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AIR FORCE

HUMAN RESOURCES

LABORATORY

AFHRL-TR-72-10 (IV)

# NAVIGATOR-OBSERVER UTILIZATION FIELD FLYING SPECIALTIES STUDY APPENDIX III. DEVELOPMENT OF TRAINING REQUIREMENTS

By

Clarence A. Semple, Jr.
Raymond J. Heapy
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Manned Systems Sciences, Inc.

FLYING TRAINING DIVISION
Williams Air Force Base, Arizona

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AIR FORCE SYSTEMS COMMAND

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FLYING TRAINING DIVISION
AIR FORCE HUMAN RESOURCES LABORATORY
AIR FORCE SYSTEMS COMMAND
Williams Air Force Base, Arizona

## FOREWORD

Appendix III documents the development of training Criterion Objectives during Phase III of Contract F41609-71-C-0014 by MANNED SYSTEMS SCIENCES, INC., 8949 Reseda Blvd, Suite 206, Northridge, California.

The objective of Phase I (Appendix I) was to examine the present and future roles of the Air Force Navigator. Phase II (Appendix II) dealt with describing, analyzing and determining commonality among requisite operational navigator tasks. Phase III addressed the anlaysis of present and future navigator training requirements and the documentation of research requirements. Research requirements are separately documented.

The study was initiated under Project 1123, Flying Training Development, Task 1123-06, Task Analysis and Inventory for Flying Training Program Development. Dr William V. Hagin was project scientist and Major Robert E. MacArgel was task scientist. Lt Colonel Dan D. Fulgham assisted in technical direction. This report covers the period from 1 October 1971 through 7 January 1972.

This report was submitted by the authors in January 1972.

This technical report has been reviewed and is approved.

GEORGE K. PATTERSON, Colonel, USAF
Commander

## ABSTRACT

Appendix III presents information developed during Phase III of a three-phase study designed to provide a technical basis for determining future (1975-1990) navigator training requirements. The term navigator is used generically to refer to Navigator (AFSC 1535), Radar Navigator (Navigator-Bombardier) (AFSC 1525), Weapon Systems Officer (AFSC 1555), and Electronic Warfare Officer (AFSC 1575). This Appendix addresses the methodology used for developing training Criterion Objectives, along with methodological problems encountered while developing the objectives. Resulting Criterion Objectives are presented. Results of comparing the Criterion Objectives with present course training standards for the purpose of validating present training requirements are presented.

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## INTRODUCTION

Air Force Manual 50-2 (Ref. 1) defines Instructional System Development (ISD) as a deliberate and orderly process of planning and developing instructional programs to ensure that personnel are taught the knowledges and skills essential to successful job performance. Such planning requires decision making, and decision making requires information.

The Navigator-Observer Utilization Field Flying Specialties Study (NOUFFSS) was designed to generate a solid foundation of information to be used in the development of navigator training philosophy, program design, and research requirements. Both the near term (1971-1975) and the future (1976-1990) were addressed.

The Navigator-Observer Utilization Field (AFSC 15XX) has envolved into a complex set of job types including the following four flying specialties:

AFSC 1525 Radar Navigator
AFSC 1535 Navigator
AFSC 1555 Weapon System Officer
AFSC 1575 Electronic Warfare Officer

The four flying specialties may appear to have cohesiveness and continuity because they are in the same flying field. Indeed, there is some degree of job similarity between the Navigator AFS and the Radar Navigator AFS. To some extent, the job similarity continues through the Weapon System Officer AFS. However, there presently is little continuity between job requirements of these specialties and the job of the Electronic Warfare Officer. Such factors have complicated the navigator training process.

Rapid technological advances also have complicated the navigator training process. Further technological advances promise to even more markedly alter the roles and tasks of at least some navigator job types. Accordingly, the navigator training system must prepare to teach the skills and knowledges required by changes in mission requirements, technological improvements, and corresponding changes in the navigator's role and operational tasks.

It may be anticipated that some very significant changes will occur in navigator training in the very near future. Many of the changes will be related to the introduction of new and more sophisticated training devices. These will include: the T-43 Navigator Training Aircraft and the T-45 Undergraduate Navigator Training Simulator (UNTS), and the Simulator for Electronic Warfare Training (SEWT). Broad spectrum changes, however, will probably have their fullest collective impact in the post 1975 timeframe.

Between now and then, many training philosophy, policy content and method questions must be answered. Representative questions are:

-In which operational, mission-imposed tasks must the navigator be proficient?

-Which operational tasks are common to the broad spectrum of navigators?

-Which operational tasks are highly unique to particular navigator AFSCs?

-What is the navigator AFSC structure apt to be in the future?

-Should total navigator training system organization be restructured to accomplish the necessary training?

-Should major modifications be made to course content or student performance standards?

-Would minor modifications to course content and training methods and media be sufficient?

-Which methods and media would most effectively enhance the student's acquisition of necessary skills, knowledges and proficiencies?

-What objective, measurable performance standards should apply to many different learning tasks?

-What are criterion objectives, and how should they be sequenced and interrelated in a modified training program?

-What are enabling objectives, how are they developed, and how should they be interrelated and sequenced in a modified training program?

-Are training program changes even required?

Historically, questions dealing with navigator training philosophy and program design could not be answered with assurance. This had been due primarily to a lack of the information needed to make the necessary decisions.

These and other factors made it necessary to accomplish a systematic analysis of navigator training requirements. It has been the objective of the NOUFFSS study to accomplish the analyses and thereby provide much of the needed information. The NOUFFSS study addressed this goal through three distinct but highly interrelated phases.

Phase I (Ref. 2) examined the present operational role of the Air Force navigator and projected his role into the future. Factors addressed in Phase I included: the threat, projected Air Force mission and roles, technology projections, present and psychological aspects of the operational environment, projection of the need for navigators, and career factors.

The Phase II objective was to develop information which would assist navigator training program personnel in developing new training programs and furthering training program continuity. Phase II was a tasks analysis phase and was predicated upon the following assumptions: What should be taught should be based largely upon operational task requirements. How to train should be based, to a large extent, upon what must be taught. Task analysis data are useful for curriculum and syllabus development.

Phase II required the development of an objective means for identifying and analyzing navigator operational tasks, and the use of a computer-based technique for determining common and non-common navigator operational tasks. Accomplishing Phase II required refinement and expansion of basic techniques recently developed for similar requirements (Refs. 3 and 4). The Phase II methodology has been separately documented (Ref. 5).

Phase III required the use of information from both Phases I and II. Operational tasks developed during Phase II were clustered based upon their degrees of relatedness and commonality. The changing role of the navigator, as developed during Phase I, was used in projecting operation task (and therefore training) requirements into the post 1975 timeframe.

Related clusters of operational tasks were stated in terms of Criterion Objectives (and objectives of training). Resulting Criterion Objectives were then compared with present Course Training Standards for the following ATC and TAC schools: Undergraduate Navigator Training (UNT), Navigator Bombardier Training (NBT), Electronic Warfare Officer Training (EWOT), and F-4 Weapon System Officer (WSO) Training. Based upon the comparisons, present training requirements were evaluated and new requirements identified as appropriate.

Research topics identified throughout the NOUFFSS study also were documented in Phase III as a separate report (Ref. 6).

Each phase presented requirements for advancing the state-of-the-art of training analysis. Phase III most severely challenged available technology. Technical problems encountered during Phase III are approached in the next section. The technical problems are presented as a backdrop for understanding the numerous complexities involved in identifying and starting training Criterion Objectives.

SECTION II

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# METHODOLOGICAL CONSIDERATIONS

## A Basic Approach

Combining aspects of NOUFFSS Phases I and II produced a series of tasks which appear to have generality to all training analyses designed to generate Criterion Objectives. The tasks are:

1. Describe requisite operational tasks.
2. Analyze tasks for training content.
3. Determine common and non-common tasks.
4. Identify related task clusters.
5. Translate related clusters into Criterion Objectives.

Steps 1 and 2 frequently are tailored to the requirements of particular training analyses, or are designed to cope with unique job analysis requirements. A recent study based upon a comprehensive review of the task analysis literature (Ref. 3) also indicated that many task description and analysis procedures appear to be based strongly upon the individual analyst's preferences. The effect is that training program designers cannot assume that all task analyses are fundamentally the same or that data from different analyses will be comparable. In other words, there is no such thing as a "Mil Standard" task analysis. Any training program design methodology must consider this fact.

Determining common and non-common tasks is not unique to an "across the board" study such as NOUFFSS. On any representative operational mission, for example, navigating on outbound and homebound legs is apt to be similar if not identical. Consequently, task commonalities may be anticipated. Similarly, flight planning a combat air drop mission is not totally different from planning a hop to a near-by base. Again, task commonalities may be anticipated. Yet, none of the training analysis methodologies which the authors have reviewed has taken the "commonality" step into account. Practically all methodologies make the assumption that all tasks identified through task analysis methods are uniquely different from each other. This does not appear to be a valid assumption.

Step 4 is even more illusive. Although some training analysis methodologies allude to clustering related behaviors, the clustering is almost always addressed with respect to describing task activities. The assumption in most training analysis methods appears to be that a separate criterion training objective may be developed for each operational task.

There is little question that the grossness with which tasks are described comes into play with respect to requirements for clustering. Tasks which are very grossly or generally stated may

not require subsequent grouping or clustering. However, the NOUFFSS study employed a hierarchical description system of functions, tasks and subtasks. A fairly fine level of description was obtained at the subtask level. Consequently, clustering of both subtasks and tasks was required in order to integrate related job behaviors, knowledges and skills for the purpose of developing Criterion Objectives. The fact that clustering may be required must be taken into account in training analysis methodologies.

Attempting to accomplish the fifth step, translating related clusters of operational tasks into training Criterion Objectives, soon revealed that the training analysis state-of-the-art requires additional development in this area. Remaining portions of this section address some of the fundamental problems encountered during performance of the fifth step. The problems are briefly identified with the objective that the following will be stimulated: (1) more explicit definition of technical problems associated with developing training Criterion Objectives; (2) research needed to solve the problems.

## Definitions

During the past decade, many authors have addressed the specification of training program objectives. In 1962, Mager (Ref. 7) emphasized the concept that instructional program design should be based upon clear and concise statements of the end objectives of training. He referred to the end objectives as specific behavioral objectives (SBO). The present Air Force concept of Criterion Objectives (Ref 1) shares Mager's characteristics of SBOs. Specifically, a Criterion Objective should objectively state the terminal behaviors which the student should demonstrate, the performance standards which should be achieved by the student's behaviors, and the conditions under which the terminal behaviors should be performed.

Ammerman (Ref. 8) further distinguished between terminal objectives and enabling objectives. The distinction also is reflected by the present Air Force concept of learning objectives (Ref. 1). Ammerman defined enabling objectives as the necessary student learning tasks that bridge the gap between initial student ability and the ability to perform as specified in the Criterion Objective. The Air Force similarly defines Enabling Objectives as the behavioral specification of prerequisite skills and knowledges necessary for the achievement of a Criterion Objective (Ref. 1).

Other terms have been used by various authors. Common synonyms for Criterion Objectives are: performance objectives, behavioral objectives, training objectives, instructional objectives, functional objectives, and training requirements. Common synonyms for Enabling Objectives are: learning tasks, task demands, learning objectives and intermediate objectives (Ref. 4).

Although various authors disagree upon terminology, they appear to agree upon concepts. The first concept is that training programs should be based upon the specification of the type of job behavior which the training program should teach. The second concept is that training program design should be based upon objective analysis and specification of the intermediate "learning" behaviors through which the student should be guided. This general conceptual framework is in total keeping with the systems approach to total system design.

Technical problems arise, however, when attempts are made to implement the general concept to produce specific training requirements.

## Prior Precedents

Prior to 1971, the only large-scale attempts to apply the learning objectives approach to flying training program design were those of airframe manufacturers and commercial airlines to develop 747 and DC-10 training programs (Ref. 4). Although early planning documents outlined more complex approaches (Ref. 9), the approaches ultimately were to equate Criterion Objectives with operator functions, and Enabling Objectives with operator tasks. During 1971 the same simplifications were adopted in at least one of the UPT 75-90 pilot training analysis studies (Ref. 4).

These simplified approaches were not used in NOUFFSS; rather, state-of-the-art advances were sought and used. The NOUFFSS methodology allowed a commonality to be determined down to the subtask level of job description. To address Criterion Objectives at the function-level should have amounted to ignoring information.

Attempting to develop Criterion Objectives from more detailed task and subtask-level information, however, uncovered a number of technical difficulties, several of which are discussed below.

## Level of Detail

A primary requirement of NOUFFSS was to combine and integrate relatively detailed task analysis information into Criterion Objectives. Short of function-level attempts, little was available to provide guidance. The search, however, provided an interesting insight into the reasons why prior researchers had fallen back upon function descriptions to provide the base for defining Criterion Objectives. Air Force Manual 50-2 (Ref. 1) defines Criterion Objectives in the following words: "The specification of the behavior which leads to or satisfies a job performance requirement or standard." ATC Study Guide 3AIR75130-X-5 (Ref. 10) defines Criterion Objective as that "which involves measurable behavior and specifies a performance proficiency of the graduate." In a recent paper, Sullivan (Ref. 11) defines a Criterion Objective as that which "lists essential instructional and assessment content for the objective." Furthermore, Sullivan

suggests that "A set of instructional specifications... for an instructional program serves as a blueprint for development of the program."

A fundamental problem is readily apparent. Virtually every training analyst agrees that terminal objectives should be specified in operational, measurable, behavioral terms. Further, they agree that Criterion Objectives should serve as guidelines or blueprints for training program development. However, objective and quantitative definitions of just what a Criterion Objective is remain to be developed.

The following examples of Criterion Objectives will serve to illustrate the point. It is suggested that the reader bear in mind the basic distinction between Criterion Objectives (end products) and Enabling Objectives (learning tasks).

1. "When provided with a picture showing the front view of eight 1970 model cars, write the names for any six cars." (Ref. 12)

2. "Prepare systems for operation." (Ref. 4)

3. "The learner will identify isosceles triangles, given examples of equilateral, isosceles and scalene triangles." (Ref. 11)

4. "When placed in an Air Traffic Control Tower Simulator and in contact with a Jet Fighter Aircraft on a parking ramp, use FAA handbooks 7110.8 and 7110.9 to issue routine take-off instructions IAW AFM 60-5." (Ref. 10)

5. "Given an illustration of five U.S. coins commonly found in circulation, identify each coin as being a penny, nickel, dime, quarter, or half-dollar." (Ref. 12)

It is apparent that analysts do not agree upon level of detail (comprehensiveness) for Criterion Objectives. This statement is made irrespective of whether the three conditions of behavior, conditions and standard are met for any one objective. Level of detail is an independent consideration.

The implication in many writings is that Criterion Objectives somehow define themselves. This is not true. The above examples show that level of detail appears to be up to the preference of the analyst.

One additional factor needs to be considered. To be a criterion or terminal objective, behavior which is trained should have job-related application. In other words, simply "preparing systems for operation" (Ref. 4) means little in operational terms, unless the objective was written for a Crew Chief. Although "job-related application" is not highly specific in terms of providing

guidance for the writing of Criterion Objectives, the authors feel that the requirement does provide an additional element of guidance regarding the degree of generality which should characterize job-related Criterion Objectives. The requirement is in general keeping with AFM 50-2 (Ref. 1). In the listing above, item #4 most closely reflects the criterion. For example, if the student could successfully accomplish item #4, he would at least be qualified to issue takeoff instructions. In items 1, 2, 3, and 5, however, the student would be ill qualified to perform any meaningful job-related activity, even though he might have mastered the stated "Criterion Objective."

Specifying Test Conditions

Air Force Manual 50-2 (Ref. 1) specifies that Criterion Objectives should identify "test items which will measure the student's ability to accomplish the ...objectives." Other authors appear to be in agreement with this requirement. Careful examination of many examples of Criterion Objectives reveals, however, that the objectives frequently are the test items. In other words, the test for establishing achievement of an objective is so integral with the statement of the objective, that the two simply cannot be separated. A question arises. Is this desirable or even practical in many applied situations?

In the whole-part-whole training context, for example, Criterion Objectives represent the behavioral specification of the first "whole". Enabling objectives represent behavioral specification of the "parts". Criterion tests identify the contexts, settings and specific exercises which must be accomplished by the student to behaviorally demonstrate acceptable performance of the final "whole". In other words, criterion tests are highly detailed final exams which quantitatively assure that the student has achieved satisfactory performance. For complex Criterion Objectives, such as those required for Navigator-Observer training, many final examination alternatives exist. Accordingly, no single specific criterion test is applicable. Many equally valid alternatives may be used.

Figure 1 presents a generalized training system design model. It is apparent from examination of the model that many factors must be considered when developing the total training system. This is particularly true for flying training because many of the skills and knowledges which the student must acquire are quite complex. Training and testing of the skills and knowledges frequently require use of sophisticated training devices. Overly specifying test conditions prior to considering factors such as training devices, course structure, sequencing, and requirements for performance measurement would be premature.

This is particularly true in a study such as NOUFFSS. Criterion Objectives were developed in a manner which would not pre-empt program design decision prerogatives. Accordingly, the

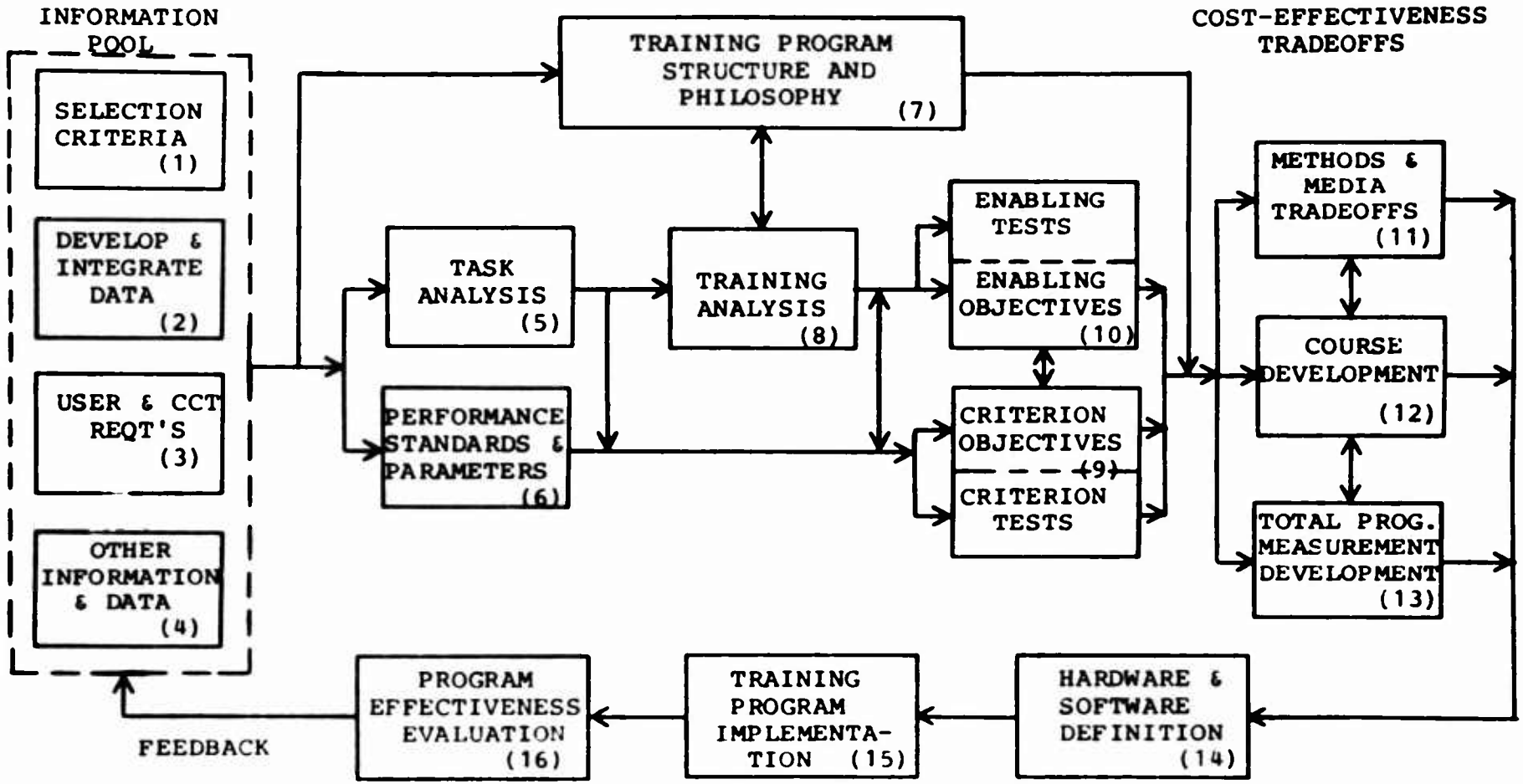



Figure 1. Training System Design Model.

study team avoided assuming particular training program structures, method-media selections, Enabling Objective concepts or training philosophies. Since all of these factors (and others) enter into program design, it follows that they also should be reflected in Criterion Objectives. Because the NOUFFSS program was not chartered to address these types of decisions, performance tests could not be specified as elements of the Criterion Objectives.

Is this situation unique to the NOUFFSS study? Probably not. For any training program which may undergo revision or which is being designed for the first time, it would appear most reasonable to develop Criterion Objectives sans explicit test conditions. The next logical step would be to develop training tasks (Enabling Objectives). The third step, then, would be to establish explicit criteria for training and testing devices which would be meaningful throughout the continuum of enabling and criterion behaviors. From these criteria, all tests and testing devices should be identified, with attention given to presently available training and testing devices and factors such as planned utilization rates and testing and measurement continuity.

The above points become clearer in light of the following discussion which addresses concepts for defining and integrating criterion and enabling objective behaviors.

CO-EO Concepts and Discussion

Consider for a moment the following requirements. In a real-world training setting, the training program designer would want to specify conditions, behaviors, performance standards and testing devices for both Criterion and Enabling Objectives as currently defined. He would want to do this in order to achieve the degree of behavioral specificity necessary to objectively and unequivocally determine whether the student had mastered either type of objective.

This is not presently possible using the current concepts of Criterion and Enabling Objectives for a number of reasons. First, many authors in the training literature (e.g., Ref. 7, 8, 10, 11, 12) treat Criterion and Enabling Objectives as distinct entities. These authors also imply that any Criterion Objective is supported by only one level or "echelon" of Enabling Objectives and that each Criterion Objective is somehow independent of all other Criterion Objectives. Additionally, they define an ordered sequence for deriving Criterion and Enabling Objectives as follows: Criterion Objectives are specified first; then the associated Enabling Objectives are specified. Evidence obtained in the present study indicated that none of the above suppositions may be realistic.

Consider the following example:

> Passing the navigator entry exams in an enabling factor for entering UNT.

Successfully completing UNT is an enabling factor for assignment to EWOT or NBT.

Successfully completing NBT or EWOT is an enabling factor for a SAC bomber assignment.

A SAC bomber assignment is an enabling factor for getting into the supplement.

Getting into the supplement is an enabling factor for a career which might lead to the rank of General.

Becoming a General Officer is an enabling factor for becoming Air Force Chief of Staff.

Becoming Chief of Staff is an enabling factor for becoming a presidential candidate.

Becoming a presidential candidate is an enabling factor for becoming President of the United States.

Becoming President is an enabling factor for--etc.

One might ask, then, where does it all stop? Are Criterion Objectives and Enabling Objectives really distinct entities or are they simply different points or levels of competency along a related continuum? Do Criterion Objectives define ends in themselves, or merely steps towards some higher behavioral goal?

If, indeed, all learning objectives are really just different levels of sophistication along some continuum of behavior, then it cannot be said that any single Criterion Objective is supported by one level of Enabling Objectives. In actuality, it would be supported by all the levels that precede it on that continuum.

Finally, during both the present NOUFFSS study and one of the original flying training analysis studies (Ref. 3), the authors found that the development of function, task and subtask hierarchies was not a sequential process. Rather, when any level was adjusted, both of the remaining levels frequently required adjustment also. In other words, development of hierarchies of behavioral description is a synergistic, back and forth process. It is not the simple sequential process implied by the majority of documents which deal with system analysis methodology.

Criterion Objectives and Enabling Objectives are also hierarchies of behavioral description. It follows, therefore, that modifying either of these types of objectives may result in the need to modify the other accordingly. If this is valid, then the sequential order which is frequently implied or stated is not totally realistic. It may be hypothesized, in fact, that the sequential approach would be even less plausible for highly complex Criterion Objectives since so many learning behaviors may be involved.

The above discussion is not intended to completely negate the utility of Criterion Objectives and Enabling Objectives as presently defined in the literature. Rather, it is intended to suggest that the definitions require additional exploration and expansion. Figure 2 illustrates a number of alternative relationships between Criterion Objectives and Enabling Objectives. Each of the alternative examples is simply an expansion of the relationship shown in Example A. However, the expansion occurs along several different dimensions:

> Vertical Expansion: This principle suggests that Criterion Objectives and Enabling Objectives may be related in a vertical or multi-level dimension.
>
> Horizontal Expansion: This principle suggests that Criterion Objectives and Enabling Objectives may be related in a horizontal or inter-related manner.
>
> Multi-dimensional Expansion: This principle suggests that Criterion Objectives and Enabling Objectives may be related on vertical and horizontal dimensions. In other words, they may be multi-level and inter-related at the same time.

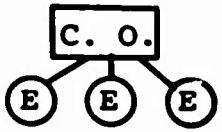
Example B illustrates a simple multi-level or vertical relationship. In this concept, three "learning avenues" are presented. Two of the three avenues consist of more than one Enabling Objective. Implied in this sequential objective structure are requirements for successively accomplishing multiple learning steps while progressing towards the achievement of criterion skills and knowledges.

Example C shows a simple interactive multi-level concept or relationship. In this example, multiple "learning avenues" also are assumed. However, this example also identifies interrelationships among several Enabling Objectives. The interrelationships imply that accomplishing one Enabling Objective is a prerequisite for successfully accomplishing other, related Enabling Objectives.

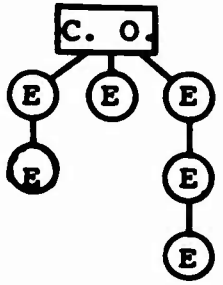
Example D is a variation of Example C. The principal difference is that the various Enabling Objectives have been arranged with respect to time. Example D, therefore, also shows requirements for sequencing Enabling Objectives in addition to identifying and interrelating them.

Example E is an expansion of Example D, but also imposes a training philosophy decision. In Example E, it is assumed that Enabling Objectives are designed to produce successive approximations of the Criterion Objective. It is further assumed that knowledges and skills learned in preceding Enabling Objectives are practiced in all subsequent Enabling Objectives. This approach provides for repeated practice of basic skills and

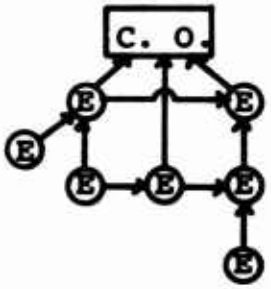
(A)
BASIC CONCEPT



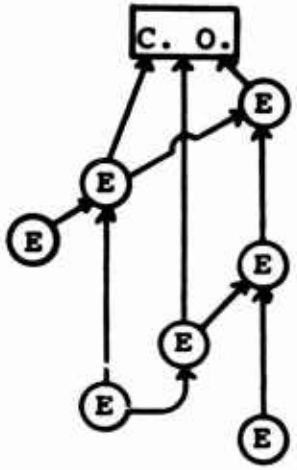

(B)
SIMPLE, MULTI-LEVEL CONCEPT



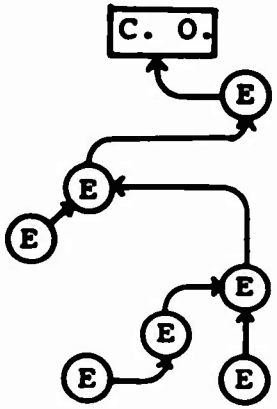

(C)
SIMPLE, INTERACTIVE, MULTI-LEVEL CONCEPT




(D)
TIME SEQUENCED, INTERACTIVE, MULTI-LEVEL CONCEPT




(E)
TIME SEQUENCED, CUMULATIVE, MULTI-LEVEL CONCEPT




(F)
SIMPLE HIERARCHIAL CONCEPT

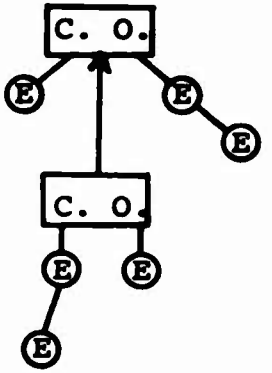



Figure 2. Alternative Enabling Objective - Criterion Objective Concepts.

knowledges in an ever-expanding behavioral context. The approach also organizes learning experiences into one "learning avenue" rather than the three avenues shown in the preceding examples. Each Enabling Objective in Example E is a cumulative building block which provides integrated training of successively more complex skills and knowledges.

Example F in Figure 2 simply reflects the fact that Criterion Objectives may also provide prerequisite skills and knowledges for the accomplishment of other Criterion Objectives. Successfully learning how to plan a routine cruise type mission, for example, appears to be a meaningful prerequisite for learning to plan a combat air drop mission. Either of these planning requirements might be stated as Criterion Objectives. If they were, then one Criterion Objective would, in reality, be an Enabling Objective for the second Criterion Objective.

In each of the above examples, it is implied that Criterion Objectives and Enabling Objectives should be designed as units rather than independently and sequentially. This is particularly true in Examples E and F wherein successively stronger and broader units of skill and knowledge are developed from highly interrelated and sequenced learning steps.

In addition, Example E strongly reflects a training philosophy decision. It also reflects the artificiality of distinguishing between enabling and criterion behaviors since each successive enabling block in the example is simply a closer and closer approximation of the final criterion behavior.

Conceptual relationships shown in Figure 3 further expand upon points which have been touched upon above. The first point is that the distinction between enabling and criterion behaviors may not be totally valid and that the two may simply be different levels of the same thing. The second point is that training program philosophy inevitably becomes directly involved in defining and interrelating either enabling or criterion behaviors.

Example G in Figure 3 represents the concept of Spiral Training. Spiral Training is a coined term. As a training concept, it implies that multiple enabling behaviors should be addressed concurrently in training for the purpose of establishing relationships among all related behaviors. Further, the concept implies successive building of skills and knowledges in multiple areas by "spiraling through" numerous training subjects while successively building skills and knowledges to terminal levels. Several terminal levels (proficiency levels or levels of sophistication) are possible in one spiral and would be based upon the skill and knowledge levels required to perform different jobs in the same area of specialization. It is apparent that both terminal and intermediate skill and knowledge clusters could be markedly influenced by adoption of the Spiral Training concept.

In Example G, the reader may consider the three vertical paths as knowledge levels relating to the following items: communication radios and characteristics; communications discipline and procedures; and verbal shorthand and hand signals. Implementation of the Spiral Training concept would require teaching successively more complex and demanding knowledges and skills in all three areas concurrently. When the student achieved the terminal level of performance for the instructional unit, he would be qualified and well practiced in all aspects of airborne communications. His training also would have been highly integrated with respect to communications and related airborne tasks.

Example H in Figure 3 reflects the concept of training Synerg. Synerg also is a coined term. As a training concept, it reflects the clustering of training content within the context of an overriding principle.

The term is derived from two components. "Syn" implies synthesis and integration. "Erg" implies a unit of force or energy. A Synerg, then, is an instructional unit based upon an overriding principle and consisting of the data, skills, knowledges, learning tasks and operational tasks requiring use of the principle. It is, in essence, a functioning unit of skills and knowledges.

(G)
SPIRAL TRAINING
CONCEPT

(H)
SYNERG
CONCEPT

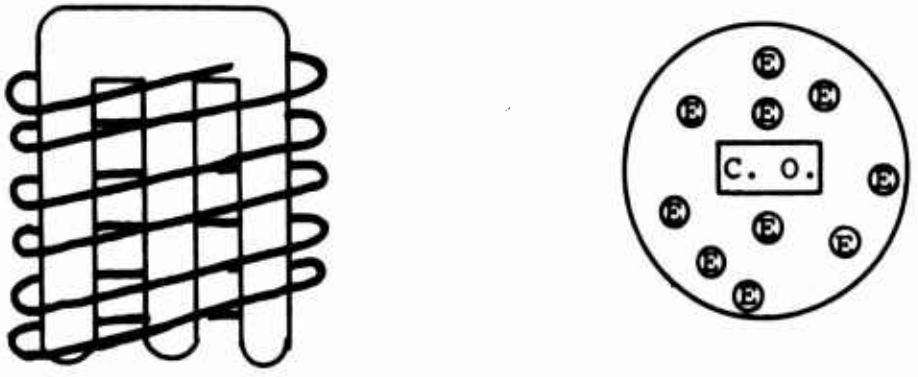



Figure 3. CO - EO Relationships Reflecting Training Policy Alternatives.

A partial listing of candidate principles for navigator training is presented in Table 1. Principles shown in the table were derived from the NOUFFSS Phase II task analysis data (Ref. 5). The purpose of any principle would be that of a unifying or bonding agent for tieing together the training content of a Synerg.

## Summary

The present authors fully agree with the concept of specifying all end products of training in observable, measurable, objective behavioral terms. The authors further agree that training program content and organization should be systematically developed to ensure efficient and rapid student attainment of end product skills and knowledges. The question is: How does one achieve these noble objectives? The present state-of-the-art of training analysis provides no concrete answer to the question.

A review of relevant training analysis and technology literature reveals the following critical deficiencies. Explicit definitions of criterion and enabling behaviors are lacking. Explicit, validated concepts of the relationships between the two behavioral categories have not been developed. Workable, validated methodologies for identifying and specifying criterion and enabling behaviors have not been developed. In summary, basic concepts are available, but validated working tools are lacking.

Development of the criterion and enabling behavior concepts shown in Figures 2 and 3 was undertaken during NOUFFSS Phase III as a part of the search for workable conceptual and methodological frameworks. At the outset of Phase III, few practical guidelines were available for developing criterion behaviors for navigator training. As a consequence, a methodology for identifying and developing Criterion Objectives was developed specifically for NOUFFSS. The methodology makes many simplifying assumptions. For example, no particular training program design philosophy was assumed. Criterion Objectives were developed independently of the enabling behaviors. The methodology excludes factors such as method-media selection and optimum utilization profiles.

At best, the method is an attempt to advance the training analysis state-of-the-art. At worst, it is an unvalidated procedure. The methodology which was developed and used during Phase III of the NOUFFSS study is discussed in the next section.

Table 1. Partial Listing of Candidate Principles for Synerg Concept.

| | |
|---|---|
| Aerial Geometry: | Offsets (All Types)<br>Air-to-Air Intercepts<br>Drift<br>TF/TA |
| Airspace Utilization: | Control/Defense Zones<br>Commercial Corridors<br>Flight Levels |
| Aviation Physics: | Aerodynamics<br>Propulsion<br>Acceleration/G's<br>Altimeters |
| Aviation Physiology: | Physiological Effects<br>Life Support<br>Escape/Survival |
| Communications: | Voice Communications<br>Beacons<br>Non-Verbal<br>Coding Techniques |
| Earth Physics: | Magnetic Fields<br>Variations<br>Time |
| Electro-Optics: | TV<br>IR<br>Film-Based |
| Electronic Data Processing: | Computer Basics<br>Inputs vs. Outputs<br>Applications<br>Bomb<br>EMAC<br>Nav<br>Weapon |
| Electronic Sensors: | Sensor Basics<br>Radar Features<br>Applications<br>Search<br>Weapon Delivery<br>Track<br>Up-Dating |

## SECTION III

## CRITERION OBJECTIVE METHODOLOGY

### Introduction

Primary training objectives of NOUFFSS Phase III were to evaluate existing navigator training requirements, identify new navigator training requirements, and state all requirements in terms of Criterion Objectives. The strategy used to accomplish the training objectives was: (1) develop Criterion Objectives based upon operation task data; (2) compare resulting Criterion Objectives with existing Course Training Standards for Undergraduate Navigator Training (UNT), Navigator-Bombardier Training (NBT), Electronic Warfare Officer Training (EWOT), and F-4 Weapon System Officer Training; and (3) in the course of making the comparisons, evaluate existing training requirements and identify new requirements. Task analysis data along with commonality analysis results were the primary constituents from which Criterion Objectives were developed.

Details of the NOUFFSS Phase II tasks description and analysis methodology are presented in a separate document (Ref. 5). The four levels of navigator job description are summarized below to provide a basic context for interpreting the methodology described in subsequent pages. Examples of the four levels are presented in Table 2.

Function: A broadly defined system activity contributing to mission performance.

Task: A unit of work performed by the navigator in order to accomplish a function-level requirement.

Subtask: A sub-goal associated with or required for the accomplishment of a task-level behavioral requirement.

Microfunction: Functionally oriented clusters of procedural steps required to accomplish a subtask.

Details of the Phase II commonality analysis also are presented in Reference 5. As used in the NOUFFSS study, commonality analysis was defined as a methodology applied to task analysis data to indicate the relative numbers (percents) of individuals in the sample population who performed various subtasks. The commonality analysis was programmed to provide information including the following:

-Which of 14 aircraft-crew position combinations performed each of 446 standardized subtasks.

TABLE 2. Example of Function, Task, Subtask, and Microfunction Relationships.

| | |
|---|---|
| FUNCTION: | Direct Aircraft Along Required Route. |
| TASK: | Monitor Flight Performance. |
| SUBTASK: | Monitor Flight Control and Propulsion. |
| MICROFUNCTIONS: | Monitor engine instruments.<br>Monitor fuel instruments.<br>Monitor flight profile & power settings.<br>Monitor flight instruments.<br>Crosscheck flight-navigation displays.<br>Coordinate with pilot as required. |
| SUBTASK: | Monitor Communications. |
| MICROFUNCTIONS: | Monitor interphone.<br>Monitor UHF radio.<br>Monitor HF radio.<br>Coordinate with pilot as required. |
| SUBTASK: | Perform Visual Search. |
| MICROFUNCTIONS: | Search surrounding airspace visually.<br>Detect obstacles or enemy.<br>Coordinate with pilot as required. |

-The percent of the total sample population each crew position performing a given subtask represented.

-The percent of the total sample population which all crew positions performing a given subtask represented.

Output from the analysis presented a percentage figure under each of 14 aircraft-crew combinations comprising the NOUFFSS sample. The percentage indicated the relative number of individuals assigned to that position in relation to the total population of navigators in the NOUFFSS sample. The total commonality weight across all 14 positions indicated the total percent of all navigators in the sample who performed a particular subtask. In the analysis, a subtask that was 100% common was one that was performed by all 14 aircraft-crew position combinations. One which was only 10% common was performed by only 10% of the persons comprising the total sample.

Results of the Phase II commonality analysis showed quite stable trends in subtask commonalities throughout the 1971-1985 timeframe. Data for the 1986-1990 time period showed similar overall trends, but the latter trends were based upon a markedly reduced number of weapon systems and crew positions. This was due to the projected phasing out of many weapon systems comprising the NOUFFSS sample. Accordingly, commonality data for the 1971-1985 timeframe were used.

Commonality data were combined over the 1971-1985 timeframe. Resulting commonality trends are shown in Figure 4. The figure shows that there are three distinct levels or trends in degrees to which subtasks were common. A relatively large number of subtasks fell in the low commonality range (1-19%). In fact, approximately 40% of all subtasks were in the low commonality range. The second stable range is from 20 to 49 percent commonality. Approximately 30% of all subtasks were in this range. Finally, a stable range is observed between 50 and 100 percent commonality. Relatively few subtasks fell into each of the 10% increments comprising the high commonality range. However, the total range contained the remaining 30% of all subtasks.

The appearance of three distinct levels or trends in the degrees to which subtasks were common suggested that NOUFFSS Phase III should address the development of training requirements in a multi-level fashion. The suggestion was borne out during the development of training Criterion Objectives. Subtasks falling in the low commonality range were very system specific. Those falling in the moderate range were more mission specific. Subtasks in the high commonality range reflected broad-based job requirements.

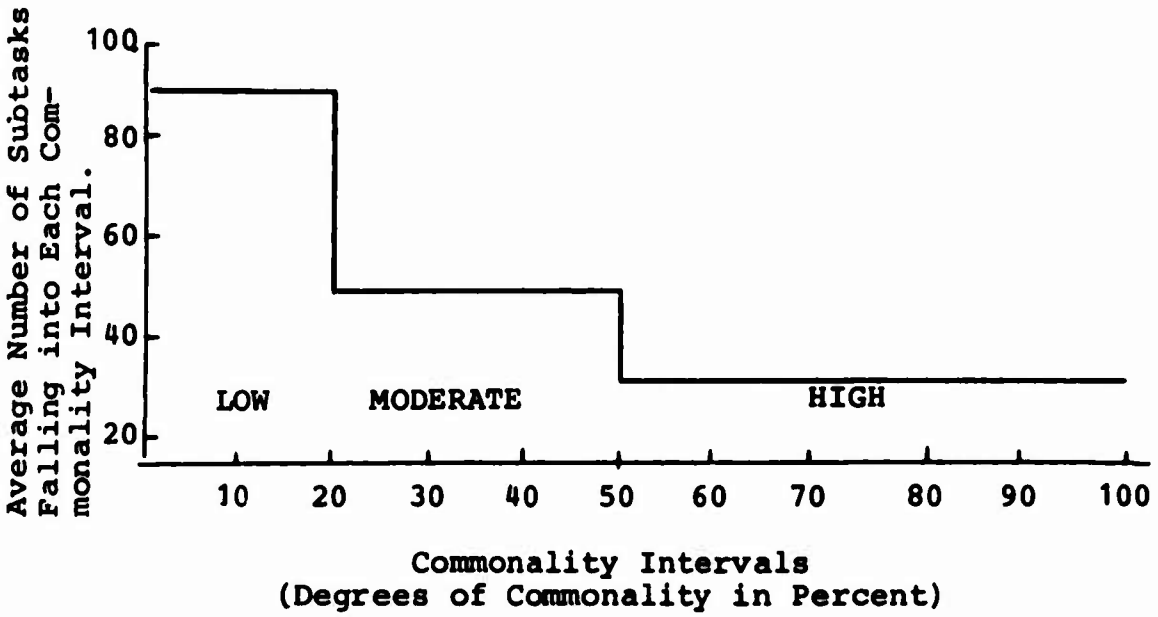



Figure 4. Commonality Trends

The presence of three distinct and consistent commonality ranges also suggested that more than simple statistical interpretation of task analysis data would be required during Phase III. This followed from the fact that patterns in the commonality data did not correspond with patterns in crew distribution data or weapon system distribution data.

These observations led to the conclusion that commonality trends were the products of interactions among variables such as mission types, weapon systems, equipment types, AFSCs, and probably a task relatedness factor reflecting uniquenesses within weapon system categories. The conclusion was borne out during Phase III. Simple, statistically-based commonality decisions were not practical as the sole means for clustering job requirements and translating the clusters into Criterion Objectives. Details of the interactive procedure required for Phase III are presented below.

## Criterion Objective Development Procedure

Decision logic of procedure developed to generate Criterion Objectives is shown in Figure 5. The figure shows sequences and relationships among source data, decision points and Criterion Objective output points.

As mentioned previously, there are no physical laws or exacting criteria governing the development or evaluation of Criterion Objectives. The process is subjective and judgemental, as is the basic tasks analysis process from which source data were derived. Figure 5, therefore, only presents a systematized and formalized procedure within which subjective processes were exercised.

Step 1. Are Tasks and Subtasks Mission Phase Related? During Phase II, total missions were subdivided into mission phases. Functions, tasks, subtasks and microfunctions were separately identified within each mission phase. The first step in the development of Criterion Objectives was to review the basic Phase II task catalog (Ref. 5) and all tasks analysis data to identify subtasks which were operationally related with each other within mission phases. Prerequisite skills and knowledges were then reviewed for each of the highly related subtasks. Based upon comparisons of subtask operations (including microfunctions) and prerequisite skills and knowledges, preliminary groupings of subtasks were made. Each grouping provided a candidate cluster of behaviors for integration into a Criterion Objective.

Subtask clusters found to be directly and sequentially (operationally) related to the accomplishment of a particular behavioral goal within a mission phase were advanced to Step 3 for further treatment. Subtasks which could not be so related within a mission phases were advanced to Step 2 for further analysis.

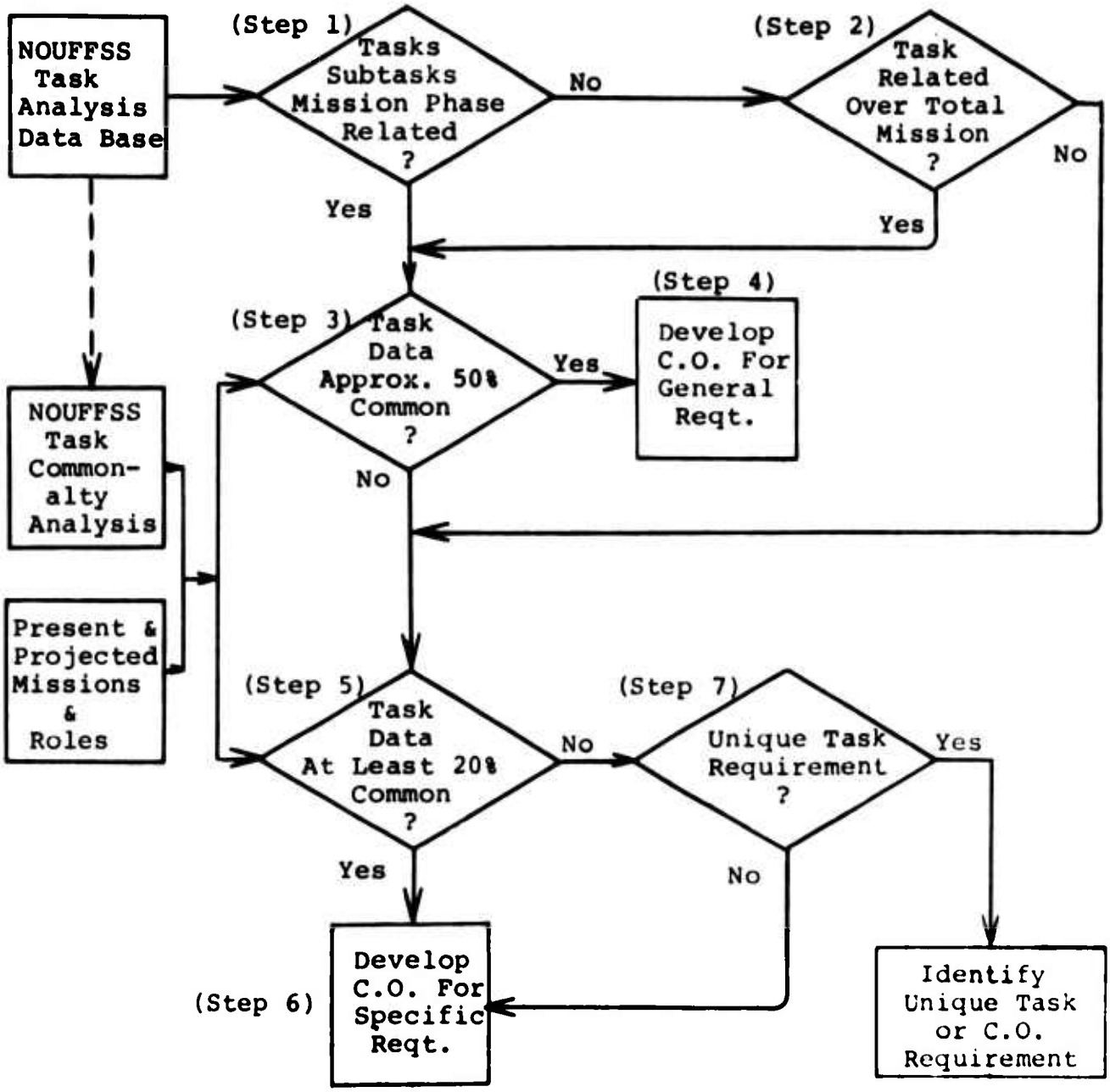



Figure 5. Criterion Objectives Development Procedure.

Step 2. Are Tasks, Subtasks Related Across Mission Phases? During this step, the task catalog and all task analysis data were again reviewed to identify subtasks within other mission phases which might be highly similar or highly related to tasks and subtasks in preceeding mission phases. This resulted in the clustering of tasks and subtasks which were related in the sense of supporting the entire mission of the aircraft.

Tasks and subtasks found to be related in a total mission context were added to preliminary clusters from Step 1 and were advanced to Step 3. Tasks and subtasks which could not be clustered were advanced to Step 5 for additional analysis and treatment.

The rationale for clustering tasks and subtasks which contribute to a specific goal attainment was based on a number of tradeoffs. For example, it was conluded that by examining tasks and subtasks on a related-nonrelated scale, it would be possible to examine job behaviors as meaningful whole units rather than discrete, individual steps. Examining the whole has the advantage of allowing the analyst to determine where a series of individual steps is leading, what the ultimate goal is, and the performance which is required to attain the goal. With the behavioral goal in mind, supporting skills and knowledges could be compared and structured in a more integrated manner.

The clustering of related tasks and subtasks involved subjective judgement. Past experience of the NOUFFSS data collection team and the information contained in the task analysis data were brought to bear on the judgemental process, together with other documentation and research data which were available. Nonetheless, numerous subjective judgements were required. In an effort to reduce variations in the decision process, three "decision shaping" rules were used.

Rule 1: Merge Checklist Procedures. Subtasks which emphasized the use of checklist procedures for equipment activation were merged into clusters of other subtasks which emphasized related operational requirements. The rule was based upon the decision that creating Criterion Objectives which simply said in effect "follow checklist procedures" would not satisfy the requirement that Criterion Objectives would be both job oriented and operationally oriented.

Rule 2: Cluster Purposes and Objectives, Not Procedural Detail. The full impact of the second rule became apparent early in the development of the Criterion Objectives. Occasionally (for 100% common subtasks) it was necessary to combine subtask data along with prerequisite skill and knowledge information across a maximum of 14 different weapon system-crew position combinations. Lesser degrees of subtask commonality also posed the same fundamental requirement. Procedural detail (microfunctions) and equipment uniquenesses of the many different

weapon systems had to be largely ignored: Instead, relatedness among the purposes for procedural steps and equipment operations were considered, along with prerequisite skills and knowledges.

Rule 3: Cluster Common Techniques. Many of the subtasks identified during NOUFFSS Phase II were highly system-specific. For example, the F-111A, the FB-111, and the B-1 weapon systems employ ejection capsules. A majority of the remaining systems in the NOUFFSS sample employ ejection seats. Although descent procedures are different for the two ejection techniques, both are common in the sense that they involve ejection-type egress from the system. Prerequisite skills and knowledges are similar for the two types of systems. Consequently, subtasks dealing with the different ejection techniques were combined, as were their commonality weighting factors. Other subtasks dealing with other job-related activities also were combined on occasion for the same reasons. The requirement to review and combine Phase II tasks analysis data further points out that determining related and common subtasks involved more than simple, statistically-based decision making.

Step 3. Are Clustered Subtasks Each Approximately 50% Common? Step 3 was used for identifying highly general training requirements. In the step, subtasks comprising clusters identified in Steps 1 and 2 were individually checked for degree of commonality across the entire NOUFFSS sample. A criterion commonality value of "approximately 50%" or greater was established as the basis for identifying candidate subtasks for highly general training requirements. Clusters of highly common subtasks were advanced to Step 4 to be formalized into Criterion Objectives. Subtasks which did not meet the criterion were advanced to Step 5 for further treatment.

It must be pointed out that the 50% rule was not hard and fast. As mentioned previously, it was found that commonality was the byproduct of many factors. Additionally, task analysis data are products of subjective processes. As a result, it was occasionally necessary to merge the content of two or more subtasks, and in the process, to combine their indivdual commonality weights. Through this process, for example, two subtasks of 30% and 25% commonality would yield one "merged subtask" of 55% commonality. The commonality of the "merged subtask" was then assessed against the criterion value of "approximately 50%."

Selection of "approximately 50%" as a criterion for highly common subtasks was not made arbitrarily. The 50% commonality point was one of two distinct change points in the overall commonality trend. It was, therefore, a primary candidate for consideration. Two additional factors also were identified during early portions of Phase III. Both factors are discussed below.

A highly general training requirement should reflect a broad spectrum of aircraft and crew positions. No single aircraft-crew position in the NOUFFSS sample represented a majority (over 50%) of all navigator positions. At a minimum, a combined commonality weight of over 50% could be achieved only if the three most heavily weighted of the 14 crew positions perf med a subtask. Nonetheless, a broad based mission sample would result because the three most heavily weighted positions included fighter, bomber, and cargo aircraft. Additionally, three of the four flying specialties would be included. For cutoff criteria of much less than 50%, much narrower mission requirements and fewer AFSCs could result in commonality. Accordingly, the selection of a criterion of approximately 50% forced inclusion of only generally occurring subtasks and excluded the possibility of clusters based upon highly mission-specific of system-specific subtasks.

Selection of higher levels of commonality (e.g., 70% or 90%) would have resulted in an undue restriction of content of subtask clusters. Subtasks addressing highly proceduralized behavior (e.g., checklist items) comprised a sizeable number of very highly common subtask:. For example, 100% of navigators in the sample perform checklist procedures and operate an interphone, but only approximately 69% participate in airborne radar approaches. Restricting highly general Criterion Objectives to simple, proceduralized behaviors was judged to be unsatisfactory.

Selection of any criterion commonality level can be debated ad infinitum. The 50% point selected for the present study appeared to reflect a workable compromise. It avoided including an unacceptably large number of highly system-specific or AFSC-specific subtasks, while avoiding the problem of unduely restricting highly general training requirements to overly simplified behaviors which, in themselves, do not reflect the job of navigating. Furthermore, some statistical basis existed for the decision.

Step 4. Develop Criterion Objective for General Requirement. Clusters of operationally related subtasks which were a least approximately 50% common were used to develop Criterion Objectives for general training requirements. This consisted of translating subtask behaviors, related skills and knowledges, and other task analysis information into training Criterion Objective content. The procedure and form which were used are discussed at the end of this section.

Step 5. Are Clustered Subtasks Each at Least 20% Common? Clusters of operationally related subtasks which did not meet the 50% commonality criterion were addressed in Step 5. Here, a range of commonalities (20% through approximately 49%) was employed. Subtasks falling within the range were advanced to Step 6 to be formalized into Criterion Objectives. Subtasks of less that 20% commonality were identified as system-specific or AFSC specific and were advanced to Step 7 for further treatment.

Again, the question of a cutoff commonality criterion value was involved. Again, the criterion value (20%) was somewhat flexibly interpreted for the same reasons as presented in the discussion of the "approximately 50%" criterion. As mentioned in the introduction to this section, the 20% commonality point reflected a change point in the overall commonality trend. Below the 20% point, a marked increase in the number of "unique," low commonality subtasks occurred. Aircraft-specific subtasks do not lend themselves to clustering.

The 20% point also is a convenient cutoff point for isolating subtasks which are specific to single weapon systems. The two most highly weighted aircraft-crew position combinations each comprise approximately 20% of the total navigator sample population. Above 20%, subtasks must be performed by more than one weapon system navigator in order to remain clustered. Accordingly, the 20% to 49% commonality range included the requirement for system representativeness, although the extent of the requirement was less than for highly common subtasks.

Step 6. Develop Criterion Objective for Specific Requirement. Clusters of related subtasks which were between 20% and 49% common were used to develop Criterion Objectives for specific training requirements. The procedure and form which were used were the same as those used in Step 4 and are discussed at the end of this section.

Step 7. Identify Unique Task or Requirement. This step was included to handle cases of highly unique subtasks. The intent of the step was to provide a means to critically evaluate unique subtasks to ascertain whether, in fact, the 20% cutoff point was valid in each individual case. Additionally, Step 7 provided the opportunity to re-examine apparently unrelated subtasks from Steps 1 and 2.

There were two avenues out of Step 7. If it was decided that a low commonality subtask was fundamentally similar with other more highly common subtasks, then it was recycled through Step 5 and Step 6. If, on the other hand, it was decided that the subtask was highly system-specific, then it was not recycled for inclusion into Criterion Objectives. Only approximately 25 out of the 446 subtasks were not treated for this reason.

Stating Criterion Objectives. Steps 4 and 6 required the formalizing of subtask clusters into Criterion Objectives. The procedure followed in each step was the same. The procedure is described below, along with directly relevant background information.

As noted in Section II of this report, the available literature predominates with overly simple examples of Criterion Objective statements. Typically, the statements are only one sentence in length. Such examples were found to be too highly

restrictive to serve as meaningful examples for NOUFFSS Phase III. Although the basic concept of the Criterion Objective was retained, it was found necessary to considerably expand the information content of NOUFFSS-generated objectives.

A fundamental requirement for the expansion was that navigator requisite operational behaviors are more complex than those typically used in example Criterion Objectives. Also, conditions under which navigators perform and the standards of performance are more complex than those found in existing examples. In many cases, for example, it would have been impossible to state a navigator Criterion Objective in a single sentence without sacrificing information content.

Finally, Criterion Objective examples found in the literature did not address behaviors involving higher orders of mental activity such as decision making, data integrating, and planning. Higher order mental activities of this type can be effectively addressed only though complex behavioral statements. For these reasons, content of Criterion Objectives developed during NOUFFSS Phase III contained considerably more information than did sample objectives which were found in the literature.

Figure 6 presents the form used to state Criterion Objectives. The form consists of two sections. The top section presents background and evaluation information. The bottom section presents behavioral information. Content of both sections of the form is defined below.

CRIT. OJB. ORIGINS: TASKS, SUBTASKS. These entries identified tasks numbers and subtask numbers. All tasks and subtasks were numbered. The numbers indicate the behavioral units which were clustered to form the Criterion Objective. Titles associated with the numbers are contained in the NOUFFSS Phase II report (Ref. 5). The reader may use the numbers to reference back to the basic task analysis information.

WPN. SYS. This entry was used to identify the weapon systems in which subtasks contributing to each cluster are performed. The reader may also use this entry to reference back to the basic task analysis information.

OBJECTIVE REQUIREMENT: NEW, PAR. VAL., VAL. Completion of this entry indicated whether the Criterion Objective represented a new training requirement, a partial validation of an existing training requirement, or a complete validation of an existing training requirement (course training standard). Lists of the course training standards are contained in Section V, Part II.

APPROX. COMMONALITY. This entry contained an approximately average commonality of all subtasks used to construct the Criterion Objective. Data were rounded to the nearest 5%.

FIGURE 6.
CRITERION OBJECTIVE WORKSHEET

CRIT. OBJ. ORIGINS: TASKS _____

SUBTASKS _____

WPN. SYS. _____

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. _____ VAL. _____

APPROX. COMMONALITY _____ C.T.S. NO. _____

C.T.S. DESCRIPTION _____

_____

OBJECTIVE TITLE:

CONDITION(S):

BEHAVIOR(S):

STANDARD(S):

PREREQUISITE SKILLS AND KNOWLEDGES:

SUPPORTING SUBTASK BEHAVIORS:

COMMENT(S):

C.T.S NO. This entry was used to identify the course training standard number(s) corresponding with the course training standard(s) against which the Criterion Objective was compared in determining whether it was a new, partially validated or validated requirement. C.T.S. numbers and associated titles are contained in Section V, Part II.

C.T.S. DESCRIPTION. This entry contained the title(s) for C.T.S. number(s).

The Criterion Objective specification section included the following information entries:

OBJECTIVE TITLE. This entry contained a brief descriptive title which was developed for the Criterion Objective.

CONDITIONS. This entry briefly described the set of operational, environmental conditions under which the student should be able to accomplish the Criterion Objective behavior. Condition entries were derived from mission-imposed requirements extracted from Phase II task analysis data.

BEHAVIOR. This entry operationally described the behavioral outputs required by the student in order to demonstrate skill and knowledge proficiencies required by the overall Criterion Objective. Behavioral descriptions were developed largely from subtask titles and microfunction data. Where complex or sequential behavioral output is required, the sequence was presented.

STANDARDS. This entry stated, as objectively and quantitatively as the task analysis data allowed, the performance parameters and consensus standards (averaged across applicable subtasks and weapon systems). Data for this entry were extracted from Phase II task analysis.

PREREQUISITE SKILLS AND KNOWLEDGES. This entry was used to summarize skills and knowledges required to perform the subtasks from which the Criterion Objective was developed. These entries also were extracted from Phase II task analysis data.

SUPPORTING SUBTASK BEHAVIORS. This entry was used to record the numbers of subtasks which were judged by the analysts to be somewhat related with, but not integral to the Criterion Objective. For example, subtasks relating to general flight planning might be related to, but not integral with a Criterion Objective dealing specifically with the planning of a combat air drop mission. Titles associated with the numbers are contained in the NOUFFSS Appendix II (Phase II) report (Ref. 5).

COMMENTS. This space was provided for the notation of exceptions, deviation and alternatives applicable to all of the preceeding entries.

All Criterion Objectives developed during NOUFFSS Phase III are contained in Section V, Part I.

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# SECTION IV

## SUMMARY OF FINDINGS

A total of 48 Criterion Objectives were developed. All Criterion Objectives are shown in Appendix A, along with the course training standards which were validated. The course training standards validated (evaluated) included: Navigator-Bombardier Training, Electronic Warfare Officer Training, Undergraduate Navigator Training, and F-4 Weapon System Officer Training. F-4 course training standards were selected for the validation process because F-4 WSOs account for practically all Weapon System Officer crew positions addressed in the NOUFFSS study.

Criterion Objectives were developed from tasks analysis data. They represented a combining of task data across as many as 14 aircraft-crew positions from 1971-1985. In validating (evaluating) present training, the total content of each Criterion Objective was compared with the total content for each course training standard (CTS). The most recent CTSs were used.

Five categories of validation were used. FULL VALIDATION indicated that a CTS fully covered all of the training content of a Criterion Objective. PARTIAL VALIDATION indicated that a CTS only partially covered the training content of a Criterion Objective. If a CTS was unrelated to any Criterion Objective, then the CTS was rated as NOT VALIDATED. If a Criterion Objective had no direct operational counterpart in any CTS, then the Criterion Objective reflected a NEW training requirement.

Finally, the category of NO OPERATIONAL EQUIVALENT was used. This category identified CTSs which were judged to represent training Enabling Objectives (preliminary learning tasks) rather than directly operational job related requirements. The NO OPERATIONAL EQUIVALENT category does <u>not</u> mean that these CTSs should not be taught. Rather, the category simply identified preliminary learning task CTSs and distinguished them from validated or partially validated CTSs.

Table 3 summarizes results of the validation (evaluation) of present course training standards. A total of 81 course training standards were identified. Of these, 81% were fully validated or partially validated. No direct operational equivalents were identified for an additional 16%. Only 2% fell into the not validated category. Only 1% were categorized as exceptions. The exceptions involved Electronic Intelligence (ELINT). ELINT requirements were not addressed in NOUFFSS.

A general finding, therefore, was that almost half of all CTSs were fully valid. An additional one third may require modification to bring them fully in line with operational requirements through 1985.

Table 3. Summary of Course Training Standard Validations Against NOUFFSS-Generated Criterion Objectives.

| Schools | Total Number of CTSs | Fully Validated CTSs | Partially Validated CTSs | No Direct Operational Equivalent | Not Validated | Exceptions |
|---|---|---|---|---|---|---|
| UNT | 27 | 9 (33%) | 12 (44%) | 5 (19%) | 1 (4%) | 0 (-) |
| NBT | 12 | 8 (67%) | 2 (17%) | 1 (8%) | 1 (8%) | 0 (-) |
| EWOT | 20 | 9 (45%) | 3 (15%) | 7 (35%) | 0 (-) | 1 (5%) |
| WSOT (F-4) | 22 | 13 (59%) | 9 (41%) | 0 (-) | 0 (-) | 0 (-) |
| TOTALS ACROSS ALL SCHOOLS | 81 | 39 (48%) | 26 (33%) | 13 (16%) | 2 (2%) | 1 (1%) |

NOTE: Percent equivalents are shown in parentheses.

Validation trends were similar for training requirements within each ATC and TAC school.

For UNT, 77% of the CTSs were fully validated or partially validated. An additional 19% were judged to reflect preliminary learning tasks. Only one UNT CTS was not validated.

For NBT, 84% of all CTSs were fully or partially validated. An additional 8% were judged to reflect preliminary learning tasks. Only one NBT CTS was not validated. Specific training content for a number of NBT standards may require revision during the late 1970's to early 1980's, however. This will be caused by the eventual phasing out of B-52 weapon system and phasing in of B-1 systems.

For EWOT, 60% of all CTSs were fully or partially validated. An additional 35% were judged to reflect preliminary learning tasks. No EWOT CTSs were found to be invalid. One CTS dealing with ELINT was not validated. The NOUFFSS Study did not deal with ELINT in depth, and validation was not possible.

For the F-4 WSO CTS comparisons, 100% of CTSs were partially or fully validated.

All validation comparisons assumed that NOUFFSS-generated Criterion Objectives 100% validly stated all Navigator-Observer training requirements. However, training analysis remains a soft and highly subjective art, in spite of the advances achieved during the NOUFFSS study. Validation results, therefore, must be interpreted in this light.

Not all NOUFFSS-generated Criterion Objectives represented the same degree of training content. Similarly, existing CTSs also represent differing degrees of training content. For example, there are 22 CTSs just for F-4 WSO training; there are only 12 for all of Navigator-Bombardier Training. The net result is that no direct correlations may be made between degrees of CTS validation and degrees of training time, resource or cost needed to bring all training into full alignment with NOUFFSS training Criterion Objectives. This is an additional matter which NOUFFSS was not tasked to address.

Finally, all validations were made in the context of present ATC and TAC training program structures. If training course content or overall program structures are changed, then the validation must be updated. Similarly, the present validation of CTSs in no way represents a validation of present ATC navigator training program structure. Total program structure is an independent matter; NOUFFSS was not tasked with designing the optimum flow of all of Navigator-Observer training.

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# SECTION V

## CRITERION OBJECTIVES AND COURSE TRAINING STANDARDS

Primary training objectives of NOUFTSS Phase III were to evaluate existing navigator training requirements, identify new navigator training requirements, and state all requirements in terms of Criterion Objectives. The strategy used to accomplish the training objectives was: (1) develop Criterion Objectives based upon operational task data; (2) compare resulting Criterion Objectives with existing Course Training Standards for Undergraduate Navigator Training (UNT; Ref 13), Navigator-Bombardier Training (NBT; Ref 14), Electronic Warfare Officer Training (EWOT; Ref 15), and F-4 WSO Training (Ref 16); and (3) in the course of making the comparisons, evaluate existing training requirements and identify new requirements.

Criterion Objectives are presented in Part 1 of this section in the following order. First, they were divided into three commonality levels: 50% and above, 20-49%- and 1-10%. Within each level, the Criterion Objectives were further subdivided into three groups based upon the extents to which they represented new training requirements or validated existing training requirements (course training standards). Criterion Objectives reflecting new training requirements are presented first. Those partially validating existing course training standards are second. Those fully validating course training standards are third.

Each Criterion Objective worksheet presents the degree to which the objective validates existing course training standards (CTSs). A new training requirement indicates that the Criterion Objective had no equivalent in terms of any CTS. Full validation indicates that a CTS fully covered all of the training content in a Criterion Objective. Partial validation indicates that a CTS only partially covered the training content of the Criterion Objective. Course training standards to which the Criterion Objective apply are identified on the Criterion Objective worksheet.

Part 2 of this section lists titles of the CTSs which were validated (evaluated). Each CTS title is preceded by columns indicating the extent to which the CTS was validated. The categories of validated and partially validated have been addressed above. The third column indicates a not-validated CTS.

The fourth column shows the category "no operational equivalent." This category identifies CTSs which were judged to represent training Enabling Objectives (preliminary learning tasks) rather than directly operational, job-related Criterion Objectives. As such, the category does not mean that these CTSs should be taught. Rather, it simply was used to identify preliminary, learning task CTSs, thus distinguishing them from validated or partially validated CTSs for which direct, operationally-based Criterion Objectives existed.

Each CTS entry also presents numbers in parentheses behind the title. The entry numbers identify the Criterion Objective worksheets (Criterion Objectives) which were used to validate (evaluate) each CTS. Thus, crossreferencing is complete. Criterion Objective worksheets identify appropriate CTS numbers, and CTSs identify corresponding Criterion Objective numbers. The reader, therefore, may work either way to further relate training content with present training requirements.

# PART I

# CRITERION OBJECTIVES

## CRITERION OBJECTIVE

1. Commonality 50% and above.

2. NEW training requirements are presented.

CRITERION OBJECTIVE WORKSHEET NO. 1

CRIT. OBJ. ORIGINS: TASKS 001, 002

SUBTASKS 001, 002, 004, 005, 008

WPN. SYS. Total NOUFFSS sample

OBJECTIVE REQUIREMENT: NEW X PAR. VAL. _____ VAL. _____

APPROX. COMMONALITY 85% C.T.S. NO. N/A

C.T.S. DESCRIPTION N/A

OBJECTIVE TITLE: Interpret and Interrelate Mission Briefing Information

CONDITION(S): Student is seated in briefing room and has been provided, as appropriate, with: written mission order, maps & charts on which all data have been annotated; and prepared flight plan. Student brings note pad and pencils.

BEHAVIOR(S): Student listens to prepared briefing; records, as required, mission-relevant information; asks questions on items not fully understood by him.

STANDARD(S): Correctly takes notes and annotates charts with waypoints, coordinates, route restrictions, enemy OB, ETAs, escape or evasion routes, usable nav aids, weather data, and anticipated communications difficulties.

PREREQUISITE SKILLS AND KNOWLEDGES: Mission order content; mission coding system; impact of intelligence data on flight plan; mission planning procedures; chart types and scales.

SUPPORTING SUBTASK BEHAVIORS:

COMMENT(S): Further detailed analysis of common briefing content or training briefing content required for explicit performance stds.

## CRITERION OBJECTIVE WORKSHEET NO. 2

CRIT. OBJ. ORIGINS: TASKS 073

SUBTASKS 323

WPN. SYS. B-1, B-52, FB-111, F-4, F-111

OBJECTIVE REQUIREMENT: NEW X PAR. VAL. _____ VAL. _____

APPROX. COMMONALITY 50% C.T.S. NO. N/A

C.T.S. DESCRIPTION N/A

OBJECTIVE TITLE: Authenticate Strike Order

CONDITION(S): Airborne aircraft has arrived at pre-planned point for strikeverification. UHF or other designated radio is tuned to receive strike order message. Strike verification form and documents present.

BEHAVIOR(S): Receives and copies strike order message in radio log; uses authenticator or authentication document. Authenticates strike order words & recall words. Coordinates with crew; makes go-no-go decision.

STANDARD(S): Go-no-go decision correct. Authenticator or authentication document correctly used; message correctly copied in radio log.

PREREQUISITE SKILLS AND KNOWLEDGES: Communications radio procedures; use of authenticator or authentication document; decision making; crew coordination.

SUPPORTING SUBTASK BEHAVIORS: N/A

COMMENT(S): Strike order verification employed primarily in conjunction with nuclear attack. Authentication may be accomplished prior to takeoff.

CRITERION OBJECTIVE WORKSHEET NO. 3

CRIT. OBJ. ORIGINS: TASKS 017, 106

SUBTASKS 072, 441

WPN. SYS. Total NOUFFSS sample

OBJECTIVE REQUIREMENT: NEW X PAR. VAL. _____ VAL. _____

APPROX. COMMONALITY 100% C.T.S. NO. N/A

C.T.S. DESCRIPTION N/A

OBJECTIVE TITLE: Review, Check and Complete Air Force Form 781 Maintenance Data

CONDITION(S): An up to date and correctly completed Air Force Form 781 is stowed in its normal location onboard the aircraft.

BEHAVIOR(S): During preflight inspection, the student reads and interprets the content of A.F. Form 781, determines whether recorded maintenance has been performed, and verifies through visual inspection whether mission-specific preparatory tasks have been accomplished. During post-flight, the student correctly enters all malfunctions and completes standard entries on Form 781.

STANDARD(S): Maintenance entries correctly identified and verified. New entries made correctly.

PREREQUISITE SKILLS AND KNOWLEDGES: Nature of malfunctions; nature of pre-mission maintenance & servicing tasks; content and use of A.F. Form 781

SUPPORTING SUBTASK BEHAVIORS: 444

COMMENT(S):

CRITERION OBJECTIVE WORKSHEET NO. 4

CRIT. OBJ. ORIGINS: TASKS 106

SUBTASKS 443

WPN. SYS. B-52, FB-111, F-4, KC-135, AWACS, C-130, C-141, C-5, RF-4

OBJECTIVE REQUIREMENT: NEW X PAR. VAL. _____ VAL. _____

APPROX. COMMONALITY 80% C.T.S. NO. N/A

C.T.S. DESCRIPTION N/A

OBJECTIVE TITLE: Complete Weather Debriefing

CONDITION(S): Student is seated with weather debriefing officer following flight. Student has flight plan, charts, required notes and flight log with him.

BEHAVIOR(S): Verbally relates wind and weather conditions encountered enroute; uses charts and flight log to describe weather conditions and locations encountered. Complete COMBAR and AFREP forms as required. Answers debriefing officer's questions regarding enroute weather.

STANDARD(S): Correctly identifies wind and weather conditions encountered during flight. Correctly answers all weather debriefing questions asked by debriefing officer. Correctly completes COMBAR and AFREP forms as required.

PREREQUISITE SKILLS AND KNOWLEDGES: Weather debriefing requirements and content; descriptions of weather types, and factors and units quantifying weather descriptions. Content of COMBAR and AFREP forms.

SUPPORTING SUBTASK BEHAVIORS: 002, 015

COMMENT(S): Additional analysis of briefing content required to specifiy test conditions and detailed performance standards.

CRITERION OBJECTIVE WORKSHEET NO. 5

CRIT. OBJ. ORIGINS: TASKS 106

SUBTASKS 442

WPN. SYS. Total NOUFFSS sample

OBJECTIVE REQUIREMENT: NEW X PAR. VAL. _____ VAL. _____

APPROX. COMMONALITY 100% C.T.S. NO. N/A

C.T.S. DESCRIPTION N/A

OBJECTIVE TITLE: Complete Intelligence Debriefing

CONDITION(S): Student is seated with intelligence debriefing officer following flight. Student has flight plan, charts, required notes and flight log with him.

BEHAVIOR(S): Verbally relates eletronic surveillance or interference encountered during mission; correctly completes ELINT form; verbally relates hostile enemy action or received voice communications; identifies positions of intelligence information on chart. Answers debriefing officer's questions regarding enroute intelligence information.

STANDARD(S): Correctly identifies intellignece information encountered during flight; correctly answers all intelligence debriefing questions asked by debriefing officer; correctly completes ELINT forms and other local or command-specific intelligence forms.

PREREQUISITE SKILLS AND KNOWLEDGES: Intelligence debriefing content; content of ELINT form.

SUPPORTING SUBTASK BEHAVIORS: 004

COMMENT(S): Additional analysis of briefing content required to specify test conditions and detailed performance standards.

## CRITERION OBJECTIVES

1. Commonality 50% and above.

2. Partially validated course training standards.

CRITERION OBJECTIVE WORKSHEET NO. 6

CRIT. OBJ. ORIGINS: TASKS 069, 070

SUBTASKS 308-313, 315, 316

WPN. SYS. F-4, B-52, FB-111, B-1, RF-4, F-111

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. X VAL. _____

APPROX. COMMONALITY 50% C.T.S. NO. W9

C.T.S. DESCRIPTION Air Refueling

OBJECTIVE TITLE: Perform Pre-Refueling Rendezvous Operations

CONDITION(S): All mission pre-rendezvous and supporting tasks have been completed. The aircraft is airborne in cruise and approaching the rendezvous area.

BEHAVIOR(S): Student follows checklist sequence and procedures; enters rendezvous coordinates into navigation computer; and configures a beacon for rendezvous. Student performs rendezvous communications, identifies tanker aircraft, deactivates non-essential equipment and determines and coordinates the relative position of tanker.

STANDARD(S): Correctly enters rendezvous coordinates and configures rendezvous beacon. Correctly performs checklist sequence and procedures; performs correct communications procedures (content, format and timing); correctly identifies tanker aircraft and determines the tanker's relative range ± 5nm and bearing ± 5 deg.

PREREQUISITE SKILLS AND KNOWLEDGES: Beacon operation procedures, radar equipment operational procedures, rendezvous procedures, checklist procedures and associated controls and displays, communication radio operational procedures, identification equipment operational procedures, decision making, data integration, radar interpretation, chart interpretation, flight plan interpretation.

SUPPORTING SUBTASK BEHAVIORS: 008, 010, 015, 017, 018, 019 022

COMMENT(S):

CRITERION OBJECTIVE WORKSHEET NO. 7

CRIT. OBJ. ORIGINS: TASKS 071, 072

SUBTASKS 317, 318, 319, 320, 321, 322

WPN. SYS. F-4, F-111, B-52, FB-111, B-1, RF-4

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. X VAL. _____

APPROX. COMMONALITY 50% C.T.S. NO. W9

C.T.S. DESCRIPTION Air Refueling

OBJECTIVE TITLE: Perform Refueling Operations

CONDITION(S): All pre-refueling rendezvous operations are completed and the tanker and receiver aircraft are in the refueling area.

BEHAVIOR(S): Student follows checklist sequence and procedures; computes and coordinates tanker offset range and bearing; directs tanker aircraft to required turning point; completes refueling procedures and monitors refueling operations. After refueling the student activates required subsystems and equipment and performs any post-refueling operations.

STANDARD(S): Correctly computes tanker range ± 2 nm and bearing ± 5 deg.; utilizes correct format, content and procedures in coordination with tanker; correctly turns tanker, performs pre-refuleing procedure and monitory refuleing operation; correctly activates subsystems and equipment after refueling and correctly performs post-refueling procedures.

PREREQUISITE SKILLS AND KNOWLEDGES: Radar interpretation, computer operation, communications radio operational procedures, communication procedures, refueling procedures, flight planning, chart interpretation, data integration, use of turn tables, tanker visual characteristics, crew coordination, checklist procedures, use of flight log, refueling safety requirements.

SUPPORTING SUBTASK BEHAVIORS: 008, 010, 015, 017, 018, 019, 022, 023, 308, 309, 310, 311, 312, 313, 315, 316

COMMENT(S):

CRITERION OBJECTIVE WORKSHEET NO. 8

CRIT. OBJ. ORIGINS: TASKS 018,021,029,037,039,042,044,047,051,053, 070-071,087,090,095,097,101

SUBTASKS 243, 248, 313, 318, 370, 382, 385, 404, 412, 426 075, 089-90, 128-29, 163-65, 174, 185, 190, 214

WPN. SYS. Total NOUFFSS sample

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. X VAL. _____

APPROX. COMMONALITY 90% C.T.S. NO. U3, U12, U14, U18,

C.T.S. DESCRIPTION See Section V, Part II for corresponding CTS titles.

OBJECTIVE TITLE: Perform General Mission Communications

CONDITION(S): Requirements exist for general aircraft communication during mission segments such as taxi, pretakeoff, takeoff, departure, cruise, ATC, rendezvous, refueling, contingencies, descent, and post-mission taxi.

BEHAVIOR(S): Student performs checkout, activation, and utilization beginning with power-off checks and power-on checks of radio and identification equipment. Mission communication includes: ground control communications, H.F. radio checks; pretakeoff, takeoff cruise (including ATC coordination) and position reporting; rendezvous; refueling; contingencies, emergencies and requests for assistance; approach (including ATC communications); post-mission communication with ground control. Deactivation of communication equipment follows post-mission taxi.

STANDARD(S): Correctly checks out, activates/deactivates, tunes, and communicates according to established communication procedures during all mission phases requiring general aircraft communications.

PREREQUISITE SKILLS AND KNOWLEDGES: Familiarity with communication CB's, radio equipment operational procedures, communication procedures message content and abbreviations, position report content, refueling communication procedures, emergency message content, interphone operational procedures.

SUPPORTING SUBTASK BEHAVIORS: 024

COMMENT(S): Additional analysis required to identify correct communication procedures, message content and format; establish performance standards and performance measurement criteria.

CRITERION OBJECTIVE WORKSHEET NO. 9

CRIT. OBJ. ORIGINS: TASKS 054

SUBTASKS 250, 252, 253

WPN. SYS. F-4, F-111, FB-111, RF-4, C-130, C-5, AWACS

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. X VAL. _____

APPROX. COMMONALITY 55% C.T.S. NO. U4, U16

C.T.S. DESCRIPTION Prepare and use maps, charts and navigation logs; Range control.

OBJECTIVE TITLE: Perform Inflight Fuel Management

CONDITION(S): Aircraft is in nominal cruise flight and requirements exist for fuel management computations.

BEHAVIOR(S): Student establishes fuel quantity and flow; compares and plots actual with predicted fuel usage. The student then determines if fuel is adequate for mission completion and if any alterations are required in the vertical navigation profile to optimize fuel usage.

STANDARD(S): Correctly determines fuel quantity ± 5% and if fuel is adequate for mission completion ± TBD%. Performs fuel management computations according to correct procedures; determines correct vertical profile for optimum fuel usage (± as reqd ft.) and plots and/or records fuel data on forms.

PREREQUISITE SKILLS AND KNOWLEDGES: Aircraft performance capabilities and requirements, chart interpretation, decision making, read fuel and computer displays, interpret flight plan, use of fuel forms, fuel planning procedures, aircraft fuel consumption characteristics.

SUPPORTING SUBTASK BEHAVIORS: 019, 022

COMMENT(S):

CRITERION OBJECTIVE WORKSHEET NO. 10

CRIT. OBJ. ORIGINS: TASKS 087, 089

SUBTASKS 369, 370, 371, 372, 377, 378, 379

WPN. SYS. Total NOUFFSS sample

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. X VAL. _____

APPROX. COMMONALITY 85% C.T.S. NO. U14, U15

C.T.S. DESCRIPTION Use of navigation equipment, Navigate using prescribed techniques.

OBJECTIVE TITLE: Perform Inflight Mission Replanning

CONDITION(S): Aircraft is airborne during a normal operational mission and maybe flying either a high altitude or a low altitude leg. Because of weather, onboard emergency, change in mission objective, ARCT, recovery base or similar reason, student is required to replan route while airborne. Allonboard navigation equipment is operational.

BEHAVIOR(S): The student determines present position and desired alternative position; coordinates with aircraft commander; communicates with ATC as required; plots new course on chart; computes new fuel requirements; and updates flight log. Correctly inputs destination coordinates to computer; informs pilot of new heading to be flown.

STANDARD(S): Message transmission and content correct; flight log entries correct; new checkpoints and/or destination correctly identified; new computation: course ± 2 deg., ETA ± 3 minutes, fuel ± 5%, TAS ± 5 knots; electronics computer entries correct if computer used; replanning accomplished in approximately 5 minutes.

PREREQUISITE SKILLS AND KNOWLEDGES: Communication procedures and message content; crew coordination; mission planning procedures; use of hand held navigation tools; chart interpretation; onboard navigation equipment operation; weather radar interpretation; time control techniques; aircraft performance characteristics; letdown plate interpretation.

SUPPORTING SUBTASK BEHAVIORS: 008, 010, 014, 015, 016, 017, 018, 019, 020, 022, 023, 025, 026, 027, 028, 031, 033

COMMENT(S): Manual procedure replaced by computer operation in sophisticated avigation systems of B-1, FB-111, F-4, F-111, AWACS, and C-5. Less than 100% commonality reflects EWO's not performing this objective.

CRITERION OBJECTIVE WORKSHEET NO. 11

CRIT. OBJ. ORIGINS: TASKS 051

SUBTASKS 235, 236, 237, 238, 239, 240, 241, 242

WPN. SYS. Total NOUFFSS sample

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. x VAL. _____

APPROX. COMMONALITY 85% C.T.S. NO. U2

C.T.S. DESCRIPTION Interpret Weather

OBJECTIVE TITLE: Direct Aircraft Along Weather Penetration Route

CONDITION(S): Student is executing a routine preplanned mission and receives a radio weather report advising him of possible adverse weather (a thunder storm) on his filed flight route that includes high crosswinds (direction & velocity of wind undefined) and has at his command his flight plan and charts, TAS Indicator, nav. clock, computer, hand computer, radar, flight log.

BEHAVIOR(S): Determine current wind direction and velocity using (1) Radar Target Timing Techniques, (2) Fix to Fix Techniques, and (3) Point Wind Run Technique, determine effect of winds on groundspeed, compute new required TAS to maintain flight plan, project wind conditions along planned route, determine most favorable penetration route, communicate required changes to pilot and monitor aircraft heading and TAS

STANDARD(S): Correct wind velocity determination to ± 10 knots, and correct wind direction determination to ± 10 degrees using Target Timing, Fix to Fix and Point Wind Run Technique, computation of TAS to ± 1 knot using hand computer, calculation of required changes in airspeed and heading to maintain required heading and airspeed and selection of weather penetration ~~route that would keep A/C on course based on above.~~

PREREQUISITE SKILLS AND KNOWLEDGES: Weather interpretation, knowledge of wind computation, relationship of wind to IAS/TAS; Target Timing, Fix to Fix and Wind Run Techniques, chart interpretation, crew coordination, aircraft performance characteristics.

SUPPORTING SUBTASK BEHAVIORS: 002, 008, 014, 015, 106, 022

COMMENT(S):

CRITERION OBJECTIVE WORKSHEET NO. 12

CRIT. OBJ. ORIGINS: TASKS 090

SUBTASKS 380, 381, 382, 383, 384, 385

WPN. SYS. Total NOUFFSS sample

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. X VAL. _____

APPROX. COMMONALITY 100% C.T.S. NO. U12, W18

C.T.S. DESCRIPTION Aircraft emergency procedures; Normal and emergency operations.

OBJECTIVE TITLE: Perform Corrective Actions for Onboard Equipment Fires

CONDITION(S): Smoke of fault warning signals are identified at or near the student's work area in the aircraft. Aircraft is airborne and is on a normal operational flight. Student identifies occurrence of fire or is verbally alerted of equipment fire by another crewmember.

BEHAVIOR(S): Student identifies source of fire; deactivates equipments involved in the fire; requests assistance from other crewmembers as appropriate; operates $CO^2$ extinguisher in a manner which will extinguish the fire as appropriate; advises aircraft commander of system status; prepares and transmits emergency message as required.

STANDARD(S): Source of fire correctly identified; correct equipment deactivation procedures performed; $CO^2$ extinguisher correctly used to extinguish fire as appropriate; system operating status correctly determined; aircraft commander correctly informed of system status; emergency message correctly prepared and transmitted as required.

PREREQUISITE SKILLS AND KNOWLEDGES: Crew coordination; fire indications and annunciators; emergency procedures; equipment deactiviation procedures; emergency message content and communications procedures; extinguisher operation, system trouble-shooting.

SUPPORTING SUBTASK BEHAVIORS: 386

COMMENT(S): Fire fighting capabilities & techniques vary broadly among weapon systems.

CRITERION OBJECTIVE WORKSHEET NO. 13

CRIT. OBJ. ORIGINS: TASKS 092

SUBTASKS 390, 391, 392, 393, 394, 395, 396

WPN. SYS. Total NOUFFSS sample

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. X VAL. _____

APPROX. COMMONALITY 100% C.T.S. NO. U12, U21, W18

C.T.S. DESCRIPTION Aircraft emergency procedures; Survival techniques and procedures; Normal and emergency operation.

OBJECTIVE TITLE: Prepare for Ditch or Crash Landing

CONDITION(S): Aircraft is airborne, but ditch or crash landing is to be accomplished.

BEHAVIOR(S): Student identifes & acknowledges ditch or crash landing order; prepares and transmits emergency message as required; performs pre-crash or ditching checklist procedures; assumes ditching or crash landing position; evacuates aircraft and deploys survival equipment as required.

STANDARD(S): Procedures correctly performed, message correctly transmitted as required; ditching or crash landing position correctly assumed; aircraft exited through correct exit; survival equipment obtained and correctly deployed as required.

PREREQUISITE SKILLS AND KNOWLEDGES: Crash landing and ditching signals and procedures; aircraft evacuation procedures; survival and emergency communications techniques.

SUPPORTING SUBTASK BEHAVIORS: 387

COMMENT(S):

CRITERION OBJECTIVE WORKSHEET NO. 14

CRIT. OBJ. ORIGINS: TASKS 090, 091

SUBTASKS 389

WPN. SYS. B-52, FB-111, B-1, F-4, RF-4, F-111

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. X VAL. _____

APPROX. COMMONALITY 55% C.T.S. NO. U12, U21, W18

C.T.S. DESCRIPTION Aircraft emergency procedures; Survival techniques and procedures; Normal and emergency operation.

OBJECTIVE TITLE: Eject from Airborne Aircraft

CONDITION(S): Ejection has been ordered by the aircraft commander. Aircraft speed, altitude and attitude are within acceptable limits for safe ejection.

BEHAVIOR(S): Student identifies ejection order signal; assumes correct ejection position in ejection seat; ejects, descends and lands.

STANDARD(S): Ejection signal or command correctly identified; ejection procedures correctly accomplished within approximately 3.0 seconds; separation from seat accomplished after ejection; descent using parachute or parasail accomplished.

PREREQUISITE SKILLS AND KNOWLEDGES: Ejection seat checkout, arming & safing procedure; ejection signals & procedures; manual control of parachute or parasail; landing techniques; survival and emergency communication techniques.

SUPPORTING SUBTASK BEHAVIORS: 065, 156, 159, 160, 421, 422, 423

COMMENT(S): F-111, FB-111 and B-1 employ capsule ejection; separation from seat & manual control of descent not required.

CRITERION OBJECTIVE WORKSHEET NO. 15

CRIT. OBJ. ORIGINS: TASKS 091

SUBTASKS 388

WPN. SYS. B-52, F-4, RF-4, AWACS, KC-135, C-130, C-141, C-5A

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. X VAL. _____

APPROX. COMMONALITY 75% C.T.S. NO. U12, U21, W18

C.T.S. DESCRIPTION Aircraft emergency procedures; Survival techniques and procedures; Normal and emergency operation.

OBJECTIVE TITLE: Bailout of Airborne Aircraft

CONDITION(S): Bailout has been ordered. Aircraft speed, altitude and attitude are within acceptable limits for bailout.

BEHAVIOR(S): Student identifies and acknowledges bailout order; transmits emergency message as required; performs pre-evacuation procedures as required; advances to assigned exit, bails out, operates chute opening controls, descends and lands.

STANDARD(S): Bailout signal or command correctly identified and acknowledged; emergency message correctly transmitted as re-required; pre-evacuation procedures correctly performed as required; exited through correct aircraft exit; parachute opening controls correctly operated; descent using parachute or parasail accomplished.

PREREQUISITE SKILLS AND KNOWLEDGES: Bailout signals and procedures; pre-evacuation procedures; manual control of parachute or parasail; landing techniques; survival and emergency communication techniques; parachute inspection procedures.

SUPPORTING SUBTASK BEHAVIORS: 066, 387

COMMENT(S):

## CRITERION OBJECTIVES

1. Commonality 50% and above.
2. Validated course training standards.

CRITERION OBJECTIVE WORKSHEET NO. 16

CRIT. OBJ. ORIGINS: TASKS 008

SUBTASKS 373, 374, 375, 376

WPN. SYS. Total NOUFFSS sample

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. _____ VAL. X

APPROX. COMMONALITY 100% C.T.S. NO. U9, U19, E18, N9, W18

C.T.S. DESCRIPTION See Section V, Part II for corresponding CTS titles.

OBJECTIVE TITLE: Perform Equipment Malfunction Analysis

CONDITION(S): During preflight equipment checkout, or while airborne during any mission phase, equipment malfunctions of two types occur: (1) conspicuous and (2) insidious. Equipments involved include, as appropriate to the weapon system, Navigation, Fire Control, Bombing, Missile, Flight Control, Communication, Life Support, or Penetration Aids.

BEHAVIOR(S): Student identifies conspicuous (annunciator light) or insidious (drifting or gradual) malfunctions; identifies and takes appropriate remedial action; correctly assesses remaining system capabilities; coordinates with other crew members.

STANDARD(S): Performance standards cannot be specified without reference to particular malfunctions, except to specify that the malfunctions are detected.

PREREQUISITE SKILLS AND KNOWLEDGES: Trouble-shooting Techniques; fault of malfunction indications; acceptable tolerance levels; specific subsystem operation; replaceable units and replacement procedures; alternative modes of operation.

SUPPORTING SUBTASK BEHAVIORS: All equipment checkout and operation subtasks.

COMMENT(S): Malfunction analysis and isolation skills are very system and equipment specific. Malfunction analysis principles, however, should be generalizable.

CRITERION OBJECTIVE WORKSHEET NO. 17

CRIT. OBJ. ORIGINS: TASKS 003, 004, 006

SUBTASKS 014, 015, 016, 018, 019, 020, 022, 025

WPN. SYS. Total NOUFFSS sample except C-5

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. _____ VAL. X

APPROX. COMMONALITY 85% C.T.S. NO. U1, U4, U5, U16, U24 W11

C.T.S. DESCRIPTION See Section V, Part II for corresponding CTS titles.

OBJECTIVE TITLE: Perform Mission Planning and Chart Preparation

CONDITION(S): Student has recieved mission order and/or mission briefing for a high-low-high over land and water mission to a distant Air Force Base. He is provided with working space suitable for flight planning.

BEHAVIOR(S): Student plans the required mission, preparing all necessary charts, flight planning forms and required local forms.

STANDARD(S): Selects appropriate charts; verifies currency of planning documents; identifies destination, alternatives, restricted areas, suitable enroute CP coordinates (± 0.5 min.); interprets enroute wind & weather data; plots course (± 2 deg.); determines headings and mag. var. (± 2.0 deg.); computes ETAs (± 2.0 min.); determines required fuel (± 5%), correct altitudes, radio nav. & comm. frequencies; correctly annotates charts and completes cellestial precomputations as required.

PREREQUISITE SKILLS AND KNOWLEDGES: Use of charts, flips, notams, supplements, sigmets, mission weather forms, letdown plates, flight plan forms; military, FAA, ICAO & Local regulations; mission planning procedures; weather interpretation; aircraft performance profile; HO-249; use of radio nav aids and onboard computers & radars; fuel consumption characteristics; celestial navigation.

SUPPORTING SUBTASK BEHAVIORS: 001, 002, 004, 005, 008, 009, 010, 017, 021, 023, 024, 031, 033, 369, 370, 372, 378, 379

COMMENT(S): Measurement of performance, including planning time, requires development of a "test" mission.

CRITERION OBJECTIVE WORKSHEET NO. 18

CRIT. OBJ. ORIGINS: TASKS 008, 046

SUBTASKS 040, 041, 042, 043, 066, 067, 068, 205

WPN. SYS. Total NOUFFSS sample

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. _____ VAL. X

APPROX. COMMONALITY 80% C.T.S. NO. U6, U7, U8, U12, U21, N4, W17

C.T.S. DESCRIPTION See Section V, Part II for corresponding CTS titles.

OBJECTIVE TITLE: Demonstrate Proficiency in Life Support Subsystems Principles of Operation and Utilization

CONDITION(S): Mission planning has been completed. Personnel equipment (flight clothing, G-suit, oxygen mask, regulator, helmet, headset, weapons, life vest and parachute) and required life support subsystems (oxygen system, air condition panel, pressurization panel, defog/deice panel) are provided. The TO's and checklists specific to this equipment are provided.

BEHAVIOR(S): Student checks out and identifies equipment damage of malfunction of the following items: oxygen mask and regulator, helmet, G-suit, headset, personal weapons, parachute and survival kit. Student performs checks on oxygen subsystem, cabin pressure & air conditioning system, and defog/deice equipment for takeoff, climb, high altitude and low altitude mission phases. Student explains symptoms of oxygen deprivation, G-force blackout and effect of depressurization.

STANDARD(S): Student correctly identifies and checks out each item of personal equipment; connects equipment to appropriate life support subsystem; identifies equipment damage/malfunction, equipment configuration for take-off, cruise, high altitude and low altitude mission and identifies and explains the physiological effects of altitude, G-force, and depressurization.

PREREQUISITE SKILLS AND KNOWLEDGES: Visual Inspection criteria, knowledge of mask, regulator, G-suit, helmet and headset construction; parachute, life vest, personal weapon and survival kit serviceability criteria, on-board systems (oxygen, pressurization and air conditioning) principles and operation and life support subsystems emergency procedures.

SUPPORTING SUBTASK BEHAVIORS: 002, 015, 017, 040-043, 066-068, 156, 157, 158, 169, 205, 258, 270, 319, 387, 390, 431, 446

CRITERION OBJECTIVE WORKSHEET NO. 19

CRIT. OBJ. ORIGINS: TASKS 18, 19, 26-28, 39, 41, 42, 44

SUBTASKS 075-79, 080-84, 108-110, 113, 116, 117, 121, 123-25, 173, 182-85, 189

WPN. SYS. Total NOUFFSS Sample

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. _____ VAL. X

APPROX. COMMONALITY 90% C.T.S. NO. U9, U11, U13. U14, U15, U27, N3, W3

C.T.S. DESCRIPTION See Section V, Part II for corresponding CTS titles.

OBJECTIVE TITLE: Perform Navigation Operations Prior to Cruise

CONDITION(S): Student is seated in aircraft. All mission planning is completed and appropriate checklists, TO's, charts, FLIPS, flight plan, forms, etc. are aboard.

BEHAVIOR(S): Student performs equipment/subsystem procedures including power-off, power-on, taxi, and pretakeoff, and takeoff and departure checks. Equipment checked includes: CB's, radar, doppler, inertial, loran, TACAN, sextant, ADF, altimeter, nav-computer (including entering of present position, enroute and vertical nav data), TFR, and compass. Takeoff, climb and departure procedures include monitoring aircraft performance (acceleration, rate of climb, wingman configuration and position); monitoring adherence to departure clearance and procedures.

STANDARD(S): Correctly follows checklist sequence and procedures; correctly enters computer waypoint data and monitors aircraft performance and position.

PREREQUISITE SKILLS AND KNOWLEDGES: Radar, inertial nav. computer, TACAN, sextant, doppler, TFR, compass operational procedures; checklist procedures, flight plan interpretation, visual display interpretation, flight instrument interpretation, departure procedures, radio or radar altimeter operational procedures, decision making, project aircraft flight path.

SUPPORTING SUBTASK BEHAVIORS: 008, 009, 017, 018, 022, 031

COMMENT(S): Loran, omega, consolan, radios (LF, VOR) and autocelestial are very low commonality and should be considered unique for specialized applications, systems or backup capabilities.

CRITERION OBJECTIVE WORKSHEET NO. 20

CRIT. OBJ. ORIGINS: TASKS 048, 049, 053

SUBTASKS 218, 219, 220, 223, 224, 228, 230, 247, 248

WPN. SYS. Total NOUFFSS sample

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. _____ VAL. X

APPROX. COMMONALITY 90% C.T.S. NO. U4, U14, U15

C.T.S. DESCRIPTION Prepare and use maps, charts and navigation logs; Use of navigation equipment; Navigate using prescribed techniques.

OBJECTIVE TITLE: Determine Aircraft Position

CONDITION(S): Aircraft is in nominal cruise flight and requirements exist to determine present aircraft position.

BEHAVIOR(S): Student identifies landmark either visually or on radar using charts, photographs, or other information for reference. Using as appropriate, pilotage, loran, radios (LF, VOR, TACAN), doppler, celestial, or automatic systems (inert , tapes, etc.), individually or in combination, the student determines present position. Having determined present position a position report is prepared and transmitted.

STANDARD(S): Student correctly identifies landmark and determines present aircraft position ± 0.5 nm; correctly prepares and transmits position report.

PREREQUISITE SKILLS AND KNOWLEDGES: Chart interpretation, mapping radar interpretation, cultural display features, decision making, converting cartographic to visual data, radar operational procedures, computer procedures, dead reckoning, use of flight log, evaluation of integrated data to determine most probable location, self-orientation, message content communication radios operational procedures.

SUPPORTING SUBTASK BEHAVIORS: 204, 208, 209

COMMENT(S): Loran, Omega, consolan, radios (LF, VOR), and Autocelestial are very low commonality and should be considered unique for specialized applications, systems, or backup capabilities.

CRITERION OBJECTIVE WORKSHEET NO. 21

CRIT. OBJ. ORIGINS: TASKS 050, 052

SUBTASKS 231, 232, 233, 234, 244, 245, 246

WPN. SYS. Total NOUFFSS Sample

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. _____ VAL. X

APPROX. COMMONALITY 90% C.T.S. NO. U4, U14, U15

C.T.S. DESCRIPTION Prepare and use maps, charts and navigation logs; Use of navigation equipment; Navigate using prescribed techniques.

OBJECTIVE TITLE: Compute and Maintain Track Altitude, and Airspeed

CONDITION(S): Aircraft is in nominal cruise flight and requirements exist to determine or maintain required track, altitude, and airspeed.

BEHAVIOR(S): Student determines present track and groundspeed using as appropriate, charts, plotter, manual computer, radar timing techniques, or computer displays. Student then performs timing point computations, adjusts airspeed and determines any changes required in heading or altitude.

STANDARD(S): Determines course ± 2 deg., distance ± 5nm, groundspeed ± 5-10 knts. ETA ± 3.0 min, heading ± 2 deg., and altitude ± 100 ft.

PREREQUISITE SKILLS AND KNOWLEDGES: Integrate position and wind data to determine new heading, crew coordination, interpret compass and drift displays, use of flight log, compute new heading, altitude computation procedures, interpret flight plan, A/C fuel consumption charac., manual computer operation, timing control techniques and procedures, dead reckoning, use of plotter and dividers, computer displays.

SUPPORTING SUBTASK BEHAVIORS: 218, 219, 220, 222, 224, 228, 230, 247, 248

COMMENT(S):

## CRITERION OBJECTIVE WORKSHEET NO. 22

CRIT. OBJ. ORIGINS: TASKS 093, 095, 096

SUBTASKS 398, 399, 400, 403, 404, 405, 407, 408, 409, 410

WPN. SYS. Total NOUFFSS sample

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. _____ VAL. X

APPROX. COMMONALITY 85% C.T.S. NO. U17

C.T.S. DESCRIPTION Airborne radar approach procedures.

OBJECTIVE TITLE: Perform Airborne Radar Approach

CONDITION(S): Aircraft in normal operation and prepared to turn to the final approach heading. All navigation predescent and descent operations have been performed.

BEHAVIOR(S): Identifies runway on radar return; lays crosshairs over runway point and maintains them there; monitors vertical profile and coordinates with pilot as required. Monitors and interprets radio Nav. aid displays and computer displays. Monitors and interprets ATC communications, and records clearances; monitors vertical clearance and flight profile; identifies significant departures from acceptable approach flight path and coordinates with pilot.

STANDARD(S): Correctly identifies target point; positions cursor correctly over radar return and updates cursor on time; correctly enters data into computer; communications content correct; clearances recorded correctly. Reads radar altitudes ± 20 feet; identifies significant departures from acceptable flight path.

PREREQUISITE SKILLS AND KNOWLEDGES: Scope interpretation, crosshair alignment, approach procedures, ground communication, terminal area procedures, ATC communication content, routine safety procedures, missed approach procedures, computer operational procedures; letdown plate interpretation; radar altimeter interpretation

SUPPORTING SUBTASK BEHAVIORS:

COMMENT(S): Allowable crosshair error to be determined. Additional analysis required to specify "significant departures from acceptable flight path."

CRITERION OBJECTIVE WORKSHEET NO. 23

CRIT. OBJ. ORIGINS: TASKS 93, 95, 101

SUBTASKS 397, 399, 400, 401, 403, 405, 425

WPN. SYS. Total NOUFFSS sample

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. _____ VAL. X

APPROX. COMMONALITY 90% C.T.S. NO. U9, U11, U14, U15, W2

C.T.S. DESCRIPTION See Section V, Part II for corresponding CTS titles.

OBJECTIVE TITLE: Perform Post-Cruise Navigation Operations

CONDITION(S): Aircraft is in nominal flight and all cruise operations have been completed.

BEHAVIOR(S): Student configures navigation subsystems for approach and landing, including setup of navigation radios, entering vertical, horizontal and present position (radar update) data into computer. Student also secures sextant, monitors navigation subsystems and aircraft performance. During post flight the student deactivates navigation equipment.

STANDARD(S): Correctly follows checklist sequence and procedures; correctly sets up navigation radios and correctly enters data into navigation computer; all navigation subsystems are correctly deactivated.

PREREQUISITE SKILLS AND KNOWLEDGES: Crew coordination, chart interpretation, letdown plate interpretation, interpret flight plan; tacan, ILS, nav. computer, operation procedures; decision making, interpret radar, data integration, mental dead reckoning, checklist procedures.

SUPPORTING SUBTASK BEHAVIORS:

COMMENT(S): Some navigation subsystems and equipment may be deactivated during various phases of cruise.

CRITERION OBJECTIVE WORKSHEET NO. 24

CRIT. OBJ. ORIGINS: TASKS 001

SUBTASKS 006, 007

WPN. SYS. C-130, C-5, C-141

OBJECTIVE REQUIREMENT: NEW X PAR. VAL. _____ VAL. _____

APPROX. COMMONALITY 30% C.T.S. NO. N/A

C.T.S. DESCRIPTION N/A

OBJECTIVE TITLE: Interpret Combat Air Drop Briefing Content

CONDITION(S): Student is seated in briefing room; has been provided as appropriate, with: written mission order, charts, prepared flight plan, MAC air drop forms, and pre-planned combat air drop procedures.

BEHAVIOR(S): Listen to prepared combat air drop lead navigator and special briefings; interpret approach, dropzone and escape data; record, as required, mission-relevant data.

STANDARD(S): Correctly records: DZ description, dimensions, altitude, coordinates, artificial aids, sequences and drop times; radar aim point descriptions, corrdinates, aimpoint to DZ distance and bearing; wind, temperature, weather data and visual timing points data; cargo/troop type, weight, loading, number and chute data. Correctly completes MAC and/or local forms as appropriate.

PREREQUISITE SKILLS AND KNOWLEDGES: Radar and sensor return interpretation, map interpretation, flight planning procedures, cargo and release procedure tech. data, wind compensation techniques.

SUPPORTING SUBTASK BEHAVIORS: 001, 002, 004, 005, 008, 012, 01 017, 018

COMMENT(S): If all briefing materials are fully prepared and simply distributed, direct measurement of student performance may not be possible.

CRITERION OBJECTIVE WORKSHEET NO. 25

CRIT. OBJ. ORIGINS: TASKS 005

SUBTASKS 028

WPN. SYS. C-130, C-141

OBJECTIVE REQUIREMENT: NEW X PAR. VAL. _____ VAL. _____

APPROX. COMMONALITY 25% C.T.S. NO. N/A

C.T.S. DESCRIPTION N/A

OBJECTIVE TITLE: Perform Combat Air Drop Mission Planning

CONDITION(S): Student has received combat air drop mission briefings; is provided with: written mission order; MAC or TAC Form 853; prepared charts; hand-held flight planning tools; and suitable working space.

BEHAVIOR(S): Student identifies approach and excape corridors; identifies the drop zone, identifies terrain features, heights and hazards along corridors and at DZ; verifies safety of flight plan; performs preflight CARP computations; and completes MAC or TAC Form 853.

STANDARD(S): Approach/Escape corridors are correctly identified, as are course, heading and altitude data. Drop zone and timing point corectly identified. All CARP computations completed with correct data and no computational errors; Form 853 completed correctly.

PREREQUISITE SKILLS AND KNOWLEDGES: Chart interpretation, terrain impact interpretation; weather data interpretation; use of manual computer, mental calculations, weather impact on planning; cargo release procedures, manual CARP computations, cargo drop procedures & timing techniques, radar return features, crew coordination.

SUPPORTING SUBTASK BEHAVIORS: 001, 002, 004, 005, 006, 007, 008, 009, 010, 014, 017, 018, 020, 022, 024, 025, 031

COMMENT(S): Majority of air drop missions are pre-planned, but evaluation of pre-planned mission requires planning skills.

CRITERION OBJECTIVE WORKSHEET NO. 26

CRIT. OBJ. ORIGINS: TASKS 022, 030, 044, 057, 069, 094, 101

SUBTASKS 091, 092, 133, 134, 188, 265-268, 312, 402, 427

WPN. SYS. FB-111, F-111, F-4, RF-4, B-1

OBJECTIVE REQUIREMENT: NEW X PAR. VAL. _____ VAL. _____

APPROX. COMMONALITY 35% C.T.S. NO. N/A

C.T.S. DESCRIPTION N/A

OBJECTIVE TITLE: Setup, Monitor and Override Penetration Aids and Determine Appropriate Defensive Tactics or Evasive Action

CONDITION(S): Aircraft is designated for a tactical or strategic mission as appropriate; flight planning has been completed; both crewmembers are on-board and have necessary charts, flight plan, logs and checklists.

BEHAVIOR(S): Uses appropriate checklists to preflight penetration aids; presets penetration aid controls as briefed; activates and monitors penetration aids when near or over hostile area; monitors & interprets visual and auditory threat displays; determines whether pen. aids are operating correctly; employs defensive strategies & tactics as required by manually overriding equipment; deactivates pen. aids in accordance with checklist.

STANDARD(S): Correctly performs checklist procedures; correctly presets controls; correctly identifies auditory & visual threat displays; correctly identifies equipment malfunctions; correctly manually selects override modes.

PREREQUISITE SKILLS AND KNOWLEDGES: Checklist procedures; malfunction indications; audio threat signal and visual threat symbol identification; defensive strategies & tactics; correct use of manual override controls; crew coordination; flight plan, chart & threat symbol code interpretation.

SUPPORTING SUBTASK BEHAVIORS: 002, 004, 012, 013, 029

COMMENT(S): B-1 Pen. aids operation tasks may be highly similar to those above, but equipment and system have not yet been determined.

CRITERION OBJECTIVE WORKSHEET NO. 27

CRIT. OBJ. ORIGINS: TASKS 023, 058, 059, 060

SUBTASKS 120, 269, 271-282

WPN. SYS. C-130, C-5, C-141

OBJECTIVE REQUIREMENT: NEW X PAR. VAL. _____ VAL. _____

APPROX. COMMONALITY 30% C.T.S. NO. N/A

C.T.S. DESCRIPTION N/A

OBJECTIVE TITLE: Direct Combat Air Drop

CONDITION(S): Previous checkpoint ETA was made within ± 3 minutes. Aircraft has been decellerated to drop speed, and is flying at drop altitude. VFR conditions prevail.

BEHAVIOR(S): Drop zone coordinates are correctly entered into navigation computer; setup radar for low level operations; completes predrop checklist procedures; updates CARP computations using Form 853 and other local forms as required. Directs aircraft's approach to D.Z. visually or using radar; identifies timing landmark visually or using radar; times drop and advises cargo release; performs post-drop checklist procedures.

STANDARD(S): Procedures performed correctly; CARP computations arithmatically correct; cargo/troops dropped ± 90 seconds of planned drop time; cargo/troops land within 300 yard radius of center of drop zone. Course over DZ ± 2 degrees.

PREREQUISITE SKILLS AND KNOWLEDGES: Checklist procedures; NAV or AWADS computer operation; mapping radar interpretation & cursor loging; combat air drop requirements & procedures; low level navigation & chart interpretation; time control, use of hand-held computer, Form 853 and drop zone diagrams; crew coordination.

SUPPORTING SUBTASK BEHAVIORS: 006, 007, 028

COMMENT(S): Visually directed drop presently is most common technique for all three systems.

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## CRITERION OBJECTIVE

1. Commonality 20-49%.

2. Partially validated course training standards.

CRITERION OBJECTIVE WORKSHEET NO. 28

CRIT. OBJ. ORIGINS: TASKS 002, 005, 007

SUBTASKS 001, 026, 030, 035

WPN. SYS. F-4, F-111, FB-111, B-52

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. X VAL. _____

APPROX. COMMONALITY 35% C.T.S. NO. N2, W13

C.T.S. DESCRIPTION Planning of navigation and bombing phases of a mission; Weapons delivery planning.

OBJECTIVE TITLE: Perform Weapon Delivery Planning

CONDITION(S): Student is provided with target description and target intelligence data; necessary charts and aircraft weapons load information; student is given written mission order and has received mission briefing.

BEHAVIOR(S): Student obtains required forms, TO's, checklists, weapon delivery documents. Student interprets target data to identify radar scope presentation; identifies best approach corridor on charts; identifies weapon load & distribution; selects weapon delivery techniques & release sequence; computes target, IP & offset coordinates; computes last resort bombing and emergency weapon release data, plots approach and escape routes on charts and completes required TAC or SAC forms.

STANDARD(S): Coordinates calculated ± 0.5 min.; decisions correct; calculations correct; necessary form entries correct. Approach and escape course ± 0.2 deg.

PREREQUISITE SKILLS AND KNOWLEDGES: Tech. order document weapons content; decision making; weapon types, performance envelopes and delivery techniques; chart interpretation, mission planning procedures, translating cartographic and photo data into radar display characteristics; use of SAC or TAC weapon delivery planning forms.

SUPPORTING SUBTASK BEHAVIORS: 001, 002, 003, 004, 008, 010, 041, 015, 017, 018, 022, 024, 025, 032

COMMENT(S): This objective is oriented heavily toward the F-4 weapon system.

CRITERION OBJECTIVE WORKSHEET NO. 29

CRIT. OBJ. ORIGINS: TASKS 005, 056

SUBTASKS 254-264

WPN. SYS. B-52, B-1, FB-111, RF-4C, F-4E

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. X VAL. _____

APPROX. COMMONALITY 40% C.T.S. NO. N5, N6, W7, W10

C.T.S. DESCRIPTION Operation of nav-bomb systems; Operation of AN/ASQ-38 ancillary equipment; Ground attack; Ground attack (Night).

OBJECTIVE TITLE: Perform Low Level Navigation Procedures

CONDITION(S): Aircraft is designated for TF/TA mission segment; flight planning has been completed, all crewmembers have requisite charts, flight plans, logs and checklists aboard; aircraft has reached descent initiation point and order to descend has been given.

BEHAVIOR(S): Utilize approptiate checklists, charts and plans to configure required subsystems (TF/TA radars, BNS, altimeters, computers, subsystems) for descent/low level flight; monitor required subsystems (communications, altimeter and Nav-computer) while negotiating required low-level leg of mission.

STANDARD(S): Correct performance of checklist precedures, detection of incorrect subsystem indications or unsafe conditions, and completion of mission segment at required airspeed to ± 10 knots, altitude to ± 20 feet, heading to ± 2 degrees and time to ± 1 second.

PREREQUISITE SKILLS AND KNOWLEDGES: Self-orientation, checklist procedures, scope interpretation, malfunction indications, unsafe aircraft and subsystem conditions, aircrew coordination procedures, TF/TA tactics and procedures, flight plan and chart interpretation, required corrective action for malfunctions or unsafe conditions, and emergency procedures; A/C performance characteristics.

SUPPORTING SUBTASK BEHAVIOR: 002, 014, 016, 017, 018, 022, 025, 113, 115, 118, 122, 125, 31, 229, 231, 232, 233, 234

COMMENT(S): Additional analysis required to establish system specific standards.

CRITERION OBJECTIVE WORKSHEET NO. 30

CRIT. OBJ. ORIGINS: TASKS 074, 075, 076, 077

SUBTASKS 325-338, 212

WPN. SYS. F-4E, F-111A B-52G, FB-111, B-1

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. X VAL. _____

APPROX. COMMONALITY 25% C.T.S. NO. N5, N11, N12, W6, W7, W8, W22

C.T.S. DESCRIPTION Operation of Bomb-Nav systems, Delivery of nuclear weapons; Delivery of conventional weapons; Ground attack; Nuclear weapons delivery.

OBJECTIVE TITLE: Perform Low-Level Weapon Delivery Procedures

CONDITION(S): Student is executing a routine low-level weapons delivery mission; the aircraft has reached target area and is flying at weapon delivery altitude and airspeed; the final Nav. system up-date has been performed and system is on course; student has all requisite TO's, checklists, flight plans, charts, target briefing data, and is using a typical bomb-nav system radar, weapon control system, or ADM-20 control panel.

BEHAVIOR(S): Configure the above equipment for delivery of a HE weapon and then for a nuclear weapon, under normal horizontal from the appropriate checklist; perform HE and nuclear weapon pre-release procedures, coordinate final approach with pilot to direct A/C to weapon release point, coordinate weapon release with pilot and perform post-release procedures.

STANDARD(S): Completion of pre-release checklist procedures in correct sequence, maintain specified airspeed (± 20 kts.), and altitude (± 100 ft.) during final approach, correct approach timing (± 1 sec.) and correct performance of post-release checklist procedures.

PREREQUISITE SKILLS AND KNOWLEDGES: Chart interpretation, bombing tactics, weapon & A/C characteristics, weapon arming and fuzing procedures, basic navigation skills, aircrew coordination skills, nuclear weapon safing procedures, jettison procedures, last resort bombing techniques.

SUPPORTING SUBTASK BEHAVIORS: 002, 003, 004, 008, 010, 011, 014, 015, 017, 022, 025, 026, 030

COMMENT(S):

CRITERION OBJECTIVE WORKSHEET NO. 31

CRIT. OBJ. ORIGINS: TASKS 009, 012, 102, 104

SUBTASKS 044, 045, 061, 435, 436, 439

WPN. SYS. B-52, F-4, F-111, FB-111, RF-4

OBJECTIVE REQUIREMENT: NEW ____ PAR. VAL. X VAL. ____

APPROX. COMMONALITY 35% C.T.S. NO. E18

C.T.S. DESCRIPTION Preflight; Operate and recognize malfunction of representative electronic warfare systems.

OBJECTIVE TITLE: Perform External Aircraft Electronic Warfare Equipment Inspection.

CONDITION(S): Student is standing before aircraft with appropriate checklist in hand. Aircraft has been readied for mission and is in pre-mission parking area.

BEHAVIOR(S): Student follows checklist sequence and procedures; walks under and around aircraft; examines appropriate EW equipment, stores, antennae and antennae covers.

STANDARD(S): Correctly follows checklist sequence and procedures; correctly identifies any abnormal external EW equipment conditions.

PREREQUISITE SKILLS AND KNOWLEDGES: Visual inspection, checklist procedures, inspection procedures, antennae and antennae cover visual appearance criteria, EW antennae types and stores.

SUPPORTING SUBTASK BEHAVIORS: N/A

COMMENT(S):

CRITERION OBJECTIVE WORKSHEET NO. 32

CRIT. OBJ. ORIGINS: TASKS 002, 005

SUBTASKS 012, 029

WPN. SYS. B-52, F-4, F-111, FB-111, RF-4, B-1

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. X VAL. _____

APPROX. COMMONALITY 35% C.T.S. NO. E6, E14, U24

C.T.S. DESCRIPTION See Section V, Part II for corresponding CTS titles.

OBJECTIVE TITLE: Perform Defensive Electronic Warfare and Penetrations Aid Planning

CONDITION(S): Student is provided with a planned route, including prepared charts and flight plan. Suitable working space also is provided.

BEHAVIOR(S): Student identifies and obtains necessary intelligence data documents; correctly identifies threat types and locations along route; compares onboard equipment capabilities with threat-imposed requirements; identifies countermeasure requirements; annotates charts with threat & countermeasure requirements; annotates chart with NORAD and other defense sites as required by mission.

STANDARD(S): Threat types & locations correctly identified; countermeasure requirements correctly identified; defensive sites correctly identified; charts correctly annotated; planning completed within reasonable time with respect to onboard equipment sophistication, mission type and mission duration.

PREREQUISITE SKILLS AND KNOWLEDGES: Decision making; determining threat priorities; threat types & applicable countermeasures; capabilities of onboard penetration aides; countermeasure tactics; intelligence data ues; annotation symbology, chart interpretation; use of penetration aides planning forms.

SUPPORTING SUBTASK BEHAVIORS: 010, 011, 013, 024

COMMENT(S): Planning requirements highly dependent upon mission requirements and penetration aids airborne equipment.

CRITERION OBJECTIVE WORKSHEET NO. 33

CRIT. OBJ. ORIGINS: TASKS 012

SUBTASKS 062

WPN. SYS. RF-4, F-4

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. X VAL. _____

APPROX. COMMONALITY 25% C.T.S. NO. W19, W20

C.T.S. DESCRIPTION Preflight checks; Postflight checks.

OBJECTIVE TITLE: Perform External Aircraft Reconnaissance Equipment Inspection

CONDITION(S): Student is standing before aircraft with apropriate checklist in hand. Aircraft has been readied for mission and is in pre-mission parking area.

BEHAVIOR(S): Student follows checklist sequence and procedures; walks under and around aircraft; examines appropriate reconaissance equipment, sensors, cameras, dispensers and photo flash cartridges.

STANDARD(S): Correctly follows checklist sequence and procedures; correctly identifies any abnormal external reconaissance equipment conditions; correctly checks camera loadings, configurations and parameter control boxes.

PREREQUISITE SKILLS AND KNOWLEDGES: Camera operational procedures, checklist procedures, photo flash cartridge inspection criteria.

SUPPORT ASK BEHAVIORS:

COMMENT(S): Only very limited reconnaissance-type sensors on F-4.

CRITERION OBJECTIVE WORKSHEET NO. 34

CRIT. OBJ. ORIGINS: TASKS 023, 024, 035, 038, 039, 043, 047, 056, ~~097, 101~~

SUBTASKS 101, 105, 106, 148, 151, 152, 153, 155, 170, 179, 186, 187, 213, 215, 216, 262, 411, 413, 433

WPN. SYS. F-4, RF-4, F-111, FB-111

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. X VAL. _____

APPROX. COMMONALITY 35% C.T.S. NO. W1

C.T.S. DESCRIPTION Transition.

OBJECTIVE TITLE: Participate with Aircraft Commander in Engine Operation; Flight Control System Operation and Taxi Operations

CONDITION(S): Both crew members are seated in the cockpit. All ~~power-off~~ checks have been completed; each crewmember has all necessary checklists; controlability checks are performed when airborne.

BEHAVIOR(S): Performs engine start, taxi and and pre-takeoff checks in accordance with checklist; monitors engine start, engine performance and engine functional checks; performs flight instrument checks; monitors control system functional checks; monitors controlability checks when airborne, performs visual search doctine; monitors aircraft movement during taxi.

STANDARD(S): All copilot-type assistance to the aircraft commander is performed in accordance with each weapon system's checklists and Technical Order documents. Engine and flight control system performance standards are checked to be in keeping with Technical Order documents.

PREREQUISITE SKILLS AND KNOWLEDGES: Crew coordination; decision making; engine operation procedures & performance, fuel system operation; checklist procedures & associated displays & controls; taxi procedures including braking & steering; control system function & operational checks & performance; recovery from unusual attitudes; flight instrument interpretation.

SUPPORTING SUBTASK BEHAVIORS: N/A

COMMENT(S): Performance standards and details of task performance are highly unique to each weapon system

CRITERION OBJECTIVE WORKSHEET NO. 35

CRIT. OBJ. ORIGINS: TASKS 078, 079, 080

SUBTASKS 342, 344-353

WPN. SYS. F-4E, B-52, B-1

OBJECTIVE REQUIREMENT: NEW ____ PAR. VAL. X VAL. ____

APPROX. COMMONALITY 25% C.T.S. NO. W8, N7, N8, W22

C.T.S. DESCRIPTION Ground attack (tactical); Operation of AGM-69 (SRAM) weapons systems; Operations of AGM-28 weapons systems.

OBJECTIVE TITLE: Perform Terminally Guided Weapon Launch Porcedures

CONDITION(S): Student is flying routine attack mission against preplanned tartet(s) and is approaching weapon launch point; the nav system has been updated on target updatepoint; the aircraft is on course and flying at required altitude, heading and airspeed; student has checklist for SRAM and Hounddog launching, target study data, chartsand other required data.

BEHAVIOR(S): Following checklist procedures, program one SRAM and one houndog missile for the prebriefed target in accordance with weapon delivery plans, prearm and arm the wapons at the appropriate time, direct aircraft to release point, configure radar for target acquisiton and acquire target, update missile guidance systems as required, coordinate release with other crewmembers, release and perform post-release procedures.

STANDARD(S): Completion of pre-release checks in correct sequence, maintain specified approach airspeed (± 20 kts) and altitude (± 100 ft) prior to release, correct weapon release timing (± 1 sec. or TBD), delivery of weapon on target (± 500 ft or TBD), and correct performance of weapon system safing and post-release procedures.

PREREQUISITE SKILLS AND KNOWLEDGES: Checklist procedures, chart interpretation, weapon delivery techniques and tactics, A/C and weapon characteristics, basic Nav skills, aircrew co-ordination skills, weapon jettison and safing procedures, emergency procedures.

SUPPORTING SUBTASK BEHAVIORS: 002, 003, 004, 008, 010, 014, 015, 017, 022, 025, 026, 030.

COMMENT(S): B-1 to have both terminally guided and bomber defense missiles. F-4E missiles other than SCRAM and Houndog.

CRITERION OBJECTIVE WORKSHEET NO. 36

CRIT. OBJ. ORIGINS: TASKS 098

SUBTASKS 417, 418, 419, 420

WPN. SYS. F-111, F-4

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. X VAL. _____

APPROX. COMMONALITY 25% C.T.S. NO. W21

C.T.S. DESCRIPTION Reservicing

OBJECTIVE TITLE: Perform Hot Refueling Procedures

CONDITION(S): Aircraft is parked in hot refueling area; one engine is running; aircraft commander and the WSO are onboard the aircraft. Hot refueling has been pre-planned; post-landing and taxi checklists have been completed.

BEHAVIOR(S): WSO assists pilot by reading appropriate checklist items and monitoring pilot's compliance. WSO monitors and interprets ground communications; monitors and interprets refueling supervisor's voice and hand signals; records quantity of fuel serviced.

STANDARD(S): Performs checklist procedures as required; correctly interprets refueling supervisor's voice and hand signals; correctly records fuel quantity serviced.

PREREQUISITE SKILLS AND KNOWLEDGES: Hot refueling procedures; voice message and hand signal meaning; hot refueling safety procedures.

SUPPORTING SUBTASK BEHAVIORS:

COMMENT(S):

## CRITERION OBJECTIVE

1. Commonality 20-49%
2. Validated course training standards.

CRITERION OBJECTIVE WORKSHEET NO. 37

CRIT. OBJ. ORIGINS: TASKS 013, 102, 105

SUBTASKS 063, 435, 436, 440

WPN. SYS. F-4, F-111

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. _____ VAL. X

APPROX. COMMONALITY 25% C.T.S. NO. W19, W20

C.T.S. DESCRIPTION Preflight checks; Postflight checks.

OBJECTIVE TITLE: Perform General Aircraft Exterior Inspection

CONDITION(S): Student is standing before aircraft with appropriate checklist in hand. Aircraft has been readied for mission and is in the pre-mission parking area.

BEHAVIOR(S): Student follows checklist sequence and examines: aircraft exterior conditions, control surfaces, propulsion systems, protective covers, landing gear, arresting hook, static sensors, drag chute pin, intake ducts, refrigeration ducts, pylon pins, ground locks, nose wheel area and tires; also checks for any fluid leaks, conditions of safety pins, and any exteriorly read gauge indications, such as engine fire extinguisher pressure or wheel well pressure.

STANDARD(S): Correctly follows checklist sequence and procedures; correctly identifies any abnormal general aircraft exterior conditions.

PREREQUISITE SKILLS AND KNOWLEDGES: Visual inspection, walk around inspection procedures, checklist procedures, general aircraft conditions, visual inpsection criteria for items inspected.

SUPPORTING SUBTASK BEHAVIORS: N/A

COMMENT(S):

CRITERION OBJECTIVE WORKSHEET NO. 38

CRIT. OBJ. ORIGINS: TASKS 010, 103

SUBTASKS 046, 047, 048, 049, 437

WPN. SYS. F-4, F-111, B-52, FB-111, B-1

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. _____ VAL. x

APPROX. COMMONALITY 40% C.T.S. NO. W12

C.T.S. DESCRIPTION Ordinance preflight

OBJECTIVE TITLE: Perform External Aircraft Bombing Equipment Inspection

CONDITION(S): Student is standing before aircraft with appropriate checklist in hand. Aircraft has been readied for mission, loaded with bombs and is in parking area.

BEHAVIOR(S): Student follows checklist sequence and procedures; examines and manipulates bombs, racks and release mechanisms; determines, as appropriate, bomb type, model, number, distribution, stations, loading, fuzing, fins, and status of arm or safe plugs and safety pins.

STANDARD(S): Correctly follows checklist sequence and procedures; correctly identifies all abnormal bomb equipment conditions.

PREREQUISITE SKILLS AND KNOWLEDGES: Safety check procedures, proper bomb mounting, bomb fuzing mechanism, crew coordination, checklist procedures.

SUPPORTING SUBTASK BEHAVIORS:

COMMENT(S): Inspection procedures highly system-specific.

CRITERION OBJECTIVE WORKSHEET NO. 39

CRIT. OBJ. ORIGINS: TASKS 014

SUBTASKS 064

WPN. SYS. F-4, F-111, FB-111, RF-4

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. _____ VAL. X

APPROX. COMMONALITY 30% C.T.S. NO. W19, W20

C.T.S. DESCRIPTION Preflight checks; Postflight checks.

OBJECTIVE TITLE: Perform Canopy Serviceability Checks

CONDITION(S): Student has entered aircraft cockpit and has appropriate checklist in hand. Canopy is open and all canopy related struts and pins are in place.

BEHAVIOR(S): Student follows checklist sequence and procedures; examines canopy and canopy related struts, pins, lock and levers.

STANDARD(S): Correctly follows checklist sequence and procedures; correctly accesses canopy serviceability and status of canopy related controls and supports.

PREREQUISITE SKILLS AND KNOWLEDGES: Canopy observation, serviceability criteria, checklist procedures.

SUPPORTING SUBTASK BEHAVIORS: N/A

COMMENT(S):

## CRITERION OBJECTIVE

1. Commonality 1-19%

2. NEW training requirements are presented.

CRITERION OBJECTIVE WORKSHEET NO. 40

CRIT. OBJ. ORIGINS: TASKS 018, 023, 031, 044, 061, 097

SUBTASKS 075, 096, 099, 102, 136, 138, 140, 191, 283-291, 416

WPN. SYS. RF-4C

OBJECTIVE REQUIREMENT: NEW X PAR. VAL. _____ VAL. _____

APPROX. COMMONALITY 5% C.T.S. NO. N/A

C.T.S. DESCRIPTION N/A

OBJECTIVE TITLE: Perform Reconnaissance Mission

CONDITION(S): All mission pre-reconnaissance and supporting tasks have been completed. Mission order charts, maps, flight plan checklists and T.O.'s are provided. Student is seated in aircraft.

BEHAVIOR(S): Student performs reconnaissance equipment check-out, activation, and mission utilization beginning with power off checks and power on checks of SL radar, photo equipment, and photo flash cartridges. Subsystems are configured for the reconnaissance run in checklist sequence. IP and target area are identified and timing initiated. Reconnaissance sensors are activated and the aircraft is maintained on the required track. At end of the run the sensors are deactivated, the aircraft directed along egress route. After reconnaissance run appropriate reconnaissance forms are completed.

STANDARD(S): Correctly checks out, activates/deactivates, and configures reconnaissance subsystems and equipment. Correctly follows checklist sequence and procedures and performs the reconnaissance run ± TBD nm of initial point, ± AS REQD min. of timing sequence, ± 500 ft. of required track, ± 10 kts. groundspeed, ± 50 ft. altitude and ± 2.0 deg. attitude.

PREREQUISITE SKILLS AND KNOWLEDGES: Checklist procedures, photo equipment operation, IR detection equipment operation, side looking radar operation, crew coordination, target reconnaissance sensor data, decision making, target characteristics, radar interpretation, interpret flight instruments & flight plan, use of reconnaissance forms, communication radio operation, fuel management.

SUPPORTING SUBTASK BEHAVIORS:

COMMENT(S):

CRITERION OBJECTIVE WORKSHEET NO. 41

CRIT. OBJ. ORIGINS: TASKS 005, 006

SUBTASKS 027, 034

WPN. SYS. RF-4C

OBJECTIVE REQUIREMENT: NEW X PAR. VAL. _____ VAL. _____

APPROX. COMMONALITY 5% C.T.S. NO. N/A

C.T.S. DESCRIPTION N/A

OBJECTIVE TITLE: Perform Tactical Reconnaissance Planning

CONDITION(S): Student is provided, as appropriate, with: written mission order; prepared charts with course, waypoints, targets and times annotated; sector table documents; hand-held flight planning tools; flight plan; and TAC reconnaissance planning forms.

BEHAVIOR(S): Student reviews sensor data documents for currency and completeness and obtains data necessare and updates documents; student determines altitude and speed for each sensor to be used; determines correct control settings for each sensor; completes local reconnaissance planning forms.

STANDARD(S): Correctly completes all appropriate entries on local reconnaissance planning forms; plans within resources and within sensor performance envelopes; plans within optimal aircraft performance envelope; completes planning in approximately 30 minutes depending upon mission complexity.

PREREQUISITE SKILLS AND KNOWLEDGES: Chart interpretation, mission planning procedures, reconnaissance equipment utilization and planning procedures, reconnaissance document content, sensor data utilization, and data integration.

SUPPORTING SUBTASK BEHAVIORS: 001, 002, 008, 010, 014, 015, 017, 018, 022, 024, 025

COMMENT(S): Quality of measurement dependent upon utility of local planning forms as measurement tools.

CRITERION OBJECTIVE WORKSHEET NO. 42

CRIT. OBJ. ORIGINS: TASKS 106

SUBTASKS 445

WPN. SYS. RF-4C

OBJECTIVE REQUIREMENT: NEW x PAR. VAL. _____ VAL. _____

APPROX. COMMONALITY 5% C.T.S. NO. N/A

C.T.S. DESCRIPTION N/A

OBJECTIVE TITLE: Assist Photo Interpreters with Film Analysis

CONDITION(S): Reconnaissance films have been developed and printed; navigator who flew the reconnaissance mission is assembled with photo interpreters. Standard viewing conditions and equipments are assumed.

BEHAVIOR(S): Navigator visually interprets reconnaissance photographs; identifies targets, locations, defenses and damage.

STANDARD(S): Targets, locations, defenses and damage correctly identified; reconnaissance forms content.

PREREQUISITE SKILLS AND KNOWLEDGES: Target characteristics, flight plan interpretation; photo interpretation.

SUPPORTING SUBTASK BEHAVIORS: 003, 004, 027, 416

COMMENT(S): Task data insufficient to provide detailed perfromance standard for this complex visual-perceptual task.

## CRITERION OBJECTIVE

1. Commonality 1-19%

2. Partially validated course training standards.

CRITERION OBJECTIVE WORKSHEET NO. 43

CRIT. OBJ. ORIGINS: TASKS 001

SUBTASKS 003

WPN. SYS. B-52, FB-111, F-111, B-1

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. X VAL. _____

APPROX. COMMONALITY 15% C.T.S. NO. N2, W14

C.T.S. DESCRIPTION Planning of navigation and bombing phases of a mission; Combat mission planning.

OBJECTIVE TITLE: Interpret Target Study Briefing Information

CONDITION(S): Student is seated in briefing room; has been provided , as appropriate, with: written mission order, maps & charts, prepared flight plan, mission folder, command-specific target data forms, and pre-planned bombing procedures.

BEHAVIOR(S): Listen to prepared briefing; interpret target intelligence data; record, as required, mission -relevant data.

STANDARD(S): Correctly records target description and co-ordinates; correctly records offset description and coordinates; correctly records approach and escape heading and course, bombing equipment usage; correctly records bomb run procedures; correctly records IP description and coordinates.

PREREQUISITE SKILLS AND KNOWLEDGES: Map & chart interpretation; target book content; weapon types and characteristics; weapon delivery techniques, equipment and procedures.

SUPPORTING SUBTASK BEHAVIORS:

COMMENT(S): If all briefing materials are fully prepared and simply distributed, measurement of student performance may not be possible.

CRITERION OBJECTIVE WORKSHEET NO. 44

CRIT. OBJ. ORIGINS: TASKS 007

SUBTASKS 037, 038

WPN. SYS. B-52, FB-111, B-1

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. X VAL. _____

APPROX. COMMONALITY 10% C.T.S. NO. N2

C.T.S. DESCRIPTION Planning of navigation and bombing phases of a mission.

OBJECTIVE TITLE: Perform Mission Planning for Strategic Missile Launch

CONDITION(S): Student is provided, as appropriate, with: flight plan, annotated chart, target data, turning point data, and missile launch forms.

BEHAVIOR(S): Student selects check point fix points; verifies mission profile, target data, turning point data; plans launch points, flight path and turning points for AGM-28, AGM-69 and ADM-20 missiles. Student enters all above data, in accordance with requirements, on missile launch planning forms.

STANDARD(S): Determines missile launch points, flight path and turning points within ± 0.5 min. longitude and latitude; correctly completes appropriate missile launch planning forms.

PREREQUISITE SKILLS AND KNOWLEDGES: Chart interpretation, use of plotter; flight planning, missile computer operational procedures, missile flight characteristics, missile deployment tactics, use of missile documents.

SUPPORTING SUBTASK BEHAVIORS: 003, 004, 008, 011, 015, 017, 018, 026

COMMENT(S): Planning for SCAD & SCUD (ST 039) should be considered for inclusion upon their introduction into the inventory.

CRITERION OBJECTIVE WORKSHEET NO. 45

CRIT. OBJ. ORIGINS: TASKS 022, 044, 045, 046, 055, 057, 094, 101

SUBTASKS 091, 092, 094, 095, 188, 195-201, 210, 259, 265-267, 402, 427

WPN. SYS. B-52

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. X VAL. _____

APPROX. COMMONALITY 8% C.T.S. NO. E5, E8, E9, E10, E12, E13, E14, E15, E16, E18,

C.T.S. DESCRIPTION See Section V, Part II for corresponding CTS titles.

OBJECTIVE TITLE: Checkout, Calibrate and Operate B-52 Penetration Aids.

CONDITION(S): B-52A weapon system is designated for a training mission or an EWO mission. All crewmembers are on-board. Defensive EW mission planning has been completed. The Electronic Warfare Officer is provided with necessary charts, a flight plan, logs, preset guide, checklist T.O. 1B-52G-1CL-4, a completed copy of SAC Form 609, and a copy of T.O. 1B-52C-1-2.

BEHAVIOR(S): Uses checklist 1B-52G-1CL-4; performs preflight equipment checks; activates equipment during climb; performs calibration checks; performs defensive coordination exercise; presets equipment according to preset guide (SAC Form 609); monitiors & interprets visual and auditory threat displays; employs defensive tactics by setting and operating pen-aids; deactivates pen-aids in accordance with checklist.

STANDARD(S): Not available beyond correct performance of checklist and malfunction procedures, and correct employment of defensive strategies & tactics through equipment operation.

PREREQUISITE SKILLS AND KNOWLEDGES: Checklist & T.O. procedures; calibration & malfunction analysis procedures & associated equipment performance characteristics; pen-aids equipment uses & operation; flight plan, chart & threat symbol code interpretation; auditory threat signal & visually displayed threat symbol identification; pan scope operation & interpretation; defensive strategies & tactics; use of preset guide & SAC Form 609; defensive coordination exercise procedures; crew coordination.

SUPPORTING SUBTASK BEHAVIORS: 002, 004, 012, 013, 029

COMMENT(S): Manual defensive tasks are highly equipment-specific. Additional, detailed analysis required to specify meaningful student performance standards.

## CRITERION OBJECTIVE

1. Commonality 1-19%

2. Validated course training standards are presented.

CRITERION OBJECTIVE WORKSHEET NO. 46

CRIT. OBJ. ORIGINS: TASKS 029, 044

SUBTASKS 131, 132, 192

WPN. SYS. B-52

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. _____ VAL. X

APPROX. COMMONALITY 8% C.T.S. NO. E17

C.T.S. DESCRIPTION Operation of airborne communications systems.

OBJECTIVE TITLE: Perform Authenticator Checks

CONDITION(S): B-52 weapon system is designated for training mission or an EWO mission. All crewmembers are onboard; flight plan and radio logs are available to the Electronic Warfare Officer.

BEHAVIOR(S): During power-on checks, the EWO distributed authenticators to designated crew members; the EWO copies results of copilot's authenticator check in log; EWO transmits requrest for authentication message to command post; copies message in radio log, use authenticator & cooridinates results with Navigator. When airborne, requests copies & authenticator HF & UHF Giant Step Traffic; coordinates with crew & records message in radio logs.

STANDARD(S): Authenticators correctly distributed & operated. Authentication requests & content correctly transmitted & recorded.

PREREQUISITE SKILLS AND KNOWLEDGES: UHF & HF radio procedures; use of radio log; use of authenticator; Giant Step message content; training launch message content, crew coordination.

SUPPORTING SUBTASK BEHAVIORS:

COMMENT(S):

CRITERION OBJECTIVE WORKSHEET NO. 47

CRIT. OBJ. ORIGINS: TASKS 082, 083, 084, 085, 086

SUBTASKS 354, 356-368

WPN. SYS. F-4E

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. _____ VAL. X

APPROX. COMMONALITY 19% C.T.S. NO. W4, W5, W16

C.T.S. DESCRIPTION Air attack; Air combat maneuvers; Weapon systems settings.

OBJECTIVE TITLE: Execute Air-to-Air Intercept of Hostile Aircraft

CONDITION(S): Student is flying a routine air-to-air search and detection mission using visual and electronic scanning techniques when unknown target is detected on radar scope; student has interecpt TM and checklists and intelligence data, RHAWS, radar, and GCI commo, air-to-air missiles, guns and IFF/SIF subsystems.

BEHAVIOR(S): Utilize appropriate subsystems to verify target is unknown, determine probable track of target; determine optimum intercept route; direct own a/c to intercept point, prepare missiles and guns for engagement; coordinate release with pilot; acquire and fire on target (missiles & gun); perform post launch/strike procedures; perform damage assessment and break-away procedures.

STANDARD(S): Correct performance of checklist procedures. Correct target ID, airspeed (± TBD), heading and intercept route determination (± heading and ± alt TBD), correct weapon system configuration, intercept within weapon launch envelope (± TBD), correct weapon release procedure, positive strike damage assessment (kill/no kill) and performance of correct breakaway procedure.

PREREQUISITE SKILLS AND KNOWLEDGES: Radar scope interpretation, visual operation, identification procedures, AN/APR-36/37 RHAWS operation, target track determination, intercept principles and geometry, target and hositle weapon characteristics, auto and manual tracking procedures, basic nav skills, own ship weapon characteristics and limitations, weapon release procedures, damage assessment skills, breakaway procedures.

SUPPORTING SUBTASK BEHAVIORS: 002, 003, 004, 011, 014, 015, 019, 022, 026

COMMENT(S): This C.O. unique to F-4E WSO.

## CRITERION OBJECTIVE WORKSHEET NO. 48

CRIT. OBJ. ORIGINS: TASKS 011

SUBTASKS 052, 053, 054, 055, 057, 058

WPN. SYS. F-4E

OBJECTIVE REQUIREMENT: NEW _____ PAR. VAL. _____ VAL. X

APPROX. COMMONALITY 19% C.T.S. NO. W12

C.T.S. DESCRIPTION Ordinance preflight

OBJECTIVE TITLE: Perform External Aircraft Missile Inspection

CONDITION(S): Student is standing before aircraft with appropriate checklist in hand. Aircraft is loaded with missile inventory and is in parking area

BEHAVIOR(S): Student follows checklist sequence and procedures, walks under and around aircraft, examines and manipulates missiles; determines, as appropriate, missile type, model, number, distribution, stations, loading, fuzing, and status of safety pins or safety switches. Inspects, as appropriate, the following missiles: AIM-7, AIM-4, AGM-65, AIM-9, AGM-12, and AGM-45.

STANDARD(S): Correctly follows checklist sequence and procedures; correctly identifies all abnormal missile conditions.

PREREQUISITE SKILLS AND KNOWLEDGES: Visual inspection, checklist procedures, inspection procedures, inspection criteria for AIM-7, AIM-4, AGM-65, AIM-9, AGM-12, and AGM-45.

SUPPORTING SUBTASK BEHAVIORS: 414

COMMENT(S):

# PART II

# COURSE TRAINING STANDARDS

## UNT COURSE TRAINING STANDARDS

| | Validated | Par. Val. | Not Val. | No Oper. Equiv. | |
|---|---|---|---|---|---|
| 1. | | X | | | Select appropriate maps and charts. (17) |
| 2. | | X | | | Interpret weather. (11) |
| 3. | | X | | | FAA, ARTC, and ICAO procedures. (8) |
| 4. | X | | | | Prepare and use maps, charts, and navigation logs. (9,17,20,21) |
| 5. | | X | | | Use of FLIP. (17) |
| 6. | X | | | | Inspect and use personal equipment. (18) |
| 7. | | X | | | Recognize physiological effects of altitude. (18) |
| 8. | X | | | | Inspect and use airborne oxygen equipment. (18) |
| 9. | | X | | | Aircraft systems. (16, 19, 23) |
| 10. | | | | X | Aerodynamics of flight. |
| 11. | X | | | | Interpretation of flight instruments. (19, 23) |
| 12. | X | | | | Aircraft emergency procedures. (8, 12, 13, 14, 15, 18) |
| 13. | | X | | | Use of checklist to preflight navigation equipment. (19) |
| 14. | X | | | | Use of navigation equipment. (8, 10, 19, 20, 21, 23)<br>a. Basic DR equipment<br>b. Gyro compasses<br>c. Radar altimeter<br>d. Periscopic/hand-held sextants<br>e. Airspeed indicators and pressure altimeters.<br>f. Loran systems<br>g. Search radar systems<br>h. Doppler radars<br>i. Radios (LF, VOR, TACAN)<br>j. Communications radios<br>k. Inertial navigation equipment<br>l. Digital navigation equipment |

| | Validated | Par. Val. | Not Val. | No Oper. Equiv. | |
|---|---|---|---|---|---|
| 15. | X | | | | Navigate using: (10, 19, 20, 21, 23)<br>a. Dead reckoning<br>b. Map reading techniques<br>c. Radio aids<br>d. Celestial techniques<br>e. Grid techniques<br>f. Pressure differential techniques<br>g. Loran<br>h. Radar<br>i. Low level techniques<br>j. Consolan |
| 16. | | X | | | Range control. |
| 17. | X | | | | Airborne radar approach procedures. (22) |
| 18. | | X | | | Crew coordination procedures. (8) |
| 19. | | X | | | Use of aircraft and equipment tech orders. (16) |
| 20. | | | X | | Aural code. |
| 21. | | X | | | Survival techniques and procedures. (13, 14, 15, 18) |
| 22. | | | | X | Principles of electronic warfare. |
| 23. | | | | X | Duties and responsibilities of an Air Force Officer. |
| 24. | X | | | | Use of intelligence data and target predictions. (17) |
| 25. | | | | X | Principles of bombing. |
| 26. | | | | X | New developments (i.e., laser, infrared). |
| 27. | | X | | | Operational techniques. (19) |

## NBT COURSE TRAINING STANDARDS

| | Validated | Par. Val. | Not Val. | No. Oper. Equiv. | |
|---|---|---|---|---|---|
| 1. | | | | X | Capabilities and limitations of navigation bombardment systems. |
| 2. | | X | | | Planning of navigation and bombing phases of a mission: (28, 43, 44) |
| | | | | | a. Preparation and use of maps, charts, and forms. |
| | | | | | b. Use of weather data. |
| | | | | | c. Use of target intelligence information. |
| | | | | | d. Computation of ballistic information. |
| | | | | | e. Preparation of high and low level target predictions. |
| | | | | | f. Use of flight information publications. |
| 3. | X | | | | Preflight of a typical navigation-bombardment system. (19) |
| 4. | X | | | | Inspection and use of personal flying equipment. (18, 29) |
| 5. | X | | | | Operation of navigation-bombardment systems: (29, 30) |
| | | | | | a. Preoperational check, turn-on and tune-up procedures. |
| | | | | | b. Position fixing, wind determination and measurement of altitude. |
| | | | | | c. Automatic crosshair laying and autofixing. |
| | | | | | d. DR and airplot techniques. |
| | | | | | e. Day celestial techniques. |
| | | | | | f. Night celestial techniques. |
| | | | | | g. Grid techniques. |
| | | | | | h. Pressure differential techniques. |
| | | | | | i. Low altitude navigation techniques and procedures. |
| | | | | | j. Directs and offset radar bomb run procedures. |
| | | | | | k. Fixed angle bomb run procedures. |
| | | | | | l. Emergency bomb run procedures. |
| | | | | | m. Low altitude bomb run procedures. |
| | | | | | n. Operation of the O-15 and O-32 camera equipment. |
| | | | | | o. Anti-jamming procedures. |
| | | | | | p. Airborne radar approach techniques. |

| | Validated | Par. Val. | Not Val. | No Oper. Equiv. | |
|---|---|---|---|---|---|
| 6. | | X | | | Operation of AN/ASQ-38 ancillary equipment: (29)<br>a. Operation of APN-89 doppler radar equipment.<br>b. Operation of MD-1 automatic astro compass.<br>c. Characteristics of an employment of ADM-20.<br>d. Operation of ADM-20 panels.<br>e. Use of emergency control panels. |
| 7. | X | | | | Operation of AGM-28 Weapon System: (35)<br>a. Operator controls and procedures.<br>b. Azimuth and Gyrocompassing alignment.<br>c. Position and course determination.<br>d. Bomb-Nav System tie-in.<br>e. Flight control and missile systems. |
| 8. | X | | | | Operation of AGM-69 (SRAM) Weapons System: (35)<br>a. Operator controls & procedures.<br>b. Location and function of basic components.<br>c. Mission planning and in-flight programming.<br>d. In-flight alignment of missile and Carrier Aircraft Equipment (CAE).<br>e. Identification of system malfunctions.<br>f. Degraded operations. |
| 9. | X | | | | Analysis and reporting of electronic malfunctions. (16) |
| 10. | | | X | | Use of AN/ASQ-38 In-Flight Maintenance Manual. |
| 11. | X | | | | Delivery of Nuclear Weapons: (30)<br>a. Characteristics, capabilities, and effects of nuclear weapons.<br>b. Inspection of the weapon and related equipment.<br>c. Normal monitoring and control of the weapon.<br>d. Emergency monitoring and control of the weapon.<br>e. Special delivery techniques.<br>f. Safety precautions.<br>g. Employment of security measures. |

| | Validated | Par. Val. | Not Val. | No Oper. Equiv. |
|---|---|---|---|---|
| 12. | X | | | |

Delivery of Conventional Weapons: (30)

a. Types and characteristics of conventional weapons.
b. Inspection of the weapons and related equipment.
c. Conventional weapon release systems.

## EWOT COURSE TRAINING STANDARDS

| | Validated | Par. Val. | Not Val. | No Oper. Equiv. | |
|---|---|---|---|---|---|
| 1. | | | | X | Electronic fundamentals as applied to radar, electronic warfare equipment, avionics and other related electromagnetic systems. |
| 2. | | | | X | Basic theory of ECM, infra-red, radar and communications systems. |
| 3. | | | | X | Basic analog and digital computer principles. |
| 4. | | | | X | Philosophy and role of electronic warfare applied to past, current and future air operations. |
| 5. | | X | | | Typical electronic warfare procedures, tactics and techniques. (45) |
| 6. | | X | | | Electronic intelligence (ELINT) cycle to include the application of an EOB/ROB in air operations. (32) |
| *7. | | | | | Current airborne electronic reconnaissance vehicles and systems. |
| 8. | X | | | | Electronic counter-counter measures (ECCM) principles and operational concepts affecting ground based electronic systems, airborne navigation systems and aids, communications and weapons delivery systems. (45) |
| 9. | X | | | | Characteristics, capabilities, limitation, and vulnerabilities of friendly and hostile air defense systems. (45) |
| 10. | X | | | | Audio analysis of radar signals and threat assessment. (45) |
| 11. | | | | X | Use of electronic warfare systems simplified block diagrams to include power and control, and antenna systems. |
| 12. | X | | | | Use technical orders and flight manuals. (45) |

* Reconnaissance requirements were not addressed in NOUFFSS.

| | Validated | Par. Val. | Not Val. | No Oper. Equiv. | |
|---|---|---|---|---|---|
| 13. | X | | | | Use electronic warfare reference publications and directives. (32, 45) |
| 14. | | X | | | Prepare and use flight plans. (32, 45) |
| 15. | X | | | | Use electronic warfare logs. (45) |
| 16. | X | | | | Use electronic warfare checklists. (45) |
| 17. | X | | | | Operate airborne communications systems. (46) |
| 18. | X | | | | Preflight, operate, and recognize malfunctions of representative electronic warfare systems to include: (16, 31, 45)<br>a. Electronic warfare receivers.<br>b. Direction finders.<br>c. Signal analyzers.<br>d. Recorders.<br>e. Radar homing and warning (RHAW) systems.<br>f. Noise jammers.<br>g. Jammer programmers.<br>h. Deceptive countermeasures systems.<br>i. Expendable countermeasures devices.<br>j. Special purpose systems. |
| 19. | | | | X | New developments in electronic warfare. |
| 20. | | | | X | Electronic warfare staff responsibilities. |

## WSO COURSE TRAINING STANDARDS

## (F-4, COURSE 111507B)

| | Validated | Par. Val. | Not Val. | No Oper. Equiv. | |
|---|---|---|---|---|---|
| 1. | | X | | | Transition: (34)<br>a. Single-Engine Procedures.<br>b. Emergency Procedures.<br>c. Aircraft Characteristics.<br>d. Unusual Position Recovery. |
| 2. | | X | | | Instruments: (23)<br>a. Basic Instruments.<br>b. TACAN Procedures & Penetrations.<br>c. UHF/ADF Procedures.<br>d. GCA Procedures. |
| 3. | X | | | | Formation: Visual Signals (19) |
| 4. | | X | | | Air Attack: (47)<br>a. Positioning for Attack.<br>b. Missile Attacks.<br>c. Crew Coordination. |
| 5. | | X | | | Air Combat Maneuvers: (47)<br>a. Radar Techniques.<br>b. Crew Coordination. |
| 6. | X | | | | Nuclear Weapons Delivery: (30)<br>a. Radar Delivery.<br>b. Visual Delivery. |
| 7. | | X | | | Ground Attack: (29, 30)<br>a. Visual Navigation.<br>b. Integrated Systems Navigation/Bombing.<br>c. Crew Coordination. |

## WSO COURSE TRAINING STANDARDS

## (F-4, COURSE 111507B)

| | Validated | Par. Val. | Not Val. | No Oper. Equiv. | |
|---|---|---|---|---|---|
| 8. | | X | | | Ground Attack (Tactical): (30, 35)<br>a. Close Air Support with FAC.<br>b. Tactical Ordnance Procedures.<br>c. Target Identification.<br>d. Armed Reconnaissance<br>e. Integrated Systems Navigation/Bombing.<br>f. Crew Coordination. |
| 9. | X | | | | Air Refueling: (6, 7)<br>a. Rendezvous.<br>b. Precontact<br>c. Departure.<br>d. Crew Coordination. |
| 10. | X | | | | Ground Attack (Night): (29)<br>a. Navigation.<br>b. Pattern Procedures.<br>c. Crew Coordination. |
| 11. | X | | | | Mission Planning (17) |
| 12. | X | | | | Ordnance Preflight. (38, 48) |
| 13. | X | | | | Weapons Delivery Planning. (28) |
| 14. | | X | | | Combat Mission Planning. (43) |
| 15. | | X | | | Route Selection. (43) |
| 16. | X | | | | Weapons Systems Settings. (47) |
| 17. | X | | | | Care and Use of Personal Equipment. (18) |
| 18. | X | | | | Normal and Emergency Operations. (16, 12, 13, 14, 15) |
| 19. | X | | | | Preflight Checks. (37, 33, 39) |

## WSO COURSE TRAINING STANDARDS

## (F-4, COURSE 111507B)

| | Validated | Par. Val. | Not Val. | No Oper. Equiv. | |
|---|---|---|---|---|---|
| 20. | X | | | | Postflight Checks. (37, 33, 39) |
| 21. | | X | | | Reservicing. (36) |
| 22. | X | | | | Arming and De-Arming. (30, 35) |

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13. ABSTRACT

Appendix III presents information developed during Phase III of a three-phase study designed to provide a technical basis for determining future (1975-1990) navigator training requirements. The term navigator is used generically to refer to Navigator (AFSC 1535), Radar Navigator (Navigator-Bombardier) (AFSC 1525), Weapons Systems Officer (AFSC 1555), and Electronic Warfare Officer (AFSC 1575). This appendix addresses the methodology used for developing training Criterion Objectives, along with methodological problems encountered while developing the objectives. Resulting Criterion Objectives are presented. Results of comparing the Criterion Objectives with present course training standards for the purpose of validating present training requirements are presented.

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| Navigator-Observer training requirements | | | | | | |
| Behavioral Objectives | | | | | | |
| Criterion Objectives | | | | | | |
| Enabling objectives | | | | | | |
| Instructional System Development | | | | | | |
| Systems approach to training | | | | | | |
| Systems engineering in training | | | | | | |
| Curriculum development | | | | | | |
| Course development | | | | | | |