. Instructor may modify existing IC sets, create new IC sets, save modified and new IC sets, and delete existing IC sets.

- One hundred forty-six navigation facilities (VOR and TACAN) preprogranuned into overall gaming area simulate real-world facilities.

- Twenty preprogrammed emergencies available to simulate emergency situations described in publications pertaining to actual UNFO aircraft.

- Fifteen preprogrammed APG-66NT malfunctions available to simulate malfunctions in student's simulated radar.

- Instructor printer provides hard copies of monitor displays and summaries of IC sets.

Scenario Initialization and Control

- Four instructor-controlled modes of operation: initialization, run, freeze, and replay.

- Scenario initialized by selecting 1 of 22 (maximum) preprograrmned IC sets.

Table 1-4. Trainer Capabilities and Limitations – CONT

Scenario Initialization and Control - continued

One of 20 preprogrammed navigation routes assigned to scenario to define route that student is to navigate.

Instructor multifunction display (MFD) repeater allows instructor to monitor student MFD display at all times.

Real-time gaming area displays allow instructor to monitor student progress through gaming area at all times.

Sidebar menu displays aid in instructor control of following:

- Trainer aircraft
- Simulated targets
- Simulated threats
- Simulated navigation facilities
- Radar degradation effects
- Simulated aircraft emergencies
- Simulated radar malfunctions

Instructor plays role of pilot and flies trainer aircraft in accordance with navigation instructions from student.

Instructor may control flight of Trainer aircraft via instructor monitor or joystick. Simulated attitude reference indicator (ARI) and horizontal situation indicator (HSI) are displayed on instructor monitor as pilotingaids.

Instructor may . transfer flight control to Student Station to permit student

to train (practice) with minimal supervision.

Instructor simulates tuning of VOR and TACAN receivers by activating navigation facility frequencies/channels as Trainer aircraft travels navigationroute.

Information from simulated navigation facilities is received by student only if facility **is** activated (by instructor) and Trainer aircraft **is** within rangeof facility.

During scenario execution, system records audio communications and parameters of trainer aircraft, targets, threats, etc, for scenario replay.

Table 1-4. Trainer Capabilities and Limitations – CONT

Scenario Initialization and Control - continued

- Replay mode allows instructor to play back up to most recent 30 minutes of

scenario for student debriefing.

- Two replay speeds: 1X (real-time) and 4X (fast forward)

- During replay, instructor may halt replay and resume training from current replay point.

Trainer Aircraft Control Parameters

- Controllable heading: 0 to 360 degrees

-Controllable bank angle: 0 to 90 degrees

-Controllable airspeed: 0 to 750 knots true airspeed

-Controllable acceleration: 0 to 64 feet/second/second

-Controllable altitude: 0 to 40,000 feet

- Controllable climb/dive rate: 0 to 10,000 feet/minute

- Controllable fuel load: 0 to 7,181 pounds

-Instructor may change Trainer aircraft position via latitude/longitude coordinates.

-Controllable RAM temperature: 0 to 200 degrees Celsius

-Controllable environment: wind direction (O to 360 degrees), wind speed (O to 100 knots), barometric altimeter setting (28.12 to 31 inches mercury).

Surface Tareets

- Up to eight surface targets may be active in scenario to provide training in surface surveillance procedures

- Targets assigned identification numbers: 1 to 8

- Targets 1 through 7 simulate radar returns of 800-foot cargo/tanker ships for Trainer aircraft altitudes of 200 to 20,000 feet.

- Target 8 simulates radar return of a 1,000-foot carrier for Trainer aircraft altitudes of 200 to 20,000 feet.

- Targets I through 3 are dynamic and may be assigned motion courses; targets 4 through 8 are stationary.

**Table** 1-4. Trainer Capabilities and Limitations - CONT

Surface Targets - continued

- To provide training in carrier departure and arrival procedures, a TACAN station can be simulated on carrier by positioning target 8 carrier at same latitude/longitude coordinates as one of the sea-located preprogrammed navigation facilities.

- Instructor may individually control the following target parameters:

Target status (activelinactive)

·Target latitude/longitude position

·Target heading: 0 to 360 degrees (targets 1 through 3 only)

0 Target speed: 0 to 750 knots true airspeed (targets I through 3 only)

Instructor-Controllable Radar Features

Simulates all air-to-ground modes of APG-66NT radar.

Instructor controls power up sequence for simulated APG-66NT. At power up, simulates APG-66NT built-in test (BIT) and warmup sequence.

Simulates INS alignment (initialization) during warmup sequence. Student enters present latitude and longitude. After 4 minutes, minimum INS alignment is completed; after 4 more minutes, optimal alignment is achieved. The simulated radar may be commanded out of the align mode any time after the minimum INS align is complete.

Instructor may bypass radar warmup sequence and INS initialization to allow immediate training after applying radar power.

Six types of radar degradation simulated: radar malfunctions, weather effects, false hits, clutter, electronic jamming, and chaff.

Instructor can assign jamming to one of the eight targets in the scenario.

Target must be active before jamming can be seen.

Instructor can select one of the eight scenario targets to dispense a chaff cloud. Target must be active to dispense chaff.

Chaff, when dispensed, appears as a cloud that lingers for 30 seconds, then disappears.

Controllable false hits: 0 to 8 per scan. False hits appear as targets (1to 8) that appear randomly on the radar display every scan period.

Controllable clutter/noise effects range from 0 (none) **to** 5 (maximum).

Table 1-4. Trainer Capabilities and Limitations - CONT

Instructor-Controllable Radar Features - continued

- Weather patterns represent areas of precipitation (rain) and simulate effects of such areas on radar.

Up to five weather patterns may be active simultaneously in a scenario.

Instructor positions patterns in latitude/longitude.

Instructor can activate and deactivate individual patterns at any time.

Seventeen preprograrmned weather patterns (shapes) are stored in system. Instructor selects from these available patterns when assigning a pattern to a scenario.

Each weather pattern consists of up to five cells. One outer cell is the base cell and encloses up to four inner cells.

Instructor controls the intensity of the base cell (o to 10 with 10 as maximum intensity).

The intensities of the inner cells are relative to the base cell and vary ,automatically as the base cell intensity changes.

Radar Malfunctions

-Instructor may activate and deactivate malfunctions at any time.

-Fifteen radar malfunctions available:

| | |
|---|---|
| 1 - Squint failure | 6 - Auto antenna |
| 2 - Auto range failure | failure |
| 3 - Symbology failure | 7 - Sector scan |
| 4 - Co-channel | failure |
| interference | 8 - MFD pushbutton |
| 5 - Hand control unit | failure |
| (HCU) thumbwheel | 9 - INS problemfailure |
| 10 -Transmitter failure | |
| 11 - Pitch stabilizer failure | |
| 12 - Roll stabilizer failure | |
| 13 - HCU submode button failure | |
| 14. Antenna Failure | |
| 15 HCU input failure threat Simulation | |

- Controllable simulated threats presented on Student Station threat warning indicator (TWI).

- TWI display divided into three lethality bands: critical (outermost band), lethal (second band), and nonlethal (third band).

**Table** 1-4. Trainer Capabilities and Limitations - CONT

Threat Simulation - continued

- TWI display divided into four quadrants as follows:

0 0 to 90 degrees

0 90 to 180 degrees

0 180 to 270 degrees

0 270 to 360 degrees

- Instructor can activate up to 12 threats simultaneously (maximum of 3 in any 1 quadrant).

For each threat, instructor defines symbol (1 to 6 and A to E), band, and quadrant.

Symbols may be modified to show shipboard threats, self-protect designated threats, and high-speed anti-radiation missile (HARM) designated threats.

Instructor activates/deactivates individual threats. When activated, threat symbol appears in specified TWI band and quadrant. Threat symbol remains in position until it is deactivated by instructor.

Audio is presented at Student Station speaker for most recent threat activated (only one audio tone is generated at a time).

**Section** III. OPERATION

GENERAL.

This section describes the controls and indicators located on the Student Station and Instructor Station and provides instructions for system power up, Diagnostic Unit operation, shutdown, and emergency shutdown. Table 3-1 lists Trainer performance characteristics in tabular form.

3-2 INSTRUCTOR STATION CONTROLS AND INDICATORS.

The following paragraphs describe the Instructor Station controls used to power up the Trainer, initialize and control scenarios, and perform other instructorrelated tasks.

3-2.1 Instructor Monitor, Keyboard, and Joystick Controls and Indicators. Figures 3-1 through 3-3 illustrate the controls and indicators on the instructor monitor, keyboard, and joystick respectively. Table 3-2 describes the controls and indicators for all three figures. These three units provide the instructor with the ability to monitor and control training scenarios. The monitor provides scenario graphic summaries in the left three-fourths of the display area and data entry sidebars in the right one-fourth of the display area. The keyboard is used to control, enter data, and modify parameters for the training scenario. The joystick allows the instructor to fly the ownship manually for the selected Student Station in response to student piloting directions. The joystick maintains the last commanded position to permit hands-off instructor control. Instead of using the joystick, the instructor may use the keyboard to fly the ownship.

3-2.2 Instructor Intercom Panel Controls and Indicators. Figure 3-4 and table 3-3 identify and describe the Instructor Station intercom panel controls and indicators. The Trainer utilizes a two-channel intercom system that allows communication between the Instructor Station and the two Student Stations. Intercom channel 1 is dedicated to Student Station A and channel 2 to Student Station B. The instructor can configure the Trainer intercom system in one of two modes: COMBINE or ISOLATE. In ISOLATE mode, the two intercom channels are independent and the instructor communicates with only one Student Station at a time. In COMBINE mode, the-two intercom channels are combined

to provide one overall party line. In this mode, the instructor can communicate with both students simultaneously and either student can communicate with the instructor as well as the other student. The instructor intercom assembly contains a belt pack station, a two-line power supply, an EMERGENCY OFF pushbutton, and the multifunction display (MFD) repeater. The belt pack station is a portable belt pack unit that is permanently mounted in the intercom panel and is used to control the intercommunications between the Instructor and Student Stations. The instructor headset plugs into the belt pack station. The two-line power supply provides power to the entire intercom system and is used to select the COMBINE or ISOLATE mode of operation. The EMERGENCY OFF pushbutton switch provides the instructor with the capability to shut down the Trainer in the event of an emergency. The MFD repeater is also mounted in the Instructor Station intercom panel assembly. Figure 3-5 illustrates the controls on the MFD repeater. Table 3-4 describes these controls.

Table 3-1. Trainer Performance Characteristics

Trainer Configuration

- One Instructor Station Controls two Student Stations, although Instructor Station communicates with only one Student Station at a time **(selectable** from Instructor Station).

- Dual channel intercom system allows instructor to communicate with each Student Station independently or with both stations simultaneously.

- Each Student Station contains independent DRLMS to simulate ground mapping modes of APG-66NT radar.

- Each Student Station contains a real-time simulation computer.

Each Student Station contains a digital **voice** card that digitally **records** up to 30 minutes of Student Station intercom for later replay.

Performance Characteristics

- Simulates all air-to-ground modes of APG-66NT radar.

- Four instructor-controlled modes of operation: initialization, run, freeze,.and replay.

- Gaming area: Eastern United States from Mississippi River to Atlantic Ocean and from Gulf of Mexico to Great Lakes (1,250 nautical miles (=i) x 1,250 nmi).

- Twenty preprogrammed navigation routes available for scenario use.

- Up to 22 preprogrammed initial conditions (IC) sets available for scenario initialization. Instructor may modify existing IC sets, create new IC sets, save modified and new sets, and delete existing IC sets.

- One hundred forty-@ix navigation facilities (VOR and TACAN) preprogrammed into overall gaming area simulate real-world facilities.

- Twenty preprogra=ned emergencies available to simulate emergency situations described in publications pertaining to actual UNFO aircraft.

- Fifteen preprogrammed APG-66NT malfunctions available to simulate malfunctions in student's simulated radar.

**Instructor plays role of pilot** and **flies trainer aircraft per navigation** instructions from student or the aircraft can be flown by the individual

Table 3-1. Trainer Performance Characteristics - COI+T

Performance Characteristics - continued

- Instructor simulates tuning of VOR and TACAN receivers by activating navigation facility frequencies/channels as Trainer aircraft travels navigation route.

- Replay mode allows instructor to play back (up to) most recent 30 minutes of scenario for student debriefing. Two replay speeds: 1X (real time) and 4X (fast forward).

- Up to eight surface targets may be active in scenario to provide training in surface surveillance procedures. Seven targets simulate tanker/cargo ships; one target simulates aircraft carrier.

- To provide training in carrier departure and arrival procedures, a TACAN station can be simulated on carrier by positioning carrier at same latitude/ longitude coordinates as one of the sea-located preprogrammed navigation facilities.

- Six types of radar degradation simulated: radar malfunctions, weather

effects, false hits, clutter, electronic januning, and chaff.

- Up **to** 12 simulated threats may be presented simultaneously on Student Station

threat warning indicator (TWI).

- Audio is presented at Student Station speaker for most recent threat activated (only one audio tone is generated at a time).

UNFO-AIRT-20

TECHNICAL MANUAL

# ORGANIZATION AND MAINTENANCE INSTRUCTIONS
# ORGANIZATIONAL MAINTENANCE

## AIR INTERCEPT RADAR TRAINER (AIRT)

## P/N 63212-40100-10

## FOR THE

## UNDERGRADUATE NAVAL FLIGHT OFFICER (UNFO)
## TRAINING SYSTEMS PROGRAM


PREPARED BY

**AAI CORPORATION**

HUNT VALLEY, MAYLAND

FOR

**SABRELINER CORPORATION**

CHESTERFIELD, MISSOURI



**1 APRIL 1993**

1-1 PURPOSE AND SCOPE.

The Undergraduate Naval Flight Officer (UNFO) Air Intercept Radar Trainer (AIRT) (figure 1-1), hereinafter referred to as the Trainer, is a computer classroom trainer for instructing UNFOs destined for tactical aircrew assignments in the principles and concepts of air-to-air radar intercepts. The Trainer is a stand alone device that consists of an Instructor Station and a Student Station. The UNFOs train in air intercept techniques by interpreting relative target aircraft movement on their display. The UNFO maneuvers simulated Trainer aircraft through commands issued to the instructor to achieve correct firing positions throughout the training mission profile. The student radar display is a high resolution raster display that simulates the Westinghouse APG-66NT radar display used in the actual aircraft Student Station. In addition, the Trainer provides radar control training, including warmup, testing, and calibration procedures and inertial navigation system (INS) initialization procedures. The Trainer is capable of displaying the same threat warnings (including audio) as the aircraft and demonstrates the effects of chaff and electronics jamming. The Trainer provides student performance monitoring for each Trainer event with real-time presentation of training parameters to the Instructor Station and replay capability of the most recent 30 minutes of the mission for student debriefing purposes.

1-2DESCRIPTION OF MAJOR ASSEMBLIES.

1-2.1 EquiRment SupRlied. Table 1-1 lists the equipment supplied as part of the Trainer. Table 1-2 lists the commercial vendor equipment manuals supplied aspart of the Trainer.

1-2.2 EguiRment Required But Not SuRplied. Table 1-3 lists the equipment that is required to operate, maintain, and repair the UNFO AIRT but is not supplied as

part of the Trainer.

1-2.3 Instructor Station, Unit 1. The Instructor Station (figure 1-2) controls training for the Student Station. It consists of a desk-type work station and includes Instructor Monitor lAl, Instructor Keyboard lA2, Instructor Joystick lA5, Multifunction Display Repeater lA4, Intercom Assembly lA6, and Power Control System lA9. The instructor monitor, keyboard, and Joystick allow the instructor to select training scenarios for the Student Station; run the scenarios while monitoring student responses; freeze the mission; quickly slew the Trainer aircraft latitude, longitude, and altitude; or replay the most recent 30 minutes of the training session. The multifunction display repeater allows the instructor to monitor the radar presentation that the student is using. The intercom assembly provides an intercom channel to the Student Station. During a scenario, electronics within the Student Station digitize and store communications ' between the Instructor Station and the Student Station. These stored communications are then played back when the instructor replays the scenario for student debriefing. The Diagnostic Unit (figure 1-3), which consists of 24-pin Graphics Printer lA3, Monitor lA7, and Keyboard lA8, is on a height-adjustable stand next to the Instructor Station work station. The 24-pin printer allows hard copy printouts of data displayed on the Instructor Monitor.

| | | | | |
|---|---|---|---|---|
| Acft Carrier (CV) Proc | CVP | 4.0 | EC/PP | **ADD CAI & COTS** (III-7) |
| Strike Seminar | SS | 5.0 | EC/PP | |
| Fleet Brief | FB | 3.0 | EC/PP | |
| Instrument Ground School | IGS | 13.0 | EC/PP | **ICW** (III-8) |
| Strike Phase Review/Exam | SPX | 5.0 | EC/PP | **2 HRS OF ICW TESTING** (III-9) |
| TOTALS | | 119.0 | | |

CR = Classroom; EC = Electronic Classroom; CAI = Computer Assisted Instruction; ICW = Interactive Courseware; CBT = Computer-Based Training; COTS = Commercial-Off-The-Shelf software; Sim = Simulator; PP = PowerPoint.

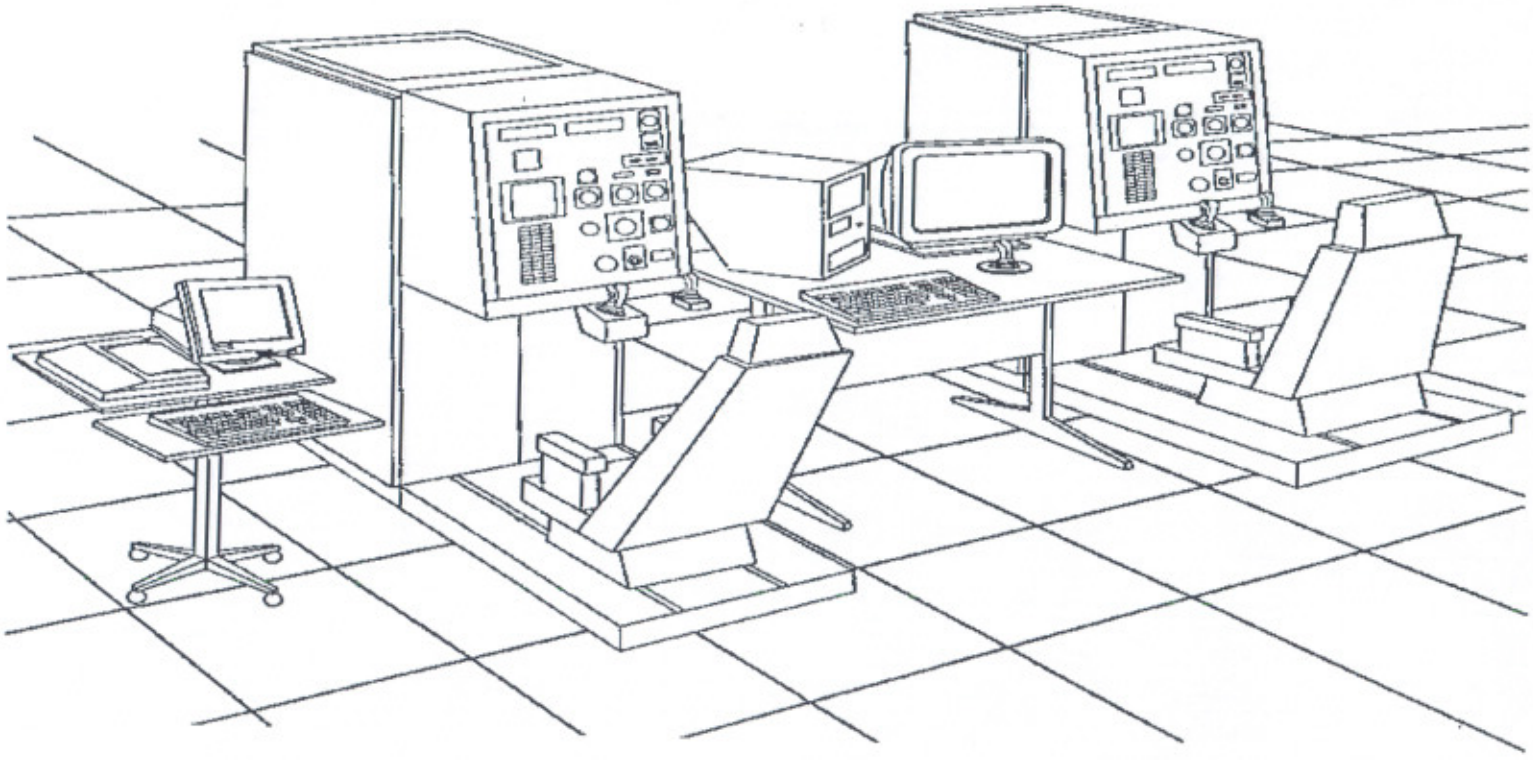


**Figure 1-1- Air Intercept Radar Trainer**

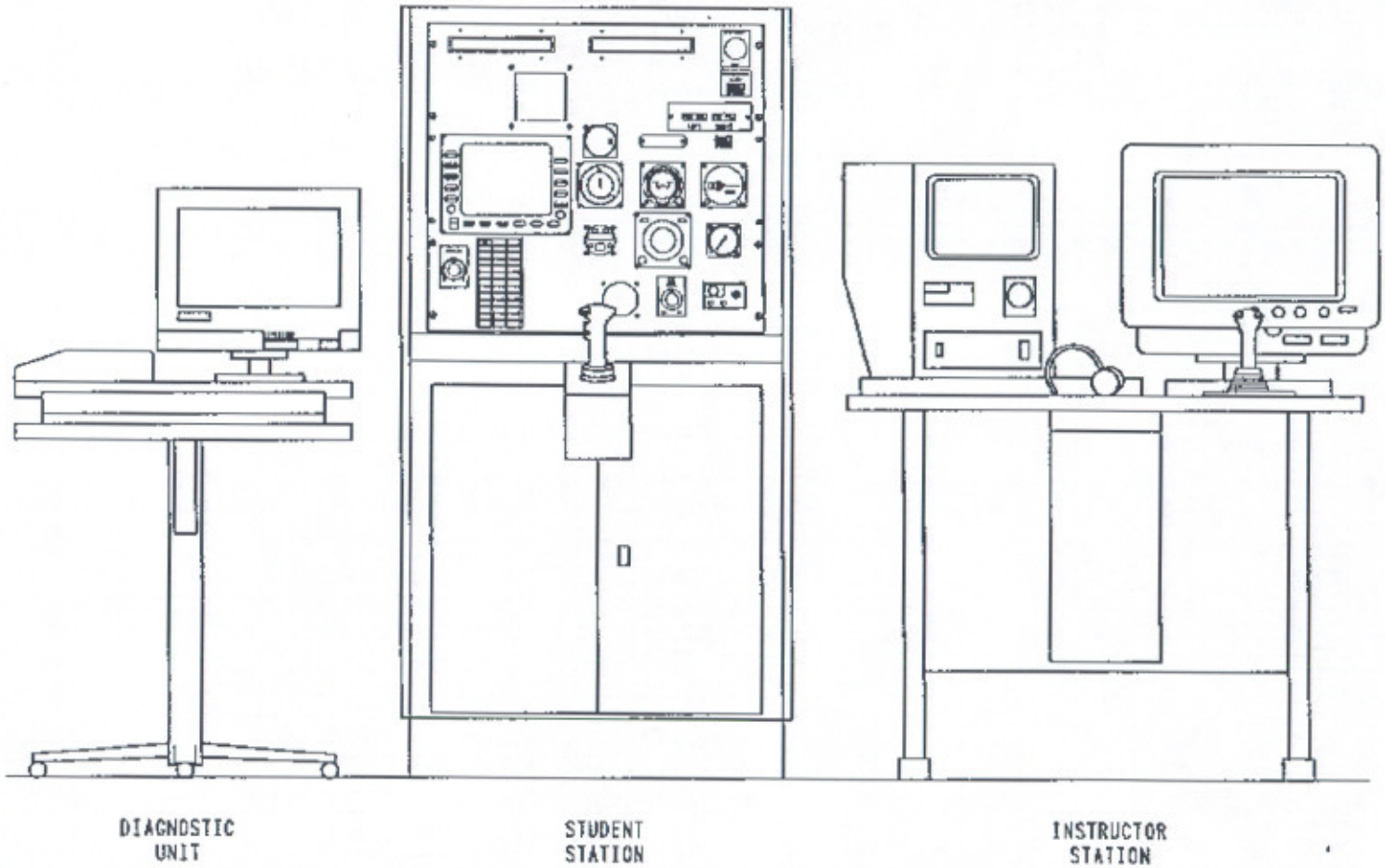
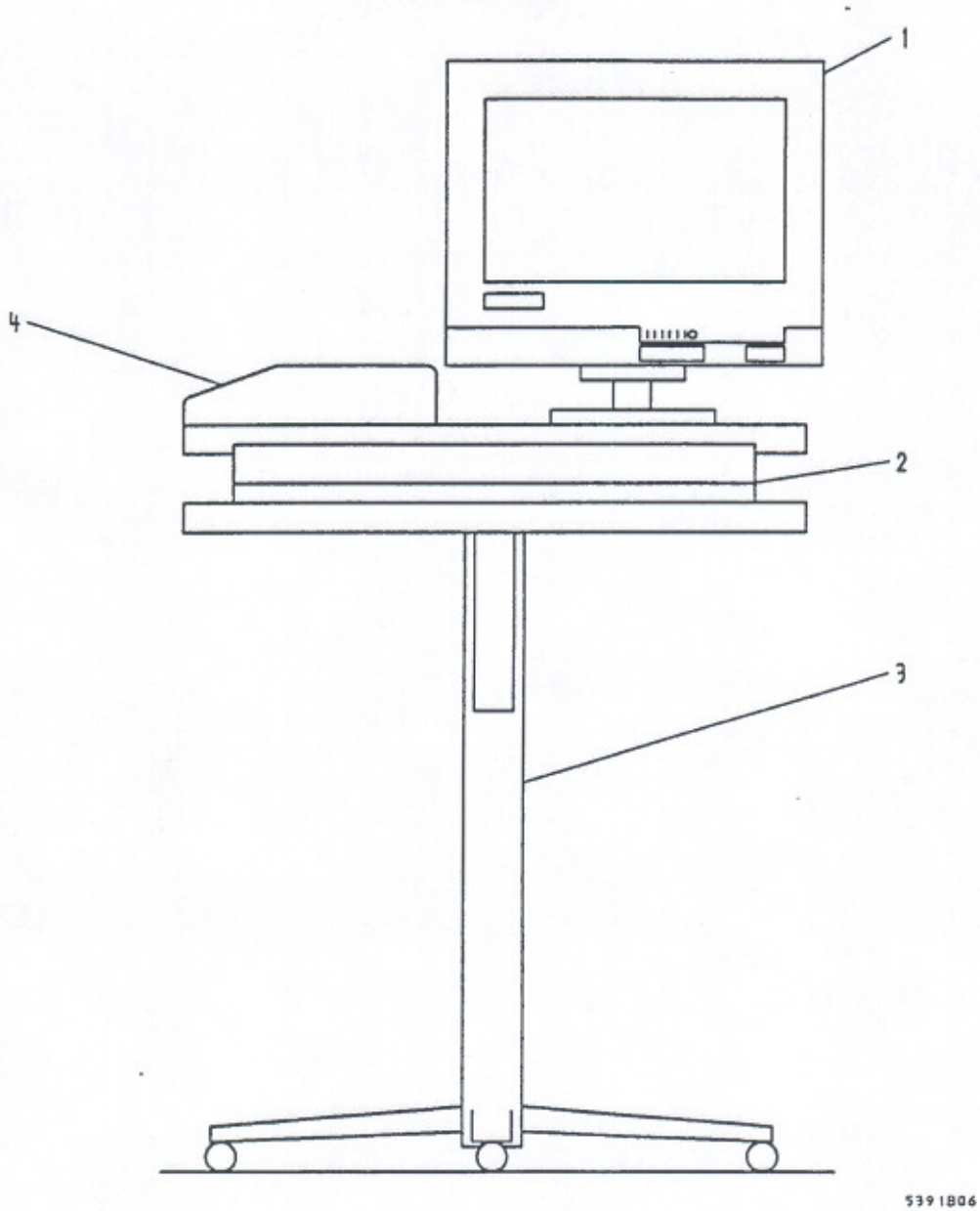



**Figure 1-2. Trainer Configuration**




1. MONITOR
2. KEYBOARD
3. STAND
4. PRINTER

Figure 1-3. Diagnostic Unit (Part of Unit 1)

The Maintenance Console is used by maintenance personnel after powering up the Trainer to initialize training mode, enter extended diagnostic mode, or-enter the Maintenance Menu where software maintenance can be selected or system shutdown can be accomplished. Training is suspended in the Student Station while diagnostic testing is in process.

1-2.4 Student Station, Unit 2. The Student Station (figure 1-4) houses the Trainer computer system (A2), which sends and receives data to and from the Instructor Station during simulation scenarios. In addition to the multifunction display (MFD), the student has the following avionics panels to aid in training: Fuel Flow Totalizer AlMl, Fuel Indicator AlM2, Threat Warning Indicator AlM3, Angle of Attack Indicator AlM4, Radar Altimeter AlM5, Mach/Airspeed Indicator AlM6, Standby Attitude Indicator AlM7, Barometric Altimeter AlM8, Digital Clock AlM9, Horizontal Situation Indicator AIM10, Vertical Velocity Indicator AlMll, Master Caution Indicator AlDS1, Radar Antenna Coarse Elevation AlRl, Caution Advisory Panel AlA2, Threat Audio Volume Control AlR2, and Headset Control Panel AlA3. Hand Control Unit A8 is a right-handed, self-centering, displacement-type control stick that moves the cross-hair cursor on the radar multifunction display.

1-3 TRAINER CAPABILITIES AND LIMITATIONS.

Table 1-4 outlines the capabilities and limitations of the Trainer from a system **level** and functional viewpoint. The capabilities and limitations are categorized as overall device, scenario initialization and control, Trainer aircraft control parameters, surface targets, instructor-controllable radar features, radar malfunciions, and threat simulation.

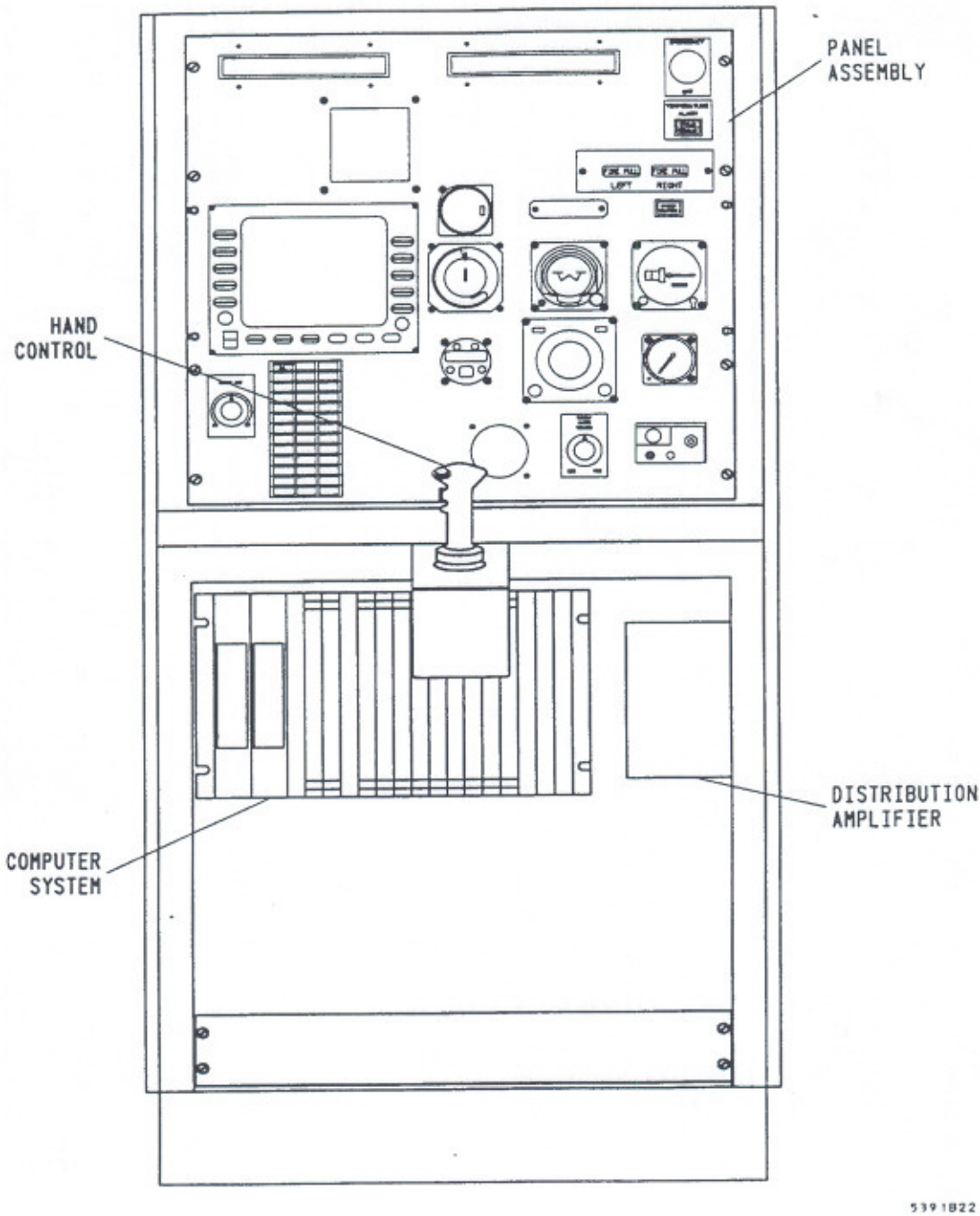



**Figure 1-4. Student Station, Unit 2**

Table 1-4. Trainer Capabilities and Limitations

Overall Device

One Instructor Station controls one Student Station.

Student Station duplicates appearance of Student Station on actual Trainer aircraft (cabinet, instrument panel, seat).Intercom system allows instructor to communicate with Student Station.

Gaming area: unlimited area of the earth's surface; however, the UNFO aircraft is assumed to be flying over water.

Up to 22 preprogrammed initial conditions (IC) sets available for scenario initialization. Instructor may modify existing IC sets, create new IC sets, save modified and new IC sets, and delete existing IC sets.

One hundred forty-six navigation facilities (very high frequency omnidirectional radio range (VOR) and tactical air navigation (TACAN)) preprogra=ned into overall gaming area simulate real-world facilities.

Twenty preprogrammed emergencies available to simulate emergency situations described in publications pertaining to actual UNFO aircraft.

Fifteen preprogrammed APG-66NT malfunctions available to simulate malfunctions in student simulated radar.

Instructor printer provides hard copy of monitor displays and summaries of initial conditions sets.

Scenario-Initialization and Control

- Four instructor-controlled modes of operation: initialization, run, freeze and replay.

- **Scenario initialized** by **selecting 1 of** 22 (maximum) preprogrammed **initial conditions sets.**

Instructor MFD repeater allows instructor to monitor student MFD display at all times.

- Real-time gaming area displays allow instructor to monitor student progress through gaming area at all times.Sidebar menu displays aid in instructor control of the following: t Trainer aircraft 0 Simulated targets 0 Simulated threats s

Scenario Initialization and Control - continued 0 Radar degradation effects

Simulated aircraft emergencies

Simulated radar malfunctions

- Instructor plays role of pilot and flies Trainer aircraft.

- Instructor may control flight of Trainer aircraft via instructor keyboard or instructor joystick. Simulated attitude reference indicator (ARI) and horizontal situation indicator (HSI) are displayed on instructor monitor as piloting aids.

- Instructor simulates tuning of VOR and TACAN receivers by activating navigation facility frequencies/channels.

Information from simulated navigation facilities is received by student only if facility is activated by instructor and Trainer aircraft is within range of facility.

During scenario execution, system records audio communications and parameters of Trainer aircraft, targets, threats, etc, for scenario replay.

Replay mode allows instructor to play back (up to) most recent 30 minutes of scenario for student debriefing.

Two replay speeds: 1X (real-time) and 4X (fast forward)

During replay, instructor may halt replay and resume training from current replay point.

Trainer Aircraft Control Parameters- Controllable heading: 0 to 360 degrees

-Controllable bank angle: 0 to 90 degrees

-Controllable airspeed: 0 to 750 knots true airspeed

-Controllable acceleration: 0 to 64 feet/second/second

-Controllable altitude: 0 to 40,000 feet

-Controllable climb/dive rate: 0 to 10,000 feet/minute

-Controllable fuel load: 0 to 7,181 pounds

-Instructor may change Trainer aircraft position via latitude/longitude coordinates.

Trainer Aircraft Control Parameters - continued

- Controllable environment: wind direction (O to 360 degrees in 1-degree increments), wind speed (O to 100 knots in 1-knot increments), and barometric altimeter setting (28 to 32 inches mercury).

Targets- up to three targets may be active in scenario to provide training in air intercept procedures.

Targets assigned identification numbers: 1 to 3

Instructor may control the following target parameters individually:

- Target initial heading (O to 360 degrees)
- Target ordered heading (O to 360 degrees)
- Target altitude (O to 40,000 feet)
- Target speed (O to 750 knots true airspeed (KTAS))
- Target visible (yes or no)
- Target position (slew bearing and range relative to Trainer aircraft)
- Target jammtng (radar jamming - barrage, spot, sweep, or false targets)
- Target chaff (up to 8 drops per scenario)
- Target size (1 to 4 square meters)
- Target bank angle (bank angle for turns 0 to 90 degrees)

- Target VSI (vertical speed indicator for climbs/dives of 0 to 10,000 feet per minute)
- Target acceleration (rate of acceleration/deceleration for speed changes of 0 to 64 feet/second/second)

- Target status (active or inactive)

Instructor-Controllable Radar Features

- Simulates all air-to-air modes of APG-66NT radar.

- Instructor controls power up sequence for simulated APG-66NT. At power up, simulates APG-66NT built-in test (BIT) and warmup sequence.

Table 1-4. Trainer Capabilities and Limitations - CONT

Instructor-Controllable Radar Features - continued

- Simulates inertial navigation system (INS) alignment (initialization) during warmup sequence. Student enters present latitude and longitude. After 4 minutes, minimum INS alignment is completed; after 4 more minutes, optimal alignment is achieved. The simulated radar may be commanded out of the alignment mode at any time after the minimum INS alignment is complete.

Instructor may bypass radar warmup sequence and INS initialization to allow immediate training after applying radar power.

Eight types of simulated radar degradation: sea returns, radar malfunctions, weather effects, target fade, false hits, clutter, electronic jamming, and chaff.

Instructor can assign jamming to each of the three targets in the scenario.

Target must be active before jamming can be seen.

Instructor can select any of the three targets to dispense a chaff bundle. Chaff, when dispensed, appears as a cloud that lingers for 60 seconds, then disappears. Target must be active to dispense chaff.

Controllable false hits: 0 to 8 per scan. False hits appear as random targets (1 to 8) on the radar display every scan period.

Controllable clutter/noise effects range from 0 (none) to 5 (maximum).

One preprogrammed weather pattern (shape) is stored in the system. The weather pattern represents an area of precipitation (rain) to simulate the effects of weather on the radar.

The weather pattern may be positioned anywhere in the scenario in relative bearing and range to the Trainer aircraft.

Instructor **can activate** and **deactivate** pattern at any time and **controls** the density (intensity) of the pattern, which affects the return.

Radar Malfunctions

- **Instructor may activate and deactivate** malfunctions **at any time.**
- **Fifteen radar malfunctions available:**

| | |
|---|---|
| 28 | High Oil Pressure Right |
| 29 | Loss of Oil Pressure Left |
| 30 | Loss of Oil Pressure Right |
| 31 | PCL Linkage Failure |
| 32 | PT5 Failure Left |
| 33 | RPM Failure Left |
| 34 | #1 Engine And Fuel CB Failure |
| 35 | #2 Engine and Fuel CB Failure |
| 36 | #1 Engine Ignition CB Failure |
| 37 | #2 Engine Ignition CB Failure |
| 38 | Fuel Quantity Indicator Failure |
| 39 | Tip Tank Transfer Failure |
| 40 | Wing Transfer Failure |
| 41 | AFT Boost Pump CB Failure |
| 42 | Fwd Boost Pump CB Failure |
| 43 | Hydraulic Boost Failure |
| 44 | Hydraulic Power System Failure (Slow Bleed) |
| 45 | Complete Hydraulic Failure |
| 46 | Battery Thermal Runaway |
| 47 | Wheel Brake Failure Left |
| 48 | Wheel Brake Failure-Both |
| 49 | Failure Of Landing Gear To Extend (Will Extend W/Override) |
| 50 | All Gear Up Emergency Failed W/Handle Down (No Override) |
| 51 | Nose Gear Unsafe W/Handle Down |
| 52 | Both Main Gear Up Nose Gear Unsafe W/Handle Up |
| 53 | One Main Gear Up/Unsafe/Cocked W/Handle Down Gear Will Retract W/Handle Up |
| 54 | One Main Gear Up W/Handle Down No Retract No Arrest |

| | |
|---|---|
| 55 | One Main Gear Unsafe W/Handle Down No Retract W/Arrest |
| 56 | All Gear Down W/Handle Down Indicator Unsafe |
| 57 | Aileron Trim Failure |
| 58 | Elevator Trim Failure |
| 59 | Elevator Trim Runaway |
| 60 | Rudder Trim Failure |
| 61 | Trim Control CB Failure |
| 62 | Flaps Cycling |
| 63 | Flaps Split |
| 64 | Flaps Fail To Extend/Retract |
| 65 | Flap Indicator Failure |
| 66 | Complete Electrical Failure |
| 67 | Electrical Fire |
| 68 | Generator Failure #1 No Reset |
| 69 | Generator Failure #2 No Reset |
| 70 | Generator Failure Both No Reset |
| 71 | Generator Failure Both #1 Resets |
| 72 | Inverter Failure #1 |
| 73 | Inverter Failure #2 |
| 74 | Split Amperage |
| 75 | UB:F Command Set Failure |
| 76 | Airspeed Indicator Static |
| 77 | Altimeter Failure |
| 78. | Pressure Instruments Failure |
| 79. | Rate Of Climb Indicator Failure |
| 80. | AOA Low/Airspeed Slow |
| 81. | AOA Indicator Failure |

| | |
|---|---|
| 82. | BDHI Total Indicator Failure |
| 83. | BDIU Compass Transmitter Failure |
| 84. | BDIE #1 Needle Failure |
| 85. | BDI-H #2 Needle Failure |
| 86. | BDI-E DME Failure |
| 87. | Spare |
| 88. | CDI Failure |
| 89. | VGI Failure (Off Flag) |
| 90. | VGI Failure (No Off Flag) |
| 91. | Canopy Fail Unlocked |
| 92. | Failure Of Seat To Eject |
| 93. | Oxygen System Failure |
| 94. | Windshield Overheat |
| 95. | Engine Icing |
| 96. | Turbulence And Thunderstorms |
| 97. | VGI Tumble (No Off Flag) |
| 98. | VGI Stabilized Improper Wing Position |
| 99. | VGI Precess (No Off Flag) |
| 100. | Stby Gyro Failure |
| 101. | Gear Hdl Lock Won't Release |
| 102. | Runaway Aileron Trim |
| 103. | Runaway Rudder Trim |
| 104. | Spare |
| 105. | Blown Tire - Nose |
| 106. | Blown Tire - Left |
| 107. | Blown Tire - Right |
| 108. | Nose Wheel Shimmy |

| | |
|---|---|
| 109. | TACAN (Complete) Failure |
| 110. | TACAN T/R Failure |
| 111 | TACAN XMTR Failure |
| 112. | Inflight Vibration - Inverter #2 |
| 113. | Inflight Vibration - Left Generator |
| 114. | Inflight Vibration - Right Generator |
| 115. | Inflight Vibration - Left Engine |
| 116. | Inflight Vibration - Right Engine |
| 117. - 150. | Spare |

* Pending Malfunction

Description

2.6 PERSONNEL CONSIDERATIONS.

2.6.1 TRAINEE USE OF TRAINER. It is assumed that most training facilities will have the trainer available for student use in an unsupervised mode. For this reason the following precautions must be passed on to the students, regardless of whether or not they participate in this activity. First, the students should receive instructions on the basic operation of the trainer, emphasizing that they are not to use any mode but Operate. (It is suggested that all instructors/operators delete any active submodes before relinquishing use of the trainer.) This mode allows the student to place the simulated aircraft in any attitude, location, or status desired. Emergency procedures training requiring malfunctions insertion wfll require MAN FLT mode to be established. The students should receive a cursory explanation of the basic procedures for establishing aircraft parameters and how to recover from simulated crashes. The second consideration for students concerns those sites utilizing the 2FlOl(MTS) trainers. All personnel associated with these trainers should be aware of certain features. First, as the tmfler is designed to act as a self-contained device, it has fire detection and suppression systems buflt into it. There are two alarms associated with the fire detection/suppression system. The first alarm (bell) is sounded when smoke is detected. Personnel should start evacuation at this time. The second alarm (horn) sounds to indicate that the fire suppression system (Halon) will discharge in about 27 seconds. Though Halon is nontoxic, it acts to consume oxygen. When Halon is discharged, electrical power to the trainer is disconnected, but emergency lighting will provide sufficient illumination for a safe eidt. If the cockpit is occupied (with canopy lowered) prior to power loss, the canopy is automatically released but must be raised manually.

NTSC P-5696

TECHNICAL MANUAL

(PRELIMINARY)

# INSTRUCTOR'S UTILIZATION HANDBOOK

# T-2C OPERATIONAL FLIGHT TRAINER

# DEVICE 2FIOl

# VOLUME 11


Prepared by:

SIMTEC, INC.

San Joaquin Division

230 Commerce Ave.

Atwater, CA 95301



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SECTION IV

TRAINING OBJECTIVES

4.0 OVERVIEW. Section IV of the handbook identifies the training objectives of the IUH and the procedures for utilizing the training exercises to accomplish training for prospective instructors. The handbook may be used in conjunction with formal classroom instruction as a lesson guide for the student, supplying the reference material for reading assignments and training exercises, or it may be used in a self-paced environment. The Training Schedule in Section V contains annotations identifying those exercises to be used for each type of instruction. Instructions, further describing the use of the schedule, can be found in Section V.

4.1 TRAINING OBJECTIVES.

**4.1.1** GOALS. The basic goal of the training sections, contained within the handbook, is to furnish prospective instructors with the skills and knowledge necessary to conduct effective pilot training using the 2FlOl OFT. The basic premise is that instructors must fully realize the capabilities and limitations of the trainer before effective training can take place. The training objectives are designed to meet the basic goal of the handbook. The following list identifies all the objectives of the training section by first listing a Terminal Objective and then the supporting Enabling Objective(s). All Terminal Objectives listed pertain to both styles of instruction, however, not all Enabling Objectives are relevant for classroom instruction. Those differences will be identified in the listing.

**4.1.2** LISTOFOBJECTIVES. The following is the list of objectives for training:

| Terminal Objective | Enabling Objective | Description |
|---|---|---|
| 1.0 | | The Student will be able to operate the T-2C Operational Flight Trainer (OFT), Device 2FlOl, and effectively employ the Trainer's capability during Training Missions and Exercises for T-2C Student Pilots and Naval Flight Officers |
| 1.1 | | The Student will be able to identify the purpose of the Instructor's Utilization Handbook and its intended use. |
| | 1.1 | The Student will identify the nature and content of the Instructor's Utilization Handbook by correctly answering a multiple-choice exam. |
| | 1.2 | The Student will identify the purpose and function of the Instructor's Utilization Handbook by correctly answering a multiple-choice exam. |
| 1.2 | | The Student will be able to identify the purpose and function of all major components of the Trainer. |

| | | |
|---|---|---|
| | 2.1 | The Student will identify Trainer component location by correctly labeling a blank block diagram of the Trainer, or a blank block diagram of the MTS, without error. |
| | 2.2 | The Student will identify the purpose and function of the Computer System by correctly answering a multiple-choice exam. |
| | 2.3 | The Student will identify the purpose and function of the Display System by correctly answering a multiple-choice exam. |
| | 2.4 | The Student will identify the purpose and function of the Printing System by correctly answering a multiple-choice exam. |
| | 2.5 | The Student will identify the purpose and function of the Audio Record/Playback System by correctly answering a multiple-choice exam. |
| | 2.6 | The Student will identify the purpose and function of all controls and indicators associated with the Instructor Operator Station (IOS) by correctly answering a multiple-choice exam. |
| | 2.7 | The Student will identify the Navigation and Communication Systems, the Instructor Controls and Indicators, and major assemblies of the Trainer Flight Compartment (Cockpit) by correctly answering a multiple-choice exam. |
| | 2.8 | The Student will identify the location and use of the Emergency Stop Ac. tuators by correctly answering a fill-in exam. |
| | 2.9 | The Student will identify the location of, and all controls and indicators on, the Trainer or MTS Power Distribution Panel by correctly answering a multiple-choice exam. |
| 1.3 | | The Student will be able to apply power, initialize, and verify the operational status of the Trainer in preparation of training. |
| | 3.1 | The Student will apply power, initialize, and verify the operational status of the Trainer or MTS in preparation of Training, in accordance with the procedures stated in Section III of NTSC P-5696, without error. |
| 1.4 | | The Student will be able to identify the purpose of the Instructor Operator Station, the main user interface |
| | 4.1 | The Student will demonstrate proper use of the Instructor Operator Station (IOS) by correctly preparing the Trainer or MTS for use with a preprogrammed mission. |

| | | |
|---|---|---|
| | 4.2 | The Student will be able to identify the purpose and use of the Format A, B, and C CRT Display pages. |
| | 4.3 | The Student will demonstrate proper use of the Instructor Operator Station (IOS) by correctly preparing the Trainer or MTS for use in NFO Mode. |
| | 4.4 | The Student will demonstrate proper use of the Instructor Operator Station (IOS) by generating hard-copy print outs of selected display pages during a Demonstration Flight. |
| | 4.5 | The Student will demonstrate proper use of the Instructor Operator Station (IOS) by conducting a mock training mission in Manual Flight Mode. |
| | 4.6 | The Student will demonstrate proper use of the Instructor Operator Station (IOS) by correctly establishing and releasing Plan Mode. |
| 1.5 | | The Student will be able to identify the purpose and use of the Format A, B, and C CRT Display pages. |
| | 5.1 | The Student will be able to identify the purpose and use of the Format A, B, and C CRT Display pages. |
| 1.6 | | The Student will be able to identify the use of the Trainer in Normal Operating Mode. |
| | 6.1 | The Student will identify the Trainer capabilities and restrictions while in the Normal operating mode by correctly completing an associated Training Exercise. |
| 1.7 | | The Student will be able to identify the operation and purpose of DRED mode. |
| | 7.1 | The Student will identify the capabilities of DRED Mode operation by correctly answering a multiple-choice exam. |
| | 7.2 | The Student will identify the purpose and function of DRED Mode by conducting the Daily Preoperational Readiness Tests, as indicated on Card 1 of NAVTRADEV P-4105R4, and completing an associated assignment sheet. |
| 1.8 | | The Student will be able to identify the operation and purpose of Plan Mode and the formulation of new exercises. |
| | 8.1 | The Student will identify the capabilities of Plan Mode operation by correctly answering a multiple-choice exam. |

| | | |
|---|---|---|
| | 8.2 | The Student will demonstrate the proper use of the Trainer while in Plan Mode by correctly creating a new temporary Training Mission. |
| 1.9 | | The Student will be able to identify the purpose and use of NFO Mode. |
| | 9.1 | The Student will demonstrate the proper use of NFO Mode by correctly conducting a mock Training Mission. |
| 1.10 | | The Student will be able to identify the Trainer power off procedures and precautions. |
| | 10.1 | The Student will identify the correct power off procedures by correctly answering a multiple-choice exam. |
| | 10.2 | The Student will demonstrate the proper power off procedure by placing the Trainer or MTS in a power off state from a fully operational condition, in accordance with procedures stated in NTSC P-5696, Section UI, without error. |

# I. PRIMARY PHASE

## 1. Terminal Objectives

| | |
|---|---|
| **1.A** | Apply without error the policies and guidance of Squadron and Naval Aviation Safety Programs to identify, avoid and report hazards. |
| **1.B** | Navigate an aircraft via visual references and navigation instruments. |
| **1.C** | Communicate with appropriate facilities via two-way radio. |
| **1.D** | Apply Cockpit Resource Management (CRM) concepts and procedures during aircraft operations. |
| **1.E** | Operate and assess an aircraft and its systems. |
| **1.F** | Determine aircraft condition and readiness for flight. |
| **1.G** | Demonstrate preparation for flight and mission accomplishment. |

## 1. Enabling Objectives

### 1.A. Safety

| | |
|---|---|
| **1.A.1** | Detect, report and avoid all aircraft in visual range, Visual Meteorological Conditions (VMC), day and night, given a T-34 mission and flight instructor, in accordance with (IAW) NATOPS and local directives. |
| **1.A.2** | Comply with specified flight policies and procedures provided in OPNAVINST 3710.7Q, during aircraft operations, without error. |
| **1.A.2.1** | Recall specified flight policies and procedures in OPNAVINST 3710.7Q, given an oral or written examination, with 80% accuracy. |
| **1.A.3** | Comply with specified flight policies and procedures set forth in FAA 1.A.3.1Regulations Part 91, during aircraft operations, without error. |
| **1.A.3.1** | Recall specified flight policies and procedures set forth in FAA Regulations Part 91, given an oral or written examination, with 80% accuracy. |
| **1.A.4** | Operate a two-seat aircraft within limitations and capabilities, given a mission, with instructor assistance as required, and in accordance with NATOPS. |
| **1.A.4.1** | Identify T-34C operating limits, given an oral or written exam, with 80% accuracy. |
| **1.A.4.2** | Recall the scope and section purposes of the T-34C NATOPS, given an oral or written exam, with 80% accuracy. |
| **1.A.4.3** | Define selected terms associated with the interpretation of NATOPS directives, given an oral or written exam, with 80% accuracy. |
| **1.A.4.4** | Discuss and demonstrate the all normal checklists, given a Pocket Checklist and cockpit trainer. |
| **1.A.5** | Comply with T-34 emergency procedures, given actual or simulated emergencies, with no errors. |
| **1.A.5.1** | Perform the emergency ground egress procedure, IAW NATOPS, with no errors. |
| **1.A.5.2** | Demonstrate the T-34C bailout procedures, IAW NATOPS, given a bailout trainer and flight gear, without error. |
| **1.A.5.3** | Perform the strap-in procedure, IAW NATOPS, with no errors. |
| **1.A.5.4** | Perform emergency procedures, given a simulator and Pocket Checklist, IAW the NATOPS. |

**1.A.5.5** Perform the blindfold cockpit test.

**1.A.5.6** Recall verbatim "immediate action" T-34 aircraft emergency procedures, IAW NATOPS, without error.

## 1.B. Navigation

**1.B.1** Observe as a flight instructor demonstrates the identification of aircraft position relative to geographic references.

**1.B.2** Identify aircraft position relative to a TACAN station, given an aircraft mission, without error.

**1.B.2.1** Maintain a specified course given radio aids to navigation and flight information publications (FLIP), with instructor assistance as required.

**1.B.2.2** Identify aircraft position relative to a TACAN station, given an opportunity to practice, without error.

**1.B.2.3** Locate the Area-1 boundaries, OLFs and prominent features, given an Area-1 chart/TCF Handout and an oral or written exam, with 80% accuracy.

**1.B.3** Execute TACAN point-to-point navigation, given an aircraft mission, within 4 nm.

**1.B.3.1** Practice execution of TACAN point-to-point navigation, given a trainer and a mission.

**1.B.4** Execute a standard instrument departure, with the assistance of a flight instructor, within ±1nm of arcs and ±6° or 2nm of course.

**1.B.4.1** Execute a standard instrument departure, given practice, within ±1nm of arcs and ±6° or 2nm of course.

**1.B.4.2** Calculate the lead point and lead radical to enter and exit a TACAN ARC, given ground speed and bank angle, with and without wind input, with 80% accuracy.

**1.B.4.3** Calculate a MENTR departure procedure, given a departure plate and instrument graphics within ±1nm of arcs and ±6° or 2nm of course.

**1.B.5** Execute a radio instrument approach, with the assistance of a flight instructor, within ±5° of course, 100' above to 0' below MDA; 0' below on DH.

**1.B.5.1** Execute a radio instrument approach, given practice on a RIOT trainer, within ±5° of course, 100' above to 0' below MDA; 0' below on DH.

**1.B.6** Execute a GCA approach, with the assistance of a flight instructor, within ±5° of assigned heading, 100' above to 0' below MDA; 0' below on DH.

**1.B.7** Execute entry and holding pattern procedures, with the assistance of a flight instructor, IAW the FTI, AIM and NATOPS.

**1.B.7.1** Execute entry and holding pattern procedures, given practice, IAW the FTI, AIM and NATOPS.

**1.B.7.2** Identify proper holding patterns, given illustrations and clearances, with 80% accuracy.

**1.B.7.3** Calculate the proper holding entry procedure, given an approach plate with published holdings and present position and a written exam, with 80% accuracy.

**1.B.8** Determine mission completion feasibility based on fuel requirements at each navigational checkpoint, given an aircraft mission, ±30 pounds.

**1.B.8.1** Calculate estimated fuel remaining at destination approach fix (IAF), given a jet log, a single en route chart and a simulated mission, ±30 pounds and determine mission completion feasibility.

| | |
|---|---|
| **1.B.9** | Perform the 2-minute prior, mark-on-top and wings level call at each turnpoint, given a specified route, without error. |
| **1.B.9.1** | Calculate estimated time of arrival at each navigational checkpoint, given a mission, within ±1 minute. |
| **1.B.9.2** | Solve navigation problems, given a brief scenario, graphics of navigation instruments, enroute charts and CR-2 computer with 80% accuracy. |
| **1.B.9.3** | Solve navigation problems, given a brief scenario, enroute charts and CR-2 computer with 80% accuracy. |
| **1.B.9.4** | Define selected navigation terms, given a list, with 80% accuracy. |
| **1.B.9.5** | Recall the characteristics of radio aids to navigation, given a list of equipment, with 80% accuracy. |
| **1.B.9.6** | Interpret the indications of navigation instruments, given graphics of the indicators, with 80% accuracy. |
| **1.B.10** | Determine groundspeed, given a mission, ±10 nm per hour. |
| **1.B.11** | Derive aircraft course using dead reckoning techniques, given a position, time flown, wind and heading, within ±5°. |
| **1.B.11.1** | Compute the third component of the wind triangle, given any two components, with 80% accuracy. |
| **1.B.12** | Perform a ground controlled approach with reference to instruments, given printed approach criteria, IAW FTI and published procedures. |
| **1.B.12.1** | Demonstrate approach procedures, given approach plates and simulated instruments and radio, IAW the FTI and FLIP. |
| **1.B.12.2** | Interpret data from approach plates, given graphics, with 80% accuracy. |

## 1.C Communication

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| **1.C.1** | Communicate via two-way radio with appropriate agencies during ground operations, during departure, en route, and upon arrival in a T-34C aircraft with an instructor and mission in VFR conditions, using standard naval aviation/FAA terminology, with no errors that will preclude mission success. |
| **1.C.1.1** | Identify common naval aviation and FAA communications terms, formats and call signs, given audible or written examples, with 80% accuracy. |
| **1.C.1.2** | Identify military and civilian two-way radio communication procedures, given audible or written examples, with 80% accuracy. |
| **1.C.1.2.1** | Practice VFR communication procedures, given appropriate software. |
| **1.C.1.3** | Identify the correct procedures to be followed in special situations, including malfunctions and emergencies, given a scenario, with 80% accuracy. |
| **1.C.1.4** | Demonstrate standard VFR naval aviation and FAA two-way radio communications under simulated scenarios, including 1) ground operation, 2) departure, 3) en route, and 4) arrival, with 80% accuracy. |
| **1.C.2** | Communicate via two-way radio with appropriate agencies during ground operations, during departure, en route, and upon arrival in an aircraft, with an instructor and mission in IFR conditions, using standard naval aviation/FAA terminology, with no errors that will preclude mission success. |
| **1.C.2.1** | Recall the differences between VFR and IFR radio communication procedures, given an oral or written exam, with 80% accuracy. |

**1.C.2.2** Demonstrate standard IFR naval aviation and FAA two-way radio communications under simulated scenarios, including 1) ground operation, 2) departure, 3) en route, and 4) arrival, with 80% accuracy.

**1.C.2.2.1** Practice IFR communications procedures, given appropriate software.

## 1.D Cockpit Resource Management

**Note:** The flight training ("stick time") objectives are included below, but are not recommended for use in the revised curriculum.

**1.D.1** Demonstrate spatial and geographic awareness while accomplishing mission tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**1.D.1.1** Identify cues to abnormal conditions, given graphics of T-34C instruments, with no error.

**1.D.1.1.1** Explain the significance of T-34C instrument readings, given graphics, with 80% accuracy.

**1.D.1.1.2** Provide information required for mission success before it is required for use, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**1.D.1.2** Demonstrate timely action in accomplishing assigned tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**1.D.2** Demonstrate skilled time sharing by discriminating and prioritizing the most critical tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**1.D.2.1** Demonstrate understanding of the mission and tasking during pre-flight brief and through compliance with SOPs during flight, given a mission and aircraft or simulator, IAW the FTIs.

**1.D.2.1.1** Discriminate and explain instances of selected CRM concepts, given a scenario, with 80% accuracy.

**1.D.2.1.2** Define selected terms associated with CRM with 80% accuracy.

**1.D.2.1.3** Inform crew members when taking actions that may impact their situational awareness, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**1.D.2.2** Contribute to team situational awareness by appropriately informing crew members of actions taken during role-play of various crew members, given a scenario, with instructor assistance as required.

**1.D.2.2.1** Adhere to standard communication protocols, with brevity and succinctness, given a mission and aircraft or simulator, IAW the FTIs.

**1.D.2.2.2** Evaluate ICS and UHF communications for accuracy and standard protocol, given a scenario and appropriate software, IAW the FTIs.

**1.D.2.2.3** Use all pertinent available information in the accomplishment of assigned tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**1.D.3** Cross-check information sources, including those of the pilot to ensure accuracy, given a mission and an aircraft or simulator, IAW the FTIs.

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| **1.D.3.1** | Brief the crew on the status of your assigned tasks, in a timely, succinct and standard manner, given a mission and an aircraft or simulator, with no errors that would preclude mission success. |
| **1.D.3.2** | Contribute to team situational awareness by appropriately briefing crew members on the status of your assigned tasks during role-play of various crew members, given a scenario, with instructor assistance as required. |
| **1.D.3.2.1** | Resolve aeronautical problems by exercising accepted decision making procedures, given a mission and an aircraft or simulator, with instructor assistance as required. |
| **1.D.4** | Report developing problems to the crew, given a mission and an aircraft or simulator, with no errors that would preclude mission success. |
| **1.D.4.1** | Provide and request back-up to and from crew members for assigned tasks as appropriate, given a mission and an aircraft or simulator, with no errors that would preclude mission success. |
| **1.D.4.1.1** | Locate the sources of aeronautical problems as they develop, given a mission and an aircraft or simulator, with no errors that would preclude mission success. |
| **1.D.4.1.2** | Anticipate the consequences of alternative actions in response to problems, given a mission and an aircraft or simulator, with no errors that would preclude mission success. |
| **1.D.4.1.3** | Engage in problem solving during role-play of various crew members, using accepted aeronautical decision making procedures, given a scenario, with instructor assistance as required. |
| **1.D.4.1.4** | Taxi and perform ground operations with instructor and ground crew assistance, given a prescribed route, keeping clear of obstructions in compliance with NATOPS and air operations manual. |
| **1.D.5** | Take off and transition to climb in VMC with instructor assistance as required, aircraft systems ready; while accelerating to climb speed and establishing proper aircraft configuration; and maintaining aircraft alignment and positive rate of climb; in compliance with NATOPS and operations manual. |
| **1.D.6** | Abort takeoff; appraise aircraft systems and energy level in an OFT or actual emergency IAW NATOPS procedures. |
| **1.D.7** | Transition to and from the climb, descent and level flight, with instructor assistance as required, recognizing and attempting to correct deviations of + 300' VFR, + 20 kts IAS, + 20 degrees heading. |
| **1.D.8** | Measure and stabilize the T-34C attitude and power setting for specified visual and instrument maneuvers with instructor assistance as required within geographical limits and recognizing and attempting to correct deviations of + 300' VFR, + 20 kts IAS, + 20 degrees heading. |
| **1.D.8.1** | Maintain internal and external visual scan patterns while evaluating aircraft systems performance and geographical position in VMC conditions, day and night, in compliance with NATOPS and local directives. |
| **1.D.9** | Demonstrate an understanding of aircraft system functions and interrelations by correctly assessing a set of visual/instrument indications (cues), with 90% accuracy. |
| **1.D.9.1** | Demonstrate the use of metacognition by generating and explaining goals and strategies, given a complex problem in a time-constrained setting. |
| **1.D.9.2** | Perform aircraft stall and stall recovery, with instructor assistance as required, day VMC, IAW training instructions. |

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| **1.D.10** | Identify conditions creating stall and the stall warnings, given a T-34 aircraft and flight instructor, in accordance with training instructions. |
| **1.D.10.1** | Identify out-of-control flight and upright spin in day VMC cruise configuration, given a T-34C and flight instructor, in accordance with training instructions. |
| **1.D.11** | Locate the landing field and enter the landing pattern, with instructor assistance as required, day and night, given course rules and defined pattern, in compliance with NATOPS and the air station operations manual. |
| **1.D.12** | Conduct landings, with instructor assistance as required, in compliance with the flight training instruction (FTI). |
| **1.D.13** | Detect and attempt to correct glide slope errors, with instructor assistance as required, in compliance with the FTI. |
| **1.D.13.1** | Appraise attitude and power requirements for desired aircraft performance, with instructor assistance as required, in compliance with the FTI. |
| **1.D.13.2** | Initiate or accept a landing wave-off, with instructor assistance as required, in compliance with the FTI. |
| **1.D.14** | Monitor landing roll-out and deceleration, with instructor assistance as required, day and night, while slowing aircraft, avoiding porpoise or bounce and assuring alignment ±25 ft. |
| **1.D.15** | Recognize and correct unusual aircraft attitudes, modifying attitude and power for a controlled transition to the original flight path using visual cues and instruments, with instructor assistance as required, given aircraft attitude error induced by the instructor, without exceeding aircraft limitations and IAW NATOPS and FTIs. |
| **1.D.16** | Recognize and attempt to correct deviations in heading and altitude in Visual Flight Rules (VFR), with instructor assistance as required, ±300', ±20°. |
| **1.D.16.1** | Recognize and inform instructor pilot of deviations of ±100' in Instrument Flight Rules (IFR). |
| **1.D.16.2** | Fly VFR departure, entry and traffic pattern procedures, given a mission and instructor, IAW FLIP and local directives. |
| **1.D.17** | Properly brief a T-34 VFR course rules departure, given a mission, IAW local procedures. |
| **1.D.17.1** | Properly brief a T-34 VFR course rules departure, given a mission, IAW local procedures. |

## 1.E Aircraft Systems

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| **1.E.1** | Perform appropriate T-34 aircraft operations checklists, given a mission and flight instructor, IAW NATOPS. |
| **1.E.1.1** | Perform the actions required by selected checklists, given a simulator and Pocket Checklist IAW the NATOPS. |
| **1.E.1.2** | Describe the following procedures, given an oral or written exam: a) electrical/unknown fire, b) smoke and fume elimination, c) generator failure, d) emergency gear extension, e) high altitude power loss, f) practice precautionary emergency landing, g) ditching, and h) fuel control rollback IAW NATOPS. |
| **1.E.2** | Operate and evaluate navigation equipment, given a mission, IAW NATOPS. |

**1.E.2.1** Interpret the state of respective systems and select corrective action if required, given a brief scenario and/or instrument readings, a NATOPS and flight training instructions (FTIs), with 80% accuracy.

**1.E.2.2** Identify the relationships among the major components of aircraft systems, given a partial block diagram, with 80% accuracy.

**1.E.2.3** Describe the operation of T-34 aircraft systems, given a list of systems, with 80% accuracy.

**1.E.2.4** Identify the operating parameters of T-34 aircraft systems components from a list with 80% accuracy.

**1.E.2.5** Identify the location of major T-34 aircraft system components, given illustrations and diagrams, with 80% accuracy.

**1.E.3** Recall the T-34 aircraft servicing procedures, given a list of procedure nomenclatures, with 80% accuracy.

## 1.F Aircraft Condition & Readiness for Flight

**1.F.1** Determine aircraft documented suitability for flight by reviewing information including (but not limited to) VIDs/MAFs, Aircraft Inspection and Acceptance Record) contained in the aircraft discrepancy book with instructor and maintenance assistance IAW NATOPS.

**1.F.2** Perform aircraft preflight and postflight inspections, given a Pocket NATOPS, IAW the NATOPS.

**1.F.2.1** Observe completion of preflight and postflight inspections, performed IAW the NATOPS by an instructor.

**1.F.2.2** Recall T-34 aircraft preflight and postflight procedures, given associated terms, with 80% accuracy.

**1.F.3** Observe completion of Maintenance Action Forms (MAF) IAW the NAMP by an instructor, as necessary during preflight/postflight.

**1.F.4** Complete applicable parts of a Naval Aircraft Flight Record (NAVFLIRS) during preflight/postflight without error.

## 1.G Flight Preparation/Mission Accomplishment

**1.G.1** Demonstrate adequate preparation for flight and mission accomplishment, given a mission, IAW the FTI.

**1.G.1.1** Interpret scheduled flights, given a flight schedule and an oral or written exam, with 80% accuracy.

**1.G.1.2** Recall the terms, policies and procedures associated with Fam Flights, given an oral or written exam, with 80% accuracy.

**1.G.1.3** Observe the procedures for survival gear issue and inspection and oxygen mask usage, given a demonstration.

**1.G.1.4** Recall the policies and procedures applicable to the following subjects: weather brief, NOTAMS, VFR Working Area, course rules, bailout and emergency ground egress, given an oral exam, with 80% accuracy.

**1.G.2** Complete a Jet Log, given a mission, FLIP, NATOPS, and OPNAVINST 3710.7, IAW the applicable PAT publication without error.

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| **1.G.2.1** | Extract required data from the resources provided and complete the respective fields on the jet log IAW the applicable publication. |
| **1.G.2.2** | Interpret the data for climb and bingo fuel, given a planning chart, with 80% accuracy. |
| **1.G.2.3** | Compute first and second alternate profile fuel plans, a bingo fuel plan and the total required OPNAV minimum fuel. |
| **1.G.3** | Extract data from a provided FLIP (General Planning) and Jet Log, and complete a DD-175 given a mission, IAW the applicable PAT publication with 80% accuracy. |
| **1.G.3.1** | Define selected terms and acronyms associated with FLIP, given a list, with 80% accuracy. |
| **1.G.3.2** | Solve mathematical problems, given brief scenarios and conversion tables, with 80% accuracy. |
| **1.G.3.3** | Extract and interpret required flight data from FLIP, NOTAMS and other applicable references, given brief scenarios and the respective publications, with 80% accuracy. |
| **1.G.4** | Evaluate observed and forecasted meteorological conditions to avoid weather hazards and enhance mission accomplishment, given a simulated mission, weather reports, warnings, forecasts, weather maps and prognostic charts IAW OPNAVINST 3710.7Q. |
| **1.G.4.1** | Recall OPNAVINST 3710.7Q weather minimums for destination and alternates. |
| **1.G.4.2** | Interpret observed conditions and data displayed on weather reports, warnings, forecasts, weather maps and prognostic charts, given these resources, with 80% accuracy. |
| **1.G.4.3** | Identify and interpret displayed data on provided resources, including but not limited to METAR, TAF, charts and weather reports with 80% accuracy. |
| **1.G.4.4** | Recall characteristics of meteorological phenomena, given weather graphics reports, maps and prognostic charts with 80% accuracy. |
| **1.G.5** | Determine mission feasibility based on fuel requirements at each navigational checkpoint, given a jet log and en route chart IAW OPNAVINST 3710.7Q. |
| **1.G.5.1** | Calculate estimated fuel remaining at destination in approach fix (IAF), given a mission. |

# II. INTERMEDIATE PHASE

## 2. Terminal Objectives

**2.A** Navigate an aircraft via visual references and navigation instruments, with instructor assistance, and through coordination with a pilot, IAW the FTIs.

**2.B** Apply without error the policies and guidance of Squadron and Naval Aviation Safety Programs to identify, avoid and report hazards.

**2.C** Communicate accurately with appropriate facilities and other aircraft.

**2.D** Apply Cockpit Resource Management (CRM) concepts and procedures during aircraft operations.

**2.E** Operate and assess an aircraft and its systems IAW NATOPS and FTIs, reporting any anomaly to the instructor.

**2.F** Demonstrate adequate preparation for flight and mission accomplishment.

## 2. Enabling Objectives

### 2.A Safety

**2.A.1** Detect, report and avoid all aircraft in visual range Visual Meteorological Conditions (VMC) or Instrument Meteorological Conditions (IMC), day or night, given an aircraft training mission and instructor, in accordance with (IAW) NATOPS and local directives.

**2.A.2** Make recommendations for operating a T-34C aircraft within limitations and capabilities, given a mission, with instructor assistance as required, and IAW NATOPS.

**2.A.2.1** Identify T-34C operating limits, given an oral or written exam, with 80% accuracy.

**2.A.3** Demonstrate standard NATOPS emergency procedures in response to real or simulated emergencies, in all T-34C operating conditions.

**2.A.3.1** Execute T-34C "immediate action" procedures, IAW NATOPS, with no errors.

**2.A.3.2** Recall verbatim, "immediate action" T-34C aircraft emergency procedures IAW NATOPS.

**2.A.3.3** Maintain proper T-34C checklist discipline in an emergency (simulated or actual), without error.

**2.A.4** Make recommendations for operating a T-1A aircraft within limitations and capabilities, given a mission, with instructor assistance as required, and IAW TO 1T-1A-1.

**2.A.4.1** Identify T-1A operating limits, given an oral or written exam, with 80% accuracy.

**2.A.5** Demonstrate standard 1T-1A-1 emergency procedures in response to real or simulated emergencies, in all T-1A operating conditions.

**2.A.5.1** Execute T-1A "immediate action" procedures, IAW OT 1T-1A-1, with no errors.

**2.A.5.2** Recall verbatim, "immediate action" T-1A aircraft emergency procedures IAW OT 1T-1A-1.

**2.A.5.3** Maintain proper T-1A checklist discipline in an emergency (simulated or actual), without error.

## 2.B Navigation

**2.B.1** Recommend heading corrections to maintain a specified course on a published standard instrument departure or approach, given a mission and required FLIP, arcs + 1/2nm T-34C, 1nm T-1A; course + 3 degrees or 2nm.

**2.B.2** Recommend heading corrections to maintain a specified enroute course, including TACAN point-to-points, given a route of flight, radio aids to navigation and FLIP, within + 5 degrees or 3nm.

**2.B.3** Recommend heading corrections to maintain a specified enroute course, including TACAN point-to-points, given a route of flight, radio aids to navigation and FLIP, within + 5 degrees or 3nm.

**2.B.4** Direct the pilot in executing holding procedures, given a specified or published holding pattern, IAW Federal Aviation Administration Regulations (FARs).

**2.B.4.1** Recommend a heading to fly to enter a holding pattern, given a specified or published holding pattern, IAW FARs.

**2.B.5** Recommend corrections to maintain assigned and published altitudes, given a mission, IAW FARs.

**2.B.5.1** Recognize and make recommendations to correct deviations of altitude +/- 200 feet IFR; 300 feet VFR; heading 20 degrees; IAS 20 knots.

**2.B.6** Recommend corrections to arrive on target on time, given a low-level route within + 1 minute/T-34C; + 30 seconds/T-1A.

**2.B.6.1** Identify visual low-level intermediate checkpoints and turnpoints, given a low-level route; turnpoints 80% accuracy and intermediate checkpoints 50% accuracy.

**2.B.6.2** Calculate wind direction and speed, given a mission + 30 degrees, + 10 kts.

**2.B.6.3** Recommend compensated headings and airspeeds to adjust preflight planned headings and airspeeds to compensate for the effects of wind, given a target time and a low-level route within + 2 degrees, + 5 kts of instructor calculated heading and airspeed.

**2.B.6.4** Recommend heading corrections to maintain a low-level course, given a low level route, + 2nm.

**2.B.7** Direct the pilot in executing VFR entry and traffic pattern procedures, given a specified airfield, IAW FLIP and local directives.

**2.B.8** Determine glideslope position, given an aircraft and visual glideslope indicator, without error.

**2.B.9** Derive aircraft position using dead-reckoning techniques, given a position, time of flight, heading and wind, within + 5nm.

**2.B.10** Compile a 'DRAFT' report in flight as required by destination weather, without error.

## 2.C Communication

**2.C.1** Communicate via two way radio using standard naval aviation and FAA terminology with appropriate agencies and other aircraft, with no error that will preclude mission success during ground operations, departure, enroute, and arrival in a T-34C/T-1A aircraft, with an instructor and a mission in VFR conditions.

**2.C.1.1** Demonstrate standard communications protocol for selected missions, given a scenario and real or simulated communications equipment IAW the FTIs.

**2.C.2** Communicate via two way radio using standard naval aviation and FAA terminology with appropriate agencies and other aircraft, with no error that will preclude mission success during ground operations, departure, enroute, and arrival in a T-34C/T-1A aircraft, with an instructor and a mission in IFR conditions.

**2.C.3** Communicate with a wingman using visual signals, given a two-plane T-34C formation, with no errors that will preclude mission success.

## 2.D Cockpit Resource Management

**2.D.1** Demonstrate spatial and geographic awareness while accomplishing mission tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**2.D.1.1** Scan internal and external environment for abnormal conditions, changes and landmarks, given a mission and aircraft or simulator, with no errors that would preclude mission success.

**2.D.1.1.1** Identify cues to abnormal conditions, given graphics of T-1A instruments, with no error.

**2.D.1.1.2** Explain the significance of T-1A instrument readings, given graphics, with 80% accuracy.

**2.D.1.2** Provide information required for mission success before it is required for use, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**2.D.2** Demonstrate timely action in accomplishing assigned tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**2.D.2.1** Demonstrate skilled time sharing by discriminating and prioritizing the most critical tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**2.D.2.1.1** Demonstrate understanding of the mission and tasking during pre-flight brief and through compliance with SOPs during flight, given a mission and aircraft or simulator, IAW the FTIs.

**2.D.2.2** Inform crew members when taking actions that may impact their situational awareness, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**2.D.2.2.1** Contribute to team situational awareness by appropriately informing crew members of actions taken during role-play of various crew members, given a scenario, with instructor assistance as required.

**2.D.2.2.2** Adhere to standard communication protocols, with brevity and succinctness, given a mission and aircraft or simulator, IAW the FTIs.

**2.D.2.2.3** Evaluate ICS and UHF communications for accuracy and standard protocol, given a scenario and appropriate software, IAW the FTIs.

**2.D.3** Use all pertinent available information in the accomplishment of assigned tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**2.D.3.1** Cross-check information sources, including those of the pilot to ensure accuracy, given a mission and an aircraft or simulator, IAW the FTIs.

**2.D.3.2** Brief the crew on the status of your assigned tasks, in a timely, succinct and standard manner, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**2.D.3.2.1** Contribute to team situational awareness by appropriately briefing crew members on the status of your assigned tasks during role-play of various crew members, given a scenario, with instructor assistance as required.

**2.D.4** Resolve aeronautical problems by exercising accepted decision making procedures, given a mission and an aircraft or simulator, with instructor assistance as required.

**2.D.4.1** Report developing problems to the crew, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**2.D.4.1.1** Provide and request back-up to and from crew members for assigned tasks as appropriate, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**2.D.4.1.2** Locate the sources of aeronautical problems as they develop, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**2.D.4.1.3** Anticipate the consequences of alternative actions in response to problems, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**2.D.4.1.4** Engage in problem solving during role-play of various crew members, using accepted aeronautical decision making procedures, given a scenario, with instructor assistance as required.

**2.D.5** Given a T-34C and wingman in like aircraft, coordinate cruise formation maneuvers with instructor assistance, recognize and make recommendations to correct for any deviations, with no errors that would preclude mission success.

**2.D.5.1** Demonstrate standard formation maneuvers, using T-34C aircraft models.

**2.D.5.2** Recall the procedures to execute standard formation maneuvers, IAW the FTIs, with 80% accuracy.

## 2.E Aircraft Systems

**2.E.1** Interpret T-34C performance data, given performance data charts and an oral or written exam, with 80% accuracy.

**2.E.1.1** Operate and assess a T-34C aircraft and its' systems, reporting any anomaly to the instructor, given a mission, IAW NATOPS and flight training instructions (FTIs),

**2.E.1.2** Identify the relationships among major components of the T-34 aircraft systems, given a partial block diagram and an oral or written exam, with 80% accuracy.

**2.E.1.3** Describe the operation of T-34C aircraft systems, given an oral or written exam, with 80% accuracy.

**2.E.1.4** Identify T-34C aircraft servicing procedures, given an oral or written exam, with 80% accuracy.

**2.E.1.5** Describe T-34C all-weather operating procedures, given an oral or written exam, with 80% accuracy.

**2.E.2** Perform appropriate T-34C aircraft operations checklists, given a mission with an instructor, IAW NATOPS.

**2.E.3** Operate and assess a T-1A aircraft and it's systems, reporting any anomaly to the instructors, given a mission, IAW TO 1T-1A-1 and FTIs.

**2.E.3.1** Interpret T-1A performance data, given performance data charts, with 80% accuracy.

**2.E.3.2** Identify the relationships among major components of the T-1A aircraft systems, given a partial block diagram, with 80% accuracy.

**2.E.3.3** Describe the operations of T-1A aircraft systems, given an oral or written exam, with 80% accuracy.

**2.E.3.4** Recall selected limitations and procedures relating to the Pratt & Whitney JT15D-5B turbofan engine, given an oral or written exam, with 80% accuracy.

**2.E.3.5** Identify the location of major T-1A aircraft system components, given an aircraft, IAW NATOPS.

**2.E.3.6** Identify T-1A aircraft servicing procedures, given an oral or written exam, with 80% accuracy.

**2.E.3.7** Describe T-1A all-weather operating procedures, given an oral or written exam, with 80% accuracy.

**2.E.4** Perform appropriate T-1A aircraft operations checklists, given a mission with an instructor, IAW TO IT-A-1.

## 2.F Aircraft Condition & Readiness for Flight

**2.F.1** Determine aircraft documented suitability for flight by reviewing information including (but not limited to) VIDs/MAFs, Aircraft Inspection and Acceptance Record) contained in the aircraft discrepancy book with instructor and maintenance assistance IAW NATOPS.

**2.F.2** Perform aircraft preflight and postflight inspections, given a Pocket Checklist, IAW NATOPS.

**2.F.3** Observe completion of MAFs as necessary during T-34C preflight/postflight.

**2.F.4** Complete WINFLIR during postflight without error.

## 2.G Flight Preparation/Mission Accomplishment

**2.G.1** Demonstrate adequate preparation for flight and mission accomplishment by arriving for a premission briefing with all required flight materials and recalling the required mission procedures and information, IAW the Flight Briefing Guide and FTIs.

**2.G.2** Retain previous mission procedure and information, given an oral or written quiz, with 90% accuracy.

**2.G.3** Prepare a visual low-level navigation chart, given a specific route, a Tactical Pilotage Chart (TPC) and a T-34C, within + 40 lbs, + 36 sec overall, + 24 sec at each turnpoint, + 2 degrees plotting.

**2.G.4** Prepare a visual low-level navigation chart, given a specific route, a TPC and a T-1A, within + 100 lbs, + 36 sec overall, + 18 sec at each turnpoint, + 2 degrees plotting.

**2.G.5** Complete a Jet Log, given a mission, with no errors.

**2.G.5.1** Estimate time enroute, given a specific route of flight, Jet Log, a weather forecast and forecast winds aloft within + 5 minutes of instructor's calculation.

**2.G.5.2** Determine mission completion feasibility given a specific route, based upon fuel requirements, ensuring adequate fuel reserves are available IAW OPNAVINST 3710.7 series, without error.

**2.G.6** Complete a DD-175, using FLIP and Jet Log information, without error.

**2.G.7** Interpret a weather brief, given a DD-175-1 without error.

**2.G.8** Update destination estimated fuel remaining and mission completion feasibility at each navigational checkpoint, given a specified course, Jet Log, forecast and observed weather, +1 minute; fuel +/- 30 lbs (T-34C), +100 lbs (T-1A).

**2.G.9** Make recommendations to alternate flight profile based upon estimated fuel requirements, and observed and forecast meteorological conditions, given a specified course, Jet Log, forecast and observed weather, without error.

**2.G.9.1** Update estimated time of arrival at each navigational checkpoint and after each ground speed check, given a specified course and a Jet Log, +/-1 minute of actual mark-on-top or mark abeam.

**2.G.9.2** Estimate time of arrival at destination, given a specified course, Jet Log, and forecast weather, +/-5 minutes of instructor's calculations.

# III. ADVANCED PHASE

## 3.1 Core Terminal Objectives

**3.1.A** Apply without error the policies and guidance of Squadron and Naval Aviation Safety Programs to identify, avoid and report hazards.

**3.1.B** Effectively navigate using preflight planning data and radio navigation aids or visual reference to the ground.

**3.1.C** Communicate in an aircraft using the radio, hand signals, and the Intercockpit Communications System (ICS) using standard Navy and Federal Aviation Administration (FAA) terminology..

**3.1.D** Apply Cockpit Resource Management (CRM) concepts and procedures during aircraft operations.

**3.1.E** Continually assess aircraft and aircraft systems operation and ensure operations are within limits and are maintained in accordance with NATOPS.

**3.1.F** Determine aircraft condition and readiness for flight during preflight and postflight.

**3.1.G** Demonstrate adequate preparation for flight and mission accomplishment.

## 3.1 Core Enabling Objectives

### 3.1.A Safety

**3.1A.1** Operate a T-39N within limitations, given a flight training event, IAW NATOPS.

**3.1A.1.1** Recall T-39N operating limits, given an oral or written exam, with 80% accuracy.

**3.1.A.2** Execute T-39N 'immediate action' emergency procedures, as required by flight instructor or actual emergency, IAW NATOPS.

**3.1.A.2.1** Recall T-39N "immediate action" emergency procedures, given an oral or written exam, with no error.

### 3.1.B Navigation

**3.1.B.1** Make recommendations to fly a specified course in the preflight planned amount of time (course control/time on target), given a radar training event, within 4 nm (+ 2nm) and 30 seconds time.

**3.1.B.1.1** Determine position in relation to a specified course (Navigation Situation Analysis) from displayed radar information, given a radar training event, within 1 nm.

**3.1.B.1.2** Apply computed wind to flight recommendations to maintain specified course and time, given a radar training event, within + 1 degree of course.

**3.1.B.1.3** Make heading and speed recommendations using radar display interpretations to correct back to specified course and maintain preflight planned time enroute, given a radar training event, within 1 nm of course and 12 seconds time enroute.

**3.1.B.1.4** Describe the components of Dead Reckoning (DR) navigation, given a written or oral examination, with 80% accuracy.

**3.1.B.2** Make recommendations to intercept and fly a specified course to include 6 different routes in day, night, VMC or IMC conditions given FLIP, radio aids to navigation,

NATOPS and a flight or event, IAW FAR, OPNAVINST 3710.7 series and TRAWING SIX SOP, within + 2 nm or 3 degrees (whichever is less) on jet routes, VOR routes, SID and approaches, 3 nm TACAN point-to-point; + 1 nm arcs.

**3.1.B.2.1** Make recommended corrections to return aircraft to intended course, day, night, VMC, IMC, given a flight event, within 1 nm.

**3.1.B.2.2** Determine aircraft position in relation to intended course, day, night, VMC, IMC, given a radar training event, within 1 nm.

**3.1.B.2.2.1** Determine position from NAVAID, day, night, VMC, IMC, given FLIP and a flight training event within 1 nm.

**3.1.B2.3** Adjust headings and speed or estimated times enroute (ETE) to compensate for computed wind effect, day, night, VMC, IMC, given a radar training event, within 1 degree of course, + 1 minute.

**3.1.B.2.3.1** Determine navigation course winds, day, night, VMC, IMC, given a flight training event, within 20 degrees, + 10 kts.

**3.1.B.2.3.2** Determine amount and duration of heading correction to return aircraft to intended course, day, night, VMC, IMC, given a flight training event, within 1 nm.

**3.1.B.2.4** Ensure compliance with SIDs, approaches and ATC clearances, day, night, VMC, IMC, given a flight or simulator training event, IAW FAR.

**3.1.B.3** Make recommendations to intercept and/or correct back to and fly a specified visual low-level course, day, VMC, given NATOPS, charts, and a flight training event, IAW FAR, OPNAVINST 3710.7 series and TRAWING SIX SOP, to the accuracy of 1 nm and 12 seconds ETE.

**3.1.B.3.1** Determine by visual reference, geographic position, day, VMC, given appropriate chart, without error.

**3.1.B.3.2** Adjust headings and speed to compensate for wind effects, day, night, VMC, IMC, given a training event, within 1 degree heading, + 5 kts.

**3.1.B.3.2.1** Determine navigation course winds, day, night, VMC, IMC, given a flight, within 15 degrees direction and + 10 kts.

### 3.1.C Communication

**3.1.C.1** Communicate via aircraft radios with appropriate agencies and other aircraft using standard Navy and FAA terminology, given a flight training event, so that 95% of transmissions or receptions need not be repeated.

**3.1.C.2** Use proper visual signals to communicate with wingman or aircraft ground personnel given a flight training event, so that 90% of the signals need not be repeated.

**3.1.C.2.1** Use proper visual signals to communicate with wingman or aircraft ground personnel given a simulated training event, so that 90% of the signals need not be repeated.

### 3.1.D Cockpit Resource Management

**3.1.D.1** Demonstrate spatial and geographic awareness while accomplishing mission tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.1.D.1.1** Scan internal and external environment for abnormal conditions, changes and landmarks, given a mission and aircraft or simulator, with no errors that would preclude mission success.

**3.1.D1.1.1** Identify cues to abnormal conditions, given graphics of T-39 instruments, with no error.

**3.1.D1.1.2** Explain the significance of T-39 instrument readings, given graphics, with 80% accuracy.

**3.1.D1.2** Provide information required for mission success before it is required for use, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.1.D.2** Demonstrate timely action in accomplishing assigned tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.1.D.2.1** Demonstrate skilled time sharing by discriminating and prioritizing the most critical tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.1.D.2.1.1** Demonstrate understanding of the mission and tasking during pre-flight brief and through compliance with SOPs during flight, given a mission and aircraft or simulator, IAW the FTIs.

**3.1.D.2.2** Inform crew members when taking actions that may impact their situational awareness, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.1.D.2.2.1** Contribute to team situational awareness by appropriately informing crew members of actions taken during role-play of various crew members, given a scenario, with instructor assistance as required.

**3.1.D.2.2.2** Adhere to standard communication protocols, with brevity and succinctness, given a mission and aircraft or simulator, IAW the FTIs.

**3.1.D.2.2.3** Evaluate ICS and UHF communications for accuracy and standard protocol, given a scenario and appropriate software, IAW the FTIs.

**3.1.D.3** Use all pertinent available information in the accomplishment of assigned tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.1.D.3.1** Cross-check information sources, including those of the pilot to ensure accuracy, given a mission and an aircraft or simulator, IAW the FTIs.

**3.1.D.3.2** Brief the crew on the status of your assigned tasks, in a timely, succinct and standard manner, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.1.D.3.2.1** Contribute to team situational awareness by appropriately briefing crew members on the status of your assigned tasks during role-play of various crew members, given a scenario, with instructor assistance as required.

**3.1.D.4** Resolve aeronautical problems by exercising accepted decision making procedures, given a mission and an aircraft or simulator, with instructor assistance as required.

**3.1.D.4.1** Report developing problems to the crew, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.1.D.4.1.1** Provide and request back-up to and from crew members for assigned tasks as appropriate, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.1.D.4.1.2** Locate the sources of aeronautical problems as they develop, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.1.D.4.1.3** Anticipate the consequences of alternative actions in response to problems, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.1.D.4.1.4** Engage in problem solving during role-play of various crew members, using accepted aeronautical decision making procedures, given a scenario, with instructor assistance as required.

### 3.1.E Aircraft Systems

**3.1.E..1** Locate and operate T-39N aircraft systems, given a flight training event, IAW NATOPS.

**3.1.E.1.1** Identify the functional relationships among T-39 aircraft systems, given a diagram, with 80% accuracy.

**3.1.E.1.1.1** Describe the correct nomenclature, purpose, characteristics, functions and limitations of the T-39N aircraft systems, given an oral or written exam, with 80% accuracy.

**3.1.E.1.2** Recall the T-39N servicing procedures, given an oral or written exam with 80% accuracy.

**3.1.E.1.3** Recall the T-39N all-weather operating procedures, given an oral or written exam, with 80% accuracy.

**3.1.E.1.4** Extract and apply appropriate T-39N aircraft performance data from NATOPS, given an oral or written exam, with 80% accuracy.

**3.1.E.2** Perform appropriate T-39N checklists as required, given a flight training event, IAW NATOPS.

**3.1.E.3** Explain the relationships among characteristics of pulsed radar systems, given a list and oral or written exam, with 80% accuracy.

**3.1.E.3.1** Explain the transmission characteristics affecting pulsed radar systems, given an oral or written exam, with 80% accuracy.

**3.1.E.3.1.1** Recognize and describe the imagery displayed in each mode and submode, given a radar training event, with 80% accuracy.

**3.1.E.3.2** Interpret ground mapping radar display for navigational information to include: (1) controllable and uncontrollable factors affecting radar display; (2) topographical and weather returns; (3) three inherent radar display errors; given a radar training event, without error.

**3.1.E.3.4** Initialize inertial navigation system (INS), given a radar training event, without error IAW NATOPS and FTI.

### 3.1.F Aircraft Condition & Readiness for Flight

**3.1.F.1** Determine ground mapping radar operability and suitability for mapping use, given a preflight warm-up period, without error IAW NATOPS and FTI.

**3.1.F.2** Execute ground mapping radar turn on and warm-up, given a radar training event, without error IAW NATOPS and FTI.

**3.1.F.3** Adjust radar controls to include antenna, receiver gain, video gain, range, brightness, persistence, focus, azimuth and range cursor, sector scan, sweep speed, modes and

submodes to obtain the best navigational display/information, given a radar training event, with 80% accuracy.

**3.1.F.3.1** Adjust radar controls to include antenna, receiver gain, video gain, range, brightness, persistence, focus, azimuth and range cursor, sector scan, sweep speed, modes and submodes to obtain the best navigational display/information, given a radar training event, with 80% accuracy.

**3.1.F.3.2** Identify and state the purpose of radar controls, given a written or oral examination without error.

### 3.1.G Flight Preparation/Mission Accomplishment

**3.1.G.1** Plan an airborne radar mapping navigation mission to include: (1) extracting data from FLIPs; (2) preparing a radar navigation chart; (3) prepare a jet log; (4) prepare a DD-175; (5) interpret a DD-175-1; given FLIP, TPC and a jet log, IAW FTIs to the accuracy of: fuel + 100 lbs, time + 6 seconds, course + 2 degrees, and maximum of 1 error on the DD-175.

**3.1.G.1.1** Construct radar predictions using radar prediction procedures and knowledge of basic radar principles from interpretations of a TPC, given a specified course on a TPC, IAW FTI/instructor discretion.

**3.1.G.2** Describe the conduct of a mission, given a flight briefing period and scenario, IAW briefing guide.

**3.1.G.3** Plan a mission to be flown under IFR to include: (1) extract data from FLIP; (2) extract data from NATOPS; (3) prepare a jet log; (4) prepare a DD-175; (5) obtain, interpret and apply DD-175-1 information, given a specified course, IAW FAR, OPNAVINST 3710.7 series and TRAWING SIX SOP, within + 100 lbs, + 1 minute, + 2 degrees and no errors on the DD-175.

**3.1.G.4** Plan a visual, low level flight to be flown under VFR to include: (1) preparing a nav chart, (2) preparing a jet log, (3) preparing a DD-175, (4) obtain, interpret and properly apply a DD-175-1, day, night, VMC, IMC, to the accuracy of: + 100 lbs of fuel, + 6 seconds, + 2 degrees, and a maximum of 1 error on the DD-175.

**3.1.G.5** Direct flight course and destination deviation as appropriate to avoid or minimize hazardous meteorological conditions, day, night, VMC, IMC, given a flight training event, IAW OPNAVINST 3710.7 series and TRAWING SIX SOP, without error.

**3.1.G.5.1** Evaluate differences between forecast weather, forecast weather updates and observed weather, day night, VMC, IMC, given a flight training event, without error.

**3.1.G.5.2** Interpret meteorological conditions for aviation hazards enroute, day, night, VMC, IMC, given a flight training event, without error.

**3.1.G.5.3** Use aviation weather services to update forecast of enroute and destination weather, day, night, VMC, IMC, given a flight event, without error.

**3.1.G.6** Ensure all landings are made with adequate fuel reserves, day, night, VMC, IMC, given a flight training event, IAW OPNAVINST 3710.7 series and TRAWING SIX SOP, without error.

**3.1.G.6.1** Direct appropriate destination deviation if sufficient fuel, based on ETE and fuel consumption computations, is unavailable, day, night, VMC, IMC, given a flight training event, IAW OPNAVINST 3710.7 series and TRAWING SIX SOP, without error.

**3.1.G.6.2** Update fuel required at each navigational checkpoint, day, night, VMC, IMC, given a flight training event, within + 200 lbs.

## 3.2 Strike Terminal Objectives

**3.2.A** Apply without error the policies and guidance of Squadron and Naval Aviation Safety Programs to identify, avoid and report hazards.

**3.2.B** Effectively navigate using preflight planning data and radio navigation aids.

**3.2.C** Communicate in an aircraft using the radio, hand signals, and the Intercockpit Communications System (ICS) using standard Navy and Federal Aviation Administration (FAA) terminology.

**3.2.D** Apply Cockpit Resource Management (CRM) concepts and procedures during aircraft operations.

**3.2.E** Continually assess aircraft and aircraft systems operation and ensure operations are within limits and are maintained in accordance with NATOPS.

**3.2.F** There are no Aircraft Readiness objectives in this unit.

**3.2.G** Demonstrate adequate preparation for flight and mission accomplishment.

## 3.2 Strike Enabling Objectives

### 3.2.A Safety

**3.2.A.1** Operate T-39N within limitations, given a flight training event, IAW NATOPS.

**3.2.A.1.1** Recall T-39N operating limits, given an oral or written exam, with 80% accuracy.

**3.2.A.2** Execute T-39N 'immediate action' emergency procedures, as required by flight instructor or actual emergency, IAW NATOPS.

**3.2.A.2.1** Recall T-39N 'immediate action' emergency procedures, given an oral or written exam, with no error.

### 3.2.B Navigation

**3.2.B.1** Make recommendations to fly a specified course in the preflight planned amount of time (course control/time on target), given a radar training event, within 4 nm (+ 2 nm) and 30 seconds time.

**3.2.B.1.1** Apply computed wind to flight recommendations to maintain specified course and time, given a radar training event, within + 1 degree of course and 5 kts.

**3.2.B.1.1.1** Describe the components of Dead Reckoning (DR) navigation, given a written or oral examination, with 80% accuracy.

**3.2.B.1.2** From displayed radar information determine position in relation to a specified course (Navigation Situation Analysis), given an airborne radar training event, within 1 nm.

**3.2.B.1.2.1** Make heading and speed recommendations using radar display interpretations to correct back to specified course and maintain preflight planned time enroute, given an airborne training event, within 1 nm of course and 12 seconds time enroute.

**3.2.B.2** Ensure compliance with SIDs, approaches, ATC clearances, day, night, VMC, IMC, given a flight training event, IAW FAR.

### 3.2.C Communication

**3.2.C.1** Communicate via aircraft radios with appropriate agencies and other aircraft using standard Navy and FAA terminology, given a flight training event, so that 95% of transmissions or receptions need not be repeated.

### 3.2.D Cockpit Resource Management

**3.2.D.1** Demonstrate spatial and geographic awareness while accomplishing mission tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.2.D.1.1** Scan internal and external environment for abnormal conditions, changes and landmarks, given a mission and aircraft or simulator, with no errors that would preclude mission success.

**3.2.D.1.1.1** Identify cues to abnormal conditions, given graphics of T-39 instruments, with no error.

**3.2.D.1.1.2** Explain the significance of T-39 instrument readings, given graphics, with 80% accuracy.

**3.2.D.1.2** Provide information required for mission success before it is required for use, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.2.D.2** Demonstrate timely action in accomplishing assigned tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.2.D.2.1** Demonstrate skilled time sharing by discriminating and prioritizing the most critical tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.2.D.2.1.1** Demonstrate understanding of the mission and tasking during pre-flight brief and through compliance with SOPs during flight, given a mission and aircraft or simulator, IAW the FTIs.

**3.2.D.2.2** Inform crew members when taking actions that may impact their situational awareness, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.2.D.2.2.1** Contribute to team situational awareness by appropriately informing crew members of actions taken during role-play of various crew members, given a scenario, with instructor assistance as required.

**3.2.D.2.2.2** Adhere to standard communication protocols, with brevity and succinctness, given a mission and aircraft or simulator, IAW the FTIs.

**3.2.D.2.2.3** Evaluate ICS and UHF communications for accuracy and standard protocol, given a scenario and appropriate software, IAW the FTIs.

**3.2.D.3** Use all pertinent available information in the accomplishment of assigned tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.2.D.3.1** Cross-check information sources, including those of the pilot to ensure accuracy, given a mission and an aircraft or simulator, IAW the FTIs.

**3.2.D.3.2** Brief the crew on the status of your assigned tasks, in a timely, succinct and standard manner, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.2.D.3.2.1** Contribute to team situational awareness by appropriately briefing crew members on the status of your assigned tasks during role-play of various crew members, given a scenario, with instructor assistance as required.

**3.2.D.4** Resolve aeronautical problems by exercising accepted decision making procedures, given a mission and an aircraft or simulator, with instructor assistance as required.

**3.2.D.4.1** Report developing problems to the crew, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.2.D.4.1.1** Provide and request back-up to and from crew members for assigned tasks as appropriate, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.2.D.4.1.2** Locate the sources of aeronautical problems as they develop, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.2.D.4.1.3** Anticipate the consequences of alternative actions in response to problems, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

### 3.2.E Aircraft Systems

**3.2.E.1** Locate and operate T-39N aircraft systems, given a flight training event, IAW NATOPS.

**3.2.E.1.1** Identify the functional relationships among T-39 aircraft systems, given a diagram, with 80% accuracy.

**3.2.E.1.1.1** Explain the relationships among characteristics of pulsed radar systems, given a list and oral or written exam, with 80% accuracy.

**3.2.E.1.1.2** Recognize and describe the imagery displayed in each mode and submode, given a radar training event, with 80% accuracy.

**3.2.E.1.1.3** Interpret ground mapping radar displays for navigational information to include: (1) controllable and uncontrollable factors affecting radar display; (2) topographical and weather returns; (3) three inherent radar display errors; given an airborne radar training event, without error.

**3.2.E.2** Initialize inertial navigation system (INS), given an airborne radar training event, without error IAW NATOPS and FTI.

### 3.2.F Aircraft Condition & Readiness for Flight

**Note:** There are no objectives for this unit.

### 3.2.G Flight Preparation/Mission Accomplishment

**3.2.G.1** Plan a composite strike mission to include: (1) extracting data from FLIPs; (2) preparing a radar navigation chart; (3) prepare a jet log; (4) prepare a DD-175; (5) interpret a DD-175-1; given FLIP, TPC and a jet log, IAW FTIs to the accuracy of: fuel + 100 lbs, time + 6 seconds, course + 2 degrees, and maximum of 1 error on the DD-175.

**3.2.G.1.1** Construct radar predictions using radar prediction procedures and knowledge of basic radar principles from interpretations of a TPC, given a specified course on a TPC, IAW FTI/instructor discretion.

**3.2.G.2** Describe the conduct of a mission, given a flight briefing period, IAW briefing guide.

## 3.3 Strike Fighter Terminal Objectives

**3.3A** Apply without error the policies and guidance of Squadron and Naval Aviation Safety Programs to identify, avoid and report hazards.

**3.3B** There are no Navigation objectives in this unit.

**3.3.C** Communicate in an aircraft using the radio, hand signals, and the Intercockpit Communications System (ICS) using standard Navy and FAA terminology.

**3.3.D** Apply Cockpit Resource Management (CRM) concepts and procedures during aircraft operations.

**3.3.E** Continually assess aircraft and aircraft systems operation and ensure operations are within limits and are maintained in accordance with NATOPS.

**3.3.F** There are no Aircraft Readiness objectives in this unit.

**3.3.G** There are no Preparation for Flight objectives in this unit.

**3.3.H** Perform pursuit, attack-reattack and conversion intercepts, given airborne radar and GCI information, IAW NATOPS and FTIs.

## 3.3 Strike Fighter Enabling Objectives

### 3.3.A Safety

**3.3A.1** Operate T-39N within limitations, given a flight training event, IAW NATOPS.

**3.3.A.1.1** Recall T-39N operating limits, given an oral or written exam, with 80% accuracy.

**3.3.A.2** Execute T-39N 'immediate action' emergency procedures, as required by flight instructor or actual emergency, IAW NATOPS.

**3.3.A.2.1** Recall T-39N 'immediate action' emergency procedures, given an oral or written exam, with no error.

### 3.3.B Navigation

**Note:** There are no Navigation objectives in this unit.

### 3.3.C Communication

**3.3.C.1** Communicate via aircraft radios with appropriate agencies and other aircraft using standard Navy and FAA terminology, given a flight training event, so that 95% of transmissions or receptions need not be repeated.

**3.3.C.2** Use standard directive and descriptive commentary, given a a radar training event IAW the FTI, with 80% accuracy.

**3.3.C.3** Use proper visual signals to communicate with wingman or aircraft ground personnel, given a flight training event, so that 90% of the signals need not be repeated.

### 3.3.D Cockpit Resource Management

**3.3.D.1** Demonstrate spatial and geographic awareness while accomplishing mission tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.3.D.1.1** Scan internal and external environment for abnormal conditions, changes and landmarks, given a mission and aircraft or simulator, with no errors that would preclude mission success.

**3.3.D.1.1.1** Identify cues to abnormal conditions, given graphics of T-39 instruments, with no error.

**3.3.D.1.1.2** Explain the significance of T-39 instrument readings, given graphics, with 80% accuracy.

**3.3.D.1.2** Provide information required for mission success before it is required for use, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.3.D.2** Demonstrate timely action in accomplishing assigned tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.3.D.2.1** Demonstrate skilled time sharing by discriminating and prioritizing the most critical tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.3.D.2.1.1** Demonstrate understanding of the mission and tasking during pre-flight brief and through compliance with SOPs during flight, given a mission and aircraft or simulator, IAW the FTIs.

**3.3.D.2.2** Inform crew members when taking actions that may impact their situational awareness, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.3.D.2.2.1** Contribute to team situational awareness by appropriately informing crew members of actions taken during role-play of various crew members, given a scenario, with instructor assistance as required.

**3.3.D.2.2.2** Adhere to standard communication protocols, with brevity and succinctness, given a mission and aircraft or simulator, IAW the FTIs.

**3.3.D.2.2.3** Evaluate ICS and UHF communications for accuracy and standard protocol, given a scenario and appropriate software, IAW the FTIs.

**3.3.D.3** Use all pertinent available information in the accomplishment of assigned tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.3.D.3.1** Cross-check information sources, including those of the pilot to ensure accuracy, given a mission and an aircraft or simulator, IAW the FTIs.

**3.3.D.3.2** Brief the crew on the status of your assigned tasks, in a timely, succinct and standard manner, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.3.D.3.2.1** Contribute to team situational awareness by appropriately briefing crew members on the status of your assigned tasks during role-play of various crew members, given a scenario, with instructor assistance as required.

**3.3.D.4** Resolve aeronautical problems by exercising accepted decision making procedures, given a mission and an aircraft or simulator, with instructor assistance as required.

**3.3.D.4.1** Report developing problems to the crew, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.3.D.4.1.1** Provide and request back-up to and from crew members for assigned tasks as appropriate, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.3.D.4.1.2** Locate the sources of aeronautical problems as they develop, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.3.D.4.1.3** Anticipate the consequences of alternative actions in response to problems, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.3.D.4.1.4** Engage in problem solving during role-play of various crew members, using accepted aeronautical decision making procedures, given a scenario, with instructor assistance as required.

### 3.3.E Aircraft Systems

**3.3.E.1** Locate and operate T-39N aircraft systems, given a flight training event, IAW NATOPS.

**3.3.E.1.1** Describe the correct nomenclature, purpose, characteristics, functions and limitations of the T-39N aircraft systems, given an oral or written exam, with 80% accuracy.

**3.3.E.1.2** Recall the T-39N servicing procedures, given an oral or written exam with 80% accuracy.

**3.3.E.1.3** Recall the T-39N all-weather operating procedures, given an oral or written exam, with 80% accuracy.

**3.3.E.1.4** Extract and apply appropriate T-39N aircraft performance data from NATOPS, given an oral or written exam, with 80% accuracy.

**3.3.E.2** Perform appropriate T-39N checklists as required, given a flight training event, IAW NATOPS.

**3.3.E.3** Determine airborne intercept radar operability and suitability, given a preflight warm up training event, without error, IAW NATOPS and FTIs.

**3.3.E.3.1** Execute airborne intercept radar or airborne intercept radar simulator turn on and warm up, given an airborne radar training event, without error, IAW NATOPS and FTIs.

**3.3.E.4** Adjust radar controls to obtain most discernable and earliest radar contact with the target, given an airborne or simulator training event, within 80% accuracy.

**3.3.E.4.1** Select appropriate radar mode, range, and antenna sector scan to enhance earliest target detection, given an airborne radar training event, within 80% accuracy.

**3.3.E.4.2** Use appropriate antenna elevation search pattern to enhance earliest target detection, given an airborne radar training event, within 80% accuracy.

**3.3.E.4.3** Select appropriate radar mode, range, and antenna sector scan to enhance earliest target detection, given a simulator radar training event, within 80% accuracy.

**3.3.E.5** Appropriately analyze displayed radar information, given an airborne or simulator radar training event, within 80% accuracy.

**3.3.E.5.1** Differentiate assigned target from other displayed radar information, given an airborne radar training event, within 80% accuracy.

**3.3.E.5.1.1** Appropriately adjust radar display controls for most discernable target display, given an airborne radar training event, within 80% accuracy.

**3.3.E.5.2** Confirm target using radar displayed and Ground Control Intercept (GCI) information, given an airborne or simulator radar training event, within 80% accuracy.

**3.3.E.5.2.1** Correlate (GCI) target information with displayed radar information, given an airborne or simulator radar training event, within 80% accuracy.

**3.3.E.6** Obtain automatic radar track of target, given an airborne or simulator radar training event, within 80% accuracy.

**3.3.E.6.1** Initiate automatic radar track of target via acquisition symbols and hand control unit, given an airborne or simulator radar training event, within 80% accuracy.

**3.3.E.6.2** Maintain target spotlight until initiation of automatic radar track, given an airborne radar training event, within 80% accuracy.

**3.3.E.6.2.1** Achieve and maintain best radar display (spotlight) target, given an airborne radar training event, within 80% accuracy.

**3.3.E.6.2.2** Achieve and maintain best radar display (spotlight) target, given an airborne or simulator radar training event, within 80% accuracy.

**3.3.E.7** Analyze radar display to ascertain proper automatic track on proper target, given an airborne or simulator radar training event, within 80% accuracy.

**3.3.E.7.1** Analyze radar's search or automatic track display to include: (1) Bearing; (2) range; (3) altitude; given an airborne radar training event, to the accuracy of + 2 degrees angle, 1/2 nm range, and + 1000 ft altitude (when applicable).

**3.3.E.7.2** Analyze radar's automatic track display to determine, relative to intercept aircraft, target's: (1) Angle off; (2) range; (3) altitude; (4) overtake; given an airborne radar training event, to the accuracy of + 2 degrees angle, 1/2 nm range, + 1 degree elevation altitude and 10 knot overtake (when applicable).

### 3.3.F Aircraft Condition & Readiness for Flight

**Note:** There are no Aircraft Readiness objectives in this unit.

### 3.3.G Flight Preparation/Mission Accomplishment

**Note:** There are no Preparation for Flight objectives in this unit.

### 3.3.H Pursuit, Attack-reattack & Conversion Intercepts

**3.3.H.1** Perform pursuit intercepts using GCI information and airborne radar information in search and track modes, given an airborne radar training event, IAW the FTI with 80% accuracy.

**3.3.H.1.1** Compute the attack intercept geometry to determine cut, angle off, target aspect (TA), collision course (CC); establish CC, the need for CC corrections and direct CC corrections.

**3.3.H.1.2** Direct reattack maneuvers to include displacement turn, counterturn and AIM-9 missile firing position, given a scenario, IAW the FTI.

**3.3.H.1.3** Accurately determine and debrief kill/VID status, given a scenario, IAW the FTI.

**3.3.H.2** Perform attack-reattack intercepts using airborne radar information in search and track modes, given a radar training event with GCI information IAW the FTI, with 80% accuracy.

**3.3.H.2.1** In addition to H-1.1, H-1.2, and H-1.3 above, establish proper lead point for AIM-7, given a radar training event with GCI information; with 80% accuracy.

**3.3.H.3** Perform intercepts against a target of unknown heading using airborne radar information in search and track modes, given an airborne radar training event with GCI information, IAW the FTI with 80% accuracy.

**3.3.H.3.1** In addition to H-2.1 above, analyze target aspect, heading and drift, given a radar training event with GCI information, IAW the FTI.

**3.3.H.3.2** Using the data computed in H-3.1 above, establish the collision course and update estimated target heading and aspect as required, IAW the FTI.

**3.3.H.4** Perform conversion intercepts to achieve 15 degree TA, using airborne radar information in search and track modes, given a radar training event with GCI information, IAW the FTI and 80% accuracy.

**3.3.H.4.1** In addition to H-2.1, determine interceptor's position relative to target's flight path, cut heading and speed to achieve 15 degree target aspect, given a radar training event, IAW the FTI.

**3.3.H.4.2** Establish cut heading and speed to achieve and maintain 15 degree TA, given a radar training event, IAW the FTI.

**3.3.H.4.3** Place achieved TA on collision not later than 14 nm, given a radar training event.

**3.3.H.5** Perform conversion intercepts to achieve a specified TA between 0 degrees and 45 degrees or equivalent lateral separation in feet from target's flight path using airborne radar information in search and track modes, given a radar training event with GCI information, IAW the FTI and 80% accuracy.

**3.3.H.5.1** Determine interceptor's position relative to target's flight path, given a radar training event, IAW the FTI.

**3.3.H.5.2** Determine cut heading and speed adjustment required to achieve specified TA or lateral separation, given a radar training event, IAW the FTI.

**3.3.H.5.3** Establish cut heading and speed to achieve and maintain specified TA or lateral separation, given a radar training event, IAW the FTI.

**3.3.H.6** Perform intercepts against a target making multiple changes in heading, airspeed, and altitude using airborne radar information in search and track modes, given a radar training event with GCI information, IAW the FTI and 80% accuracy.

**3.3.H.6.1** In addition to H-5.1, H-5.2 and H-5.3 above, establish appropriate lead point for AIM-54/AIM-120, given a radar training event, IAW the FTI.

**3.3.H.6.2** Analyze displayed radar information to detect target's changes in heading, airspeed and altitude, given a radar training event, IAW the FTI.

**3.3.H.6.3** Use appropriate action to counter target's changes in heading, airspeed and altitude, given a radar training event, IAW the FTI.

## 3.4 Advanced Tactical Maneuvering Terminal Objectives

**3.4.A** Apply without error the policies and guidance of Squadron and Naval Aviation Safety Programs to identify, avoid and report hazards.

**3.4.B** Effectively navigate using preflight planning data and radio navigation aids or visual to the ground.

**3.4.C** Communicate in an aircraft using the radio, hand signals, and the Intercockpit Communications System (ICS) using standard Navy and FAA terminology.

**3.4.D** Apply Cockpit Resource Management (CRM) concepts and procedures during aircraft operations.

**3.4.E** Continually assess aircraft and aircraft systems operation and ensure operations are within limits and are maintained in accordance with NATOPS.

**3.4.F** There are no aircraft condition and readiness for flight objectives in this unit.

**3.4.G** Demonstrate adequate preparation for flight and mission accomplishment.

**3.4.H** Identify advanced tactical maneuvers and function as a crew member in a high "G" maneuvering flight environment.

## 3.4 Enabling Objectives

### 3.4.A Safety

**3.4.A.1** Operate a T-2C within limitations, given a high-G, high speed flight training event, IAW NATOPS.

**3.4.A.1.1** Recall T-2C operating limits, given an oral or written exam, with 80% accuracy.

**3.4.A.2** Execute T-2C 'immediate action' emergency procedures, as required by flight instructor or actual emergency, IAW NATOPS.

**3.4.A.2.1** Recall T-2C 'immediate action' emergency procedures, given an oral or written exam, with no error.

### 3.4.B Navigation

**3.4.B.1** Make recommendations to intercept and fly a specified course in day, night, VMC or IMC conditions given FLIP, radio aids to navigation, NATOPS and a flight training event, IAW FAR, OPNAVINST 3710.7 series and TRAWING SIX SOP, within +2 nm or 3 degrees (whichever is less) on jet routes, VOR routes, SID and approaches, 3 nm TACAN point-to-point; +1 nm arcs.

**3.4.B.1.1** Determine position from NAVAID, day, night, VMC, IMC, given FLIP and a flight or simulator training event within 1 nm.

**3.4.B.1.1.1** Select and identify NAVAID, day, night, VMC, IMC, given FLIP and a flight training event, without error.

**3.4.B.1.2** Determine aircraft position in relation to intended course, day, night, VMC, IMC, given a flight training event, within 1 nm.

**3.4.B.1.2.1** Determine navigation course winds, day, night, VMC, IMC, given a flight training event, within 20 degrees, + 10 kts.

**3.4.B.1.2.2** Adjust headings and speed or estimated times enroute (ETE) to compensate for computed wind effect, day, night, VMC, IMC, given a flight training event, within 1 degree of course, + 1 minute.

**3.4.B.1.2.3** Make recommended corrections to return aircraft to intended course, day, night, VMC, IMC, given a flight or simulator training event, within 1 nm.

**3.4.B.1.2.4** Ensure compliance with SIDs, approaches, ATC clearances, day, night, VMC, IMC, given a flight training event, IAW FAR.

**3.4.B.2** Make recommendations to intercept and/or correct back to and fly a specified visual low-level course, day, VMC, given NATOPS, charts, and a flight training event, IAW FAR, OPNAVINST 3710.7 series and TRAWING SIX SOP, to the accuracy of 1 nm and 12 seconds ETE.

**3.4.B.2.1** Determine by visual reference, geographic position, day, VMC, given appropriate chart, without error.

**3.4.B.2.2** Adjust headings and speed to compensate for wind effects, day, night, VMC, IMC, given a flight training event, within 1 degree heading, + 5 kts.

**3.4.B.2.2.1** Determine navigation course winds, day, night, VMC, IMC, given a flight training event, within 15 degrees direction and + 10 kts.

**3.4.B.2.3** Perform as the lead navigator on an aircraft section visual low-level navigation flight, day, VMC, given a flight training event, within 30 seconds of planned ETA, 100 lbs planned EFR, and 2nm of course.

**3.4.B.2.3.1** Make recommendations to maneuver the section while maintaining tactical section integrity, course and ETE, day, VMC, given a flight training event with 90% accuracy.

**3.4.B.3** Perform CV departures and approaches in an aircraft simulator to an accuracy of 1) course: +/- 2 degrees; 2) arc: +/- .5 nm; 3) marshall holding: +/- 15 seconds; and 4) voice reports: without error.

**3.4.B.3.1** Perform Case III CV departures and approaches, given a radar simulator training event, IAW CV NATOPS.

**3.4.B.3.2** Practice CV departures and approaches, given appropriate software, IAW CV NATOPS.

**3.4.B.3.2.1** Recall CV terminology, procedures and communication protocols, given an oral or written exam, with 90% accuracy.

### 3.4.C Communication

**3.4.C.1** Communicate via aircraft radios with appropriate agencies and other aircraft using standard Navy and FAA terminology, given a flight training event, so that 95% of transmissions or receptions need not be repeated.

**3.4.C.1.1** Use standard Navy/Marine Corps aircraft section radio communications procedures, day, night, IMC, VMC, given a flight training event, with 95% accuracy.

**3.4.C.2** Use proper visual signals to communicate with wingman or aircraft ground personnel, given a flight training event, so that 90% of the signals need not be repeated.

**3.4.C.3** Report hazards to flight to section, day, VMC, given a flight training event, without error.

## 3.4.D Cockpit Resource Management

**3.4.D.1** Demonstrate spatial and geographic awareness while accomplishing mission tasks, given a high-G, high speed mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.4.D.1.1** Scan internal and external environment for abnormal conditions, changes and landmarks, given a mission and aircraft or simulator, with no errors that would preclude mission success.

**3.4.D.1.1.1** Identify cues to abnormal conditions, given graphics of T-2C instruments, with no error.

**3.4.D.1.1.2** Explain the significance of T-2C instrument readings, given graphics, with 80% accuracy.

**3.4.D.1.2** Provide information required for mission success before it is required for use, given a high-G, high speed mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.4.D.2** Demonstrate timely action in accomplishing assigned tasks, given a high-G, high speed mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.4.D.2.1** Demonstrate skilled time sharing by discriminating and prioritizing the most critical tasks, given a high-G, high speed mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.4.D.2.1.1** Demonstrate understanding of the mission and tasking during pre-flight brief and through compliance with SOPs during flight, given a mission and aircraft or simulator, IAW the FTIs.

**3.4.D.2.2** Inform crew members when taking actions that may impact their situational awareness, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.4.D.2.2.1** Contribute to team situational awareness by appropriately informing crew members of actions taken during role-play of various crew members, given a scenario, with instructor assistance as required.

**3.4.D.2.2.2** Adhere to standard communication protocols, with brevity and succinctness, given a mission and aircraft or simulator, IAW the FTIs.

**3.4.D.2.2.3** Evaluate ICS and UHF communications for accuracy and standard protocol, given a scenario and appropriate software, IAW the FTIs.

**3.4.D.3** Use all pertinent available information in the accomplishment of assigned tasks, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.4.D.3.1** Cross-check information sources, including those of the pilot to ensure accuracy, given a mission and an aircraft or simulator, IAW the FTIs.

**3.4.D.3.2** Brief the crew on the status of your assigned tasks, in a timely, succinct and standard manner, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.4.D.3.2.1** Contribute to team situational awareness by appropriately briefing crew members on the status of your assigned tasks during role-play of various crew members, given a scenario, with instructor assistance as required.

**3.4.D.4** Resolve aeronautical problems by exercising accepted decision making procedures, given a mission and an aircraft or simulator, with instructor assistance as required.

**3.4.D.4.1** Report developing problems to the crew, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.4.D.4.1.1** Provide and request back-up to and from crew members for assigned tasks as appropriate, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.4.D.4.1.2** Locate the sources of aeronautical problems as they develop, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.4.D.4.1.3** Anticipate the consequences of alternative actions in response to problems, given a mission and an aircraft or simulator, with no errors that would preclude mission success.

**3.4.D.4.1.4** Engage in problem solving during role-play of various crew members, using accepted aeronautical decision making procedures, given a scenario, with instructor assistance as required.

**3.4.D.5** Direct appropriate aircraft flight profiles, with emphasis on airspeed, for maintaining and changing altitude, day, night, VMC, IMC, given a flight training event, IAW NATOPS, without error.

**3.4.D.5.1** Direct pilot to perform appropriate maneuver to avoid descending through hard deck and breaking imaginary bubble around the bogey, day, VMC, given a flight training event, with 90% accuracy.

**3.4.D.5.2** Coordinate correcting the aircraft to the intended flight path with the pilot, day, night, VMC, IMC, within 1 nm.

### 3.4.E Aircraft Systems

**3.4.E.1** Locate and operate T-2C aircraft systems, given a flight training event, IAW NATOPS.

**3.4.E.1.1** Describe the correct nomenclature, purpose, characteristics, functions and limitations of the T-2C aircraft systems, given an oral or written exam, with 80% accuracy.

**3.4.E.1.2** Recall the T-2C servicing procedures, given an oral or written exam with 80% accuracy.

**3.4.E.1.3** Recall the T-2C all-weather operating procedures, given an oral or written exam, with 80% accuracy.

**3.4.E.1.4** Extract and apply appropriate T-2C aircraft performance data from NATOPS, given an oral or written exam, with 80% accuracy.

**3.4.E.2** Perform appropriate T-2C checklists as required, given a flight training event, IAW NATOPS.

### 3.4.F Aircraft Condition & Readiness for Flight

**Note:** There are no aircraft condition and readiness for flight objectives in this unit.

### 3.4.G Flight Preparation/Mission Accomplishment

**3.4.G.1** Plan a mission to be flown under IFR to include: (1) extract data from FLIP; (2) extract data from NATOPS; (3) prepare a jet log; (4) prepare a DD-175; (5) obtain,

interpret and apply DD-175-1 information, given a specified course, IAW FAR, OPNAVINST 3710.7 series and TRAWING SIX SOP, within +100 lbs, +1 minute, +2 degrees and no errors on the DD-175.

**3.4.G.2** Plan a visual, low level flight to be flown under VFR to include: (1) preparing a nav chart, (2) preparing a jet log, (3) preparing a DD-175, (4) obtain, interpret and properly apply a DD-175-1, day, night, VMC, IMC, to the accuracy of: +100 lbs of fuel, +6 seconds, +2 degrees, and a maximum of 1 error on the DD-175.

**3.4.G.3** Direct avoidance of meteorological hazards to flight by evaluating differences between forecast weather, forecast weather updates and observed weather, day night, VMC, IMC, given a flight training event, without error.

**3.4.G.3.1** Interpret meteorological conditions for aviation hazards enroute, day, night, VMC, IMC, given a flight training event, without error.

**3.4.G.3.1.1** Use aviation weather services to update forecast of enroute and destination weather, day, night, VMC, IMC, given a flight event, without error.

**3.4.G.3.2** Direct flight course and destination deviation as appropriate to avoid or minimize hazardous meteorological conditions, day, night, VMC, IMC, given a flight training event, IAW OPNAVINST 3710.7 series and TRAWING SIX SOP, without error.

**3.4.G.4** Ensure all landings are made with adequate fuel reserves, day, night, VMC, IMC, given a flight training event, IAW OPNAVINST 3710.7 series and TRAWING SIX SOP, without error.

**3.4.G.4.1** Direct appropriate destination deviation if sufficient fuel, based on ETE and fuel consumption computations, is unavailable, day, night, VMC, IMC, given a flight training event, IAW OPNAVINST 3710.7 series and TRAWING SIX SOP, without error.

**3.4.G.4.1.1** Update fuel required at each navigational checkpoint, day, night, VMC, IMC, given a flight training event, within + 200 lbs.

### 3.4.H Advanced Tactical Maneuvering

**3.4.H.1** Recommend appropriate advanced tactical maneuvers (ATM) in offensive and defensive situations against a bogey aircraft, day, VMC, given a training flight, with 90% accuracy.

**3.4.H.1.1** Describe ATM, given an oral exam, without error.

**3.4.H.1.2** Identify ATM performed by pilot, day, VMC, given a training flight, with 90% accuracy.

**3.4.H.2** Identify offensive, neutral or defensive position relative to a bogey aircraft, day, VMC, given a flight training event, with 90% accuracy.

**3.4.H.3** Maintain spatial orientation throughout ATM through aircraft instrument and external scan with reference to the following: (1)Terrain; (2) altitude; (3) airspeed; (4) attitude; (5) hard deck; (6) soft deck; (7) bogey; day, VMC, given a flight training event, with 90% accuracy.

**3.4.H.4** Apply tactical lookout doctrine, day, VMC, given a flight training event, AW FTI with 90% accuracy.

**3.4.H.4.1** Maintain visual contact with the bogey aircraft, day, VMC, given a flight training event, with 90% accuracy.

**3.4.H.4.2** Report bogey's position, attitude, overtake, maneuver, and threat to pilot, day, VMC, given a flight training event, with 90% accuracy.

**3.4.H.4.3** Report appropriately 'visual' and 'six clear', day, VMC, given a flight training event, without error.

**3.4.H.4.4** Report bogey's position to section, day, VMC, given a flight training event, without error.

**3.4.H.5** Maintain visual orientation with wingman/lead terrain and course, day, VMC, given a flight training event, with 90% accuracy.

**3.4.H.6** Maneuver a section of aircraft to the center of an operating area using engagement turns while maintaining section integrity and lookout doctrine, day, VMC, given a flight training event, without error.

**For your information:**

The Media Analysis is printed by a Crystal Report, using the UMFO database contained in Integreator Professional. The Crystal Report is contained in the zipped UMFO database file in this Appendix. Both Integreator® and Crystal Reports® software are required to print the media analysis recommendations.

The Learning Hierarchy Analysis was constructed in Inspiration software because of the parent/child relationships that are possible. The LHA file is enclosed, but Inspiration® is required to view or print it.

Only one copy of each of the above software was purchased by the Navy under this contract. The software and documentation will be provided to NAWCTSD at the contract debrief in October, 1999.

AN-1

| | VERBAL | OBSERVATION | PERFORMANCE | | |
|---|---|---|---|---|---|
| Objectives | Discuss | Demonstrate | Introduce | Practice | Review |
| A-1.1 | | | | | X |
| A-2 | | | | | X |
| A-2.1 | | | | | X |
| B-2 | | | | X | |
| B-2.3 | | | | X | |
| B-2.4 | | | | X | |
| B-2.5 | | | | X | |
| B-2.7.1 | | | | X | |
| B-2.7.2 | | | | X | |
| B-3.2 | | | | X | |
| B-3.3.1 | | | | X | |
| C-1 | | | | X | |
| D-1 | | | | X | |
| D-1.1 | | | | X | |
| D-1.2 | | | | X | |
| D-2.1 | | | | X | |
| D-2.1.1 | | | | X | |
| D-2.2.2 | | | | X | |
| D-3 | | | | X | |
| D-3.1 | | | | X | |
| D-3.2 | | | | X | |
| D-4.1.1 | | | | X | |
| D-4.1.2 | | | | X | |
| G-3 | | | | X | |
| | | | | | |

AVX 2X

| | VERBAL | OBSERVATION | PERFORMANCE | | |
|---|---|---|---|---|---|
| Objectives | Discuss | Demonstrate | Introduce | Practice | Review |
| A-4.1 | | | | | X |
| A-5 | | | | | X |
| A-5.3 | | | | | X |
| B-2 | | | | | X |
| B-6 | | | | | X |
| B-6.1 | | | | | X |
| B-6.2 | | | | | X |
| B-6.3 | | | | | X |
| B-6.4 | | | | | X |
| C-1 | | | | | X |
| D-1 | | | | | X |
| D-1.1 | | | | | X |
| D-1.2 | | | | | X |
| D-2 | | | | | X |
| D-2.1 | | | | | X |
| D-2.2 | | | | | X |
| D-2.2.2 | | | | | X |
| D-3 | | | | | X |
| D-3.1 | | | | | X |
| D-4 | | | | | X |
| D-4.1 | | | | | X |
| D-4.1.1 | | | | | X |
| D-4.1.2 | | | | | X |
| D-4.1.3 | | | | | X |
| E-3 | | | | | X |
| F-2 | | | | | X |
| F-4 | | | | | X |
| G-1 | | | | | X |
| G-4 | | | | | X |
| G-5 | | | | | X |
| G-6 | | | | | X |
| G-7 | | | | | X |

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ANAV 4x

| | VERBAL | OBSERVATION | PERFORMANCE | | |
|---|---|---|---|---|---|
| Objectives | Discuss | Demonstrate | Introduce | Practice | Review |
| A-4 | | | | | X |
| A-4.1 | X | | | | X |
| A-4.4 | X | | | | X |
| A-4.6 | X | | | | X |
| B-2 | | | | | X |
| B-3 | | | | | X |
| B-5 | | | | | X |
| B-7 | | | | | X |
| B-8 | | | | | X |
| B-9 | | | | | X |
| C-1 | | | | | X |
| C-2 | | | | | X |
| D-1 | | | | | X |
| D-1.1 | | | | | X |
| D-1.1.2 | | | | | X |
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| D-2 | | | | | X |
| D-2.1 | | | | | X |
| D-2.1.3 | | | | | X |
| D-2.2.1 | | | | | X |
| D-2.2.3 | | | | | X |
| D-3 | | | | | X |
| D-4.1.1 | | | | | X |
| D-4.1.2 | | | | | X |
| G-1 | | | | | X |
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| G-2.1 | | | | | X |
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| G-4 | | | | | X |
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# Advanced Naval Flight Officer/

# Air Force Navigator

# Strike Training Curriculum

| Difficulty to Perform | |
|---|---|
| Spatial awareness | 3.25 |
| uses info sources | 2.90 |
| briefs status | 2.25 |
| provides info | 3.30 |
| informs others of action | 2.15 |
| cross checks | 3.40 |
| task knowledge | 2.80 |
| backup | 3.50 |
| time sharing | 4.45 |
| scan | 3.89 |
| anticipates consequences | 4.40 |
| takes action | 3.15 |
| reports problems | 2.45 |
| locates source of prob | 3.45 |
| resolves discrepancies | 3.40 |
| standard comms | 3.25 |

| | Criticality to Training Goal | | | | |
|---|---|---|---|---|---|
| | Ground Mapping Radar | adio Aids Na | Comm | Safety | Vis nav |
| Spatial awareness | 4.63 | 4.86 | 3.43 | 4.57 | 4.95 |
| uses info sources | 3.38 | 4.00 | 3.76 | 4.05 | 4.30 |
| briefs status | 2.88 | 2.95 | 2.95 | 3.19 | 3.25 |
| provides info | 2.88 | 3.14 | 3.33 | 3.52 | 4.00 |
| informs others of action | 2.38 | 3.24 | 3.81 | 4.05 | 3.45 |
| cross checks | 3.25 | 3.38 | 3.10 | 4.19 | 4.00 |
| task knowledge | 2.88 | 3.19 | 3.05 | 3.95 | 3.95 |
| backup | 1.75 | 2.57 | 3.24 | 3.76 | 3.05 |
| time sharing | 3.75 | 3.71 | 3.62 | 3.90 | 4.15 |
| scan | 4.00 | 3.67 | 2.52 | 4.25 | 4.80 |
| anticipates consequences | 3.88 | 3.67 | 2.95 | 4.38 | 4.35 |
| takes action | 3.88 | 3.86 | 3.52 | 4.24 | 4.35 |
| reports problems | 2.75 | 3.14 | 3.81 | 4.48 | 3.65 |
| locates source of prob | 3.50 | 3.14 | 2.90 | 4.29 | 3.65 |

| | | | | | |
|---|---|---|---|---|---|
| resolves discrepancies | 4.13 | 3.86 | 3.10 | 4.10 | 3.85 |
| standard comms | 2.50 | 2.76 | 4.52 | 3.19 | 2.90 |

**Adequacy to train SA skill in the aircraft**

| | Ground radar | | radio aids nav | | comm | | safety | | vi |
|---|---|---|---|---|---|---|---|---|---|
| | 2 seat | Multi-place | 2 seat | Multi-place | 2 seat | Multi-place | 2 seat | Multi-place | 2 seat |
| Spatial awareness | 2.75 | 4.14 | 3.90 | 4.60 | 3.52 | 3.85 | 3.95 | 4.50 | 3.75 |
| uses info sources | 2.38 | 3.86 | 3.81 | 4.40 | 3.86 | 4.20 | 3.86 | 4.45 | 3.60 |
| briefs status | 2.50 | 3.86 | 3.76 | 4.10 | 3.71 | 4.05 | 3.52 | 3.65 | 3.80 |
| provides info | 2.50 | 4.00 | 3.67 | 4.10 | 3.67 | 4.05 | 3.33 | 3.75 | 3.50 |
| informs others of action | 2.50 | 4.29 | 3.76 | 4.35 | 3.67 | 4.30 | 3.67 | 4.20 | 3.70 |
| cross checks | 2.75 | 4.14 | 3.24 | 4.25 | 3.57 | 4.00 | 3.57 | 4.25 | 3.75 |
| task knowledge | 2.38 | 3.71 | 3.76 | 4.20 | 3.62 | 3.95 | 4.00 | 4.10 | 3.80 |
| backup | 2.50 | 3.43 | 3.19 | 4.30 | 3.19 | 3.95 | 3.57 | 4.25 | 3.40 |
| time sharing | 2.63 | 3.86 | 3.24 | 4.25 | 3.38 | 3.80 | 3.62 | 4.00 | 3.70 |
| scan | 2.75 | 3.86 | 3.67 | 4.30 | 3.38 | 3.65 | 3.81 | 4.30 | 3.75 |
| anticipates consequences | 2.13 | 3.86 | 3.62 | 4.20 | 3.43 | 4.00 | 4.00 | 4.35 | 3.75 |
| takes action | 2.50 | 3.86 | 3.95 | 4.25 | 3.57 | 3.90 | 4.10 | 4.45 | 4.00 |
| reports problems | 2.50 | 4.14 | 3.62 | 4.40 | 3.62 | 4.10 | 3.76 | 4.25 | 3.60 |
| locates source of prob | 2.50 | 4.00 | 3.62 | 4.10 | 3.29 | 3.80 | 3.52 | 4.05 | 3.55 |
| resolves discrepancies | 2.63 | 3.86 | 3.71 | 4.15 | 3.29 | 3.85 | 3.71 | 4.00 | 3.70 |
| standard comms | 3.38 | 4.14 | 4.14 | 4.35 | 4.05 | 4.25 | 3.48 | 3.85 | 3.75 |
| | 41.25 | 63.00 | 58.67 | 68.30 | 56.81 | 63.70 | 59.48 | 66.40 | 59.10 |

**Adequacy to train SA skill in the simulator**

| | Ground radar | | radio aids nav | | comm | | safety | | vi |
|---|---|---|---|---|---|---|---|---|---|
| | no visual | visual | no visual | visual | no visua | visual | no visua | visual | no visua |
| Spatial awareness | 3.13 | 4.25 | 3.52 | 3.81 | 2.86 | 3.38 | 3.10 | 3.95 | 1.45 |
| uses info sources | 2.63 | 3.63 | 3.00 | 3.70 | 3.05 | 3.52 | 3.05 | 3.81 | 1.60 |
| briefs status | 3.50 | 3.88 | 3.33 | 3.62 | 3.19 | 3.33 | 3.05 | 3.33 | 2.35 |
| provides info | 3.50 | 3.88 | 3.19 | 3.67 | 3.00 | 3.48 | 2.95 | 3.48 | 1.90 |
| informs others of action | 3.25 | 3.88 | 3.48 | 3.57 | 3.14 | 3.38 | 3.14 | 3.48 | 2.40 |
| cross checks | 3.00 | 4.00 | 3.43 | 4.10 | 3.10 | 3.52 | 3.05 | 3.81 | 1.85 |
| task knowledge | 3.50 | 4.00 | 3.81 | 3.90 | 3.10 | 3.19 | 3.67 | 3.86 | 2.10 |
| backup | 2.63 | 3.13 | 3.14 | 3.43 | 2.90 | 3.29 | 2.95 | 3.24 | 2.25 |
| time sharing | 3.00 | 3.88 | 3.14 | 3.48 | 2.95 | 3.14 | 2.81 | 3.33 | 1.90 |
| scan | 2.38 | 3.75 | 2.67 | 3.90 | 2.76 | 3.38 | 2.67 | 3.71 | 1.50 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| anticipates consequences | 3.00 | 3.63 | 3.19 | 3.62 | 3.00 | 3.29 | 3.19 | 3.57 | 1.95 |
| takes action | 3.50 | 3.75 | 3.57 | 3.67 | 3.10 | 3.14 | 3.57 | 4.05 | 1.90 |
| reports problems | 2.88 | 3.38 | 3.19 | 3.71 | 3.10 | 3.52 | 3.10 | 3.71 | 2.00 |
| locates source of prob | 3.13 | 3.75 | 3.10 | 3.52 | 3.00 | 3.33 | 3.19 | 3.76 | 1.95 |
| resolves discrepancies | 3.13 | 3.63 | 3.48 | 3.67 | 3.00 | 3.38 | 3.05 | 3.52 | 2.05 |
| standard comms | 3.00 | 3.50 | 3.19 | 3.62 | 3.52 | 3.76 | 2.86 | 3.33 | 2.40 |
| | 49.13 | 59.88 | 52.43 | 58.99 | 48.76 | 54.05 | 49.38 | 57.95 | 31.55 |

| | |
|---|---|
| Adequacy to train in a/c for Ground Mapping | Adequacy to train in a/c for Radio Aids |

| is nav Multi-place |
|---|
| 4.47 |
| 4.32 |
| 3.95 |
| 4.00 |
| 4.37 |
| 4.26 |
| 4.05 |
| 4.21 |
| 4.32 |
| 4.63 |
| 4.37 |
| 4.26 |
| 4.05 |
| 3.89 |
| 3.95 |
| 4.05 |
| 67.16 |

| is nav visual |
|---|
| 4.20 |
| 4.00 |
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| 4.00 |
| 3.75 |
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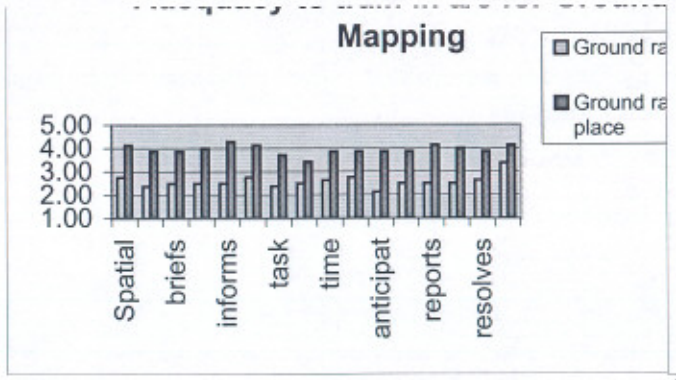
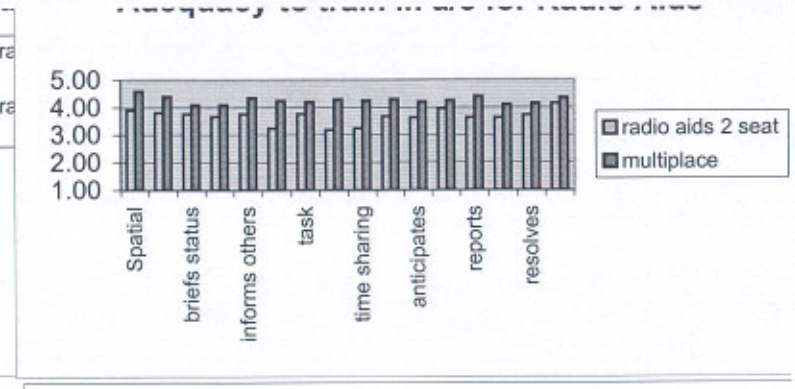
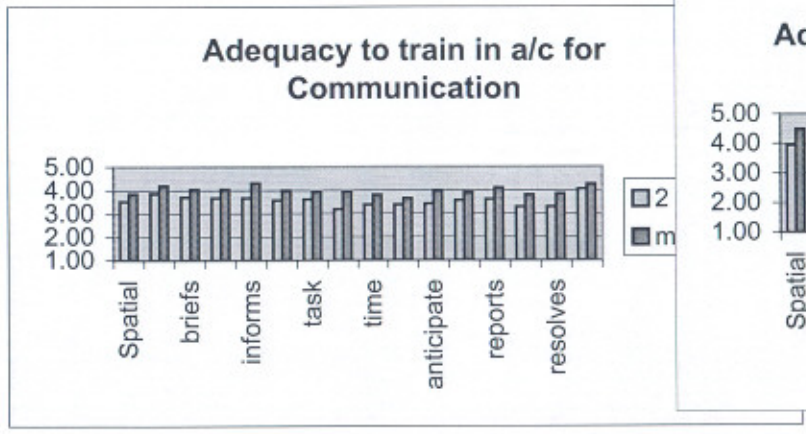
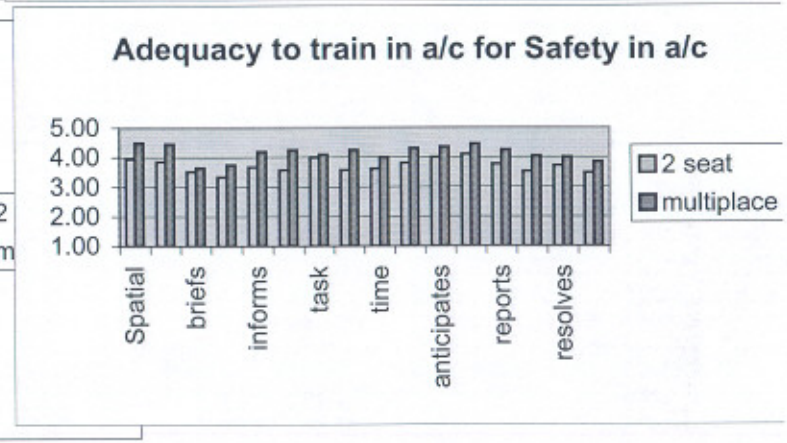
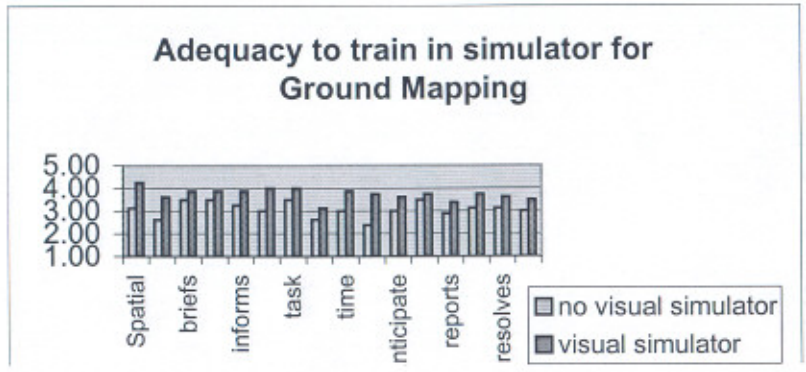
| 4.10 |

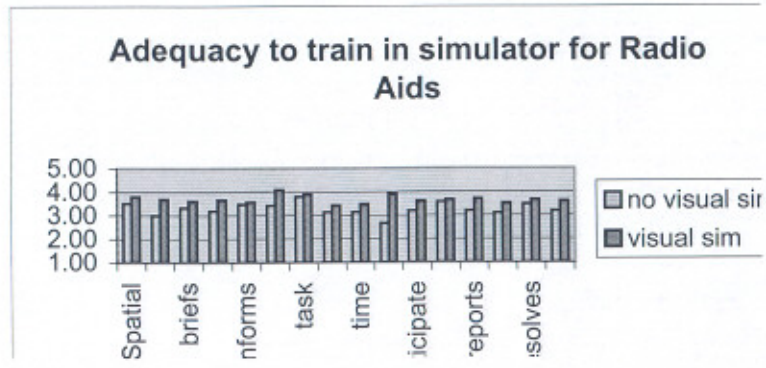


| |
|---|
| 3.85 |
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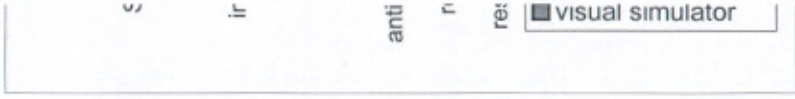
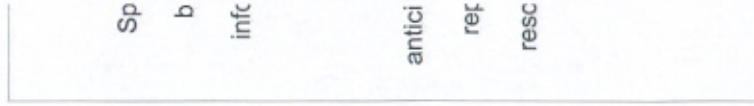
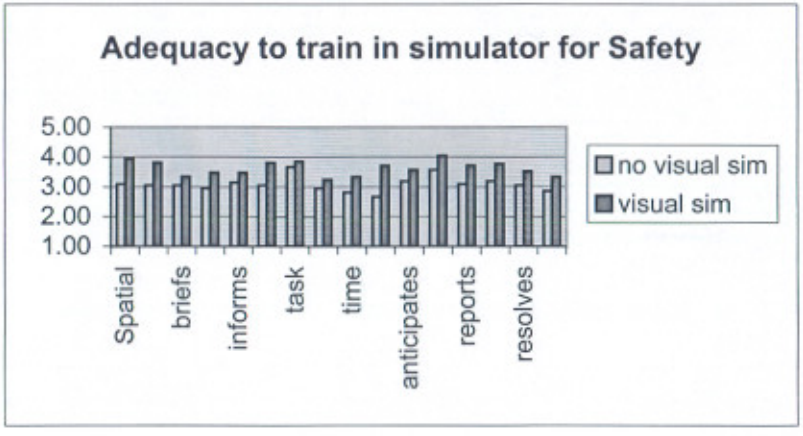
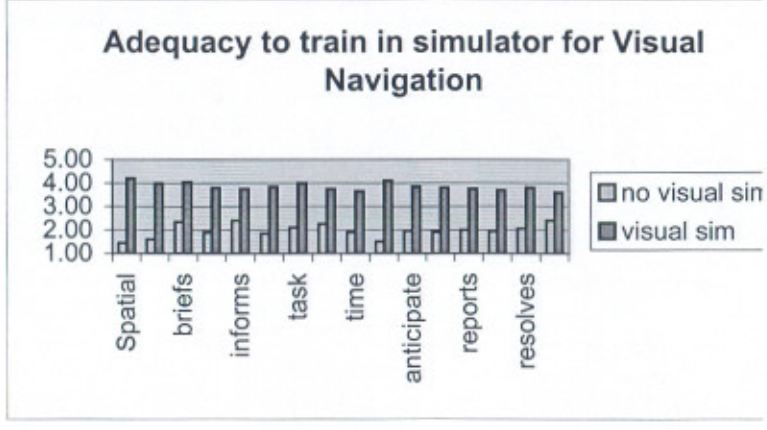
| 61.65 |



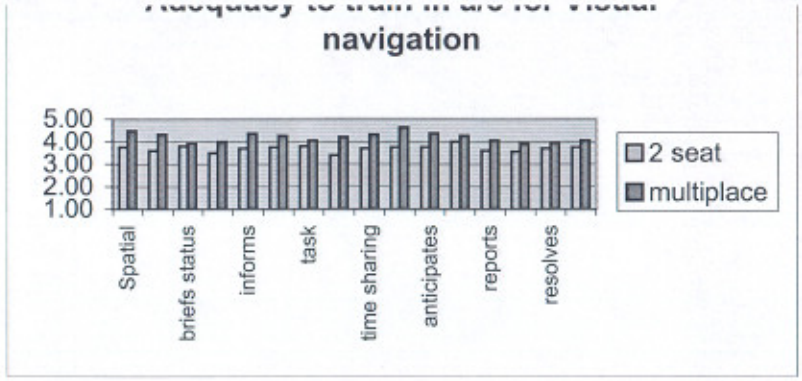





Adequacy to train in a/c for Visual

seat

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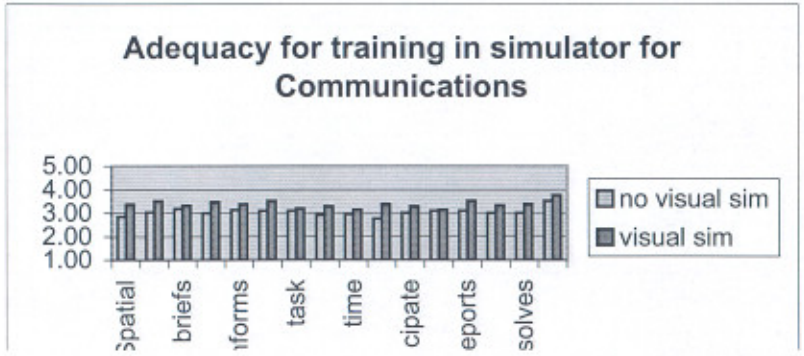

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## ANAV/VNAV/SA Simulator for the Undergraduate Military Flight Officer (UMFO) Program

This simulator would be a mock-up of a T-34 cockpit. The student would be seated in the cockpit and an instructor would be seated just outside the cockpit. Both would have access to an operable control stick/throttle. The simulator would be loaded with Microsoft Flight Simulator xx. Changes to altitude, course, winds, etc. could be made real-time by the instructor, in addition to simulated malfunctions and emergencies. The simulator would exercise pre-loaded flight profiles in both IFR and VFR conditions. The simulators could also be controlled simultaneously by one instructor in a classroom-lab situation similar to the present 2B-47 configuration.

The simulator would be driven by the latest generation of personal computer with ample capacity for dealing with memory-intensive graphics. The ground terrain graphics would be satellite images that include the Southeastern United States. The simulator would include three 2 1 " high-resolution monitors for a 270-degree field of vision. The cockpit layout would include actual T-34 control boxes including (not limited to) UHF, VHS, ICS, IFF, TACAN and VOR. The engine instruments would be simulated The flight controls would be limited to the control stick/throttles. The simulator would be equipped with voice recognition software that would assess the accuracy of UHF communication protocols and collect data relating to the accuracy and timeliness of the two-minute prior, mark-on-top and wings level calls and visual recognition of turn points and check points. Data would also be collected concerning the accuracy of course and time corrections by the student Other data to be collected will be ascertained in development of the first (prototype) simulator.

**A Description and ROM for the**
**ANAV/VNAV/SA Simulator**
**Provided by ECC International Corporation**

## Configuration

| | 3D | Active Glass | Cockpit Artwork | Active |
|---|---|---|---|---|
| 1. Forward Electronic Command Panel | | | x | |
| 2. Forward Oxygen Regulator Panel | | | x | |
| 3. UHF Radio | | | | x |
| 4. TACAN Radio | | | | x |
| 5. VOR Radio | | | | x |
| 6. RNAV Panel | | | | x |
| 7. DME Indicator Panel | | | | x |
| 8. Audio Control Panel | | | | x |
| 9. Transponder Panel | | | | x |
| 10. Forward Avionics Command Panel | | | | x |
| 11. Interior Light Panel | | | | x |
| 12. Miscellaneous Switch Panel | | | x | |
| 13. Forward Circuit Breaker Panel | | | x | |
| 14. Landing Gear Control Panel | | | x | |
| 15. Compass Panel | | | | x |
| 16. Fuel Shutoff | | | x | |
| 17. Flaps Switch | | | x | |
| 18. Errvironmental Controls | | | x | |
| 19. Power Control Lever | | | | x |
| 20. Test Panel | | | x | |
| 21. Fire Warning Test | | | | x |
| 22. Starter Ignition Control Panel | | | | x |
| 23. Parking Brake | | | x | |
| 24. Engine Air | | | x | |
| 25. Alternate Static | | | x | |
| 26. Emergency Landing Gear Handle | | | x | |
| 27. Tdm Controls | | | x | |
| 28. Rudder Pedals | | | | x |
| 29. Control Stick | | | | x |
| 30. Magnetic Bearing Reference | | x | | |
| 31. VOR/I LS Indicator | | x | | |
| 32. Radio Magnetic Indicator (RMI | | x | | |
| 33. Accelerometer | | x | | |
| 34. Turn and Slip Indicator | | x | | |
| 35. Altimeter | | x | | |

| | | | |
|---|---|---|---|
| 36. Vertical Speed Indicator | x | | |
| 37. Fuel Flow Indicator | x | | |
| 38. Oil Temp Indicator | x | | |
| | **Active** | **Cockpit** | **Active** |
| **3D** | | | |
| | **Glass** | **Artwork** | |
| 39. Oil Pressure Indicator | x | | |
| 40. Turbine Tachometer | x | | |
| 41. Attitude Indicator | x | | |
| 42. Air'speed Indicator | x | | |
| 43. Torquemeter | x | | |
| 44. AOA Indicator | x | | |
| 45. ITT Indicator | x | | |
| 46. Propellor Tachometer | x | | |
| 47. Flap Positon Indicator | x | | |
| 48. Clock/Stop Watch | x | | |

## System Components

Cockpit

Fiberglass structure.
Simplified seat
Side panels.

Front instrument panel would consist of a 2 I" touch-screen monitor.
Headset with microphone`.

3-channel visual system.
Single high-performance PC.

Instructor Station

Desk, chair.
2 1 " touch-screen monitor.
Single medium performance PC.

## Software Component Options

1. MS Flight Simulator "Core". MS Flight Simulator continues to gain strong support in the training community. MS is currently providing software development kits that support Flight Simulator customizations. In addition, growing lists of third-party suppliers are available to support updates and modifications. The assumption is that by 2006, the capability of Flight Simulator will surpass any "stove pipe" implementations that currently exist.

2. TJDIS "Core". UDIS is a "stove pipe" implementation. Support and maintenance of UDIS is seriously in question. The assumption is that by 2006 UDTS will not be supportable.

3. Device 2B47 Aviation Communication/Navigation Trainer "Core". This existing trainer framework appears to satisfy the majority of the functional requirements associated with the navigator trainer curriculum. IOS functionality requirements appear to be satisfied by this device.

The lowest cost option appears to be the integration of the MS Flight Simulator "Core" with the Device 2B47 "Core" components.

MS Flight Simulator would provide all flight instrumentation, models, and visual scenery. MS Flight Simulator would be modified to support interfacing to the existing 2B47 instructor station.

## ROM Cost

Software

Panel Modifications: 3 LM
Integration with controls: 3 LM

Integration with Visual System: 4 LM
Integration with IOS to include ICS: 3 LM
Test and Integration: 3 LM

Total: 16 LM

Hardware (Parts and labor)

Fiberglass shell $5000
Modified GFE control panels: $15000
Front instrumentation panel installation: $3000
Seat: $1 000
Control Stick/Rudder Pedals/Power Lever: $ 1 0000
PC that includes a 3-channel visual system: $5000
IOS PC: $3000
Installation and checkout: 4LM

**Total**

Hardware: $42,000 + ((4L@@85) = $55,000) = $97,000
Software: 16LM @$120/H = $307,200

**Prototype** Development Estimate (Software and Hardware):
307,200 + 97,000 = $467,000 x 1.35 = **$545,670**

**For an additional 39 copies**: ($97,000 x 1.35 = 131,000) x 39 = **$5,100,000**

CNATRAINST 1542.54K , SECTION II - APPENDIX A

TERMINAL OBJECTIVES (TOs)

The **Primary** Naval Flight Officer/Navigator Training Curriculum is designed to teach the basic skills and knowledge required to safely aviate, navigate, communicate, and manage aircraft systems. Upon satisfactory completion of this phase, the student will be able to perform the following terminal objectives:

A. Safety. Apply without error the policies and guidance of Squadron and Naval Aviation Safety Programs to identify, avoid and report hazards.

B. Aircraft Control. Maintain spatial orientation while controlling an aircraft through the use of visual scan in visual meteorological conditions with instructor assistance, during day and night shore based operations. Maintain spatial orientation backing up the instructor through the use of instrument scan in instrument meteorological conditions with instructor assistance, during day and night shore based operations.

C. Navigation. Navigate an aircraft via visual references and navigation instruments with the assistance of a flight instructor.

D. Communications. Communicate with appropriate facilities via two-way radio using standard naval aviation and Federal Aviation Administration terminology.

E. Flight Policy. Comply with specified flight policies, guidance and procedures provided by OPNAVINST 3710.7Q, Naval Air Training and Operating Procedures Standardization (NATOPS), Federal Aviation Regulations and command directives.

F. Mission Planning. Use Flight Information Publications (FLIP), Notices to Airmen (NOTAMS) and other applicable flight information to plan and fly in the Federal Aviation Administration's Air Traffic Control (ATC) system.

G. Meteorology. Use forecast and observed weather conditions, and knowledge of meteorology and meteorological theory and its effects on aircraft performance to plan and conduct safe and efficient flight operations.

H. Aircraft Condition. Determine aircraft condition and readiness for flight during preflight and postflight.

I. Systems Operation. Operate and assess an aircraft and its systems in accordance with NATOPS and flight training instructions (FTIs), reporting any anomaly to the instructor.

J. Crew Coordination. Apply crew coordination concepts and procedures during aircraft operations.

K. Flight Mission Planning. Demonstrate adequate preparation for flight and mission accomplishment.

## ENABLING OBJECTIVES

The enabling objectives (EOs) listed below are grouped into ten areas which, when completed, will satisfy the corresponding terminal objectives. Upon satisfactory completion of the Primary Flight Officer Training Curriculum, the student will be able to perform the following EOs. Given one T-34C aircraft, a thorough briefing, approved checklists and publications the student will be able to conduct dual flight with a qualified flight instructor on board providing instruction, assistance, or supervision. Though it is not an objective of this course to solo the student in the T-34C, a specific intent is to develop as much as possible those pilot skills that would enable the student to control the T-34C from engine start to engine shut down with the minimum of instructor assistance.

A. Safety

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| A-1. Recall the functions, organization, and procedures of the Naval Aviation Safety program as defined in OPNAVINST 3750.6Q. | Given an oral or written examination. | 80% accuracy. |
| A-2. Recall specific safety hazards and their avoidance procedures associated with VT-4/10 flight operations. | Given an oral or written examination. | 80% accuracy. |

B. Aircraft Control

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| B-1. Taxi and perform ground operations. | With instructor and ground crew assistance, given prescribed route. | Clear of obstructions in compliance with NATOPS and air operations manual. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| B-2. Takeoff and transition to climb. | VMC with instructor assistance as required, aircraft systems ready while accelerating to climb speed and establishing proper aircraft configuration. | Maintain aircraft alignment; maintain positive rate of climb, in compliance with NATOPS and operations manual. |
| B-3. Abort takeoff, appraise aircraft systems and energy level. | Operational Flight Trainer, as required by actual emergency. | In compliance with NATOPS procedures. |
| B-4. Transition to and from climb, descent, level flight. | With instructor assistance as required. | Recognizing and attempting to correct deviations of ± 300' VFR, ± 20 kts IAS, ± 20 degrees heading. In IFR, recognizing and informing instructor pilot of deviations of ± 100' IFR. |
| B-4.1. Measure and stabilize the T-34C attitude and power setting for specified visual and instrument maneuvers. | With instructor assistance as required within geographical limits. | Same as B-4. |
| B-5. Maintain internal and external visual scan patterns while evaluating aircraft systems performance and geographical position. | Visual meteorological conditions (VMC), day, night. | In compliance with NATOPS and local directives. |
| B-5.1. Detect, report and avoid all aircraft in visual range. | VMC, day, night. | In compliance with NATOPS and local directives. |
| B-6. Perform aircraft stall and stall recovery. | With instructor assistance as required, day, VMC. | In accordance with training instructions. |
| OPERATIONS | CONDITIONS | STANDARDS |

| | | |
|---|---|---|
| B-6.1. Identify conditions creating stall and the stall warnings. | Same as B-6. | In accordance with training instructions. |
| B-7. Identify out-of-control flight and upright spin. | Day, VMC, cruise configuration. | In accordance with FTIs. |
| B-8. Locate the landing field and enter the landing pattern. | With instructor assistance as required, day and night given course rules and defined pattern. | In compliance with NATOPS and air station operations manual. |
| B-9. Conduct landings. | With instructor assistance as required, day and night. | In accordance with the FTI. |
| B-9.1. Detect and attempt to correct glide slope errors. | With instructor assistance as required. | In compliance with the FTI. |
| B-9.2. Appraise attitude and power requirements for desired aircraft performance. | Same as B-9. | In compliance with the FTI. |
| B-10. Initiate or accept a landing wave-off. | Same as B-9. | In compliance with the FTI. |
| B-11. Monitor landing roll-out and deceleration. | With instructor assistance as required, day and night. | Ensure alignment $\pm$ 25 ft, while slowing aircraft, avoiding porpoise or bounce. |
| B-12. Recall aircraft emergency procedures. | As required, in all T-34C operating conditions during actual or simulated emergencies. | In accordance with NATOPS procedures. Maintain aircraft control. |
| B-12.1. Recall "immediate action" emergency procedures. | Given an oral or written examination, as required by actual emergency. | Without error. |

C. Navigation

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| C-1. Identify aircraft position relative to an operable Tactical Air Navigation (TACAN)/VOR station. | Given a TACAN/VHF Omnidirectional Range (VOR) and FLIP. | Without error. |
| C-1.1. Recall the characteristics of radio aids to navigation. | Given an oral or written examination. | 80% accuracy |
| C-2. Identify aircraft position relative to geographic reference. | VMC, day, and night. | 75% accuracy. |
| C-3. Perform the 2-minute prior, mark-on-top and wings level call at each turnpoint. | Given a specified route and Simulator or in flight. | Without error. |
| C-4. Execute TACAN point-to-point navigation. | Given a specified route, with instructor assistance as required. | Within 4 nm. |
| C-5. Execute a standard instrument departure. | Same as C-1. | Within $\pm$ 1 nm of arcs, $\pm$ 6 degrees or 2 nm of course. |
| C-6. Execute a radio instrument and ground controlled approach (GCA). | Same as C-1. | Within $\pm$ 5° of course for Radio Instrument Approach; $\pm$ 5° of assigned heading on GCA; 100' above to 0' below MDA; O' below DH |
| C-7. Execute entry and holding pattern procedures. | Same as C-1. | In accordance with the FTI, AIM and NATOPS. |
| C-8. Determine mission completion feasibility based on fuel requirements at each navigational checkpoint. | Given a jet log and single en route chart during simulator or flight navigation training mission. | In accordance with OPNAVINST 3710.7Q. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| C-8.1. Calculate estimated fuel remaining at destination initial approach fix (IAF). | During simulator or flight navigation training mission. | ± 30 pounds. |
| C-9. Calculate estimated time of arrival at each navigational checkpoint. | During simulator or flight navigation training mission. | ± 1 minute. |
| C-9.1 Determine ground speed. | During simulator or flight navigation training mission. | ± 10 nm per hour. |
| C-10. Evaluate observed and forecast meteorological conditions to avoid weather hazards and enhance mission accomplishment. | During simulator or flight navigation training mission. | In accordance with OPNAVINST 3710.7Q. |
| C-11. Derive aircraft heading using dead reckoning techniques. | Given a course. | ± 5 degrees. |
| C-12. Perform ground control approach. | With reference to instruments given printed approach criteria, with instructor assistance as required. | In accordance with FTI and published procedures. |

D. Communications

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| D-1. Communicate via two-way radio using standard naval aviation and Federal Aviation Administration (FAA) terminology with appropriate agencies during:<br>a. ground operations<br>b. departure<br>c. en route<br>d. arrival | VMC, Instruments Meteorological Conditions (IMC), day and night, given assigned mission and route, in normal or emergency conditions. | With no errors that will preclude mission success. |
| D-1.1. Recall naval aviation and FAA two-way radio communication procedures. | Given an oral or written examination. | With no errors that will preclude mission success. |

E. Flight Policy

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| E-1. Recall the scope of the NATOPS program. | Given an oral or written examination. | 80% accuracy. |
| E-2. Recall the parts of the NATOPS manual. | Given an oral or written examination. | 80% accuracy. |
| E-3. Recall the sections of the NATOPS Pocket Checklist. | Given an oral or written examination. | 80% accuracy. |
| E-4. Comply with specified flight policies and procedures provided in OPNAVINST 3710.7Q. | During aircraft operations. | Without error. |
| E-4.1. Recall specified flight policies and procedures in OPNAVINST 3710.7Q. | Given an oral or written examination. | 80% accuracy. |
| E-5. Comply with specified flight policies and procedures set forth in FAA Regulations Part 91. | During aircraft operations. | Without error. |
| OPERATIONS | CONDITIONS | STANDARDS |
| E-5.1. Recall specified flight policies and procedures set forth in FAA Regulations Part 91. | Given an oral or written examination. | 80% accuracy. |

F. Mission Planning

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|

| | | |
|---|---|---|
| F-1. Locate, interpret and apply information in FLIP General Planning. | Given a mission. | Without error. |
| F-2. Locate, interpret and apply information in FLIP Area Planning 1, 1A and 1B. | Given a mission. | Without error. |
| F-3. Locate, interpret and apply information in the FLIP IFR En Route Supplement. | Given a mission. | Without error. |
| F-4. Locate, interpret and apply information in FLIP Flight Information Handbook. | Given a mission. | Without error. |
| F-5. Locate, interpret and apply information on FLIP IFR En Route High Altitude Chart. | Given a mission. | Without error. |
| F-6. Locate, interpret and apply information on FLIP En Route Low Altitude and Area Charts. | Given a mission. | Without error. |
| F-7. Locate, interpret and apply information on FLIP Standard Instrument Departure. | Given a mission. | Without error. |
| F-8. Locate, interpret and apply information in FLIP Terminal Instrument Approach Procedures. | Given a mission. | Without error. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| F-9. Complete a Jet Log. | Given a mission, FLIP, NATOPS and OPNAVINST 3710.7Q. | In accordance with appropriate Peculiar to Aviation Training (PAT) publication and without error. |
| F-10. Complete a DD-175 using FLIP and Jet Log information. | Given a mission. | In accordance with appropriate PAT publication and without error. |

G. Meteorology

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| G-1. Describe the lower layers of the atmosphere and its composition, stating the primary flight hazards and weather elements, including hypoxia and the OPNAVINST 3710.7Q rules for oxygen use. | Given an oral or written examination. | 80% accuracy. |
| G-2. Define, state, compute, and list selected parameters used with atmospheric temperatures, including its effect on aircraft altimetry, and its application to density altitude. | Given an oral or written examination. | 80% accuracy. |
| G-3. Define, state, compute and list selected parameters used with atmospheric pressure, and its effects on aircraft altimetry, including the solving of altimeter problems. | Given an oral or written examination. | 80% accuracy. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| G-4. State the basic concepts behind the large and small scale wind systems, including the determination of gradient and surface winds. | Given an oral or written examination. | 80% accuracy. |
| G-5. Describe the relationship between atmospheric temperature and moisture content and its effects on flight, including a familiarization of the major cloud types and their associated flight characteristics. | Given an oral or written examination. | 80% accuracy. |
| G-6. Define and state various definitions, terms, rates, and requirements, associated with stability/instability of the atmosphere. | Given an oral or written examination. | 80% accuracy. |
| G-7. Define an air mass and describe the classification system of air masses, including the flight conditions of selected air masses. | Given an oral or written examination. | 80% accuracy. |
| G-8. Describe how the various frontal systems form, including the characteristics of each and their associated weather patterns that affect flight. | Given an oral or written examination. | 80% accuracy. |
| G-9. State the fundamentals of thunderstorm development, including classification, structure, associated hazards, and the proper flight techniques for safe flight through or in the vicinity of thunderstorms. | Given an oral or written examination. | 80% accuracy. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| G-10. Describe the causes of turbulence, including the wake turbulence phenomena, and state the various frequencies and intensity terms used to describe turbulence. | Given an oral or written examination. | 80% accuracy. |
| G-11. State the requirements for ice formation, types of icing, and their effects on aircraft flight and aircraft components, including the evasive tactics that should be adhered to for a safe flight. | Given an oral or written examination. | 80% accuracy. |
| G-12. Describe fogs and low ceiling clouds, stating the requirements for formation, including the saturation process, effects of wind, and how the various types form and dissipate. Then define the difference between obscuration and partial obscuration. | Given an oral or written examination. | 80% accuracy. |
| G-13. State and describe selected tropical and tornado weather phenomena, including the warnings issued for them and other weather phenomena. | Given an oral or written examination. | 80% accuracy. |
| G-14. State information about and identify displayed data shown on station model plots, surface analysis charts, and the two types of surface prognostic charts. | Given an oral or written examination. | 80% accuracy. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| G-15. State information about and identify displayed data on radar summary and weather depiction charts. | Given an oral or written examination. | 80% accuracy. |
| G-16. State information about and identify displayed data on severe weather watches and area forecasts. | Given an oral or written examination. | 80% accuracy. |
| G-17. State information about and identify displayed data on in-flight weather advisories and pilot reports. | Given an oral or written examination. | 80% accuracy. |
| G-18. State information about and identify displayed data on winds-aloft prognostic charts, constant-pressure charts, and winds-aloft forecasts. | Given an oral or written examination. | 80% accuracy. |
| G-19. State information about and identify displayed data on aviation weather reports. | Given an oral or written examination. | 80% accuracy. |
| G-20. State information about and identify displayed data on terminal forecasts. | Given an oral or written examination. | 80% accuracy. |
| G-21. State the five parts of a DD175-1 "Flight Weather Briefing Form," and state the sources of weather information required to fill in the various blocks shown on the DD175-1, including Flight Forecast Folders. | Given an oral or written examination. | 80% accuracy. |

H. Aircraft Condition

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| H-1. Review information (VIDs/MAFs, Aircraft Inspection and Acceptance Record, etcetera) contained in aircraft discrepancy book to determine aircraft documented suitability for flight. | Given a mission with instructor and maintenance assistance. | In accordance with NATOPS. |
| H-2. Perform aircraft preflight and postflight inspections. | Given a mission. | In accordance with NATOPS. |
| H-3. Observe completion of Maintenance Action Forms (MAF) as necessary. | During pre/postflight given a mission. | Without error. |
| H-4. Complete applicable parts of a Naval Aircraft Flight Record (NAVFLIRS). | During pre/postflight given a mission. | Without error. |

I. Systems Operation

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| I-1. Recognize the correct nomenclature, purpose, characteristics, functions, and location of T-34C systems, system components, and installed equipment. | Given a mission. | In accordance with NATOPS and FTI. |
| I-2. Operate and evaluate navigation equipment. | Given a mission. | In accordance with NATOPS and FTI. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| I-3. Operate and evaluate communication equipment. | Given a mission. | In accordance with NATOPS and FTI. |
| I-4. Operate and evaluate environmental system. | Given a mission. | In accordance with NATOPS and FTI. |
| I-5. Operate and evaluate fuel system. | Given a mission. | In accordance with NATOPS and FTI. |
| I-6. Operate and evaluate electrical system. | Given a mission. | In accordance with NATOPS and FTI. |
| I-7. Operate and evaluate engine system. | Given a mission. | In accordance with NATOPS and FTI. |
| I-8. Operate and evaluate flight instruments. | Given a mission. | In accordance with NATOPS and FTI. |

J. Crew Coordination

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| J-1. Coordinate aircraft operation with instructor. | Given a mission, VMC, IMC, day and night. | In accordance with NATOPS and local instructions. |
| J-1.1. Coordinate positive control of aircraft and transfer of control. | Given a mission, VMC, IMC, day and night. | Without error. |
| J-2. Coordinate aircrew duties and responsibilities. | Given a mission, VMC, IMC, day and night. | In accordance with NATOPS and local instructions. |
| J-2.1. Coordinate operational control of aircraft systems. | Given a mission, VMC, IMC, day and night. | Without error. |
| J-3. Relay safety of flight information to instructor. | Given a mission, VMC, IMC, day and night. | Without error. |

K. Flight Mission Preparation

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| K-1. Possess required flight materials. | Given a mission and a permission briefing. | Without error. |

| | | |
|---|---|---|
| K-2. Recall required mission procedures and information. | Given a mission and a permission briefing. | 90% accuracy. |

CNATRAINST 1542.131, TRAINING OBJECTIVES

SUMMARY OF TERMINAL OBJECTIVES

INTERMEDIATE PHASE CURRICULUM

The **Intermediate** Naval Flight Officer/Navigator Training Curriculum is designed to teach by reinforcement and amplification the skills and knowledge required to safely aviate, navigate, communicate, manage aircraft systems, and describe two-plane formations in naval aircraft in visual and instrument conditions. Upon satisfactory completion of this intermediate phase, the student will be able to perform the following Terminal Objectives.

1. Operate and assess an aircraft and its systems in accordance with NATOPS, limitations and FTIs, reporting any anomaly to the instructor.

2. Navigate an aircraft via visual references and navigation instruments with instructor assistance, and through coordination with a pilot.

3. Compute and evaluate, factoring in the effects of meteoro-logical conditions, fuel requirements and en route times.

4. Communicate with appropriate facilities and other aircraft.

5. Use Flight Information Publications (FLIPs), Notices to Airmen (NOTAMs), and other applicable flight information to plan and fly in the T-34C and T-1A in the Federal Aviation Administration's Air Traffic Control (ATC) system.

6. Determine T-34C and T-1A condition and readiness for flight during preflight and postflight.

7. Apply aircrew coordination concepts and procedures during aircraft operations.

8. Perform with instructor assistance specified aircraft maneuvers.

9. Direct, with instructor assistance, specified two-plane formation maneuvers.

10. Demonstrate adequate preparation for flight and mission accomplishment.

CNATRAINST 1542.131, TRAINING OBJECTIVES

SUMMARY OF ENABLING OBJECTIVES

The enabling objectives (EOs) listed below are grouped into ten areas which, when completed, will satisfy the corresponding terminal objectives. Upon satisfactory completion of the Intermediate Student Naval Flight Officer/Navigator Training Curriculum, the student will be able to perform the following EOs. Given one 2B37, T-34C or T-1A aircraft, a thorough briefing, approved in-flight checklists, and publications the student will be able to conduct dual flight with a qualified flight instructor on board providing instruction, assistance, or supervision.

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| 1. Aircraft and Systems Operation | | |
| 1-1. Locate and operate T-34C/T-1A aircraft systems. | Given a mission in a T-34C or T-1A. In accordance with NATOPS. | Without error. |
| 1-2. Describe the correct nomenclature, purpose, characteristics, functions, and limitations of T-34C/ T-1A aircraft systems. | Given an oral or written examination. | Without error. |
| 1-3. Recall the T-34C/T-1A aircraft servicing procedures. | Given an oral or written examination. | Without error. |
| 1-4. Recall the T-34C/T-1A all-weather operating procedures. | Given an oral or written examination. | Without error. |
| 1-5. Extract T-34C/ T-1A aircraft perform- ance data from charts. | Given an oral or written examination. | Without error. |
| 1-6. Perform T-34C/ T-1A checklists. | Given a mission in a T-34C or T-1A. In accordance with NATOPS. | Without error. |
| 1-7. Operate T-34C/ T-1A within limita- tions. | Given a mission in a T-34C or T-1A. In accordance with NATOPS. | Without error. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| 1-8. Recall T-34C/ T-1A operating limitations. | Given an oral or written examination. | Without error. |
| 1-9. Execute T-34C/ T-1A specified "immediate action" emergencies. | As required by flight instructor or actual emergency. In accordance with NATOPS. | Without error. |
| 1-10. Recall T-34C/ T-1A specified "immediate action" emergency procedures. | Given an oral or written examination. | Without error. |
| 2. Navigation | | |
| 2-1. Maintain or make recommendations to maintain a specified course. | Given a published standard instrument departure or approach. | Arcs ± 1/2nm/2B37 & T-34C, 1nm T-1A; course ± 3 degrees or 2nm. |
| 2-2. Maintain or make recommendations to maintain a specified en route course, including TACAN point-to-points. | Given radio aids to navigation, FLIPs and appropriate charts. | ± 5 degrees or 3nm. |
| 2-3. Maintain or make recommendations to maintain a visual low-level course. | Given a specified course. | ± 2nm. |
| 2-4. Identify visual low-level course inter-mediate checkpoints and turnpoints. | Given a specified course. | Turnpoints 80% accuracy, inter-mediate check-points 50% accuracy. |
| 2-5. Recommend air-speed adjustments to arrive on target on time on a visual low-level course. | Given a target time and a specified course. | T-1A ± 30 seconds, T-34C ± 1 min. |

| | | |
|---|---|---|
| 2-6. Adjust or makes recommendations to adjust preflight planned headings and airspeeds to compensate for the effects of wind. | Given a target time and a specified course. | ± 2 degrees and ± 5 kts of instructor calculated course and airspeed. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| 2-7. Determine wind direction and speed. | Given a T-1A mission. | ± 30 degrees, ± 10 kts. |
| 2-8. Determine wind direction and speed. | Given a T-34C mission. | ± 30 degrees, ± 10 kts. |
| 2-9. Maintain or make recommendations to maintain assigned and published altitudes. | Given a specified route or assigned a specific altitude. | In accordance with Federal Aviation Regulations. |
| 2-10. Execute or make recommendations to execute holding procedures. | Given a specified holding course. | In accordance with Federal Aviation Regulations. |
| 2-11. Fly or make recommendations to fly a course to enter a holding pattern. | Given a specified holding course. | In accordance with Federal Aviation Regulations and FTIs. |
| 2-12. Execute or make recommendations to execute VFR entry and traffic pattern procedures. | Given a specified airfield. | In accordance with FLIPs and local directives. |
| 2-13. Determine glideslope position. | Given an aircraft and visual glide-slope indicator. | Without error. |
| 2-14. Derive aircraft position using Dead Reckoning techniques. | Given a course. | ± 5 miles. |
| 2-15. Execute "DRAFT" in flight, as required. | Given instructor assistance, T-34C, T-1A, or simulator. | Without error. |

3. Fuel Requirements and En Route Time Calculations

| | | |
|---|---|---|
| 3-1. Update destina-tion estimated fuel remaining and mission completion feasibility at each navigational checkpoint factoring in the effects of forecast and observed meteoro-logical conditions. | Given a specified course, Jet Log, forecast weather, and observed weather. | ± 1 min; fuel ± 30 lbs for the T-34C, ± 100 lbs in the T-1A. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| 3-2. Make recommen-dations to alternate flight profile based upon estimated fuel requirements, and observed and forecast meteorological conditions. | Given a specified course, Jet Log, forecast weather, and observed weather. | Without error. |
| 3-3. Estimate time of arrival at destination. | Given a specified course, Jet Log, and forecast weather. | ± 5 min of instructor's calculations. |
| 3-4. Update estimated time of arrival at each navigational checkpoint and after each ground speed check. | Given a specified course and a Jet Log. | ± 1 minute of actual mark-on- top or mark abeam. |
| 4. Communications | | |
| 4-1. Communicate via two-way radio using standard naval aviation and FAA terminology with appropriate agencies and aircrew during:<br>a. ground operations<br>b. departure<br>c. en route<br>d. formation flight<br>e. arrival | Visual Meteorological Conditions (VMC), Instrument Meteorological Conditions (IMC), wingman, day and night, given assigned mission and route, in normal or emergency condi-tions. | With no errors that will preclude mission success. |
| 4-2. Communicate with wingman using visual signals. | Given two-plane formation flight. | With no errors that will preclude mission success. |
| 5. Flight Planning | | |

| | | |
|---|---|---|
| 5-1. Prepare a visual low-level navigation chart. | Given a specified course and a Tactical Pilotage Chart (TPC). | Fuel ± 40 lbs T-34C, ± 100 lbs T-1A; time ± 36 sec overall, ± 18 sec T-1A, ± 36 secs overall, ± 24 sec at each turn point, T-34C; course: ± 2 degrees; plotting without error. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| 5-2. Complete a Jet Log. | Given a mission, FLIPs, NATOPS, OPNAVINST 3710.7Q and forecast weather. | In accordance with appropriate PAT publication. |
| 5-3. Determine mission completion feasibility based upon fuel requirements, ensuring adequate fuel reserves are available as set forth in OPNAVINST 3710.7Q. | Given a specified course. | Without error. |
| 5-4. Estimate time en route. | Given a specified course, Jet Log and forecast weather. | ± 5 min of instructors' calculations. |
| 5-5. Complete a DD-175 using FLIPs and Jet Log information. | Given a mission. | In accordance with appropriate PAT publication. |
| 5-6. Obtain a weather brief resulting in a completed DD-175-1. | Given a mission. | In accordance with appropriate PAT publication. |
| 5-7. Interpret a weather brief | Given a DD-175-1. | Without error. |

6. Aircraft Condition

| | | |
|---|---|---|
| 6-1. Review informa- tion (Visual Informa-tion Display System (VIDS)/Maintenance Action Forms (MAFs), Aircraft Inspection and Acceptance Records, etcetera) contained in aircraft discrepancy book to determine aircraft documented suitability for flight. | Given a mission with instructor and maintenance assistance. | In accordance with NATOPS. |
| 6-2. Perform aircraft preflight and post- flight inspections. | Given a mission. | In accordance with NATOPS. |
| 6-3. Observe completion of MAFs as necessary. | During pre/ postflight, given a mission. | Without error. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| 6-4. Complete appli-cable parts of a naval aircraft flight record (yellow sheet). | During pre/ postflight, given a mission. | Without error. |
| 7. Crew Coordination | | |
| 7-1. Communicate with the pilot and instruc-tor using proper format, phraseology, and terminology. | Given a mission. | With no errors that will preclude mission success. |
| 7-2. Make recommen- dations to maintain proper aircraft flight parameters through the use of instrument scan. | Given a mission. | Heading $\pm$ 5 degrees, airspeed $\pm$ 10 kts, altitude $\pm$ 100 ft. |
| 7-3. Use proper check-list discipline in an emergency (simulated or actual) situation as it differs from normal checklist procedures. | Given a mission. | Without error. |
| 7-4. Coordinate air- craft operation with instructor (T-34C). | Given a mission, VMC, IMC, day or night. | In accordance with NATOPS and standard operat-ing procedures. |

| | | |
|---|---|---|
| 7-5. Coordinate positive control of aircraft and transfer of control (T-34C). | Given a mission, VMC, IMC, day or night. | Without error. |
| 7-6. Coordinate aircrew duties and responsibilities (T-34C and T-1A). | Given a mission, VMC, IMC, day or night. | In accordance with NATOPS and local instructions. |
| 7-7. Coordinate operational control of aircraft systems (T-34C and T-1A). | Given a mission, VMC, IMC, day or night. | Without error. |
| 7-8. Relay safety of flight information to pilot and instructor. | Given a mission, VMC, IMC, day or night. | Without error. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| 7-9. As appropriate make VNAV turnpoint, intermediate check-point, and hazard calls using proper format and terminology. | Given a mission. | Without error. |
| 7-10. Execute instru-ment navigation turn-point calls for each checkpoint. | Given a mission. | Without error. |
| 8. Aircraft Maneuvers | | |
| 8-1. Maintain spatial orientation through the use of visual and instrument scan. | Given a mission. | 75% accuracy. |
| 8-2. Monitor specified flight maneuvers. | Given a mission. | Recognize and make recommendations to correct deviations of altitude ± 200 ft IFR, ± 300 ft VFR; heading 20 degrees; IAS 20 kts. |

| | | |
|---|---|---|
| 8-3. Perform specified flight maneuvers. | Given a 2B37 mission. | Recognize and attempt to correct deviations of altitude ± 200 ft IFR, ± 300 ft VFR; heading 20 degrees; IAS 20 kts. |

9. Formation Flight

| | | |
|---|---|---|
| 9-1. Coordinate cruise formation maneuvers with instructor assistance recognizing relative motion and make recommendations to correct for deviations. | Given a T-34C and a wingman. | In accordance with FTIs. |
| 9-2. Describe standard formation maneuvers. | Given an oral examination and aircraft models/ training aids. | Without error. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|

10. Flight/Mission Preparation

| | | |
|---|---|---|
| 10-1. Possess required flight material. | Given a mission and a mission briefing. | Without error. |
| 10-2. Recall required mission procedures and information. | Given a mission and a mission briefing. | 90% accuracy. |
| 10-3. Recall previous mission procedures and information. | Given a mission and a mission briefing. | 90% accuracy. |

CNATRAINST 1542.132, SECTION II - APPENDIX A

TERMINAL OBJECTIVES (TOs)

The **Advanced** NFO/AF NAV **Core** training is designed to teach by reinforcement and amplification the skills and knowledge required to safely navigate, communicate, and manage aircraft systems. Major training emphasis is placed upon performance in the airborne environment of visual and ground mapping radar navigation, radio instrument navigation, and strike mission planning and execution. Upon satisfactory completion of this advanced phase, the student will be able to perform the following terminal objectives:

1. Ground Mapping Radar Navigation. Effectively navigate using preflight planning data and a ground mapping radar system.

2. Radio Aids Navigation. Effectively navigate using preflight planning data and radio navigation aids.

3. Visual Navigation. Effectively navigate using preflight planning data and visual reference to the ground.

4. Communicate. Communicate in an aircraft using the radio, hand signals, and the Intercockpit Communications System (ICS) using standard Navy and Federal Aviation Administration (FAA) terminology.

5. Aircraft Operation. Continually assess aircraft and aircraft systems operation and ensure operations are within limits and are maintained in accordance with Naval Air Training Operating Procedures Standardization (NATOPS).

ENABLING OBJECTIVES

A. Ground Mapping Radar Navigation

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| A-1 Explain the transmission characteristics affecting pulsed radar systems to include:<br><br>a. Advantages of radar navigation over visual navigation.<br>b. Relationship between frequency and wavelength.<br>c. Pulse width.<br>d. Pulse length computation.<br>e. Pulse repetition frequency (PRF).<br>f. Relationship between PRF and pulse repetition time (PRT).<br>g. Radar range mile.<br>h. Range to target computation.<br>i. Range resolution.<br>j. Max theoretical range computation.<br><br>k. Bearing resolution. | Given a written or oral examination. | To 80% accuracy. |
| A-2 Interpret ground mapping radar display for navigational information to include explanations of:<br><br>a. Controllable and uncontrollable factors affecting radar display.<br>b. Topographical and weather radar returns.<br>c. Three inherent radar display errors. | Given an airborne or simulator radar training event. | Without error. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| A-3 Plan an airborne radar mapping navigation mission to include:<br><br>a. Extracting data from Flight Information Publications (FLIPs).<br>b. Preparing a radar navigation chart.<br>c. Preparing a jet log.<br>d. Preparing a DD-175.<br>e. Interpreting a DD-175-1. | Given a classroom training period. | In accordance with (IAW) Flight Training Instructions (FTIs) to the accuracy of: fuel ± 100 lbs, time ± 6 seconds, course ± 2°, and DD-175 maximum of one error. |
| A-4 Construct radar predictions using radar prediction procedures and knowledge of basic radar principles from interpretations of a Tactical Pilotage Chart (TPC). | Given a specified course on a TPC. | IAW FTI/instructor discretion. |
| A-5 Make recommendations to fly a specified course in the preflight planned amount of time (course control/ time on target). | Given an airborne or simulator radar training event. | To an accuracy of 4nm (± 2nm) and 30 seconds time. |
| A-6 Describe components of Dead Reckoning (DR) navigation. | Given a written or oral examination. | To 80% accuracy. |
| A-7 Use turnpoint procedures. | Given an airborne or simulator radar training event. | IAW FTI to 80% accuracy. |
| A-8 Apply computed wind to flight recommendations to maintain specified course and time. | Given an airborne or simulator radar training event. | To an accuracy of ± 1 degree of course and 5 kts. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| A-9 Make heading and speed recommendations using radar display interpretations to correct back to specified course and maintain preflight planned time en route. | Given an airborne or simulator radar training event. | To an accuracy of 1nm of course and 12 seconds time en route. |
| A-10 From displayed radar information determine position in relation to a specified course (Navigation Situation Analysis). | Given an airborne or simulator radar training event. | Within 1 nm. |
| A-11 Execute ground mapping radar turn on and warm-up. | Given an airborne or simulator radar training event. | Without error, IAW NATIOS and FTI. |
| A-12 Initialize inertial navigation system (INS). | Given an airborne or simulator radar training event. | Without error, IAW NATIOS and FTI. |
| A-13 Determine ground mapping radar operability and suitability for mapping use. | Given a preflight warm-up period. | Without error, IAW NATIOS and FTI. |
| A-14 Adjust radar controls to include antenna, receiver gain, video gain, range, brightness, persistence, focus, azimuth and range cursor, sector scan, sweep speed, and modes and submodes to obtain best navigational display/information. | Given an airborne or simulator radar training event. | 80% of the time. |
| A-15 Identify and state purpose of radar controls. | Given a written or oral examination. | Without error. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| A-16 Recognize and describe the imagery displayed in each mode and submode. | Given an airborne or simulator radar training event. | 80% of the time. |
| A-17 Describe the conduct of a radar navigation flight mission. | Given a flight briefing period. | IAW briefing guide. |

B. Radio Aids Navigation

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| B-1 Plan a mission to be flown under Instrument Flight Rules to include the following:<br><br>a. Extract data from FLIP.<br>b. Extract data from NATOPS.<br>c. Prepare a jet log.<br>d. Prepare a DD-175.<br><br>e. Obtain, interpret, and apply DD-175-1 information. | Given a specified course. | IAW Federal Aviation Regulations (FAR), OPNAVINST 3710.7Q, and TRAWING SIX Standard Operating Procedures (SOP), to the accuracy of: fuel ± 100 lbs, time ± 1 min, course 2°, and DD-175 no errors. |
| B-2 Make recommendations to intercept and fly a specified course to include:<br><br>a. Jet routes.<br>b. VHF Omnidirectional Range (VOR) routes. c. Standard Instrument Departure (SID).<br>d. Tactical Air Navigation (TACAN) point-to-point.<br>e. TACAN arcs.<br>f. Published TACAN, ILS, VOR, and non-directional radio beacon approaches. | Day, night, in Visual Meteorological Conditions (VMC), and Instrument Meteorological Conditions (IMC), given FLIP, radio aids to navigation (NAVAIDS), NATOPS, and a flight or simulator training event. | IAW FAR, OPNAVINST 3710.7Q, and TRAWING SIX SOP, to the accuracy of ± 2nm or ± 3° whichever is less on jet routes, VOR routes, SID and approach; 3nm TACAN point-to-point; and arcs ± 1nm. |
| B-3 Select and identify NAVAID. | Day, night, VMC, IMC, given FLIP and a flight training event. | Without error. |
| B-4 Determine position from NAVAID. | Day, night, VMC, IMC, given FLIP and a flight or simulator training event. | Within 1 nm. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| B-5 Determine navigation course winds. | Day, night, VMC, IMC, given a flight training event. | Direction within 20°, speed ± 10 kts. |
| B-6 Adjust headings and speed or estimated times en route (ETEs) to compensate for computed wind effects. | Day, night, VMC, IMC, given a flight or simulator training event. | 1° of course, ± 1 min ETE. |

| | | |
|---|---|---|
| B-7 Ensure compliance with SIDs, approaches, and Air Traffic Control (ATC) clearances. | Day, night, VMC, IMC, given a flight or simulator training event. | IAW FARs. |
| B-8 Monitor aircraft's airspeed, altitude, rate of climb or descent, attitude, fuel consumption and systems operation throughout duration of flight or simulator training event. | Day, night, VMC, IMC, given a flight or simulator training event. | IAW FARs, NATOPS, and FTIs. |
| B-9 Make recommended corrections to return aircraft to intended course. | Day, night, VMC, IMC, given a flight or simulator training event. | Within 1 nm. |
| B-10 Determine aircraft position in relation to intended course. | Day, night, VMC, IMC, given a flight or simulator training event. | Within 1 nm. |
| B-11 Determine amount and duration of heading correction to return aircraft to intended course. | Day, night, VMC, IMC, given a flight or simulator training event. | Within 1 nm. |
| B-12 Coordinate correcting aircraft to intended flight path with pilot. | Day, night, VMC, IMC, given a flight or simulator training event. | Within 1 nm. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| B-13 Direct appropriate aircraft flight profiles, with emphasis on airspeed, for maintaining and changing altitude. | Day, night, VMC, IMC, given a flight or simulator training event. | IAW NATOPS, without error. |
| B-14 Communicate clearly and concisely using radios with appropriate agencies using standard Navy and FAA terminology. | Day, night, VMC, IMC, given a flight training event. | So that 95% of transmissions need not be repeated. |
| B-15 Communicate clearly and concisely with embarked crew members using ICS without interfering with incoming radio transmissions. | Day, night, VMC, IMC, given a flight training event. | Without error. |
| B-16 Direct avoidance of meteorological hazards to flight by evaluating differences between forecast weather, forecast updates, and observed weather. | Day, night, VMC, IMC, given a flight training event. | Without error. |
| B-17 Interpret meteorological conditions for aviation hazards en route. | Day, night, VMC, IMC, given a flight training event. | Without error. |
| B-18 Use aviation weather services to update forecast of en route and destination weather. | Day, night, VMC, IMC, given a flight training event. | Without error. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| B-19 Direct flight course and destination deviation as appropriate to avoid or minimize hazardous meteorological conditions. | Day, night, VMC, IMC, given a flight training event. | IAW OPNAVINST 3710.7Q and TRAWING SIX SOP, without error. |
| B-20 Ensure all landings are made with adequate fuel reserves. | Day, night, VMC, IMC, given a flight training event. | IAW OPNAVINST 3710.7Q and TRAWING SIX SOP, without error. |
| B-21 Direct appropriate destination deviation if sufficient fuel, based on ETE and fuel consumption computations, is unavailable. | Day, night, VMC, IMC, given a flight training event. | IAW OPNAVINST 3710.7Q and TRAWING SIX SOP, without fuel error. |
| B-22 Update fuel requirements at each navigational checkpoint. | Day, night, VMC, IMC, given a flight training event. | Within $\pm$ 200 lbs. |
| B-23 Recommend mission deviation or abort as appropriate for any unplanned or discrepancies in aircraft, personnel, flight planning, weather, or other hazards to aviation. | Day, night, VMC, IMC, given a flight training event. | IAW NATOPS and TRAWING SIX SOP, without error. |

C. Visual Navigation

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| C-1 Plan a visual, low-level flight to be flown under visual flight rules (VFR) to include:<br><br>a. Preparing a nav chart.<br>b. Preparing a jet log. c. Preparing a DD-175. d. Obtain, interpret, and properly apply DD-175-1. | Day, VMC, given NATOPS, charts, and specified course. | To the accuracy of: fuel ± 100 lbs, time ± 6 seconds, course 2°, and DD-175 maximum of one error. |
| C-2 Make recommendations to intercept and/or correct back to and fly a specified visual low-level course. | Day, VMC, given NATOPS, charts, and a flight training event. | IAW FAR, OPNAVINST 3710.7Q, and TRAWING SIX SOP; to the accuracy of 1nm of course and 12 seconds ETE. |
| C-3 Use proper turnpoint procedures. | Day, VMC, given a flight training event. | Without error. |
| C-4 Determine by visual reference geographic position. | Day, VMC, given appropriate chart. | Without error. |
| C-5 Determine navigation course winds. | Day, night, VMC, IMC, given a flight or simulator training event. | Direction within 15°, speed ± 10 kts. |
| C-6 Adjust headings and speed to compensate for wind effects. | Day, night, VMC, IMC, given a flight or simulator training event. | Direction within 1° heading, speed ± 5 kts. |

D. Communication

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| D-1 Communicate via aircraft radios with appropriate agencies and other aircraft using standard Navy and FAA terminology. | Given a flight training event. | So that 95% of transmissions or receptions need not be repeated. |
| D-2 Communicate with aircraft crew using ICS. | Given a flight training event. | So that 95% of transmissions or receptions need not be repeated. |
| D-3 Use proper visual signals to communicate with wingman or aircraft ground handling personnel. | Given a flight training event. | So that 90% of signals need not be repeated. |

E. Aircraft Operation

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| E-1 Locate and operate T-39N aircraft systems. | Given a flight training event. | IAW NATOPS. |
| E-2 Describe the correct nomenclature, purpose, characteristics, functions, and limitations of T-39N aircraft systems. | Given an oral or written exam. | To 80% accuracy. |
| E-3 Recall T-39N aircraft servicing procedures. | Given an oral or written exam. | To 80% accuracy. |
| E-4 Recall T-39N all-weather operating procedures. | Given an oral or written exam. | To 80% accuracy. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| E-5 Extract and apply as appropriate T-39N aircraft performance data from NATOPS Flight Manual. | Given an oral or written exam. | To 80% accuracy. |
| E-6 Perform appropriate T-39N checklists as required. | Given a flight training event. | IAW NATOPS. |
| E-7 Operate T-39N within limitations. | Given a flight training event. | IAW NATOPS. |
| E-8 Recall T-39N operating limitations. | Given an oral or written exam. | To 80% accuracy. |
| E-9 Execute T-39N "immediate action" emergencies. | As required by flight instructor or actual emergency. | IAW NATOPS. |
| E-10. Recall T-39N "immediate action" emergencies. | Given an oral or written exam. | To 100% accuracy. |

CNATRA INST 1542.122B, SECTION II - APPENDIX A

TERMINAL OBJECTIVES (TOs)

The Advanced NFO/AF NAV **Strike** training is designed to teach by reinforcement and amplification the skills and knowledge required to safely navigate, communicate, and manage aircraft systems. Major training emphasis is placed upon performance in the airborne environment of visual and ground mapping radar navigation, radio instrument navigation, and strike mission planning and execution. Upon satisfactory completion of this advanced phase, the student will be able to perform the following terminal objectives:

1. Ground Mapping Radar Navigation. Effectively navigate using preflight planning data and a ground mapping radar system.

2. Radio Aids Navigation. Effectively navigate using preflight planning data and radio navigation aids.

3. Visual Navigation. Effectively navigate using preflight planning data and visual reference to the ground.

4. Communicate. Communicate in an aircraft using the radio, hand signals, and the Intercockpit Communications System (ICS) using standard Navy and Federal Aviation Administration (FAA) terminology.

5. Aircraft Operation. Continually assess aircraft and aircraft systems operation and ensure operations are within limits and are maintained in accordance with Naval Air Training Operating Procedures Standardization (NATOPS).

ENABLING OBJECTIVES

A. Ground Mapping Radar Navigation

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| A-1 Explain the transmission characteristics affecting pulsed radar systems to include:<br><br>a. Advantages of radar navigation over visual navigation.<br>b. Relationship between frequency and wavelength.<br>c. Pulse width.<br>d. Pulse length computation.<br>e. Pulse repetition frequency (PRF).<br>f. Relationship between PRF and pulse repetition time (PRT).<br>g. Radar range mile.<br>h. Range to target computation.<br>i. Range resolution.<br>j. Max theoretical range computation.<br><br>k. Bearing resolution. | Given a written or oral examination. | To 80% accuracy. |
| A-2 Interpret ground mapping radar display for navigational information to include explanations of:<br><br>a. Controllable and uncontrollable factors affecting radar display.<br>b. Topographical and weather radar returns.<br>c. Three inherent radar display errors. | Given an airborne or simulator radar training event. | Without error. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| A-3 Plan an airborne radar mapping navigation mission to include:<br><br>a. Extracting data from Flight Information Publications (FLIPs).<br>b. Preparing a radar navigation chart.<br>c. Preparing a jet log.<br>d. Preparing a DD-175.<br>e. Interpreting a DD-175-1. | Given a classroom training period. | In accordance with (IAW) Flight Training Instructions (FTIs) to the accuracy of: fuel ± 100 lbs, time ± 6 seconds, course ± 2°, and DD-175 maximum of one error. |
| A-4 Construct radar predictions using radar prediction procedures and knowledge of basic radar principles from interpretations of a Tactical Pilotage Chart (TPC). | Given a specified course on a TPC. | IAW FTI/instructor discretion. |
| A-5 Make recommendations to fly a specified course in the preflight planned amount of time (course control/ time on target). | Given an airborne or simulator radar training event. | To an accuracy of 4nm (± 2nm) and 30 seconds time. |
| A-6 Describe components of Dead Reckoning (DR) navigation. | Given a written or oral examination. | To 80% accuracy. |
| A-7 Use turnpoint procedures. | Given an airborne or simulator radar training event. | IAW FTI to 80% accuracy. |
| A-8 Apply computed wind to flight recommendations to maintain specified course and time. | Given an airborne or simulator radar training event. | To an accuracy of ± 1 degree of course and 5 kts. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| A-9 Make heading and speed recommendations using radar display interpretations to correct back to specified course and maintain preflight planned time en route. | Given an airborne or simulator radar training event. | To an accuracy of 1nm of course and 12 seconds time en route. |
| A-10 From displayed radar information determine position in relation to a specified course (Navigation Situation Analysis). | Given an airborne or simulator radar training event. | Within 1 nm. |
| A-11 Execute ground mapping radar turn on and warm-up. | Given an airborne or simulator radar training event. | Without error, IAW NATIOS and FTI. |
| A-12 Initialize inertial navigation system (INS). | Given an airborne or simulator radar training event. | Without error, IAW NATIOS and FTI. |
| A-13 Determine ground mapping radar operability and suitability for mapping use. | Given a preflight warm-up period. | Without error, IAW NATIOS and FTI. |
| A-14 Adjust radar controls to include antenna, receiver gain, video gain, range, brightness, persistence, focus, azimuth and range cursor, sector scan, sweep speed, and modes and submodes to obtain best navigational display/information. | Given an airborne or simulator radar training event. | 80% of the time. |
| A-15 Identify and state purpose of radar controls. | Given a written or oral examination. | Without error. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| A-16 Recognize and describe the imagery displayed in each mode and submode. | Given an airborne or simulator radar training event. | 80% of the time. |
| A-17 Describe the conduct of a radar navigation flight mission. | Given a flight briefing period. | IAW briefing guide. |

B. Radio Aids Navigation

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| B-1 Plan a mission to be flown under Instrument Flight Rules to include the following:<br><br>a. Extract data from FLIP.<br>b. Extract data from NATOPS.<br>c. Prepare a jet log.<br>d. Prepare a DD-175.<br><br>e. Obtain, interpret, and apply DD-175-1 information. | Given a specified course. | IAW Federal Aviation Regulations (FAR), OPNAVINST 3710.7Q, and TRAWING SIX Standard Operating Procedures (SOP), to the accuracy of: fuel ± 100 lbs, time ± 1 min, course 2°, and DD-175 no errors. |
| B-2 Make recommendations to intercept and fly a specified course to include:<br><br>a. Jet routes.<br>b. VHF Omnidirectional Range (VOR) routes. c. Standard Instrument Departure (SID).<br>d. Tactical Air Navigation (TACAN) point-to-point.<br>e. TACAN arcs.<br>f. Published TACAN, ILS, VOR, and non-directional radio beacon approaches. | Day, night, in Visual Meteorological Conditions (VMC), and Instrument Meteorological Conditions (IMC), given FLIP, radio aids to navigation (NAVAIDS), NATOPS, and a flight or simulator training event. | IAW FAR, OPNAVINST 3710.7Q, and TRAWING SIX SOP, to the accuracy of ± 2nm or ± 3° whichever is less on jet routes, VOR routes, SID and approach; 3nm TACAN point-to-point; and arcs ± 1nm. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| B-3 Select and identify NAVAID. | Day, night, VMC, IMC, given FLIP and a flight training event. | Without error. |
| B-4 Determine position from NAVAID. | Day, night, VMC, IMC, given FLIP and a flight or simulator training event. | Within 1 nm. |
| B-5 Determine navigation course winds. | Day, night, VMC, IMC, given a flight training event. | Direction within 20°, speed ± 10 kts. |
| B-6 Adjust headings and speed or estimated times en route (ETEs) to compensate for computed wind effects. | Day, night, VMC, IMC, given a flight or simulator training event. | 1° of course, ± 1 min ETE. |
| B-7 Ensure compliance with SIDs, approaches, and Air Traffic Control (ATC) clearances. | Day, night, VMC, IMC, given a flight or simulator training event. | IAW FARs. |
| B-8 Monitor aircraft's airspeed, altitude, rate of climb or descent, attitude, fuel consumption and systems operation throughout duration of flight or simulator training event. | Day, night, VMC, IMC, given a flight or simulator training event. | IAW FARs, NATOPS, and FTIs. |
| B-9 Make recommended corrections to return aircraft to intended course. | Day, night, VMC, IMC, given a flight or simulator training event. | Within 1 nm. |
| B-10 Determine aircraft position in relation to intended course. | Day, night, VMC, IMC, given a flight or simulator training event. | Within 1 nm. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| B-11 Determine amount and duration of heading correction to return aircraft to intended course. | Day, night, VMC, IMC, given a flight or simulator training event. | Within 1 nm. |
| B-12 Coordinate correcting aircraft to intended flight path with pilot. | Day, night, VMC, IMC, given a flight or simulator training event. | Within 1 nm. |
| B-13 Direct appropriate aircraft flight profiles, with emphasis on airspeed, for maintaining and changing altitude. | Day, night, VMC, IMC, given a flight or simulator training event. | IAW NATOPS, without error. |
| B-14 Communicate clearly and concisely using radios with appropriate agencies using standard Navy and FAA terminology. | Day, night, VMC, IMC, given a flight training event. | So that 95% of transmissions need not be repeated. |
| B-15 Communicate clearly and concisely with embarked crew members using ICS without interfering with incoming radio transmissions. | Day, night, VMC, IMC, given a flight training event. | Without error. |
| B-16 Direct avoidance of meteorological hazards to flight by evaluating differences between forecast weather, forecast updates, and observed weather. | Day, night, VMC, IMC, given a flight training event. | Without error. |
| B-17 Interpret meteorological conditions for aviation hazards en route. | Day, night, VMC, IMC, given a flight training event. | Without error. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| B-18 Use aviation weather services to update forecast of en route and destination weather. | Day, night, VMC, IMC, given a flight training event. | Without error. |
| B-19 Direct flight course and destination deviation as appropriate to avoid or minimize hazardous meteorological conditions. | Day, night, VMC, IMC, given a flight training event. | IAW OPNAVINST 3710.7Q and TRAWING SIX SOP, without error. |
| B-20 Ensure all landings are made with adequate fuel reserves. | Day, night, VMC, IMC, given a flight training event. | IAW OPNAVINST 3710.7Q and TRAWING SIX SOP, without error. |
| B-21 Direct appropriate destination deviation if sufficient fuel, based on ETE and fuel consumption computations, is unavailable. | Day, night, VMC, IMC, given a flight training event. | IAW OPNAVINST 3710.7Q and TRAWING SIX SOP, without fuel error. |
| B-22 Update fuel requirements at each navigational checkpoint. | Day, night, VMC, IMC, given a flight training event. | Within $\pm$ 200 lbs. |
| B-23 Recommend mission deviation or abort as appropriate for any unplanned or discrepancies in aircraft, personnel, flight planning, weather, or other hazards to aviation. | Day, night, VMC, IMC, given a flight training event. | IAW NATOPS and TRAWING SIX SOP, without error. |

C. Visual Navigation

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| C-1 Plan a visual, low-level flight to be flown under visual flight rules (VFR) to include:<br><br>a. Preparing a nav chart.<br>b. Preparing a jet log. c. Preparing a DD-175. d. Obtain, interpret, and properly apply DD-175-1. | Day, VMC, given NATOPS, charts, and specified course. | To the accuracy of: fuel ± 100 lbs, time ± 6 seconds, course 2°, and DD-175 maximum of one error. |
| C-2 Make recommendations to intercept and/or correct back to and fly a specified visual low-level course. | Day, VMC, given NATOPS, charts, and a flight training event. | IAW FAR, OPNAVINST 3710.7Q, and TRAWING SIX SOP; to the accuracy of 1nm of course and 12 seconds ETE. |
| C-3 Use proper turnpoint procedures. | Day, VMC, given a flight training event. | Without error. |
| C-4 Determine by visual reference geographic position. | Day, VMC, given appropriate chart. | Without error. |
| C-5 Determine navigation course winds. | Day, night, VMC, IMC, given a flight or simulator training event. | Direction within 15°, speed ± 10 kts. |
| C-6 Adjust headings and speed to compensate for wind effects. | Day, night, VMC, IMC, given a flight or simulator training event. | Direction within 1° heading, speed ± 5 kts. |

D. Communication

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| D-1 Communicate via aircraft radios with appropriate agencies and other aircraft using standard Navy and FAA terminology. | Given a flight training event. | So that 95% of transmissions or receptions need not be repeated. |
| D-2 Communicate with aircraft crew using ICS. | Given a flight training event. | So that 95% of transmissions or receptions need not be repeated. |
| D-3 Use proper visual signals to communicate with wingman or aircraft ground handling personnel. | Given a flight training event. | So that 90% of signals need not be repeated. |

E. Aircraft Operation

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| E-1 Locate and operate T-39N aircraft systems. | Given a flight training event. | IAW NATOPS. |
| E-2 Describe the correct nomenclature, purpose, characteristics, functions, and limitations of T-39N aircraft systems. | Given an oral or written exam. | To 80% accuracy. |
| E-3 Recall T-39N aircraft servicing procedures. | Given an oral or written exam. | To 80% accuracy. |
| E-4 Recall T-39N all-weather operating procedures. | Given an oral or written exam. | To 80% accuracy. |
| E-5 Extract and apply as appropriate T-39N aircraft performance data from NATOPS Flight Manual. | Given an oral or written exam. | To 80% accuracy. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| E-6 Perform appropriate T-39N checklists as required. | Given a flight training event. | IAW NATOPS. |
| E-7 Operate T-39N within limitations. | Given a flight training event. | IAW NATOPS. |
| E-8 Recall T-39N operating limitations. | Given an oral or written exam. | To 80% accuracy. |
| E-9 Execute T-39N "immediate action" emergencies. | As required by flight instructor or actual emergency. | IAW NATOPS. |
| E-10. Recall T-39N "immediate action" emergencies. | Given an oral or written exam. | To 100% accuracy. |

## SECTION II - APPENDIX A

## TERMINAL OBJECTIVES (TOs)

The Advanced NFO/AF NAV **S/F** training is designed to teach by reinforcement and amplification the skills and knowledge required to safely navigate, communicate, and manage aircraft systems. Major training emphasis is placed upon performance in air-to-air intercepts and operation of tactical weapons skills. Upon satisfactory completion of this advanced phase, the student will be able to perform the following terminal objectives:

A. Air-To-Air Radar Operation. Operate an airborne intercept radar system in an air-to-air environment.

B. Intercept. Direct an air-to-air intercept of a simulated enemy (target/bogey) aircraft in an airborne environment.

C. Communication. Communicate in an aircraft using the radio, hand signals, and the Intercockpit Communications System (ICS) using standard Navy and Federal Aviation Administration (FAA) terminology.

D. Aircraft Operation. Continually assess aircraft and aircraft systems operation and ensure operations are within limits and are maintained in accordance with Naval Air Training and Operating Procedures Standardization (NATOPS).

ENABLING OBJECTIVES

A. Air-To-Air Radar Operation

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| A-1 Execute airborne intercept radar or airborne intercept radar simulator turn-on and warmup. | Given an airborne or simulator radar training event. | Without error, in accordance with (IAW) NATOPS and Flight Training Instructions (FTIs). |
| A-2 Determine airborne intercept radar operability and suitability. | Given a preflight warmup training event. | Without error, IAW NATOPS FTIs. |
| A-3 Adjust radar controls to obtain most discernible and earliest radar contact with target. | Given an airborne or simulator radar training event. | IAW FTI and 80% accuracy. |
| A-4 Appropriately adjust radar display controls for most discernible target display. | Given an airborne or simulator radar training event. | IAW FTI and 80% accuracy. |
| A-5 Select appropriate radar mode, range, and antenna sector scan to enhance earliest target detection. | Given an airborne or simulator radar training event. | IAW FTI and 80% accuracy. |
| A-6 Use appropriate antenna elevation search pattern to enhance earliest target detection. | Given an airborne or simulator radar training event. | IAW FTI and 80% accuracy. |
| A-7 Differentiate assigned target from other displayed radar information; To include multi bogey presentation | Given an airborne or simulator radar training event. | IAW FTI and 80% accuracy. |
| A-8 Appropriately analyze displayed radar information. | Given an airborne or simulator radar training event. | IAW FTI and 80% accuracy. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| A-9 Correlate Ground Control Intercept (GCI) target information with displayed radar information. | Given an airborne or simulator radar training event. | IAW FTI and 80% accuracy. |
| A-10 Confirm target using radar displayed and GCI information. | Given an airborne or simulator radar training event. | IAW FTI and 80% accuracy. |
| A-11 Achieve and maintain best radar display (spotlight) target. | Given an airborne or simulator radar training event. | IAW FTI and 80% accuracy. |
| A-12 Maintain target spotlight until initiation of automatic radar track. | Given an airborne or simulator radar training event. | IAW FTI and 80% accuracy. |
| A-13 Obtain automatic radar track of target. | Given an airborne or simulator radar training event. | IAW FTI and 80% accuracy. |
| A-14 Initiate automatic radar track of target via acquisition symbols and hand control unit. | Given an airborne or simulator radar training event. | IAW FTI and 80% accuracy. |
| A-15 Analyze radar display to ascertain proper automatic track on proper target. | Given an airborne or simulator radar training event. | IAW FTI and 80% accuracy. |
| A-16 Analyze radar's search or automatic track display.<br>a. bearing.<br>b. range.<br>c. altitude. | Given an airborne or simulator radar training event. | To the accuracy of ± 2 degrees angle off, 1/2 nm range, and ± 1000 feet altitude (when applicable). |
| A-17 Analyze radar's search or automatic track display.<br>a. angles off<br>b. range<br>c. altitude<br>d. overtake | Given an airborne or simulator radar training event. | To the accuracy of ± 2 degrees angle off, 1/2 nm range, and ± 1000 feet altitude (when applicable). |

B. Intercept

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| B-1 Perform pursuit intercepts using GCI information and airborne radar information in search and track modes to include the following actions:<br><br>a. determine cut.<br>b. determine angle off (AO).<br>c. determine target aspect (TA).<br>d. determine collision course (CC).<br>e. establish CC.<br>f. determine need for collision course corrections (CCC).<br>g. direct CCC.<br>h. direct displacement turn (DT).<br>i. direct counterturn (CT).<br>j. establish AIM-9 missile firing position.<br>k. determine and retain kill/VID status.<br>l. use proper directive commentary.<br>m. use proper descriptive commentary. | Given an airborne or simulator radar training event. | IAW FTI and 80% accuracy. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| B-2 Perform attack-reattack intercepts using airborne radar information in search and track modes to include the following actions:<br><br>a. actions a - m listed in B-1.<br>b. establish proper lead point for AIM-7. | Given an airborne or simulator radar training event with GCI information. | IAW FTI and 80% accuracy. |
| B-3 Perform intercepts against a target of unknown heading using airborne radar information in search and track mode to include the following actions:<br><br>a. analyze target drift.<br>b. estimate TA.<br>c. estimate target's heading.<br>d. establish CC.<br>e. update estimate of TA and target heading as required.<br>f. actions a and b listed in B-2 as required. | Given an airborne or simulator radar training event with GCI information. | IAW FTI and 80% accuracy. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| B-4 Perform conversion intercepts to achieve 15° TA using airborne radar information in search and track modes to include the following actions:<br><br>a. determine interceptor's position relative to target's flight path.<br>b. determine cut heading and speed to achieve 15° TA.<br>c. establish cut heading and speed to achieve 15° TA.<br>d. monitor changing TA to determine achievement of desired TA.<br>e. place achieved TA on collision not later than 14 NM.<br>f. actions a and b listed in B-2 as required. | Given an airborne or simulator radar training event with GCI information. | IAW FTI and 80% accuracy. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| B-5 Perform conversion intercepts to achieve a specified TA between $0^{o}$ - $45^{o}$ or equivalent lateral separation in feet from target's flight path using airborne radar information in search and track modes to include the following actions:<br><br>a. determine interceptor's position relative to target's flight path.<br>b. determine cut heading and speed adjustment required to achieve specified TA or lateral separation.<br>c. establish cut heading and speed to achieve specified TA or lateral separation.<br>d. monitor changing TA or lateral separation to determine achievement of desired TA or lateral separation.<br>e. establish appropriate cut to maintain achieved TA or lateral separation.<br>e. actions a and b listed in B-2 as required. | Given an airborne or simulator radar training event with GCI information. | IAW FTI and 80% accuracy. |

| OPERATIONS | CONDITIONS | STANDARDS |
| --- | --- | --- |
| B-6 Perform intercepts against a target making multiple changes in heading, airspeed,<br>and altitude using airborne radar information in search and track modes to include the following actions:<br><br>a. actions a - f listed in B-5.<br>b. establish appropriate lead point for AIM-54/ AIM-120.<br>c. analyze displayed radar information to detect target's changes in heading, airspeed, and altitude.<br>d. use appropriate action to counter target's changes in heading, airspeed, and altitude. | Given an airborne or simulator radar training event with GCI information. | IAW FTI and 80% accuracy. |

C. Communication

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| C-1 Communicate via aircraft radios with appropriate agencies and other aircraft using standard Navy and FAA terminology. | Given a flight training event. | So that 95% of transmissions or receptions need not be repeated. |
| C-2 Communicate with aircraft crew using ICS. | Given a flight training event. | So that 95% of transmissions or receptions need not be repeated. |
| C-3 Use proper visual signals to communicate with wingman or aircraft ground handling personnel. | Given a flight training event. | So that 90% of signals need not be repeated. |

D. Aircraft Operation

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| D-1 Locate and operate T-39N aircraft systems. | Given a flight training event. | IAW NATOPS. |
| D-2 Describe the correct nomenclature, purpose, characteristics, functions, and limitations of T-39N aircraft systems. | Given an oral or written exam. | To 80% accuracy. |
| D-3 Recall T-39N aircraft servicing procedures. | Given an oral or written exam. | To 80% accuracy. |
| D-4 Recall T-39N all-weather operating procedures. | Given an oral or written exam. | To 80% accuracy. |
| D-5 Extract and apply as appropriate T-39N aircraft performance data from NATOPS Flight Manual. | Given an oral or written exam. | To 80% accuracy. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| D-6 Perform appropriate T-39N checklists as required. | Given a flight training event. | IAW NATOPS. |
| D-7 Operate T-39N within limitations. | Given a flight training event. | IAW NATOPS. |
| D-8 Recall T-39N operating limitations. | Given an oral or written exam. | To 80% accuracy. |
| D-9 Execute T-39N "immediate action" emergencies. | As required by flight instructor or actual emergency. | IAW NATOPS. |
| D-10. Recall T-39N "immediate action" emergencies. | Given an oral or written exam. | To 100% accuracy. |

CNATRAINST1542.133, SECTION II - APPENDIX A

## TERMINAL OBJECTIVES

The Advanced NFO/AF NAV **Advanced Tactical Maneuvering** (ATM) training is designed to teach by reinforcement and amplification the skills and knowledge required to adapt students to the tactical high "G" environment. Upon satisfactory completion of this advanced phase, the student will be able to perform the following terminal objectives:

A. Radio Aids Navigation. Effectively navigate using preflight planning data and radio navigation aids.

B. Visual Navigation. Effectively navigate using preflight planning data and visual reference to the ground.

C. Communication. Communicate in an aircraft using the radio, hand signals, and the Intercockpit Communications System (ICS) using standard Navy and Federal Aviation Administration (FAA) terminology.

D. Aircraft Operation. Continually assess aircraft and aircraft systems operation and ensure operations are within limits and are maintained in accordance with Naval Air Training Operating Procedures Standardization (NATOPS).

E. Advanced Tactical Maneuvering. Identify advanced tactical maneuvers and function as a crew member in a high "G" maneuvering flight environment.

ENABLING OBJECTIVES

A. Radio Aids Navigation

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| A-1 Plan a mission to be flown under Instrument Flight Rules to include the following: a. extract data from Flight Information Publications (FLIPs). b. extract data from NATOPS. c. prepare a jet log. d. prepare a DD-175. e. obtain, interpret, and apply DD-175-1 information. | Given a specified course. | In accordance with (IAW) Federal Aviation Regulations (FAR), OPNAVINST 3710.7Q and TRAWING SIX Standard Operating Procedures (SOPs), to the accuracy of: fuel ± 100 lbs, time ± 1 min, course 2°, and DD-175 no errors. |
| A-2 Make recommendations to intercept and fly a specified course to include:<br><br>a. jet routes.<br>b. VHF Omnidirectional Range (VOR) routes. c. Standard Instrument Departure (SID).<br>d. Tactical Air simulator training<br>Navigation (TACAN) point-to-point.<br>e. TACAN arcs.<br>f. published TACAN, ILS, VOR, and non-directional radio beacon approaches. | Day, night, in Visual Meteorological Conditions (VMC), and Instrument Meteorological Conditions (IMC), given FLIP, radio aids to navigation (NAVAIDS), NATOPS, and a flight or simulator training event. | IAW FAR, OPNAVINST 3710.7Q and TRAWING SIX SOP, to the accuracy of: ± 2 nm or ± 3° whichever is less on jet routes, VOR routes, SID, and approach; 3 nm TACAN point-to-point; and arcs ± 1 nm. |
| A-3 Select and identify NAVAID. | Day, night, VMC, IMC, given FLIP and a flight training event. | Without error. |
| OPERATIONS | CONDITIONS | STANDARDS |
| A-4. Determine position from NAVAID. | Day, night, VMC, IMC, given FLIP and a flight or simulator training event. | Within 1 nm. |
| A-5. Determine navigation course winds. | Day, night, VMC, IMC, given a flight training event. | Direction within 20°, speed ± 10 kts. |

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| A-6. Adjust headings, speed, or estimated time en route (ETE) to compensate for computed wind effects. | Day, night, VMC, IMC, given a flight or simulator training event. | 1° of course, ± 1 min ETE. |
| A-7. Ensure compliance with SIDs, approaches, and Air Traffic Control (ATC) clearances | Day, night, VMC, IMC, given a flight or simulator training event. | IAW FARs. |
| A-8. Monitor aircraft's airspeed, altitude, rate of climb or descent, attitude, fuel consumption and systems operation throughout duration of flight or simulator training event. | Day, night, VMC, IMC, given a flight or simulator training event. | IAW FARs, NATOPS, and Flight Training Instructions (FTIs). |
| A-9. Make recommended corrections to return aircraft to intended course. | Day, night, VMC, IMC, given a flight or simulator training event. | Within 1 nm. |
| A-10. Determine aircraft position in relation to intended course. | Day, night, VMC, IMC, given a flight or simulator training event. | Within 1 nm. |
| A-11. Determine amount and duration of heading correction to return air-craft to intended course. | Day, night, VMC, IMC, given a flight or simulator training event. | Within 1 nm. |
| OPERATIONS | CONDITIONS | STANDARDS |
| A-12. Coordinate correcting aircraft to intended flight path with pilot. | Day, night, VMC, IMC, given a flight or simulator training event. | Within 1 nm. |
| A-13. Direct appropriate aircraft flight profiles, with emphasis on airspeed, for maintaining and changing altitude. | Day, night, VMC, IMC, given a flight or simulator training event. | IAW NATOPS, without error. |
| A-14. Communicate clearly and concisely using radios with appropriate agencies using standard Navy and FAA terminology. | Day, night, VMC, IMC, given a flight training event. | So that 95% of transmissions need not be repeated. |
| A-15. Communicate clearly and concisely with embarked crew members using ICS without interfering with incoming radio | Day, night, VMC, IMC, given a flight training event. | Without error. |

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| transmissions. | | |
| A-16. Direct avoidance of meteorological hazards to flight by evaluating differences between forecast weather, forecast updates, and observed weather. | Day, night, VMC, IMC, given a flight training event. | Without error. |
| A-17. Interpret meteorological conditions for aviation hazards en route. | Day, night, VMC, IMC, given a flight training event. | Without error. |
| A-18. Use aviation weather services to update forecast of en route and destination weather. | Day, night, VMC, IMC, given a flight training event. | Without error. |
| OPERATIONS | CONDITIONS | STANDARDS |
| A-19. Direct flight course and destina-tion deviation as appropriate to avoid or minimize hazardous meteoro-logical conditions. | Day, night, VMC, IMC, given a flight training event. | IAW OPNAVINST 3710.7Q and TRAWING SIX SOP, without error. |
| A-20. Ensure all landings are made with adequate fuel reserves. | Day, night, VMC, IMC, given a flight training event. | IAW OPNAVINST 3710.7Q and TRAWING SIX SOP, without error. |
| A-21. Direct appro-priate destination deviation if suffi-cient fuel, based on ETE and fuel consumption compu-tations, is unavail-able. | Day, night, VMC, IMC, given a flight training event. | IAW OPNAVINST 3710.7Q and TRAWING SIX SOP, without error. |
| A-22. Update fuel requirements at each navigational checkpoint. | Day, night, VMC, IMC, given a flight training event. | Within $\pm$ 200 lbs. |
| A-23. Recommend mission deviation or abort as appropriate for any unplanned or discrepancies in aircraft, personnel, flight planning, weather, or other hazards to aviation. | Day, night, VMC, IMC, given a flight training event. | IAW NATOPS and TRAWING SIX SOP, without error. |

B. Visual Navigation

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| B-1. Plan a visual, low-level flight to be flown under visual flight rules to include: a. preparing a nav chart. b. preparing a jet log. c. preparing a DD-175. d. obtain, interpret, and properly apply DD-175-1. | Day, VMC, given NATOPS, charts, and specified course. | To the accuracy of: fuel ± 100 lbs, time ± 6 seconds, course 2°, and DD-175 maximum of one error. |
| B-2. Make recommen-dations to intercept and/or correct back to and fly a specified visual low-level course. | Day, VMC, given NATOPS, charts, and a flight training event. | IAW FARs, OPNAVINST 3710.7Q, and TRAWING SIX SOP; to the accuracy of 1nm of course and 12 seconds ETE. |
| B-3. Use proper turnpoint procedures. | Day, VMC, given a flight training event. | Without error. |
| B-4. Determine by visual reference geographic position. | Day, VMC, given appropriate chart. | Without error. |
| B-5. Determine navigation course winds. | Day, night, VMC, IMC, given a flight or simulator training event. | Direction within 15°, speed ± 10 kts. |
| B-6. Adjust headings and speed to compensate for winds effects. | Day, night, VMC, IMC, given a flight or simulator training event. | Direction within 1° heading, speed ± 5 kts. |

C. Communication

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| C-1. Communicate via aircraft radios with appropriate agencies and other aircraft using standard Navy and FAA terminology. | Given a flight training event. | So that 95% of transmissions or receptions need not be repeated. |
| C-2. Communicate with aircraft crew using ICS. | Given a flight training event. | So that 95% of transmissions or receptions need not be repeated. |
| C-3. Use proper visual signals to communicate with wingman or aircraft ground handling personnel. | Given a flight training event. | So that 90% of signals need not be repeated. |

D. Aircraft Operation

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| D-1. Locate and operate T-2C aircraft systems. | Given a flight training event. | IAW NATOPS. |
| D-2. Describe the correct nomencla-ture, purpose, characteristics, functions, and limitations of T-2C aircraft systems. | Given an oral or written exam. | To 80% accuracy. |
| D-3. Recall T-2C aircraft servicing procedures. | Given an oral or written exam. | To 80% accuracy. |
| D-4. Recall T-2C all-weather operating procedures. | Given an oral or written exam. | To 80% accuracy. |
| D-5. Extract and apply as appropriate T-2C aircraft performance data from NATOPS Flight Manual. | Given an oral or written exam. | To 80% accuracy. |
| D-6. Perform appropriate T-2C checklists as required. | Given an oral or written exam. | IAW NATOPS. |
| D-7. Operate T-2C within limitations. | Given a flight training event. | IAW NATOPS. |
| D-8. Recall T-2C operating limitations. | Given an oral or written exam. | To 80% accuracy. |
| D-9. Execute T-2C "immediate action" emergencies. | As required by flight instructor or actual emergency. | IAW NATOPS. |
| D-10. Recall T-2C "immediate action" emergencies. | Given an oral or written exam. | To 100% accuracy. |

E. Advanced Tactical Maneuvers (ATMs)

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| E-1. Recommend appropriate ATM in offensive and defensive situations against a bogey aircraft. | Day, VMC, given a flight training event. | To 90% accuracy. |
| E-2. Describe ATM. | Given an oral exam. | To 100% accuracy. |
| E-3. Identify ATM performed by pilot. | Day, VMC, given a flight training event. | To 90% accuracy. |
| E-4. Identify whether in an offen-sive, neutral, or defensive position relative to a bogey aircraft. | Day, VMC, given a flight training event. | To 90% accuracy. |
| E-5. Maintain spatial orientation throughout ATM through aircraft instrument and external visual scan with reference to the following:<br>a. terrain.<br>b. altitude.<br>c. airspeed.<br>d. attitude.<br>e. hard deck.<br>f. soft deck.<br>g. bogey. | Day, VMC, given a flight training event. | To 90% accuracy. |
| E-6. Direct pilot to perform appro-priate maneuver to avoid descending through hard deck and breaking imaginary bubble around bogey. | Day, VMC, given a flight training event. | To 90% accuracy. |
| E-7. Identify bogey's position, attitude, overtake, tactical maneuver, and threat. | Day, VMC, given a flight training event. | IAW FTI to 90% accuracy. |

| OPERATIONS | CONDITIONS | STANDARDS |
|---|---|---|
| E-8. Apply tactical lookout doctrine. | Day, VMC, given a flight training event. | IAW FTI to 90% accuracy. |
| E-9. Maintain visual contact with bogey aircraft. | Day, VMC, given a flight training event. | To 90% accuracy. |
| E-10. Report bogey's position, attitude, overtake, maneuver, and threat to pilot. | Day, VMC, given a flight training event. | To 90% accuracy. |
| E-11. Maneuver a section of aircraft to the center of an operating area using engaging turns while maintaining section integrity and lookout doctrine. | Day, VMC, given a flight training event. | Without error. |
| E-12. Report appropriately "visual" and "six clear." | Day, VMC, given a flight training event. | Without error. |
| E-13. Report bogey position to section. | Day, VMC, given a flight training event. | Without error. |
| E-14. Use standard Navy/Marine Corps aircraft section radio communication procedures. | Day, night, IMC, VMC, given a flight training event. | To 95% accuracy. |
| E-15. Perform as the lead navigator on an aircraft section visual low-level navigation flight. | Day, VMC, given a flight training event. | To within 30 seconds of planned ETA, 100 lbs planned EFR, and 2nm of course. |
| E-16. Maintain visual orientation with wingman/lead, terrain, and course. | Day, VMC, given a flight training event. | To 90% accuracy. |
| E-17. Report hazards to flight to section. | Day, VMC, given a flight training event. | Without error. |

| OPERATIONS | CONDITIONS | STANDARDS |
| --- | --- | --- |
| E-18. Make recommendations to maneuver the section while maintaining tactical section integrity, course, and ETE. | Day, VMC, given a flight training event. | To 90% accuracy. |