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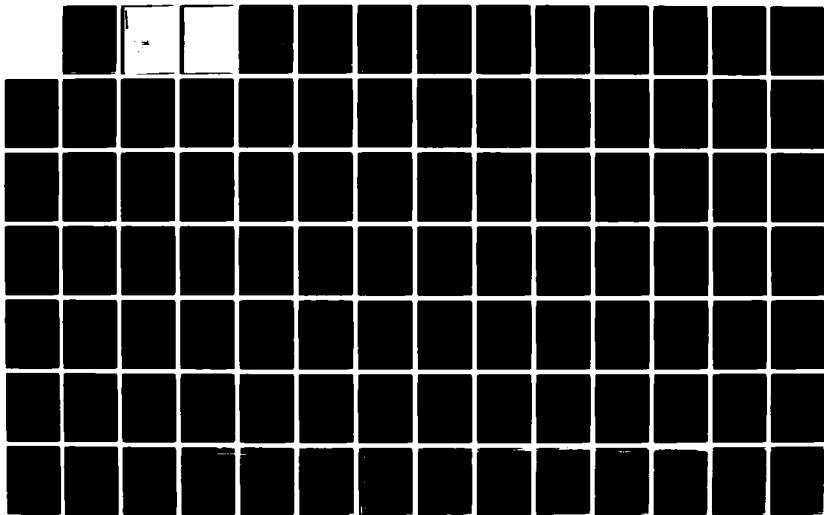
COMPUTER AIDED SYSTEM FOR DEVELOPING AIRCREW TRAINING  
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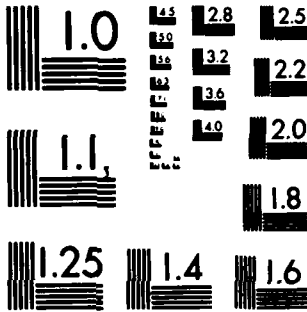
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The Naval Training Equipment Center (NAVTRAEQUIPCEN) initiated a research program to investigate automation and other aids as tools to reduce time and personnel requirements of instructional systems development (ISD). This study was conducted in three phases. 1) Determine the theoretical feasibility of using automation to reduce the cost of ISD. 2) Demonstrate feasibility by building a prototype aid to ISD. 3) Develop the prototype CASDAT into a useful operational system.		

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Phase one succeeded in demonstrating theoretical feasibility of using certain aids to ISD by answering four questions: Do families of tasks exist? Is it feasible to build a task data base? Are generic data bases feasible for other ISD steps? and Could time and cost savings be realized through automation? Demonstration of theoretical feasibility was accomplished by review of aircrew task data from 14 aircraft ISD efforts previously completed. Families of tasks were identified and a generic task list model was derived. Researchers found that by using the generic task list model, they could build a task list data base. Researchers were further able to use that task list data base as a basis for developing aids to complete other ISD steps. By virtue of their algorithmic nature, task listing, objectives hierarchy, media selection, syllabus design and lesson specification were identified as ISD steps suitable for automation. An analysis of aiding systems and their capabilities indicated that cost and time savings could be best achieved using a computer/text editor system in conjunction with the generic task model approach.

The second phase of the study resulted in development of a prototype set of computer based aids. The prototype, the Computer Aided System for Developing Aircrew Training (CASDAT) was installed at NAVTRAEQUIPCEN in April 1980. It provided seven user aiding routines that allowed a system developer to accomplish five ISD steps: task list development, objectives hierarchy development, media selection, syllabus development, and lesson specification. At that stage of development, CASDAT provided automated aid to the five ISD steps for two mission phases (preflight and navigation) and three aircrew jobs (pilot, copilot, and radar intercept officer/naval flight officer).

The third phase of the study brought CASDAT to its current stage of development. The system contains aircrew training data from seven aircrew phases of flight: pre-mission planning, pre-flight, take-off/departure, navigation, approach/landing, post-mission debrief, and special procedures. Supporting software routines allow these data to be manipulated over five ISD steps: task list development, objectives hierarchy development, media selection, syllabus design, and lesson specification development.

Taking inputs from a training developer on the features and capabilities of an aviation weapons system, CASDAT uses a generic task model to define a task listing and an objectives hierarchy for that aircraft. After validation by the developer, these tasks and objectives become the basis for the remaining ISD steps aided by the system.

Preliminary data indicate that the system generates quality ISD products for aircrew training programs in significantly less time than is required using traditional ISD methods. A full-scale field trial of CASDAT is recommended in order to fully measure its contribution to aircrew training design.

The future direction of CASDAT awaits government definition of requirements, i.e., expansion of CASDAT to more ISD steps, other mission phases and/or other aircrew jobs.

## PREFACE

Human factors is strongly influenced by revolutionary technology (e.g., computers) from other disciplines; however, it apparently has not yet enjoyed the glamour, support and heuristics that derive from breakthroughs that are distinctively its own. It is important and interesting to speculate, therefore, about human factors developments that augur breakthroughs that are revolutionary in magnitude.

Speculation about revolutionary contributions from the human factors field appears to be quite scant. The impact of human factors products, however, frequently are not readily apparent, even to the scientists themselves. Methods and concepts from the behavioral and social sciences trickle into common use, making their application difficult to detect. Further, even where such applications are known, their effects often are difficult to objectively evaluate. This appears to be the case with the instructional systems development (ISD) methodologies.

It might make some uncomfortable, therefore, to consider that something as apparently unremarkable as ISD methodology deserves high praise. Nevertheless, the ISD movement has reached a point where the potential of the ISD approach is becoming increasingly evident, impressive, and deserving of attention. One revolutionary aspect of ISD lies in its ability to organize and mobilize human factors techniques and information for applied and R&D purposes.

This conception of ISD might be dismissed as another case of wishful thinking, if not for preliminary but significant confirmations of the concept by a number of independent investigators. Encouraged by the progress to date, momentum from these pioneering efforts appears to be increasing. However, the tasks of developing an ISD system that for the first time enables orderly, efficient and comprehensive applications and enhancements of human factors technology are neither obvious or simple. Significant programs for improving the ISD process with computer aids, cognitive approaches, and procedural refinements have been underway at TAEG and the NAVPERSRANDCEN, as well as the NAVTRAEQUIPCEN. Plans for continuing these efforts are being coordinated among these three organizations, and more efforts are needed.

A major contribution of the current project to the overall goals projected for ISD is that a system was produced (CASDAT) which enables apparently the first and only application of a generic data base to the ISD process. Further, CASDAT is one of a very few systems to provide specially designed computer-based programs for assisting ISD applications. In CASDAT, support is provided to the instructional developer through the automation of five key steps in the instructional design process. These five steps include the development of task lists, objective hierarchies, media selection, training syllabi and lesson specifications. Source data for task, objective and syllabus development is drawn from a generic data base. This data base contains a standardized form of aircrew task and objective data derived from previous ISD efforts on fourteen military aircraft. The generic data

base structure in CASDAT applies across all types of aircraft, missions and flight crew positions and provides a substantial portion, at least 70 percent, of the information needed in the development of task lists or objectives hierarchies. Communication programs within CASDAT guide and allow the Instructional Developer to interact with the generic data base to manipulate, update and create new material to meet the requirements of the aircrew training program being developed.

CASDAT is presently capable of providing instructional data for seven of eight mission phases: pre-launch, pre-mission planning, take-off/departure, navigation, approach/landing, post-mission debrief and special procedures. Further expansion of CASDAT awaits a more definitive evaluation of its contributions to ISD. However, a preliminary assessment indicates that CASDAT will improve the efficiency of conducting aircrew training system analysis and design for the five ISD steps by between 37 and 62 percent. This is a significant improvement. Costs for conducting these analyses commonly range between \$200,000 and one million dollars.

Some benefits resulting from CASDAT perhaps can be anticipated. Others may only be known through routine use of the system. It is expected that CASDAT's speed in searching, sorting, typing, etc., will: (a) decrease ISD man-hour, lead-time and dollar requirements; (b) increase the time available for more creative aspects of ISD, including improving the ISD methodology; and (c) allow ISD applications where time, money or people are inadequate for traditional ISD approaches.

CASDAT is designed to aid the design of new training systems, as well as improve the training system modification process--an unwieldy job and a major concern. By relating student performance and equipment change information to CASDAT's data base via word searches, areas of the training systems can be designed based on common features of different jobs--as identified by CASDAT's generic data base and amplified by word search speed.

In addition to speed advantages, CASDAT also offers management benefits. CASDAT manages the ISD process by providing cues, instruction, menus, etc., which lead a person through the ISD procedures. These features decrease the demand on high-level ISD experts who normally serve these management functions. These management features will help ISD team members learn more about ISD procedures as part of the process of using the system.

CASDAT standardizes ISD processes by facilitating repeated applications of the same procedures by different people. This, in turn, standardizes ISD products and facilitates the identification of deficiencies in the system, which then can be improved. Because some improvements will require R&D, CASDAT can help define R&D issues. Implementation of improvements will be more likely with CASDAT since the implementation is automatic. Standardization of ISD outputs will encourage similar training at different sites, which will allow interchange of personnel, training materials and equipment.

Such improvements to ISD should significantly contribute to its usefulness. User misconceptions, however, can impede progress. Some CASDAT users might misuse the system by doing too little, because CASDAT does so much. On the other hand, even where CASDAT is used properly, people may misperceive that human control over CASDAT is less than it is, and reject the products for this reason.

A related effort under this project produced an automated instructional media selection system (AIMS), an endeavor to improve CASDAT's automated media selection model. CASDAT will be field implemented along with AIMS in actual training analysis and design applications at the NAVTRAEQUIPCEN in FY 1983.

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## SECTION I

## INTRODUCTION

The Naval Training Equipment Center (NAVTRAEQUIPCEN) has procured many instructional programs for aviation weapon systems. Aircrew training programs procured by NAVTRAEQUIPCEN over the past 10 years have included the A-6E, E-2C, EA-6B, SH-2F, F-14 and F-4. Currently aircrew training programs are being designed for the CH-46, F/A-18 and AV-8B.

NAVTRAEQUIPCEN has found instructional systems development (ISD) technology to be useful when developing large training programs for major aviation weapon systems. ISD combines the results of research in human learning with the methodology of systems analysis to provide a structure for training design. This structure helps ensure that the resulting training program will be both complete and efficient. Despite this advantage, there are built-in disadvantages with the ISD process. One indication of the size of merely the "front-end" portion (i.e., steps including job/task analysis through lesson specification) of an ISD effort required to design and develop an aircrew training system shows manhours ranging from 6668 for the E-2C to 13006 for the A-6E (Table 1).<sup>1</sup>

NAVTRAEQUIPCEN recognized the costly nature of ISD and initiated a research and development program to investigate ways to reduce time and personnel requirements of instructional design. A major result of this research effort is a system which provides automated aid to the instructional design process. The system is a Computer Aided System for Developing Aircrew Training (CASDAT).

CASDAT was developed first as a prototype to demonstrate the feasibility of enhancing the cost-effectiveness of ISD by automating portions of the process. Later, it was further developed into an operational tool for developing aircrew training. In its current configuration it provides automated support for completing five ISD steps; task list development, objectives hierarchy, media selection, syllabus design, and lesson specification development. It can be used to design training for seven aircrew mission phases (pre-mission planning, pre-flight, take-off/departure, navigation, approach/landing, post-mission debrief, and special procedures) and three crew positions (pilot, co-pilot and radar intercept officer). In using CASDAT, the training developer interacts with the system on a real time basis via a terminal consisting of a CRT display screen and a typewriter-like keyboard. Based on the developer's real time inputs, CASDAT generates lists delineating the tasks to be trained and the objectives for the training; selects media; develops a prototype syllabus for training; and summarizes information needed by the developer to write training lessons.

<sup>1</sup> Prophet, W.W., U.S. Navy Fleet Aviation Training Program Development, Technical Report NAVTRAEQUIPCEN 77-C-0009-1, Naval Training Equipment Center, Orlando, Florida, March 1978.

TABLE 1. CONTRACTOR PROFESSIONAL AND NAVY SME EFFORT BY ISD STEPS AND AIRCREW TRAINING PROGRAM

EFFORT CATEGORY	AIRCREW TRAINING PROGRAM							
	A-6E		E-2C		EA-6B		SH-2F	
	Hours	% of Total	Hours	% of Total	Hours	% of Total	Hours	% of Total
Work Plan	174	1	224	3	NS <sup>a</sup>	NS	NS	NS
Task Analysis	3,654	31	1,740	26	449	7	560	16
Training Objectives	3,045	26	965	15	736	12	1,044	30
Trng. Prog. & Lesson Specifications	3,306	28	3,652	55	2,632	43	1,865	54
Other	1,479	13	NS	NS	2,318	38	NS	NS
Professional Effort Total	11,658	100	6,581	100	6,135	100	3,469	100
Navy SME Effort	1,348	100	87	100	1,547	100	5,752	100
Total Effort <sup>a</sup>	13,006	100	6,668	100	7,682	100	9,221	100

NS = Not Shown

\*Data Source: Prophet, W.W., U.S. Navy Fleet Aviation Training Program Development, NAVTRAEQUIPCEN 1978

## SECTION II

## BACKGROUND

CASDAT has evolved from an effort by NAVTRAEQUIPCEN to reduce the costs of ISD. Impetus for research in this area came after the gradual maturing of ISD technology had led to general acceptance of its role in Department of Defense training programs. However, system program managers, tasked with funding ISD efforts, pointed to the high "up front" costs of ISD and as a result questioned its overall cost-effectiveness.

NAVTRAEQUIPCEN began in 1977 to systematically address the problem. First, a specification and data item descriptions (MIL-T-29053)<sup>2</sup> were produced which standardized design, development, procurement and evaluation of training systems. This should make good progress toward solving a problem of lack of standardization in ISD.

Looking next to automation as an approach to reducing labor costs, NAVTRAEQUIPCEN procured functional specifications for a Computer Assisted Training System Development and Management Model (CATSDM).<sup>3</sup> The objective of the study was to identify functional specifications for a series of computer programs and data bases needed to support ISD steps from problem analysis through system implementation. The results of the effort identified 24 individual ISD steps as candidates for automation (see Figure 1). CATSDM provided the theoretical basis for future study in that it mapped the course that needed to be followed. Although quite comprehensive, it left to other research the practical issues that had to be addressed before automation and ISD could be melded into a useful and economical combination.

The necessary practical considerations became the subject of the current research study to demonstrate feasibility of attaining cost effective ISD by using automation and generic data bases as aids to the process. The problem addressed during this study was the duplication of effort on similar ISD programs and consequential duplication of costs. As a result, ISD data common to a number of aircrew training applications were developed repeatedly. In effect, some portion of every ISD effort was paid for more than once. In a cooperative effort between NAVTRAEQUIPCEN and Veda Incorporated, a study was undertaken to determine if some investment made in previous ISD projects could be recouped by using products from past efforts to reduce the cost of future ISD efforts.

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2

Naval Training Equipment Center. Military Specifications, Training Requirements for Aviation Weapon Systems, MIL-T-29053. Naval Training Equipment Center, Orlando, Florida, October 1977.

3

Hughes, J., O'Neal, F., Kearsley, F., O'Neal, H., Fee, M., Rodi, L., and Hermans, J., Functional Specifications for Computer Aided Training Systems Development and Management (CATSDM) Support Functions. Technical Report NAVTRAEQUIPCEN 77-C-0018-1. Naval Training Equipment Center, Orlando, Florida, July 1978.

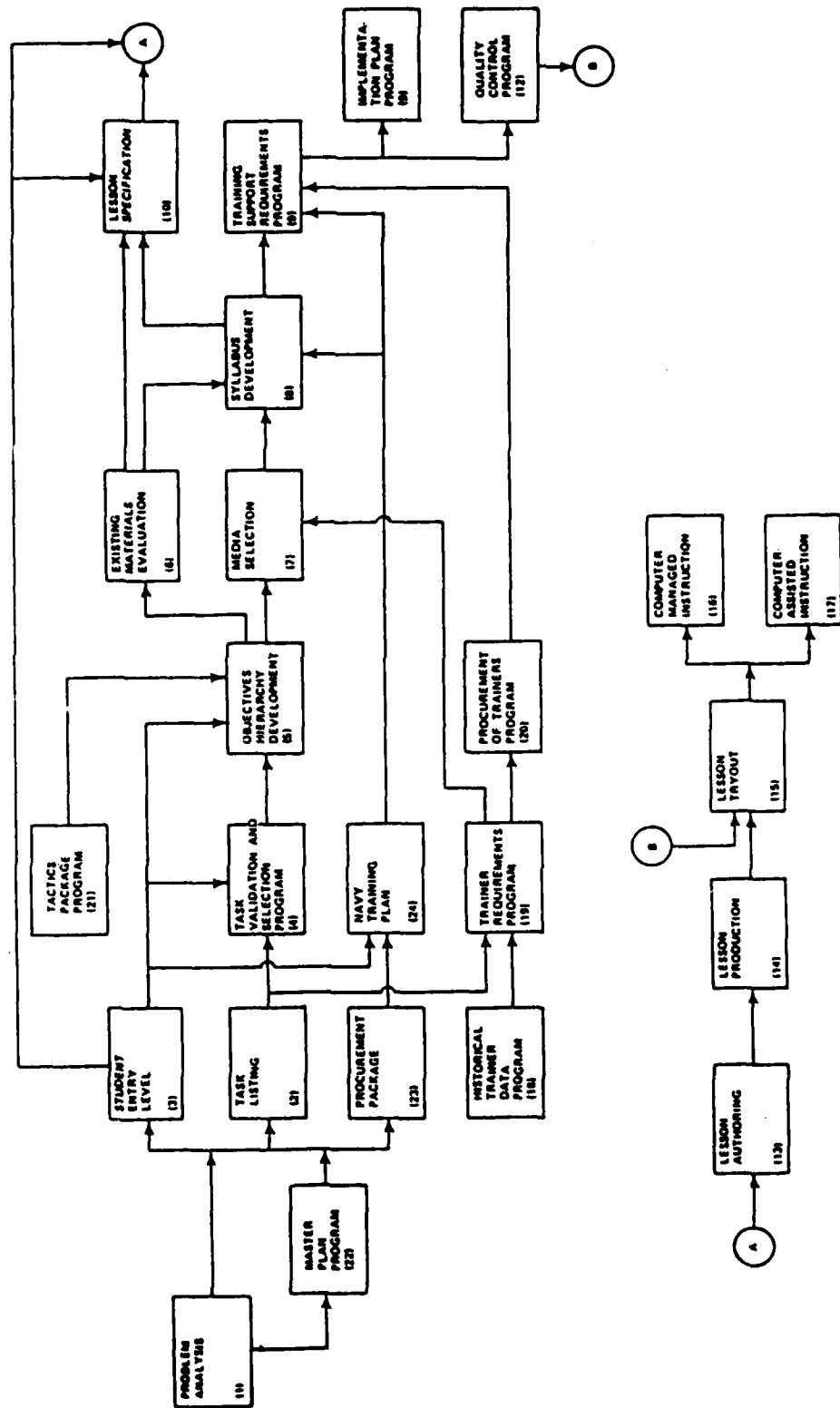


FIGURE 1. 24 ISD Steps Identified as Candidates For Automation

The study consisted of three phases:

<u>Phase</u>	<u>Purpose</u>	<u>Time</u>
I Feasibility Study	Determine the theoretical feasibility of using automation to reduce the cost of ISD.	September 1978 - May 1979
II Prototype Development	Build a prototype system to verify the feasibility of using automation to reduce the cost of ISD.	October 1980 - May 1981
III Operational Development	Expand the prototype system into a useful, operational tool to aid the ISD process.	September 1981 - July 1982

Each phase of the study is described in the following sections of this report. Section III describes the procedures used to determine the feasibility of using an automated data base to reduce the costs of ISD. Section IV describes the prototype system which was developed to verify feasibility. Section V describes the fully operational computer aided system for developing aircrew training (CASDAT).



## SECTION III

## PHASE I: THE FEASIBILITY STUDY

NAVTRAEQUIPCEN tasked Veda Incorporated with investigating the feasibility of using automated aids and general data bases to reduce ISD costs. Specifically, the feasibility study was designed to investigate whether data bases could be created to support critical steps in the ISD process. Further, the study investigated the contribution to this purpose of using aircrew training program data developed during previous ISD efforts. Additionally, could an instructional developer be provided with a system of computer programs, which aid in the editing and manipulating of data, in order to save time and money?

The study effort was divided into two parts, each of which was structured to answer specific questions. This served to direct the activities of each part. The specific questions, by part were:

- Part 1: Do families of tasks exist among aircrew training data from different aircraft types?
- Part 2: If task families exist, is a general task data base feasible to aid ISD?

If a general task data base is feasible, are general data bases feasible for other ISD steps?

What are the potential savings in resources and time when a general data base system is applied to steps in the ISD process?

These questions were stated so that the answer to each determined whether or not the next question would be asked. The procedure established whether or not work progressed to subsequent questions of the study, thus allowing NAVTRAEQUIPCEN to make go, no-go decisions at several crucial points. Following a review of the results of this study, NAVTRAEQUIPCEN made the decision to develop a computer-based prototype aid to ISD (Phase 2). This section of the report will describe the procedure and results of the feasibility study.

## PROCEDURES AND RESULTS

PART I PROCEDURES AND RESULTS. The first part of the study addressed the question: Do families of tasks exist? The purpose of this part was to identify a common framework of task families which could be ordered into a data base and accessed and manipulated to support one or more steps of the ISD process. A preliminary review of available Navy aviation training data revealed broad similarities in aircrew tasks across various aircraft types. This observation was expected since flight training in general and military flight training in particular is highly standardized. A more in-depth review of these same data, however, indicated a wide range of

variability in the terminology, data organization, type of content and level of detail. It was concluded that these data, in their present form, could not be used in subsequent analyses to determine the existence of families of tasks. These data had to be restructured into a common format in order to facilitate the search for task families.

The task data were organized into a generic structure, i.e., a hierarchy for analyzing and displaying existing aircrew training data in a common form. The generic structure was developed by comparing the existing task listing data from previously completed aircrew training analyses, as well as from military instructions and directives (MIL-T-29053A, NAVEDTRA 105A and AFP50-58). The result was a generic task listing structure composed of seven elements. These seven elements are shown in Table 2 to illustrate the variability found in these data.

Once the generic task listing structure was established, project researchers reviewed each level of the generic task listing structure to standardize the data within each level. At the mission phase level, mission phase data from available aircrew training analyses were collapsed into eight generic phases. The results of this analysis are shown in Table 3. Similar analyses at the task and subtask levels produced additional generic task families. Because of the increased detail at these levels of task listing, the number of generic statements produced was increased. The product of this analysis was the generic task listing model shown in Table 4. Task listing data contained in the model are displayed at the mission phase, task, and subtask levels of the task listing hierarchy.

Researchers validated the generic task listing model by comparing it with task data from nine individual aircraft across mission, mission phase, task and subtask levels. These nine, F-14, F-4, E-2, P-3, A-6, SH-2F, A-10, F-16 and F-18 were selected because the analyses had been done using the mission, mission phase, and task organizations. This comparison identified the presence or absence of a given task for a particular aircraft with the same generic task identified in the model. A review of the results indicated a very high level of comparability between these generic statements and those from individual aircraft task listings.

An additional step was taken to verify the generic task listing model. Researchers were concerned about whether the generic model would be useful in generating a task listing for a given aircraft, independently of any existing task listing for that aircraft. To ensure that the model would be useful in generating a full range of tasks for one specific aircraft, it was necessary to develop a series of questions that would aid in providing necessary task data in the task listing development process. These questions are contained in Appendix A and serve to help create and organize information required for the final product. When this model was used to derive a task listing, tasks contained in the new task listing were compared with those listed in an existing task list. It was found that the generic task listing model together with

Table 2. A COMPARISON OF THE GENERIC TASK LISTING STRUCTURE WITH THE TASK LISTING STRUCTURES CONTAINED IN MILITARY ISD DOCUMENTATION AND FROM SELECTED AIRCRAFT ISD PROJECTS.

Generic Task Listing Structure	Military Task Listing Structures	Aircraft ISD Project Task Listing Structures
1. Aircraft Type	MIL-T-29053 Job or Function	F-14 Job
2. Aircrew Position	NAVEDTRA 106A Job	F-4 Job or Function
3. Mission	AFFSO-58 Job	E-2 Responsibility area
4. Phase	NAVEDTRA 106A Duties	P-3(TAGE) Mission Phase
5. Task	AFFSO-58 Duties	E-2 Mission Segment
6. Subtask	NAVEDTRA 106A Tasks	F-16 Mission Phase
7. Step	AFFSO-58 Tasks	A6 Event
	NAVEDTRA 106A Elements	F-4 Task
	AFFSO-58 Subtasks	E-2 Task Element
	AFFSO-58 Activities	F-4 Perform Checklist
		F-16 Task Statement

Table 3. A COMPARISON OF A GENERIC MISSION PHASE STRUCTURE WITH THOSE OF SELECTED NAVY AND AIR FORCE AIRCRAFT

GENERIC MISSION PHASE	F-4	F-14	SB-27	F-3 (TAEC)	A-10	F-16	F-15
Pre-mission Planning	Pre-mission Planning Brief	None	Pre-mission Planning	Mission Preparation	Mission Preparation and Briefing	Pre-mission Planning	Pre-mission Planning Briefing Mission
Pre-takeoff	Pre-launch	Pre-launch	Pre-launch	Pre-takeoff Procedures	Pre-takeoff	Pre-takeoff Procedures	Pre-launch
Takeoff/Departure	Takeoff/Departure	Takeoff/Post-launch	Takeoff	Takeoff Climb/Departure	Takeoff/Departure	Takeoff/Departure	Aircraft Launch
Navigation	Navigation	Navigation	Navigation	Cruise Out	Enroute	Enroute Procedures	Instrument Flying Maneuvers
Tactics	Conduct Mission	Surveillance Combat	Tactics	Tactics	Mission	Combat	A/C Tactics A/A Tactics Recon. Tactics Escort Tactics
Approach/Landing	Approach/Landing	Approach/Landing	Recover	Descent Final Approach & Landing Missed Appt.	Approach/Landing	Recovery Procedures Landing Procedures	Approach/Landing
Post-Mission	Post-Mission Debrief	Post-Mission Debrief	Post Flight Procedures Mission Debriefing	Post-Landing Post-Mission	After landing & Post Flight Operations	Post Flight Procedures Mission Debriefing	Post-Mission Debrief
Special Procedures	Refueling	Inflight Fundamentals Emergency Procedures	Inflight Emergencies Inflight Refueling	Emergency Procedures Abnormal & Special Procedures	Inflight Fundamentals Emergencies	Air Refueling Procedures	Refueling

Table 4. GENERIC TASK LISTING MODEL

- 1.0 PREMISSION PLANNING
  - 1.1 Collect Mission Data
    - 1.1.1 Select Pubs
    - 1.1.2 Gather Data
  - 1.2 Determine Mission Data
    - 1.2.1 Compute T/O and Landing Data
    - 1.2.2 Compute Aircraft Data
    - 1.2.3 Compute Navigation Data
    - 1.2.4 Compute Mission Data
  - 1.3 Record Data
  - 1.4 Conduct Brief
- 2.0 PRELAUNCH
  - 2.1 Prepare/Check
    - 2.1.1 Personal Equipment
  - 2.2 Exterior Preflight Checks
  - 2.3 Interior Preflight Checks
    - 2.3.1 Before Entering Cockpit Inspection
    - 2.3.2 Before Electrical Power Checklist
    - 2.3.3 After Electrical Power Checklist
  - 2.4 Engine Start
    - 2.4.1 Before Starting Engines Checklist
    - 2.4.2 Engine Start Procedures Checklist
    - 2.4.3 Respond to Emergencies During Engine Start
  - 2.5 Systems Check/Set Up
    - 2.5.1 Flight Controls Checks
    - 2.5.2 Avionics Systems Checks
  - 2.6 Taxi
    - 2.6.1 Before Taxi Checklist
    - 2.6.2 Perform Taxi
    - 2.6.3 Respond to Emergencies During Taxi
    - 2.6.4 Perform Communications During Taxi
  - 2.7 Before Takeoff Checks
    - 2.7.1 Takeoff Checklist
- 3.0 TAKEOFF/DEPARTURE
  - 3.1 Execute Takeoff
    - 3.1.1 Perform After Takeoff Checklist
    - 3.1.2 Perform Departure Transition During Takeoff
    - 3.1.3 Respond to Emergencies During Takeoff
    - 3.1.4 Perform Communications During Takeoff
  - 3.2 Reconfigure Systems
  - 3.3 Maneuver on Departure Profile
- 4.0 NAVIGATION
  - 4.1 Establish Objectives
  - 4.2 Evaluate Systems
    - 4.2.1 Respond to Failures/Degrades
  - 4.3 Configure/Update Systems
  - 4.4 Maneuver Aircraft
    - 4.4.1 Fly a Course/Heading
    - 4.4.2 Fly a Vector
    - 4.4.3 Fly a Point to Point
    - 4.4.4 Fly an Arc
- 5.0 TACTICS
  - 5.1 Exterior Preflight Checks
    - 5.1.1 Perform Ordnance Preflight Checklist
  - 5.2 Configure Aircraft
    - 5.2.1 Perform Missile Tuning/Arming
  - 5.3 Navigation
    - 5.3.1 Perform Search/Patrol
  - 5.4 Acquire Targets
    - 5.4.1 Intercept Targets
    - 5.4.2 Engage Targets
  - 5.5 Perform Tactical Communications
  - 5.6 Deliver Weapon
  - 5.7 Evaluate Delivery Results
  - 5.8 Counter Threats During Engagement
  - 5.9 Respond to Emergencies During Tactical Mission
  - 5.10 Disengage
- 6.0 APPROACH/LANDING
  - 6.1 Prepare Aircraft
    - 6.1.1 Perform Descent Checklist
  - 6.2 Execute Approach Profile
    - 6.2.1 Perform Landing Checklist
    - 6.2.2 Execute Landing
    - 6.2.3 Respond to Emergencies During Approach/Landing
    - 6.2.4 Perform Communications During Approach/Landing
- 7.0 POST MISSION
  - 7.1 Taxi
  - 7.2 Check Systems
    - 7.2.1 Perform Post Landing Checklist
  - 7.3 Shutdown
    - 7.3.1 Perform Engine Shutdown Checklist
  - 7.4 Inspect Aircraft
  - 7.5 Maintenance Debrief
  - 7.6 Flight Debrief
- 8.0 SPECIAL OPERATIONS
  - 8.1 Conduct Hot Refueling
    - 8.1.1 Perform Hot Refueling Checklist
    - 8.1.2 Perform Hot Refueling Comm
    - 8.1.3 Respond to Emergencies During Hot Refueling
  - 8.2 Conduct Air Refueling
    - 8.2.1 Rendezvous With Tanker Aircraft
    - 8.2.2 Perform Air Refueling Checklist
    - 8.2.3 Perform Air Refueling Comm
    - 8.2.4 Reconfigure Aircraft After Air Refueling

the task analysis questions could produce a task list which matched approximately 75 percent of the tasks listed in the original document.

PART II PROCEDURES AND RESULTS. Part II of the study addressed three questions:

- a. If the task families exist, is a general task data base feasible for ISD?
- b. If a general task data base is feasible, are general data bases feasible for other ISD steps?
- c. What are the potential savings in resources and time when a general data base system is applied to steps in the ISD process?

Instructional programs for Navy aviation are designed in response to two categories of training situations: (1) training required to operate an entire training system whether new or existing, and (2) training required for some portion of an existing training system. In the first situation, training must be developed for an entire range of crew duties and aircraft missions. In the second situation, training must be selectively altered for an existing program to accommodate such changes as equipment modification, expanded aircraft missions or alterations in crew complement.

At this point, the general data base concept was not sufficiently developed to be regarded as an answer to every kind of training problem. Therefore, a decision was reached to investigate the technical feasibility of establishing a task listing data base for those situations where training is required for the operation of a whole aircraft weapons systems, regardless of whether it is emerging or existing. A number of important factors entered into this decision. The preponderance of available training data was from this training environment. Additionally, more personnel, time and money are involved in these programs, making it more likely that a general data base would have a greater impact. Finally, the problems to be solved in developing an emerging system training program are more complex than encountered in modifying an existing training program. That is, there are typically more skills and knowledge to be acquired by the student over a wider range of learning environments: classroom, flight trainers, and actual aircraft. If the data base concept were found feasible as an aid to ISD for an emerging training system development effort, it would also be feasible for modifying an existing training program.

The next major step was to determine the format of the data base system. Candidate data base formats were selected that were compatible with ISD objectives. These system formats are described in Table 5. Criteria were identified for the evaluation and final selection of the system format with the most potential for meeting present and future ISD requirements. A strategy was developed to apply these criteria.

Table 5. DESCRIPTIONS OF FEATURES OF VARIOUS DATA BASE FORMAT CANDIDATES

DATA BASE FORMAT CANDIDATES	
<u>SYSTEM FEATURES</u>	
A. Storage Medium	<p><u>Document System</u> This is a print-based, manually operated system which uses the following features.</p> <p>A library of printed volumes which contain the organized data bases in print form.</p> <p>An indexing system for organizing the data base library.</p>
B. Input/Output System	<p><u>Word Processor System</u> This is an electronic semi-automatic data (word) processing system which uses the following features.</p> <p>A library of magnetic tape (or other electronically compatible) units which contain the organized data base contents.</p> <p>An indexing system which either accesses the desired portion of a data base with electronic code selection or displays the tape library list of the user for manual selection of material.</p>
C. Processing System	<p><u>Computer Text-Editor System</u> This system is similar to the word processor system but also provides for the use of automatic data storage and retrieval capabilities and uses the following features.</p> <p>A library of magnetic tape or magnetic disk units which contain the coded data base contents.</p> <p>An indexing system which retrieves, displays, and loads the desired data base contents based on user query or command.</p> <p><u>On-line Interactive protocols/</u> algorithms which aid and request the user for input information, accesses and retrieves material from the data bases as a result of user input, organizes and displays the result for review.</p>
D. Output Product	<p>A "receiving" or working tape upon which desired material is first loaded and then displayed for review.</p> <p>A "generic model" of the final product to be produced as a result of interacting with data base programs. Stored on receiving time for review.</p>

The information processing/storage loads required for each ISD step were determined in sufficient detail to assess their effects upon each candidate system. Information such as numbers of task statements, word/character counts, and total storage requirements for a generic data base approach to the eight mission phases was compiled. This information is shown in Table 6. Next, a list of system features of the desired generic data base was identified and evaluated by the project staff. Functional variables such as final system costs, personnel requirements, support resources, portability, and system capabilities were considered for both data base implementation and use (see Table 7). Sources of costing data were obtained from equipment manufacturers and research reports. These variables and features were assigned a weight to reflect the relative importance of each to final system selection. The data loads identified earlier were applied to each candidate system format. Finally, each format was evaluated in terms of weighted system features and functional variables to arrive at a prioritized list of format candidates (see Table 8). Ratings for each candidate system on each system feature and functional variable (i.e., the selection criteria) are presented in Table 8.

When the functional analysis was completed for the list of data base format candidates, a cost-benefit analysis was performed for each. This analysis was conducted in the following manner:

a. Based on researcher experience with ISD and available data from Prophet (see Table 1) and others, the percentage of effort for each ISD step was assessed. In addition, the development procedures or functions common to all ISD steps were delineated and the percentage of effort for each was estimated. The results are shown in Table 9.

b. Next, the candidate data base formats were rated using a scale of 1 (low) to 4 (high) to determine their relative capabilities in aiding development procedures. As shown by Table 10, the computer text editor format scored highest in all procedure categories. For comparison purposes, the score of 1 was assigned to current practice and was used as a baseline.

c. The next step was to project time savings which could be expected when using each computing system for performing ISD. In order to accomplish this, percentage figures were assigned to each rating, based on expected reduction in time required to perform each ISD step. After analyzing each computing system, it was assumed that the greatest possible time savings which could be expected was 80 percent. The following is the scale used to estimate time savings expected from each computing system:

Rating from Table 10 = Expected percentage time reduction compared to baseline

1 = 0 percent  
 2 = 26.6 percent  
 3 = 53.2 percent  
 4 = 80 percent



Table 6. DATA BASE INFORMATION PROCESSING STORAGE REQUIREMENTS

Data Description	DATA BASES					
	Task Listing	Objective Hierarchies	Course Syllabus	Media Selection	Lesson Specifications	
Estimated No. of Statements	300 *	3500	300	600	100,000	
Average Word Length of Each Statement	10	20	5	10	20	
No. of Characters/Word	8	8	8	8	8	
Storage Requirement	24K	560K	12K	48K	16M	

\* Original Estimate. Final number of task statements in CASDAT was significantly higher. See page 49.

TABLE 7. DATA BASE FORMAT PRELIMINARY EVALUATION CRITERIA

FUNCTIONAL VARIABLES	DATA BASE FORMAT CANDIDATES		
	Document System	Word Processor System	Computer Text-Editor System
A. System Costs	\$5,000 to \$10,000	\$10,000 to \$20,000	\$10,000 to \$35,000
B. Ease of System Operation & Data Maintenance	Difficult since data is frozen in print form in numerous documents.	Moderately difficult; data must be manipulated by trained system operator.	Moderately easy; computing system permits random storage and retrieval of coded data. On-line user protocols guide developer through ISD processes.
C. Time to Develop A Working System	4 - 6 man months	10 - 12 man months	14 - 18 man months
D. System Updating and Expansion	Difficult, (see ease of system operation)	Possible, but expensive because system features are incorporated as a stand-alone device. New systems required, or expensive modification of existing equipment.	Easy, but expensive. System assembled from readily available, interchangeable off-the-shelf components. Little difficulty in locating system compatible peripherals.
E. System Flexibility to Meet Data Output Requirements	Relatively inflexible because data is frozen in documents that are not responsive to change. User system instructions, "workbooks", etc., in similar state.	Flexible but limited to scope. Data is stored on tapes or disks (flexible). Lacks capability to manipulate large data chunks. User interactions with system, instructions, limited to print form.	Flexible but may require modification of system software. System permits wide range of data manipulation requirements. User provided with on-line interactive protocols to guide him through required developmental steps.
F. Portability	Individual volumes are relatively portable.. large library of printed volumes and user materials would be difficult and expensive to move.	Due to their size and weight, word processors are typically "fixed", in-place systems. Not very portable once established.	Individually, system components are relatively portable. System can be readily broken down for transportation.
G. Personnel Qualifications	Instructional Psychologist, Subject Matter Specialist, Information Storage and Retrieval Specialists	Instructional Psychologist, Subject Matter Specialist, Word Processor System Operator	Instructional Psychologist, Subject Matter Specialist, System Analyst, Computer Programmer

Table 8. RESULTS OF RATING DATA BASE SYSTEM CANDIDATES AGAINST SYSTEM SELECTION CRITERIA

CRITERIA	DATA BASE SYSTEM CANDIDATES						
	Weight	Document System Rating	Document System Score	Word Processing System Rating	Word Processing System Score	Computer Text-Editor System Rating	Computer Text-Editor System Score
<u>SYSTEM FEATURES</u>							
A. Storage Medium	(5)	2	10	4	20	4	20
B. Input/Output Medium	(5)	1	5	3	15	5	25
C. Processing System	(15)	1	15	4	60	5	75
D. Output Product	(20)	2	40	4	80	4	80
			70		175		200
<u>FUNCTIONAL VARIABLES</u>							
A. Cost	(10)	4	40	3	30	2	20
B. Ease of Operation	(20)	1	20	3	60	4	80
C. System Development Time	(5)	4	20	3	15	2	10
D. System Update, Expansion	(15)	1	15	2	30	3	45
E. System Flexibility	(10)	1	10	3	30	4	40
F. Portability	(5)	2	10	1	5	3	15
G. Personnel Qualifications	(5)	2	10	3	15	3	15
	(115)		125		185		225
TOTAL SCORE:		195		360		425	
PERCENT OF TOTAL:		34%		63%		74%	

Table 9. ESTIMATES OF PERCENTS OF TOTAL PROJECT TIME REQUIRED TO PERFORM DEVELOPMENT PROCEDURES WITHIN SELECTED ISD STEPS.

DEVELOPMENT PROCEDURES	ISD STEPS				PERCENT OF TOTAL PROJECT TIME
	TASK LISTING	OBJECTIVE HIERARCHY	COURSE SYLLABUS	MEDIA SELECTION	
<b>1. COLLECTING INFORMATION</b> <ul style="list-style-type: none"> <li>Identify Information Sources</li> <li>Develop Information Collection Strategies</li> <li>Collect the Information</li> <li>Verify Quality of Information Gathered</li> </ul>	4	3	.5	.5	18
<b>2. AUTHORIZING PRODUCT</b> <ul style="list-style-type: none"> <li>Select Appropriate Information</li> <li>Arrange Selected Information Into Desired Format or Concepts</li> <li>Identify Missing Content; Author This Information</li> </ul>	6	12	5	1.5	54.5
<b>3. ENCODING</b> <ul style="list-style-type: none"> <li>Transform Authored Material From One Medium to Another; i.e., Prepare Typed Copy from Handwritten or Dictated Sources</li> <li>Additional Encoding May Be Required in Procedures 4, 5, and 6</li> </ul>	1	2	.25	.25	7.5
<b>4. EDITING</b> <ul style="list-style-type: none"> <li>Identify Omissions, Duplications, or Errors in Authored Product</li> <li>Reformat, Resequence or Correct Material</li> <li>Perform Additional Encoding, Included in No. 3</li> </ul>	.75	2	1	.25	7.0
<b>5. VERIFYING PRODUCT</b> <ul style="list-style-type: none"> <li>Ensure That Product Content Reflects Real World Requirements</li> <li>Perform Additional Editing As Required</li> <li>Perform Additional Encoding As Required; Part of No. 3</li> </ul>	1	3.75	1	.25	10
<b>6. PRODUCING FINAL PRODUCT</b> <ul style="list-style-type: none"> <li>Prepare "Smooth" Copy of Product in User Compatible Format</li> <li>Incorporate Product Into Storage/Retrieval System</li> <li>Perform Any Additional Encoding; Included as Part of No. 3</li> </ul>	.25	.25	.25	.25	3
<b>ISD STEP TOTALS</b>					<b>100%</b>
					<b>13%    23%    8%    3%    53%</b>

Table 10. RELATIVE CAPABILITIES OF DATA BASE SYSTEM FORMATS

DEVELOPMENT PROCEDURE	DATA BASE FORMAT			
	Current Practice	Document System	Word Process System	Computer Test-Editor System
1. COLLECTING INFORMATION <ul style="list-style-type: none"> <li>Identify Information Sources</li> <li>Develop Information Collection Strategies</li> <li>Collect the Information</li> <li>Verify Quality of Information Gathered</li> </ul>	1	2	3	4
	1	3	3	4
	1	2	3	4
	1	3	3	3
	Average	2.5	3	3.75
2. AUTHORIZING PRODUCT <ul style="list-style-type: none"> <li>Select Appropriate Information</li> <li>Arrange Selected Information Into Desired Format or Concepts</li> <li>Identify Missing Content; Author This Information</li> </ul>	1	2	3	4
	1	1	2	4
	1	1	2	2
	Average	1.3	2.3	3.3
3. ENCODING <ul style="list-style-type: none"> <li>Transform Authored Material From One Medium To Another; e.g., Prepare Typed Copy From Handwritten or Dictated Sources</li> <li>Additional Encoding May Be Required In Procedures 4, 5, and 6</li> </ul>	1	1	4	4
	1	1	2	4
	1	1	3	4
	Average	1	1	4
4. EDITING <ul style="list-style-type: none"> <li>Identify Omissions, Duplications, or Errors In Authored Product</li> <li>Reformat, Resequence or Correct Material; Perform Additional Encoding, Included In No. 3</li> </ul>	1	1	2	3
	1	1	3	4
	1	1	2.5	3.5
	Average	1	1	3
5. VERIFYING PRODUCT <ul style="list-style-type: none"> <li>Ensure that Product Content Reflect Real-World Requirements</li> <li>Additional Encoding As Required: Part of No.3</li> </ul>	1	1	1	1
	1	1	2	3
	1	1	1.5	2
	Average	1	1.5	2
6. PRODUCING FINAL PRODUCT <ul style="list-style-type: none"> <li>Prepare "Smooth" Copy of Product In User Compatible Format</li> <li>Incorporate Product Into Storage/Retrieval System; Perform Any Additional Encoding; Included as Part of No. 3</li> </ul>	1	1	3	4
	1	2	1	3
	1	1.5	2	3.5
	Average	1	1.5	3.5
SUM 1 - 6				51
RELATIVE SYSTEM CAPABILITY AVE 1 - 6				3.4

Key: Expected Percentage Time Reduction: 1-0%; 2-26.6%; 3-53.2%; 4-80%

In using this scale, researchers were able to assess the percentage reduction in time using the ratings shown in Table 10. Therefore, the time requirements for an ISD effort shown in Table 9, were reduced by the percentages assigned as a result of the analysis in Table 10.

For example, the 11 percent of total ISD time projected for performing task listings by the document system (see Table 11) was derived by a three-step process: (1) the percent of project time estimated for performing each development procedure of task listings (from Table 9) is reduced (i.e., multiplied) by the percent of time reductions expected for the same development procedures as a result of using the document system (see Table 10); (2) the products resulting from the multiplications performed in Step 1 are added to obtain the total percent time savings expected for performing all the development procedures for task listings with use of the document system; and (3) the total percent time savings for the document system is subtracted from the percent of time estimated for performing task listings by current methods, to obtain the estimated percent of total ISD time to perform task listings by the document system.

Actual computations for these three steps for the foregoing example are as follows:

	<u>% OF TIME FOR TASK LISTINGS BY CONVENTIONAL METHODS</u>		<u>% OF TIME REDUCTIONS WITH DOCUMENT SYSTEM</u>		<u>% TIME SAVINGS</u>
Collecting Information	4.00	X	39	=	1.60
Authoring Product	6.00	X	8	=	.48
Encoding	1.00	X	0	=	0
Editing	.75	X	0	=	0
Verifying Product	1.00	X	0	=	0
Producing Final Product	.25	X	13	=	<u>.03</u>
					= 2.11%
<b>TOTAL TIME SAVED FOR TASK LISTINGS</b>					= 2.11%
					= 13.00%
Time required for task listings with current method				=	<u>2.11%</u>
Time saved for task listings with document system					
Time required for task listings with document system				=	11.00%

The other estimates (in Table 11) of the time required for performing ISD steps by the document system, word processors and computer text-editors were computed by the same method.

Estimates were made of cost savings that would accrue from applying each data base system format to an instructional development project. A project budget of \$200,000 was assumed as a conservative estimate of costs for front end analyses for a full aircrew ISD effort following current ISD practices. Percentages of man-hour savings for each data base system were then applied to the assumed project to arrive at an estimated cost savings for conducting ISD for each system format. An

Table 11. PROJECTED TIME SAVINGS\* OFFERED BY EACH OF THE DATA BASE SYSTEM OPTIONS FOR COMPLETING SELECTED STEPS OF THE ISD PROCESS

SYSTEM FORMATS	ISD STEPS					System Format Totals	Percent of Total Project Manhours Saved
	Task Listing	Objectives Hierarchy	Course Syllabus	Media Selection	Lesson Specification		
CURRENT PRACTICE	13%	23%	8%	3%	5%	100%	-0-
DOCUMENT SYSTEM	11%	21%	7.5%	2.5%	46.5%	88.5%	11.5%
WORD PROCESSOR	8%	15%	5%	2%	33%	63%	37%
COMPUTER TEXT-EDITOR	4.5%	9.5%	3%	1%	20%	38%	62%

\*Time savings estimates are expressed in terms of percent of total project manhours and were determined by subtracting total time for each system format from the total for current practice.

examination of the results of these calculations in Table 12 suggested that the computer text-editor system provides the most savings (\$124,000.00) of the three candidate system formats. Somewhat less savings would result from the use of a word processor system (\$74,000.00) or a document system (\$23,000.00).

The analyses conducted in this part of the project were intended to address the technical feasibility of establishing an automated system to support the ISD process. It was clear from the analyses that of the three system formats deemed worthy of consideration for providing automated aid to ISD, the computer text-editor system appeared to offer the most advantages. Of the three system candidates, a computer text-editor system could most readily be programmed to manipulate, rearrange, and update data based information to produce new training programs, which reflect new insights or new requirements. As part of this analysis, it was further indicated that the costs of conducting ISD would be reduced if the instructional developer were provided with the computer based system containing on-line, interactive statements which guide him through the various steps in the ISD process, thus reducing many of the redundancies and inefficiencies inherent in present ISD methodology. Therefore, the total process could be completed in a shorter period of time by fewer and less skilled ISD personnel.

#### CONCLUSIONS

The investigation into the feasibility of establishing an automated aid to ISD proceeded systematically through both parts by producing affirmative answers to the four questions. Task families were identified at the Mission, Mission Phase, Task, and Subtask levels. This effort resulted in the development of a generic task listing model. This model represented a wide variety of aircrew task listing data from a number of aircraft types, having the same underlying rationale, organizational structure, type of content and level of detail. Not only was the model a powerful tool in generating a comprehensive task listing for a given aircraft, but it facilitated future research in the development of a prototype automated aid to ISD.

A general data base for ISD was shown to be feasible. This area of the investigation was in essence divided into two parts. The first part addressed the technical issues of feasibility and focused on the format for the data based system. Three system options were identified as a result of evaluating the functional requirements of designing, developing and managing a data base of aircrew training data and those requirements of the training environment. These three systems were an aided document based system, a word processor system, and a computer text-editor system. Of the three systems, the computer text-editor system possessed more capabilities needed to support an aircrew training program development effort. It possessed the memory capacity essential for storing large amounts of training data and interactive capabilities for user aids. It permitted random storage and retrieval of these data as well as on-line review and edit capabilities. The principal shortcoming of this system was the amount of time required to establish the data base system. This cost was negligible, however, when compared with the anticipated benefits of the system over long-term use and with subsequent improvements to the system.



Table 12. ESTIMATED COST SAVINGS FOR CONDUCTING ISD BY  
DATA BASE SYSTEM FORMAT

<u>DATA BASE SYSTEM FORMAT</u>	<u>PROJECTED PERCENT OF MANHOURL SAVINGS</u>	<u>ISD BUDGET SAVINGS</u>
1. DOCUMENT BASED SYSTEM	11.5%	\$23,000
2. WORD PROCESSOR SYSTEM	37%	\$74,000
3. COMPUTER TEXT-EDITOR	62%	\$124,000

The second part of answering the feasibility issue for selecting an automated aid to ISD was to assess the potential cost savings of format systems to support the process. The results of this analysis clearly indicated that the computer text-editor system would provide the greatest potential cost savings benefits. This would result from the reduction of redundancies and inefficiencies in the use of aircrew training data while developing various steps in the ISD process. Moreover it was thought feasible that the computer text-editor system could be programmed to contain instructional development guidelines to guide the user through the development process. This feature would further reduce ISD costs by obviating the requirement of having a full-time instructional psychologist available who typically would provide the same information during development. Thus, the computer text-editor system was determined capable of providing effective, efficient instructional development support at a lower cost and with fewer ISD personnel than the current expensive, labor-intensive methodology.

Because of the positive results of this feasibility study, NAVTRAEQUIPCEN undertook to demonstrate feasibility by building a prototype system which could provide an automated aid to ISD. Section IV of this report describes this prototype Computer Aided System for Developing Aircrew Training (CASDAT).

## SECTION IV

## PHASE II: THE PROTOTYPE SYSTEM

The CASDAT prototype was built in order to verify and demonstrate the principles theoretically derived during the feasibility study. CASDAT's purpose was to demonstrate that an automated aid to ISD could, indeed, result in cost savings during the training design process. Furthermore, it was designed to demonstrate that an automated aid could be designed based upon a data base created from existing aircrew training data. For demonstration purposes, researchers selected a portion of the recognized ISD steps and a portion of the possible subject matter with which to demonstrate cost and time savings as a result of automation. This computer aiding of a "slice" of the aircrew training design process could be demonstrated and compared to the efficiency and effectiveness of more traditional aircrew training design practices.

Five ISD steps were selected to be included in the CASDAT prototype.<sup>4</sup> These five ISD steps, task list, objectives hierarchy, media selection, syllabus design and lesson specifications, were selected from 24 candidate ISD steps identified from a previous investigation.<sup>5</sup> They were selected because of such criteria as manpower requirements, skill level requirements or compatibility with automation. Media selection, for example, required a large amount of manpower to assess media requirements of each learning objective within a training course. At the same time it is conducive to automation because of the algorithmic nature of the selection process.

Two mission phases, prelaunch and navigation, were selected from the eight mission phases defined in the generic task listing model to provide aircrew data to be manipulated over the five ISD steps. Researchers recognized that if the CASDAT software programming could manipulate prelaunch and navigation data sufficiently to generate task lists, objective hierarchies, media selection, syllabus and lesson specifications, it would indicate the feasibility of manipulating other aircrew data.

The prototype CASDAT was designed to be used by either a trained instructional developer or a subject matter expert with a minimum of instructional design background. Taking inputs from the user on the characteristics of the aircraft, CASDAT generated a task list and objectives hierarchy for the user's particular aircraft. This became the user's data base which was modified and expanded by the system through each of the ISD steps.

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Veda Incorporated. Establishing The Feasibility Of A General Data Base For Instructional Systems Development. Interim Report for Contract N61339-78-C-0142, Veda Incorporated, San Diego, CA, May 1979.

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Hughes, J., O'Neal, F., Kearsley, F., O'Neal, H., Fee, M., Rodi, L., and Hermans, J. Functional Specifications for Computer Aided Training System Development and Management (CATSDM) Support Functions. Technical Report NAVTRAEQUIPCEN 77-C-0018-1. Naval Training Equipment Center, Orlando, FL, July 1978.

A computer text-editor system was selected after having been proven most cost-effective during the feasibility study. The prototype software package was written in FORTRAN for the PDP-11/34 computer system.

The prototype CASDAT will not be described in detail because it was very similar to the full-scale CASDAT which is described in Section V.

#### PROTOTYPE EVALUATION

As a prototype, CASDAT was incomplete. Additional work was required to transition the system from an experimental concept to an operational tool. To this end, NAVTRAEQUIPCEN undertook two separate efforts to evaluate the prototype version of CASDAT and to provide recommendations for improving the system to bring it closer to the status of an operational tool. During the first of these efforts, Appli-Mation Incorporated was tasked with evaluating the system's user interface, i.e., the set of interactions that occur between the training developer and CASDAT as the system is used to assist the developer in completing a training development effort. The second effort was an evaluation of CASDAT conducted by NAVTRAEQUIPCEN to assess the utility of the CASDAT concept, and to make recommendations for further enhancement. When evaluation of the prototype system showed that the system did, in fact, generate quality ISD products in significantly less time than is required using traditional ISD methods, additional development of CASDAT was recommended.

EVALUATION PROCEDURES. NAVTRAEQUIPCEN's internal evaluation was conducted in order to achieve two major objectives:

- a. Demonstrate the cost/time savings of CASDAT as compared to manual instructional systems design.
- b. Determine future development needs of the CASDAT system.

In addressing the first objective, the evaluation attempted to compare two task listings and objective hierarchies for the same aircraft system; one using the CASDAT system, one using manual procedures. Four aircraft were used: F-4, F-14, SH-2F and CH-46. All had previously had ISD performed using conventional methods. The evaluation was structured to measure the development time differential between CASDAT and a manually developed baseline following the procedures specified in MIL-T-29053(A). Data recorded included:

- a. time elapsed for each ISD step
- b. user interface problems
- c. estimate of accuracy of CASDAT data

The second objective was met through analysis of the data gathered and review of the needs of potential users of an operational CASDAT system. Specifically, training design and development specialists and managers within NAVTRAEQUIPCEN were polled to identify areas within their purview that could be aided by CASDAT.

## EVALUATION RESULTS

**COST/TIME SAVINGS.** Test results indicated that a user aircraft subject matter expert (SME) with marginal ISD knowledge could generate and validate the task list and objective hierarchy for two mission phases (prelaunch and navigation) in about two hours. Table 13 provides time data collected for developing task lists and objective hierarchies for four aircraft using CASDAT. It was estimated, based on evaluating SME's experience with traditional ISD approaches to the same weapon system, that performance of the same tasks by conventional ISD methods would require 168 hours; a savings of 99 percent. Furthermore, the CASDAT generated task lists and objective hierarchies for the two mission phases were consistently 75 percent complete. That is, 75 percent of the tasks and objectives in the final, validated task listings and objective hierarchies were provided by CASDAT.

The data collected from two mission phases were used to estimate savings for an entire aircrew training program. This was done very conservatively to allow for differences between the test situation and an actual ISD. For example, because the evaluation was not conducted in an actual training environment, training designers may not have been as careful (i.e., used as much time) to validate tasks and objectives as they might have if they had actually been responsible for developing training for an aircraft. In contrast, the two mission phases within the prototype CASDAT were two of the more simple phases for developing training. Conventional development of the tactics mission phase, for instance was expected to take considerably more time. Thus, considerable time savings could be expected in developing task lists, objective hierarchies, media selection, syllabus, and lesson specifications using CASDAT.

Table 14 shows the expected time savings for each of the five ISD steps using CASDAT. Time figures shown in the table for traditional ISD were taken from NAVTRAEQUIPCEN data on the F-14 aircrew training effort; expected CASDAT time figures were estimated for a comparable training design effort. Time estimates were made by assuming that the prototype CASDAT contained approximately one-twelfth the data a full-scale CASDAT would contain. Therefore, the estimated time required to perform each ISD step using CASDAT for all eight mission phases, was twelve times the time required for the two mission phases. An estimated 37 percent savings<sup>7</sup> was derived by dividing the total man-months (104.5) predicted for performing these ISD steps with CASDAT by the total man-months (166.5) in the baseline (F-14) effort and subtracting this number from 100 percent.

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<sup>6</sup> Veda Incorporated, Training Program Work Report. Naval Training Equipment Center, Orlando, Florida, October 1980

<sup>7</sup> The 37 percent savings is less than the 62 percent savings projected in an earlier section of this report. This discrepancy is due to an unusually large amount of time required for lesson specifications for the F-14 project and a relatively small advantage of CASDAT for this step.

Table 13. TIME REQUIRED TO DEVELOP AND VALIDATE TASK LISTING AND OBJECTIVES HIERARCHY FOR PRELAUNCH AND NAVIGATION MISSION PHASES USING CASDAT (BASED ON DATA FROM SYSTEM EVALUATION)

ISD STEP	AIRCRAFT TYPE					AVERAGE
	F-14	F-4	CH-46	SH-2F		
TASK LISTING	79 min	69 min	56 min	47 min		63 min
OBJECTIVES HIERARCHY	85 min	60 min	-----	40 min		62 min

Table 14. PROJECTED TIME SAVINGS WHEN DEVELOPING AIRCREW TRAINING PROGRAMS USING CASDAT (BASED ON DATA FROM SYSTEM EVALUATION).

ISD STEPS	MAN-MONTHS			% Savings
	Traditional	CASDAT		
TASK LISTING	12	< 1		92%
OBJECTIVES HIERARCHY	19	< 1		95%
MEDIA SELECTION	1.5	.5		66%
SYLLABUS DEVELOPMENT	20	2		90%
LESSON SPECIFICATIONS	114	100		13%
TOTAL	166.5	104.5		37%

Analysts were very careful not to overestimate the time savings to be gained from CASDAT. For example, in the evaluation test mentioned previously, SMEs reported that it took two hours to generate and validate a task list and objective hierarchy. If this were multiplied by 12, the time estimates in table 14 should read 24 hours, or .14 man months. However, analysts chose to project that SMEs in an actual training environment, would use something closer to one-man month. A similar conservative estimate was made to compute time savings during syllabus generation. Theoretically, with the objectives validated and media selected, CASDAT should be able to produce a syllabus in a matter of minutes. Again, analysts chose to be very conservative in their estimates of time savings, assuming that SMEs would do a great deal of study of the syllabus and several individuals would be involved in its validation and final approval.

Cost savings were estimated by multiplying the development time estimates from table 14 by an average cost per man month of \$6,000. Table 15 shows that an F-14 sized training program costs approximately \$999,000 for a conventional ISD application. This compares to \$627,000 for ISD operations if developed using CASDAT, resulting in a savings of \$372,000.

**USER INTERFACE EVALUATION.** Both Appli-Mation Incorporated (see a report by Maxie, 1980<sup>8</sup>) and NAVTRAEQUIPCEN human factors specialists evaluated CASDAT from the users' standpoint. Evaluators were asked to use CASDAT and identify user problems or additional needed system capabilities. Several refinements to CASDAT were identified as being especially desirable. They are summarized below.

Additional Flexibility. The prototype CASDAT was programmed for a lock-step process. The user could not go back and forth easily between ISD steps. Further development of CASDAT could modify this to allow the user to access various ISD steps at will to make changes and review material.

Easier Validation of Tasks and Objectives. The prototype CASDAT required the user to validate each task and objective on-line by answering yes or no to the question: Is this task or objective valid? This process could get extremely tedious, especially if it were to be done for an entire syllabus - not just the two mission phases that resided in the prototype CASDAT. It was suggested that in future development, CASDAT could be refined to allow validation by exception. Then tasks and objectives could be added or deleted by number. All CASDAT-generated tasks and objectives could be assumed valid unless otherwise indicated by the user.

Enhanced Media Selection for Psychomotor Skills. CASDAT was programmed using the media selection algorithm as specified in an early version of MIL-T-29053A. Since incorporation into the specification, the media

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Maxey, Jeffery L., User Model Development and Human Factor Analysis of the Computer Aided System for Developing Aircrew Training. Naval Training Equipment Center, Orlando, FL, September 1980.



Table 15. ESTIMATED COST SAVINGS FOR EACH ISD STEP WHEN DEVELOPED USING CASDAT (BASED ON DATA FROM SYSTEM EVALUATION).

ISD STEP	Cost Traditional	Cost CASDAT	Estimated Savings
TASK LISTING	\$72,000	\$6,000	\$66,000
OBJECTIVES HIERARCHY	\$114,000	\$6,000	\$108,000
MEDIA SELECTION	\$9,000	\$3,000	\$6,000
SYLLABUS	\$120,000	\$12,000	\$108,000
LESSON SPECIFICATIONS	\$684,000	\$600,000	\$84,000
TOTAL	\$999,000	\$627,000	\$372,000

selection algorithm has been questioned for its ability to specify psychomotor training media. CASDAT's usefulness to both media selection and the training device procurement process could be greatly enhanced if additional programming were added to enable selection of specific trainer device requirements.

As a result of the evaluation of the prototype system, the decision was made to develop it into an operational system. Section V describes the operationally capable CASDAT system.

SECTION V

PHASE III: OPERATIONAL DEVELOPMENT

The purpose of this effort was to enhance the previously developed prototype computer aided system for developing aircrew training (CASDAT) by making it a useful, operational system. The prototype CASDAT system consisted of a series of integrated computer programs necessary to provide automated aid to five instructional systems development (ISD) steps: task list development, objectives hierarchy development, media selection, syllabus design, and lesson specification development. In addition, the prototype CASDAT contained a limited amount of aircrew training data.

The purpose of this phase of the project was to add enough aircrew training data to make CASDAT much more useful to an instructional design effort. Earlier research under this project showed that all aircrew training data could be organized into eight categories, representing phases of an aircraft mission. Data from two of the eight mission phases, preflight and navigation, had been incorporated into the prototype CASDAT. The goal of this effort was to incorporate data representing five additional mission phases into the existing CASDAT system.

At the completion of this effort, CASDAT contained aircrew training data representing seven of the eight mission phases:<sup>9</sup>

- a. pre-mission planning
- b. preflight
- c. take-off/departure
- d. navigation
- e. approach/landing
- f. post-mission debrief
- g. special procedures

Supporting software routines allowed these data to be manipulated over five ISD steps:

- a. task list development
- b. objectives hierarchy development
- c. media selection
- d. syllabus design
- e. lesson specification development

REQUIREMENTS

CASDAT was built as an aid to the instructional developer. It was, and is, to be used as an interactive device, providing draft ISD products to a user who can then modify and improve them for his own purposes.

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<sup>9</sup>Tactics data have not yet been incorporated into CASDAT

CASDAT was designed as a tool which could save the instructional developer time and labor in various aspects of an ISD effort such as formatting instructional products, tracking tasks and objectives through each ISD step, and providing first draft versions of ISD products. CASDAT relieves the user from some of these mundane, and time consuming tasks. On the other hand, the user's portion of the job--to verify and improve CASDAT outputs--remains the most critical. CASDAT can save the instructional developer much time and anguish in creating the first draft of task list, objectives hierarchy, media selection, syllabus, and lesson specifications. It is, however, the user who transforms these data into products specific to the instructional design needs of a specific training system.

#### ASSUMPTIONS

It is assumed that the user knows something about instructional systems design. The user need not be an ISD expert, but should be familiar with ISD terms and recognize the use of each step in the ISD process.

The design of CASDAT is based upon the assumption that all aircrew training programs require training of similar tasks. This was proven to be true in a previous study which compared task lists and syllabi across fourteen aircrew training programs.<sup>10</sup> These generic tasks are embedded in CASDAT's programming.

Tasks are made more specific by tying them to equipment. The assumption is made that specific aircrew tasks are dictated by the requirements to operate equipment. Therefore, CASDAT programming allows generic tasks such as "configure systems for takeoff" to be broken into more specific tasks such as "configure flight control system for takeoff."

#### CONSTRAINTS

The ISD products created by CASDAT follow the guidelines presented in military specification MIL-T-29053 and associated data item descriptions.<sup>11</sup> In addition to the formats specified, the media selection algorithm specified in an early version of MIL-T-29053 has been incorporated into CASDAT.

The task listing and objectives hierarchies created by CASDAT are focused on the fleet readiness squadron (FRS) level of training. Fleet training and undergraduate (i.e., training command) level objectives are not necessarily included in CASDAT at this time.

The tasks and objectives created by CASDAT are generic in nature. Specific actions and procedures that support the tasks and objectives are aircraft-specific and, therefore, were not included in CASDAT.

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<sup>10</sup>  
Veda Incorporated. Establishing The Feasibility Of A General Data Base For Instructional Systems Development. Interim Report for Contract N61339-78-C-0142, Veda Incorporated, San Diego, CA, May 1979.

<sup>11</sup>  
Naval Training Equipment Center. Military Specifications, Training Requirements for Aviation Weapon Systems, MIL-T-29053. NAVTRAEQUIPCEN, Orlando, Florida, October 1977

Thus, although CASDAT will create a task which states "configure weapon control system," it is for the user to specify the actual procedures required to configure the system.

The CASDAT program is designed to run on the NAVTRAEQUIPCEN N-712 PDP 11/34 system under RSX11-M V3.2. The programming language is FORTRAN.

#### SYSTEM DESCRIPTION

Casdat was designed to be used either by a trained instructional developer or a subject matter expert with a minimum of instructional design background. CASDAT is not a totally automated instructional design system which provides the developer with a predetermined finished product. The user must validate and tailor the CASDAT output at each step of the ISD process to reflect the peculiarities of the system for which instruction is being designed.

By asking questions of the user, CASDAT generates a data base. This data base is then used and modified by both CASDAT and the user during each ISD step until the final syllabus and lesson specifications are produced. Figure 2 illustrates this process. This approach is made possible by the systematic nature of ISD itself.

ISD was built upon systems analysis techniques which specify that each step in an analysis problem has an input, process and output. Furthermore, the output of the first step in the analysis serves as the input for the next step, and so on through as many steps as are necessary to solve the problem. This provides for a continuous flow of information through each step in the ISD process and allows CASDAT to work upon the same data base throughout each ISD step. In simplistic terms, CASDAT aids the ISD process as follows:

- a. CASDAT asks questions of the user and generates a task listing based upon the answers given.
- b. The user corrects, adds to, modifies the task listing.
- c. CASDAT generates an objectives hierarchy based upon the validated task listing.
- d. The user corrects, adds to, modifies the objectives hierarchy.
- e. CASDAT asks questions of the user in order to select media for tasks and objectives.
- f. The user modifies media selection as necessary.
- g. CASDAT uses objectives hierarchy and media selection to create a syllabus.
- h. The user modifies the syllabus as necessary.

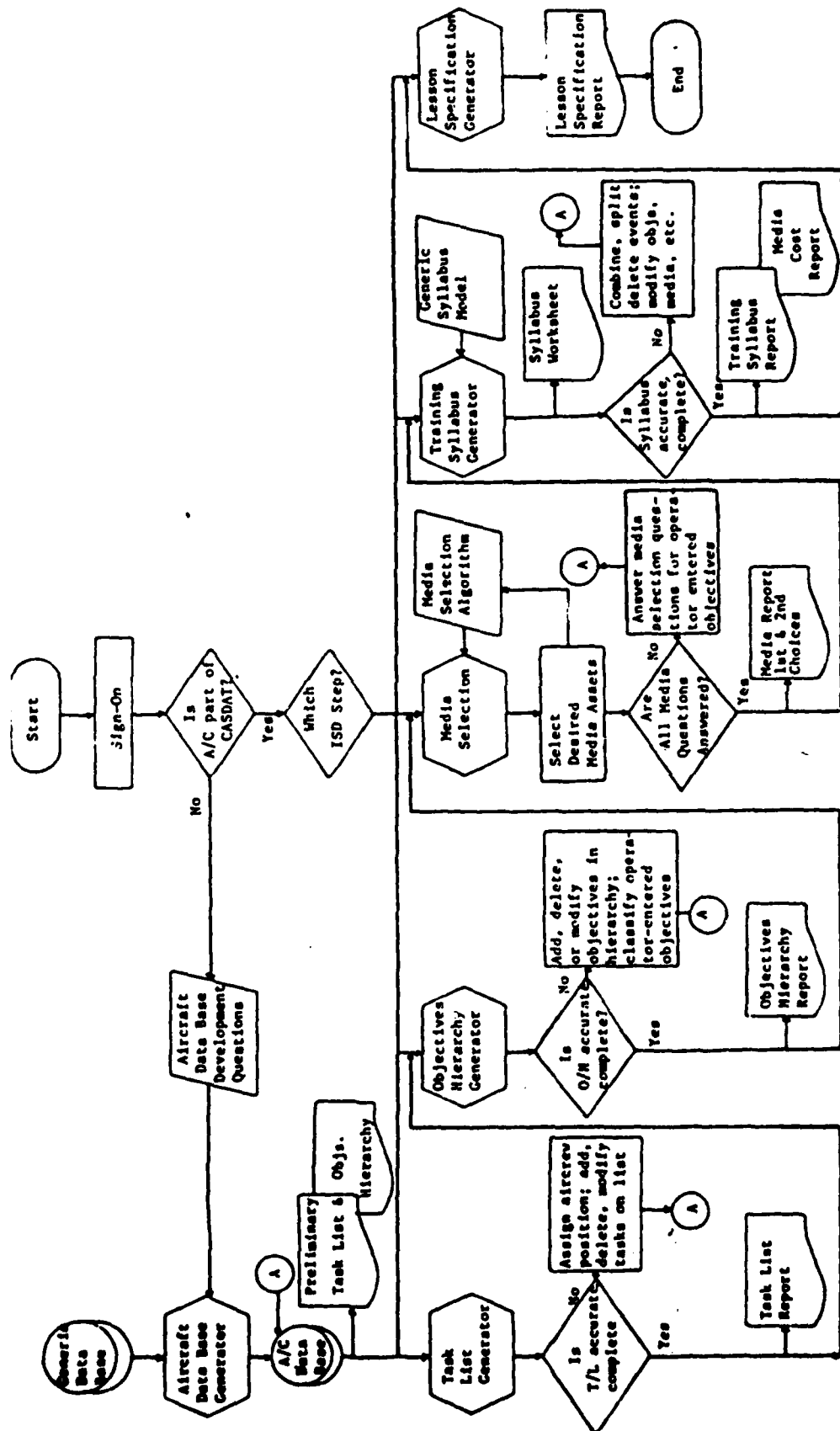


Figure 2. An Operational Flowchart of CASDAT

i. CASDAT uses the syllabus and media data to create lesson specifications.

j. The user modifies and completes the lesson specifications.

The CASDAT software package was written in FORTRAN for the PDP-11/34 computer system. It is portable in that it can be utilized on any computer with the following attributes: FORTRAN compiler, overlay capability, 32K-16 bit word user space, disk I/O with random access capability, five megabyte disk, line printer, CRT and keyboard. The package consists of system programming for each of the five ISD steps, programs for generating data bases and archives for the storage of data bases that have been generated by the interaction of the user with the generic models and the ISD algorithms. The package allows either the generation of a totally new data base for a given aircraft and crew position, or the modification of existing data bases.

CASDAT generates a data base for the users' particular needs. The user then manipulates and refines the data base in order to design the required syllabus. The following paragraphs discuss each step in the ISD process as it is aided by CASDAT.

**TASK LIST DEVELOPMENT.** The aircraft-specific task list becomes the user's data base which is manipulated and refined throughout each ISD step. The aircraft-specific task list is generated through interaction of the following:

a. The generic task list model represented by generic task statements. For example, "respond to emergency" or "Fly a vector." The task statements, which consists of verbs and objects without equipment description, are transparent to the user. The generic task list model is presented in Appendix B of this document.

b. A menu of aircraft characteristics such as, aircraft mission, weapons loading and avionics.

c. A set of questions which allows the user to select from the menu of aircraft characteristics.

d. A data base creation and management structure used to create the aircraft-specific data base. This allows data from a, b, and c above to interact and create an aircraft-specific task list. For instance, after the CASDAT user answers the questions as to aircraft mission, weapons loading, avionics, etc., CASDAT data base management structure matches the equipment with the generic task listing to create an aircraft-specific task: e.g., "Respond to fuel transfer system emergency" or "Fly a vector using TACAN." Figure 3 illustrates the system programming concept using these data.

Once the aircraft-specific task list is generated, a printout is produced for the user. Figure 4 presents a portion of a typical task list generated by CASDAT. The user can revise the task list in any of the following ways:

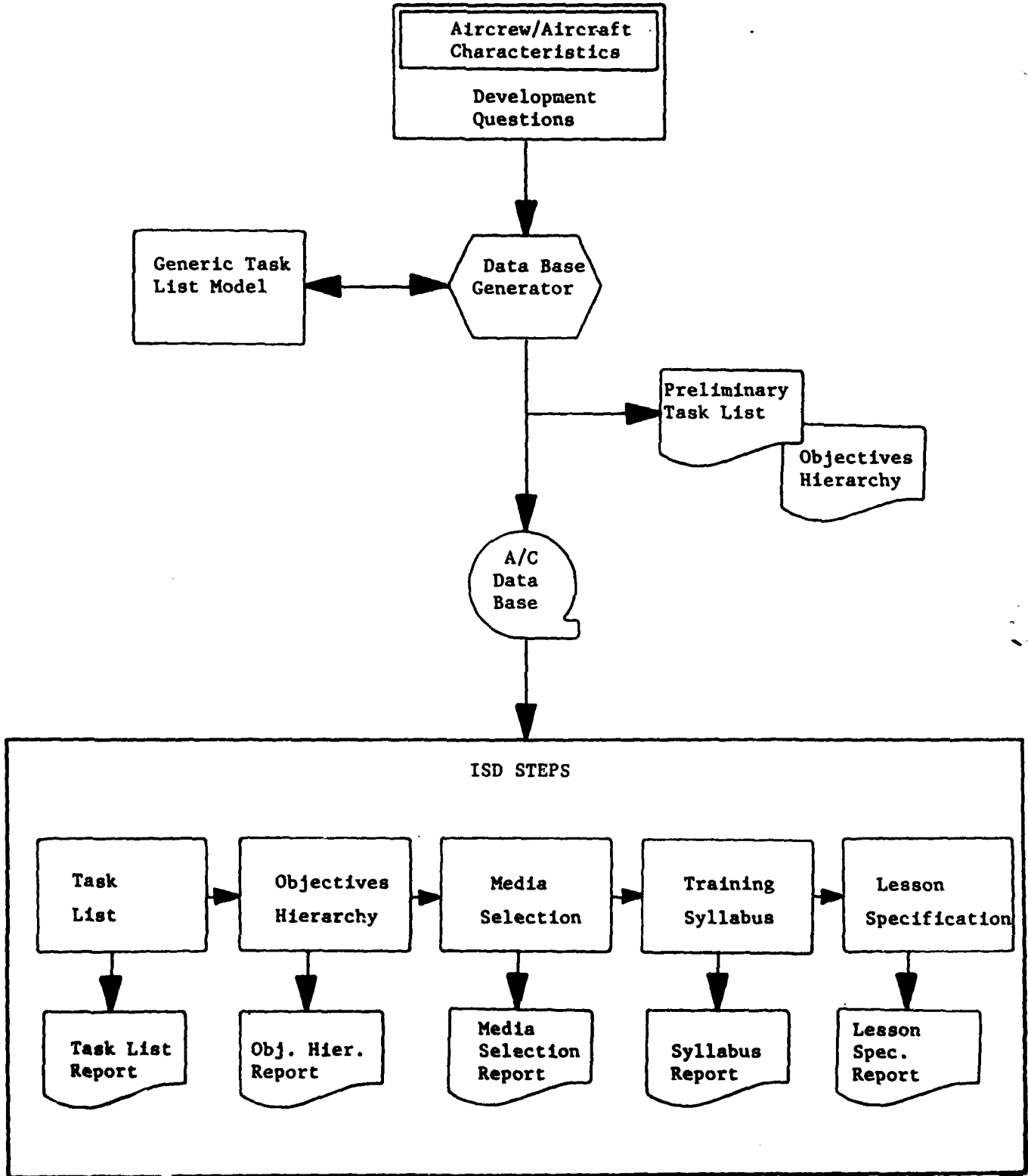


Figure 3 System Programming Concept Distinguished By Four Sets of Data.



## F-4S TASK LIST

CREW POSN	SEQ. NO.	TASK
	2.2.2	PERFORM ORDNANCE PRE-FLIGHT INSPECTIONS
	2.2.2.1	PERFORM PRE-FLIGHT INSPECTION OF AIM-9
	2.2.2.2	PERFORM PRE-FLIGHT INSPECTION OF AIM-7
	2.2.2.3	PERFORM PRE-FLIGHT INSPECTION OF 2.75-FFAR
	2.2.3	PERFORM WCS PRE-FLIGHT INSPECTIONS
	2.2.3.1	PERFORM PRE-FLIGHT INSPECTION OF RADAR
	2.2.3.2	PERFORM PRE-FLIGHT INSPECTION OF GUNSIGHT
	2.3	PERFORM INTERIOR PRE-FLIGHT INSPECTIONS
	2.3.1	PERFORM BEFORE-ENTERING COCKPIT INSPECTIONS
	2.3.2	PERFORM BEFORE-ELECTRICAL POWER CHECKLIST
	2.3.3	PERFORM AFTER-ELECTRICAL POWER CHECKLIST
	2.3.4	PERFORM EJECTION-SEAT INSPECTION
	2.4	PERFORM ENGINE-START PROCEDURE
	2.4.1	PERFORM BEFORE-STARTING ENGINE CHECKLIST
	2.4.2	PERFORM STARTING-ENGINE CHECKLIST
	2.4.3	RESPOND TO ENGINE-START EMERGENCIES
	2.4.3.1	RESPOND TO ENGINE HUNG-START EMER
	2.4.3.2	RESPOND TO ENGINE HOT-START EMER
	2.4.3.3	RESPOND TO ENGINE FIRE-ON-START EMER
	2.4.3.4	RESPOND TO ENGINE WET-START EMER
	2.4.3.5	RESPOND TO ENGAGED-STARTER EMER
	2.4.3.6	RESPOND TO RUNAWAY ENGINE-ON-START EMER
	2.5	PERFORM SYSTEMS CHECK/SET-UP
	2.5.1	PERFORM FLIGHT-CONTROLS CHECK/SET-UP
	2.5.2	PERFORM AVIONICS SYSTEMS CHECK/SET-UP
	2.5.2.1	PERFORM CHECK/SET-UP OF DATA-LINK
	2.5.2.2	PERFORM CHECK/SET-UP OF UHF
	2.5.2.3	PERFORM CHECK/SET-UP OF KY-28
	2.5.2.4	PERFORM CHECK/SET-UP OF TACAN
	2.5.2.5	PERFORM CHECK/SET-UP OF ADF
	2.5.2.6	PERFORM CHECK/SET-UP OF IFF
	2.5.2.7	PERFORM CHECK/SET-UP OF RADAR
	2.5.2.8	PERFORM CHECK/SET-UP OF GUNSIGHT
	2.5.2.9	PERFORM CHECK/SET-UP OF VISUAL

Figure 4. Portion Of Typical Task List Generated By CASDAT

- a. assign tasks to aircrew members
- b. add new tasks
- c. replace existing tasks
- d. delete tasks

Once the user finishes validating and modifying the task list, a final printout is produced for the user. Figure 5 presents a sample validated task list. In addition, CASDAT produces a draft objectives hierarchy printout. The following matrix describes how the user and CASDAT work together to create the task list.

USER ACTIONS	SYSTEM ACTIONS
<p>The user types in name, date, and aircraft identifier.</p> <p>If the training program is partially complete, the user will be required to tell the system which phase is to be entered, e.g., task validation, objective validation, media selection, syllabus generation, lesson edit or lesson specification.</p> <p>If the training program is new, the user will be required to answer a series of questions about the aircraft system. These questions consist of:</p> <ul style="list-style-type: none"> <li>• The number of aircrew positions and their designations, e.g., pilot, copilot and RIO.</li> <li>• The features or applications of the aircraft's weapon control system, e.g., infrared, laser, camera, sonobouy.</li> </ul>	<p>The system retains the user's name, date and aircraft identifier to be used in the header of reports.</p> <p>The system uses the aircraft identifier to determine the status of the training program; i.e., new or existing within CASDAT.</p> <p>The system determines from the first record of the data base (a header record) what phase the training program is currently in. The system will tell the user what phase he is in and what phase he has completed. The user can enter the current phase or re-enter a completed phase. The system will not allow the user to skip phases or enter them out of sequence.</p> <p>If the system cannot find the requested aircraft name in the aircraft "ID" table a data base for the requested aircraft will be generated. The data base is generated by linking the generic data base with the defined characteristics of the aircraft.</p>

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F-4S TASK LIST

CREW POSN	SEQ. NO.	TASK
PR	2.2.2	PERFORM ORDNANCE PRE-FLIGHT INSPECTIONS
PR	2.2.2.1	PERFORM PRE-FLIGHT INSPECTION OF AIM-9
PR	2.2.2.2	PERFORM PRE-FLIGHT INSPECTION OF AIM-7
PR	2.2.2.3	PERFORM PRE-FLIGHT INSPECTION OF 2.75-FFAR
PR	2.2.3	PERFORM WCS PRE-FLIGHT INSPECTIONS
R	2.2.3.1	PERFORM PRE-FLIGHT INSPECTION OF RADAR
PR	2.2.3.2	PERFORM PRE-FLIGHT INSPECTION OF GUNSIGHT
PR	2.3	PERFORM INTERIOR PRE-FLIGHT INSPECTIONS
PR	2.3.1	PERFORM BEFORE-ENTERING COCKPIT INSPECTIONS
PR	2.3.2	PERFORM BEFORE-ELECTRICAL POWER CHECKLIST
PR	2.3.3	PERFORM AFTER-ELECTRICAL POWER CHECKLIST
PR	2.3.4	PERFORM EJECTION-SEAT INSPECTION
PR	2.4	PERFORM ENGINE-START PROCEDURE
PR	2.4.1	PERFORM BEFORE-STARTING ENGINE CHECKLIST
PR	2.4.2	PERFORM STARTING-ENGINE CHECKLIST
PR	2.4.3	RESPOND TO ENGINE-START EMERGENCIES
PR	2.4.3.1	RESPOND TO ENGINE HUNG-START EMER
PR	2.4.3.2	RESPOND TO ENGINE HOT-START EMER
PR	2.4.3.3	RESPOND TO ENGINE FIRE-ON-START EMER
PR	2.4.3.4	RESPOND TO ENGINE WET-START EMER
PR	2.4.3.5	RESPOND TO ENGAGED-STARTER EMER
PR	2.4.3.6	RESPOND TO RUNAWAY ENGINE-ON-START EMER
PR	2.5	PERFORM SYSTEMS CHECK/SET-UP
PR	2.5.1	PERFORM FLIGHT-CONTROLS CHECK/SET-UP
PR	2.5.2	PERFORM AVIONICS SYSTEMS CHECK/SET-UP
PR	2.5.2.1	PERFORM CHECK/SET-UP OF DATA-LINK
PR	2.5.2.2	PERFORM CHECK/SET-UP OF UHF
PR	2.5.2.3	PERFORM CHECK/SET-UP OF KY-28
PR	2.5.2.4	PERFORM CHECK/SET-UP OF TACAN
PR	2.5.2.5	PERFORM CHECK/SET-UP OF ADF
PR	2.5.2.6	PERFORM CHECK/SET-UP OF IFF
R	2.5.2.7	PERFORM CHECK/SET-UP OF RADAR
PR	2.5.2.8	PERFORM CHECK/SET-UP OF GUNSIGHT
PR	2.5.2.9	PERFORM CHECK/SET-UP OF VISUAL

Figure 5. Portion Of Typical Validated Task List

## TASK LIST DEVELOPMENT (continued)

USER ACTIONS	SYSTEM ACTIONS
<ul style="list-style-type: none"> <li>• The ordnance carried by the aircraft, e.g., gun, depth charge, missiles.</li> <li>• The aircraft's wing structure, e.g., vector-thrust, helicopter, fixed wing.</li> <li>• Whether or not the aircraft is carrier capable.</li> <li>• The avionics suite of the aircraft, including which are used for communication, navigation, and identification, e.g., data-link, INS, UHF.</li> <li>• The personal survival equipment carried on the aircraft, e.g., helmet, g-suit, parachute.</li> </ul>	<p>For example, if the aircraft is defined as a fixed-wing aircraft, the system will only build upon those generic tasks that are linked to the fixed wing characteristic. The generic tasks that are linked to helicopter will be bypassed.</p> <p>The system will print out the generated task listing. Figure 4 presents a typical task list generated by CASDAT.</p>
<p>Prior to validating the task list, the user should do an off-line review of the generated task list.</p>	
<p>While in the task list validation phase the user can:</p>	
<ul style="list-style-type: none"> <li>• assign aircrew members to the tasks</li> </ul>	<p>Once the task has been validated for an aircrew member, the system will put an indicator into the data base record. This indicator is in the form of a P, C and/or R indicating whether the task is validated for pilot, co-pilot and/or Radio Intercept Officer (RIO).</p>
<ul style="list-style-type: none"> <li>• add new tasks</li> </ul>	<p>The system will add the task to the data base where the task falls into the task hierarchy along with pointers indicating that it is a new task. The system informs user of invalid task statements by checking new tasks against a menu of acceptable terms.(See Appendix C)</p>
<ul style="list-style-type: none"> <li>• replace existing tasks</li> </ul>	<p>The system will replace the old task statement of the data base record with the user-entered task statement.</p>

## TASK LIST DEVELOPMENT (continued)

USER ACTIONS	SYSTEM ACTIONS
<ul style="list-style-type: none"> <li>• delete tasks (this is accomplished by not validating the task for any of the aircrew members)</li> <li>• exit the task list validation at any time</li> <li>• request a hardcopy printout of the validated task list</li> </ul>	<p>The system will indicate in the data base record that no aircrew member performs this task.</p> <p>If the task list validation is completed, the system recognizes this and alerts the user. Wherever the user stops, CASDAT takes note and reminds the user of that point the next time he or she signs on.</p> <p>The system will print on the line-printer all validated tasks and the aircrew members assigned to each task. Figure 5 presents an example validated task list.</p> <p>In addition the system will generate an objectives hierarchy which will be printed for the user at this time.</p>

**OBJECTIVES HIERARCHY DEVELOPMENT.** The objectives hierarchy is generated by CASDAT through the use of a subset of the generic task list model. For each task in the generic model, learning objectives are specified. For each CASDAT-generated task which the user validates, the associated objectives are printed in the CASDAT-generated objectives hierarchy. The user must add objectives for user-created tasks, and may add to, or modify CASDAT-generated objectives. Once the user has completed objectives validation, a completed task and objectives hierarchy is printed. A sample portion of a CASDAT-generated objectives hierarchy is presented in figure 6. Figure 7 presents a portion of a typical validated objectives hierarchy.

Currently, the generic task list model residing in CASDAT is capable of generating approximately 2000 tasks and an additional 3000 supporting objectives. Of course, a single aircrew training program would not contain the entire set of tasks and objectives. In addition to the CASDAT-generated tasks and objectives, CASDAT can store and track the full set of tasks and objectives the user may wish to add to his specific data base.

The following matrix describes how the user working with CASDAT can validate the objective hierarchy:

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F-4S OBJECTIVE HIERARCHY

SEQUENCE NO.	OBJECTIVE
2.2	PERFORM EXTERIOR PRE-FLIGHT INSPECTIONS
2.2.1	PERFORM PRE-FLIGHT A/C EXTERIOR INSPECTIONS
2.2.1.0.1	STATE LOCATION OF INSPECTION POINTS FOR PRE-FLIGHT A/C EXTERIOR INSPECTIONS
2.2.1.0.1.1	IDENTIFY LOCATION OF INSPECTION POINTS FOR PRE-FLIGHT A/C EXTERIOR INSPECTIONS
2.2.1.0.2	IDENTIFY DISCREPANCIES FOR EACH POINT FOR PRE-FLIGHT A/C EXTERIOR INSPECTIONS
2.2.1.0.3	STATE REQUIRED ACTION FOR EACH ITEM OF PRE-FLIGHT A/C EXTERIOR INSPECTIONS
2.2.2	PERFORM ORDNANCE PRE-FLIGHT INSPECTIONS
2.2.2.1	PERFORM PRE-FLIGHT INSPECTION OF AIM-9
2.2.2.1.0.1	STATE LOCATION OF INSPECTION POINTS FOR PRE-FLIGHT INSPECTION OF AIM-9
2.2.2.1.0.2	IDENTIFY DISCREPANCIES FOR EACH POINT FOR PRE-FLIGHT INSPECTION OF AIM-9
2.2.2.1.0.3	STATE REQUIRED ACTION FOR EACH ITEM OF PRE-FLIGHT INSPECTION OF AIM-9
2.2.2.2	PERFORM PRE-FLIGHT INSPECTION OF AIM-7
2.2.2.2.0.1	STATE LOCATION OF INSPECTION POINTS FOR PRE-FLIGHT INSPECTION OF AIM-7
2.2.2.2.0.2	IDENTIFY DISCREPANCIES FOR EACH POINT FOR PRE-FLIGHT INSPECTION OF AIM-7
2.2.2.2.0.3	STATE REQUIRED ACTION FOR EACH ITEM OF PRE-FLIGHT INSPECTION OF AIM-7
2.2.2.3	PERFORM PRE-FLIGHT INSPECTION OF 2.75-FFAR
2.2.2.3.0.1	STATE LOCATION OF INSPECTION POINTS FOR PRE-FLIGHT INSPECTION OF 2.75-FFAR
2.2.2.3.0.2	IDENTIFY DISCREPANCIES FOR EACH POINT FOR PRE-FLIGHT INSPECTION OF 2.75-FFAR
2.2.2.3.0.3	STATE REQUIRED ACTION FOR EACH ITEM OF PRE-FLIGHT INSPECTION OF 2.75-FFAR
2.2.3	PERFORM WCS PRE-FLIGHT INSPECTIONS
2.2.3.1	PERFORM PRE-FLIGHT INSPECTION OF RADAR
2.2.3.1.0.1	STATE LOCATION OF INSPECTION POINTS FOR PRE-FLIGHT INSPECTION OF RADAR

Figure 6. Portion of Typical Objectives Hierarchy Generated By CASDAT

USER ACTIONS	SYSTEM ACTIONS
<p>Prior to entering this phase, the user should do an off-line review of the generated objectives hierarchy.</p> <p>While in the objectives validation phase the user can:</p> <ul style="list-style-type: none"> <li>• assign aircrew members to the objectives</li> <li>• add new objectives</li> <li>• replace existing objectives</li> <li>• delete objectives (this is accomplished by not validating the objectives for any of the aircrew members)</li> <li>• exit the objectives validation at any time</li> <li>• request a hardcopy printout of the validated objectives hierarchy.</li> </ul>	<p>Once the objectives have been validated for an aircrew member, the system will put an indicator into the data base record. This indicator is in the form of a P, C and/or R indicating whether the objective is validated for the pilot, co-pilot or RIO.</p> <p>The system will add the objective to the data base where it falls into the objective hierarchy along with pointers indicating that it is a new objective. The system informs user of invalid objectives(s) against a menu of acceptable terms. (See Appendix C).</p> <p>The system will replace the old objective statement of the data base record with the user entered objective statement.</p> <p>The system will indicate in the data base record that no aircrew member performs this objective.</p> <p>If the objectives validation is completed, the system recognizes this and alerts the user. Wherever the user stops, CASDAT keeps track, and reminds the user of that point the next time he or she signs on.</p> <p>The system will print on the line-printer the objectives hierarchy and the aircrew members assigned to each objective. Figure 7 presents an example validated objectives hierarchy.</p>

F-4S OBJECTIVE HIERARCHY

<u>CREW POSN</u>	<u>SEQUENCE NO.</u>	<u>OBJECTIVE</u>
PR	2.2	PERFORM EXTERIOR PRE-FLIGHT INSPECTIONS ENVIR: F COND: GIVEN AIRCRAFT
PR	2.2.1	PERFORM PRE-FLIGHT A/C EXTERIOR INSPECTIONS ENVIR: F COND: GIVEN AIRCRAFT
PR	2.2.1.0.1	STATE LOCATION OF INSPECTION POINTS FOR PRE-FLIGHT A/C EXTERIOR INSPECTIONS ENVIR: A COND: GIVEN AIRCRAFT, DAY OR NIGHT
PR	2.2.1.0.1.1	IDENTIFY LOCATION OF INSPECTION POINTS FOR PRE-FLIGHT A/C EXTERIOR INSPECTIONS ENVIR: A COND: GIVEN AIRCRAFT, DAY OR NIGHT
PR	2.2.1.0.2	IDENTIFY DISCREPANCIES FOR EACH POINT FOR A/C EXTERIOR INSPECTIONS ENVIR: A COND: FROM MEMORY
PR	2.2.1.0.3	STATE REQUIRED ACTION FOR EACH ITEM OF PRE- FLIGHT A/C EXTERIOR INSPECTIONS ENVIR: A COND: FROM MEMORY
PR	2.2.2	PERFORM ORDNANCE PRE-FLIGHT INSPECTIONS ENVIR: F COND: GIVEN AIRCRAFT
PR	2.2.2.1	PERFORM PRE-FLIGHT INSPECTION OF AIM-9 ENVIR: F COND: GIVEN AIRCRAFT
PR	2.2.2.1.0.1	STATE LOCATION OF INSPECTION POINTS FOR PRE-FLIGHT INSPECTION OF AIM-9 ENVIR: A COND: FROM MEMORY
PR	2.2.2.1.0.2	IDENTIFY DISCREPANCIES FOR EACH POINT FOR PRE- FLIGHT INSPECTION OF AIM-9 ENVIR: A COND: FROM MEMORY
PR	2.2.2.1.0.3	STATE REQUIRED ACTION FOR EACH ITEM OF PRE- FLIGHT INSPECTION OF AIM-9 ENVIR: A COND: FROM MEMORY
PR	2.2.2.2	PERFORM PRE-FLIGHT INSPECTION OF AIM-7 ENVIR: F COND: GIVEN AIRCRAFT
PR	2.2.2.2.0.1	STATE LOCATION OF INSPECTION POINTS FOR PRE- FLIGHT INSPECTION OF AIM-7 ENVIR: A COND: FROM MEMORY

Figure 7. Portion of Typical Validated Objectives Hierarchy



**MEDIA SELECTION.** During media selection, CASDAT aids the user in selecting media for each validated objective. CASDAT prompts the user to identify learning type, behavior type, display requirements, etc. for each objective. CASDAT then selects primary and secondary media choices for each objective. CASDAT currently contains an algorithm which was specified in an early version of MIL-T-29053 and focuses primarily on selecting media for academic objectives. Using this algorithm, media selection is accomplished by answering five questions:

a. What is the level of behavior expected of the student in this objective?

1. Familiarization
2. Remember
3. Use

b. What is the level of content being taught in this objective?

1. Familiarization
2. Fact
3. Concept
4. Rule/procedure
5. Principle

c. Is the minimum critical set of instances the student needs to see small or large?

1. Small
2. Large

d. What is the minimum display requirement?

1. Verbal and/or symbolic and/or static simple pictorial
2. Verbal and/or symbolic and/or static complex pictorial
3. Dynamic pictorial
4. Interactive

e. Is the memorization component of this objective large or small?

1. Small
2. Large

Once media selection is complete, CASDAT generates a printout. A sample portion of media selection printout is provided in figure 8.

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F-4S MEDIA SELECTION

MEDIA KEY:  
A/C AIRCRAFT CAI COMPUTER AIDED INSTRUCTION  
MIL MEDIATED INTERACTIVE LECTURE VT VIDEO TAPE  
WS WORKSHEET WB WORKBOOK  
SIM SIMULATOR RAS RANDOM ACCESS SLIDE WORKBOOK  
ST SLIDE TAPE

CREW POSN	SEQUENCE NO.	OBJECTIVE
PR	2.2	PERFORM EXTERIOR PRE-FLIGHT INSPECTIONS PRIMARY MEDIA: A/C SECONDARY MEDIA:
PR	2.2.1	PERFORM PRE-FLIGHT A/C EXTERIOR INSPECTIONS PRIMARY MEDIA: A/C SECONDARY MEDIA:
PR	2.2.1.0.1	STATE LOCATION OF INSPECTION POINTS FOR PRE-FLIGHT A/C EXTERIOR INSPECTIONS PRIMARY MEDIA: ST SECONDARY MEDIA: MIL
PR	2.2.1.0.1.1	IDENTIFY LOCATION OF INSPECTION POINTS FOR PRE-FLIGHT A/C EXTERIOR INSPECTIONS PRIMARY MEDIA: ST SECONDARY MEDIA: MIL
PR	2.2.1.0.2	IDENTIFY DISCREPANCIES FOR EACH POINT FOR PRE-FLIGHT A/C EXTERIOR INSPECTIONS PRIMARY MEDIA: CAI SECONDARY MEDIA: RAS
PR	2.2.1.0.3	STATE REQUIRED ACTION FOR EACH ITEM OF PRE-FLIGHT A/C EXTERIOR INSPECTIONS PRIMARY MEDIA: ST SECONDARY MEDIA: MIL
PR	2.2.2	PERFORM ORDNANCE PRE-FLIGHT INSPECTIONS PRIMARY MEDIA: A/C SECONDARY MEDIA:
PR	2.2.2.1	PERFORM PRE-FLIGHT INSPECTION OF AIM-9 PRIMARY MEDIA: A/C SECONDARY MEDIA:
PR	2.2.2.1.0.1	STATE LOCATION OF INSPECTION POINTS FOR PRE-FLIGHT INSPECTION OF AIM-9 PRIMARY MEDIA: ST SECONDARY MEDIA: MIL
PR	2.2.2.1.0.2	IDENTIFY DISCREPANCIES FOR EACH POINT FOR PRE-FLIGHT INSPECTION OF AIM-9 PRIMARY MEDIA: CAI SECONDARY MEDIA: RAS
PR	2.2.2.1.0.3	STATE REQUIRED ACTION FOR EACH ITEM OF PRE-FLIGHT INSPECTION OF AIM-9 PRIMARY MEDIA: ST SECONDARY MEDIA: MIL

Figure 8. Portion Of Typical Media Selection Listing

The following matrix describes the media selection process:

USER ACTIONS	SYSTEM ACTIONS
<p>The media selection phase allows the user to:</p> <ul style="list-style-type: none"> <li>● identify the resources, e.g., slide tape, workbook, CAI which are available at the training installation.</li> <li>● input answers to a series of questions (5 maximum) that deal with learning considerations for each academic objective</li> <li>● exit the media selection at any time</li> <li>● request a hard copy printout of the media selected for each validated objective</li> </ul>	<p>The system will select the available resources from the resources which are available through the media selection algorithm. Example: media choices might be CAI, slide tape and workbook; but if the installation does not have CAI, workbook and slide tape become the only choices.</p> <p>The system will assign primary and secondary media to each objective based on the inputs to the media selection algorithm described in Paragraph 6.4 of MIL-T-29053(A).</p> <p>The system will put an indicator into the data base of where the user stopped. If media selection is completed CASDAT alerts the user that he can go to syllabus development.</p> <p>The system will print on the lineprinter all objectives, their aircrew assignments and primary and secondary media selections.</p> <p>Figure 8 presents a typical listing.</p>

**SYLLABUS GENERATION.** CASDAT generates a syllabus for the users' aircraft. The syllabus consists of a sequence of lessons, each represented by a lesson number, lesson title and lesson media. Each objective assigned to the lesson is identified by number, text, aircrew member, environment (academic, trainer or flight) and by specific media assigned to the individual objective. This information is provided on a syllabus worksheet which the user can use to edit the syllabus. The user can change parts of lessons (e.g., title, media, objectives), split lesson into multiple lessons, combine two or more lessons, or delete a lesson. The following paragraphs explain how this is accomplished.

CASDAT generates a syllabus by sorting objectives into lessons. The objectives are first sorted by topic, then by aircrew position, and finally by environment (academic, trainer and flight). Sequencing of lessons is accomplished using a predetermined sequence of topic areas. Therefore, as objectives are sorted into a topic area, they are simultaneously being sequenced. Within the topic area, lessons are sequenced by training environment. Academic lessons are trained first, then the trainer lessons and then flights. This process is illustrated in Figure 9.

In order for this process to work, the designers of CASDAT generated a generic aircrew syllabus. Most aircrew syllabi are designed using a predictable sequence of topic areas. For example, most aircrew syllabi start out with a familiarization phase consisting of such topics as aircraft systems, avionics systems and weapon system. The syllabi continue through flight proficiency, mission execution (or tactics), and special operations (e.g., carrier qualification). The generic syllabus was designed by comparing existing topical sequences and creating a sequence of phases (e.g., familiarization), topics (e.g., aircraft systems) and titles (e.g., flight controls). This generic syllabus is included in Appendix D.

CASDAT designers coded the key words used in the course objectives so that CASDAT could assign objectives to topics and lesson titles within the generic syllabus. Each objective contains a verb, modifier and object. For example:

<u>Perform</u>	<u>Ejection-seat</u>	<u>Inspection</u>
verb	modifier	object

The verbs, modifiers and objects which CASDAT currently recognizes are listed in Appendix C. These were each assigned to one or more topic area and lesson title within the generic syllabus. This is shown in Appendix D. CASDAT reads each objective in the objective hierarchy developed by the user via CASDAT for his aircraft and assigns it to a topic area using a word search for verb, modifier and object. Specifically, the process is performed as follows:

- a. CASDAT creates a file containing all validated objectives.
- b. Next, the generic syllabus is read for phase (e.g., familiarization), topic (e.g., communications procedures) and title (e.g., normal communications).

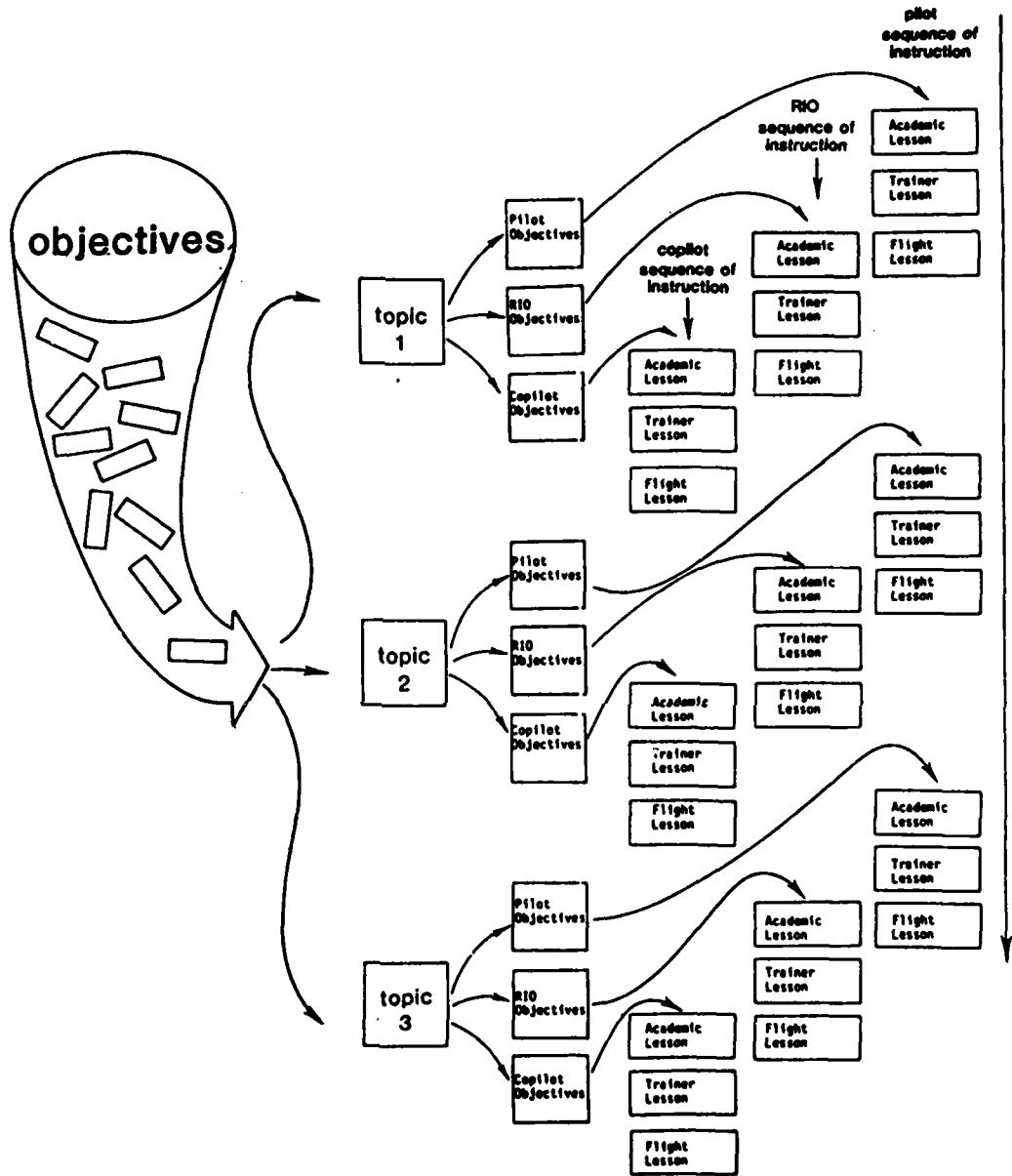


Figure 9. Syllabus Generation Process

Upon getting a title, the objectives file is read. If the verb, modifier and object of an objective matches those of the lesson title, the objective and its subordinate/enabling objectives are assigned to the lesson title.

c. If the verb, modifier and object of the objective do not match those of the title, CASDAT continues to the next objective. Each objective is read and compared with the various titles until all are assigned a title.

d. All objectives have now been assigned a title. Within the title, all objectives are now sorted by aircrew member. All pilot objectives are sorted together; all radar intercept officer (RIO) objectives are sorted together; and all copilot objectives are sorted together.

e. The objectives for each aircrew member are further sorted by training environment, i.e., academic, trainer and flight. It is at this point in the process, that lessons are created. For each aircrew member, three types of lessons (representing the three environments) are possible within a title area.

pilot	academic	normal communications
pilot	trainer	normal communications
pilot	flight	normal communications
RIO	academic	normal communications
RIO	trainer	normal communications
RIO	flight	normal communications

No more than twenty objectives are grouped together into a single lesson. Therefore, there may be two or more of the same type of lesson within a topic area. For example, there may be two academic lessons on normal communication for the pilot.

A coding system was created to label the lessons. An alphanumeric code indicates the phase of training, the aircrew member, the training environment and the sequence of training within the phase of training. An example lesson code and title is:

FAPA	20	fuel system
------	----	-------------

The lesson reference number can be interpreted as follows:

**FA** refers to phase of training; in this case, aircraft familiarization. The other phases and their abbreviations are indicated in the generic aircrew syllabus (Appendix D).

**P** refers to aircrew member for whom the lesson will be taught, in this case, the pilot. Others are:

**C** = copilot  
**R** = radar intercept officer

A refers to the training environment, in this case, academic. Others are:

T = trainer  
F = flight

20 refers to the sequence of the academic lessons within the familiarization phase. The numbers normally start with 20 and progress in increments of 20. Therefore, a normal sequence of numbers would be 20, 40, 60, etc. The titles are sequenced in the same order that they occur on the generic syllabus. Some typical titles and their sequence numbers are:

FAPA 20	Fuel System
FAPA 40	Power Plant System
FAPA 60	Hydraulic System
FAPA 80	Electrical System
FAPT 20	Fuel System
FAPT 40	Power Plant System
FAPT 60	Hydraulic System
FAPT 80	Electrical System
FAPF 20	Fuel System
FAPF 40	Power Plant System
FAPF 60	Hydraulic System
FAPF 80	Electrical System

f. Finally, media are assigned to lessons. Trainer and flight lessons are assigned a trainer or aircraft accordingly. An academic lesson is assigned the media common to the most objectives within the lesson. "Primary and secondary" media have been assigned to individual objectives during media selection. After these objectives have been assigned to a lesson, the media previously assigned to each objective are tallied for all objectives in the lesson. The most frequently used medium is assigned to the lesson. The second most frequently used medium is assigned as the secondary medium option.

g. The syllabus worksheet is printed. The syllabus worksheet contains a listing of all lessons within the syllabus. For each lesson, the printout lists lesson number, title, primary and secondary media. Each objective assigned to the lesson is identified by number, text, aircrew member, environment and specific media assigned to the objective during media selection. Figure 10 shows an example portion of the syllabus worksheet.

SYLLABUS WORKSHEET

***FAPA 20	NORMAL COMMUNICATIONS VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.6.1.0.1	PR A STATE REQUIRED ACTION FOR EACH ITEM OF BEFORE-TAXI CHECKLIST ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.6.2.0.1	PR A STATE PROCEDURES FOR FIXED-WING FIELD TAXI VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.6.2.0.2	PR A STATE APPROPRIATE RESPONSE TO PLANE CAPTAIN HAND SIGNALS VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.6.3.0.1	PR A STATE PROCEDURES FOR FIXED-WING CARRIER-DECK TAXI VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.6.3.0.2	PR A STATE APPROPRIATE RESPONSE TO PLANE CAPTAIN HAND SIGNALS VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURES
2.6.4.1.0.1	PR A STATE CUES AND ALERTS FOR FAILED-BRAKE EMER ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.6.4.1.0.2	PR A STATE CORRECTIVE ACTIONS FOR FAILED-BRAKE EMER VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.6.4.2.0.1	PR A STATE CUES-AND-ALERTS FOR FAILED-NGS EMER ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.6.4.2.0.2	PR A STATE CORRECTIVE ACTIONS FOR FAILED-NGS EMER VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.6.5.0.1	PR A STATE THE STEPS REQUIRED TO ACCOMPLISH TAXI COMMUNICATIONS CAI-COMPUTER AIDED INSTRUCTION WB-WORKBOOK
4.5.5.1.1.0.1	PR A STATE PROCEDURES TO COMMUNICATE WITH GROUND STATIONS USING DATA-LINK VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE
4.5.5.1.2.0.1	PR A STATE PROCEDURES TO COMMUNICATE WITH GROUND STATIONS USING UHF VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE
4.5.5.2.1.0.1	PR A STATE PROCEDURES TO COMMUNICATE WITH OTHER AIRCRAFT USING DATA-LINK VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURES
4.5.5.2.2.0.1	PR A STATE PROCEDURES TO COMMUNICATE WITH OTHER AIRCRAFT USING UHF VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURES

Figure 10. Sample Portion Of Syllabus Worksheet



At the conclusion of syllabus development CASDAT generates a media cost report. This is automatically produced for the user. It computes relative costs of producing the primary and secondary media plans for the training syllabus. Relative costs, not real costs, are computed. This is because actual costs change over time and among geographic locations. The training analyst can use the media cost report to get a comparison of the cost between the two media plans generated by CASDAT. Three tables are produced in the media cost report. The first of these, "Alternative Media Plans" presents in summary form, the number and percent of lessons employing each medium used in the two media plans. Figure 11 presents an example table.

The second table, the media cost factors, is shown in Figure 12. Production time and cost factors are presented for each type of medium in terms of relative values, (i.e., how much more time/cost it takes to produce one medium over another). These values were determined by Courseware Incorporated and explained in detail in the Training Support Requirements document produced by them.<sup>12</sup> Time/cost factors are itemized for each job classification required to complete authoring and production of each medium type. Time/cost factors are specified for author, instructional psychologist, script writer/editor, and production. A total time/cost factor is also given. The factors are constants; they do not change with media mix or with real production costs; and they are relative. For example, a time/cost factor of twenty indicates that the time and cost to produce that particular medium is twice that to produce a medium receiving a factor of ten. A user interpreting the media cost factors in Figure 12 would see that authoring a slide tape (ST) and authoring a workbook (WB) would take approximately the same amount of time and money. Authoring a computer aided instruction (CAI) lesson would take slightly more time. Looking at the "total" column, a completed slide tape program will take approximately twice as much time and money as a completed mediated interactive lecture (MIL). A MIL and WB lesson will take approximately the same time and money to complete.

To complete the third table, media time/cost matrix, the time/cost factors are multiplied by the percentage of lessons employing each medium, and then totaled for each time/cost factor. A sample matrix is presented in Figure 13. This table shows the relative costs of the two media plans generated by the syllabus. The user can see how much relative time is required of each job category to produce each media plan, as well as a total relative value. In Figure 13, the primary media plan is approximately 25 percent more costly than the secondary media plan.

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<sup>12</sup>

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	PRIMARY MEDIA PLAN		SECONDARY MEDIA PLAN	
	# OF LESSONS	% OF TOTAL	# OF LESSONS	% OF TOTAL
1. AC	18	37.5	18	37.5
2. SIM	12	25.0	12	25.0
3. VT	5	10.4	0	.0
4. MIL	0	.0	16	33.3
5. ST	11	22.9	0	.0
6. WB	1	2.1	0	.0
7. WS	0	.0	0	.0
8. CAI	1	2.1	1	2.1
9. RAS	0	.0	1	2.1
TOTAL	48	100%	48	100%

Figure 11. Alternative Media Plans

TIME/COSTS			PRODUCTION TIME/COST FACTORS		
MEDIA	AUTHOR	IP	SW/ED	PROD	TOTAL
1. AC	10.00	1.00	.00	20.00	19.00
2. SIM	10.00	1.00	.00	20.00	19.00
3. VT	10.00	1.00	15.00	27.00	30.00
4. MIL	10.00	1.00	.00	16.00	17.00
5. ST	8.00	3.00	7.00	37.00	35.00
6. WB	8.00	1.00	2.00	20.00	17.00
7. WS	3.00	.50	.50	3.50	5.00
8. CAI	10.00	1.00	.00	20.00	19.00
9. RAS	13.00	2.00	3.00	50.00	41.00

Figure 12. Media Cost Factors

PLAN/CAT	AUTHOR	IP	SW/ED	PROD	TOTAL
Primary Media Plan	950.00	145.83	320.83	2462.50	2377.08
Secondary Media Plan	1006.25	102.08	6.25	1929.17	1879.17

Figure 13. Media Time/Cost Matrix

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The system actions and user interaction required for syllabus development are briefly described below:

USER ACTIONS	SYSTEM ACTIONS
<p>There is no user action required during syllabus generation.</p> <p>The user should do an off-line review of the generated syllabus.</p> <p>During syllabus validation, the user can:</p> <ul style="list-style-type: none"> <li>• delete lessons</li> <li>• display lessons</li> <li>• change a part of a lesson, e.g., title, media for the lesson, objectives etc.</li> <li>• split a lesson into multiple lessons</li> <li>• combine two or more lessons into one</li> </ul>	<p>The system will assign objectives to lessons by matching the objective statement taxonomy (verb, modifier and object) with generic syllabus taxonomy (allowable verb, modifier and object shown in Appendix D). After the taxonomy match is made, the objectives are further broken down into lessons by aircrew members and environment (academic, flight, trainer).</p> <p>Upon completion, a hard copy print-out of the syllabus will be printed on the line printer. Each lesson title, its lesson number, primary and secondary media for the lesson, and the objectives assigned to the lesson (including the types of the assigned objectives) are included in this report.</p> <p>The system will delete the indicated lessons from the syllabus</p> <p>The system will provide an on-line review of all parts of the lesson, e.g., lesson number, title, media and assigned objectives.</p> <p>The system will substitute based on the user inputs. The lesson file will be updated to reflect this change.</p> <p>The system will create multiple lessons from one lesson. The system will take the information given to it by the user to assign titles, media and objectives to each of the multiple lessons. The lesson that was split will be deleted from the syllabus.</p> <p>The system will combine the objectives of a number of lessons into one lesson. The lesson title and media will be specified by the user.</p>

## SYLLABUS DEVELOPMENT (continued)

USER ACTIONS	SYSTEM ACTIONS
<ul style="list-style-type: none"> <li>• request a hard copy printout of the validated syllabus</li> </ul>	<p>The system will print on the line-printer each lesson number, its title, the media for the lesson, and the objectives assigned to the lesson. At the conclusion of the syllabus printout, media cost summaries are printed.</p>

LESSON SPECIFICATIONS. The lesson specifications supplied to the user by CASDAT are outlines of each lesson. They provide guidelines to the lesson author; they contain no lesson content. For each lesson within the syllabus, several pages of authoring guidelines are provided:

a. Page 1 (shown in Figure 14) contains the lesson number and title, primary and secondary media, and prerequisite information map. The prerequisite information map lists the five lessons which the student should have completed before taking the subject lesson and the five lessons which he will attend after completing subject lesson. The lesson addressed by the lesson specification is identified in the prerequisite information map by an asterisk located to the left of the lesson number. Lessons are listed in the same order as they occur in the syllabus worksheet.

b. Page 2 (shown in Figure 15) lists the lesson objectives. The objectives are listed in the sequence in which they should be taught in the lesson. Objectives are identified by number, text, and conditions. The classification of each objective is also listed.

The classification of each objective is determined during media selection and referenced at this time to aid the lesson author. Each objective classification refers to a level of content and level of behavior represented by the objective. In conjunction with this, different authoring rules apply depending on the classification of the objective. This is described in MIL-T-29053B. A summary of the authoring requirements for each objective classification is provided by CASDAT and is included in this document on pages 146-153. The following is a list of possible objective classifications.

<u>Classification</u>	<u>Level of Content</u>	<u>Level of Behavior</u>
A	Familiarization	Remember
B	Fact	Remember
C	Concept	Remember
D	Concept	Use
E	Rules/Procedures	Remember
F	Rules/Procedures	Use
G	Principles	Remember
H	Principles	Use

\*\*\* LESSON SPECIFICATION \*\*\*

LESSON REFERENCE NUMBER: FAPA 100                    AUTHOR: JOE SMITH  
LESSON TITLE: FLIGHT GEAR

PRIMARY MEDIA: ST-SLIDE TAPE  
SECONDARY MEDIA: MIL-MEDIATED INTERACTIVE LECTURE

PRE-REQUISITE INFORMATION MAP:

FAPA 20 NORMAL COMMUNICATIONS  
FAPA 40 TACAN AND NAVID SYSTEMS  
FAPA 60 POWER PLANT OPS AND EMERGENCIES  
FAPA 80 FLIGHT GEAR  
\* FAPA 100 FLIGHT GEAR  
FAPT 20 NORMAL COMMUNICATIONS  
FAPT 40 TACAN AND NAVID SYSTEMS  
FAPT 60 POWER PLANT OPS AND EMERGENCIES  
FAPT 80 FLIGHT GEAR  
FAPT 100 FLIGHT GEAR

Figure 14. Example Page 1 Of The Lesson Specification

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\*\*\* LESSON SPECIFICATION \*\*\*

LESSON REFERENCE NUMBER: FAPA 100                      AUTHOR: JOE SMITH  
 LESSON TITLE: FLIGHT GEAR

LESSON OBJECTIVES

<u>SEQ #</u>	<u>OBJECTIVE CODE</u>	<u>OBJECTIVES</u>	<u>OBJ. CLASS</u>
1	2.1.15.0.2	STATE INSPECTION POINTS OF TORSO-HARNES	B FACT-REM
2	2.1.16.0.1	COND: GIVEN FLIGHT GEAR IDENTIFY DOWNING DISCREPANCIES OF LIFE-VEST	D CONCEPT-USE
3	2.1.16.0.2	COND: GIVEN FLIGHT GEAR STATE INSPECTION POINTS OF LIFE-VEST	B FACT-REM
4	2.1.17.0.1	COND: GIVEN FLIGHT GEAR IDENTIFY DOWNING DISCREPANCIES OF SURVIVAL-RADIO	D CONCEPT-USE
5	2.1.17.0.2	COND: GIVEN FLIGHT GEAR STATE INSPECTION OF SURVIVAL-RADIO	B FACT-REM
6	2.1.18.0.1	COND: GIVEN FLIGHT GEAR IDENTIFY DOWNING DISCREPANCIES OF EXPOSURE-SUIT	D CONCEPT-USE
7	2.1.18.0.2	COND: GIVEN FLIGHT GEAR STATE INSPECTION POINTS OF EXPOSURE-SUIT	B FACT-REM
		COND: GIVEN FLIGHT GEAR	

Figure 15. Example Page 2 Of The Lesson Specification

c. Page 3 (shown in Figure 16) lists the primary and secondary media for the lesson, and the personnel, media, facilities and evaluation support required for each.

The following matrix shows the user and system actions during lesson specification development.

USER ACTIONS	SYSTEM ACTIONS
<p>The user requests lesson specifications from CASDAT. There is no other user action required to produce the lesson specifications. The user uses the lesson specifications as an aid in authoring the lessons.</p>	<p>The system will generate the lesson specification and print on the line printer each lesson and its attributes, including pre-requisite information map, lesson objectives, lesson media and resource worksheet and authoring aids. The lesson specification format and authoring aids are based on the requirements of MIL-T-29053B.</p>

Appendix E provides examples of the products generated by the system, in context of a sample run of CASDAT.

USER AIDS. One of the major concerns in developing CASDAT was to facilitate user interaction with the system, particularly SMEs with little or no ISD experience. For this purpose, tutorial information is available to the user at critical points. When uncertain about specific responses required, a user can obtain tutorial information from CASDAT simply by typing in a question mark. Appendix E is structured as a sample run of CASDAT. The information shown is what the user sees on the CRT while using CASDAT. The sample run starts with the user signing on. It continues by showing CRT displays asking for user inputs at each ISD step and sample user inputs. At most critical points in the process, the user has typed in a question mark so that the reader of Appendix E can see what the tutorial is at each point. A sample report is provided at the completion of each ISD step. This will show the reader what the output of each ISD step looks like as it would be printed on the line printer.

A user's manual has been developed for CASDAT.<sup>13</sup> The reader interested in additional information about CASDAT is urged to read this document.

SPECIAL FEATURE. CASDAT is also capable of performing key word searches. The user can type in any word, and CASDAT will search for tasks or objectives containing that word. CASDAT will print out a list of tasks

<sup>13</sup> Ace, Ronald. Computer Aided System for Developing Aircrew Training (CASDAT) User's Manual. Veda Incorporated. 30 May 1982.



\*\*\* LESSON SPECIFICATION \*\*\*

LESSON REFERENCE NUMBER: FAPA 100

AUTHOR: JOE SMITH

LESSON TITLE: FLIGHT GEAR

LESSON MEDIA AND RESOURCE WORKSHEET

PRIMARY MEDIA:

SLIDE/TAPE

PERSONNEL: NONE

MEDIA: SLIDE/TAPE  
WORKBOOK

FACILITIES: CARREL (U)  
CARREL (S)

EVALUATION: SELF TEST

SECONDARY MEDIA:

MEDIATED INTERACTIVE LECTURE

PERSONNEL: INSTRUCTOR PILOT  
INSTRUCTOR NFO

MEDIA: CHALKBOARD  
OVERHEAD TRANSPARENCIES  
35MM SLIDES  
WALLCHART  
PHOTO PANEL  
LECTURE GUIDE  
STRUCTURE NOTES

FACILITIES: CLASSROOM

EVALUATION: GRADE SHEET

Figure 16. Example Page 3 Of The Lesson Specification

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and objectives and their sequence numbers which contain the word requested by the user. This capability is very useful if, for example, there is a change to the aircraft. If there is a change in the aircraft heads-up display (HUD) for instance, CASDAT can identify all listed tasks and learning objectives affected by the change. On the other hand, if designers are considering change to the aircraft, they can readily identify the extent that training would be affected if the change were implemented.

SECTION VI

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Evaluation of the CASDAT system has shown that it has face, content, and construct validity. During evaluation of the prototype system, subject matter experts from several aircraft types (i.e., F-4, F-14, CH-46 and SH-2F) were able to create task listings and objective hierarchies for their aircraft in significantly less time than would be required under traditional ISD methods. In addition, the ISD products generated by CASDAT during this and an earlier evaluation were found to be at least 75 percent complete.

It is difficult to say exactly how complete the current version of CASDAT is, or exactly how much time can be saved by using CASDAT for aircrew ISD. Evaluations conducted thus far have been informal. Rigorous control over the users' activities was not practical and no evaluation has been performed on the current, more complete version of CASDAT. However, based on this partial and informal evaluation of CASDAT combined with a logical analysis of CASDAT's capabilities, one can point with confidence to some expected advantages of using CASDAT. These include:

- a. Training analysis is less labor intensive and, therefore, less expensive.
- b. Training product standardization is improved.
- c. Data manipulation is more efficient and flexible.
- d. Data redundancy is reduced.
- e. Responses to training program changes are more timely.
- f. SME and instructional technologist requirements for training design are reduced.
- g. Assessment of effects of operational equipment change on a training program is more timely.

At this point in its developmental process, CASDAT could provide specific use to DoD training development agencies, as follows:

- a. Aid the instructional designer in the design of an emerging aircrew training program.
- b. Aid the instructional designer in the modification of an existing aircrew training program.
- c. Aid the training manager to quickly assess the impact on the training system of planned or proposed weapon system modifications.

d. Aid the training system evaluator to quickly evaluate an existing training system and recommend areas for change.

e. Aid the training device manufacturer to assess the training tasks and objectives to which his device must be designed.

#### RECOMMENDATIONS

It is recommended that a full-scale field trial of CASDAT be conducted. This trial could be accomplished by using CASDAT to design an aircrew training program for a military aircraft. This training program could be designed for an existing or emerging, complete or partial training system. The critical criterion is that the trial include a real design effort, aimed at producing training materials that would be incorporated into an operational training community. This full-scale, field trial would produce more definitive data on the quality of CASDAT's products and its time-saving capabilities. In addition, this evaluation would provide additional insight into the need for user interface enhancements that, then, could be incorporated into CASDAT.

Future research and development on CASDAT needs to address the utility of the system to the operational community. In efforts to increase CASDAT's operational utility, consideration must be given to (1) how the system can be used and (2) the needs of the DoD training community. Three stages of system development have been planned:

- a. Additional Mission Phase
- b. Additional ISD steps
- c. Other jobs

System refinements, such as user interface requirements will be addressed and evaluated at each phase. The following discusses each stage of CASDAT development.

**ADDITIONAL MISSION PHASE.** The generic task list model identified eight mission phases that comprise the aircrew job. Currently CASDAT contains aircrew data relating to all but one of these phases, tactics. In order to make CASDAT a more useful operational system, aircrew data must be added for tactics, including the various aircraft missions:

- a. Air-to-air
- b. Air-to-ground
- c. Anti-submarine warfare
- d. Airborne early warning/electronic warfare
- e. Reconnaissance

- f. Mine countermeasures
- g. Electronic surveillance
- h. Search and rescue
- i. Logistics/transport
- j. Troop assault/delivery
- k. Air refueling

These additions would provide significant advantages to future Department of Defense (DoD) training development efforts for aircrew training. For the first time CASDAT will be able to aid an instructional developer in the design of an entire aircrew training syllabus. Once these data are added, CASDAT would be a completed aid to aircrew ISD for five ISD steps - task list, objective hierarchy, media selection, syllabus, and lesson specifications.

**ADDITIONAL ISD STEPS.** Twenty-four ISD steps have been documented as being appropriate for automation. Looking at the requirements of the DoD training community, some of these ISD steps are more useful than others. Additional ISD steps which seem to have the most utility to DoD training and procurement requirements at the present time are:

- a. problem analysis
- b. training support requirements analysis
- c. enhanced media selection focused on training device functional requirements.

When these ISD steps are incorporated into CASDAT programming, CASDAT will be able to manipulate aircrew training data over seven ISD steps.

**OTHER JOBS.** After the developments identified in the foregoing are successfully completed, the feasibility of the concept should be sufficiently demonstrated to suggest that other job areas could benefit from this type of an ISD aid.

CASDAT can be designed to provide similar aids to ISD for other types of operator jobs (e.g., sonar operators), maintenance jobs, and leadership/management jobs. Research and development will be needed to select job areas suitable for CASDAT applications. Suitability will be based on the commonality inherent in the data bases of a particular job area, since this determines the extent to which an area can be served with a generic data base. Priorities for extending CASDAT to other job areas also need to be based on operational requirements for training development. CASDAT should be developed for job areas which need it most.

An obstacle to the extension of CASDAT to other job areas is that appropriate ISD data for specific jobs may not exist in some important areas. In these cases, ISD data would have to be generated for specific jobs before generic data bases could be developed and tested for the whole area.

#### IMPLICATIONS FOR TRAINING DESIGN

Implications of the CASDAT project for training are far-reaching and highly significant. Because the capabilities of the device are general, many of its applications will evolve only with repeated use, and CASDAT's contributions will be best known in this way. Most benefits to training, however, would seem to derive from the increased speed and standardization, and improved management qualities that CASDAT lends to ISD operators.

The increased speed of ISD operations via CASDAT leads directly to a decrease in man-hour requirements and consequently to dollar savings. Faster ISD operations also allow highly skilled ISD personnel to spend more of their time with more creative aspects of ISD. Instead of performing routine tasks such as collecting information and following routine algorithms, they can apply their skills to higher level problems. For example, because various combinations of media and syllabi can be generated in minutes and hours via CASDAT, instead of days, weeks or months required by traditional manual methods, instructional designers can experiment with changes in system input parameters and even change the ISD methodology itself and explore the effects of such changes on system outputs. Thus, CASDAT's speed can lead to improvements in the product resulting from the ISD effort as well as improvements to the CASDAT system.

Increased ISD speed will also enable ISD procedures to be applied to more training problems, since time, money and/or personnel shortages typically result in less systematic approaches to the development of training systems.

CASDAT's speed can also contribute importantly to the evaluation, maintenance and improvement of existing training systems. Relationships between operational equipment modifications and training program design can be determined through rapid access to the data bases. Similarly, student performance data can be quickly related to relevant portions of the data base. In these ways, training problems that otherwise would go undetected or undefined can be remedied in a timely fashion.

Finally, CASDAT's speed will enable rapid searches of the data bases for specific jobs to determine relationships and uniquenesses among the jobs. This information can be used as basis for developing generalized trainers and for the design of instruction at basic level schools.

CASDAT's management qualities will allow many ISD tasks to be performed by relatively low-skilled personnel. This will save money. It will also allow ISD to be completed where the higher levels of ISD expertise, that normally would be required, are unavailable. The management features can provide an on-the-job training ground for imparting technical ISD skills to ISD team members.

Improved training products are also expected, due to the organization and standardization of ISD operations provided by CASDAT. Deficiencies in currently available data bases and procedures should become more readily apparent with repeated applications of standard procedures and can be continually improved based on these applications. These improvements, in turn, will be passed on to all future applications. This will help assure, for example, that the task listings are generated from the best possible source materials. In the same way, the media pool can be continually improved and introduction of a new medium into the CASDAT system will help assure its consideration in all subsequent ISD applications. Thus, CASDAT can serve to improve not only the testing and implementation of new training technology, but it can also help research and development efforts by identifying technological weaknesses which need to be improved. Standardization of ISD procedures also will encourage similar training at different sites, which allow interchange of personnel and training materials and equipment.

CASDAT can fail to reach its anticipated potential for a variety of reasons having to do with funding constraints and technological barriers, problems common to research and development efforts. A danger perhaps more unique to CASDAT is that the users will attempt to "overuse" the system by accepting CASDAT's products too uncritically, and not properly performing their editing and revision functions. If this occurs, the product will suffer and CASDAT will get the blame. Human creativity is an essential ingredient in ISD and this is even more true with CASDAT.

Another potential problem is that some people will assume that CASDAT's products are produced mechanically, with little human thought and control, even where the system actually is used properly and effectively. This misperception of the CASDAT process could predispose ISD consumers to erroneously reject CASDAT's contributions, without giving them due consideration.

APPENDIX A

TASK LISTING DEVELOPMENT QUESTIONS  
(USED TO VERIFY GENERIC DATA BASE FEASIBILITY)

1. What is the aircrew complement?

Indication of the aircrewman focuses all subsequent task listing development activity. Task listings for each individual aircrew member can be selectively retrieved by selecting the desired aircrew position for a given aircraft type. When the task listing is assembled into a single hierarchy, both functional and temporal relationships can be expressed. Thus, the task loading for an individual aircrew member becomes immediately apparent.

2. What are the tactical missions of the aircraft?

Specification of all projected missions provides at least Task level statements for the Mission Phase and Subtask level statements for premission planning (e.g., content of planning activities, types of publications used, etc.), prelaunch, (e.g., types of ordnance to preflight), and navigation, (e.g., navigational objectives such as penetration to a target, maintenance of a cap pattern, etc.). Subtasks within the Mission Phase can be generated through correlations with other branching questions, such as "type of WCS" (question 10) or other avionics (question 9) and certain "common sense" subtask additions. For example, if one task is to search for a target, a nominal subtask would be to search for it visually.

3. Will the aircraft be required to launch from an alert/scramble condition?

If the aircraft will be required to launch from a scramble or alert condition, then an additional prelaunch phase must be generated to describe the special procedures associated with this condition. Such changes are well defined for either case, so generation of new tasks is relatively simple.

4. What ordnance, or weapons, will the aircraft carry?

Listing all of the ordnance which the aircraft is capable of carrying will generate the delivery tasks or the premission planning phase and the ordnance preflight tasks during prelaunch, as these are primarily dictated by the nature of that ordnance. Delivery tasks and subtasks are, likewise, generated for the mission phase, although they will not be as complete due to the number and varied conditions under which they are employed.



5. Is the aircraft equipped with an ejection seat system?

If an aircraft has an ejection seat system, then prelaunch tasks must include preflight tasks of associated equipment (e.g., oxygen mask, G-suit, etc.) and the seat itself. If there is no ejection seat, various other equipment procedures may be generated, depending on information from another question (question 7)--type of aircraft; depending on the type of aircraft, there may be no seat inspection but instead a preflight of group survival equipment and personal headsets, as is the case for the P-3C.

6. How many engines and of which type does the aircraft have?

The number of engines will determine the number of starting procedures generated for the task listing and will also dictate the presence of partial/single engine flight procedures. The type of engines will affect the subtasks and steps associated with any start procedure. When correlated with question 7, aircraft type, blade engagement tasks may be appended to the start procedures. When correlated to question 17, military service, cartridge start procedures may be added to Air Force aircraft.

7. What is the basic nomenclature (i.e., type) of the aircraft?

Such information as fixed wing, variable geometry, helicopter, or vectored thrust will help to generate tasks for virtually all phases of the task analysis. Helicopters must show tasks for hovering, as well as running, takeoffs and must perform autogyro approaches. Variable geometry aircraft must have procedures for flight with malfunctioning wing programs. Vectored thrust aircraft must have task sets for performing tactical flight maneuvers using vector thrust augmentation.

8. Is the aircraft equipped with an INS?

The inertial navigation system is separated from other avionics systems due to the distinct tasks associated with this equipment. If an aircraft is equipped with an INS, then alignment procedures and updating procedures must be added to the task listing. Correlation with (question 11) carrier capability, further adds the tasks for on-deck alignment with ship sources. If the aircraft will be required to scramble start (question 3), then rapid alignment procedures must be included. With just this information (as avionics, to follow) a task listing can be generated to the subtask level; if specific equipment (e.g., the AN/ARN \_\_\_) can be entered into the data base, then the task listing can be generated all the way to the step level.

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9. What is the avionics suit of the aircraft?

Tasks and subtasks can be generated regarding activation, BIT checks, and basic system usage (e.g., navigate using TACAN, navigate using ADF, BIT check the data link, etc.). Basic correlations between systems may also be possible (e.g., update INS with TACAN). Again, if specific models of equipment are known in the data base, the addition of certain lower-order subtasks is possible (e.g., perform air-to-air ranging with TACAN--if the particular model of TACAN has this feature) and the task listing may even be generated to the step level.

10. What are the features/applications of the aircraft WCS?

Although weapon control systems are probably the most specific types of aircraft equipment, knowledge of certain basic features, plus correlation with other task listing development questions (e.g., 2) mission and 4) ordnance) can yield a capability to generate at least some tasks and subtasks for prelaunch, navigation, and mission requirements. A preliminary list of WCS question elements would include such information as:

- 1) Type of systems: Gunsight  
Cameras  
Infrared  
Sonar  
ECM systems--active/passive  
Radar  
  
TISEO  
MAD/JEZEBEL  
Data Link
- 2) Use of systems: Associate each piece of equipment (above) with all applicable missions.

Not all aircraft missions will use the WCS installed, but the association step (question 2) above will assist in the generation of subtasks unique to each system. For example, a radar may be used for intercepts, bombing, and navigation, while TISEO would only be used for intercepts. Thus, the radar system must show three sets of subtasks in the task analysis and the association operation would supply at least the first subtask for each "task tree."

11. Is the aircraft capable of carrier operations?

If the aircraft is to be carrier launched, selected mission phases will have to be repeated for the task listing in order to account for the specialized carrier procedures found in each phase. These phases are, a) prelaunch (including yet another set of procedures if the aircraft uses a scramble start, (question 3), b) takeoff/departure, c) approach/landing, and d) post mission. Addition of these tasks is relatively simple, as such procedures are broken down in the Navy

CV NATOPS manual by jet, prop, and helicopter, providing an easy generation task through correlation with questions 6 and 7.

12. Is the aircraft capable of SATS operations?

The Navy/USMC SATS system is a short airstrip with modified catapulting and arresting equipment. It is intended for operation in remote areas following rapid setup by ground troops. If an aircraft is intended for use with this system, additional tasks must be added to the basic task listing in exactly the same way as carrier procedures. Tasks sufficient to complete these portions of the hierarchy can be generated by a generic base, but use of the SATS system is practically nonexistent and it may prove most efficient to delete this question entirely.

13. Is aircraft intended for formation flight?

If the aircraft is capable of formation flight, additional tasks for this must be added for takeoff, navigation, mission phases, approach and landing. Correlation with military service can further modify the task analysis by grouping formation flight tasks in a separate category for USAF aircraft (in keeping with this service's practice).

14. Is the aircraft equipped with a tailhook?

If the aircraft has a tailhook, then landing tasks for arrestments must be generated. Having a tailhook is not the same as being carrier capable, (e.g., USAF fighters, most of which have tailhooks).

15. Is the aircraft capable of hot refueling?

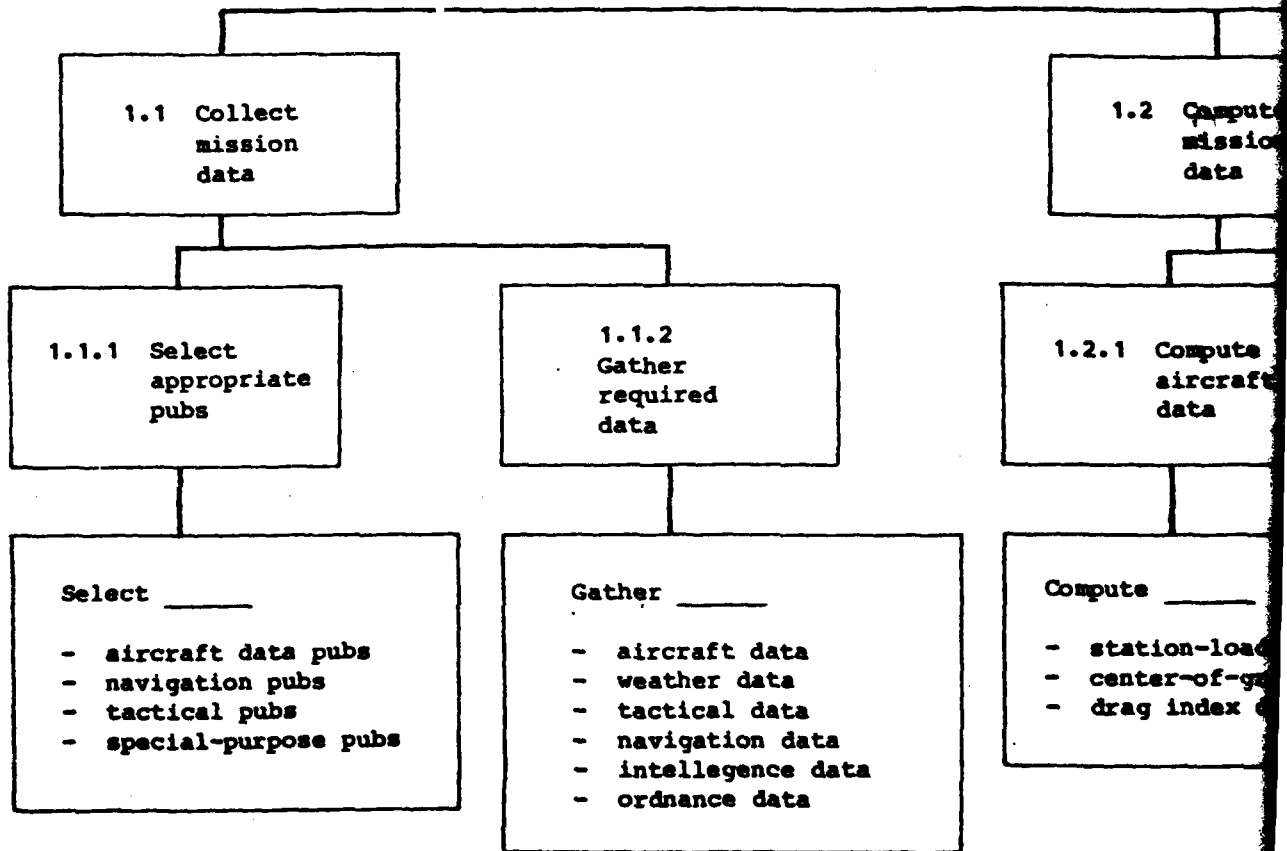
A basic refueling task set may be added to the initial list if the aircraft will be hot refueling as part of expected operations. If included, this task set occupies a discrete time slice, much the same as a mission phase.

16. Is the aircraft capable of airborne refueling?

If the aircraft can refuel airborne, an additional set of generic tasks can be added to the task listing for this activity. Like question 15, this set is a discrete "time slice."

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APPENDIX B  
GENERIC TASK LIST



# MISSION PLANNING

1.0 Perform Mission Planning Procedures

Computer mission data

Compute aircraft data

1.2.2 Compute takeoff and landing data

1.2.3 Compute navigation data

1.2.4 Compute Tactical Data

mission-loading data  
center-of-gravity data  
weight index data

Compute \_\_\_\_\_

- conventional takeoff distance
- vertical takeoff capability
- aircraft hover capability
- vertical landing capability
- conventional landing capability
- conventional landing distance

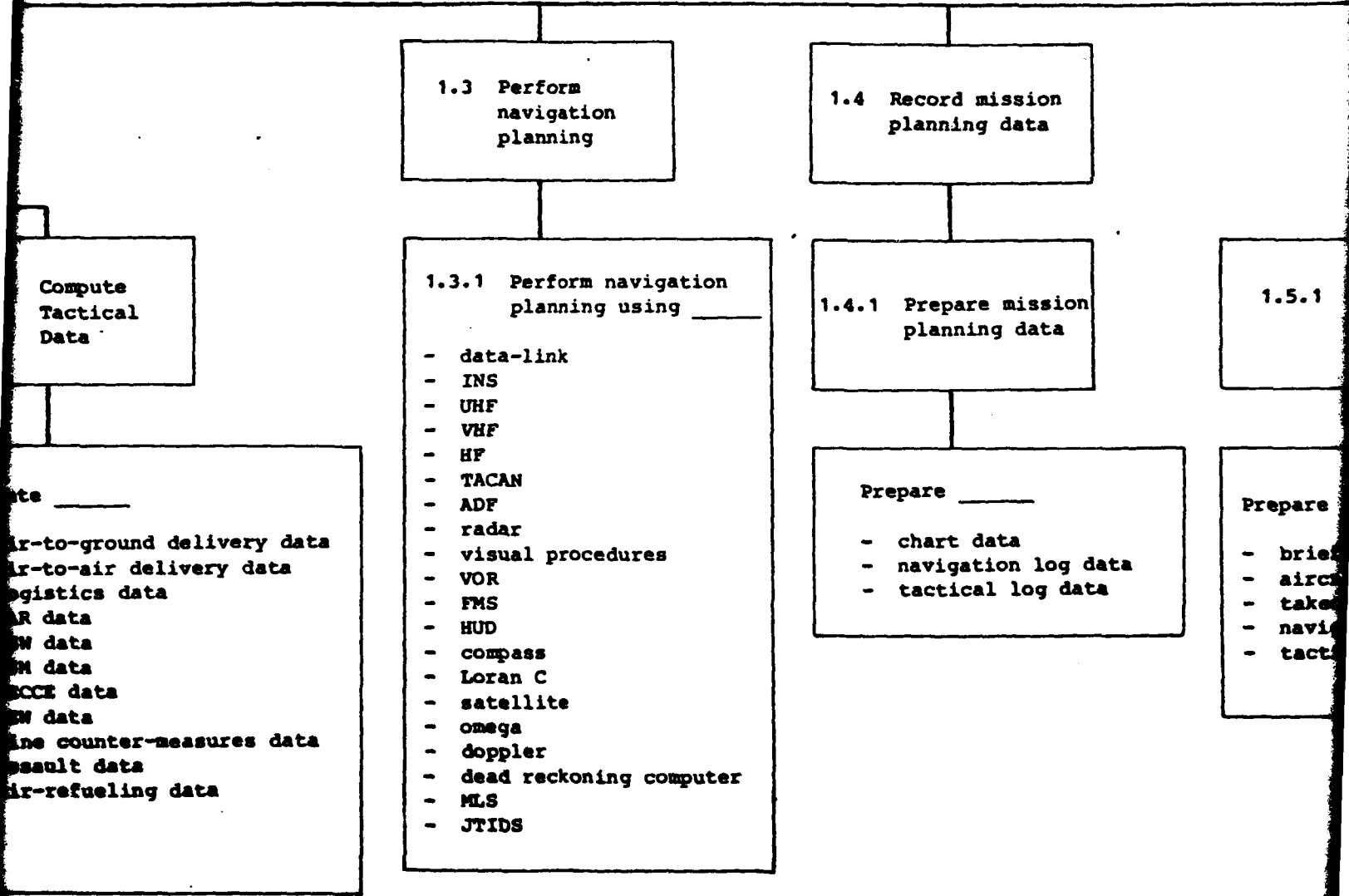
Compute \_\_\_\_\_

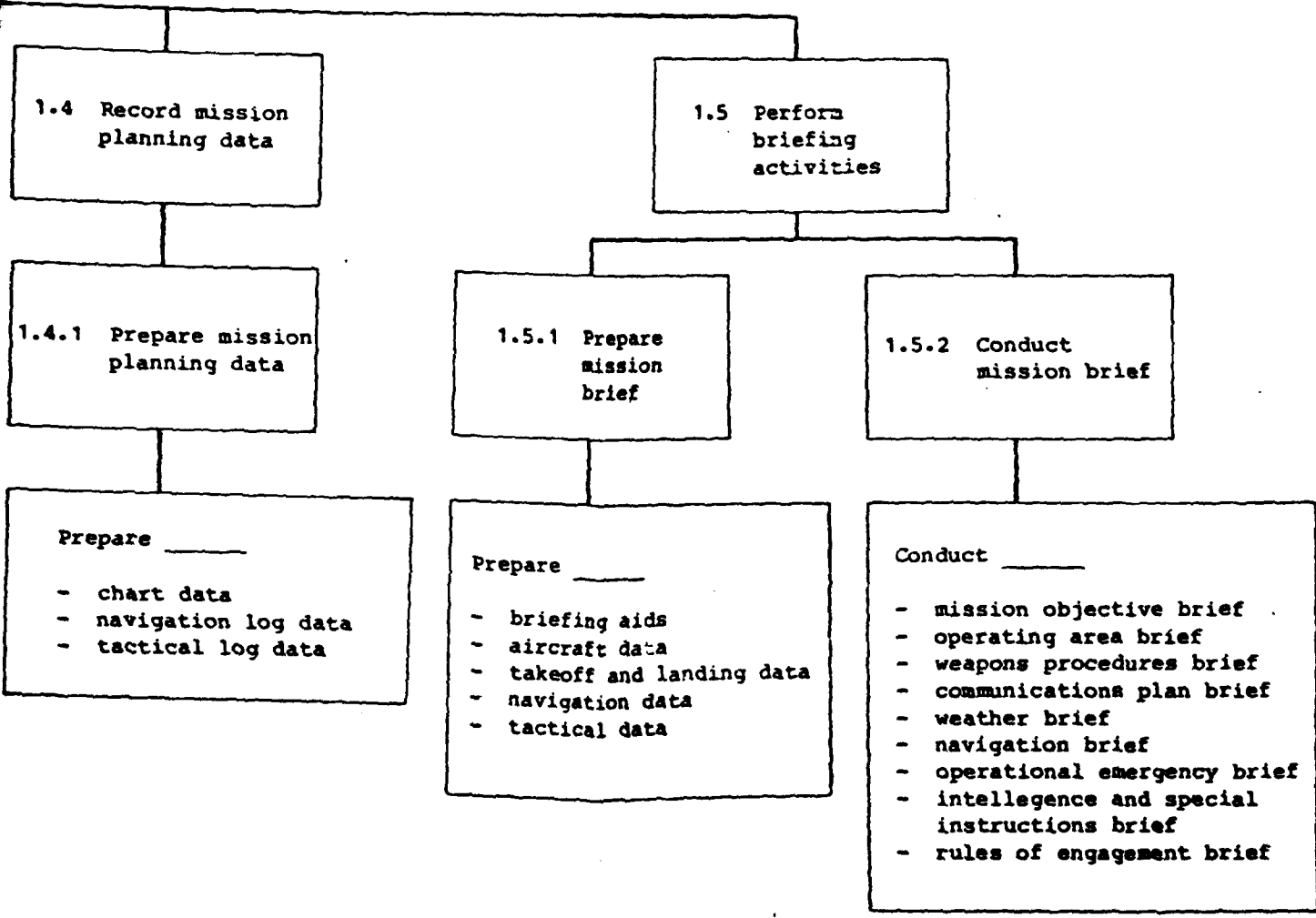
- departure navigation data
- cruise navigation data
- descent navigation data
- approach data

Compute \_\_\_\_\_

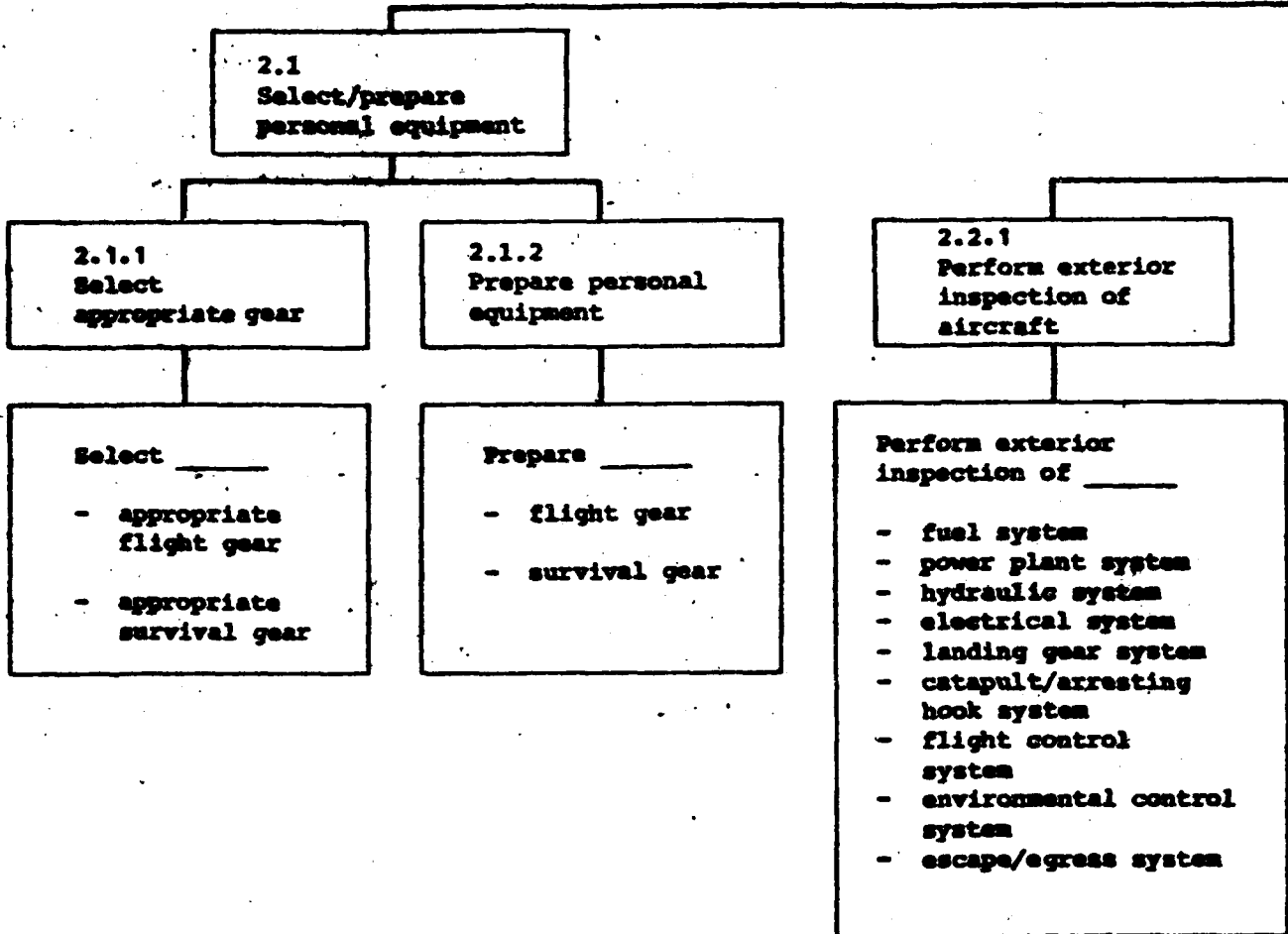
- air-to-ground
- air-to-air
- logistics
- SAR data
- ASW data
- ESM data
- RECCE data
- AEW data
- mine countermeasures
- assault
- air-refuel

# PLANNING









**2.2**  
Perform exterior  
preflight inspections

**2.2.2**  
Perform exterior  
inspection of  
expendables

Perform exterior  
inspection of \_\_\_\_\_

- gun
- air-to-air missiles
- air-to-ground missiles
- rockets
- bombs
- depth-charge
- torpedo
- sonar sensors
- mines
- chaff
- flares
- jammer
- fuel tanks

**2.2.3**  
Perform exterior  
inspection of air-  
craft mission system

Perform exterior  
inspection of \_\_\_\_\_

- infra-red
- laser
- camera
- air-to-air radar
- air-to-ground radar
- MAD
- Jezebel
- sonar
- gunsight
- ESM
- sonobuoy
- TISEO/TVSU
- refuel boom
- hoist/rescue system
- cargo extraction system
- mine counter measures system
- TF/TA
- ANACS/AEW suite
- troop carrier equipment
- ECM/DECM

**2.3.1**  
Perform before-  
entering cock-  
pit inspections

Inspect \_\_\_\_\_

- aircraft cockpit
- escape system

2.3  
Perform interior  
preflight inspections

2.4  
Perform engine  
start procedure

2.3.2  
Perform before-  
electrical power  
inspections

2.3.3  
Perform after-  
electrical  
power inspections

2.4.1  
Perform  
before-starting  
engine inspections

2.4.2  
Perform start  
engine proced

engine  
procedure

2.5  
Perform systems  
check/set-up

starting  
procedure

2.4.2  
Respond  
to engine-start  
emergencies

2.5.1  
Perform flight  
controls check/  
set-up

2.5.2  
Perform avionics  
systems check/  
set-up

- Respond to \_\_\_\_\_
- engine hung start
  - engine hot start
  - engine fire on start
  - engine wet start
  - engine engaged starter
  - runaway engine start

- Perform  
check/set-up  
of \_\_\_\_\_
- FMS
  - HUD
  - UHF
  - VHF
  - HF
  - ADF
  - KY-28
  - JTIDS
  - IFF
  - radar
  - INS
  - TACAN
  - VOR
  - compass
  - Loran C
  - satellite
  - omega
  - doppler
  - dead reckoning comput
  - visual procedures
  - MLS
  - data-link

# PRELAUNCH

2.0  
Perform prelaunch  
procedures

2.5.3  
Perform aircraft  
mission systems  
check/set-up

Perform  
check/set-up  
of \_\_\_\_\_

- infra-red
- laser
- camera
- air-to-air radar
- air-to-ground radar
- MAD
- Jezebel
- sonar
- gunsight
- ESM
- sonobuoy
- TISEO/TVSU
- refuel boom
- hoist/rescue system
- cargo extraction system
- mine counter measures system
- TF/TA
- ANACE/AEW suite
- troop carrier equipment
- ECM/DECM

2.5.4  
Perform  
expendables  
check/set-up

Perform  
check/set-up  
of \_\_\_\_\_

- gun
- air-to-air missiles
- air-to-ground missiles
- rockets
- bombs
- depth-charge
- torpedo
- sonar-sensors
- mines
- chaff
- flares
- jammer
- fuel-tanks

2.6.1  
Perform  
field  
taxi

Perform \_\_\_\_\_

- helo shorebase  
ground taxi
- helo shorebase  
hover taxi
- fixed-wing  
field taxi

5

2.6  
Perform  
taxi

2.6.1  
Perform  
old  
taxi

2.6.2  
Perform  
carrier  
taxi

2.6.3  
Respond  
to taxi  
emergencies

2.6.4  
Perform  
taxi  
communications

2.6.5  
Perform  
taxi

shorebased  
taxi  
shorebased  
taxi  
wing  
taxi

Perform

- helo carrier  
desk taxi
- helo carrier  
deck hover  
taxi
- fixed wing  
carrier deck  
taxi

Respond to \_\_\_\_\_

- failed brake  
emergencies
- failed NGS  
emergencies

Perform  
of \_\_\_\_\_

- gun
- air
- air
- ro
- bo
- de
- to
- so
- air
- ch
- fl
- ja
- fu

2.7  
Perform before-takeoff  
checks/set-up

2.7.1  
Perform  
pendables arming

2.7.2  
Perform takeoff  
checks/set-up

Form arming  
gun  
air-to-air missiles  
air-to-ground missiles  
rockets  
bombs  
depth-charge  
torpedo  
sonar-sensors  
mines  
chaff  
flares  
jammer  
fuel-tanks

2.7.2.1  
Perform field  
takeoff checks/set-up

2.7.2.1.1  
Configure  
aircraft for  
takeoff

2.7.2.1.2  
Configure  
aircraft mission  
systems for takeoff

Perform  
takeoff  
configuration  
of \_\_\_\_\_

- fuel systems
- power plant system
- hydraulic system
- electrical system
- landing gear system
- catapult/arresting hook  
system
- flight control system
- environmental control system
- escape/egress system
- misc. aircraft systems

Perform  
takeoff  
configuration  
of \_\_\_\_\_

- infra-red
- laser
- camera
- air-to-air radar
- air-to-ground radar
- MAD
- Jezebel
- sonar
- gunsight
- ESM
- sonobuoy
- TISSO/TVEU
- refuel boom
- hoist/rescue system
- cargo extraction system
- mine counter measures system
- TF/TA
- ANACE/AEW suite
- troop carrier equipment
- ECM/DCM

Perf  
conf  
of \_\_\_\_\_

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2.7.2.2  
Perform carrier  
takeoff checks/set-up

2.7.2.1.3  
Configure  
avionics  
for takeoff

2.7.2.2.1  
Configure  
aircraft for  
carrier takeoff

2.7.2.2.2  
Configure  
aircraft mission  
systems for  
carrier takeoff

Perform takeoff  
configuration

FMS  
FUD  
URF  
VRF  
RF  
ADF  
KY-28  
JTIDS  
IFF  
radar  
INS  
TACAN  
WOR  
compass  
Loran C  
satellite  
omega  
doppler  
dead reckoning computer  
visual procedures  
MLS  
data-link

Perform takeoff  
configuration  
of \_\_\_\_\_

- fuel systems
- power plant system
- hydraulic system
- electrical system
- landing gear system
- catapult/aressting hook system
- flight control system
- environmental control system
- escape/egress system
- misc. aircraft systems

Perform  
takeoff  
configuration  
of \_\_\_\_\_

- infra-red
- laser
- camera
- air-to-air radar
- air-to-ground radar
- MAD
- Jezebel
- sonar
- gunsight
- ESM
- sonobuoy
- TISBO/TVEU
- refuel boom
- hoist/rescue system
- cargo extraction system
- mine counter measures system
- TT/TA
- ANACS/AEW suite
- troop carrier equipment
- ECM/DCM

Pe  
co  
of



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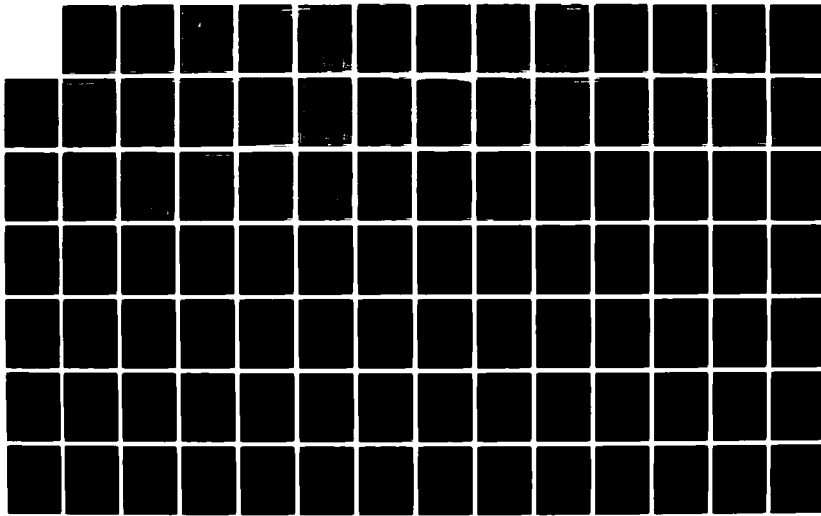
COMPUTER AIDED SYSTEM FOR DEVELOPING AIRCREW TRAINING  
(CASDAT)(U) VEDA INC ARLINGTON VA N C MARCUE ET AL.  
MAR 83 VEDA-113425-82U/P0707 NAVTRAEQUIPC-79-C-0076-1  
N61339-80-D-0009

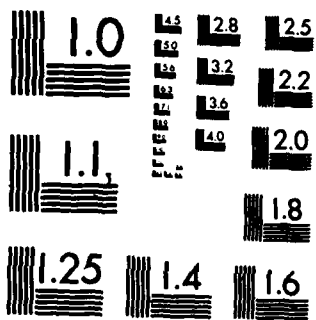
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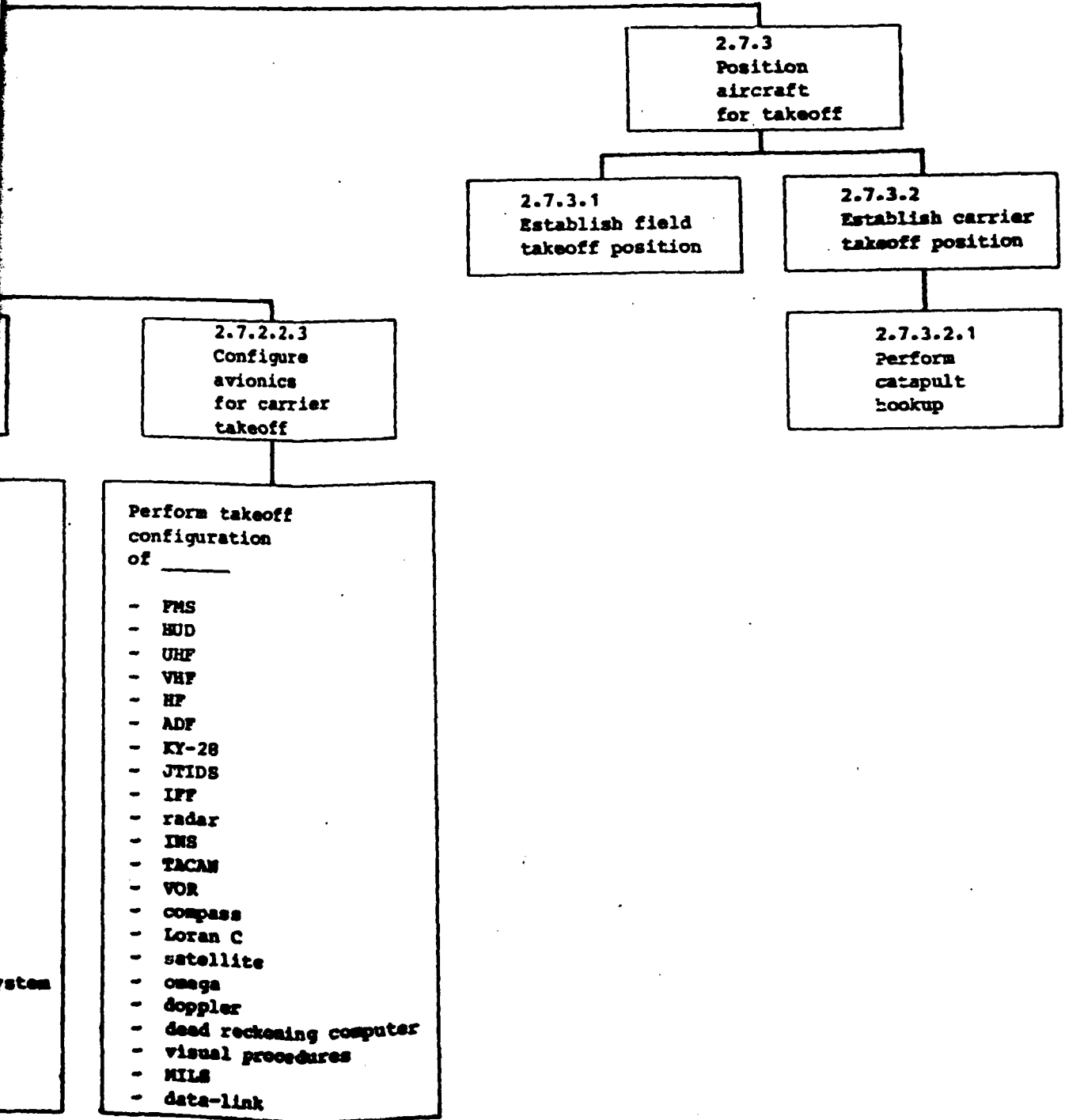
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MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A



3.1 Perform takeoff procedure

3.1.1 Perform field takeoff

- Perform \_\_\_\_\_
- field vertical takeoff
  - field rolling verticle takeoff
  - short field takeoff
  - field conventional takeoff
  - field crosswind takeoff
  - field aborted takeoff
  - field formation takeoff

3.1.2 Perform ship takeoff

- Perform \_\_\_\_\_
- ship catapult takeoff
  - ship vertical takeoff
  - ship ramp takeoff
  - ship deck-launch takeoff

3.2

Comm with statf using

# TAKEOFF

3.0  
Phase  
takeoff  
ground

3.1.3  
Perform  
takeoff  
communications

3.1.4  
Respond to  
takeoff emergencies

3.2.1  
Perform takeoff  
transition

3.1.1  
Communicate  
ground  
procedures for  
takeoff

3.1.3.2  
Communicate  
with other  
aircraft for  
takeoff

Respond  
to \_\_\_\_\_

- engine fire
- engine flameout
- afterburner failure
- electrical failure
- blown tire
- hydraulic failure
- flight control failure
- high AOA

Perform \_\_\_\_\_

- forward flight  
transition
- takeoff altitude  
transition
- hover transition
- accelerated  
transition

Locate ground  
as \_\_\_\_\_

as  
as

satellite  
ground procedures  
data-link

Communicate  
with other  
aircraft  
using \_\_\_\_\_

- UHF
- VHF
- HF
- ADF
- KY-20
- JTIDS
- VOR
- satellite
- visual procedures
- data-link

# DEPARTURE

Departure

3.2.2  
Configure  
systems for  
departure

3.2.2.1  
Configure  
aircraft for  
departure

3.2.2.2  
Configure aircraft  
mission systems for  
departure

3.2.2.3  
Configure  
avionics for  
departure

- Perform departure configuration of \_\_\_\_\_
- fuel systems
  - power plant system
  - hydraulic system
  - electrical system
  - landing gear system
  - catapult/arresting hook system
  - flight control system
  - environmental control system
  - egress/egress system
  - misc. aircraft systems

- Perform departure configuration of \_\_\_\_\_
- infra-red
  - laser
  - camera
  - air-to-air radar
  - air-to-ground radar
  - MAD
  - Jesebel
  - sonar
  - gunsight
  - ECM
  - squaboo
  - TISEO/TVSU
  - refuel boom
  - hoist/rescue system
  - cargo extraction system
  - mine counter measures system
  - TT/TA
  - MACE/MSW suite
  - troop carrier equipment
  - ECM/DECM

- Perform departure configuration of \_\_\_\_\_
- FMS
  - HUD
  - UHF
  - VHF
  - HF
  - ADF
  - KY-28
  - JTIDS
  - IFF
  - radar
  - IRS
  - TACAN
  - VOR
  - compass
  - Loren C
  - satellite
  - omeg
  - Doppler
  - dead reckoning
  - visual procedures
  - HGS
  - GMA-1300

**3.2  
Perform  
departure  
procedures**

**3.2.3  
Perform  
climbout  
procedures**

**3.2.3.1  
Perform climbout  
procedures  
using \_\_\_\_\_**

- FMS
- HUD
- UHF
- VHF
- HF
- ADF
- JTIDS
- radar
- INS
- TACAN
- VOR
- compass
- Loran C
- satellite
- omega
- doppler
- dead reckoning computer
- visual procedures
- MLS
- data-link

**3.2.3.2  
Perform  
rendezvous  
using**

- FMS
- HUD
- UHF
- VHF
- HF
- ADF
- JTIDS
- radar
- INS
- TACAN
- VOR
- Compass
- Loran C
- Satellite
- omega
- doppler
- dead reckoning computer
- visual procedures
- MLS
- data-link

**3.2.3.3  
Fly formation  
using**

- FMS
- HUD
- UHF
- VHF
- HF
- ADF
- JTIDS
- radar
- INS
- TACAN
- VOR
- compass
- Loran C
- satellite
- omega
- doppler
- dead reckoning computer
- visual procedures
- MLS
- data-link

3.2.4  
Perform  
departure  
communications

3.2.3.3  
Fly formation  
using

- FMS
- HUD
- UHF
- VHF
- HF
- ADF
- JTIDS
- radar
- INS
- TACAN
- VOR
- compass
- Loran C
- satellite
- omega
- doppler
- dead reckoning computer
- visual procedures
- MLS
- data-link

3.2.4.1  
Communicate  
with ground  
stations for  
departure

Communicate  
with ground  
stations  
using \_\_\_\_\_

- UHF
- VHF
- HF
- ADF
- KY-28
- JTIDS
- VOR
- satellite
- visual procedures
- data-link

3.2.4.2  
Communicate  
with other  
aircraft for  
departure

Communicate  
with other  
aircraft  
using \_\_\_\_\_

- UHF
- VHF
- HF
- ADF
- KY-28
- JTIDS
- VOR
- satellite
- visual procedures
- data-link



4.1  
Configure  
navigation  
systems

4.2  
Maneuver  
aircraft for  
navigation

- Configure  
for navigation  
using \_\_\_\_\_
- FMS
  - HUD
  - UHF
  - VHF
  - HF
  - ADF
  - JTIDS
  - radar
  - INS
  - TACAN
  - VOR
  - compass
  - Loran C
  - satellite
  - omega
  - doppler
  - dead reckoning computer
  - visual procedures
  - MLS
  - data-link

4.2.1  
Fly a navigation  
course/heading

4.2.2  
Fly a navig  
vector

- Fly a course  
heading with \_\_\_\_\_
- FMS
  - HUD
  - UHF
  - VHF
  - HF
  - ADF
  - JTIDS
  - radar
  - INS
  - TACAN
  - VOR
  - compass
  - Loran C
  - satellite
  - omega
  - doppler
  - dead reckoning computer
  - visual procedures
  - MLS
  - data-link

- Fly a vector  
with \_\_\_\_\_
- FMS
  - HUD
  - UHF
  - VHF
  - HF
  - ADF
  - JTIDS
  - radar
  - INS
  - TACAN
  - VOR
  - compass
  - Loran C
  - satellite
  - omega
  - doppler
  - dead reckon
  - visual proc
  - MLS
  - data-link

# NAVIGATION

4.0  
Perform  
Navigation  
Procedures

4.2.3  
Fly a  
navigation  
point-to-point

Fly a point-to-  
point using \_\_\_\_\_

- FMS
- HUD
- UHF
- VHF
- HF
- ADF
- JTIDS
- radar
- INS
- TACAN
- VOR
- compass
- Loran C
- satellite
- omega
- doppler
- dead reckoning computer
- visual procedures
- NLS
- data-link

4.2.4  
Fly a navigation arc

Fly an arc using \_\_\_\_\_

- FMS
- HUD
- UHF
- VHF
- HF
- ADF
- JTIDS
- radar
- INS
- TACAN
- VOR
- compass
- Loran C
- satellite
- omega
- doppler
- dead reckoning computer
- visual procedures
- NLS
- data-link

4.2.5.1  
Communicate with  
ground stations  
for navigation

Communicate  
with ground  
stations using \_\_\_\_\_

- UHF
- VHF
- HF
- ADF
- KP-20
- JTIDS
- VOR
- satellite
- visual procedures
- data-link

4.3  
Perform  
navigation  
systems  
evaluation

4.4  
Respond to navigation  
system malfunctions

- Evaluate aircraft \_\_\_\_\_
- FMS
  - HUD
  - UHF
  - VHF
  - HF
  - ADF
  - JTIDS
  - radar
  - INS
  - TACAN
  - VOR
  - compass
  - Loran C
  - satellite
  - omega
  - doppler
  - dead reckoning computer
  - visual procedures
  - MLS
  - data-link

- Respond to malfunctions  
of \_\_\_\_\_
- FMS
  - HUD
  - UHF
  - VHF
  - HF
  - ADF
  - JTIDS
  - radar
  - INS
  - TACAN
  - VOR
  - compass
  - Loran C
  - satellite
  - omega
  - doppler
  - dead reckoning computer
  - visual procedures
  - MLS
  - data-link

4.2.5.2  
Communicate  
with other air-  
craft for  
navigation

- Communicate with  
other aircraft  
using \_\_\_\_\_
- UHF
  - VHF
  - HF
  - ADF
  - KY-28
  - JTIDS
  - VOR
  - satellite
  - visual procedures
  - data-link

4.3  
Perform  
navigation  
systems  
evaluation

Evaluate aircraft \_\_\_\_\_

- FMS
- HUD
- UHF
- VHF
- HF
- ADF
- JTIDS
- radar
- INS
- TACAN
- VOR
- compass
- Loran C
- satellite
- omega
- doppler
- dead reckoning computer
- visual procedures
- MLS
- data-link

4.4  
Respond to navigation  
system malfunctions

Respond to malfunctions  
of \_\_\_\_\_

- FMS
- HUD
- UHF
- VHF
- HF
- ADF
- JTIDS
- radar
- INS
- TACAN
- VOR
- compass
- Loran C
- satellite
- omega
- doppler
- dead reckoning computer
- visual procedures
- MLS
- data-link

4.5  
Respond to  
navigation  
emergencies

Respond to \_\_\_\_\_

- ECS failure
- generator failure
- engine oil level low
- engine fire overheat
- smoke/fumes
- fuel transfer malfunction
- hydraulic system failure
- loss of cabin pressure

6.1  
Perform  
enroute  
descent

6.1.1  
Configure systems  
for descent

6.1.1.1  
Configure aircraft  
for descent

6.1.1.2  
Configure aircraft  
mission systems for  
descent

6.1.1.3  
Configure  
avionics  
for descent

Perform descent  
configuration  
of \_\_\_\_\_

- fuel systems
- power plant system
- hydraulic system
- electrical system
- landing gear system
- catapult/arresting hook system
- flight control system
- environmental control system
- escape/egress system
- misc. aircraft systems

Perform descent  
configuration  
of \_\_\_\_\_

- infra-red
- laser
- camera
- air-to-air radar
- air-to-ground radar
- MAD
- Jezebel
- sonar
- gunsight
- ESM
- sonobuoy
- TISEO/TVSU
- refuel boom
- hoist/rescue system
- cargo extraction system
- mine counter measures system
- TF/TA
- ANRCS/AEW suite
- troop carrier equipment
- ECM/DCM

Perform descent  
configuration  
of \_\_\_\_\_

- FMS
- HUD
- UHF
- VHF
- HF
- ADF
- KY-28
- JTIDS
- IFF
- radar
- INS
- TACAN
- VOR
- compass
- Loran C
- satellite
- omega
- doppler
- dead reckoning
- visual procedure
- MLS
- data-link

6.1.2  
Fly enroute  
descent

Fly enroute  
descent  
using \_\_\_\_\_

- FMS
- HUD
- UHF
- VHF
- HF
- ADF
- JTIDS
- radar
- INS
- TACAN
- VOR
- compass
- Loran C
- satellite
- omega
- doppler
- dead reckoning computer
- visual procedures
- MLS
- data-link

6.2.1  
Configure  
systems  
for approach

6.2.1.1  
Configure  
aircraft for  
approach

Perform approach  
configuration  
of \_\_\_\_\_

- fuel systems
- power plant system
- hydraulic system
- electrical system
- landing gear system
- catapult/arresting  
hook system
- flight control system
- environmental control  
system
- escape/egress system
- misc. aircraft systems

6.2.1.2  
Configure aircraft  
mission systems for  
approach

Perform approach  
configuration  
of \_\_\_\_\_

- infra-red
- laser
- camera
- air-to-air radar
- air-to-ground radar
- MAD
- Jezebel
- sonar
- gunsight
- ESM
- sonobuoy
- TISEO/TVSU
- refuel boom
- hoist/rescue system
- cargo extraction system
- mine counter measures system
- TF/TA
- AWACS/AEW suite
- troop carrier equipment
- ECM/DECM

6.2  
Perform  
approach  
procedures

6.2.2  
Establish/depart  
holding fix

6.2.3  
Penetrate to  
approach  
altitude

6.2.4  
Execute final  
approach

6.2.1.3  
Configure  
avionics for  
approach

- Perform approach configuration of \_\_\_\_\_
- FMS
  - HUD
  - UHF
  - VHF
  - HF
  - ADF
  - KY-28
  - JTIDS
  - IFF
  - radar
  - INS
  - TACAN
  - VOR
  - compass
  - Loran C
  - satellite
  - omega
  - doppler
  - dead reckoning computer
  - visual procedures
  - MLS
  - data-link

- Establish/depart holding using \_\_\_\_\_
- FMS
  - HUD
  - UHF
  - VHF
  - HF
  - ADF
  - JTIDS
  - radar
  - INS
  - TACAN
  - VOR
  - compass
  - Loran C
  - satellite
  - omega
  - doppler
  - dead reckoning computer
  - visual procedures
  - MLS
  - data-link

- Penetrate to approach altitude using \_\_\_\_\_
- FMS
  - HUD
  - UHF
  - VHF
  - HF
  - ADF
  - JTIDS
  - radar
  - INS
  - TACAN
  - VOR
  - compass
  - Loran C
  - satellite
  - omega
  - doppler
  - dead reckoning computer
  - visual procedures
  - MLS
  - data-link

- Execute final approach using \_\_\_\_\_
- FMS
  - HUD
  - UHF
  - VHF
  - HF
  - ADF
  - JTIDS
  - radar
  - INS
  - TACAN
  - VOR
  - compass
  - Loran C
  - satellite
  - omega
  - doppler
  - dead re
  - visual
  - MLS
  - data-link

# APPROACH AND LANDING

6.0  
Perform Approach/  
Landing procedures

6.4  
Route  
to  
Approach

6.3.1  
Configure  
aircraft for  
landing

6.3.1.1  
Configure aircraft  
for landing

6.3.1.2  
Configure aircraft  
mission systems  
for landing

6.3.1.3  
Configure  
avionics  
for landing

Perform landing configuration of \_\_\_\_\_

- fuel systems
- power plant system
- hydraulic system
- electrical system
- landing gear system
- catapult/arresting hook system
- flight control system
- environmental control system
- escape/egress system
- misc. aircraft systems

Perform landing configuration of \_\_\_\_\_

- infra-red
- laser
- camera
- air-to-air radar
- air-to-ground radar
- MAD
- Jezebel
- sonar
- gunsight
- ESM
- sonobuoy
- TISEO/TVSU
- refuel boom
- hoist/rescue system
- cargo extraction system
- mine counter measures system
- TF/TA
- AWACS/AEW suite
- troop carrier equipment
- ECM/DECM

Perform landing configuration of \_\_\_\_\_

- FMS
- HUD
- UHF
- VHF
- HF
- ADF
- KY-28
- JTIDS
- IFF
- radar
- INS
- TACAN
- VOR
- compass
- Loran C
- satellite
- omega
- doppler
- dead reckoning
- visual procedure
- MLS
- data-link

6.1  
Routing computer  
procedures



6.3  
Perform landing  
procedures

6.4  
Respond to  
approach/  
landing  
emergencies

6.3.2  
Perform  
field  
landing

6.3.3  
Perform ship  
landing

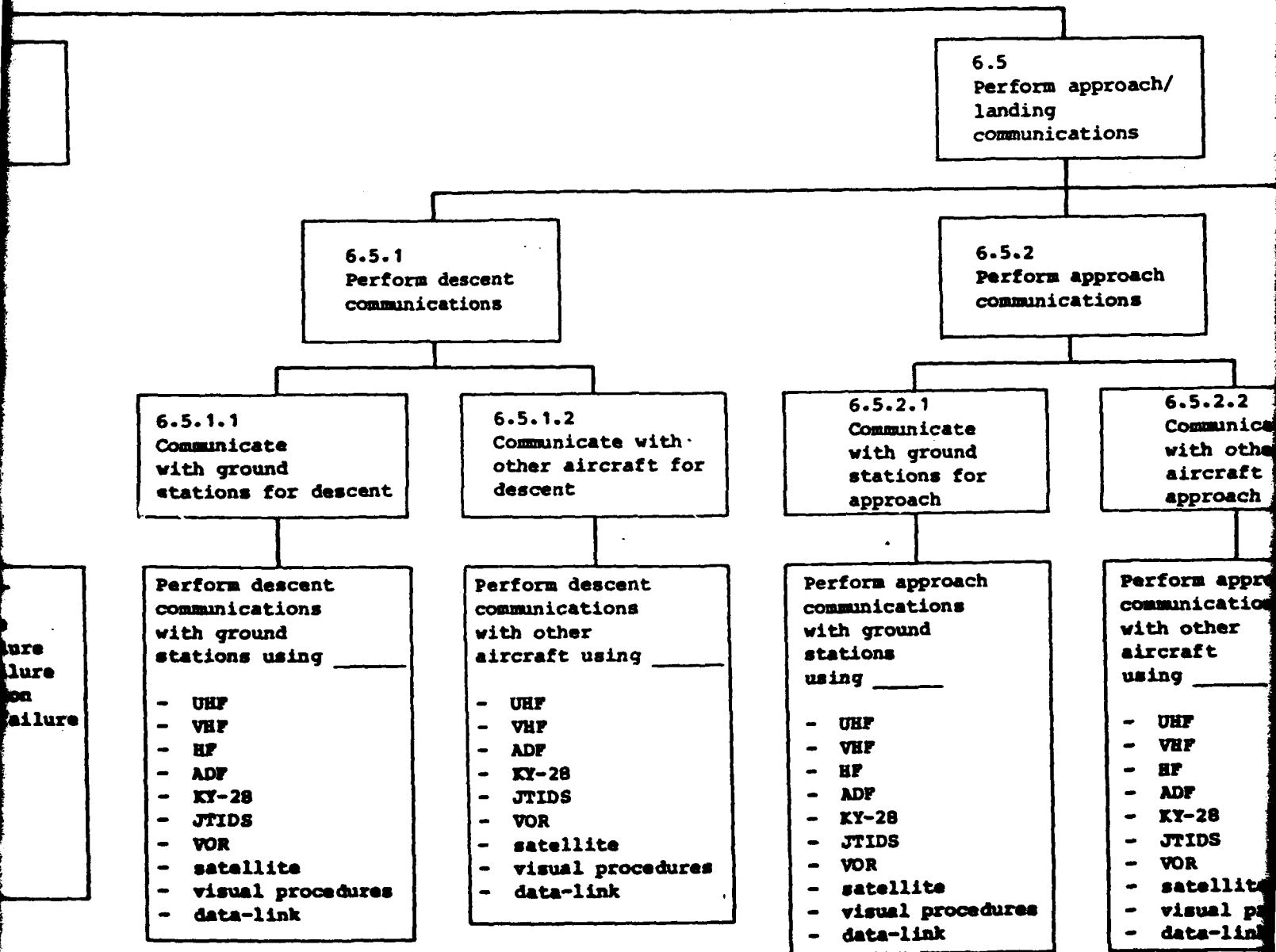
- Perform \_\_\_\_\_
- field vertical landing
  - field decelerating transition landing
  - field hover landing
  - field rolling landing
  - field slow landing
  - field brake slow landing
  - field conventional landing
  - field crosswind landing
  - field waveoff

- Perform \_\_\_\_\_
- ship vertical landing
  - ship waveoff
  - ship arrested landing
  - ship bolter landing
  - ship barricade landing

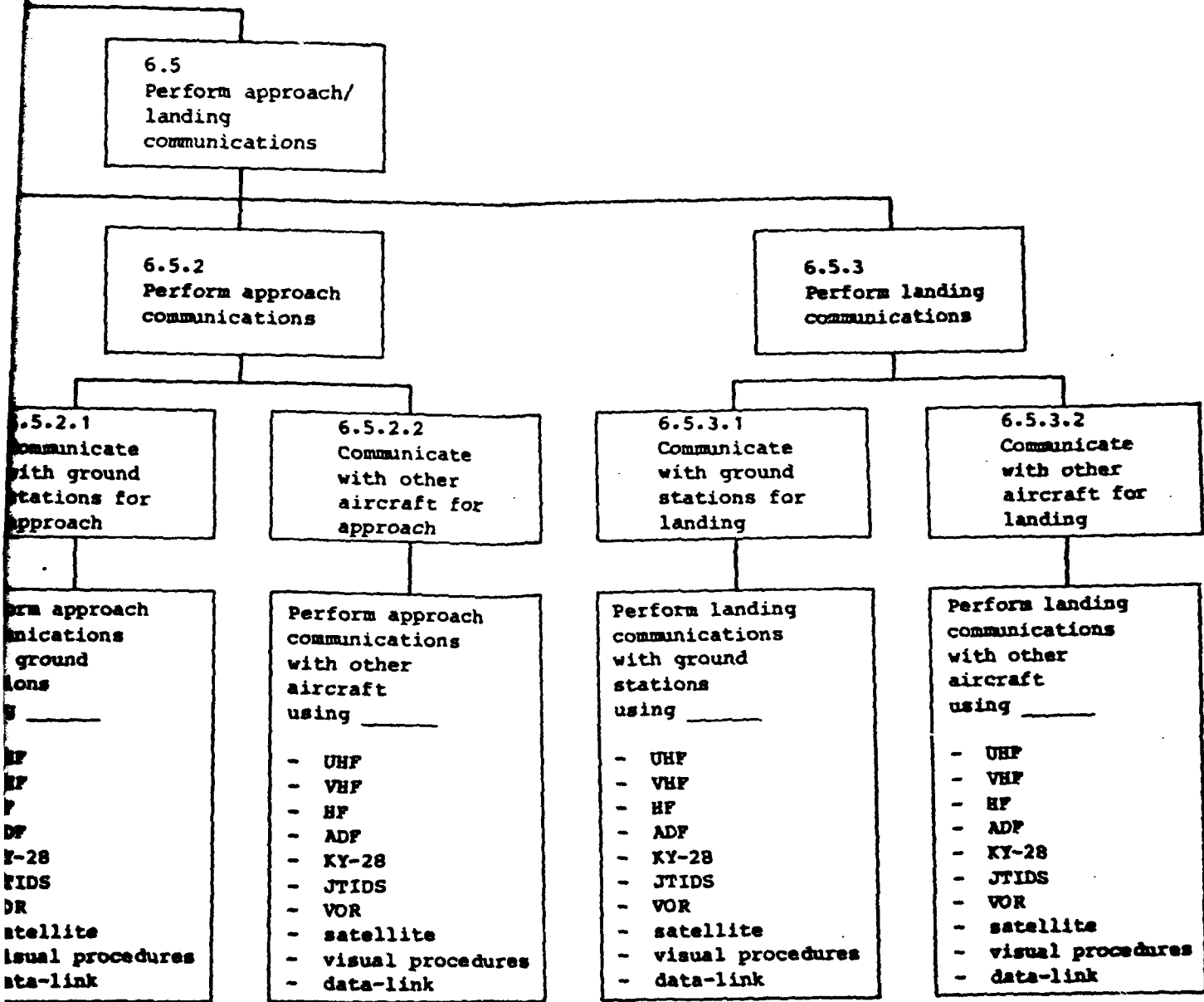
- Respond to \_\_\_\_\_
- engine failure
  - hydraulic failure
  - electrical failure
  - fuel malfunction
  - landing gear failure
  - blown tire
  - hung ordnance
  - brake failure
  - radio out
  - NGS failure
  - flap failure
  - no flap

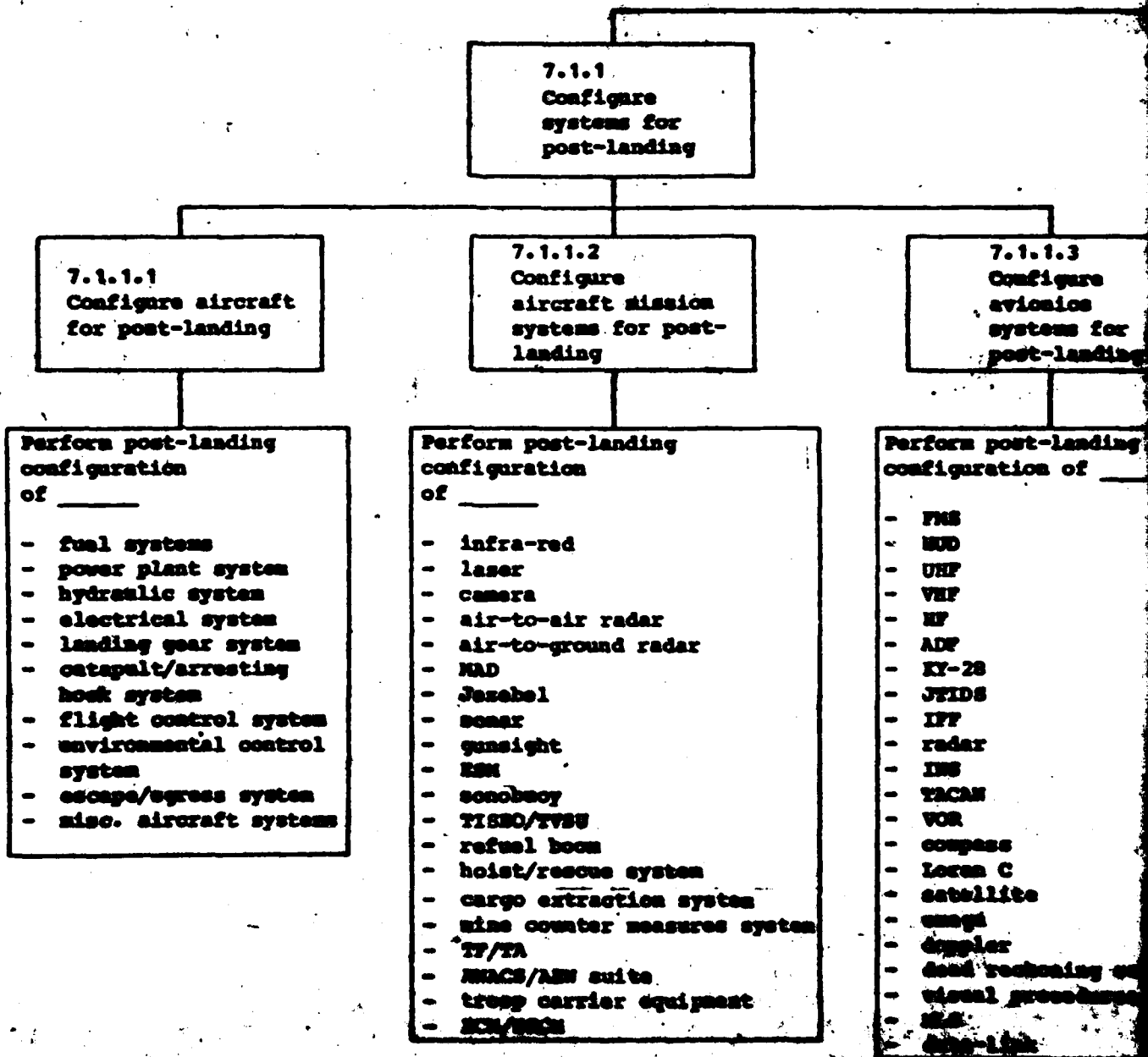
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by computer  
sures



Failure on failure





7.1.2  
Perform dearm  
procedures

Perform dearm  
procedures for \_\_\_\_\_

- gun
- air-to-air missiles
- air-to-ground missiles
- rockets
- bombs
- depth-charge
- torpedo
- sonar-sensors
- mines
- chaff
- flares
- jammer
- fuel-tanks

7.1.3  
Perform  
post-flight  
taxi

7.1.3.1  
Perform field taxi

Perform \_\_\_\_\_

- helo shorebased  
ground taxi
- helo shorebased  
hover taxi
- fixed-wing  
field taxi

7.1.3.2  
Perform  
carrier  
taxi

Perform \_\_\_\_\_

- helo carrier deck taxi
- helo carrier deck hover  
taxi
- fixed wing carrier deck  
taxi

7.1.  
Resp  
emer

Respo

- fa
- em
- fa
- em

7.1

7.1.4  
Perform  
taxi  
communications

7.1.4.1  
Communicate  
with ground  
stations for  
post-mission

7.1.4.2  
Communicate with  
other aircraft  
for post mission

7.1.5.1  
Perform flight  
controls shut-down

7.1  
Per  
shu

3  
nd to taxi  
ancies

3  
nd to \_\_\_\_\_  
nd brake  
ancies  
nd NCS  
ancies

- Communicate with ground stations using \_\_\_\_\_
- UHF
  - VHF
  - HF
  - ADF
  - KY-28
  - JTIDS
  - VOR
  - satellite
  - visual procedures
  - data-link

- Communicate with other aircraft using \_\_\_\_\_
- UHF
  - VHF
  - HF
  - ADF
  - KY-28
  - JTIDS
  - VOR
  - satellite
  - visual procedures
  - data-link

- Perform of \_\_\_\_\_
- gun
  - air
  - air
  - rock
  - bomb
  - dep
  - tor
  - son
  - min
  - obs
  - fle
  - jam
  - fu

1 Perform post-landing activities

7.1.5 Perform systems shut down

7.1.5.2 Perform expendables shutdown

7.1.5.3 Perform aircraft mission systems shutdown

7.1.5.4 Perform avionics systems shutdown

7.1.5.5 Perform engine shutdown inspection

- Perform shutdown of \_\_\_\_\_
- air-to-air missiles
  - air-to-ground missiles
  - rockets
  - bombs
  - depth-charge
  - torpedo
  - sonar-sensors
  - mines
  - chaff
  - flares
  - jammer
  - fuel-tanks

- Perform shutdown of \_\_\_\_\_
- infra-red
  - laser
  - camera
  - air-to-air radar
  - air-to-ground radar
  - MAD
  - Jezebel
  - sonar
  - gunsight
  - ECM
  - sonobuoy
  - TISEO/TVSU
  - refuel boom
  - hoist/rescue system
  - cargo extraction system
  - mine counter measures system
  - TF/TA
  - ANACS/AEW suite
  - troop carrier equipment
  - ECM/DECM

- Perform shutdown of \_\_\_\_\_
- FMS
  - HUD
  - UHF
  - VHF
  - HF
  - ADF
  - KY-28
  - JTIDS
  - IFF
  - radar
  - INS
  - TACAN
  - VOR
  - compass
  - Loran C
  - satellite
  - omega
  - doppler
  - dead reckoning computer
  - visual procedures
  - NLS
  - data-link

7.1.5.5 Perform shutdown inspection

# POST MISSION

7.0 Perform Post-Mission Procedures

7.1.6 Perform interior post-flight inspections

7.1.6.1 Perform before exiting cockpit inspections

7.1.6.1.1 Inspect cockpit

7.1.6.1.2 Inspect escape system

7.1.5.7 Respond to post-flight engine shutdown emergencies

Respond to \_\_\_\_\_  
- ground emergencies  
- engine fire

7.1.5.6 Perform engine shutdown procedures

Line inspections

Before engine shutdown



7.1.7  
Perform exterior  
post-flight  
inspections

7.1.7.1  
Perform exterior  
inspection of  
aircraft

7.1.7.2  
Perform post-flight  
inspection of ex-  
pendables

7.1.7.3  
Perform  
inspectio  
aircraft  
systems

7.1.6.1.2  
Inspect  
escape  
system

- Perform exterior inspection of \_\_\_\_\_
- fuel systems
  - power plant system
  - hydraulic system
  - electrical system
  - landing gear system
  - catapult/arresting hook system
  - flight control system
  - environmental control system
  - escape/egress system
  - misc. aircraft systems

- Perform post-flight inspection of \_\_\_\_\_
- gun
  - air-to-air missiles
  - air-to-ground missiles
  - rockets
  - bombs
  - depth-charge
  - torpedo
  - sonar-sensors
  - mines
  - chaff
  - flares
  - jammer
  - fuel-tanks

- Perform post-flight inspection of \_\_\_\_\_
- infra-red
  - laser
  - camera
  - air-to-air ra
  - air-to-ground
  - MAD
  - Jezabel
  - sonar
  - gunsight
  - ESM
  - sonobuoy
  - TISSO/TVSU
  - refuel boom
  - hoist/rescue
  - cargo extrac
  - mine counter
  - TF/TA
  - ANACE/AEW se
  - troop carri
  - ECM/DCM

7.2.1  
Perform maintenance debrief

7.2.1.1  
Prepare maintenance forms

7.2.1.2  
Conduct maintenance debrief

7.2.1.2.1  
Debrief aircraft mission systems

7.2.1.2.2  
Debrief avionics systems

7.2.1.2.3  
Debrief expendables

- Debrief \_\_\_\_\_
- infra-red
  - laser
  - camera
  - air-to-air radar
  - air-to-ground radar
  - MAD
  - Jezebel
  - sonar
  - gunlight
  - ESM
  - sonobuoy
  - TISRO/TVSU
  - refuel boom
  - hoist/rescue system
  - cargo extraction system
  - mine counter measures system
  - TF/YA
  - MDCS/AEW suite
  - troop carrier equipment
  - ECM/DCM

- Debrief \_\_\_\_\_
- FMS
  - HUD
  - UHF
  - VHF
  - HF
  - ADF
  - KY-28
  - JTIDS
  - IFF
  - radar
  - INS
  - TACAN
  - VOR
  - compass
  - Loran C
  - satellite
  - omega
  - doppler
  - dead reckoning computer
  - visual procedures
  - MLS
  - data-link

- Debrief \_\_\_\_\_
- gun
  - air-to-air missile
  - air-to-ground missile
  - rockets
  - bombs
  - depth-charge
  - torpedo
  - sonar-sensors
  - mines
  - chaff
  - flares
  - jammer
  - fuel-tanks

rior  
of  
mission

adar

stem  
a system  
source system  
equipment

7.2  
Conduct  
debrief

7.2.2  
Conduct debrief  
of flight

7.2.1  
Prepare mission  
debrief

7.2.2  
Conduct mission  
debrief

7.2.1.2.4  
Debrief  
aircraft

Debrief \_\_\_\_\_

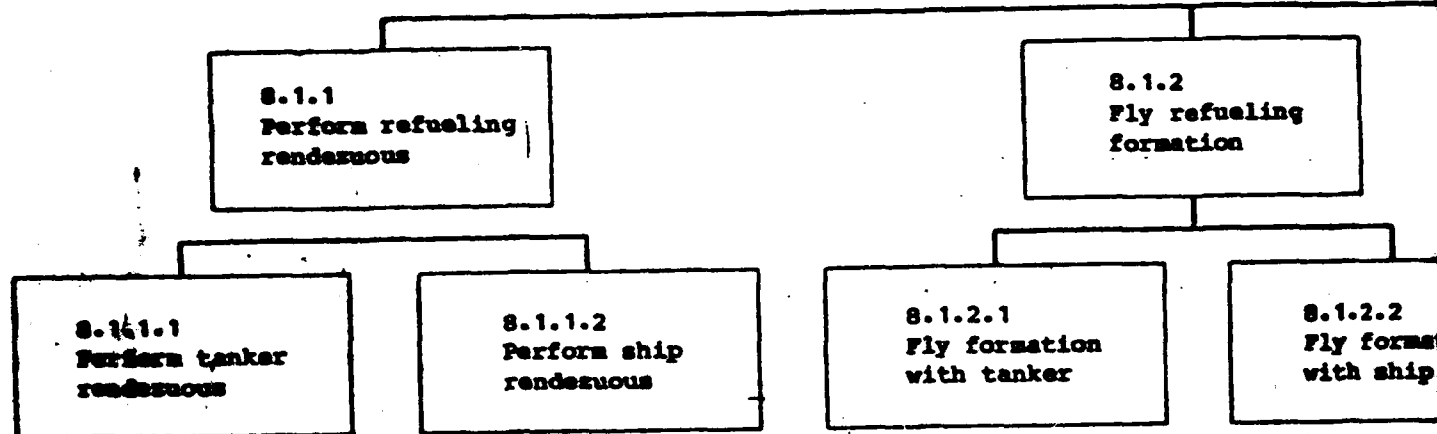
- fuel systems
- power plant system
- hydraulic system
- electrical system
- landing gear system
- catapult/arresting hook system
- flight control system
- environmental control system
- escape/egress system
- misc. aircraft systems

Conduct  
debrief  
of \_\_\_\_\_

- mission objectives
- operational area
- weapons procedures
- communications
- weather
- navigation
- operational emergencies
- intelligence and special operations
- rules of engagement

les

8



**8.1.3**  
Configure systems  
for air refueling

**8.1.3.1**  
Configure for  
tanker air  
refueling

**8.1.3.1.1**  
Configure aircraft  
for tanker air re-  
fueling

- Perform configuration  
of \_\_\_\_\_
- fuel systems
  - power plant system
  - hydraulic system
  - electrical system
  - landing gear system
  - catapult/arresting  
hook system
  - flight control system
  - environmental control  
system
  - egress/egress system
  - misc. aircraft systems

**8.1.3.1.2**  
Configure aircraft  
mission systems for  
tanker air refueling.

- Perform configuration  
of \_\_\_\_\_
- infra-red
  - laser
  - camera
  - air-to-air radar
  - air-to-ground radar
  - MAB
  - Jacobel
  - sonar
  - gunlight
  - IRM
  - sensor
  - TLMC/TMCM
  - refuel boom
  - hoist/reuse system
  - cargo extraction system
  - mine counter measures system
  - TF/SA
  - MACH/ANW suite
  - troop carrier equipment
  - ECM/ECM

**8.1.3.1.3**  
Configure avionics for  
tanker air refueling.

- Perform configuration  
of \_\_\_\_\_
- FMS
  - HEC
  - UHF
  - VHF
  - HF
  - ANF
  - EF-10
  - JTIDS
  - IFF
  - radar
  - INS
  - TDCM
  - VOR
  - compass
  - Loran C
  - satellite
  - omeg
  - doppler
  - dual redundancy
  - visual procedures
  - MSL
  - data-link

**8.1.3.**  
Config  
for sh

- Perform  
of \_\_\_\_\_
- fuel
  - power
  - hydro
  - elec
  - land
  - cargo
  - flight
  - envt
  - egress
  - misc

ation  
ip

8.1.4  
Perform  
air refuel

8.1.4.1  
Perform  
tanker air  
refueling

8.1.3.2  
Configure for  
ship air  
refueling

8.1.3.2.2  
Configure aircraft  
mission systems for  
ship air refueling

8.1.3.2.3  
Configure avionics for  
ship air refueling

1  
aircraft  
air refueling

Migration  
- base  
- fuel system  
- fuel system  
- fuel system  
- gear system  
- arresting hook  
- central system  
- central control system  
- press system  
- aircraft systems

Perform configuration  
of \_\_\_\_\_

- infra-red
- laser
- camera
- air-to-air radar
- air-to-ground radar
- IRD
- Jambal
- sensor
- gunlight
- IIR
- canopy
- TADS/TVWS
- refuel boom
- joint/rescue system
- cargo extraction system
- side counter measures system
- SP/SA
- HACS/HW suite
- towed carrier equipment
- HX/HAC

Perform configuration  
of \_\_\_\_\_

- FMS
- EOD
- IFF
- VHF
- HF
- ADF
- EF-30
- JTIDS
- IFF
- radar
- INS
- TACAN
- VOR
- compass
- Loren C
- satellite
- compass
- dupliat
- dupl posturing
- visual procedures
- ILS
- Star-Lite

8.1  
Conduct  
air refueling

8.1.5  
Reconf  
from

8.1.4.2  
Perform  
ship air  
refueling

8.1.5.1  
Reconfigure from  
tanker air refueling

8.1.5.1.1  
Reconfigure aircraft  
from tanker air  
refueling

- Perform reconfiguration  
of \_\_\_\_\_
- fuel systems
  - power plant system
  - hydraulic system
  - electrical system
  - landing gear system
  - catapult/arresting hook system
  - flight control system
  - environmental control system
  - escape/egress system
  - misc. aircraft systems

8.1.5.1.2  
Reconfigure aircraft  
mission systems from  
tanker air refueling

- Perform reconfiguration  
of \_\_\_\_\_
- infra-red
  - laser
  - camera
  - air-to-air radar
  - air-to-ground radar
  - HAD
  - Jacobel
  - sensor
  - gun/sight
  - HIR
  - canopy
  - T/RM/TVC
  - refuel hose
  - hoist/rescue system
  - mine counter measures system
  - TV/TA
  - MCCA/AM cable
  - troop carrier equipment
  - HIR/AMM

8.1.5.1.3  
Reconfigure avionics  
from tanker air  
refueling

- Perform reconfiguration  
of \_\_\_\_\_
- FMS
  - HD
  - GWP
  - VFP
  - IF
  - ADP
  - ET-10
  - JT20
  - IFF
  - radar
  - IIS
  - WDM
  - VFP
  - escape
  - Egress C
  - satellite
  - escape
  - duplexer
  - fuel distribution
  - visual procedures
  - HD
  - data-link

# SPECIAL OPERATIONS

8.0  
Perform Special  
Operations Procedures

8.1.5  
Reconfigure systems  
from air refueling

8.1.5.2  
Reconfigure from  
ship air refueling

8.1.6  
Perform  
tanker  
clear  
procedures

8.1.5.2.1  
Reconfigure aircraft  
from ship air  
refueling

8.1.5.2.2  
Reconfigure aircraft  
mission systems from  
ship air refueling

8.1.5.2.3  
Reconfigure avionics  
from ship air  
refueling

Perform reconfiguration  
of \_\_\_\_\_

- fuel system
- power plant system
- hydraulic system
- electrical system
- landing gear system
- catapult/arresting hook system
- flight control system
- environmental control system
- escape/egress system
- misc. aircraft systems

Perform reconfiguration  
of \_\_\_\_\_

- infra-red
- laser
- camera
- air-to-air radar
- air-to-ground radar
- MAD
- Joesbel
- sonar
- gunlight
- ESM
- sonobuoy
- TISEG/TISU
- refuel boom
- hoist/rescue system
- cargo extraction system
- mine counter measure system
- TV/TA
- MACH/ANW suite
- troop carrier equipment
- HC/DCM

Perform reconfiguration  
of \_\_\_\_\_

- FMS
- HUD
- UHF
- VHF
- HF
- ADF
- KY-29
- JTIDS
- IFF
- radar
- INS
- TACAN
- VOR
- compass
- Loran C
- satellite
- omeg
- doppler
- dead reckoning
- visual procedures
- MLS
- data-link



8.1.6  
Perform  
clearing  
procedures

8.1.7  
Perform  
air refueling  
communications

8.1.6.2  
Perform ship  
clearing pro-  
cedures

8.1.7.1  
Communicate  
with tanker

8.1.7.2  
Communicate  
with other aircraft

8.1.7.3  
Communicate  
ship

Communicate with  
tanker using \_\_\_\_\_

- HF
- VHF
- MF
- ADF
- KR-28
- JTIDS
- VOR
- satellite
- visual procedures
- data-link

Communicate with  
other aircraft  
using \_\_\_\_\_

- HF
- VHF
- MF
- KR-28
- JTIDS
- VOR
- satellite
- visual procedures
- data-link

Communicate  
ship using \_\_\_\_\_

- HF
- VHF
- MF
- ADF
- KR-28
- JTIDS
- VOR
- satellite
- visual
- data-link

**8.1.8**  
Respond to air refueling emergencies

Respond to \_\_\_\_\_

- emergency break-away
- disconnect-system inoperable
- receptacle failure

**8.2.1**  
Configure for hot refueling

**8.2.1.1**  
Configure aircraft for hot refueling

Configure \_\_\_\_\_

- fuel system
- power plant system
- hydraulic system
- electrical system
- landing gear system
- catapult/arresting hook system
- flight control system
- environmental control system
- escape/egress system
- misc. aircraft systems

**8.2.1.2**  
Configure aircraft mission systems for hot refueling

Configure \_\_\_\_\_

- infra-red
- laser
- camera
- air-to-air radar
- air-to-ground radar
- HUD
- Jammer
- sensor
- gun/sight
- EW
- symbology
- TIDS/TADS
- refuel boom
- hatch/rescue system
- cargo extraction system
- mine counter measures system
- TF/A
- AMCS/MS suites
- troop carrier equipment
- ECM/CCM

**8.2.1.3**  
Configure aircraft mission systems for hot refueling

Configure \_\_\_\_\_

- FMS
- INS
- DME
- VOR
- ILS
- ASW
- TCAS
- TCAS II
- TCAS III
- TCAS IV
- TCAS V
- TCAS VI
- TCAS VII
- TCAS VIII
- TCAS IX
- TCAS X
- TCAS XI
- TCAS XII
- TCAS XIII
- TCAS XIV
- TCAS XV
- TCAS XVI
- TCAS XVII
- TCAS XVIII
- TCAS XIX
- TCAS XX
- TCAS XXI
- TCAS XXII
- TCAS XXIII
- TCAS XXIV
- TCAS XXV
- TCAS XXVI
- TCAS XXVII
- TCAS XXVIII
- TCAS XXIX
- TCAS XXX

with

with

with

8.2  
Conduct  
hot refueling

8.2.2  
Perform  
hot refueling  
communications

8.2.3  
Perform  
hot refueling

8.2.1.3  
Configure  
avionics for  
hot refueling

8.2.2.1  
Communicate  
with ground  
stations for  
hot refueling

8.2.2.2  
Communicate  
with ground  
crew

Configure avionics for hot refueling

- Communicate with ground stations using \_\_\_\_\_
- HF
  - VHF
  - HF
  - AMF
  - KY-28
  - JTIDS
  - VOR
  - satellite
  - visual procedures
  - data-link

- Communicate with ground crew using \_\_\_\_\_
- HF
  - VHF
  - HF
  - AMF
  - KY-28
  - JTIDS
  - VOR
  - satellite
  - visual procedures
  - data-link

8.2.5

8.2.5 Reconfigure after hot refueling

8.2.5.1 Reconfigure aircraft after hot refueling

- Reconfigure \_\_\_\_\_
- fuel systems
  - power plant system
  - hydraulic system
  - electrical system
  - landing gear system
  - catapult/arresting hook system
  - flight control system
  - environmental control system
  - escape/egress system
  - misc. aircraft systems

8.2.5.2 Reconfigure aircraft mission systems after hot refueling

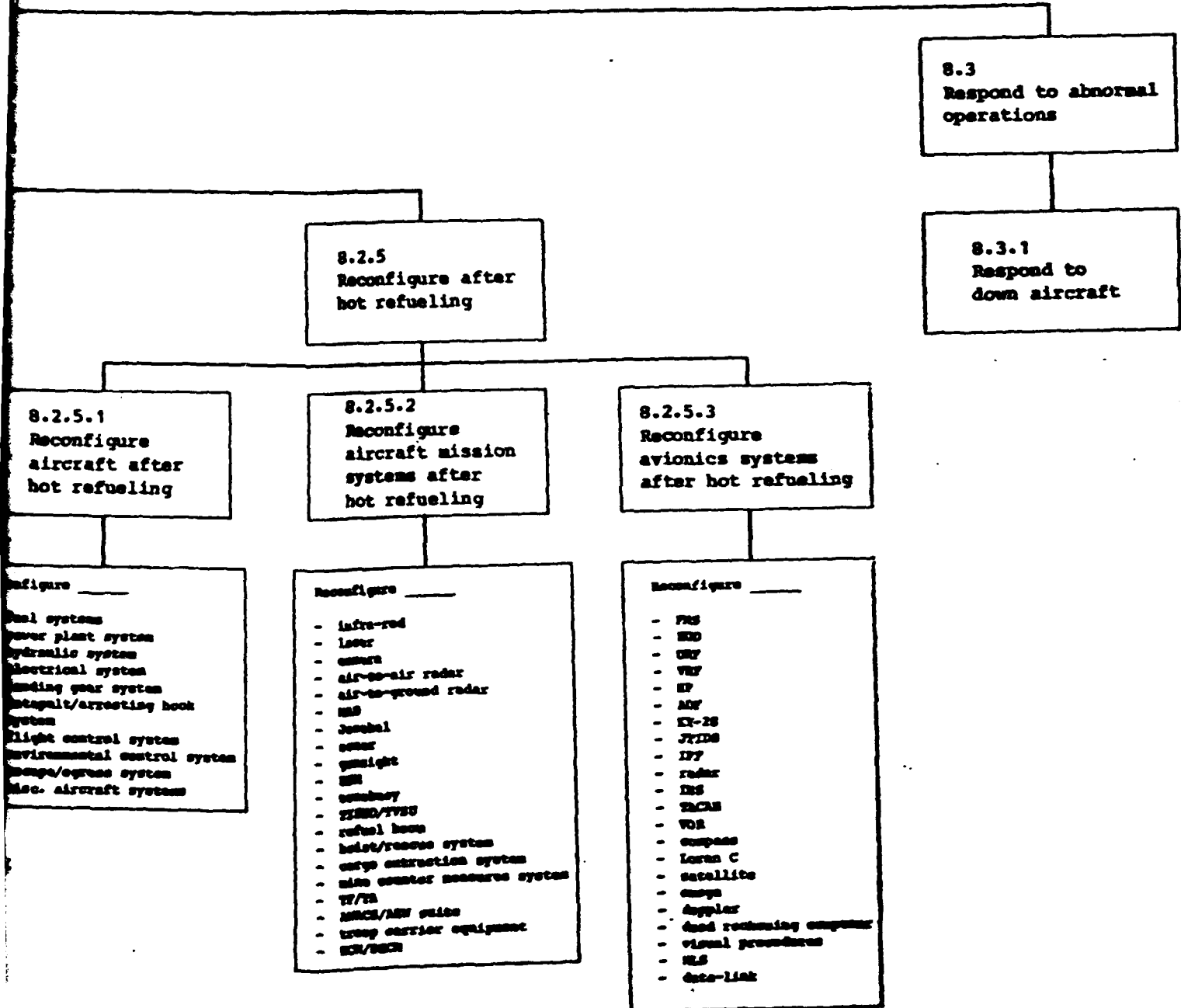
- Reconfigure \_\_\_\_\_
- infra-red
  - laser
  - camera
  - air-to-air radar
  - air-to-ground radar
  - MAD
  - Joesbel
  - sonar
  - gunsight
  - ESM
  - sonobuoy
  - TISRO/TISU
  - refuel boom
  - hoist/rescue system
  - cargo extraction system
  - mine counter measures system
  - TP/TA
  - MACE/MEW suite
  - troop carrier equipment
  - ECM/DECM

8.2.5.3 Reconfigure avionics systems after hot refueling

- Reconfigure \_\_\_\_\_
- FMS
  - HCU
  - ONY
  - WEF
  - SF
  - MF
  - KI-28
  - JTIDS
  - IFF
  - radar
  - IES
  - TACAN
  - VOR
  - compass
  - Loran C
  - satellite
  - omeg
  - dupler
  - dead reckoning computer
  - visual procedures
  - HES
  - data-link

and to refueling agencies

in cockpit fire emergencies in fire emergencies



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APPENDIX C  
TASK-OBJECTIVE TAXONOMY

VERBS

1. Perform
2. Collect
3. Select
4. Gather
5. Compute
6. Record
7. Prepare
8. Conduct
9. Select/Prepare
10. Inspect
11. Respond
12. Configure
13. Recognize
14. Position
15. Establish
16. Communicate
17. Fly
18. Maneuver
19. Evaluate
20. Establish/Depart
21. Penetrate
22. Execute
23. Reconfigure

## MODIFIERS

- |                        |                        |                       |
|------------------------|------------------------|-----------------------|
| 1. Mission-Planning    | 38. Air Refueling      | 75. Before-Takeoff    |
| 2. Appropriate         | 39. Nav-Planning       | 76. Arming            |
| 3. Aircraft Data       | 40. Chart              | 77. Takeoff           |
| 4. Navigation          | 41. Nav-Log            | 78. Field-Takeoff     |
| 5. Tactical            | 42. Tactical-Log       | 79. Normal            |
| 6. Special-Purpose     | 43. Briefing           | 80. Carrier-Takeoff   |
| 7. Required            | 44. Briefing-Aids      | 81. Carrier-Aircraft  |
| 8. Aircraft            | 45. Mission-Objective  | 82. Catapult          |
| 9. Weather             | 46. Operating-Area     | 83. Takeoff/Departure |
| 10. Tactical           | 47. Weapons-Procedures | 84. Field             |
| 11. Intelligence       | 48. Comm-Plan          | 85. Field-Formation   |
| 12. Ordnance           | 49. Operational-Emerg  | 86. Ship              |
| 13. Mission            | 50. Rules              | 87. Ground-Stations   |
| 14. Station-Loading    | 51. Prelaunch          | 88. T/O-Comm          |
| 15. Center-Of-Gravity  | 52. Personal           | 89. Other-Aircraft    |
| 16. Drag-Index         | 53. Flight             | 90. Departure         |
| 17. T/O-And-Landing    | 54. Survival           | 91. Forward-Flight    |
| 18. Conventional-T/O   | 55. Exterior           | 92. Takeoff-Attitude  |
| 19. Vertical-T/O       | 56. Interior           | 93. Hover             |
| 20. Aircraft-Hover     | 57. Before-Entering    | 94. Accelerated       |
| 21. Vertical-Land      | 58. Escape             | 95. Climbout          |
| 22. Conventional-Land  | 59. Before-Electrical  | 96. Rendezvous        |
| 23. Landing-Distance   | 60. After-Electrical   | 97. Formation         |
| 24. Departure-Nav      | 61. Engine-Start       | 98. Departure-Comm    |
| 25. Cruise-Navigation  | 62. Before-Starting    | 99. Course/Heading    |
| 26. Descent-Navigation | 63. Starting-Engine    | 100. Vector           |
| 27. Approach           | 64. Systems            | 101. Point-To-Point   |
| 28. Air-To-Ground      | 65. Flight-Controls    | 102. Arc              |
| 29. Air-To-Air         | 66. Avionics           | 103. Nav-Comm         |
| 30. Logistics          | 67. Check/Set-Up       | 104. Malfunctions     |
| 31. SAR                | 68. A/C-Mission-Sys    | 105. Approach/Landing |
| 32. ASW                | 69. Expendables        | 106. Enroute          |
| 33. ESM                |                        | 107. Approach         |
| 34. Recce              | 71. Helo               | 108. Holding          |
| 35. AEW                | 72. Helo-Carrier-Deck  | 109. Final            |
| 36. Mine-C/M           | 73. Fixed-Wing         | 110. Landing          |
| 37. Assault            | 74. Taxi               | 111. Flap             |



- |                        |                    |
|------------------------|--------------------|
| 112. No-Flap           | 150. Ground-Crew   |
| 113. Descent           | 151. Abnormal      |
| 114. Descent-Comm      | 152. Down-Aircraft |
| 115. Approach-Comm     |                    |
| 116. Landing-Comm      |                    |
| 117. Post-Mission      |                    |
| 118. Post-Landing      |                    |
| 119. Dearm             |                    |
| 120. Post-Flight       |                    |
| 121. P/M-Comm          |                    |
| 122. Shut-down         |                    |
| 123. Engine-Shut-Down  |                    |
| 124. Before-Shut-Down  |                    |
| 125. Interior-Post-Flt |                    |
| 126. Before-Exiting    |                    |
| 127. Cockpit           |                    |
| 128. Escape-System     |                    |
| 129. Exterior-Post-Flt |                    |
| 130. Maintenance       |                    |
| 131. Debrief           |                    |
| 132. Special           |                    |
| 133. Air               |                    |
| 134. Refueling         |                    |
| 135. Tanker            |                    |
| 136. T/O-Config        |                    |
| 137. Depart-Config     |                    |
| 138. Descent-Config    |                    |
| 139. Approach-Config   |                    |
| 140. Landing-Config    |                    |
| 141. Post-Land-Config  |                    |
| 142. Air-Refueling     |                    |
| 143. Clearing          |                    |
| 144. Communications    |                    |
| 145. Air Refuel-Comm   |                    |
| 146. Hot               |                    |
| 147. Hot-Refuel-Config |                    |
| 148. Hot-Refuel        |                    |
| 149. Hot-Refuel-Comm   |                    |

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OBJECTS

- |                        |                        |                        |
|------------------------|------------------------|------------------------|
| 1. Procedures          | 38. Flight-Cont-System | 74. Troop-Carrier-Eq   |
| 2. Data                | 39. Environ-Cont-Sys   | 75. ECM/DECM           |
| 3. Pubs                | 40. Escape/Egress Sys  | 76. System             |
| 4. KY-28               | 41. Expendables        | 77. Procedure          |
| 5. Data-Link           | 42. Gun                | 78. Emergencies        |
| 6. INS                 | 43. AA-Missiles        | 79. ECS-Failure        |
| 7. UHF                 | 44. AG-Missiles        | 80. Generator-Failure  |
| 8. VHF                 | 45. Rockets            | 81. Eng-Oil-Level-Low  |
| 9. HF                  | 46. Bombs              | 82. Eng-Fire/Overheat  |
| 10. TACAN              | 47. Depth Charges      | 83. Elim-Smoke/Fumes   |
| 11. ADF                | 48. Torpedo            | 84. Fuel-Transfer-Mal  |
| 12. IFF                | 49. Sonar-Sensors      | 85. Hydraulic-Sys-Fail |
| 13. Radar              | 50. Mines              | 86. Loss-of-Cabin-Pres |
| 14. Visual-Procedures  | 51. Chaff              | 87. Engine-Hung-Start  |
| 15. VOR                | 52. Flares             | 88. Engine-Hot-Start   |
| 16. FMS                | 53. Jammer             | 89. Eng-Fire-on-Start  |
| 17. HUD                | 54. Fuel-Tanks         | 90. Engine-Wet-Start   |
| 18. Compass            | 55. A/C-Mission-Sys    | 91. Engaged-Starter    |
| 19. LORAN-C            | 56. Infra-Red          | 92. Runaway-Eng/Start  |
| 20. Satellite          | 57. Laser              | 93. Failed-Brake       |
| 21. Omega              | 58. Camera             | 94. Failed-NGS         |
| 22. Doppler            | 59. A/A-Radar          | 95. Engine-Fire        |
| 23. D/R-Computer       | 60. A/G-Radar          | 96. Engine-Flameout    |
| 24. MLS                | 61. MAD                | 97. After-Burner-Fail  |
| 25. JTIDS              | 62. JÉZEBEL            | 98. Electrical Fail    |
| 26. Activities         | 63. Sonar              | 99. Blown-Tire         |
| 27. Brief              | 64. Gunsight           | 100. Hydraulic-Fail    |
| 28. Equipment          | 65. ESM                | 101. Flight-Cont-Fail  |
| 29. Gear               | 66. Sonobuoy           | 102. High-AOA          |
| 30. Inspections        | 67. TISEO/TVSU         | 103. Engine-Fail       |
| 31. Aircraft           | 68. Refuel/Boom        | 104. Hyd-Failure       |
| 32. Fuel-System        | 69. Hoist/Rescue-Eq    | 105. Elec-Failure      |
| 33. Power-Plant-System | 70. Cargo-Extract-Eq   | 106. Fuel-Mal          |
| 34. Hydraulic-System   | 71. Mine-C/M-Eq        | 107. Landing Gear-Fail |
| 35. Electrical-System  | 72. TF/TA              | 108. Tire-Blowout      |
| 36. Landing-Gear-Sys   | 73. AWACS/AEW-Suite    | 109. Hung-Ordnance     |
| 37. CAT/Arr-Hook-Sys   |                        |                        |

- |                         |                         |
|-------------------------|-------------------------|
| 110. Brake-Failure      | 146. Fix                |
| 111. Radio-Out          | 147. Altitude           |
| 112. NGS-Failure        | 148. Landing            |
| 113. Smoke/Fumes-In-C/P | 149. Waveoff            |
| 114. Fuel-Fire          | 150. Post-Landing       |
| 115. Eng-Fire           | 151. Post-Mission       |
| 116. Ground-Emer        | 152. Shut-down          |
| 117. Eng-Fire-Shutdown  | 153. Postflight         |
| 118. Emer-Breakaway     | 154. Debrief            |
| 119. Disconnect-Inop    | 155. Forms              |
| 120. Receptacle-Fail    | 156. Refueling          |
| 121. Check/Set-Up       | 157. Mission-Objective  |
| 122. Taxi               | 158. Operational-Area   |
| 123. Ground-Taxi        | 159. Weapons-Procedures |
| 124. Hover-Taxi         | 160. Communications     |
| 125. Field-Taxi         | 161. Weather            |
| 126. Carrier-Deck-Taxi  | 162. Navigation         |
| 127. Communciation      | 163. Oper Emergencies   |
| 128. Arming             | 164. Intelligence       |
| 129. Takeoff            | 165. Rules              |
| 130. Planning           | 166. Rendezvous         |
| 131. Cockpit            | 167. Formation          |
| 132. Carrier-Takeoff    | 168. Air-Refueling      |
| 133. Position           | 169. Clearing-Procedure |
| 134. Hookup             | 170. Tanker             |
| 135. Transition         | 171. Ship               |
| 136. Departure          | 172. Hot-Refueling      |
| 137. Navigation         | 173. Operations         |
| 138. Course/Heading     |                         |
| 139. Vector             |                         |
| 140. Point-to-Point     |                         |
| 141. Arc                |                         |
| 142. Evaluation         |                         |
| 143. Malfunctions       |                         |
| 144. Descent            |                         |
| 145. Approach           |                         |

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APPENDIX D  
GENERIC SYLLABUS

## GENERIC SYLLABUS STRUCTURE

Phase I: Familiarization Phase (FA)	Verbs	Modifiers	Objects
<b>AIRCRAFT SYSTEMS</b>			
Fuel Systems	3	79	32
Power Plant System	3	79	33
Hydraulic System	3	79	34
Electrical System	13	79	35
Landing Gear System	13	79	36
Catapult/Arresting Hook System	13	79	37
Flight Control System	13	79	38
Environmental Control System	13	79	39
Escape/Egress System	13	79	40
Misc. Aircraft Systems			
<b>AVIONICS SYSTEMS</b>			
Flight Instruments			
Cockpit Displays System			
FMS	13	79	16
HUD	13	79	17
UHF	13	79	7
VHF	13	79	8
HF	13	79	9
ADF	13	79	11
KY-28	13	79	4
JTIDS	13	79	25
IFF	13	79	12
Radar	13	79	13
INS	13	79	6
TACAN	13	79	10
VOR	13	79	15
Compass	13	79	18
Loran C	13	79	19
Satellite	13	79	20
Omega	13	79	21
Doppler	13	79	22
Dead Reckoning	13	79	23
Visual Procedures	13	79	14
MLS	13	79	24
Data-Link	13	79	5

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<u>Familiarization Phase (FA)</u>	<u>Verbs</u>	<u>Modifiers</u>	<u>Objects</u>
<b>AIRCRAFT MISSION SYSTEMS</b>			
Infra-Red	13	79	56
Laser	13	79	57
Camera	13	79	58
Air-To-Air Radar	13	79	59
Air-To-Ground Radar	13	79	60
MAD	13	79	61
Jezebel	13	79	62
Sonar	13	79	63
Gunsight	13	79	64
ESM	13	79	65
Sonobuoy	13	79	66
Tiseo/Tvsu	13	79	67
Refuel Boom	13	79	68
Hoist/Rescue System	13	79	69
Cargo Extraction System	13	79	70
Mine Counter Measures System	13	79	71
TF/TA	13	79	72
AWACS, AEW Suite	13	79	73
Troop Carrier Equipment	13	79	74
ECM/DECM	13	79	75
<b>EXPENDABLES</b>			
Gun	13	79	42
Air-To-Air Missiles	13	79	43
Air-To-Ground Missiles	13	79	44
Rockets	13	79	45
Bombs	13	79	46
Depth-Charge	13	79	47
Torpedo	13	79	48
Sonar-Sensors	13	79	49
Mines	13	79	50
Chaff	13	79	51
Flares	13	79	52
Jammer	13	79	53
Fuel-Tanks	13	79	54

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Phase II:	Verbs	Modifiers	Objects
<b>FLIGHT PROFICIENCY PHASE (FP)</b>			
Aircraft Performance Characteristics			
Standard Operating Procedures			
Performance Chart Planning	3,4,5,7	17,18,19,20,21 22,23,40,3,8,12, 14,15,16	3,2
Navigation Planning	3,4,5,1,7	4,24,25,26,27,39, 41	25,3,2,130,5, 7,8,9,12,14,20
Flight Planning Procedures	1,2,3,4,5,6, 7,8	44,8,17,45,46,48, 49,1,2,6,7,9,13, 4,43	1,2,3,130,26, 27
Exterior Inspection	9,3,7,1	52,2,53,54,55	55,56-75,28,29, 30,31,32-41,42-59
Interior Inspection	1,10	56,57,8,58,59, 60	30,31,76
Ground Procedures	1	67,68,69,8,71, 73,74,61,62,63, 64,65,66	42-54,122,123, 124,125,127,77, 30,121,4-25,56-75
Ground Emergencies	11	61,74,51	78,87-92,93,94
Pre-Launch Procedures	1,12,14,15	68,8,66,136,51, 75,69,76,77,78, 8	32-40,56-75,4-25, 133,1,121,128, 42-54,129
Takeoff/departure procedures	1,16,12	90,91,92,93,94, 64,8,68,83,84, 77,87,88,89,66, 95,137	19,15,16,20,25, 135,136,32-40,1, 129,77,127,5,7, 8,9,4,11,56-75, 4-25,
Takeoff/departure emergencies	11	77	78,95-102
Navigation Procedures	1,12,18,17,16, 19	87,103,89,4,8, 99,100,101,102	140,141,127, 142,1,76,4-25, 127,138,139
Navigation Malfunctions	11	4,104	143,4-25,78, 79-86
Approach Procedures	1,12,17,20, 21,22,16	89,115,138,139, 107,108,109,113, 87,114,106,64,8, 68,66	127,144,4-25, 77,145,146,147, 144,32-40,56-75

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	Verbs	Modifiers	Objects
Landing Procedures	1,12,16	105,87,116,89, 140,110,64,8, 68,66,84	4-25,127,77, 148,32-40, 56-75
Approach/Landing Emergencies	11	105,111,112	78,103-112
Post-Mission Procedures	1,12,16	119,87,121,89, 141,117,118, 64,8,68,66	56-75,4-25,77, 42-54,1,26,150, 32-40,127,151
Post Mission Ground Procedures	1,8,12,16,23	66,123,124,146, 8,120,64,65,69, 122,68,147,148, 87,149,150	4-25,30,77,156, 172,122,152, 92-54,56-75,32-40, 127
Post Mission Ground Emergencies	11	120,148	78,93,94,113, 114,115,116,117
Interior Inspection	1,10	125,126,127, 128	30,153
Exterior Inspection	1	129,55,120, 55	42-54,55,56-75, 30,153,32-40, 41
Post-flight debrief	1,7,8	130,131,13	42-54,56-75, 157-165,154,155, 4-25,32-40
Day flight procedures	1	117,132,1,51, 83,4,105	1
Night flight procedures	1	117,132,1,51, 83,4,105	1
All Weather Operations	1	117,132,1,51, 83,4,105	1
Formation Procedures	1,17,16	85,96,97,89,	144,145,148, 151,129,136,137
Operational Emergencies	11	120,148,142,51, 74,77,4,105	79-120, 78



**PHASE III: MISSION EXECUTION (ME)**

**MISSION INTRODUCTION**

- Introduction to Air-to-Air Mission
- Introduction to Air-to-Ground Mission
- Introduction to ASW Mission
- Introduction to RECCE Mission
- Introduction to Mine Countermeasures
- Introduction to ESM Mission
- Introduction to SAR Mission
- Introduction to Logistics/Transport Mission
- Introduction to Assault/Delivery Mission
- Introduction to Air Refueling Mission

**AIRCRAFT MISSION SYSTEMS**

- System Introduction
- System Modes
- System Computations
- System Test Procedures
- Displays/Symbology

**WEAPONS**

- Weapons Description
- Weapons Capabilities/Limitations

**MISSION EXECUTION**

- Doctrine
- Tactical Mission Planning      7,8,3.1.2,      9,10,11,12,13,      3,1,1,26,27  
    4,5                      5,6,1,2,7,28,  
       31,32,33,34,  
       35,36,37,38,  
       42,43,47,50,8,  
       29,30
- Search/Detect
- Acquisition/Identification
- Prepare to Execute/Employ
- Execute Mission/Employ Systems
- Evaluate/Assess Situation
- Counter Threats

**C**

## MISSION JUDGEMENT

Wingman Considerations  
 Environmental Considerations  
 Threat Considerations

## Phase IV: Special Operations Phase (SO)

	Verb	Modifier	Object
Air Refueling	8,1,17,12, 23,16,11	89,145,144, 64,68,66,8, 143,133,134, 135,86,142	78,118,119,120, 171,127,170, 32-40,56-75, 4-25,156,166,167, 168,77,169
Carrier Operation	1,12,15	66,82,86,142, 72,73,80,81, 68	132,32-40,4-25, 122,124,126,121, 56-75,133,134, 129,148,149
Abnormal Operations	11	151,152	173,77

APPENDIX E  
SAMPLE RUN OF CASDAT

COMPUTER AIDED SYSTEM FOR DEVELOPING AIRCREW TRAINING

WELCOME TO CASDAT .

CASDAT IS A SERIES OF COMPUTER PROGRAMS THAT WILL AID YOU IN DEVELOPING FIVE COMPONENTS OF AN AIRCREW TRAINING SYSTEM. THESE FIVE COMPONENTS ARE PART OF THE INSTRUCTIONAL SYSTEMS DEVELOPMENT PROCESS (ISD) AND INCLUDE TASK LIST AND OBJECTIVE HIERARCHY DEVELOPMENT, MEDIA SELECTION, TRAINING SYLLABUS AND LESSON SPECIFICATION DEVELOPMENT. IF YOU WOULD LIKE MORE INFORMATION ABOUT THESE ISD COMPONENTS, PLEASE REFER TO MIL-T-29053B.

TO INITIATE DEVELOPMENT OF THE FIRST COMPONENT IN THIS PROCESS, THE TASK LIST, IT WILL BE NECESSARY TO PROVIDE CASDAT WITH THE IDENTIFICATION OF THE TYPE OF AIRCRAFT INVOLVED. IF THIS AIRCRAFT IS NEW TO CASDAT, YOU WILL BE ASKED TO PROVIDE CASDAT WITH ADDITIONAL AIRCREW AND AIRCRAFT DATA.

WHEN ENTERING DATA INTO CASDAT, WAIT FOR THE PROMPT ('>'), ENTER THE DATA, THEN PRESS "CARRIAGE RETURN" KEY. IF MORE THAN ONE ENTRY IS MADE, PRESS THE "CARRIAGE RETURN" KEY AFTER EACH ENTRY. AFTER THE FINAL ENTRY HAS BEEN MADE, WAIT FOR THE PROMPT AND THEN PRESS THE "CARRIAGE RETURN" KEY.

IN SOME CASES, THE CRT MAY SCROLL FASTER THAN YOU WISH. TO STOP THE CRT FROM SCROLLING, HOLD THE CONTROL (CNTL) KEY DOWN WHILE TYPING IN A "S". TO RESUME CRT SCROLL, HOLD THE "CNTL" KEY DOWN WHILE TYPING IN A "Q".

IF HELP IS NEEDED IN SELECTING THE APPROPRIATE RESPONSE TO A COMPUTER INITIATED QUESTION, TYPE IN A "?" AND DEPRESS THE "CARRIAGE RETURN" KEY.

REMEMBER TO WAIT FOR THE PROMPT BEFORE ENTERING DATA, AND TO PRESS THE "CARRIAGE RETURN" KEY AFTER EACH DATA ENTRY.

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GIVE DATE (MM/DD/YY)

>09/01/82

GIVE NAME (20A1)

>ACE

GIVE AIRCRAFT ID

>TEST1

TRAINING PROGRAMS FOR THE FOLLOWING AIRCRAFT ARE IN PROGRESS  
FB-111 FB111 F-111 F111 F4 TEST

DO YOU WANT TO DEVELOP A TRAINING PROGRAM FOR TEST1 ? Y/N

>Y

WHAT IS THE COMPLEMENT OF THIS AIRCRAFT?

- 1 PILOT
- 2 CO-PILOT
- 3 RIO

>

YOU HAVE SELECTED THE FOLLOWING AIRCREW

PILOT  
RIO

IS THIS CORRECT? Y/N

>Y

WHAT ARE THE FEATURES/APPLICATIONS OF THE AIRCRAFT MISSION SYSTEMS?

- 1 INFRA-RED
- 2 LASER
- 3 CAMERA
- 4 A/A-RADAR
- 5 A/G-RADAR
- 6 MAD
- 7 JEZEBEL
- 8 SONAR
- 9 GUNSIGHT
- 10 ESM
- 11 SONOBUOY
- 12 TISEQ/TVSU
- 13 REFUEL-BOOM
- 14 HOIST/RESCUE-EQ
- 15 CARGO-EXTRACT-EQ
- 16 MINE-C/M-EQ
- 17 TF/TA
- 18 AWACS/AEW-SUITE
- 19 TROOP-CARRIER-EQ
- 20 ECM/DECM

>

>4  
>9  
>20  
>

YOU HAVE SELECTED THE FOLLOWING AIRCRAFT MISSION SYSTEMS  
A/A-RADAR  
GUNSIGHT  
ECM/DECM

IS THIS CORRECT? Y/N  
>Y

WHAT ARE THE EXPENDABLES OF THIS AIRCRAFT?

- 1 GUN
- 2 AA-MISSILES
- 3 AG-MISSILES
- 4 ROCKETS
- 5 BOMBS
- 6 DEPTH-CHARGE
- 7 TORPEDO
- 8 SONAR-SENSORS
- 9 MINES
- 10 CHAFF
- 11 FLARES
- 12 JAMMER
- 13 FUEL-TANKS

>  
>1  
>2  
>10  
>11  
>12  
>

YOU HAVE SELECTED THE FOLLOWING EXPENDABLES  
GUN  
AA-MISSILES  
CHAFF  
FLARES  
JAMMER

IS THIS CORRECT? Y/N  
>Y

WHAT IS THE WING STRUCTURE OF THIS AIRCRAFT?

- 1 VECTOR-THRUST
- 2 HELICOPTER
- 3 FIXED-WING

C

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3 FIXED-WING  
>1

YOU HAVE SELECTED THE FOLLOWING WING TYPE  
VECTOR-THRUST

IS THIS CORRECT? Y/N  
>Y

IS THIS AIRCRAFT CARRIER CAPABLE? Y/N  
>Y

WHAT IS THE AVIONICS SUITE ASSOCIATED WITH THIS AIRCRAFT?

- 1 DATA-LINK
- 2 INS
- 3 UHF
- 4 VHF
- 5 HF
- 6 KY-28
- 7 TACAN
- 8 ADF
- 9 IFF
- 10 RADAR
- 11 VISUAL-PROCEDURES
- 12 VOR
- 13 FMS
- 14 HUD
- 15 COMPASS
- 16 LORAN-C
- 17 SATELLITE
- 18 OMEGA
- 19 DOPPLER
- 20 D/R-COMPUTER
- 21 MLS
- 22 JTIDS

>  
>1  
>10  
>

YOU HAVE SELECTED THE FOLLOWING AVIONICS  
DATA-LINK  
RADAR

IS THIS CORRECT? Y/N  
>Y

WHICH OF THESE AVIONICS ARE USED FOR COMMUNICATION?

- 1 DATA-LINK
- 2 RADAR

>1  
>

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YOU HAVE SELECTED THE FOLLOWING AVIONICS FOR COMMUNICATION  
DATA-LINK

IS THIS CORRECT? Y/N

>Y

WHICH OF THESE AVIONICS ARE USED FOR NAVIGATION?

- 1 DATA-LINK
- 2 RADAR

>2

>

YOU HAVE SELECTED THE FOLLOWING AVIONICS FOR NAVIGATION  
RADAR

IS THIS CORRECT? Y/N

>Y

PLEASE PAUSE WHILE YOUR DATA-BASE IS BEING GENERATED



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TEST GENERATED TASK LIST

DATE: 06/17/82  
AUTHOR: AM

- | SEQUENCE NO   | TASK  |
|---------------|---|
| 6. 2. 1. 1    | CONFIGURE AIRCRAFT FOR APPROACH                               |
| 6. 2. 1. 1. 1 | PERFORM APPROACH-CONFIG OF FUEL-SYSTEM                        |
| 6. 2. 1. 1. 2 | PERFORM APPROACH-CONFIG OF POWER-PLANT-SYSTEM                 |
| 6. 2. 1. 1. 3 | PERFORM APPROACH-CONFIG OF HYDRAULIC-SYSTEM                   |
| 6. 2. 1. 1. 4 | PERFORM APPROACH-CONFIG OF ELECTRICAL-SYSTEM                  |
| 6. 2. 1. 1. 5 | PERFORM APPROACH-CONFIG OF LANDING-GEAR-SYS                   |
| 6. 2. 1. 1. 6 | PERFORM APPROACH-CONFIG OF CAT/ARR-HOOK-SYS                   |
| 6. 2. 1. 1. 7 | PERFORM APPROACH-CONFIG OF FLIGHT-CONT-SYSTEM                 |
| 6. 2. 1. 1. 8 | PERFORM APPROACH-CONFIG OF ENVIRON-CONT-SYS                   |
| 6. 2. 1. 1. 9 | PERFORM APPROACH-CONFIG OF ESCAPE/EGRESS-SYS                  |
| 6. 2. 1. 1.10 | RECOGNIZE NORMAL AND ABNORMAL OPERATION OF FUEL-SYSTEM        |
| 6. 2. 1. 1.11 | RECOGNIZE NORMAL AND ABNORMAL OPERATION OF POWER-PLANT-SYSTEM |
| 6. 2. 1. 1.12 | RECOGNIZE NORMAL AND ABNORMAL OPERATION OF HYDRAULIC-SYSTEM   |
| 6. 2. 1. 1.13 | RECOGNIZE NORMAL AND ABNORMAL OPERATION OF ELECTRICAL-SYSTEM  |
| 6. 2. 1. 1.14 | RECOGNIZE NORMAL AND ABNORMAL OPERATION OF LANDING-GEAR-SYS   |
| 6. 2. 1. 1.15 | RECOGNIZE NORMAL AND ABNORMAL OPERATION OF CAT/ARR-HOOK-SYS   |
| 6. 2. 1. 1.16 | RECOGNIZE NORMAL AND ABNORMAL OPERATION OF FLIGHT-CONT-SYSTEM |
| 6. 2. 1. 1.17 | RECOGNIZE NORMAL AND ABNORMAL OPERATION OF ENVIRON-CONT-SYS   |
| 6. 2. 1. 1.18 | RECOGNIZE NORMAL AND ABNORMAL OPERATION OF ESCAPE/EGRESS-SYS  |
| 6. 2. 1. 2    | CONFIGURE A/C-MISSION-SYS FOR APPROACH                        |
| 6. 2. 1. 2. 1 | PERFORM APPROACH-CONFIG OF INFRA-RED                          |
| 6. 2. 1. 2. 2 | RECOGNIZE NORMAL AND ABNORMAL OPERATION OF INFRA-RED          |
| 6. 2. 1. 3    | CONFIGURE AVIONICS FOR APPROACH                               |
| 6. 2. 1. 3. 1 | PERFORM APPROACH-CONFIG OF DATA-LINK                          |
| 6. 2. 1. 3. 2 | RECOGNIZE NORMAL AND ABNORMAL OPERATION OF DATA-LINK          |
| 6. 2. 2       | ESTABLISH/DEPART HOLDING FIX                                  |
| 6. 2. 2. 1    | ESTABLISH/DEPART HOLDING USING DATA-LINK                      |
| 6. 2. 3       | PENETRATE TO APPROACH ALTITUDE                                |

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YOU HAVE COMPLETED THE  
DATA BASE GENERATION

WHERE DO YOU WANT TO GO?  
1 - DATA BASE GENERATION  
2 - TASK LIST VALIDATION  
3 - EXIT

>

2

TASK LIST VALIDATION PHASE

BASED ON THE AIRCRAFT AND AIRCREW INFORMATION PROVIDED TO CASDAT DURING THE PREVIOUS STEP, THE SYSTEM HAS GENERATED A PRELIMINARY TASK LIST. THIS TASK LIST, WHILE SPECIFIC TO THE AIRCRAFT SELECTED EARLIER, REQUIRES FURTHER DEVELOPMENT. THIS MEANS THAT TASK STATEMENTS CONTAINED IN THE PRELIMINARY LIST MUST BE VALIDATED FOR EACH AIRCREW POSITION AND EACH MISSION PHASE (PHASE OF FLIGHT) OF THE AIRCRAFT. CURRENTLY, CASDAT WILL DISPLAY THREE AIRCREW POSITIONS: PILOT, CO-PILOT AND RIO; AND SEVEN MISSION PHASES: PRE-MISSION PLANNING, PRELAUNCH, TAKEOFF/DEPARTURE, NAVIGATION, APPROACH/LANDING, POST-MISSION, AND SPECIAL PROCEDURES.

TASK STATEMENT VALIDATION IS A PROCESS OF DETERMINING WHETHER A TASK BELONGS IN THE LIST OR WHETHER NEW TASKS SHOULD BE ADDED TO IT. THIS IS ACCOMPLISHED ONE AIRCREW POSITION AT A TIME, AND ONE MISSION PHASE AT A TIME. THEREFORE, YOU WILL BE ASKED TO SELECT WHICH MEMBER OF THE CREW AND WHICH MISSION PHASE YOU WISH TO VALIDATE FIRST. ONCE SELECTED, CASDAT AUTOMATICALLY VALIDATES ALL TASKS IN THE SELECTED PHASE FOR THAT AIRCREW MEMBER. YOU CAN THEN ADD TASKS, DELETE TASKS OR MODIFY TASKS.

ON COMPLETION OF TASK LIST VALIDATION, CASDAT WILL GENERATE AN OBJECTIVES HIERARCHY BASED ON THE VALIDATED TASK LIST. THEREFORE IT IS CALLED "PRE-VALIDATED". DURING OBJECTIVES HIERARCHY YOU WILL BE ABLE TO ADD, DELETE, OR MODIFY THE OBJECTIVES ON THE PRE-VALIDATED OBJECTIVES HIERARCHY.

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SELECT A MEMBER OF THE CREW

- 1 PILOT
- 2 EXIT

>1

SELECT A MISSION PHASE

- 1 PRE-MISSION PLANNING
- 2 PRELAUNCH
- 3 TAKEOFF/DEPARTURE
- 4 NAVIGATION
- 5 MISSION/TACTICS
- 6 APPROACH/LANDING
- 7 POST-MISSION
- 8 SPECIAL-PROCEDURES
- 9 EXIT

>1

PLEASE PAUSE WHILE CASDAT VALIDATES ALL PRE-MISSION PLANNING  
TASKS FOR PILOT

DO YOU WANT TO

- 1-ADD
- 2-DELETE
- 3-REPLACE/MODIFY
- 4-EXIT

ANY PRE-MISSION PLANNING

TASKS?

>1

\* \* ADDING TASKS \* \*

ENTER TASK SEQUENCE NUMBER  
HIT THE "RETURN" KEY WHEN DONE  
>1.6.1

GIVE TEXT

>PERFORM PRE-FLIGHT PLANNING

\* \* ADDING TASKS \* \*

ENTER TASK SEQUENCE NUMBER  
HIT THE "RETURN" KEY WHEN DONE  
>

NAVTRAEQUIPCEN 79-C-0076-1

DO YOU WANT TO

- 1-ADD
- 2-DELETE
- 3-REPLACE/MODIFY
- 4-EXIT

ANY PRE-MISSION PLANNING

TASKS?

>2

\* \* DELETING TASKS \* \*

ENTER TASK SEQUENCE NUMBER

HIT THE "RETURN" KEY WHEN DONE

(NOTE: WHEN DELETING A TASK, ALL SUBORDINATE TASKS ARE ALSO DELETED)

>1.2.1

THE FOLLOWING TASKS ARE NO LONGER VALID FOR PILOT

1. 2. 1

COMPUTE AIRCRAFT DATA

1. 2. 1. 1

COMPUTE STATION-LOADING DATA

1. 2. 1. 2

COMPUTE CENTER-OF-GRAVITY DATA

1. 2. 1. 3

COMPUTE DRAG-INDEX DATA

\* \* DELETING TASKS \* \*

ENTER TASK SEQUENCE NUMBER

HIT THE "RETURN" KEY WHEN DONE

(NOTE: WHEN DELETING A TASK, ALL SUBORDINATE TASKS ARE ALSO DELETED)

>

DO YOU WANT TO

- 1-ADD
- 2-DELETE
- 3-REPLACE/MODIFY
- 4-EXIT

ANY PRE-MISSION PLANNING

TASKS?

>3

\* \* REPLACING/MODIFYING TASKS \* \*

ENTER TASK SEQUENCE NUMBER

HIT THE "RETURN" KEY WHEN DONE

>1.3.2

1. 3. 2 DOES NOT EXIST

NAVTRAEQUIPCEN 79-C-0076-1

\* \* REPLACING/MODIFYING TASKS \* \*

ENTER TASK SEQUENCE NUMBER  
 HIT THE "RETURN" KEY WHEN DONE  
 >1.1.2

GIVE TEXT  
 >PREPARE MISSION BRIEFING

OBJECT NOT INCLUDED IN CASDAT TAXONOMY (SEE LIST)

CASDAT OBJECT LIST

PROCEDURES	DATA	PUBS	KY-28
DATA-LINK	INS	UHF	UHF
HF	TACAN	ADF	IFF
RADAR	VISUAL-PROCEDURES	VOR	FMS
HUD	COMPASS	LORAN-C	SATELLITE
OMEGA	DOPPLER	D/R-COMPUTER	MLS
JTIDS	ACTIVITIES	BRIEF	EQUIPMENT
GEAR	INSPECTIONS	AIRCRAFT	FUEL-SYSTEM
POWER-PLANT-SYSTEM	HYDRAULIC-SYSTEM	ELECTRICAL-SYSTEM	LANDING-GEAR-SYS
CAT/ARR-HOOK-SYS	FLIGHT-CONT-SYSTEM	ENVIRON-CONT-SYS	ESCAPE/EGRESS-SYS
EXPENDABLES	GUN	AA-MISSILES	AG-MISSILES
ROCKLTS	BOMBS	DEPTH-CHARGE	TORPEDO
SONAR-SENSORS	MINES	CHAFF	FLARES
JAMMER	FUEL-TANKS	A/C-MISSION-SYS	INFRA-RED
LASER	CAMERA	A/A-RADAR	A/G-RADAR
MAD	JEZEBEL	SONAR	GUNSIGHT
ESM	SONOBUOY	TISED/TVSU	REFUEL-BOOM
HOIST/RESCUE-EQ	CARGO-EXTRACT-EQ	MINE-C/M-EQ	TF/TA
AWACS/AEW-SUITE	TROOP-CARRIER-EQ	ECM/DECM	SYSTEM
PROCEDURE	EMERGENCIES	ECS-FAILURE	GENERATOR-FAILURE
ENG-OIL-LEVEL-LOW	ENG-FIRE/OVERHEAT	ELIM-SMOKE/FUMES	FUEL-TRANSFER-MAL
HYDRAULIC-SYS-FAIL	LOSS-OF-CABIN-PRES	ENGINE-HUNG-START	ENGINE-HOT-START
ENG-FIRE-ON-START	ENGINE-WET-START	ENGAGED-STARTER	RUNAWAY-ENG/START
FAILED-BRAKE	FAILED-NGS	ENGINE-FIRE	ENGINE-FLAMEOUT
AFTER-BURNER-FAIL	ELECTRICAL-FAIL	BLOWN-TIRE	HYDRAULIC-FAIL
FLIGHT-CONT-FAIL	HIGH-ADA	ENGINE-FAIL	HYD-FAILURE
ELEC-FAILURE	FUEL-MAL	LANDING-GEAR-FAIL	TIRE-BLOWOUT
HUNG-ORDNANCE	BRAKE-FAILURE	RADIO-OUT	NGS-FAILURE
SMOKE/FUMES-IN-C/P	FUEL-FIRE	ENG-FIRE	GROUND-EMER
ENG-FIRE-SHUTDOWN	EMER-BREAKAWAY	DISCONNECT-INOP	RECEPTACLE-FAIL
CHECK/SET-UP	TAXI	GROUND-TAXI	HOVER-TAXI
FIELD-TAXI	CARRIER-DECK-TAXI	COMMUNICATIONS	ARMING
TAKEOFF	PLANNING	COCKPIT	CARRIER-TAKEOFF
POSITION	HOOKUP	TRANSITION	DEPARTURE
NAVIGATION	COURSE/HEADING	VECTOR	POINT-TO-POINT
ARC	EVALUATION	MALFUNCTIONS	DESCENT
APPROACH	FIX	ALTITUDE	LANDING
WAVEDOFF	POST-LANDING	POST-MISSION	SHUT-DOWN
POSTFLIGHT	DEBRIEF	FORMS	REFUELING
MISSION-OBJECTIVE	OPERATIONAL-AREA	WEAPONS-PROCEDURES	COMMUNICATIONS
WEATHER	NAVIGATION	OPER-EMERGENCIES	INTELLIGENCE
RULES	RENDEZVOUS	FORMATION	AIR-REFUELING
CLEARING-PROCEDURE	TANKER	SHIP	HOT-REFUELING
OPERATIONS			

GIVE TEXT  
BRIEF NAVIGATION

VERB NOT INCLUDED IN CASDAT TAXONOMY (SEE LIST)

>

CASDAT VERB LIST

PERFORM  
COMPUTE  
SELECT/PREPARE  
RECOGNIZE  
FLY  
PENETRATE

COLLECT  
RECORD  
INSPECT  
POSITION  
MANEUVER  
EXECUTE

SELECT  
PREPARE  
RESPOND  
ESTABLISH  
EVALUATE  
RECONFIGURE

GATHER  
CONDUCT  
CONFIGURE  
COMMUNICATE  
ESTABLISH/DEPART

GIVE TEXT  
>GATHER NAVIGATION DATA

\* \* REPLACING/MODIFYING TASKS \* \*

ENTER TASK SEQUENCE NUMBER  
HIT THE "RETURN" KEY WHEN DONE

>

DO YOU WANT TO  
1-ADD  
2-DELETE  
3-REPLACE/MODIFY  
4-EXIT  
ANY PRE-MISSION PLANNING

TASKS?

4

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TEST VALIDATED TASK LIST

CREW POSN	SEQUENCE NO	TASK
R	6. 3. 1. 1. 4	PERFORM LANDING-CONFIG OF ELECTRICAL-SYSTEM
R	6. 3. 1. 1. 5	PERFORM LANDING-CONFIG OF LANDING-GEAR-SYS
R	6. 3. 1. 1. 6	PERFORM LANDING-CONFIG OF CAT/ARR-HOOK-SYS
R	6. 3. 1. 1. 7	PERFORM LANDING-CONFIG OF FLIGHT-CONT-SYSTEM
R	6. 3. 1. 1. 8	PERFORM LANDING-CONFIG OF ENVIRON-CONT-SYS
R	6. 3. 1. 1. 9	PERFORM LANDING-CONFIG OF ESCAPE/EGRESS-SYS
R	6. 3. 1. 1.10	RECOGNIZE NORMAL AND ABNORMAL OPERATION OF FUEL-SYSTEM
R	6. 3. 1. 1.11	RECOGNIZE NORMAL AND ABNORMAL OPERATION OF POWER-PLANT-SYSTEM
R	6. 3. 1. 1.12	RECOGNIZE NORMAL AND ABNORMAL OPERATION OF HYDRAULIC-SYSTEM
R	6. 3. 1. 1.13	RECOGNIZE NORMAL AND ABNORMAL OPERATION OF ELECTRICAL-SYSTEM
R	6. 3. 1. 1.14	RECOGNIZE NORMAL AND ABNORMAL OPERATION OF LANDING-GEAR-SYS
R	6. 3. 1. 1.15	RECOGNIZE NORMAL AND ABNORMAL OPERATION OF CAT/ARR-HOOK-SYS
R	6. 3. 1. 1.16	RECOGNIZE NORMAL AND ABNORMAL OPERATION OF FLIGHT-CONT-SYSTEM
R	6. 3. 1. 1.17	RECOGNIZE NORMAL AND ABNORMAL OPERATION OF ENVIRON-CONT-SYS
R	6. 3. 1. 1.18	RECOGNIZE NORMAL AND ABNORMAL OPERATION OF ESCAPE/EGRESS-SYS
R	6. 3. 1. 2	CONFIGURE A/C-MISSION-SYS FOR LANDING
R	6. 3. 1. 2. 1	PERFORM LANDING-CONFIG OF INFRA-RED
R	6. 3. 1. 2. 2	RECOGNIZE NORMAL AND ABNORMAL OPERATION OF INFRA-RED
R	6. 3. 1. 3	CONFIGURE AVIONICS FOR LANDING
R	6. 3. 1. 3. 1	PERFORM LANDING-CONFIG OF DATA-LINK
R	6. 3. 1. 3. 2	RECOGNIZE NORMAL AND ABNORMAL OPERATION OF DATA-LINK
R	6. 3. 2	PERFORM FIELD LANDING
R	6. 3. 2. 1	PERFORM FIELD VERTICAL LANDING
R	6. 3. 2. 2	PERFORM FIELD DECELERATING TRANSITION LANDING
R	6. 3. 2. 3	PERFORM FIELD HOVER LANDING
R	6. 3. 2. 4	PERFORM FIELD ROLLING VERTICAL LANDING
R	6. 3. 2. 5	PERFORM FIELD SLOW LANDING
R	6. 3. 2. 6	PERFORM FIELD BRAKE TO SLOW STOP LANDING
R	6. 3. 2. 7	PERFORM FIELD CROSSWIND LANDING

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TEST VALIDATED OBJECTIVES HIERARCHY

DATE: 06/17/82 PAGE 17  
AUTHOR: AMG

CREW POSN

SEQUENCE NO OBJECTIVE

6. 3. 1. 1. 1 PERFORM LANDING-CONFIG OF FUEL-SYSTEM

ENVIR: F  
COND: GIVEN AIRCRAFT

ENVIR: T  
COND: GIVEN TRAINER

6. 3. 1. 1. 1. 0. 1 STATE THE PROCEDURES TO CONFIGURE FUEL-SYSTEM

ENVIR: A  
COND: FROM MEMORY  
COND: GIVEN SOP

6. 3. 1. 1. 2 PERFORM LANDING-CONFIG OF POWER-PLANT-SYSTEM

ENVIR: F  
COND: GIVEN AIRCRAFT

ENVIR: T  
COND: GIVEN TRAINER

6. 3. 1. 1. 2. 0. 1 STATE THE PROCEDURES TO CONFIGURE POWER-PLANT-SYSTEM

ENVIR: A  
COND: FROM MEMORY  
COND: GIVEN SOP

6. 3. 1. 1. 3 PERFORM LANDING-CONFIG OF HYDRAULIC-SYSTEM

ENVIR: F  
COND: GIVEN AIRCRAFT

ENVIR: T  
COND: GIVEN TRAINER

6. 3. 1. 1. 3. 0. 1 STATE THE PROCEDURES TO CONFIGURE HYDRAULIC-SYSTEM

ENVIR: A  
COND: FROM MEMORY  
COND: GIVEN SOP



WHERE DO YOU WANT TO GO?  
1 - DATA BASE GENERATION  
2 - TASK LIST VALIDATION  
3 - OBJECTIVE VALIDATION  
4 - EXIT  
>3

OBJECTIVES HIERARCHY VALIDATION PHASE

DURING THE PREVIOUS STEP, CASDAT GENERATED A PRELIMINARY OBJECTIVES HIERARCHY. ALTHOUGH THIS HIERARCHY IS SPECIFIC TO THE AIRCRAFT AND AIRCREW POSITION SELECTED EARLIER, IT WILL REQUIRE FURTHER DEVELOPMENT. THIS MEANS THAT THE OBJECTIVE STATEMENTS CONTAINED IN THE PRELIMINARY HIERARCHY MUST BE VALIDATED FOR EACH AIRCREW POSITION AND EACH MISSION PHASE FOR THE AIRCRAFT. CURRENTLY, CASDAT WILL DISPLAY THREE AIRCREW POSITION: PILOT, CO-PILOT AND RIO; AND SEVEN MISSION PHASES: PRE-MISSION PLANNING, PRELAUNCH, TAKEOFF/DEPARTURE, NAVIGATION, APPROACH/LANDING, POST-MISSION, AND SPECIAL PROCEDURES.

OBJECTIVE STATEMENT VALIDATION IS A PROCESS OF DETERMINING WHETHER AN OBJECTIVE BELONGS IN THE HIERARCHY OR WHETHER A NEW OBJECTIVE SHOULD BE ADDED TO IT. THIS IS ACCOMPLISHED ONE AIRCREW POSITION AT A TIME, AND ONE MISSION PHASE AT A TIME. THEREFORE, YOU WILL BE ASKED TO SELECT WHICH MEMBER OF THE CREW AND WHICH MISSION PHASE YOU WISH TO VALIDATE FIRST. YOU CAN THEN ADD OBJECTIVES, DELETE OBJECTIVES, OR MODIFY OBJECTIVES.

SELECT A MEMBER OF THE CREW

1 PILOT  
2 RIO  
3 EXIT  
>2

SELECT A MISSION PHASE

- 1 PRE-MISSION PLANNING
- 2 PRELAUNCH
- 3 TAKEOFF/DEPARTURE
- 4 NAVIGATION
- 5 MISSION/TACTICS
- 6 APPROACH/LANDING
- 7 POST-MISSION
- 8 SPECIAL-PROCEDURES
- 9 EXIT

>2

DO YOU WANT TO

- 1-ADD
- 2-DELETE
- 3-REPLACE/MODIFY
- 4-EXIT

ANY PRELAUNCH

OBJECTIVES?

>1

\* \* ADDING OBJECTIVES \* \*

ENTER OBJECTIVE SEQUENCE NUMBER  
HIT THE "RETURN" KEY WHEN DONE

>2.5.4.0.1

GIVE TEXT

>STATE THE PROCEDURE FOR ENGINE START

WHAT TYPE OF OBJECTIVE IS THIS?

- 1 - FLIGHT
- 2 - TRAINER
- 3 - ACADEMIC

>3

>

SELECT A MAXIMUM OF 2 CONDITIONS FOR THIS OBJECTIVE

- 1 FROM MEMORY
- 2 GIVEN FLIGHT GEAR
- 3 GIVEN AIRCRAFT, DAY OR NIGHT
- 4 GIVEN NATOPS CHECKLIST
- 5 GIVEN TACTICAL MANUAL
- 6 GIVEN COCKPIT DISPLAY
- 7 GIVEN CHECKLIST
- 8 GIVEN APPROPRIATE HAND SIGNALS
- 9 GIVEN EJECTION SEAT
- 10 GIVEN COCKPIT
- 11 GIVEN AIRCRAFT READY TO TAXI
- 12 GIVEN AN EMERGENCY
- 13 GIVEN TACTICAL SITUATIONS
- 14 GIVEN APPROPRIATE ORDNANCE
- 15 GIVEN CHECKLIST KEYED TO EACH

\* \* ADDING OBJECTIVES \* \*

ENTER OBJECTIVE SEQUENCE NUMBER  
HIT THE "RETURN" KEY WHEN DONE

>

DO YOU WANT TO

- 1-ADD
- 2-DELETE
- 3-REPLACE/MODIFY
- 4-EXIT

ANY PRELAUNCH

OBJECTIVES?

>2

\* \* DELETING OBJECTIVES \* \*

ENTER OBJECTIVE SEQUENCE NUMBER  
HIT THE "RETURN" KEY WHEN DONE

>2.1.3

2. 1. 3 DOES NOT EXIST

\* \* DELETING OBJECTIVES \* \*

ENTER OBJECTIVE SEQUENCE NUMBER  
HIT THE "RETURN" KEY WHEN DONE

>2.2.1.0.1

2. 2. 1. 0. 1 DOES NOT EXIST

THE SEQUENCE NUMBER HAS NOT BEEN TYPED IN CORRECTLY. MAKE SURE THAT:

1. THE FIRST DIGIT MATCHES THAT OF THE MISSION PHASE.
2. EACH DIGIT IS SEPARATED WITH A DECIMAL POINT.
3. THE NUMBER IS IN HIERARCHIAL SEQUENCE.
4. ONLY ONE ZERO IS IMBEDDED IN AN OBJECTIVE SEQUENCE NUMBER.

\* \* DELETING OBJECTIVES \* \*

ENTER OBJECTIVE SEQUENCE NUMBER  
HIT THE "RETURN" KEY WHEN DONE

>2.1.1.1.0.1

THE FOLLOWING OBJECTIVES ARE NO LONGER VALID FOR RIO

2. 1. 1. 1. 0. 1  
IDENTIFY FLIGHT GEAR

ENTER OBJECTIVE SEQUENCE NUMBER  
HIT THE "RETURN" KEY WHEN DONE

>

DO YOU WANT TO

- 1-ADD
- 2-DELETE
- 3-REPLACE/MODIFY
- 4-EXIT

ANY PRELAUNCH

OBJECTIVES?

>3

\* \* REPLACING/MODIFYING OBJECTIVES \* \*

ENTER OBJECTIVE SEQUENCE NUMBER  
HIT THE "RETURN" KEY WHEN DONE

>2.1.1.2.0.1

GIVE TEXT

>IDENTIFY NAVIGATION CHARTS

WHAT TYPE OF OBJECTIVE IS THIS?

- 1 - FLIGHT
- 2 - TRAINER
- 3 - ACADEMIC

>3

>1

>

SELECT A MAXIMUM OF 2 CONDITIONS FOR THIS OBJECTIVE

- 1 FROM MEMORY
- 2 GIVEN FLIGHT GEAR
- 3 GIVEN AIRCRAFT, DAY OR NIGHT
- 4 GIVEN NATOPS CHECKLIST
- 5 GIVEN TACTICAL MANUAL
- 6 GIVEN COCKPIT DISPLAY
- 7 GIVEN CHECKLIST
- 8 GIVEN APPROPRIATE HAND SIGNALS
- 9 GIVEN EJECTION SEAT
- 10 GIVEN COCKPIT
- 11 GIVEN AIRCRAFT READY TO TAXI
- 12 GIVEN AN EMERGENCY
- 13 GIVEN TACTICAL SITUATIONS
- 14 GIVEN APPROPRIATE ORDNANCE
- 15 GIVEN CHECKLIST KEYED TO EACH
- 16 GIVEN AIRCRAFT ON FLIGHT DECK
- 17 GIVEN EXAM
- 18 GIVEN NAVIGATION PROBLEM
- 19 GIVEN NAVIGATION SYSTEMS
- 20 GIVEN SYSTEM MALFUNCTION
- 21 GIVEN MISSION
- 22 GIVEN NATOPS MANUAL
- 23 GIVEN AIRCRAFT CONFIGURATION

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\* \* REPLACING/MODIFYING OBJECTIVES \* \*

ENTER OBJECTIVE SEQUENCE NUMBER  
HIT THE "RETURN" KEY WHEN DONE

>

DO YOU WANT TO

- 1-ADD
- 2-DELETE
- 3-REPLACE/MODIFY
- 4-EXIT

ANY PRELAUNCH

OBJECTIVES?

>4

SELECT A MEMBER OF THE CREW

- 1 PILOT
- 2 RIO
- 3 EXIT

>3

IS THE OBJECTIVES HIERARCHY COMPLETED? Y/N

>Y

DO YOU WANT A LISTING OF THE OBJECTIVES HIERARCHY? Y/N

>Y

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TEST VALIDATED OBJECTIVES HIERARCHY

---

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 AUTHOR: AMG

CREW POSN	SEQUENCE NO	OBJECTIVE
R	6. 3. 1. 1. 1	PERFORM LANDING-CONFIG OF FUEL-SYSTEM  ENVIR: F COND: GIVEN AIRCRAFT  ENVIR: T COND: GIVEN TRAINER
R	6. 3. 1. 1. 1. 0. 1	STATE THE PROCEDURES TO CONFIGURE FUEL-SYSTEM  ENVIR: A COND: FROM MEMORY COND: GIVEN SOP
R	6. 3. 1. 1. 2	PERFORM LANDING-CONFIG OF POWER-PLANT-SYSTEM  ENVIR: F COND: GIVEN AIRCRAFT  ENVIR: T COND: GIVEN TRAINER
R	6. 3. 1. 1. 2. 0. 1	STATE THE PROCEDURES TO CONFIGURE POWER-PLANT-SYSTEM  ENVIR: A COND: FROM MEMORY COND: GIVEN SOP
R	6. 3. 1. 1. 3	PERFORM LANDING-CONFIG OF HYDRAULIC-SYSTEM  ENVIR: F COND: GIVEN AIRCRAFT  ENVIR: T COND: GIVEN TRAINER
R	6. 3. 1. 1. 3. 0. 1	STATE THE PROCEDURES TO CONFIGURE HYDRAULIC-SYSTEM  ENVIR: A COND: FROM MEMORY COND: GIVEN SOP

YOU HAVE COMPLETED THE  
GENERIC TASK LIST  
TASK LIST VALIDATION  
OBJECTIVE VALIDATION

YOU ARE IN THE FOLLOWING PHASE  
MEDIA SELECTION

WHERE DO YOU WANT TO GO?  
1 - TASK LIST VALIDATION  
2 - OBJECTIVE VALIDATION  
3 - MEDIA SELECTION  
4 - EXIT  
>3

\*\*\* MEDIA SELECTION PHASE \*\*\*

THE MEDIA SELECTION MODEL INCLUDED IN CASDAT PROVIDES A SYSTEMATIC WAY OF DETERMINING HOW ANY OBJECTIVE SHOULD BE TAUGHT. THIS DETERMINATION IS MADE BASED ON THE CONTENT LEVEL, BEHAVIOR LEVEL, DISPLAY REQUIREMENTS, MEMORY LOAD, AND MEDIA AVAILABILITY. THE MODEL FOCUSES LARGELY ON THE CLASSIFICATION OF OBJECTIVES INTO FIVE BROAD LEARNING CATEGORIES: FAMILIARIZATION, FACT, CONCEPT, PROCEDURE-RULE, AND PRINCIPLE. IT ALSO MATCHES THE CAPABILITIES OF EACH MEDIA WITH THE LEARNING REQUIREMENTS OF THE OBJECTIVE. THE FINAL MEDIA DETERMINATION DISPLAYED BY CASDAT IS A RECOMMENDATION OF PRIMARY AND SECONDARY CHOICES OF MEDIA HAVING THE NECESSARY REQUIREMENTS. THESE CHOICES ARE ORDERED IN TERMS OF HOW EFFICIENTLY AND EFFECTIVELY THEY PRESENT THE MATERIAL. IN CASES WHERE THE CAPABILITIES ARE NEARLY EQUAL, THE CHOICES ARE PRESENTED IN TERMS OF COST WITH THE MEDIA COSTING LEAST TO PREPARE BEING THE PRIMARY CHOICE.

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SELECT YOUR INSTALLATION'S AVAILABLE RESOURCES BY TYPING "YES" OR "NO"  
AS THEY APPEAR

1. AC-AIRCRAFT  
>?

REVIEW THE MEDIA AVAILABLE AT THIS INSTALLATION THAT WILL BE USED IN THIS  
TRAINING PROGRAM. SELECT ONLY FROM THOSE PRESENTED ON THE SCREEN.

SELECT YOUR INSTALLATION'S AVAILABLE RESOURCES BY TYPING "YES" OR "NO"  
AS THEY APPEAR

1. AC-AIRCRAFT  
>Y
2. SIM-SIMULATOR  
>Y
3. VT-VIDEO TAPE  
>Y
4. MIL-MEDIATED INTERACTIVE LECTURE  
>Y
5. ST-SLIDE TAPE  
>Y
6. WB-WORKBOOK  
>Y
7. WS-WORKSHEET  
>Y
8. CAI-COMPUTER AIDED INSTRUCTION  
>N
9. RAS-RANDOM ACCESS SLIDE WORKBOOK  
>Y

YOU SELECTED:

1. AC-AIRCRAFT
2. SIM-SIMULATOR
3. VT-VIDEO TAPE
4. MIL-MEDIATED INTERACTIVE LECTURE
5. ST-SLIDE TAPE
6. WB-WORKBOOK
7. WS-WORKSHEET
8. RAS-RANDOM ACCESS SLIDE WORKBOOK

OK TO CONTINUE, OR DONE? (YES/NO/DONE)  
>Y



PLEASE ANSWER MEDIA QUESTIONS FOR OBJECTIVES IN AN ACADEMIC ENVIRONMENT

4. 1  
ESTABLISH MISSION OBJECTIVES

Q1:  
WHAT IS THE LEVEL OF BEHAVIOR EXPECTED OF THE STUDENT IN THIS OBJECTIVE?

1. FAMILIARIZATION
2. REMEMBER
3. USE

Q1

4. 1  
ESTABLISH MISSION OBJECTIVES

Q4:  
WHAT IS THE MINIMUM DISPLAY REQUIREMENT?

1. VERBAL AND/OR SYMBOLIC AND/OR STATIC SIMPLE PICTORIAL
2. VERBAL AND/OR SYMBOLIC AND/OR STATIC COMPLEX PICTORIAL
3. DYNAMIC PICTORIAL
4. INTERACTIVE

>2  
MEDIA CHOICE 1= MIL-MEDIATED INTERACTIVE LECTURE

MEDIA CHOICE 2= ST-SLIDE TAPE

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OK TO CONTINUE, OR DONE? (YES/NO/DONE)

>Y

PLEASE ANSWER MEDIA QUESTIONS FOR OBJECTIVES IN AN ACADEMIC ENVIRONMENT

4. 1. 0. 1  
DETERMINE DESTINATION

Q1:  
WHAT IS THE LEVEL OF BEHAVIOR EXPECTED OF THE STUDENT IN THIS OBJECTIVE?

1. FAMILIARIZATION
2. REMEMBER
3. USE

>2

4. 1. 0. 1  
DETERMINE DESTINATION

Q2:  
WHAT LEVEL OF CONTENT IS BEING TAUGHT IN THIS SEGMENT?

1. FAMILIARIZATION
2. FACT
3. CONCEPT
4. RULE/PROCEDURE
5. PRINCIPLE

>2

4. 1. 0. 1  
DETERMINE DESTINATION

Q4:  
WHAT IS THE MINIMUM DISPLAY REQUIREMENT?

1. VERBAL AND/OR SYMBOLIC AND/OR STATIC SIMPLE PICTORIAL
2. VERBAL AND/OR SYMBOLIC AND/OR STATIC COMPLEX PICTORIAL
3. DYNAMIC PICTORIAL
4. INTERACTIVE

>2  
MEDIA CHOICE 1= ST-SLIDE TAPE

MEDIA CHOICE 2= MIL-MEDIATED INTERACTIVE LECTURE

OK TO CONTINUE, OR DONE? (YES/NO/DONE)  
>Y

PLEASE ANSWER MEDIA QUESTIONS FOR OBJECTIVES IN AN ACADEMIC ENVIRONMENT

4. 1. 1  
DETERMINE FLIGHT ROUTE

Q1:  
WHAT IS THE LEVEL OF BEHAVIOR EXPECTED OF THE STUDENT IN THIS OBJECTIVE?

1. FAMILIARIZATION
2. REMEMBER
3. USE

>3

4. 1. 1  
DETERMINE FLIGHT ROUTE

Q2:  
WHAT LEVEL OF CONTENT IS BEING TAUGHT IN THIS SEGMENT?

1. FAMILIARIZATION
2. FACT
3. CONCEPT
4. RULE/PROCEDURE
5. PRINCIPLE

>4

4. 1. 1  
DETERMINE FLIGHT ROUTE

Q4:  
WHAT IS THE MINIMUM DISPLAY REQUIREMENT?

1. VERBAL AND/OR SYMBOLIC AND/OR STATIC SIMPLE PICTORIAL
2. VERBAL AND/OR SYMBOLIC AND/OR STATIC COMPLEX PICTORIAL
3. DYNAMIC PICTORIAL
4. INTERACTIVE

>2

4. 1. 1  
DETERMINE FLIGHT ROUTE

Q5:  
IS THE MEMORIZATION COMPONET OF THIS OBJECTIVE LARGE OR SMALL?

1. SMALL
2. LARGE

>2

4. 1. 1  
DETERMINE FLIGHT ROUTE

Q3:  
IS THE MINIMUM CRITICAL SET OF INSTANCES THE STUDENT NEEDS TO SEE SMALL OR LARGE

1. SMALL
2. LARGE

>2

MEDIA CHOICE 1= RAS-RANDOM ACCESS SLIDE WORKBOOK

MEDIA CHOICE 2= MIL-MEDIATED INTERACTIVE LECTURE

OK TO CONTINUE, OR DONE? (YES/NO/DONE)

>Y

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PLEASE ANSWER MEDIA QUESTIONS FOR OBJECTIVES IN AN ACADEMIC ENVIRONMENT

4. 1. 1. 0. 1  
STATE PROCEDURES TO DETERMINE FLIGHT ROUTE

Q1:  
WHAT IS THE LEVEL OF BEHAVIOR EXPECTED OF THE STUDENT IN THIS OBJECTIVE?

1. FAMILIARIZATION
2. REMEMBER
3. USE

>1

4. 1. 1. 0. 1  
STATE PROCEDURES TO DETERMINE FLIGHT ROUTE

Q4:  
WHAT IS THE MINIMUM DISPLAY REQUIREMENT?

1. VERBAL AND/OR SYMBOLIC AND/OR STATIC SIMPLE PICTORIAL
2. VERBAL AND/OR SYMBOLIC AND/OR STATIC COMPLEX PICTORIAL
3. DYNAMIC PICTORIAL
4. INTERACTIVE

>1  
MEDIA CHOICE 1= WB-WORKBOOK

MEDIA CHOICE 2= MIL-MEDIATED INTERACTIVE LECTURE

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OK TO CONTINUE, OR DONE? (YES/NO/DONE)  
Y

IS THE MEDIA SELECTION COMPLETED ? Y/N  
Y

DO YOU WANT A PRINT-OUT OF MEDIA? (Y/N)  
Y

F-14 Media Selection

MEDIA KEY: VT - VIDEO TAPE  
 A/C - AIRCRAFT WB - WORKBOOK  
 MIL - MEDIATED INTERACTIVE LECTURE CAS - COMPUTER AIDED INSTRUCTION  
 WS - WORKSHEET KAS - RANDOM ACCESS SLIDE WORKBOOK

CREW POSN	SEQUENCE NO	OBJECTIVE	PRIMARY MEDIA:	SECONDARY MEDIA:
	4. 0	NAVIGATION		
FC	4. 1	ESTABLISH MISSION OBJECTIVES	SIM	SIM
			ST - SLIDE TAPE	CAI - COMPUTER AIDED INSTRUCTION
FC	4. 1. 0. 1	DETERMINE DESTINATION	SIM	SIM
FC	4. 1. 1	DETERMINE FLIGHT ROUTE	SIM	SIM
FC	4. 1. 1. 0. 1	STATE PROCEDURES TO DETERMINE FLIGHT ROUTE	SIM	SIM
			CAI - COMPUTER AIDED INSTRUCTION	WS - WORKSHEET
FC	4. 2	PERFORM NAVIGATION SYSTEMS EVALUATION	SIM	SIM
			WB - WORKBOOK	KAS - RANDOM ACCESS SLIDE WORKBOOK
C	4. 2. 1	EVALUATE INS	SIM	SIM
			WB - WORKBOOK	KAS - RANDOM ACCESS SLIDE WORKBOOK
C	4. 2. 1. 0. 1	STATE PROCEDURES TO EVALUATE INS	SIM	SIM
			CAI - COMPUTER AIDED INSTRUCTION	WS - WORKSHEET
FC	4. 3	RESPOND-TO NAVIGATION SYSTEM MALFUNCTIONS	SIM	SIM
			WB - WORKBOOK	KAS - RANDOM ACCESS SLIDE WORKBOOK
			CAI - COMPUTER AIDED INSTRUCTION	WS - WORKSHEET



YOU HAVE COMPLETED THE  
GENERIC TASK LIST  
TASK LIST VALIDATION  
OBJECTIVE VALIDATION  
MEDIA SELECTION

YOU ARE IN THE FOLLOWING PHASE  
SYLLABUS DEVELOPMENT

WHERE DO YOU WANT TO GO?  
1 - TASK LIST VALIDATION  
2 - OBJECTIVE VALIDATION  
3 - MEDIA SELECTION  
4 - SYLLABUS DEVELOPMENT  
5 - EXIT  
>4

PLEASE PAUSE WHILE CASDAT GENERATES A TRAINING SYLLABUS FROM THE LESSON OBJECTIVES VALIDATED EARLIER. WHEN THIS PROCESS IS COMPLETE, CASDAT WILL AUTOMATICALLY PRINT A LIST OF OBJECTIVES NOT ASSIGNED TO ANY LESSON IN THE SYLLABUS. THEN IT WILL AUTOMATICALLY PRINT A LIST OF LESSON NUMBERS, TITLE, AND THE OBJECTIVES ASSIGNED TO EACH LESSON. AIRCREW, LEARNING ENVIRONMENT, AND PRIMARY AND SECONDARY MEDIA CHOICES ARE ALSO INDICATED FOR EACH LESSON AND FOR EACH OBJECTIVE. THIS PRINT-OUT SERVES AS A WORKSHEET THAT CAN BE REVIEWED AND MODIFIED OFF-LINE AS A FINAL VALIDATION OF THE TRAINING SYLLABUS. DURING OFF-LINE REVIEW IT WILL BE POSSIBLE TO MAKE THE FOLLOWING EDITS:

- \* COMBINE, SPLIT, OR DELETE EXISTING LESSONS
- \* MODIFY A LESSON BY CHANGING
  - THE LESSON TITLE
  - OBJECTIVES, EITHER ADD OR DELETE THEM
  - LESSON MEDIA CHOICES

WHEN ALL MODIFICATIONS HAVE BEEN MADE OFF-LINE TO THE SYLLABUS, RETURN TO CASDAT AND SELECT "SYLLABUS VALIDATION" AS THE NEXT STEP IN THE DEVELOPMENT PROCESS.

LESSON SORT NOW EXECUTING

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SYLLABUS WORKSHEET

LESSON OBJECTIVE SEQUENCE	TITLE	LESSON MEDIA AIRCREW ATF TITLE OBJECTIVE MEDIA
*** FAPA 20	NORMAL COMMUNICATIONS	
		VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.6.1.0.1	PR A STATE REQUIRED ACTION FOR EACH ITEM OF BEFORE-TAXI CHECKLIST	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.6.2.0.1	PR A STATE PROCEDURES FOR FIXED-WING FIELD TAXI	VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.6.2.0.2	PR A STATE APPROPRIATE RESPONSE TO PLANE CAPTAIN HAND SIGNALS	VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.6.3.0.1	PR A STATE PROCEDURES FOR FIXED-WING CARRIER-DECK TAXI	VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.6.3.0.2	PR A STATE APPROPRIATE RESPONSE TO PLANE CAPTAIN HAND SIGNALS	VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.6.4.1.0.1	PR A STATE CUES-AND-ALERTS FOR FAILED-BRAKE EMER	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.6.4.1.0.2	PR A STATE CORRECTIVE ACTIONS FOR FAILED-BRAKE EMER	VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.6.4.2.0.1	PR A STATE CUES-AND-ALERTS FOR FAILED-NGS EMER	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.6.4.2.0.2	PR A STATE CORRECTIVE ACTIONS FOR FAILED-NGS EMER	VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.6.5.0.1	PR A STATE THE STEPS REQUIRED TO ACCOMPLISH TAXI COMMUNICATIONS	CAI-COMPUTER AIDED INSTRUCTION WB-WORKBOOK
4.5.5.1.1.0.1	PR A STATE PROCEDURES TO COMMUNICATE WITH GROUND STATIONS USING DATA-LINK	VI-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE
4.5.5.1.2.0.1	PR A STATE PROCEDURES TO COMMUNICATE WITH GROUND STATIONS USING UHF	VI-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE
4.5.5.2.1.0.1	PR A STATE PROCEDURES TO COMMUNICATE WITH OTHER AIRCRAFT USING DATA-LINK	VI-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE

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SYLLABUS WORKSHEET

LESSON	TITLE
OBJECTIVE SEQUENCE	LESSON MEDIA AIRCREW ATF TITLE OBJECTIVE MEDIA
***FAPA 40	TACAN AND NAVID SYSTEMS CAI-COMPUTER AIDED INSTRUCTION RAS-RANDOM ACCESS SLIDE WORKBOOK
4.4.1.0.1	PR ATF INTERPRET STEERING COMMAND INFORMATION FOR DATA-LINK CAI-COMPUTER AIDED INSTRUCTION RAS-RANDOM ACCESS SLIDE WORKBOOK
***FAPA 60	POWER PLAN OPS AND EMERGENCIES
2.4.1.0.1	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE PR A STATE LOCATION OF CONTROLS/SWITCHES FOR BEFORE-STARTING ENGINE CHECKLIST
2.4.1.0.2	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE PR A STATE REQUIRED ACTION FOR EACH ITEM OF BEFORE-STARTING ENGINE CHECKLIST
2.4.1.0.3	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE PR A STATE CRITICAL VALUES FOR EACH ITEM IN BEFORE-STARTING ENGINE CHECKLIST
2.4.2.0.1	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE PR A STATE LOCATION OF CONTROLS/SWITCHES FOR STARTING-ENGINE CHECKLIST
2.4.2.0.2	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE PR A STATE REQUIRED ACTION FOR EACH ITEM OF STARTING- ENGINE CHECKLIST
2.4.2.0.3	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE PR A STATE CRITICAL VALUES FOR EACH ITEM IN STARTING- ENGINE CHECKLIST
2.4.3.1.0.1	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE PR A STATE CUES-AND-ALERTS FOR ENGINE HUNG-START EMER
2.4.3.1.0.2	VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE PR A STATE CORRECTIVE ACTIONS FOR ENGINE HUNG-START EMER
2.4.3.2.0.1	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE PR A STATE CUES-AND-ALERTS FOR ENGINE HOT-START EMER
2.4.3.2.0.2	VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE PR A STATE CORRECTIVE ACTIONS FOR ENGINE HOT-START EMER
2.4.3.3.0.1	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE PR A STATE CUES-AND-ALERTS FOR ENGINE FIRE-ON-START EMER
	VT-VIDEO TAPE MIL-MEDIATED INTERACTIVE LECTURE

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SYLLABUS WORKSHEET

LESSON	TITLE	LESSON MEDIA
OBJECTIVE SEQUENCE	AIRCREW ATF TITLE	OBJECTIVE MEDIA
2.4.3.4.0.2	PR A STATE CORRECTIVE ACTIONS FOR ENGINE WET-START EMER	ST-SLIDE TAPE
2.4.3.5.0.1	PR A STATE CUES-AND-ALERTS FOR ENGAGED-STARTER EMER	MIL-MEDIATED INTERACTIVE LECTURE VT-VIDEO TAPE
2.4.3.5.0.2	PR A STATE CORRECTIVE ACTIONS FOR ENGAGED-STARTER EMER	ST-SLIDE TAPE
2.4.3.6.0.1	PR A STATE CUES-AND-ALERTS FOR RUNAWAY ENGINE-ON-START EMER	MIL-MEDIATED INTERACTIVE LECTURE VT-VIDEO TAPE
2.4.3.6.0.2	PR A STATE CORRECTIVE ACTIONS FOR RUNAWAY ENGINE-ON-START EMER	MIL-MEDIATED INTERACTIVE LECTURE ST-SLIDE TAPE
FAPA 80	FLIGHT GEAR	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.1.1.0.1	PR A IDENTIFY FLIGHT-PUBS/DOC	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.1.2.0.1	PR A IDENTIFY HELMET	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.1.3.0.1	PR A IDENTIFY G-SUIT	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.1.4.0.1	PR A IDENTIFY SURVIVAL-GEAR	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.1.5.0.1	PR A IDENTIFY OXYGEN-MASK	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.1.6.0.1	PR A IDENTIFY TORSO-HARNES	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.1.7.0.1	PR A IDENTIFY LIFE-VEST	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.1.8.0.1	PR A IDENTIFY SURVIVAL-RADIO	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.1.9.0.1	PR A IDENTIFY EXPOSURE-SUIT	ST-SLIDE TAPE MIL-MEDIATED INTERACTIVE LECTURE
2.1.10.0.1	PR A IDENTIFY DOWNING DISCREPANCIES OF FLIGHT-PUBS/DOC	RAS-RANDOM ACCESS SLIDE WORKBOOK CAI-COMPUTER AIDED INSTRUCTION

YOU HAVE COMPLETED THE  
GENERIC TASK LIST  
TASK LIST VALIDATION  
OBJECTIVE VALIDATION  
MEDIA SELECTION  
SYLLABUS DEVELOPMENT

YOU ARE IN THE FOLLOWING PHASE  
LESSON EDIT

WHERE DO YOU WANT TO GO?

- 1 - TASK LIST VALIDATION
- 2 - OBJECTIVE VALIDATION
- 3 - MEDIA SELECTION
- 4 - SYLLABUS DEVELOPMENT
- 5 - LESSON EDIT
- 6 - EXIT

>5

SYLLABUS VALIDATION IS AN OPPORTUNITY TO PLACE, IN CASDAT, TRAINING SYLLABUS CHANGES PREVIOUSLY MADE DURING THE OFF-LINE REVIEW OF THE SYLLABUS WORKSHEET. DURING THIS STEP, IT WILL BE POSSIBLE TO MAKE THE FOLLOWING EDITS TO THE SYLLABUS:

- \* COMBINE, SPLIT, OR DELETE EXISTING LESSONS
- \* MODIFY A LESSON BY CHANGING
  - THE LESSON TITLE
  - OBJECTIVES, EITHER ADD OR DELETE THEM
  - LESSON MEDIA CHOICES

TO MAKE THESE CHANGES, WORK FROM THE ANNOTATED WORKSHEET PROVIDED DURING THE PREVIOUS STEP AND MODIFIED OFF-LINE. THIS PROCEDURE IS PREFERRED TO DIRECT ON-LINE EDITING. WHEN THIS IS COMPLETE, A FINAL TRAINING SYLLABUS PRINT-OUT IS OBTAINABLE.

DO YOU WANT TO

- 1 - DISPLAY A LESSON
- 2 - DELETE A LESSON
- 3 - CHANGE A LESSON
- 4 - SPLIT A LESSON INTO MULTIPLE LESSONS
- 5 - COMBINE LESSONS INTO ONE NEW LESSON
- 6 - EXIT THIS EDIT SESSION

>1

- \* DISPLAYING A LESSON \*

NOTE: THIS DISPLAY PROVIDES ON-LINE REVIEW ONLY

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GIVE LESSON NUMBER TO BE DISPLAYED

>FAPA0020

RADIO SYSTEMS

WHICH OF THE FOLLOWING DO YOU WANT DISPLAYED?

- 1 - OBJECTIVES FOR THIS LESSON
- 2 - MEDIA FOR THIS LESSON
- 3 - EXIT

>1

THERE ARE 2 OBJECTIVES IN THIS LESSON

AN OBJECTIVE IN LESSON, FAPA 20 ,IS

EVALUATE UHF

DO YOU WISH TO SEE DETAILS OF THIS OBJECTIVE? Y/N

>Y

EVALUATE UHF

SEQUENCE NUMBER: 4. 2. 2

ENVIRONMENT: ACADEMIC FLIGHT TRAINER

MEDIA FIRST CHOICE: ST-SLIDE TAPE

MEDIA SECOND CHOICE: MIL-MEDIATED INTERACTIVE LECTURE

AN OBJECTIVE IN LESSON, FAPA 20 ,IS

STATE PROCEDURES TO EVALUATE UHF

DO YOU WISH TO SEE DETAILS OF THIS OBJECTIVE? Y/N

>Y

STATE PROCEDURES TO EVALUATE UHF

SEQUENCE NUMBER: 4. 2. 2. 0. 1

ENVIRONMENT: ACADEMIC

MEDIA FIRST CHOICE: WB-WORKBOOK

MEDIA SECOND CHOICE: MIL-MEDIATED INTERACTIVE LECTURE

PLEASE WAIT - MEDIA COST REPORT IS BEING GENERATED

MEDIA COST ANALYST

THE MEDIA COST REPORT PRESENTS THE RELATIVE COSTS OF PRODUCING THE PRIMARY AND SECONDARY MEDIA PLANS FOR THE TRAINING SYLLABUS. THESE RELATIVE COSTING FIGURES ARE BASED UPON TWO UNDERLYING ASSUMPTIONS THAT SHOULD BE MADE CLEAR. THE FIRST OF THESE IS THAT AUTHORS WORK FROM COMPLETE, WELL WRITTEN LESSON SPECIFICATIONS. MEDIA PRODUCTION COSTS UP TO AND INCLUDING THE DEVELOPMENT OF LESSON SPECIFICATIONS IS RELATIVELY INDEPENDENT OF THE MEDIA SELECTED. THE SECOND ASSUMPTION IS THAT ONLY ONE HARD COPY OF EACH FINISHED PRODUCT IS PRODUCED. COSTS OF ADDITIONAL COPIES OR SETS OF LESSON MATERIALS IS NOT INCLUDED.

TWO TABLES ARE PRODUCED IN THIS REPORT. THE FIRST OF THESE, "ALTERNATIVE MEDIA PLANS", PRESENTS IN SUMMARY FORM, THE NUMBER OF LESSONS EMPLOYING EACH MEDIUM USED IN THE TWO MEDIA PLANS.

TO DETERMINE THE RELATIVE COST REQUIREMENTS FOR EACH MEDIA PLAN, THE PERCENTAGE OF LESSONS USING EACH MEDIUM ARE MULTIPLIED BY THE CORRESPONDING RELATIVE PRODUCTION COST FACTORS STORED WITHIN CASDAT. A SUMMARY OF THE RESULTS OF THIS PROCEDURE ARE PRESENTED FOR EACH MEDIA PLAN IN THE SECOND TABLE, "MEDIA TIME/COST MATRIX". IT SHOULD BE STRESSED THAT THESE FIGURES ARE BOTH RELATIVE (NOT ABSOLUTE) AND APPROXIMATE. THEY ARE RELATIVE IN THAT IT CAN NOT BE SAID THAT THE TOTALS IN ANY CATEGORY FOR EITHER PLAN IS A CERTAIN NUMBER OF HOURS OR DAYS. BUT IN COMPARING THE TOTALS ACROSS BOTH MEDIA PLANS, IT CAN BE SAID THAT ONE MAY BE CERTAIN NUMBER TIMES AS MUCH AS THE TOTAL FOR ANOTHER.

END OF EDIT SESSION

RADIO SYSTEMS

WHICH OF THE FOLLOWING DO YOU WANT DISPLAYED?

- 1 - OBJECTIVES FOR THIS LESSON
- 2 - MEDIA FOR THIS LESSON
- 3 - EXIT

>2

MEDIA FIRST CHOICE: ST-SLIDE TAPE

MEDIA SECOND CHOICE: MIL-MEDIATED INTERACTIVE LECTURE

RADIO SYSTEMS

WHICH OF THE FOLLOWING DO YOU WANT DISPLAYED?

- 1 - OBJECTIVES FOR THIS LESSON
- 2 - MEDIA FOR THIS LESSON
- 3 - EXIT

>3

DO YOU WANT TO

- 1 - DISPLAY A LESSON
- 2 - DELETE A LESSON
- 3 - CHANGE A LESSON
- 4 - SPLIT A LESSON INTO MULTIPLE LESSONS
- 5 - COMBINE LESSONS INTO ONE NEW LESSON
- 6 - EXIT THIS EDIT SESSION

>C3

\* CHANGING A LESSON \*

GIVE LESSON NUMBER OF LESSON TO BE CHANGED

>FFPA0020

THIS LESSON NUMBER, FPPA 20 ,IS NOT IS SYLLABUS

DO YOU WANT TO

- 1 - DISPLAY A LESSON
- 2 - DELETE A LESSON
- 3 - CHANGE A LESSON
- 4 - SPLIT A LESSON INTO MULTIPLE LESSONS
- 5 - COMBINE LESSONS INTO ONE NEW LESSON
- 6 - EXIT THIS EDIT SESSION

>6

SYLLABUS FILE IS BEING SORTED - PLEASE WAIT

IS THE SYLLABUS VALIDATION COMPLETE? Y/N

>Y

DO YOU WANT A PRINT-OUT OF THE SYLLABUS? Y/N

N



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\*\*\* MEDIA COST \*\*\*

PAGE 1

	PRIMARY MEDIA PLAN		SECONDARY MEDIA PLAN	
	# OF LESSONS	% OF TOTAL	# OF LESSONS	% OF TOTAL
1. AC	26	46.4	26	46.4
2. SIM	26	46.4	26	46.4
3. VT	4	7.1	0	0.0
4. MIL	0	0.0	4	7.1
5. ST	0	0.0	0	0.0
6. WB	0	0.0	0	0.0
7. WS	0	0.0	0	0.0
8. CAI	0	0.0	0	0.0
9. RAS	0	0.0	0	0.0
TOTAL	56	100X	56	100X

----- ALTERNATIVE MEDIA PLANS

MEDIA COST \*\*\*

PAGE 2

MEDIA \	\ TIME/ COSTS	PRODUCTION TIME/COST FACTORS				TOTAL
		AUTHOR	IP	ISW/ED	PROD.	
1. AC		10.00	1.00	0.00	20.00	19.00
2. BIM		10.00	1.00	0.00	20.00	19.00
3. VT		10.00	1.00	15.00	27.00	30.00
4. MIL		10.00	1.00	0.00	16.00	17.00
5. ST		8.00	3.00	7.00	37.00	35.00
6. WB		8.00	1.00	2.00	20.00	17.00
7. WS		3.00	0.50	0.50	3.50	5.00
8. CAI		10.00	1.00	0.00	20.00	19.00
9. RAB		13.00	2.00	3.00	50.00	41.00

MEDIA COST \*\*\*

PAGE 3

--MEDIA TIME/COST MATRIX--

PLAN \ CAT	AUTHOR	IP	SM/ED	PROD.	TOTAL
PRIMARY MEDIA PLAN	1000.00	100.00	107.14	2050.00	1978.57
SECONDARY MEDIA PLAN	1000.00	100.00	0.00	1971.43	1885.71

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YOU HAVE COMPLETED THE  
GENERIC TASK LIST  
TASK LIST VALIDATION  
OBJECTIVE VALIDATION  
MEDIA SELECTION  
SYLLABUS DEVELOPMENT  
LESSON EDIT

YOU ARE IN THE FOLLOWING PHASE  
LESSON SPECIFICATION

WHERE DO YOU WANT TO GO?

- 1 - TASK LIST VALIDATION
- 2 - OBJECTIVE VALIDATION
- 3 - MEDIA SELECTION
- 4 - SYLLABUS DEVELOPMENT
- 5 - LESSON EDIT
- 6 - LESSON SPECIFICATION
- 7 - EXIT

70

\*\*\* LESSON SPECIFICATION \*\*\*

CASDAT PRODUCES A SPECIFICATION FOR EACH ACADEMIC, TRAINER, AND FLIGHT LESSON IN THE COMPLETED TRAINING SYLLABUS. EACH LESSON SPECIFICATION CONTAINS BOTH GENERAL INFORMATION ABOUT THE LESSON AND SOME DETAILS OF THE INSTRUCTIONAL STRATEGY NECESSARY TO TEACH LESSON OBJECTIVES. SPECIFICALLY, THE INFORMATION PROVIDED TO THE LESSON SPECIFICATION AUTHOR INCLUDES THE FOLLOWING:

- \* LESSON REFERENCE NUMBER
- \* LESSON TITLE
- \* PRE-REQUISITE LESSON LIST
- \* LESSON MEDIA, PRIMARY AND SECONDARY RECOMMENDATIONS
- \* MEDIA RESOURCES
- \* INSTRUCTIONAL STRATEGY - AUTHORING AID

WHEN COMPLETED, THE LESSON SPECIFICATION BECOMES A BLUEPRINT OR PRESCRIPTION FOR FURTHER INSTRUCTIONAL DEVELOPMENT. IT PROVIDES AN OFF-LINE GUIDELINE FOR THE DEVELOPER SO THAT HE MAY CONTRIBUTE HIS CONTENT KNOWLEDGE IN AN INSTRUCTIONALLY USEFUL WAY.

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**\*\* LESSON SPECIFICATION \*\***

LESSON REFERENCE NUMBER: FAPA 80  
LESSON TITLE: FLIGHT GEAR

PRIMARY MEDIA: VT-VIDEO TAPE  
SECONDARY MEDIA: MIL-MEDIATED INTERACTIVE LECTURE

PRE-REQUISITE INFORMATION MAP

FACF 80 POWER PLANT EMERGENCIES IN A TRAINER ENVIRONMENT  
FACF 100 FLIGHT CONTROLS  
FAPA 20 NORMAL COMMUNICATIONS  
FAPA 40 POWER PLANT OPS AND EMERGENCIES  
FAPA 60 FLIGHT CONTROLS  
\*FAPA 80 FLIGHT GEAR  
FAPT 20 NORMAL COMMUNICATIONS  
FAPT 40 POWER PLANT OPS AND EMERGENCIES  
FAPT 60 FLIGHT GEAR  
FAPF 20 NORMAL COMMUNICATIONS  
FAPF 40 POWER PLANT OPS AND EMERGENCIES

NAVTRAEQUIPCEN 79-C-0076-1

\*\*\* LESSON SPECIFICATION \*\*\*

AUTHOR: S. SIMONS

LESSON REFERENCE NUMBER: FAPA 80  
LESSON TITLE: FLIGHT GEAR

LESSON OBJECTIVES

<u>SEQ #</u>	<u>OBJECTIVE CODE</u>	<u>OBJECTIVES</u>
1	2. 1. 1. 0. 1	IDENTIFY HELMET COND: GIVEN FLIGHT GEAR
2	2. 1. 2. 0. 1	IDENTIFY DOWNING DISCREPANCIES OF HELMET COND: GIVEN FLIGHT GEAR
3	2. 1. 2. 0. 2	STATE INSPECTION POINTS OF HELMET COND: GIVEN FLIGHT GEAR

NAVTRAEQUIPCEN 79-C-0076-1

\*\*\* LESSON SPECIFICATION \*\*\*

LESSON REFERENCE NUMBER: FAPA 80  
LESSON TITLE: FLIGHT GEAR

AUTHOR: S. SIMONS

LESSON MEDIA AND RESOURCE WORKSHEET

PRIMARY MEDIA:

VIDEOTAPE  
-----

PERSONNEL: NONE  
MEDIA: VIDEOTAPE  
WORKBOOK  
FACILITIES: CARREL (U)  
CARREL (B)  
EVALUATION: NONE

SECONDARY MEDIA:

MEDIATED INTERACTIVE LECTURE  
-----

PERSONNEL: INSTRUCTOR PILOT  
INSTRUCTOR NFO  
MEDIA: CHALKBOARD  
OVERHEAD TRANSPARENCIES  
35MM SLIDES  
WALLCHART  
PHOTO PANEL  
LECTURE GUIDE  
STRUCTURE NOTES  
FACILITIES: CLASSROOM  
EVALUATION: NONE

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LEVEL OF CONTENT: "FAMILIARIZATION"    LEVEL OF BEHAVIOR: "REMEMBER"

INSTRUCTIONAL COMPONENTS TO BE DEVELOPED FOR THIS OBJECTIVE AND  
A DESCRIPTION OF THE PRESENTATION FORM OF EACH COMPONENT.

---

1. GENERALITY:    PRESENT A DESCRIPTION OF THE TOPIC OR CONTENT  
RATHER THAN SPECIFIC INFORMATION TO BE TESTED.  
THIS INFORMATION IS "NICE-TO-KNOW", BUT IS NOT  
REQUIRED. IT IS NOT TESTED.

---

2. SUPPORT:        N/A

---

3. EXAMPLES:      N/A

---

4. PRACTICE  
    &  
TEST ITEMS:        N/A

---

5. PRACTICE  
    FEEDBACK:      N/A

---



LEVEL OF CONTENT: "FACT"

LEVEL OF BEHAVIOR: "REMEMBER"

INSTRUCTIONAL COMPONENTS TO BE DEVELOPED FOR THIS OBJECTIVE  
AND A DESCRIPTION OF THE PRESENTATION FORM OF EACH COMPONENT.

1. GENERALITY: WRITE A CLEAR, CONCISE STATEMENT OF THE FACT(S)  
WITHOUT ANY EXTRANEIOUS MATERIAL.

2. SUPPORT: IF APPROPRIATE, BREAK FACT INTO SMALLER EASIER TO  
REMEMBER PARTS, OR LINKS TO FAMILIAR INFORMATION  
LEARNED EARLIER.

3. EXAMPLES: NOT APPLICABLE TO THIS TYPE OF OBJECTIVE.

4. PRACTICE

&  
TEST ITEMS: REQUIRE THAT THE LEARNER EITHER "RECALL" OR  
"RECOGNIZE" ON THE ENTIRE FACT OR PART OF IT.  
APPROPRIATE ITEMS INCLUDE:

RECOGNITION

RECALL

MATCHING

SHORT ANSWER

TRUE-FALSE

FILL-IN

MULTIPLE CHOICE

LISTING

PRACTICE AND TEST ITEMS MUST MATCH IN  
BEHAVIOR (INTENT) AND FORMAT.

5. PRACTICE  
FEEDBACK:

DEVELOP FEEDBACK FOR "EACH" PRACTICE ITEM.  
PROVIDE: 1) AN ANSWER TO THE PRACTICE ITEM  
2) A BRIEF EXPLANATION OF THE ANSWER.

LEVEL OF CONTENT: "CONCEPT"

LEVEL OF BEHAVIOR: "REMEMBER"

INSTRUCTIONAL COMPONENTS TO BE DEVELOPED FOR THIS TYPE OF OBJECTIVE AND A DESCRIPTION OF THE PRESENTATION FORM OF EACH COMPONENT ARE AS FOLLOWS:

---

1. GENERALITY: PRESENT A STATEMENT WHICH:  
1) NAMES THE CONCEPT BEING TAUGHT  
2) LISTS THE ATTRIBUTES OF THE CONCEPT

---

2. SUPPORT: SUPPORT SHOULD HELP THE LEARNER REMEMBER THE DEFINITION . PROVIDE A MNEMONIC, OR AN ELABORATION OF THE DEFINITION ITSELF. PRESENT BRIEF EXPLANATIONS OF ATTRIBUTES AS NECESSARY.

---

3. EXAMPLE: PROVIDE AN EXAMPLE(S) HAVING THESE CHARACTERISTICS:  
1) IT DEMONSTRATES AS MANY OF THE CONCEPT ATTRIBUTES AS CLEARLY AS POSSIBLE.  
2) IT IS A COMMON EXAMPLE OF THE CONCEPT.  
3) IT IS SHOWN AS SIMPLY AS POSSIBLE.

---

4. PRACTICE  
&  
TEST ITEMS: PRACTICE SET SHOULD REQUIRE THE LEARNER TO REMEMBER THE DEFINITION. APPROPRIATE ITEMS INCLUDE:  
1) SHORT ANSWER  
2) FILL-IN  
3) LISTING

PRACTICE AND TEST ITEMS MUST MATCH IN BEHAVIOR (INTENT) AND FORMAT.

---

5. PRACTICE  
FEEDBACK: DEVELOP FEEDBACK FOR "EACH" PRACTICE ITEM. PROVIDE ANSWERS TO EACH PRACTICE ITEM.

AD-A128.530

COMPUTER AIDED SYSTEM FOR DEVELOPING AIRCREW TRAINING  
(CASDAT)(U) VEDA INC ARLINGTON VA N C MARCUE ET AL.  
MAR 83 VEDA-113425-82U/P0707 NAVTRAEQUIPC-79-C-0076-1  
N61339-80-D-0009

33

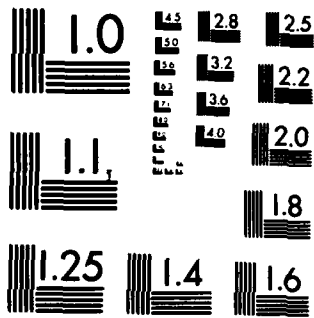
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F/G 5/9

NL



END  
DATE  
FILMED  
DTIC



MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A

LEVEL OF CONTENT: "CONCEPT"

LEVEL OF BEHAVIOR: "USE"

INSTRUCTIONAL COMPONENTS TO BE DEVELOPED FOR THIS TYPE OF OBJECTIVE  
AND A DESCRIPTION OF THE PRESENTATION FORM OF EACH COMPONENT.

---

1. GENERALITY: PRESENT A STATEMENT WHICH:
- 1) NAMES THE CONCEPT BEING TAUGHT.
  - 2) LISTS THE ATTRIBUTES OF THE CONCEPT.
- 

2. SUPPORT: PREPARE A MORE DETAILED EXPLANATION OF THE DEFINITION.  
THIS EXPLANATION MAY DEFINE TERMS IN THE DEFINITION  
AND ELABORATE UPON IDEAS IN THE DEFINITION.
- 

3. EXAMPLES

NON-EXAMPLES: "EXAMPLES" SHOULD SHOW ALL CRITICAL CHARACTERISTICS  
OF THE CONCEPT REQUIRED FOR CLASSIFICATION.  
"NON-EXAMPLES" SHOULD EXCLUDE ONE OR MORE OF THE  
CRITICAL CHARACTERISTICS. PREPARE AT LEAST ONE  
SET OF REPRESENTATIONAL EXAMPLES AND NON-EXAMPLES  
PER CONCEPT.

---

4. PRACTICE

TEST ITEMS: ITEMS SHOULD REQUIRE THE LEARNER TO CLASSIFY INSTANCES  
AS EITHER EXAMPLES OR NON-EXAMPLES. APPROPRIATE  
ITEMS INCLUDE:

- 1) PERFORMANCE
- 2) MATCHING
- 3) TRUE-FALSE
- 4) MULTIPLE CHOICE
- 5) SHORT ANSWER
- 6) FILL-IN

PRACTICE AND TEST ITEMS MUST MATCH IN BEHAVIOR.

---

5. PRACTICE

FEEDBACK: DEVELOP A STATEMENT WHICH INDICATES WHETHER THE  
ITEM BEING CLASSIFIED WAS AN EXAMPLE OR NON-  
EXAMPLE. THIS STATEMENT MAY ALSO INCLUDE:

- 1) EXPLANATIONS OF CRITICAL ATTRIBUTES.
- 2) INDICATIONS OF THE LACK OF A CRITICAL ATTRIBUTE.

---

LEVEL OF CONTENT: "RULES/PROCEDURES"      LEVEL OF BEHAVIOR: "REMEMBER"

INSTRUCTIONAL COMPONENTS TO BE DEVELOPED FOR THIS TYPE OF OBJECTIVE AND A DESCRIPTION OF THE PRESENTATION FORM OF EACH COMPONENT AS FOLLOWS:

---

1. GENERALITY:      PREPARE A STATEMENT WHICH PROVIDES:

- 1) THE NAME OF THE RULE/PROCEDURE.
- 2) ALL THE STEPS AND WHERE APPROPRIATE, THE BRANCHING DECISIONS, IN THE CORRECT ORDER.
- 3) THE OPERATIONS/TECHNIQUES TO USE IN APPLYING THE GENERALITY.

---

2. SUPPORT:              SUPPORT SHOULD HELP THE LEARNER REMEMBER THE RULE/PROCEDURE. A MNEMONIC, OR AN ELABORATION OF THE GENERALITY SHOULD BE USED.

---

3. EXAMPLE:              THE EXAMPLE SHOULD SHOW APPLICATION OF ALL STEPS AND WHERE APPROPRIATE, THE BRANCHING DECISIONS IN CORRECT ORDER. THE SELECTED INSTANCE SHOULD BE ONE CLEARLY IDENTIFIABLE AS EXEMPLIFYING THE RULE/PROCEDURE.

---

4. PRACTICE

8  
TEST ITEMS:      INSTANCES SHOULD REQUIRE THE STUDENT TO RECALL ALL THE STEPS AND WHERE APPROPRIATE, THE BRANCHING DECISIONS IN THE CORRECT ORDER REQUIRED. ITEMS MAY BE PRESENTED IN THE FOLLOWING FORMATS:

- 1) SHORT ANSWER
- 2) FILL-IN
- 3) LISTING

PRACTICE AND TEST ITEMS MUST MATCH IN BEHAVIOR (INTENT) AND FORMAT.

---

LEVEL OF CONTENT: "RULES/PROCEDURES"    LEVEL OF BEHAVIOR: "USE"

INSTRUCTIONAL COMPONENTS TO BE DEVELOPED FOR THIS TYPE OF OBJECTIVE AND A DESCRIPTION OF THE PRESENTATION FORM OF EACH COMPONENT ARE AS FOLLOWS:

- 
1. GENERALITY:    PREPARE A STATEMENT THAT CONTAINS THE FOLLOWING:
- 1) THE NAME OF THE RULE/PROCEDURE
  - 2) ALL THE STEPS AND WHERE APPROPRIATE, THE BRANCHING DECISIONS, IN THE CORRECT ORDER.
  - 3) THE OPERATIONS/TECHNIQUES TO USE IN APPLYING THE GENERALITY.

- 
2. SUPPORT:        SUPPORT SHOULD INCLUDE ONE OR MORE OF THE FOLLOWING:
- 1) AN ELABORATION OF GENERALITY IN SIMPLER TERMS
  - 2) A FLOWCHART ALGORITHM OR CHECKLIST WHICH INDICATES THE STEPS IN THE PROCEDURE/PROCESS.

- 
3. EXAMPLE:        AN EXAMPLE SHOULD BE A DEMONSTRATION WHICH SHOWS:
- 1) HOW TO PERFORM EACH STEP IN ORDER
  - 2) THE RESULTS (OUTPUT) OF EACH STEP
  - 3) COMMONLY MADE ERRORS

---

4. PRACTICE

- TEST ITEMS:        PRACTICE AND TEST ITEMS SHOULD REQUIRE THE LEARNER TO APPLY THE GENERALITY IN A SITUATION CONSISTENT WITH THE OBJECTIVE. ALL STEPS AND WHERE APPROPRIATE BRANCHING DECISIONS, MUST BE PERFORMED IN THE CORRECT ORDER. APPROPRIATE TEST ITEM FORMATS INCLUDE:
- 1) PERFORMANCE
  - 2) TRUE-FALSE
  - 3) MULTIPLE CHOICE
  - 4) SHORT ANSWER
  - 5) FILL-IN

PRACTICE ITEM FORMAT MUST BE THE SAME AS THAT FOR THE TEST. ALL PRACTICE ITEMS MUST INCLUDE FEEDBACK.

- 
5. PRACTICE FEEDBACK:    PROVIDE AN ANSWER(S) TO EACH PRACTICE ITEM.
-

LEVEL OF CONTENT: "PRINCIPALS"

LEVEL OF BEHAVIOR: "REMEMBER"

THE INSTRUCTIONAL COMPONENTS TO BE DEVELOPED FOR THIS TYPE OF OBJECTIVE AND A DESCRIPTION OF THE PRESENTATION FORM OF EACH COMPONENT ARE AS FOLLOWS:

---

1. GENERALITY: DEVELOP A STATEMENT OF A PRINCIPAL THAT PRESENTS:

- 1) ALL THE PRE- AND POST- CONDITIONS, ACTIONS, PROCESSES, CAUSES, EFFECTS AND RESULTS.
- 2) A CLARIFICATION OF THE RELATIONSHIPS BETWEEN THE PRE- AND POST- ELEMENTS OF THE STATEMENT (SEE 1 ABOVE).

---

2. SUPPORT: SUPPORT SHOULD HELP THE LEARNER REMEMBER THE PRINCIPAL.

- 1) HIGHLIGHT IMPORTANT FEATURES
- 2) SIMPLIFY THE RELEVANT INFORMATION
- 3) USE LOGICAL REPRESENTATION OF THE "IF-THEN" RELATIONSHIPS.

---

3. EXAMPLES: EXAMPLES SHOULD PRESENT AN INTERPRETATION OR PREDICTION BASED ON CAUSES, EFFECTS AND RELATIONSHIPS. THE SELECTED INSTANCE SHOULD BE ONE CLEARLY IDENTIFIABLE AS EXEMPLIFYING THE PRINCIPLE.

---

4. PRACTICE

&

TESTING:

INSTANCES SHOULD REQUIRE THE LEARNER TO RECALL, ALL CAUSES, EFFECTS, AND RELATIONSHIPS, PERTAINING TO THE PRINCIPLE. ITEMS MAY BE PRESENTED IN ANY OF THE FOLLOWING FORMATS:

- 1) SHORT ANSWER
- 2) FILL-IN
- 3) LISTING

PRACTICE AND TEST ITEMS MUST MATCH IN BEHAVIOR (INTENT) AND FORMAT.

---

5. PRACTICE  
FEEDBACK:

PROVIDE AN ANSWER(S) TO EACH PRACTICE ITEM.

---



LEVEL OF CONTENT: "PRINCIPALS"

LEVEL OF BEHAVIOR: "USE"

THE INSTRUCTIONAL COMPONENTS TO BE DEVELOPED FOR THIS TYPE OF OBJECTIVE AND A DESCRIPTION OF THE PRESENTATION FORM OF EACH COMPONENT ARE AS FOLLOWS:

1. GENERALITY: DEVELOP A STATEMENT OF A PRINCIPAL THAT PRESENTS:

- 1) ALL THE PRE- AND POST- CONDITIONS, ACTIONS, PROCESSES, CAUSES, EFFECTS AND RESULTS.
- 2) A CLARIFICATION OF THE RELATIONSHIPS BETWEEN THE PRE- AND POST- ELEMENTS OF THE STATEMENT (SEE 1 ABOVE).

2. SUPPORT: DEVELOP A STATEMENT(S) WHICH INCLUDE ONE OR MORE OF THE FOLLOWING:

- 1) AN ELABORATION OF THE GENERALITY IN SIMPLIER TERMS.
- 2) HIGHLIGHT OF IMPORTANT FEATURES.
- 3) INCLUDE LOGICAL REPRESENTATIONS OF THE "IF-THEN" RELATIONSHIPS IN THE GENERALITY.

3. EXAMPLES: SELECTED EXAMPLES SHOULD PRESENT AN INTERPRETATION OR PREDICTION BASED ON RELEVANT CAUSES, EFFECTS AND RELATIONSHIPS. THE SELECTED INSTANCES SHOULD BE THOSE CLEARLY IDENTIFIABLE AS EXEMPLIFYING THE PRINCIPLE.

4. PRACTICE

&

TESTING:

INSTANCES SHOULD REQUIRE THE LEARNER TO PROVIDE AN EXPLANATION OR PREDICTION BASED ON THE PRINCIPLE. ITEMS MAY BE PRESENTED IN ANY OF THE FOLLOWING FORMATS:

- 1) SHORT ANSWER
- 2) FILL-IN
- 3) LISTING

PRACTICE AND TEST ITEMS MUST MATCH IN BEHAVIOR (INTENT) AND FORMAT.

5. PRACTICE  
FEEDBACK:

PROVIDE AN ANSWER(S) TO EACH PRACTICE ITEM. AN EXPLANATION OF "WHY" A PARTICULAR ANSWER IS PREFERRED IS ALSO DESIRABLE.

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