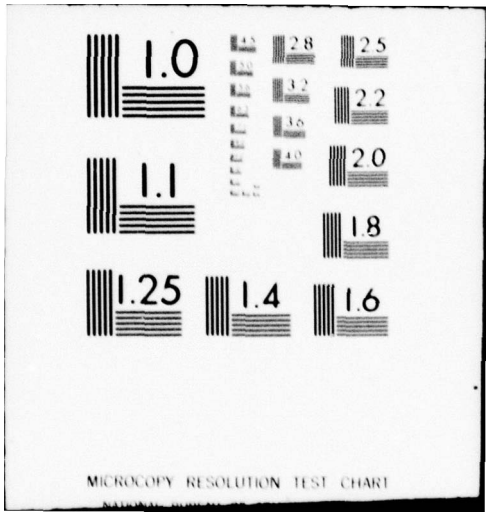
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This report summarizes a project during which the U.S. Navy's Naval Flight Officer Basic Training Course was revised in accordance with instructional system development (ISD) procedures. The principal features of the revision were to increase the emphasis upon the operational relevance of that training, to reorganize the course content, and to apply techniques of training different from those conventionally employed in Naval Flight Officer training. The project included a limited implementation of the revised course and its further revision based upon experiences obtained.

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(Appendix A)

NAVAL FLIGHT OFFICER BASIC TRAINING OBJECTIVES

Appendix A

to

Revision of Naval Flight Officer Basic Training

By

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April 1976

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SECTION I

Introduction

Background and Purpose

During the summer of 1974, the Human Resources Research Organization (HumRRO) undertook an analysis and revision of the Naval Flight Officer (NFO) Basic Training Course. The overall objective of that revision was to enhance the effectiveness of the Basic portion of NFO training through clarification of its performance objectives and through the employment of the Instructional Systems Development (ISD) methodology and state-of-the-art training techniques. During the course of this project, a revised NFO Basic Training Course was developed, and a group of NFO students were trained under the new program. The extent to which the overall project objectives were met was determined by the measured performance of these trainees. For a further discussion of the overall effort, the reader is referred to the basic final report[1/] of the overall project, to which this is an appendix.

An early project activity was a review of the objectives of NFO Basic Training. Included in the review was an examination of each existing NFO Basic Training objective in terms of its clarity and the extent to which it specified objectively measurable performance. In addition, the reviewing Navy and HumRRO personnel examined the NFO Basic Training requirements to determine the adequacy and appropriateness of the existing objectives. The purpose of this latter effort was to assure that NFO Basic Training contains all the performance objectives that are required, yet that no unnecessary or inappropriate objectives be included. In those cases where a determination was made that additional objectives were required, they were formulated.

[1/] Revision of Naval Flight Officer Basic Training. HumRRO Final Report FR-CD(P) 76-1, Pensacola, Florida, May 1976.

The results of this review of NFO Basic Training objectives were documented in an Interim Report, Proposed Training Objectives for Naval Flight Officers, dated January 1975, which was submitted for Navy review and concurrence. Since these objectives were to serve as the basis for subsequent course development efforts, Navy concurrence was required before the course development effort could proceed.

The review process involved a variety of Navy inputs from fleet representatives, CNET, CNATRA, and personnel at TRAWING SIX, particularly the instructors of Training Squadron Ten. Following the Navy's internal review, a number of interactive discussions were held between Navy and HumRRO personnel to develop the final listing of terminal objectives[1/] for NFO Basic Training around which the revised course was developed. This Appendix presents the final documentation of those objectives agreed to by the Navy and HumRRO in May 1975.

It should be noted that the material contained in both the earlier Interim Report and the present Appendix was developed solely for two basic purposes: (1) to insure that the content of the revised NFO Basic Training Course was that which was appropriate to Navy needs and desires; and (2) to provide the information required by course developers for preparation of the revised program. These two general purposes guided the content and format of the information developed and its documentation.

With reference to how the terminal objectives contained herein were implemented in the revised NFO Basic Training program, the reader is referred to the

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[1/] It should be noted that certain subsequent minor changes in specific objectives were required by circumstances that existed or developed during the course development effort. An example is those objectives that were peculiar to the use of the T-34 aircraft. Those objectives were not included in the revised training program because of the Navy's elimination of the T-34 aircraft from the NFO program.

overall Final Report[1/] of the effort which describes the details of the revised course--i.e., the training program design, training materials/resources used, sequencing of content, management of students, instructional methods, etc.--and the results of the initial implementation of the revised course by Navy instructors with a sample of student NFOs.

The present work was an application of the Instructional Systems Development (ISD) methodology which is receiving increasing emphasis in the development of training programs by the Navy and the other services. A fundamental part of the ISD methodology is that training objectives and training programs should be subject to a constant and recurring review as to their adequacy and completeness on the basis of feedback reports from the fleet and from subsequent training activities. The present report presents the outcome of one such review.

To carry the ISD process on, these objectives (and the revised NFO Basic Training Course) will no doubt be subject to further review based on fleet feedback. Each iteration of this process brings training requirements and training programs into closer consonance with fleet requirements. However, the Navy is a dynamic system, not a static one, and fleet requirements change over time and may be expected to continue to do so in the future. Probably nowhere is this change more significant than in the NFO community, since the role of the NFO is still evolving toward one of greater importance and responsibility. Thus, the objectives described in the present report should be viewed as something of a snapshot of the changing picture of fleet NFO activities. The Navy's commitment to the ISD approach will insure that its training subsystem will keep pace with the changing requirements of the fleet in the future.

[1/] Revision of Naval Flight Officer Basic Training. HumRRO Final Report FR_CD(P) 76-1, Pensacola Florida, May 1976.

Organization of Appendix

This Appendix is organized into three sections, of which the present introductory section is the first. Section II contains the listing of those terminal objectives from the existing[1/] NFO Basic Training Course that were mutually agreed upon by the Navy and HumRRO for retention in the Revised NFO Basic Training Course. That agreement resulted from the review of the Interim Report objectives mentioned earlier. Also included in the Section II listing are certain new or additional enabling objectives that were identified in the Interim Report for addition to the Revised Course. These areas were added, with Navy concurrence, because of their relevance to fleet operational requirements or to subsequent NFO training pipeline training activities. Section III lists certain of the objectives of the existing program that were excluded from the revised program due to their non-relevance to fleet requirements or due to the fact of their being justifiable only as "nice-to-know" material.

The terminal objectives in Section II represent explicitly the performance and subject matter knowledge requirements that the Student Naval Flight Officer (SNFO) must meet before moving from the Basic stage of his training to one of the several advanced NFO training pipelines. By definition, the SNFO who

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[1/] In this report, when reference is made to the "existing" course, the reference is to the NFO Basic Training Course as it existed at the time of initial course review by HumRRO in late 1974 and early 1975. It should be noted that this is the course as it was operated by the Navy at that time and generally as it continues to be operated at the present time. It should be further noted, however, that many changes have occurred over the last 15 months in the "existing" course as a result of the normal sequence of events relating to course changes that occur in Naval flight training programs. Those intimately familiar with the Navy's NFO training program will recognize that certain of the changes that have occurred in the existing NFO Basic Training Course are actually features of the Revised NFO Basic Training Course developed by Navy and HumRRO personnel in the present effort. The fact that certain of these features have already been routinely implemented by the Navy in its existing NFO training, in advance of the completion of the trial implementation and evaluation of the revised course, is evidence of the Navy's desire to implement advantageous training changes at the earliest possible moment.

demonstrates successful accomplishment of these terminal objectives has completed the requirements of the Revised Basic Course and is thereby deemed qualified[1/] to move on to the next stage or portion of SNFO training. Conversely, since all the terminal objectives were judged by the Navy to represent essential skills and knowledge (as opposed to nice-to-know), failure to achieve any of the objectives was grounds either for further training until the objective could be met or for attrition from training. Thus, these terminal objectives not only define the content of the training that was given in the revised course (though not necessarily the manner or sequencing in which it was given), they also define the performance measurement parameters that provide the criteria for successful completion of the Revised NFO Basic Training Course.

Those objectives in Section III of the report define NFO Basic Training core content existing at the time of the review that was deleted on the basis of non-relevance or non-essentiality. The reader familiar with the existing NFO training course may desire to know explicitly those previous objectives that were eliminated. Section III provides the means to assess the differences between the revised course and the existing course in terms of identifying those objectives that were dropped deliberately. The reader will note that most of the objectives dropped relate to material dealing with "basic electricity" or other material that has little or no direct relevance to what NFOs do operationally. This sort of emphasis in ISD methodology is sometimes described as teaching the man "how to operate the system," rather than "how the system operates." In other cases, objectives were deleted because of total non-relevance to current NFO jobs, equipment, or operations. An example of such an objective

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[1/] It should be noted that this means "deemed qualified by the Navy." The evaluation of successful accomplishment of objectives by SNFOs was, as is properly the case, performed by Navy instructors, not by HumRRO personnel.

is "know the principles of vacuum tube operation." This knowledge is totally irrelevant to NFO activities, since all the equipment with which the NFO interacts is now solid state.

As noted, there are certain new objectives or training procedures included in the revised program that were not previously included in the existing program. These are relatively few in number, due to the fact that the Navy had done a rather thorough job of identifying potential SNFO Basic Training objectives in developing the existing course. These items are included in the revised course principally to provide an element of exposure to specimen fleet activities related to the various pipeline choices available to the SNFO. They serve a dual purpose in the revised course. One one hand, they provide an overview of the role of the NFO in a variety of fleet assignments, while on the other hand, they provide an experience base on which subsequent pipeline training can build.

Description of Terminal Objectives

As stated, one of the principal functions of developing the statements of terminal performance objectives contained in this report was their use by HumRRO personnel in developing the Revised NFO Basic Training Course. Therefore, the format and manner in which they are stated are principally reflective of tyat purpose, though, of course, they had to be stated in a manner that would allow their review and assessment for completeness and relevance by Navy personnel. The manner in which these objectives are stated was reflective, then, of the basic organizing principle ahat governed the design of the Revised NFO Basic Training Course. That organizing principle, one that has been used previously by HumRRO in flight training program design, is known as the *phase of flight sequence*.

In general, the phase of flight principle organizes instructional content around the various natural phases of flight beginning with mission planning and ending with post-flight duties. This phase of flight sequencing is closely related to another governing principle in HumRRO course development, functional context instruction. By this is meant that course material is taught in a meaningful mission-event context, and instructional content is brought in only when and as necessary to support the performatory activities (including cognitive performances) required in that context. In other words, in the revised NFO course, material is introduced only as it is required to support or enable what the NFO does in that particular mission-event context.

In the present instance, to support the development of the revised training program, phase of flight was used as the basic structural variable for defining the training objectives. Readers familiar with various methods or systems for describing training objectives w ll be aware that many different formats are used, and that level of detail varies widely. Some systems describe objectives in terms of relatively small behavioral units, whereas others use larger, more global units of behavior. A behavior that appears as a task in one system may be described as only a sub-task in another, or as a task element. In general, the format and level of detail are related to the purposes for which the objective statement is to be used. For the course development purposes of the present effort, in which the phase of flight sequence is paramount, the training objectives are couched in terms of relatively large behavioral elements related to phases of flight with relatively firm beginning and end points, phases that denote qualitative differences in kinds of action or functional goals of the phases. As will be seen in the following discussion, though, each objective is described in considerable detail as to the component behaviors involved, the standards of performance required, and the supporting skills and knowledge required for its performance.

Components of an Objective. Generally, the objectives listed herein contain the following four elements: (1) phase of flight; (2) name or descriptor for objective; (3) component performances and criteria or standards; and (4) enabling objectives.

1. Phase of flight. In classifying the objectives for use in NFO training course development, twelve basic phases of flight were used. In addition, a thirteenth "emergency procedures" category was used to cover certain flight objectives that were more pervasive in nature and which might be related to any of several phases of flight. In addition to these thirteen flight phase categories, three additional categories of objectives were judged by the Navy as required for SNFO accomplishment in NFO Basic Training. These objectives are generally cognitive in nature (though stated in performatory terms) and, while classified as "terminal" for the Basic Training program, are more in the nature of supporting or enabling knowledge objectives for later advanced training activities or fleet activities. These three general knowledge objective areas, of course, are not phases of flight at all, at least insofar as the Basic Course flight activities are concerned. Therefore, the reader should keep in mind this liberty taken with the "phase of flight" terminology with reference to "phases" 14, 15 and 16. The Phase of Flight categories are shown in Table 1.

The twelve basic phases of flight are those that occur, generally, in the course of any flight mission. Their relative importance, complexity, and difficulty will vary, of course, as a function of the specific mission or conditions surrounding the mission. For example, a flight mission that is essentially a cross-country navigation flight from Point A to Point B may involve little or nothing in the way of Phase 7 activities (Mission Maneuvers). On the other hand, an attack mission would involve a heavy stress on Phase 7 activities. As will be noted, however, there are relatively few Phase 7 activities

involved in the Revised NFO Basic Training Course, since such maneuvers occur largely in the advanced pipeline phases of NFO training.

TABLE 1

Phase of Flight Categories Used
For NFO Basic Training Program Objectives

1. Mission Planning
2. Pre-flight
3. Ground Operations
4. Takeoff
5. Departure
6. Enroute Navigation
7. Mission Maneuvers
8. Descent/Penetration
9. Approach
10. Landing
11. Shutdown
12. Post-flight
13. Emergency Procedures

- -

14. Aircraft Systems Functions
15. Naval Aviation Organization/Functions
16. NFO Mission Functions

2. Name of objective. Within each phase of flight certain major tasks or groupings of tasks can be identified as having some degree of qualitative or contextual unity. Generally, such groupings deal with larger behavioral entities, though some are fairly circumscribed in nature. These major tasks or groupings of tasks[1/] are used to label the training objectives contained in this report.

In developing such training objective labels or descriptors, a degree of arbitrariness is necessarily involved. Since the objectives were not an end in and of themselves, the principal characteristics of their labeling were

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[1/] As noted previously, the reader may prefer to think in terms of "subtasks" or "task elements." The purpose of the task classificatory schema used here was instructional development and not task classification, per se, or the understanding of fundamental task structure to which most tax taxonomic systems are relevant.

related to their instructional development use and their utility in the instructional process itself. Therefore, the first major characteristic was that the labels deal with groupings of tasks that were relatively meaningful major behaviors that were easily understood by both students and instructors. Secondly, it was desired that they have relatively easily identified beginning and end points. Third, the tasks grouped into an objective typically differed in qualitatively identifiable ways from other groupings coming before or after in the mission-event context. Finally, the great majority of the objectives relate to performatory tasks that occur in the aircraft or are related to mission accomplishment involving the aircraft. This feature is a product of the general phase of flight orientation of instructional activities in the revised program as previously mentioned.

As a result of this procedure, some objectives are rather diverse in nature and may involve a large variety of component tasks, both cognitive and non-cognitive. An example of such an objective is "Accomplish IFR Airways Mission Planning." In contrast, other objectives, e.g., "Occupy Assigned Crew Station," are much more restricted in nature and may be almost exclusively motor in their performance. The objectives all have in common the fact that they are tasks the SNFO must demonstrate competence in performing before exiting the Basic Training program, and most occur in the cockpit in the flight environment. The emphasis is heavily on demonstrating competence by <u>doing</u>, and only lightly on <u>talking about</u> doing.

Implicit in the title of each of the training objectives identified is the sense of words to the effect that "At the completion of NFO Basic Training, the SNFO will be able to . . ." Each of the objectives then begins with an action verb such as "accomplish," "use," "perform," etc. For the sake of brevity, the objective descriptors simply begin with the action verb and continue with the action object. The implicit material is not shown.

Many formats for presenting instructional objectives begin with a statement of conditions under which the student must demonstrate task performance. Thus, an objective might read, "Given a sectional chart, flight computer, and a flight plotter, the SNFO will . . ." The present listing does not include such statements of conditions under which the task is to be performed, because the conditions are those associated with the flight environment. The normal task setting is the aircraft, and the equipment and facilities available to the student are those normally present in the flight environment. The setting and equipment are described in various Navy publications. Therefore, to avoid undue bulk in documentation, and since conditions were already known to those using the objectives statement, conditions were not listed for the various objectives.

3. Components & Criteria. The next element of the training objective is the specification of the various component behaviors that the SNFO must perform to accomplish the overall objective unit. In addition, tolerances for the performance of each of these behaviors are specified whenever appropriate. The components are those tasks or behaviors that must be performed as a direct part of the overall objective, though their accomplishment may rest on other supporting or enabling skills or knowledge as discussed in the next section.

When and where possible, specific, objective, quantitative tolerances are specified for the performances (e.g., tolerances in time, direction, altitude, etc.). The intent is to specify the specific nature of acceptable and unacceptable performance as clearly and objectively as possible so that both instructional goals and evaluation standards are known. The performance tolerances were derived from a variety of sources. Many were already in use by the Navy in the existing course. Others were derived from various Navy publications and guidance documents, while still others had to be developed through consultations between HumRRO personnel and Navy personnel, generally the VT-10 instructors.

These criteria also provided the basis for development of performance measurement indices used in the revised course.

As noted, where possible and appropriate, objective tolerance limits were used. Thus, criterion statements such as "measure and record leg distance(s) ±1 mile" are common in the objective statements. In other instances, no error tolerance is given. For example, in the statement "compute and record total mission time," the component times for the various legs or other mission elements have been computed within their individual tolerances, e.g., ±1 minute, so the task of determining total mission time allowed no error over and above that allowed for its component parts. In such instances, the implicit intention is a zero error tolerance.

Finally, as in any system for classifying and describing complex task performance, there are some tasks or elements for which a degree of subjectivity is required in the specification of performance standards. An example might be the criterion statement "identify prominent landmarks along or near planned flight route." While it is possible, at least theoretically, perhaps to develop objective standards for any performatory task, in many instances it is scarcely worth the effort involved. In such cases, the decision to use a more subjective standard of performance becomes a matter of (1) the importance of the task or behavior to the overall task, and (2) a consensus as to the clarity of such standards and the reliability with which they may be enforced. In this kind of determination, both the previous technical experience with flight measurement problems of HumRRO personnel and the great depth of flight experience represented by the VT-10 instructor personnel were important.

4. Enabling Objectives. The final element of the training objective is the listing of the "enabling objectives." These are the supporting skills and knowledges that are necessary to accomplishing the various behaviors

specified under the components and criteria listing. While many enabling or bridging skills and knowledges are already possessed by the SNFO when he enters the program (e.g., the selection process would substantially guarantee that the trainee possess the basic arithmetical skills of addition, subtraction, multiplication and division), many others must be acquired specifically as a result of NFO Basic Training in order that the SNFO successfully execute the various criterion behaviors. For example, to perform on a given mission the criterion behavior of "compute and record estimated ground speed (EGS) ±5 knots" requires that the SNFO have mastered a number of enabling objectives dealing with airspeed, altitude, wind vector, and distance relationships. These enabling or supporting skills must be specifically taught the SNFO during his Basic Training. These enabling objectives, in turn, require mastery of other enabling objectives or skills such as the basic arithmetical skills mentioned. These latter, however, are not taught in the NFO Basic Training program because their existence is presume as a condition of entry for the program.[1/]

As can be seen from inspection of the training objective statements, the number of enabling objectives required in a given instance can be quite large, generally much larger than number of criterion statements. Also, the representation of the cognitive task domain is quite heavy in the enabling objective area. Most of the formal academic training in complex military training programs is related to such enabling objectives, and the NFO program is no exception. In many of these enabling objectives the verbs "known" and "understand" are implicit, as are standards of "correctly" and "without error." Again, the concern was in developing and documenting level of detail as required by the functional use to be made of the objective statements.

[1/] In some instances it may be necessary to provide remedial training in such areas, but such a requirement is exceptional.

Many of the enabling objectives underlie the performance of several different terminal objectives. For example, the supporting knowledge and skills required to solve time/distance problems in planning an IFR airways mission (Terminal Objective (TO 1.1) are essentially the same as those required to plan a dead reckoning mission (TO 1.2) or to accomplish a dead reckoning navigation mission (TO 7.1), etc. Therefore, in the listing of enabling objectives, such objectives will be listed generally only under the first terminal objective where they occur. In addition, it should be noted that due to the great overlap and commonality of enabling objectives for the four basic flight planning terminal objective areas (i.e., TOs 1.1, 1.2, 1.3 and 1.4), the enabling objectives for flight planning activities are all listed under TO 1.1 and are not repeated thereafter.

The preceding discussion of the objectives and their four elements of phase of flight, name of objective, criteria (for component tasks), and enabling objectives is presented to give the reader the information necessary to understanding the listing contained herein and the rationale for the format used. It must be kept in mind that the purpose of this listing was its internal-to-the-program usage. The listing was quite sufficient for that purpose, though it may be less suited to other specific purposes.

Discussion

There was no intention in the present project that an extensive redefinition of the goals of NFO training would be developed, such as might require the systematic gathering of NFO performance reuqirements from the fleet. These activities had already been considerably accomplished by the Navy and provided a starting point for the present effort. It was assumed that the bulk of the subject matter being taught in NFO Basic Training was relevant and responsive to Navy fleet requirements and that VT-10 flight mission requirements were

valid. The training objective development effort described here involved a detailed examination of the existing course instructional activities in order to state the objectives in a form appropriate to the development of the revised training course.

This process, of course, drew on many sources, including a wide variety of Navy documents and the various documents and material related to the existing course. The principal resources used by the HumRRO personnel in this process, though, were the instructors of Training Squadron Ten. Their experience, both in the instructional situation and in the fleet, was critical to the in-depth review of training activities, the teasing out of enabling objectives, the specification of performance standards, and the other activities that were necessary to the development of the training objectives. Additional valuable inputs were provided by personnel from Training Squadron 86, Training Wing Six, the Airborne Electronic Warfare School, CNATRA, and CNET. These inputs allowed the determination of the necessity of instructional material for NFO performance and the appropriateness of its inclusion in the NFO Basic Training curriculum.

In addition to serving needs related to developing the revised training program, such as devising sequences of instruction, defining program content, and performance measurement parameters, this analysis has had two major benefits for NFO program efficiency: (1) redundancy of formal exposure to certain subject matter will be reduced, and (2) the level of detail at which certain material is taught will be markedly reduced. One example of instructional redundancy may be seen in the course content concerned with instrument flight rules. There are at least three separate courses in the NFO program (Flight Rules and Regulations, Airways Navigation, and Instrument Ground School) which dwell heavily on instrument flight rules. This analysis has allowed an elimination

or reduction of this redundancy. The analysis has resulted also in much more limited training objectives pertaining to certain knowledge areas such as, for example, basic electricity and electronics. A limited knowledge of relevant electronics language and equipment is appropriate for NFO Basic Training, but the training objectives specified herein have eliminated much of the more detailed "basic" material in these areas as not being required for the actual tasks the NFO must perform.

It is with this overall background and orientation that these objectives were developed. They have defined the content of the revised training program developed in this project, and they represent a considerable amount of joint effort by the Navy and HumRRO. That effort and the objectives produced provide a good "need-to-know" basis for NFO Basic Training, a basis essential to effective ISD efforts.

SECTION II

Terminal Objectives Included In Revised NFO Basic Training Program

This section lists those training objectives that were agreed upon in the Navy-HumRRO review of early 1975 for inclusion in the revised program. As was noted in Section I, the Terminal Objectives listed in Section II cover both those objectives of the existing program that were agreed upon by the Navy and HumRRO for retention in the revised program and the new enabling objectives that were agreed upon for addition to the revised course.

Each objective has four basic parts or elements. These are phase of flight, name, components and criteria, and enabling objectives. The general format for each objective is as follows:

- Phase of Flight
  - Objective # - Terminal Objective Name or Descriptor
    - Component Tasks and Performance Criteria
    - Enabling Objectives

These four elements appear, as appropriate, for each objective. The last two ("components" and "enabling objectives") typically have multiple entries.

In order to aid reader access to the individual objective statements, pages II- through II- contain an index listing of the titles and objective numbers for all of the terminal objectives contained in Section II. This index shows: (a) objective number; (b) objective name or descriptor; and (c) the page number on which that objective begins.

For ease of reference, each terminal objective is assigned an objective number (see second order heading of sample format, above). These numbers have two elements separated by a decimal. The first element of the number designates the phase of flight, as was discussed in Section I of this report. The

second element identifies the objective by number within that phase of flight. For example, objective 1.4 refers to Phase of Flight #1, "Mission Planning" and the fourth of the seven objectives contained within that phase of flight. Objective 12.1 refers to the first objective listed in Phase 12, "Post-flight." To facilitate use of the following index, the 16 Phases of Flight used and the number of terminal objectives contained in each are shown in Table 2.

TABLE 2

Number of Terminal Objectives by Phase of Flight

PHASE OF FLIGHT		NUMBER OF OBJECTIVES
Number	Title	BY PHASE
1	Mission Planning	7
2	Pre-flight	5
3	Ground Operations	11
4	Takeoff	5
5	Departure	3
6	Enroute Navigation	9
7	Mission Maneuvers	14
8	Descent/Penetration	4
9	Approach	5
10	Landing	4
11	Shutdown	1
12	Post-flight	3
13	Emergency Procedures	3
14	Aircraft Systems Functions	4
15	Naval Aviation Organization/Functions	5
16	NFO Mission Functions	4

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10.2	Identify VFR Taxi, Takeoff, Re-entry and Traffic Pattern Procedures	II-96
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13.1	Identify Suitable Divert/Emergency Fields	II-102
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13.3	Identify Onset Cues and Read Appropriate Checklist Items for all Enroute NATOPS Emergency Procedures	II-104-105
14.1	Identify Elementary Terms and Functions of Digital Computers Relevant to Naval Aircraft	II-106-107
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Objective Number	Objective Name	Page(s)
14.3	Identify and Relate Certain Terms and Characteristics of Basic Electricity to Aircraft Components and Operations	II-109
14.4	Identify Principal Elements of the Automatic Carrier Landing System	II-110
15.1	Describe Squadron, Carrier Airwing, and Fleet Airwing Organizations and Their Interrelationship. Describe Marine Corps Airwing Organization.	II-111
15.2	Describe the Interface of Aircraft and Supporting Elements in the Operational Environment	II-112-113
15.3	Describe the Intelligence Cycle Including Collection, Processing and Dissemination	II-114
15.4	State the Use of SERE and SAR Teams	II-115
15.5	Describe Naval Aviation Safety Programs	II-116
16.1	State and Explain NFO's Missions in Various Squadrons	II-117
16.2	Identify Terms and Functions of Electronic Warfare in Naval Air Operations	II-118
16.3	Define Principal EW Methods (Active, Passive, and Counter-Counter)	II-119-120
16.4	Identify Principal NFO EW activities	II-121

- PHASE OF FLIGHT

1. Mission Planning

- OBJECTIVE

#	Name
1.1	Accomplish IFR Airways Mission Planning

- COMPONENTS & CRITERIA

1. Obtain and record airport and communications data
2. Obtain and record TACAN ID and channels
3. Determine and record magnetic course of legs
4. Determine and record distance of legs
5. Compute and record EGS for each leg (± 5 kts)
6. Compute and record ETE for each leg (± 1 min)
7. Compute and record total mission ETE
8. Compute and record EFR (± 100 lbs)

- ENABLING OBJECTIVES

1. Describe the contents of the Enroute Supplement
2. Use the Enroute Supplement to extract information pertaining to aerodromes, nav aids, Flight Service Stations, and Air Route Traffic Control Centers
3. Locate and recall weather information, pilot procedures, emergency procedures, ATIS information, runway condition readings, and other information in the Procedures Section of the IFR Enroute Supplement
4. Locate the Special Notices Section of the Enroute Supplement
5. List the types of Enroute Charts and list how many charts of each type are published
6. Extract pertinent information from chart legends
7. Define intersections on Enroute Charts
8. State the altitude limits for each type of Enroute Chart
9. Explain the scope of Flight Information Publications (FLIP)

TO 1.1 -- cont'd

ENABLING OBJECTIVES (cont'd)

10. List all FLIPs utilized in CONUS
11. List the sections of the FLIP planning document
12. State how often FLIP Enroute Charts (US coverage) are published and how they are updated between publications
13. Use FLIP publications to extract VFR & IFR mission data
14. Locate and apply the following information from the FLIP publications:
    a. Procurement and distribution
    b. NOTAM codes/abbreviations
    c. Definitions
    d. ACFT categories
    e. Conversion tables
    f. Aerodromes of entry/departure
    g. Meteorological data
    h. VOR receiver checkpoints
    i. Enroute preferred routing
    j. Pilot procedures
    k. ADIZ procedures
    l. Designated mountainous areas
    m. Special NOTAMS an procedures
    n. Terminal control areas
    o. Military training routes
    p. Special use airspace
    q. International rules
15. Extract fuel requirements from NATOPS Flight Manual
16. Identify the following:
    a. Controlled airspace
    b. Uncontrolled airspace
    c. Transition area
    d. Control area
    e. Control zone
    f. Airport traffic area
    g. Restricted area
    h. Warning area
    i. Intensive student jet training area
    j. Alert area
17. State the requirements for flight within a positive control area
18. Define limits of following subdivisions of controlled airspace:
    a. Airport traffic area
    b. Control zone
    c. Terminal control area
    d. Airway
    e. Continental control area
    f. Positive control area

ENABLING OBJECTIVES (cont'd)

19. State the minimum altitude and/or lateral distance by which the following area/objects must be avoided by a naval pilot:
    a. Cities
    b. Congested areas
    c. Resorts
    d. Disaster areas
    e. Wild-life haunts
    f. Fur/poultry farms
    g. All remaining surface terrain
    h. Vessels at sea
    i. Civil aircraft
20. State the requirements for flight through the five basic divisions of special use airspace:
    a. Danger area
    b. Alert area
    c. Warning area
    d. Restricted area
    e. Prohibited area
21. State the conditions under which one aircraft has the right-of-way over another
22. State the altitude limits of the Federal Airways System and the jet routes
23. State the horizontal dimensions of the low-altitude (Victor) airways
24. Locate the following items found on a Forrest Sherman Field map:
    a. Controlling facilities
    b. Runways
    c. Nav aids
    d. Arresting gear
    e. Approach aids
    f. Highest obstacles
25. State where information can be found concerning the following:
    a. Terminal control area
    b. Restricted area
    c. Prohibited area
    d. Warning area
    e. Intensive student jet training area
    f. Alert area
26. State the requirements for flight within an airport traffic area
27. Explain the purpose of the Air Defense Identification Zone
28. State the proper procedure for penetrating an ADIZ
29. Explain the allowable tolerances for adherence to an ADIZ flight plan

TO 1.1 -- cont'd

ENABLING OBJECTIVES (cont'd)

30. Indicate where information concening ADIZ procedures can be found in the FLIP publications
31. Define airport and identify runway lights, threshold lights, taxiway lights, and obstruction lights
32. Determine the wind direction from a lighted tetrahedron
33. State the purpose of an airport rotating beacon
34. State the responsibility of the control tower
35. Match Aldis lamp (airport traffic control) signals with their meanings in the air and on the ground
36. Diagram the location of lights used at an airport at night
37. State the basic function performed by FAA, ATC, ARTCC, APC, and FSS
38. State the relationship between OPNAVINST 3710.7 and FAR, Part 91
39. List who is subject to FAR, Part 91, and OPNAVINST 3710.7
40. Define pilot-in-command
41. State the two exceptions where responsibility for the flight may not rest with the pilot-in-command
42. State who receives a report of deviation and certificate of waiver
43. State when preflight planning is required
44. Define aircraft, airplane, and helicopter
45. List the safety requirements for starting a naval aircraft
46. List the equipment required for all crew members on naval aircraft
47. List when parachutes, life preservers, life rafts, and oxygen are required
48. Name the required aircraft lights and the times when they must be on
49. Determine your position in relation to another aircraft based only on visible position lights
50. List the mandatory reporting points
51. State and explain VFR procedures
52. Explain Navy policy governing the use of aircraft
53. Explain the functions of semi-circular rules
54. State the semi-circular rules for VFR and IFR flight below FL 290
55. Determine that forecast weather is within NATOPS/ OPNAV VFR/IFR minimums
56. Locate and extract information from the Pilot to Metro Weather Radar Chart and Procdures
57. Describe special VFR clearance and state to whom it applies

ENABLIHG OBJECTIVES (cont'd)

58. Locate and extract information pertaining to completing a DD 175, the definitions and abbreviations of aeronautical terms and pilot procedures
59. List the flight plan forms other than the DD 175 that may constitute a flight plan and state their uses
60. List those persons authorized to serve as clearance authority
61. Define the term: air navigation
62. List and define the four basic problems of navigation
63. Demonstrate an understanding of the concepts underlying dead reckoning navigation
64. Define the following terms:
    a. Agonic line
    b. Calibrated airspeed
    c. Compass error
    d. Compass heading
    e. Course
    f. Deviation
    g. Drift
    h. Free air temperature
    i. Groundspeed
    j. Indicated airspeed
    k. Indicated temperature
    l. Isogonic line
    m. Mach number
    n. Magnetic heading
    o. Track
    p. True airspeed
    q. True heading
    r. Variation
    s. Wind
65. State how aircraft position is determined relative to the known position such as visual reference, radio beacon, TACAN, VOR station, or celestial body
66. State how "aircraft position" or "fix" position may be described in terms of range and/or bearing from one or two objects
67. Define bearing, explain how it is measured, and name the reference lines used in its determination
68. Define range
69. Demonstrate ability to determine certain of the following when certain others are known:
    a. Relative bearing
    b. Magnetic bearing
    c. True bearing
    d. Magnetic heading
    e. True heading
    f. Variation

ENABLING OBJECTIVES (cont'd)

70. Demonstrate knowledge of the "clock code" and how it relates to relative bearing and to true or magnetic bearing
71. Explain how to construct a DR position for a no-wind position
72. Explain how to control aircraft arrival time over a point
73. Explain how to advance and retard LOPs to a common fixed time
74. Utilize navigational aids to provide LOPs
75. Discuss necessity of maintaining no-wind and DR plots
76. Describe the plotting of an estimated position
77. State what information can be obtained from constructing an LOP nearly parallel to or nearly perpendicular to a course line
78. State what information is necessary in order to construct a no-wind position
79. Select navigation aids properly in order to obtain a fix, course line, or speed line.
80. Plot checkpoints and true courses
81. Determine magnetic courses
82. Recognize navigation flight planning chart symbols
83. Utilize navigation chart(s) to identify landmarks and symbols that will confirm tracks
84. Define the following terms:
    a. Great circle
    b. Small circle
    c. Rhumb line
    d. Latitude
    e. Meridian
    f. Longitude
    g. Equator
    h. Undevelopable
85. Show where course and distance are measured on a Lambert conformal chart
86. Show where course and distance are measured on a Mercator chart
87. Measure direction and distance on the Lambert conformal and Mercator chart
88. Explain the difference between a small-scale and a large-scale chart
89. Choose proper chart scales for a particular flight mission
90. Locate, plot, and define positions using a grid reference system
91. Demonstrate proper handling procedures and care of plotters, dividers, pencils, and charts

ENABLING OBJECTIVES (cont'd)

92. Define the following:
    a. Fix position
    b. Estimated position
    c. Dead reckoning position
    d. No-wind position
    e. Course
    f. Track
93. State the functions of the plotters and dividers
94. Plot, using the proper symbol, the following:
    a. Fix position
    b. Estimated position
    c. Dead reckoning position
    d. No-wind position
    e. Course
    f. Track
    g. Base
    h. Airplot wind vector
95. Explain how wind affects the heading and groundspeed of an aircraft
96. Solve for true heading from course and drift
97. Solve for course from true heading and drift
98. Solve for drift from true heading and course
99. Solve for Mach number from calibrated airspeed and pressure altitude
100. Solve for Mach number from true airspeed and temperature
101. Solve for true airspeed from Mach number and temperature
102. Solve for true heading and groundspeed from course, true airspeed, and wind
103. Solve for course and groundspeed from true heading, true airspeed, and wind
104. Solve for true heading and true airspeed from course, groundspeed, and wind
105. Solve track/groundspeed wind solution
106. State the names of the basic components of the navigation computer
107. Compute estimated ground speeds and magnetic headings
108. Compute ETE(s)
109. Compute EFR for mission
110. Solve time, distance, and speed problems
111. Solve fuel consumption problems
112. Solve distance conversion problems
113. Solve temperature conversion problems
114. Solve for true airspeed from calibrated airspeed, pressure altitude, and temperature
115. Solve for calibrated airspeed from true airspeed, pressure altitude, and temperature

ENABLING OBJECTIVES (cont'd)

116. Select Nav aids to get either a course line or speed line estimated position
117. Plot various courses and compute headings to fly these courses, using the CR-2/3 computer
118. Demonstrate how to compensate for wind to fly a specific course and distance
119. Perform the following radio navigation operating procedures:
    a. Preflighting
    b. Tuning
    c. Obtaining a bearing
    d. Identifying station signals
120. Select correct navigation aids to obtain a fix
121. Define VOR
122. Define radial
123. Differentiate between radial and bearing
124. State two characteristics of the VHF spectrum
125. Locate and identify the functional parts of the VOR navigational system
126. List two indicators that receive inputs from the VOR receiver
127. Recognize the cone of confusion and discuss its effect on VOR reception
128. Locate and identify the course indicator function controls
129. List the nav aids which provide inputs to the course indicator
130. Discuss correct procedures for using the course indicator
131. Interpret aircraft position, heading, and course indication using the course indicator
132. Describe the procedure for tuning and identifying a VOR station
133. Recognize the major limitation of the VHF spectrum
134. Define TACAN
135. List the instruments that obtain inputs from the TACAN receiver
136. Name the major limitations of TACAN, including 40^{o} lock-off
137. Name and describe the location of the component parts of a TACAN system
138. Name the characteristics of the UHF spectrum that most severely limits TACAN range
139. State the procedure utilized to tune and identify a TACAN station
140. Explain how ranging information is generated by TACAN
141. State the information obtained in each mode of TACAN operation

ENABLING OBJECTIVES (cont'd)

142. State TACAN/VOR changeover procedures
143. Determine radial and distance from a TACAN station by analysis of aircraft instrument presentations
144. Locate and identify the component parts of the RMI/BDHI indicator
145. State what information is made available by the RMI/BDHI, and specify which information is provided by which component
146. List the nav aids which provide inputs to the RMI/BDHI
147. State how a malfunction of the aircraft compass system can affect the RMI/BDHI
148. Determine aircraft position and heading utilizing the RMI/BDHI
149. Explain the operation of a UHF ADF receiver
150. Explain the use and identification of compass locators
151. Interpret ADF, VOR, TACAN, and ILS indicators
152. Explain the operation of the AAI and HSI
153. Locate and identify the component parts of the ADF receiver
154. List the indicators that receive inputs from the ADF receiver
155. List those publications in which ADF frequencies can be found
156. Explain how bearing information is generated in ADF, TACAN, Loran, and LOC/ILS
157. State what type of bearing is generated by ADF, VOR, and TACAN
158. Recall the frequency range within which ADF, VOR, TACAN, ILS, and Loran operate
159. List the basic compass system and the errors associated with each
160. List the advantages and disadvantages of each compass system
161. Determine the heading indications of the most commonly used compass indicator
162. Name the types of headings provided by the gyro compass system, and state the uses of each
163. List the advantages and disadvantages of the magnetic compass as a heading reference
164. List the advantages and disadvantages of the directional gyro as a heading reference
165. List the two major components of the modern aircraft compass system
166. State the advantage of the modern aircraft compass system over both directional gyros and magnetic indicating devices

ENABLING OBJECTIVES (cont'd)

167. State the conditions under which each mode of the modern aircraft compass system would be used
168. List the names of the various equipments which utilize FRS information
169. Explain how the platform to which the INS is attached is able to remain horizontal to the earth's surface and oriented at all times
170. Explain the function of the static pressure compensator
171. Discuss the following gyro phenomena:
    a. Gyro drift
    b. Apparent precession
    c. Gimbal lock
172. Define FREE GYRO
173. Name the two inputs of which all outputs of the ADC are a function
174. Label a block diagram showing the inputs and outputs of the ADC
175. Explain how heading information is obtained in the three modes of operation of the modern aircraft compass system
176. Discuss the various parts of an AAI, HSI, VOR, TACAN, and ADF and their functions
177. Explain the relation between the flight reference system and the aircraft compass system
178. State to what the flight reference set is oriented
179. List four outputs of the flight reference set
180. List the outputs of the flight reference set to the following components:
    a. Integrated electronics central (IEC)
    b. Horizontal situation indicator (HSI)
    c. All attitude indicator (AAI)
    d. Radar antenna
    e. Doppler
    f. Automatic flight control system (AFCS)
    g. Navigational computer
181. List the advantages and limitations of the various types of altitude
182. Explain how pressure varies with respect to altitude and temperature
183. Solve heading computations using compass heading, magnetic heading, true heading, variation, and deviation
184. Explain how indicated airspeed, calibrated airspeed, true groundspeed, and Mach number are related and determined
185. Explain the function of the pitot-static system
186. Identify the component parts of a typical airspeed indicator system

ENABLING OBJECTIVES (cont'd)

187. Explain the operation of a typical airspeed meter
188. Explain the operation of a typical barometric altimeter
189. Name the component parts of a radar altimeter
190. Name the component parts of the barometric altimeter
191. Define CAS, TAS, Mach number
192. Convert Mach number into groundspeed equivalent under no-wind conditions
193. Determine the airspeed and Mach number indications of a typical airspeed indicator
194. State the type of altitude provided by a radar altimeter
195. State the advantages and disadvantages of radar and barometric altimeters.
196. Determine the altitude indications of various simulated altimeters
197. Define the term, altitude
198. List the reference for true, calibrated, pressure, and absolute altitude
199. List applications of each type of altitude information
200. Explain the effect of pressure changes when the Kollsman window setting is not current
201. Determine altimeter error and maximum allowable error
202. Determine local altimeter setting, given barometric pressure and field elevation
203. Define the following terms:
    a. Static margin
    b. Neutral point
    c. Mean aerodynamic chord
    d. Center of gravity
    e. Aerodynamic center
    f. Gross weight
    g. Basic weight
204. Describe the effect of the center of gravity being located forward of the aerodynamic center or behind the neutral point
205. Define the following terms:
    a. Bingo
    b. Endurance
    c. Range
    d. Maximum power
    e. Military power
    f. Combat rated thrust
    g. Military rated thrust
206. Determine the extra fuel required in series for prop or jet aircraft

TO 1.1 -- cont'd

ENABLING OBJECTIVES (cont'd)

207. Define the free air temperature correction
208. Describe and use the following charts:
    a. Military thrust setting takeoff
    b. Takeoff and landing crosswind chart
    c. Critical field length
    d. Takeoff ground roll
    e. Air distance (two engines) from liftoff to clear 50 feet
    f. Air distance (one engine) from liftoff to clear 50 feet
    g. Refusal speed
    h. Military and normal thrust climb, two engines
    i. Military and normal thrust climb, single engine
    k. Operational range profiles
    l. Maximum range profile
    m. Bingo chart
    n. Descents, maximum range, or minimum time
    o. Landing distance over obstacle
    p. Landing distance ground roll
    q. Nautical miles per pound of fuel
209. Use 1D-23 student briefing guide to extract all radar nav mission data
210. State the three basic classifications of radar
211. State the four basic advantages of radar systems and give an example of how each is used
212. Name the three types of radar energy transmission and give an example of how each is used
213. Define the term "radar range mile"
214. Demonstrate understanding of how a radar measures range by computing radar ranges when given the total time radar pulses/echoes travel
215. State the relationship between beam width and radar bearing accuracy
216. Describe the six characteristics which determine overall performance of a pulse radar system
217. Name the two variables affected by the pulse characteristics
218. Name the three radar capabilities determined by the carrier frequency of the radar
219. Name the six elements common to all pulse radar systems
220. Describe briefly the function of each of the six elements
221. Name the two basic elements of the pulse radar transmitter
222. Label certain pulse radar transmitter wave forms

TO 1.1 -- cont'd

ENABLING OBJECTIVES (cont'd)

223. Describe the two methods of transferring electromagnetic energy
224. Describe the three forms of transmission lines
225. Name the form of transmission line used for radar electromagnetic energy
226. State the three advantages and two disadvantages of waveguides
227. State the two requirements which a radar antenna must fulfill and describe the interrelationship between the two
228. Describe the function of a radar antenna reflector
229. List and describe the four most common types of radar antenna reflectors
230. Match a list of radar antenna reflector configurations with their primary uses and the shape of the beam of radar energy they reflect
231. Describe the five major radar antenna scan patterns and state a utilization for each
232. Name the four basic requirements of a radar receiver
233. Name the four basic types of indicator scans
234. Draw the four basic scope presentations and state how each is used and the information available
235. Define the following:
    a. Range delay
    b. Altitude delay
    c. Depressed center
236. Draw a radarscope representation of a radar indicator that is depicting:
    a. Range delay
    b. Altitude delay
    c. Depressed center
237. Explain the function of AFC
238. Explain the function of FTC
239. Explain the function of STC
240. Explain the function of AGC
241. State the advantages of each of the aforementioned giving an example of the conditions which might exist which would make their utilization necessary
242. Describe a ground stabilized display presentation.
243. Name the two inputs necessary to allow a radar to present a ground stabilized display
244. Discuss the need for a special environmental control system to control pressurization, temperature, and humidity of an airborne radar

ENABLING OBJECTIVES (cont'd)

245. Relate the antenna location to type and mission of aircraft
246. State why it is necessary to stabilize antenna platforms for various types of airborne radar
247. State the primary reason for the development of the IFF system
248. Briefly describe how an IFF system works
249. Explain the operation of a typical transponder control box
250. Describe the principle of FM radar ranging
251. List two uses of FM ranging
252. Describe the advantages, disadvantages, and limitations of various FM systems
253. State the reason for the use of moving target indicators (MTI)
254. State the two main disadvantages of MTI
255. Name the two types of MTI and state which type is primarily used in airborne radars
256. Describe the methods by which MTI operates
257. State the function of the "fixed target" returns in noncoherent MTI
258. Define "blind velocity "
259. State the function of the FAA Air Control Agency
260. Name the two radar environments under control of the FAA
261. Describe the functions of each of the two environments
262. Describe IFF/radar tracking
263. Name the two types of radar approaches
264. State the main differences between the two approaches
265. State the function of the side-looking radar
266. Recall the meaning of the acronym: laser
267. List three applications of lasers
268. Define infrared radiation
269. State four applications of infrared radiation in naval aviation
270. Recall the words for which "radar" is an acronym
271. Discuss the uses of pulse radar systems as to installation, their inherent characteristics, advantages, and disadvantages

○ PHASE OF FLIGHT

1. Mission Planning

○ OBJECTIVE

#	Name
1.2	Accomplish Dead Reckoning (DR) Navigation Mission Planning

● COMPONENTS & CRITERIA

1. Determine if forecast weather will permit DR mission
2. Plot all check points (± 1 mile)
3. Draw true course(s)
4. Measure true course(s) (± 2°)
5. Determine magnetic variation
6. Determine and record magnetic course(s) (± 2°)
7. Determine and record leg distance(s) (± 1 mile)
8. Obtain forecast winds
9. Compute and record EGS (± 5 kts)
10. Compute drift angle and EMH (± 2°)
11. Compute and record ETE for each leg (± 1 min)
12. Compute and record total mission ETE
13. Compute and record EFT for mission
14. Identify nav aids along route for LOP utilization
15. Identify prominent landmarks along or near planned flight route
16. Obtain and record communications data
17. Obtain and record airport elevation

● ENABLING OBJECTIVES

As stated in TO 1.1

- PHASE OF FLIGHT

1. Mission Planning

- OBJECTIVE

#	Name
1.3	Accomplish Radar Navigation Mission Planning

- COMPONENTS & CRITERIA

1. Plot all check points (± 1 mile)
2. Draw true course(s)
3. Determine true course(s)
4. Determine magnetic variation
5. Determine and record magnetic course(s) (± 2°)
6. Determine and record leg distance(s) (± 1 mile)
7. Obtain forecast winds
8. Compute and record EGS (± 5 kts)
9. Compute drift angle and EMH (± 2°)
10. Compute and record ETE for each leg (± 1 min)
11. Compute and record total mission ETE
12. Compute and record EFR per leg (± 100 lbs)
13. Identify prominent landmarks along or near planned flight route
14. Obtain and record communication data
15. Obtain and record airport elevation

- ENABLING OBJECTIVES

As stated in TO 1.1

- PHASE OF FLIGHT

1. Mission Planning

- OBJECTIVE

#	Name
1.4	Accomplish Medium Altitude, Low Speed Visual Navigation Mission Planning

- COMPONENTS & CRITERIA

1. Determine if forecast weather will permit VFR mission
2. Plot all check points (± 1 mile)
3. Draw true course(s)
4. Measure true course(s) (± 2°)
5. Determine magnetic variation
6. Determine and record magnetic course(s) (± 2°)
7. Determine and record leg distance(s) (± 1 mile)
8. Obtain forecast winds
9. Compute and record EGS (± 5 kts)
10. Compute drift angle and EMH (± 2°)
11. Compute and record ETE for each leg (± 1 min)
12. Compute and record total mission ETE
13. Compute and record EFR per leg (± 100 lbs)
14. Identify prominent landmarks along or near planned flight route

- ENABLING OBJECTIVES

As stated in TO 1.1

- PHASE OF FLIGHT

1. Mission Planning

- OBJECTIVE

#	Name
1.5	Obtain and Employ Pre-flight Weather Briefing (DD 175-1)

- COMPONENTS & CRITERIA

1. Recognize hazardous weather conditions during departure, enroute, and approach phases of flight
2. Determine that departure, enroute and destination forecast ceiling, visibility, and turbulence are within mission safety limits
3. Determine if alternate airport is required
4. Read and interpret aviation hourly sequence reports, winds aloft charts, area forecast reports, radar summary charts, and general enroute weather charts
5. Determine if mission can be accomplished; if not, when is it forecast feasible

- ENABLING OBJECTIVES

1. Interpret meteorological symbols on DD 175-1 and their significance to mission
2. Determine enroute winds
3. Identify hazardous conditions such as icing, surface fog, thunderstorms, wet runways
4. Determine departure, destination, and alternate airport approach minima
5. Explain meaning of term VFR
6. Define six sky coverage terms
7. State what weather phenomena constitute a ceiling
8. Define term visibility
9. State takeoff and landing minimums for VFR flight
10. State minimum cloud clearances
11. Recall five hazards to aviators due to weather
12. Identify scales used to measure surface temperature and temperatures aloft
13. Equate Fahrenheit and Centigrate and vice-versa

ENABLING OBJECTIVES (cont'd)

14. State standard sea-level temperature in Fahrenheit and Centigrade
15. Compare density of hot and cold air and effects of temperature on takeoff roll
16. Identify process by which the earth's atmosphere is heated
17. Define atmospheric pressure
18. Identify where air density is greatest
19. Name two units to measure atmospheric pressure
20. Recognize two most common instruments of measuring atmospheric pressure
21. Recognize and differentiate three types of atmospheric pressure; station, sea level, and standard
22. Equate standard level pressure in millibars to inches of mercury
23. Determine how temperature variations and high and lows effect atmospheric pressure
24. Identify what type of barometric device an altimeter is an example of
25. Recognize how highs and lows are determined
26. State primary use of surface weather map in flight planning
27. Identify precipitation types with definitions
28. Identify clouds and weather associated with typical warm front
29. Indicate location of frontal fog band
30. Indicate location of frontal precipitation band
31. Indicate location of frontal cloud band
32. Indicate direction and speed of movement of surface front
33. Indicate danger of embedded warm front thunderstorms
34. Identify dangerous icing regions of a winter warm front
35. Define term "occluded front"
36. Recognize weather symbol and color for an occluded front
37. Recall speed and direction of movement of a typical occluded front
38. Recall effect passage of an occluded front has on barometric pressure
39. Name and locate upper fronts associated with occlusions and identify their colors on weather map
40. Recall difficulties of identifying occlusions from an aviator's vantage point
41. Recall location of most violent weather in an occlusion
42. Identify typical weather of an occlusion when approached from east or west

ENABLING OBJECTIVES (cont'd)

43. Recall wind shift associated with passage of an occluded front
44. Define terms "stationary front" and "quasi-stationary front", and speed of movement
45. Identify color and weather symbol of a stationary front on a weather map
46. Recall wind shift associated with passage of a stationary front
47. Identify typical weather associated with stationary fronts
48. Identify clouds and weather associated with typical cold front
49. Indicate direction and speed of movement of typical cold front and two basic reasons why it will move in this direction in the northern hemisphere
50. Indicate barometric pressure change which will occur as typical cold front approaches and passes a surface station
51. Indicate wind shift which accompanies frontal passage of typical cold front
52. Indicate temperature contrast ahead and behind typical cold front
53. Identify flight conditions associated with stable and unstable air masses and cloud types, cumuliform or stratiform
54. Name most typical prefrontal weather and identify its characteristics
55. Indicate primary factors which will determine prefrontal weather associated with typical cold front
56. Identify typical post-frontal weather associated with the cold front
57. Recognize meteorological conditions necessary for formation of aircraft icing
58. Name two basic types of icing
59. Recognize normal temperature ranges of the two basic types of icing
60. Name and identify the effects of the type of icing affecting jet engines
61. Identify hazards of icing
62. Recognize the hazard of frost on aircraft
63. Define sleet and its effect on aircraft
64. Define freezing rain and its effect on aircraft
65. Identify type of icing peculiar to cumulus clouds
66. Identify type of icing peculiar to stratus clouds
67. Identify effect airfoil shape has on rate of ice accumulation

TO 1.5 -- cont'd

ENABLING OBJECTIVES (cont'd)

68. Identify the effect airspeed has on rate of ice accumulation
69. Define anti-icing equipment and when used
70. Define de-icing equipment and when used
71. Recognize potential danger of encountering hail in flight
72. Map out gradient wind flow around highs and lows
73. State method of indicating pressure systems and fronts
74. List prevailing winds for 0^{o}-30^{o}, 30^{o}-60^{o}, and 60^{o}-90^{o} north latitude
75. Define an isobar
76. Name one semipermanent pressure system located at approximately 0^{o}, 30^{o}, 60^{o}, or 90^{o} north latitude
77. Repeat the definition of a thunderstorm
78. List four requirements for thunderstorm development
79. Compare each stage of cellular development with identifying characteristics
80. Recognize four flight hazards associated with thunderstorms
81. Recognize the most important rule about thunderstorms
82. Identify the portion of storm, including stage of development producing most violent weather
83. Compare a single cell buildup to a multicell thunderstorm
84. Recall two main classifications of thunderstorms
85. Identify portion of thunderstorm for best penetration
86. Name best instruments for aircraft attitude control and to indicate possiblilities of icing
87. Recognize recommended penetration procedures for pilot and aircraft
88. Define a hurricane
89. Recognize region of a hurricane which would produce the most violent weather
90. Recall average life span and seasons of hurricanes
91. Define a tornado
92. Compare tornadoes and waterspouts
93. Recall in which type weather most tornadoes occur
94. Define fog
95. List two processes by which fog forms
96. List three conditions for formation of fog
97. State conditions for formation of five basic types of fog
98. Name primary method of dissipating five types of fog
99. Identify flight hazards associated with fog
100. Map surface winds in relation to gradient winds
101. Indicate frontal slope and positions of warm and cold air masses

TO 1.5 -- cont'd

ENABLING OBJECTIVES (cont'd)

102. Name sources of information for surface analysis chart
103. State method of indicating pressure systems and fronts
104. Identify following information presented on the station model:
    a. Name, types, symbol and abbreviation of clouds
    b. Sky cover
    c. Barometric pressure and pressure tendency
    d. Temperature and dew point
    e. Visibility
    f. Present weather
    g. Wind
105. Name primary use of surface analysis chart in flight planning
106. Identify precipitation types with definitions
107. Identify type of weather associated with steep and shallow fronts
108. Indicate forecast period if applicable (Weather Depiction Charts)
109. Indicate teletype identifiers, if applicable (Weather Depiction Charts)
110. Indicate its use in flight planning (Weather Depiction Charts)
111. Read and interpret the presentation (Weather Depiction Charts)
112. Indicate whether presentation is observed or forecast (Radar Summary Charts)
113. Indicate forecast period, if applicable (Radar Summary Charts)
114. Indicate teletype identifiers, if applicable (Radar Summary Charts)
115. Indicate its use in flight planning (Radar Summary Charts)
116. Read and interpret the presentation (Radar Summary Charts)
117. Indicate whether presentation is observed or forecast (Freezing Level Chart)
118. Indicate its use in flight planning (Freezing Level Chart)
119. Read and interpret presentation (Freezing Level Chart)
120. Indicate whether presentation is observed or forecast (Winds Aloft Chart)
121. Indicate forecast period, if applicable (Winds Aloft Chart)
122. Indicate teletype identifiers, if applicable (Winds Aloft Chat)

TO 1.5 -- cont'd

ENABLING OBJECTIVES (cont'd)

123. Indicate its use in flight planning (Winds Aloft Chart)
124. Read and interpret the presentation (Winds Aloft Chart)
125. Indicate whether presentation is observed or forecast (Constant Pressure Charts)
126. Indicate forecast period, if applicable (Constant Pressure Charts)
127. Indicate teletype identifier, if applicable (Constant Pressure Charts)
128. Indicate its use in flight planning (Constant Pressure Charts)
129. Read and interpret presentation (Constant Pressure Charts)
130. Indicate whether presentation is observed or forecast (Area Forecasts)
131. Indicate forecast period, if applicable (Area Forecasts)
132. Indicate teletype identifiers, if applicable (Area Forecasts)
133. Indicate its use in flight planning (Area Forecasts)
134. Read and interpret the presentation (Area Forecasts)
135. Indicate whether presentation is observed or forecast (Area Forecasts)
136. Indicate forecast period, if applicable (In-flight Weather Advisories)
137. Indicate teletype identifiers, if applicable (In-flight Weather Advisories)
138. Indicate its use in flight planning (In-flight Weather Advisories)
139. Read and interpret presentation (In-flight Weather Advisories)
140. Indicate where in-flight advisories may be obtained while enroute
141. Indicate whether presentation is observed or forecast (Severe Weather Forecasts)
142. Indicate teletype identifier, if applicable (Severe Weather Forecasts)
143. Indicate forecast period, if applicable (Severe Weather Forecasts)
144. Indicate its use in flight planning (Severe Weather Forecasts)
145. Read and interpret presentation (Severe Weather Forecasts)
146. Indicate whether presentation is observed or forecast (Severe Weather Forecasts)

ENABLING OBJECTIVES (cont'd)

147. Indicate transmission schedule
148. Indicate forecast period, if applicable (Pilot Reports)
149. Indicate teletype identifier, if applicable (Pilot Reports)
150. Indicate its use in flight planning (Pilot Reports)
151. Read and interpret presentation (Pilot Reports)
152. Indicate whether presentation is observed or forecast (Winds Aloft Forecasts)
153. Indicate teletype identifier, if applicable (Winds Aloft Forecasts)
154. Indicate its use in flight planning (Winds Aloft Forecasts)
155. Indicate whether presentation is observed or forecast (Terminal Forecast)
156. Indicate forecast period (Terminal Forecast)
157. Identify teletype identifier (Terminal Forecast)
158. Indicate use of terminal forecast in flight planning
159. Indicate minimum below which a pilot must file for an alternate (Terminal Forecast)
160. Indicate differences between military and U. S. Weather Bureau terminal forecast
161. Read and interpret terminal forecast
162. Identify teletype identifier "SA"
163. Recognize SAs by their commonly known names
164. Differentiate between military and civialian SAs
165. Recognize types of SAs by their designators
166. Identify basic parts in body of an SA
167. Identify sky condition and ceiling designators
168. Identify coded cloud heights in an SA
169. Identify visibility in an SA
170. Identify basic weather symbols for precipitation and obstructions to visibility
171. Identify wind information in an SA
172. Identify altimeter setting in an SA
173. Identify names of many items frequently found in the remarks section of an SA
174. Identify clouds and weather associated with the typical cold front
175. Identify clouds and weather associated with the typical warm front
176. Identify characteristic weather associated with the typical occluded and stationary front
177. Indicate the danger of embedded warm front thunderstorms

TO 1.5 -- cont'd

ENABLING OBJECTIVES (cont'd)

178. Identify dangerous icing regions of a winter warm front
179. Identify flight conditions associates with stable and unstable air masses and cloud types, cumuliform and stratiform
180. Name the most typical prefrontal weather and identify its characteristics
181. Indicate direction and speed of movement of various typical fronts as they move across the United States
182. Indicate primary factors which will determine prefrontal weather associated with the typical cold front

- PHASE OF FLIGHT

1. Mission Planning

- OBJECTIVE

#	Name
1.6	Complete and File DD Form 175 IFR Flight Plan

- COMPONENTS & CRITERIA

1. Record required information for each block
2. File with approved authority

- ENABLING OBJECTIVES

1. Aircraft call sign, bureau and organization number
2. Type of flight plan to select
3. Proposed route of flight
4. Alternate airport requirements
5. Record other information required
6. Filing regulations
7. State semi-circular rules for VFR and IFR flight above FL 290
8. Explain pilot procedures and particularly ATC requirements as they relate to the following airspace:
   a. Low altitude airways
   b. Jet route system
   c. Positive control areas
   d. Jet advisory areas
   e. High altitude area system
9. Explain limitation imposed by navigational aid service volume on filing for direct legs in low altitude airway and jet route system
10. Explain the following terms:
    a. MEA
    b. MRA
    c. MOCA
    d. MCA

TO 1.6 -- cont'd

ENABLING OBJECTIVES (cont'd)

11. Apply planning procedures contained in FLIP Section II to DD Form 175 as pertains to:
    a. Single leg flight plans
    b. Stopover flight plans
    c. Composite flight plans
12. Understand definitions of following as pertains to DD Form 175:
    a. ETE (IFR)
    b. ETE (VFR)
    c. ETE (composite)
    d. Distance to destination (IFR)
    e. Distance to destination (VFR)
    f. Flight plan void time
13. Select an appropriate initial cruising altitude for IFR and VFR flight plans
14. List aircraft equipment required for IFR flight
15. State IFR procedures to include:
    a. Takeoff minimums
    b. Weather criteria for commencing an approach
    c. Final approach abnormalities
16. Explain in flight authorization, planning, and approval to include the following:
    a. Documentation of flights
    b. Minimum crew requirements
    c. Flight plans
    d. Manifest requirements
    e. Weather briefing
    f. Weather criteria for filing
    g. Minimum fuel requirements
    h. Weight and balance
    i. Flight plan approval
    j. Closing of flight plan
17. State OPNAVINST 3710.7 (series) minimum fuel requirements for VFR flight
18. Explain meaning of term IFR
19. State when an alternate is required for an IFR flight
20. State the two types of instrument ratings which may be held by a naval pilot
21. State IFR takeoff minimums and basis for determining IFR destination minimums.
22. State OPNAVINST 3710.7 (series) minimum fuel requirements for IFR flights

- PHASE OF FLIGHT

1. Mission Planning

- OBJECTIVE

#	Name
1.7	Accomplish Preflight Mission Briefing

- COMPONENTS & CRITERIA

1. Review flight planning navigation log, chart(s), DD 175 data, departure and total mission time, etc.
2. Review forecast weather (DD 175-1)
3. Determine crewman positions and job tasks
4. Explain and demonstrate mission communications content and sequence
5. Explain and demonstrate mission purpose (VN, DR, Airway navigation, AGM, etc.)
6. Explain and/or demonstrate mission departure, enroute, and arrival procedures
7. Advise of mission debriefing

- ENABLING OBJECTIVES

1. How to transmit mission data to other crewmembers
2. Mission procedures
3. Crewmember's job tasks and interactions during flight

- PHASE OF FLIGHT

2. Pre-flight

- OBJECTIVE

#	Name
2.1	Use Aircraft Maintenance Forms (Yellow Sheet) to Determine if Aircraft Ready for Flight

- COMPONENTS & CRITERIA

1. Note any discrepancies which have not been corrected
2. Note any major component replacements in the last ten flights
3. Note current fuel and oil servicing levels
4. Fill out name and social security account number in proper section

- ENABLING OBJECTIVES

1. Maintenance forms procedures

- PHASE OF FLIGHT

2. Pre-flight

- OBJECTIVE

#	Name
2.2	Obtain and Inspect Personal Flight Equipment

- COMPONENTS & CRITERIA

1. Inspect following personal flight equipment for flight safety requirements:
   a. Parachute
   b. G Suit
   c. Headsets
   d. Torso Harness,

- ENABLING OBJECTIVES

1. Flight equipment requirements

- PHASE OF FLIGHT

2. Pre-flight

- OBJECTIVE

#	Name
2.3	Perform Aircraft Pre-flight Inspection

- COMPONENTS & CRITERIA

1. Perform preflight tasks, using NATOPS checklist, in proper sequence
2. Determine if items checked are within safe flight limits and that aircraft is safe for flight
3. Document all unacceptable items on aircraft maintenance forms

- ENABLING OBJECTIVES

1. Use of NATOPS checklist
2. Location and function of all items in NATOPS checklist
3. Where to look for leaks, security of cowling, FOD damage
4. Acceptable limits for items on NATOPS pocket checklist
5. Document unacceptable or deficient items
6. Describe use and effect of flight controls
7. State number of fuel tanks, their location, and total usable fuel capacity

- PHASE OF FLIGHT

2. Preflight

- OBJECTIVE

#	Name
2.4	Perform Crew Station Pre-flight Inspection

- COMPONENTS & CRITERIA

1. Check all preflight items using the NATOPS checklist
2. Determine that all items are within safe limits

- ENABLING OBJECTIVES

1. Use of NATOPS checklist
2. Location and function of all items in NATOPS checklist
3. State normal and refill pressure of walk around bottle and discuss how to refill in aircraft

- PHASE OF FLIGHT

2. Pre-flight

- OBJECTIVE

#	Name
2.5	Occupy Assigned Crew Station

- COMPONENTS & CRITERIA

1. Connect all fittings, hoses, straps, and radio/ICS leads
2. Adjust seat

- ENABLING OBJECTIVES

1. Face curtain and alternate firing handle
2. Shoulder straps
3. Lap straps
4. G suit hose connector
5. Inertia reel
6. Oxygen hose and radio leads
7. Discuss use of oxygen regulator and preflight checks for regulator and O_2 mask
8. Demonstrate ejection seat inspection
9. Explain canopy operation
10. Understand canopy defrost and operation

- PHASE OF FLIGHT

3. Ground Operations

- OBJECTIVE

#	Name
3.1	Accomplish Pre-start through Pre-taxi Checklists

- COMPONENTS & CRITERIA

1. Read checklist items clearly in sequence at proper time
2. Observe pilot's actions (when possible) and note verbal responses
3. Report deviations from correct actions or responses

- ENABLING OBJECTIVES

1. Read pre-start checklist
2. Location and normal operation of all checklist items
3. Name two types of electrical power generating devices found in naval aircraft
4. State advantages/disadvantages of two types of electrical power generating devices in naval aircraft
5. Name two types of emergency power sources found in naval aircraft
6. Define "electrical bus"
7. State reason why aircraft electrical power distribution systems have more than one bus for each supplied voltage
8. Explain, in general terms, what happens in electrical bus system when main power supply fails
9. Interpret cockpit gauges and warning lights
10. Explain exterior lighting
11. Demonstrate an understanding of interior lighting
12. Discuss procedures for testing automatic shutoff of horizontal trim
13. Discuss use of emergency disconnect circuit and its effect on alternate trim
14. State system which operates trim controls

TO 3.1 -- cont'd

ENABLING OBJECTIVES (cont'd)

15. Discuss controls for alternate trim system; also, rate and effect of automatic shutoff
16. State system which operates flap system and number of actuators
17. State three positions of flap handle and its location in aircraft
18. State four switches incorporated in control wheels (yoke)
19. State number of oxygen cylinders, refiller location and normally serviced PSI in main oxygen system
20. State when and at what temperatures engine inlet duct anti-icing should be operated
21. Explain location and operation of cabin air and cabin temperature selector switches
22. Differentiate between de-icing and anti-icing systems on aircraft
23. Discuss operation of foot warmer
24. Review cause, initial action and complete NATOPS procedure for each light using a pocket checklist
25. Discuss every indicator, caution and warning light
26. Understand A.C. volt and load meter
27. Understand A.C. system switches:
    a. A.C. generator switch
    b. Main inverter switch
    c. Radio and instrument master switch
28. Recall what is needed for A.C. external power. Understand:
    a. A.C. generator
    b. Main inverter
    c. Instrument inverter
29. Understand D.C. load and volt meter
30. Understand system switches:
    a. Battery switch
    b. Electrical master switch
    c. D.C. generator switch
    d. Engine starter button
    e. Interior emergency light switch
31. Discuss fuel indicated on each guage when fuel quantity switch is moved to each of its three positions
32. Discuss fuel jettison system and state quantity of fuel remaining per tank in auto and manual positions
33. State pressure of both normal and auxiliary systems
34. State purpose of tank crossfeed valve and boost pump crossfeed valves and how they are operated

- PHASE OF FLIGHT

3. Ground Operations

- OBJECTIVE

#	Name
3.2	Monitor Engine Instruments and Plane Captain Signals During Start Engine Checklist

- COMPONENTS & CRITERIA

1. Detect normal and report abnormal engine operation
2. Report rise in oil pressure and engine light off
3. Report engine light off and maximum exhaust gas temperature
4. Observe plane captain

- ENABLING OBJECTIVES

1. Location and normal operating range of all engine instruments
2. Limitations of all engine instruments
3. State three gauges which should be monitored to prevent permanent engine damage
4. Plane captain hand signal for engine fire

- PHASE OF FLIGHT

3. Ground Operations

- OBJECTIVE

#	Name
3.3	Energize/Tune Communication and Navigation Radios

- COMPONENTS & CRITERIA

1. Obtain desired frequency information from IFR Supplement or other FLIP publications
2. Select departure comm/nav frequencies correctly
3. Identify navigation audio aids

- ENABLING OBJECTIVES

1. Obtain comm/nav frequencies from IFR Supplement
2. Name three most common types of fleet communications equipment as classified by frequency bands
3. State frequency range and emergency frequency of each of three fleet communications equipment
4. List two types of radio noise interference
5. State advantages of a transceiver over separated transmitters and receivers
6. Define "gain"
7. State three functions of a radio transmitter
8. Label a block diagram of a simple radio transmitter
9. State function of transmitting antenna
10. Define "wavelength"
11. State effects which ionosphere has on sky wave
12. Define "blind spot"
13. Name five jobs a receiver performs
14. Name and define three important characteristics of a receiver
15. Name two basic types of receivers and state basic differences
16. Name and describe two basic types of loudspeakers

TO 3.3 -- cont'd

ENABLING OBJECTIVES (cont'd)

17. Explain cockpit control functions for following equipment:
    a. IFF APX 46
    b. UHF ARC 52
    c. AUX ARR 40
    d. ICS AIC 14
    e. TACAN ARN 52
    f. VOR ARN 14/18
    g. BEACON ARN 32
    h. ARA 25
18. List and define four methods for reducing radio noise interference

- PHASE OF FLIGHT

3. Ground Operations

- OBJECTIVE

#	Name
3.4	Obtain and Employ Departure ATIS Information

- COMPONENTS & CRITERIA

1. Obtain ATIS frequency from FLIP publications
2. Tune UHF ATIS frequency
3. Copy all ATIS information
4. Copy ATIS designator
5. Advise pilot ATIS information

- ENABLING OBJECTIVES

1. Purpose and how to record ATIS information
2. Recall information provided by Automatic Terminal Information Service

- PHASE OF FLIGHT

3. Ground Operations

- OBJECTIVE

#	Name
3.5	Accomplish Before-Taxi Checklist

- COMPONENTS & CRITERIA

1. Read checklist items clearly when directed by pilot
2. Report deviation from correct actions or responses

- ENABLING OBJECTIVES

1. Location of Before-taxi checklist in pocket checklist
2. Read Before-taxi checklist
3. Location and function of checklist items including pilot actions and responses

- PHASE OF FLIGHT

3. Ground Operations

- OBJECTIVE

#	Name
3.6	Recognize Plane Captain's Hand Signals

- COMPONENTS & CRITERIA

Verbalize all signals

- ENABLING OBJECTIVES

1. Plane captain hand signals and purposes
2. Sequence in which hand signals are given
3. Explain cockpit control and displays for following:
   a. Hydraulic power systems
   b. Landing gear system
   c. Wheel brake system
   d. Speed brake system
   e. Arresting gear system

o PHASE OF FLIGHT

3. Ground Operations

o OBJECTIVE

#	Name
3.7	Accomplish IFR Clearance Communications

o COMPONENTS & CRITERIA

1. Obtain Clearance Delivery UHF frequency form IFR Supplement
2. Tune UHF Clearance Delivery frequency or channel
3. Monitor frequency; do not interrupt other communications
4. Initiate communications using ATC phraseology (Example: "Sherman Clearance Delivery, 2NO1, IFR Navy Pensacola")

● ENABLING OBJECTIVES

1. Obtain and set Clearance Delivery frequency
2. Function of Clearance Control
3. Use ATC phraseology
4. Copy IFR clearance using IFR shorthand
5. Respond to call from Clearance Delivery
6. Demonstrate proper R/T procedures consisting of:
   a. Tuning Automatic Terminal Information Service
   b. Copying and readback of clearance
   c. Calling for taxi
   d. Calling to cross off-duty
   e. Calling for takeoff
   f. Acknowledging instructions
   g. Contacting departure control before and after takeoff
   h. Acknowledging an expected approach clearance
   i. Acknowledging departure control instructions
7. Copy clearances using abbreviated symbols

- PHASE OF FLIGHT

3. Ground Operations

- OBJECTIVE

#	Name
3.8	Accomplish Ground Control Communications

- COMPONENTS & CRITERIA

1. Obtain UHF Ground Control frequency from IFR Supplement or other source
2. Set Ground Control frequency on UHF
3. Monitor frequency; do not cut in on other communications
4. Initiate communications using ATC phraseology (Example: "Sherman Ground Control, 2N01, taxi, IFR Navy Pensacola, information Alfa")
5. Copy taxi directions (using IFR shorthand)
6. Assist pilot to accomplish taxi instructions

- ENABLING OBJECTIVES

1. How to obtain and set Ground Control frequency
2. Utility of using ATIS alphabetical designator
3. Airport taxi procedures for all runways

- PHASE OF FLIGHT

3. Ground Operations

- OBJECTIVE

#	Name
3.9	Accomplish Taxi Checklist

- COMPONENTS & CRITERIA

1. Read checklist in sequence
2. Note correct pilot response to each item

- ENABLING OBJECTIVES

1. Location of Taxi Checklist in pocket checklist
2. Location and function of items on checklist, including pilot responses

- PHASE OF FLIGHT

3. Ground Operations

- OBJECTIVE

#	Name
3.10	Identify Airport Taxi Procedures

- COMPONENTS & CRITERIA

Describe traffic flow, correct taxiways to correspond with runways and runup areas

- ENABLING OBJECTIVES

Taxi procedures as described in published documents

- PHASE OF FLIGHT

4. Takeoff

- OBJECTIVE

#	Name
4.1	Accomplish Before-takeoff Checklist

- COMPONENTS & CRITERIA

1. Read checklist in sequence
2. Note correct pilot responses after each item
3. Report any abnormal aircraft subsystem behavior

- ENABLING OBJECTIVES

1. Location of Before-takeoff checklist in pocket checklist
2. Location and function of items on checklist, including pilot responses
3. Know that pilot will obtain takeoff clearance specifically to preclude unsafe departure/arrival incidents
4. State location and proper setting for trim position indicators for takeoff with full fuel load

- PHASE OF FLIGHT

4. Takeoff

- OBJECTIVE

#	Name
4.2	Identify Normal Interval Takeoff Procedures

- COMPONENTS & CRITERIA

Takeoff interval is 10 secs after aircraft in position and holding on runway

- ENABLING OBJECTIVES

Published takeoff procedures

- PHASE OF FLIGHT

4. Takeoff

- OBJECTIVE

#	Name
4.3	Accomplish Line-up Checklist

- COMPONENTS & CRITERIA

1. Read checklist in sequence
2. Note correct pilot responses to each item

- ENABLING OBJECTIVES

1. Location and function of items on checklist
2. Pilot responses
3. Discuss ground operating limitations in use of engine inlet anti-icing system
4. State indications which verify proper operation of engine inlet anti-ice system
5. State four electrically heated areas of aircraft
6. Discuss conditions under which wing and ram air inlet anti-ice system should be turned on
7. Discuss operation of wing and ram air inlet anti-ice system when aircraft is on ground
8. Discuss when and why pitot tubes are heated

- PHASE OF FLIGHT

4. Takeoff

- OBJECTIVE

#	Name
4.4	Accomplish Airspeed Reports During Takeoff Roll

- COMPONENTS & CRITERIA

1. Advise pilot of following:
   a. "Off the peg" within 3 secs of first airspeed indication
   b. Report rudder effective speed or nosewheel steering disengage speed
   c. Green nosewheel steering light is out when nosewheel steering button is depressed
   d. Steering light fails to extinguish
   e. Rotation airspeed(s)

- ENABLING OBJECTIVES

1. "off the peg" meaning -- first needle movement on airspeed indicator
2. Rudder effective speed on ground
3. Nosewheel steering disengage speed
4. Green nosewheel steering light indicates steering system is connected
5. Rotation speed(s)

- PHASE OF FLIGHT

4. Takeoff

- OBJECTIVE

#	Name
4.5	Accomplish After Takeoff Checklist

- COMPONENTS & CRITERIA

1. Begin reading checklist when positive rate of climg indicated by altimeter and VSI
2. Read checklist in proper sequence
3. Note correct pilot responses to each item

- ENABLING OBJECTIVES

1. Location of after takeoff checklist in pocket checklist
2. Location and function of items on checklist including pilot responses

- PHASE OF FLIGHT

5. Departure

- OBJECTIVE

#	Name
5.1	Accomplish Departure Control Communications

- COMPONENTS & CRITERIA

1. Select Departure Control frequency from IFR Enroute Supplement
2. Attempt one radio check prior to takeoff
3. Report "airborne and altitude climbing to" to Departure Control after gear up and checklist complete
4. Use ATC phraseology

- ENABLING OBJECTIVES

1. Recognize gear up indications
2. List facilities that handle departure phase for IFR and VFR flight
3. State when and where voice communications are initiated and received during departure phase of IFR and VFR flight

- PHASE OF FLIGHT

5. Departure

- OBJECTIVE

#	Name
5.2	Accomplish Departure Navigation Procedures

- COMPONENTS & CRITERIA

1. Attempts one radio check with Departure Control
2. Directs pilot through published departure
3. Responds by correct readback to any vectors and altitude changes from Departure Control withing 5 secs
4. Reports VFR on top when directed by instructor
5. Copies and correctly reads back EAC when received or contacts ARTCC at Departure Control's request

- ENABLING OBJECTIVES

1. Departure Control communication, vectoring, and altitude separation procedures
2. Published departure procedures
3. Purpose of Expected Approach Clearance Time
4. Lost communications procedure

- PHASE OF FLIGHT

5. Departure

- OBJECTIVE

#	Name
5.3	Accomplish Climb Checklist

- COMPONENTS & CRITERIA

1. Within ±1000 ft. of passing 10,000 ft
2. Read checklist tasks in correct sequence
3. Verify correct pilot response

- ENABLING OBJECTIVES

1. Location and function of items on checklist including pilot actions and responses
2. Read the altimeters
3. Location of climb checklist
4. Express altitudes above 18,000 ft. m.s.l.
5. Explain why pressure altitude is only used above 18,000 ft. m.s.l.
6. State flight level changeover procedures
7. State the cabin altitude the pressurization with maintain
8. Identify correct altimeter setting used above 18,000 ft.

- PHASE OF FLIGHT

6. Enroute Navigation

- OBJECTIVE

#	Name
6.1	Accomplish Cruise Checklist

- COMPONENTS & CRITERIA

1. Read checklist in sequence
2. Note correct pilot respone to each item
3. Read checklist at level-off and at intervals of 30 mins. thereafter until descent checklist is commenced.

- ENABLING OBJECTIVES

1. Location of cruise checklist in pocket checklist
2. Location and function of items on checklist, including pilot responses
3. Solve problems dealing with altimeter error due to pressure

- PHASE OF FLIGHT

6. Enroute Navigation

- OBJECTIVE

#	Name
6.2	Configure Navigation Equipment for Enroute Navigation

- COMPONENTS & CRITERIA

1. Tune and identify all on board nav aids to nearest or most appropriate aid
2. Note DME lock-on and DME information
3. Select VOR or TACAN for RMI/BDHI number two pointer needle

- ENABLING OBJECTIVES

1. Identify and choose most appropriate navigational aids
2. Flight path orientation and approximate location of nav aid with respect to nose/heading of aircraft
3. Explain proper use of TACAN equipment in following modes of operation:
   a. REC
   b. T/R
   c. A/A
4. Explain significance of following TACAN associated phenomena:
   a. 40 degree lock-off
   b. Azimuth cone of confusion
5. Determine station passage utilizing following equipment:
   a. TACAN
   b. VOR
   c. ADF
6. Explain usage of following equipment with a failure of aircraft directional gyro system:
   a. TACAN/VOR
   b. ADF

- PHASE OF FLIGHT

6. Enroute Navigation

- OBJECTIVE

#	Name
6.3	Accomplish Enroute ATC Communications

- COMPONENTS & CRITERIA

1. Respond to ARTCC instructions
2. Set in appropriate UHF frequency(s)
3. Monitor ARTCC frequency for five secs. before transmitting
4. Use correct ATC phraseology

- ENABLING OBJECTIVES

1. When to switch channels
2. ARTCC purpose and procedures
3. List the services provided by Flight Service Stations
4. Demonstrate proper communication procedures consisting of:
   a. Initial call-up to Center under radar environment
   b. Initial call-up to Center under nonradar environment
   c. IFR position report
   d. VFR position report
   e. Acknowledgment of Center instructions
5. State when and where voice communications are initiated and received during enroute phases of IFR and VFR flight
6. Explain IFR/VFR position report requirements
7. Know following frequencies:
   a. FSS (UHF)
   b. Guard (UHR/VFS
8. Understand enroute clearances as they apply to all ATC clearances and combination IFR/VFR clearances
9. Explain procedures to be followed with lost navigational equipment

ENABLING OBJECTIVES (cont'd)

10. Explain IFR/VFR position report requirements
11. Recite all mandatory voice reports in both IFR and VFR environments
12. Name those required IFR reports which may be omitted when operating in radar contact
13. Explain in-flight IFR filing procedures
14. Recite in proper format communications to be made with Ground Control, Tower, and Clearance Delivery while aircraft is on deck
15. Discuss options available to aircrew in a lost communications situation in an IFR environment as pertains to:
    a. Route of flight
    b. Altitude
    c. Climb and descent
    d. Transponder procedures
    e. Holding

- PHASE OF FLIGHT

6. Enroute Navigation

- OBJECTIVE

#	Name
6.4	Perform Enroute IFF/SIF Procedures

- COMPONENTS & CRITERIA

1. Respond correctly to ARTCC communications
2. Correctly set IFF/SIF equipment
3. "Squawk" Emergency if necessary

- ENABLING OBJECTIVES

1. IFF/SIF control functions
2. Meaning of "squawk"
3. How to "ident"
4. Emergency procedures
5. The following transponder codes:
   a. VFR (above and below 10,000)
   b, Test hop
   c. Lost commo
   d. Emergency
   e. IFR
6. Determine transponder operation procedure to comply with following:
   a. Squawk
   b. Ident
   c. Squawk normal
   d. Squawk low
   e. Squawk standby
   f. Squawk altitude
   g. Squawk MAYDAY

- PHASE OF FLIGHT

6. Enroute Navigation

- OBJECTIVE

#	Name
6.5	Accomplish Navigation Turn Point Procedures

- COMPONENTS & CRITERIA

1. Request pilot turn to new outbound heading
2. Specifies new outbound course 1 min. before turn
3. Requests start of turn at minimum DME for outbound turns of less than 45°
4. Requests start of turn at minimum DME plus a distance equivalent to one percent of groundspeed
5. States ETA to next turn point 1 min. before turn
6. Requests fuel state and flow
7. States estimated fuel remaining at next turn point and at initial approach fix

- ENABLING OBJECTIVES

1. State maximum fuel imbalances and how to balance tanks
2. State three cases in which fuel cross-feed should not be used

- PHASE OF FLIGHT

6. Enroute Navigation

- OBJECTIVE

#	Name
6.6	Perform TACAN/VOR Radial Tracking Procedures

- COMPONENTS & CRITERIA

1. Explain enroute chart airways radials information
2. Observe that pilot has correct radial set in HSI
3. Provide pilot with magnetic heading corrections to maintain radial $\pm 2^{o}$

- ENABLING OBJECTIVES

1. Use IFR Supplement Morse Code Presentation
2. Solve for magnetic course and distances from TACAN station while enroute to intended point
3. Predict radials and distances from TACAN stations while enroute to intended point
4. Plot TACAN position on wind side of navigation computer
5. Relate radial tracking to airways navigation

- PHASE OF FLIGHT

6. Enroute Navigation

- OBJECTIVE

#	Name
6.7	Advise Pilot of Altitude, Airspeed, Heading and Position

- COMPONENTS & CRITERIA

1. Advise pilot of altitude deviation greater than 200 ft.
2. Advise pilot if magnetic heading exceeds that assigned $\pm 5^{o}$ when correcting on or intercepting airways and A/S $\pm$10 kts.
3. Advise pilot if position deviates from airways radial (MAG CUS) $\pm 5^{o}$
4. Advise pilot of any deviation from ATC instructions and procedures

- ENABLING OBJECTIVES

1. Interpret altitude indicator
2. Aircraft cruise altitudes and bank angle for standard rate turns

- PHASE OF FLIGHT

6. Enroute Navigation

- OBJECTIVE

#	Name
6.8	Obtain Enroute, Destination, and Alternate Destination Weather

- COMPONENTS & CRITERIA

1. Request frequency change from ARTCC
2. Locate and tune Metro frequency
3. Communicate weather request to Metro
4. Copy weather information and advise pilot
5. Re-establish ARTCC communication

- ENABLING OBJECTIVES

1. Metro functions and capabilities
2. Location Metro frequency in FLIP Enroute Supplement
3. OPNAV 3710.7 enroute and destination WX regulations
4. Aircraft weather limitations
5. Explain relationship between RVR and prevailing visibility and application of each

- PHASE OF FLIGHT

6. Enroute Navigation

- OBJECTIVE

#	Name
6.9	Accomplish Point-to-Point TACAN Navigation Procedures

- COMPONENTS & CRITERIA

1. Identify present position (radial $\pm 2^{o}$ and DME ± 1 mile)
2. Advise pilot initial magnetic heading to next point within 30 secs.
3. Provide additional magnetic corrective headings as necessary
4. Advise pilot ETA(s)
5. Arrive at point(s); radial $\pm 2^{o}$, distance ± 2 miles, and ETA ± 30 secs.

- ENABLING OBJECTIVES

Previously cited

o PHASE OF FLIGHT

7. Mission Maneuvers

o OBJECTIVE

#	Name
7.1	Accomplish Dead Reckoning Navigation Mission

o COMPONENTS & CRITERIA

1. Manage communication and navigation equipment operations
2. Make voice communications for clearance, taxi, takeoff, enroute, and landing
3. Utilize navigation charts and log flight plan data
4. Utilize standard chart plotting symbols; all log and chart entries readable
5. Utilize estimated postition(s) ±3 NM
6. Select most appropriate navigation aids for LOPs
7. Draw advanced and retarded LOPs ±5°
8. Determine fix position every 20-30 mins, ±3 NM
9. Determine actual wind, ±5° and 5 kts.
10. Determine corrective magnetic heading(s) and advise pilot to regain magnetic course
11. Compute actual groundspeed(s), ±5 kts.
12. Accomplish navigation turn point procedures (new heading, ETA, log ATA, and compute fuel state)
13. Execute controlled time of arrival (CTA)
14. Advise pilot of any navigational data change that impacts on mission
15. Utilize correct navigator-to-pilot and ATC phraseology
16. Advise pilot of any abnormal aircraft system operations
17. Report all aircraft observed using prescribed method

o ENABLING OBJECTIVES

1. Utilize navigation charts, tools, plotting symbols, and flight planning log to accomplish DR mission
2. How to draw LOPs, plot fixes
3. How to compute actual data and make log entries

TO 7.1 -- cont'd

ENABLING OBJECTIVES (cont'd)

4. Label block diagram of an air data computer from a given list of its inputs and outputs, and of various output-receiving devices within aircraft
5. Select from a given list of inputs available, inputs that airborne computer system would utilize to compute solution to navigation problem
6. Select from a given list of inputs available, inputs that airborne computer would utilize to compute solution to bombing problem

- PHASE OF FLIGHT

7. Mission Maneuvers

- OBJECTIVE

Name

7.2 - Accomplish Square Search Navigation Procedures

- COMPONENTS & CRITERIA

1. Prepare log for search pattern
2. Maintain log throughout search
3. Establish initial search leg into wind
4. First leg length is two times visibility
5. Begin search at assigned coordinates within 5 NM
6. Apply drift correction on crosswind legs

- ENABLING OBJECTIVES

1. Obtain search coordinates
2. Determine local visibility
3. Determine search altitude
4. Establish wind speed and direction through use of Doppler Radar
5. State physical principle upon which inertial navigation is based
6. Demonstrate working knowledge of operation of, inputs to, and outputs from INS
7. Explain how and why INS is constructed and how and why it operates
8. Define various terms associated with inertial navigation system (INS)
9. Define and give examples of an accuracy improvement hybrid INS
10. State initial alignment information which operator must insert into computer prior to commencing an alignment in following situations:
    a. Ashore
    b. Aboard ship

TO 7.2 -- cont'd

ENABLING OBJECTIVES (cont'd)

11. State two INS errors which result in position error which increases with respect to time
12. List INS errors that are present and tell which do increase with time, and which do not increase with time
13. Explain how those errors which occur in INS are corrected for
14. Identify what is available with hybrid INS system if one or more of its inputs fail
15. State function of navigation computer
16. List manual inputs to navigation computer in following modes of operation:
    a. DR
    b. Doppler
17. List outputs of navigation computer in following modes of operation:
    a. DR
    b. Doppler
    c. Inertial
    d. Doppler-Inertial
18. Name inputs to and outputs from Doppler computer
19. Explain basically how doppler receives inputs, operates, and obtains output information
20. Define air data computer (ADC)
21. Identify outputs from air data computer
22. Explain how Doppler improves air data computer outputs
23. List inputs to air data computer and give source of each
24. Show relationship between inputs, and their interaction within air data computer
25. State effect of thunderstorms on aircraft's pitot-static system
26. Define accelerometer
27. Define three axes of gyro
28. Define RIGIDITY and PRECESSION
29. Identify which air data computer outputs fail when one or more of source inputs fail
30. Identify outputs from INS and FRS to Doppler
31. List inputs to navigation computer received from following components:
    a. ADS
    b. FRS
    c. Doppler
    d. INS
32. Solve Doppler wind solution

- PHASE OF FLIGHT

7. Mission Maneuvers

- OBJECTIVE

#	Name
7.3	Accomplish Radar Navigation Mission Procedures

- COMPONENTS & CRITERIA

1. Maintains aircraft within 6 NM of preflight course
2. Builds and maintains usable radar picture without instructor assistance
3. *Maintains* ETAs ± 1/2 min.

- ENABLING OBJECTIVES

1. Operate all radar controls
2. Recognizes how individual control inputs effect quality of scope presentation
3. Use radar controls to construct desire scope presentation
4. Describe method used to determine bearing of a radar target
5. Tune picture using contrast control
6. Tune picture using brightness control
7. Tune picture using tilt control
8. Define signal potential
9. Define signal strength
10. Match list of factors which affect radar-scope presentation to their effect
11. Explain type of error caused by following:
    a. Beam width error
    b. Pulse length error
    c. Spot size error
12. Define total azimuth error
13. Define total range error
14. Explain difference in radar presentation from cultural and topographical features

TO 7.3 -- cont'd

ENABLING OBJECTIVES (cont'd)

15. Explain how the following affect radarscope presentation:
    a. Glitter effect
    b. Cardinal effect
    c. Lake and mountain shadow
    c. Weather
16. Explain how experienced operator obtains consistent and reliable ranges and bearings
17. Name four characteristics of echoes which supply useful information on composition
18. Name four elements involved in reporting procedures
19. Name factors involved in determination of target size from echo strength
20. State how speed of target aids in identification
21. State how an estimate of number of contacts can be made

- PHASE OF FLIGHT

7. Mission Maneuvers

- OBJECTIVE

#	Name
7.4 -	Accomplish Low Altitude, High Speed Visual Navigation Mission Procedures

- COMPONENTS & CRITERIA

1. Recognize and make 10^{o} heading corrections for 1 min. for every 1 mile off course
2. Maintain course 4 miles either side of planned track
3. Recognize retarded or advanced progress along planned track and request airspeed change of 30 KIAS for 1 min. for every 6 sec. ahead or behind time
4. Maintain ETAs $\pm$ 1/2 min.
5. Arrive at turn point - 1 mile radius
6. Advise pilot of target description

- ENABLING OBJECTIVES

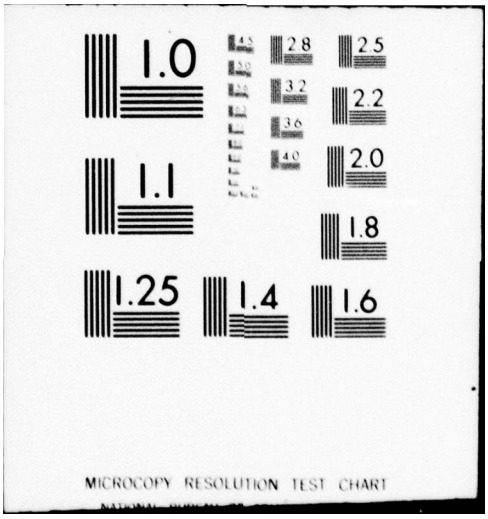
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MICROCOPY RESOLUTION TEST CHART

- PHASE OF FLIGHT

7. Mission Maneuvers

- OBJECTIVE

#	Name
7.5 -	Identify Procedures for Exterior Watch and Reporting Unidentified Aircraft

- COMPONENTS & CRITERIA

1. Identify aircrew procedures for exterior and interior visual scan sharing, e.g., divide observing outside systematically for other aircraft, navigational landmarks, and own aircraft's attitude, with managing and monitoring cockpit communication and navigation equipment
2. Report to pilot any unidentified aircraft with clock, altitude and distance/direction information immediately

- ENABLING OBJECTIVES

1. Aircrew observing and reporting procedures
2. Safety emphasis on alertness and avoiding midair collisions or near misses

- PHASE OF FLIGHT

7. Mission Maneuvers

- OBJECTIVE

#	Name
7.6	Perform Inflight TACAN Rendezvous Procedures

- COMPONENTS & CRITERIA

1. Report point 1 over UHF radio when reached
2. Report subsequent points every 90° around rendezvous circle until reaching point 1
3. Stop reports when wingman reports "Tallyho"

- ENABLING OBJECTIVES

1. TACAN rendezvous procedures as published in flight support documents
2. Solve an air-to-air TACAN problem

- PHASE OF FLIGHT

7. Mission Maneuvers

- OBJECTIVE

#	Name
7.7	Identify Elements of Landing Attitude Stall

- COMPONENTS & CRITERIA

1. Decreasing airspeed
2. Increasing angle of attack
3. Airframe buffet

- ENABLING OBJECTIVES

1. Location of airpeed indicator
2. Location of attitude indicator
3. Airframe buffet immediately precedes stall
4. Notify pilot approaching stall condition
5. Stall recovery
6. Discuss stall and high altitude flight limitations
7. State maximum altitude at which stalls can be performed and reasons for limitation

Note: Additional stall series characteristics to be determined

- PHASE OF FLIGHT

7. Mission Maneuvers

- OBJECTIVE

#	Name
7.8	Identify Elements of Acrobatic Maneuvers

- COMPONENTS & CRITERIA

Identify entry, transit, and exit procedures for the following:

a. Minimum radius turn
b. Aileron roll
c. Barrel roll
d. Wing over
e. Loop
f. One-half Cuban Eight Roll
g. Immelman

- ENABLING OBJECTIVES

1. NATOPS maneuver description
2. Location and interpretation of cockpit instrumentation essential for performing the maneuver
3. State general flight rules to include:
   a. Aircraft lighting
   b. Right-of-way
   c. Airspeed and altitude restrictions
   d. Aerobatic flight
   e. Air combat maneuvers
   f. Simulated instrument flight
   g. Formation flight
4. State requirements imposed on all naval pilots flying formation, aerobatics, or simulated aerial combat

- PHASE OF FLIGHT

7. Mission Maneuvers

- OBJECTIVE

Name
7.9 - Describe Rendezvous Procedures

- COMPONENTS & CRITERIA

1. Describe effects of bank angle and airspeed on closure rate and bearing position
2. Describe underrun
3. Describe running rendezvous procedures

- ENABLING OBJECTIVES

1. Increasing angle of bank will move aircraft forward or acute of rendezvous bearing (effects of decreasing bank angle)
2. Increasing power will increase airspeed and closure rate

- PHASE OF FLIGHT

7. Mission Maneuvers

- OBJECTIVE

#	Name
7.10	Demonstrate Formation Flight Hand Signals

- COMPONENTS & CRITERIA

Demonstrate without error the exact hand or head signal for the following maneuvers:

a. Parade
b. Cruise
c. Lead change
d. Cross under
e. Turns
f. Breakup and rendezvous
g. Free cruise
h. Affirmative
i. Negative
j. Numerals
k. Fuel check
l. Speed brakes
m. Landing gear
n. Execute
o. Defrost
p. Frequency change
q. Climb
r. Descent
s. Power
t. Rollout
u. Engine runup
v. Rejoin
w. H.E.F.O.E.

- ENABLING OBJECTIVES

Published formation and emergency hand signals

- PHASE OF FLIGHT

7. Mission Maneuvers

- OBJECTIVE

#	Name
7.11	Identify Elements of a SAM Break

- COMPONENTS & CRITERIA

Describe a SAM break as an oblique Split S

- ENABLING OBJECTIVES

1. Describe normal Split S
2. SAM break is maneuver in which defending aircraft rapidly changes altitude, heading, and airspeed so as to exceed maneuvering limitation of attacking missile

- PHASE OF FLIGHT

7. Mission Maneuvers

- OBJECTIVE

#	Name
7.12	Identify Elements of Basic Fighter Maneuvers

- COMPONENTS & CRITERIA

Identify desired altitude, airspeed, and dive angle for a pop-up and roll-ahead attack

- ENABLING OBJECTIVES

1. Altitude, airspeed, and dive angle envelope
2. Performance Section of NATOPS Flight Handbook

- PHASE OF FLIGHT

7. Mission Maneuvers

- OBJECTIVE

#	Name
7.13	Identify Elements of Basic Attack Maneuvers

- COMPONENTS & CRITERIA

Using hands or models to identify principal elements and sequence of events during a visual laydown attack

- ENABLING OBJECTIVES

Published visual laydown attack procedures

- PHASE OF FLIGHT

8. Descent/Penetration

- OBJECTIVE

#	Name
8.1	Review Destination Publications

- COMPONENTS & CRITERIA

1. Select correct approach plate(s)
2. Review approach procedures (e.g., courses, altitudes, MDA or DH)
3. Review missed approach procedures

- ENABLING OBJECTIVES

1. Locate approach plates in FLIP approach publications
2. Destination active runway
3. Destination weather
4. Destination altimeter setting
5. Name the two categories of approaches
6. Locate, identify, define, and extract all pertinent information portrayed in legend
7. Define the following:
   a. Initial approach fix
   b. Final approach fix
   c. Decision height
   d. Minimum descent altitude
   e. Height above touchdown
   f. Height above airport
   g. Missed approach point
   h. Published altitude restrictions
   i. Outer/middle markers
   j. Penetration turn
   l. Procedure turn
   m. Ceiling
   n. Visibility
   o. Minimum safe altitude
   p. Emergency safe altitude
8. Explain differences between precision and non-precision approaches, giving examples of each

- PHASE OF FLIGHT

8. Descent/Penetration

- OBJECTIVE

#	Name
8.2	Obtain Enroute Descent or Penetration Clearance

- COMPONENTS & CRITERIA

1. Use ATC phraseology
2. Contact ATC with clearance request

- ENABLING OBJECTIVEW

1. Jet penetration increases fuel consumption
2. Enroute descents take more time than penetration
3. Weather between aircraft and destination may preclude enroute descent

- PHASE OF FLIGHT

8. Descent/Penetration

- OBJECTIVE

#	Name
8.3	Accomplish Descent/Penetration Checklist

- COMPONENTS & CRITERIA

1. Read every checklist item in proper sequence
2. After entering holding pattern or 30 miles prior to initiating descent
3. Note proper responses from pilot

- ENABLING OBJECTIVES

1. Interpret BDHI to note crossing holding fix or 30 mile fix
2. Checklist location of Descent Checklist
3. Location and function of checklist items including pilot responses

- PHASE OF FLIGHT

8. Descent/Penetration

- OBJECTIVE

#	Name
8.4	Accomplish Penetration Navigation Procedures

- COMPONENTS & CRITERIA

1. Reports high station outbound and leaving altitude within 5 secs. of ADF needle passing wingtip for first time
2. Directs pilot to turn to outbound heading until needle bearing pointer stabilizes
3. Describes exact WX minimums, MDA, HAT-HAA for approach plate
4. Sets HAT/HAA in radar altimeter
5. Directs pilot to begin procedure turn at ½ initial altitude
6. Reports 100 ft. above minimum descent altitude to pilot
7. Reports MDA to pilot when reached
8. Reports field in sight to pilot

- ENABLING OBJECTIVES

Know penetration procedures

- PHASE OF FLIGHT

9. Approach

- OBJECTIVE

#	Name
9.1	Accomplish Approach Control Communications

- COMPONENTS & CRITERIA

1. Select frequency
2. Use phraseology
3. Obtain alternate frequencies from ATC or IFR Supplement if no contact on initial frequency
4. Obtain and record EAC
5. File "DRAFT"
6. Report initial approach fix ±2 NM
7. Report final approach fix ±1 NM for non-precision approaches
8. Report field in sight or missed approach for non-precision approaches
9. Readback all headings and altitudes for precision approach
10. Reports gear down to Approach Contro.

- ENABLING OBJECTIVES

Previously cited

- PHASE OF FLIGHT

9. Approach

- OBJECTIVE

#	Name
9.2	Advise Pilot of Required Speed Reductions

- COMPONENTS & CRITERIA

1. Advise pilot to slow to holding airspeed 3 mins. prior to reaching holding fix
2. Observe that pilot action within ±1 min. of reaching speed reduction point

- ENABLING OBJECTIVES

1. How to enter holding patterns as depicted on FLIP approach plate
2. Recommended holding speed for specific aircraft

- PHASE OF FLIGHT

9. Approach

- OBJECTIVE

Name

9.3 - Direct Pilot to Holding and Terminal Fixes

- COMPONENTS & CRITERIA

1. Locate and give pilot correct DOD approach plate
2. Advise pilot of magnetic heading to conform with published holding and terminal fix procedures
3. Advise pilot of holding airspeed and altitude
4. Check that pilot follows ATC holding and terminal fix procedures and instructions

- ENABLING OBJECTIVES

1. Depiction of holding pattern on FLIP approach plate
2. Three types of holding pattern entries
3. Discuss entering holding and the holding pattern
4. State holding restrictions as they pertain to the following:
   a. Airspeed
   b. Time of leg
   c. Direction and degree of turn
5. Determine proper holding pattern entry with or without a charted holding pattern
6. Describe holding procedures with and without ATC instructions
7. Explain proper procedure to correct for head-wind, tail-wind, and cross-wind in holding

- PHASE OF FLIGHT

9. Approach

- OBJECTIVE

#	Name
9.4	Report Final Approach Visual Contact to Pilot

- COMPONENTS & CRITERIA

1. Report approach lights and/or runway in sight
2. Continue to scan barometric altimeter and report 100 ft. above DH and at DH
3. Advise pilot to execute missed approach if no visual contact by DH +20, -0 ft. (for TACAN and VOR, MDH +20, -0 ft.

- ENABLING OBJECTIVES

Appearance of approach lights and other objects defining runway environment (e.g., optical landing system, runway numbers)

- PHASE OF FLIGHT

9. Approach

- OBJECTIVE

#	Name
9.5	Describe a VFR Section Approach

- COMPONENTS & CRITERIA

1. Identify location of both VFR entry points using TACAN coordinates and geographical check points
2. Identify altitudes and airspeeds which correspond to aircraft positions during the VFR entry
3. Identify positions in entry requiring radio calls (entry point, the numbers, 180 position)

- ENABLING OBJECTIVES

1. Entry procedures as described in local flight support publications
2. Course rules manual
3. Recall break procedures for jet aircraft entering NAS Pensacola
4. Describe procedures for entry to runways 6, 24, 36, and 18
5. Recall VFR operating minimums for NAS Pensacola
6. Describe procedures for departure from runways 6, 24, 36, and 18
7. Determine direction of legs of a race track pattern
8. Identify component parts of a race track pattern
9. Describe procedures utilized for complying with the following:
   a. Turbojet enroute descent
   b. Standard terminal arrival routing
   c. Single frequency approach
   d. Approach clearances

- PHASE OF FLIGHT

10. Landing

- OBJECTIVE

#	Name
10.1	Accomplish Landing Checklist

- COMPONENTS & CRITERIA

1. Accomplish check 5-10 miles from final approach fix or when requested by pilot
2. Read checklist noting response by pilot
3. Report incorrect subsystem responses
4. Accomplish emergency procedures if appropriate

- ENABLING OBJECTIVES

1. Location and function of landing checklist items including pilot responses
2. Discuss trim changes which occur when lowering flaps, speed brakes, and landing gear
3. State flap extension for normal and single-engine approaches and location of flap position indicator

- PHASE OF FLIGHT

10. Landing

- OBJECTIVE

#	Name
10.2	Identify VFR Taxi, Take-off, Re-entry, and Traffic Pattern Procedures

- COMPONENTS & CRITERIA

1. Draw take-off pattern for each runway
2. Check compass with runway heading and compare pilot compass
3. Set directional gyro compass to runway heading
4. Identify departure routes and procedures
5. Describe safety requirements during take-off
6. Identify re-entry routes and procedures

- ENABLING OBJECTIVES

1. Airport take-off pattern
2. Read and compare wet compasses
3. Uncage and set directional gyro
4. Describe departure routes
5. Describe arrival routes
6. Describe safety requirements

- PHASE OF FLIGHT

10. Landing

- OBJECTIVE

#	Name
10.3	Accomplish FVR Touch-and-Go Landing Communications

- COMPONENTS & CRITERIA

1. ATC phraseology
2. Position reporting at 180 position
3. Position for requesting downwind turn
4. Radio discipline

- ENABLING OBJECTIVES

Previously cited

- PHASE OF FLIGHT

11. Shutdown

- OBJECTIVE

#	Name
11.1 -	Accomplish After-Landing through Engine Shutdown Checklist

- COMPONENTS & CRITERIA

1. Read checklists' items in sequence
2. Note correct pilot responses
3. Note the subsystem responses
4. Record landing time

- ENABLING OBJECTIVES

1. Location of checklist items
2. Abnormal subsystems responses
3. Explain necessity for closing out flight plan upon arrival

- PHASE OF FLIGHT

12. Post-flight

- OBJECTIVE

#	Name
12.1	Perform Aircraft Post-flight Inspection

- COMPONENTS & CRITERIA

1. Perform post-flight tasks using NATOPS procedures
2. Identify any discrepancies which occurred during flight
3. Document discrepancies on aircraft maintenance forms

- ENABLING OBJECTIVES

1. Use of NATOPS checklist
2. Location and function of all items on NATOPS checklist
3. Where to look for leaks, security of cowling, FOD damage
4. Acceptable limits for items on NATOPS pocket checklist
5. Document unacceptable or deficient items
6. Describe use and effect of flight controls
7. State number of fuel tanks, their location, and total usable fuel capacity

- PHASE OF FLIGHT

12. Post-flight

- OBJECTIVE

#	Name
12.2	Identify Aircraft Servicing Procedures at Strange Airports

- COMPONENTS & CRITERIA

1. Locate single point refueling receptacle
2. Locate oil servicing access door
3. Locate electrical connections for starting engine(s)
4. Locate hydraulic reservoir and access door
5. Identify acceptable fluids

- ENABLING OBJECTIVES

1. Aircraft servicing procedures described in NATOPS manual
2. Obtain type and quantity of fuel, oil, and hydraulic fluids used from NATOPS publication
3. Discuss two systems affected by engaging the gust lock
4. Explain procedure to check oil
5. Explain steps involved in single point and gravity refueling
6. Bleed off pressure on aux accumulator
7. Bleed off pressure on reservoir

- PHASE OF FLIGHT

12. Post-flight

- OBJECTIVE

#	Name
12.3	Accomplish Mission Debriefing

- COMPONENTS & CRITERIA

Describe effects of relative motion and G forces experienced during flight

- ENABLING OBJECTIVES

Approximate positions of lead or adversary aircraft during maneuvers

- PHASE OF FLIGHT

13. Emergency Procedures

- OBJECTIVE

#	Name
13.1	Identify Suitable Divert/Emergency Fields

- COMPONENTS & CRITERIA

1. Fields must have 5,000 ft. of hard surface runway and be within 50 miles of planned operating route or area
2. Identify navigation aids serving emergency field
3. Specify runway length within 100 ft.
4. Specify exact field elevation

- ENABLING OBJECTIVES

Airfield description as indicated in FLIP Enroute Supplement

- PHASE OF FLIGHT

13. Emergency Procedures

- OBJECTIVE

#	Name
13.2	Warn Pilot When Aircraft Operating Limitations are Imminent

- COMPONENTS & CRITERIA

1. Advise pilot to preclude exceeding any aircraft operating limitations or
2. Indicate immediately if any limitation is exceeded
3. Record appropriate data on maintenance form

- ENABLING OBJECTIVES

1. "G" limitations
2. Maximum gear and flap speeds
3. Maximum airspeeds and Mach numbers
4. List the following engine limits:
   a. EGT
   b. Percent RPM
   c. Oil pressure
5. Discuss operational limitations and characteristics of wing flaps
6. In event one or both slats do not extend for landing, state increase in approach speed
7. Define normal and military rated thrust
8. State airspeed limitations for above and below 21,000 ft. and for landing gear, speed brake, flaps, windshield wiper, and pilot's side window
9. Discuss pitch trim limitations and state maximum airspeed for 6^{o} and 9^{o} nose up trim
10. Discuss limitations for zero or negative G flight
11. State center of gravity and weight limitations

- PHASE OF FLIGHT

13. Emergency Procedures

- OBJECTIVE

#	Name
13.3 -	Identify Onset Cues and Read Appropriate Checklist Items for all NATOPS Emergency Procedures

- COMPONENTS & CRITERIA

1. Detect any abnormal system symptoms
2. Advise pilot of symptoms as necessary
3. Recite from memory bold face checklist items
4. Observe pilot accomplish and report checklist action
5. Read entirely specific emergency checklist as time permits
6. Provide pilot with alternative systems information
7. Assist pilot in making mission determination, i.e., abandon aircraft, land at first suitable airfield, continue mission in degraded condition, etc.
8. Transmit emergency broadcast "MAYDAY" on UHF and squawk EMER IFF-SIF at pilot's direction

- ENABLING OBJECTIVES

1. Normal operating ranges and conditions
2. All abnormal system symptoms
3. Discuss NATOPS emergency procedures:
   a. Emergency signals
   b. Decision speed
   c. Engine failure/fire before decision speed
   d. Engine failure/fire after decision speed
   e. Minimum safe single engine speeds
   f. Engine air start
   g. Forced landing vs. bailout
   h. Single engine landing
   i. Engine fire on start/shutdown
   j. Electrical fire and isolation
   k. Cabin fire
   l. Elimination of smoke and fumes

TO 13.3 -- cont'd

ENABLING OBJECTIVES (cont'd)

3. Discuss NATOPS emergency procedures (cont'd)
   m. Tire failure
   n. Belly landing
   o. Ditching
   p. Speed brake system failure
   q. Landing gear emergency operation
   r. Trim failure
   s. Wheel brake failure
   t. Damaged windshield
4. Emergency UHF and IFF-SIF function
5. Emergency UHF MAYDAY transmission procedure
6. Discuss emergency pressurization system and state cabin altitude it will maintain
7. State ejection sequence
8. State manner in which cabin temperature can be controlled when utilizing emergency pressurization
9. Understand meaning of generator hot light and generator off light
10. State when cabin pressurization and seal pressure are automatically dumped
11. State effects of pulling a fire pull handle
12. State quantity of fuel remaining in a wing tank when a low fuel light is activated
13. Know what is meant by A.C. generator off, A.C. generator hot and instrument power fail lights
14. Discuss fuel tank cross-feed fail and fuel pump cross-feed fail lights
15. State probable cause of a fuel ejector fail light and purpose of sixty second delay in system
16. State probable cause of ejector caution light illuminating in conjunction with corresponding low fuel pressure caution light
17. Discuss probable cause of illumination of a fuel pressure fail light and procedure for finding cause
18. State reason for fuel jettison open light to remain on
19. Know which environmental system will be lost in eventof an A.C. generator failure with main inverter operating
20. State four cockpit indications of cabin pressurization failure and cabin altitude at which they occur
21. State three rear cabin indications of pressurization failure
22. Discuss pressurization duct warning light and state which additional instruments should be monitored
23. Discuss aft fuselage hot and cabin air hot warning lights
24. Explain use of emergency disconnect switch
25. Discuss anti-ice warning light

- PHASE OF FLIGHT

14. Aircraft Systems Functions

- OBJECTIVE

#	Name
14.1	Identify Elementary Terms and Functions of Digital Computers Relevant to Naval Aircraft

- COMPONENTS & CRITERIA

1. State general definition of a computer
2. State definition of a digital and analog computer
3. Explain difference between continuous and discreet; state data and give examples of each
4. Match list of analog/digital computer advantages/ disadvantages with the applicable category of computers
5. State definition of "computer program"
6. Recall proper procedures to use in operating 6B4 Digital Computer Demonstrator
7. Interpret results shown by 6B4 when the solution has been accomplished

- ENABLING OBJECTIVES

1. Label a block diagram of an air data computer from a given list of its inputs and outputs, and of various output-receiving devices within an aircraft
2. Select from a given list of inputs available, the inputs that the airborne computer system would utilize to compute the solution to a navigation problem
3. Select from a given list of inputs available, the inputs that the airborne computer system would utilize to compute the solution to a bombing problem
4. Label a given block diagram of an analog-to-binary conversion
5. State the theory by which an analog-to digital conversion is accomplished
6. Label a basic block diagram of a computer, using elements from a given list of coputer parts

TO 14.1 -- cont'd

ENABLING OBJECTIVES (cont'd)

7. Label the following components of a typical airborne computer system:
   a. Air data computer
   b. Analog-to-digital converter
   c. Compiler (or interpreting mechanism)
   d. c.p.u. input unit
   e. Control unit
   f. Arithmetic unit
   g. Core memory unit
   h. Drum memory unit
   i. c.p.u. output unit
   j. Digital-to-analog converter

- PHASE OF FLIGHT

14. Aircraft Systems Functions

- OBJECTIVE

#	Name
14.2 -	Identify the Operating Implications of Various Radio Propagation Characteristics

- COMPONENTS & CRITERIA

1. Define terms:
   a. Ground wave
   b. Sky wave
   c. Space wave
   d. Multiple refraction
   e. Fading
   f. Frequency blackout
2. Compare and contrast effects on radio reception

- ENABLING OBJECTIVES

1. Match pulse/CW, AM, & FM modulation with a list of primary Navy uses
2. Define frequency modulation
3. Define amplitude modulation
4. Define pulse or CW modulation

- PHASE OF FLIGHT

14. Aircraft Systems Functions

- OBJECTIVE

#	Name
14.3 -	Identify and Relate Certain Terms and Characteristics of Basic Electricity to Aircraft Components and Operations

- COMPONENTS & CRITERIA

1. Define terms:
   a. Sources and uses of electricity
   b. Static and current electricity
   c. Sources and means for discharging static electricity
   d. Generators, CSD, and RAT
   e. Primary components of a typical bus system
   f. Earphone
   g. Microphone
2. Describe functions

- ENABLING OBJECTIVES

Appropriate programmed text

- PHASE OF FLIGHT

14. Aircraft Systems Functions

- OBJECTIVE

#	Name
14.4	Identify Principal Elements of the Automatic Carrier Landing System

- COMPONENTS & CRITERIA

1. Discuss operation of the ACLS
2. List the four modes of operation for the ACLS
3. Discuss each mode of operation

- ENABLING OBJECTIVES

Appropriate programmed text

- PHASE OF FLIGHT

15. Naval Aviation Organization/Functions

- OBJECTIVE

#	Name
15.1	Describe Squadron, Carrier Airwing, and Fleet Airwing Organization and Their Interrelationship. Describe Marine Corps Airwing Organization

- COMPONENTS & CRITERIA

State relative seniority of each organization

- PHASE OF FLIGHT

15. Naval Aviation Organization/Functions

- OBJECTIVE

#	Name
15.2 -	Describe the Interface of Aircraft and Supporting Elements in the Operational Environment

- COMPONENTS & CRITERIA

- ENABLING OBJECTIVES

1. Discuss the characteristics, capabilities, and limitations of enemy ships, submarines, and aircraft
2. Discuss the employment of enemy ships, submarines, and aircraft vis-a-vis Navy and Marine Corp air including enemy defensive environments of radar, missiles, and AAA
3. Recall the air-to-surface weapons utilized in naval inventory
4. Recall the air-to-air weapons utilized in the naval inventory
5. Recall the surface-to-air missiles utilized in the naval inventory
6. Understand the functions and operations of a shipboard CIC
7. Recognize CIC responsibilities for data collection, display, evaluation, and dissemination and CIC equipment and logs
8. Recall CIC assist and coordination rules in AAW, ASW, and strike control operations
9. Explain the employment of ships in basic AAW tactics including missile zones, formations and CAP corridors
10. Explain the employment of aircraft in basic AAW tactics including CAP stationing and EW aircraft stationing
11. Recognize the role played by EW aircraft, attack carriers, PIRAZ and Radar Picket ships in controlling AAW operations
12. State basic AAW tactics through use of NWP 32 - AAW

TO 15.2 -- cont'd

ENABLING OBJECTIVES (cont'd)

13. Discuss the operational functions of ship based, shore based, and Marine Corps aircraft in a tactical situation
14. Define the role of the NFO in operational situations

- PHASE OF FLIGHT

15. Naval Aviation Organization/Functions

- OBJECTIVE

#	Name
15.3 -	Describe the Intelligence Cycle Including Collection, Processing, and Dissemination

- COMPONENTS & CRITERIA

1. State the means by which intelligence is gathered
2. State three common electronic intelligence gathering systems
3. State the function of the Air Intelligence Officer

- ENABLING OBJECTIVES

1. Functions of the integrated operational intelligence center
2. Tactical data input method
3. Know that refined and analyzed intelligence data is used to establish order of battle and rules of engagement
4. Define the term Tactical Data System (TDS)
5. Name three tactical data systems employed by fleet forces
6. List four capabilities of TDS
7. List the three data links in use and explain how they are employed
8. Name the two methods for obtaining communications security
9. Give a brief explanation of the use of authenticator systems

o PHASE OF FLIGHT

15. Naval Aviation Organization/Functions

o OBJECTIVE

Name

15.4 - State the use of SERE and SAR Teams

o COMPONENTS & CRITERIA

1. State under what conditions SERE and SAR teams are used
2. State factors which may degrade the SAR mission
3. State aircrew actions that will assist the SAR effort

o ENABLING OBJECTIVES

1. Sources of information for SERE and SAR
2. Purpose of search and rescue survival evasion, resistance, and escape training
3. Primary recovery vehicle
4. Types of SAR designated ships
5. Purpose of SERE and SAR training

o PHASE OF FLIGHT

15. Naval Aviation Organization/Functions

o OBJECTIVE

#	Name
15.5	Describe Naval Aviation Safety Program

o COMPONENTS & CRITERIA

1. Identify elements of squadron safety organization.
2. Define the purpose of: squadron safety survey, squadron pre-mishap plan.
3. Describe coordination procedures within the squadron among: safety, maintenance, quality assurance, training standardization, NATOPS.
4. Identify the reporting procedures for: aircraft mishap boards, accidents, incidents, ground accidents/ incidents, unsatisfactory reports, airframe change, airframe bulleting.
5. Identify the reporting and supporting commands at Naval Safety Center, CNATRA, CTW-6, NAS Pensacola.
6. Identify the channels of safety communication Approach, Cross-feed, Mech, Driver, Lifeline, Emergency Airborne Escape Summary, Safety Information Catalog, Hot Dope Sheet, CNATRA Aviation Safety, Any Mouse VT-10 SNFO questionnaire.
7. Identify policy guidance in OPNAV 3710 series for use of aircraft, flight demonstrations, command of an aircraft, flight violations, post maintenance check flights, authorized airfields.
8. Demonstrate ability to locate information in OPNAV 3710, such information as: flight authorization, flight planning requirements, VFR rules, IFR rules, general flight rules, air traffic control, general safety, survival equipment, physical and psychological requirements, flight records and reports, classification, qualification and requirements for flight crews, instrument flight requirements and qualifications.

o PHASE OF FLIGHT

16. NFO Mission Functions

o OBJECTIVE

#	Name
16.1	State and Explain NFO's Mission(s) in Various Squadrons

o COMPONENTS & CRITERIA

1. State and explain the NFO's mission in the following squadrons:
   a. VF Fighter
   b. VA Attack
   c. RVAH Reconnaissance
   d. VAW Airborne Early Warning
   e. VAQ Airborne Electronic Warfare
   f. VQ Passive Electronic Warfare
   g. VP Patrol
   h. VS Anti-submarine
2. State the type aircraft used in each squadron.
3. State the operating environment of each aircraft.

o ENABLING OBJECTIVES

1. Mission of all naval aircraft
2. Offensive and defensive capabilities of naval aircraft in the following area:
   a. Electronic
   b. Photographic
   c. Weapons delivery
3. NFO functions in naval aircraft.

o PHASE OF FLIGHT

16. NFO Mission Functions

o OBJECTIVE

#	Name
16.2	Identify Terms and Functions of Electonic Warfare in Naval Air Operations

o COMPONENTS & CRITERIA

1. List the three major divisions of electronic warfare.
2. Define the following:
   a. Electronic Warfare (EW).
   b. Electronic Warfare Support Measure (ESM)
   c. Electronic Countermeasures (ECM)
   d. Electronic Counter-countermeasures (ECCM)
3. State the major reason why electronic warfare has become an important facet of modern military operations.
4. Define ESM missions.
5. Discuss major utilization of ELINT information.
6. Define EOB.
7. Explain the roles of the RA-5C, EA-3B, and EP-3E in ELINT operations.
8. Explain the basic functions of the IOIC.

o PHASE OF FLIGHT

16. NFO Mission Functions

o OBJECTIVE

#	Name
16.3 -	Define Principal EW Methods (Active, Passive, and Counter-Counter)

o COMPONENTS & CRITERIA

1. State the five actions which ESM operations utilize in an effort to exploit enemy electromagnetic emissions
2. Explain why ESM operations are not electronically detectable by an enemy.
3. List the four basic components of an ESM system.
4. Define the following:
   a. Burn through
   b. Spot jamming
   c. Swept jamming
   d. Barrage jamming
   e. Standoff jamming
   f. Mutual support jamming
   g. Self-defense jamming
5. List the two basic sypes of jamming ECM used by the Navy.
6. State the reason for, and definition of, look-through.
7. Name the six most common mechanical ECM devices.
8. List the five types of normal voice communication jamming modulations.
9. State how deception devices basically differ from jamming devices.
10. List the basic function of the four elements of the defensive ECM package.
11. Describe the contents of the ROB and how these contents are used in strike planning.
12. Define the term "Threat" as applied to radar systems.
13. List the progression of enemy radars encountered on a strike mission and describe their characteristics and mission.
14. List the components of the SA-2 missile system.

TO 16.3 -- cont'd

COMPONENTS & CRITERIA (cont'd)

15. Describe the operating limitations and effective range of the "Guideline" missile.
16. List the components of a typical AAA site and describe the radar associated with it.
17. Describe in general, how a strike route is planned.

o PHASE OF FLIGHT

16. NFO Mission Functions

o OBJECTIVE

Name

16.4 - Identify Principal NFO EW activities

o COMPONENTS & CRITERIA

1. Define the following:
   a. Anti-active
   b. Anti-passive
   c. EMCON
   d. Timesharing
   e. COMCM
   f. NAVCM
   g. Intermittent operation
   h. EMCON plan
2. List the two purposes of radar anti-jamming devices.
3. Discuss the basic problems of weapons systems and electronic equipment operation in an EW environment.

SECTION III

Objectives Deleted From NFO Basic Training Program

As was described in Section I of this Appendix, the review of existing course objectives resulted in agreement by the Navy and HumRRO to delete a number of objectives from the existing course in preparing the revised NFO Basic Training Course. The background and rationals for that review have already been stated and will not be repeated here.

In reviewing the objectives deleted, the reader should keep in mind the instructional emphasis of the revised program on how to do, perform, and operate. Consequently, the course de-emphasizes instruction on the internal design and theory of operation of various aircraft instruments and systems or on theory of various physical phenomena. Several bases lie behind the various deletions. For example, certain of the deleted material is deleted on the basis that it is already covered by objectives retained in Section II and, thus, should not be retained to reduce unnecessary duplication or redundancy. A second basis is related to general inappropriateness for inclusion in NFO Basic Training. This does not necessarily imply that the material is not pertinent at all. For example, it was concluded in the joint review that objectives relating to junior officer responsibilities should be taught in AOCS (or other officer training courses) and then reviewed at RAG and fleet levels. Finally, the level of detail and amount of theory, generally in Cognitive domain areas, was a basis for deletion. This is especially pertinent to deletions in the areas of electricity, electronics, and electronic warfare.

The objectives are grouped in this listing by area such as Basic Meteorology, Electricity and Electronics, etc. The various objectives are then numbered within area. The numbers carry no connotation of order, sequence, complexity, or importance.

Objectives Deleted From
NFO Basic Training Program

BASIC METEOROLOGY

1. List and define the four methods of heat transfer.
2. Compare specific heat of land and water surfaces.
3. Define Coriolis force with relation to speed and latitude.
4. Diagram a three-cell circulation theory.
5. Determine past sea-level pressure.
6. Recognize the process by which warm occlusions form.
7. Identify the causes of a tornado's destructive forces.

Advanced Meteorology

1. Determine past sea-level pressure.
2. Indicate whether the following presentations are facsimile or teletype:
   a. Weather-depiction chart
   b. Radar-summary chart
   c. Freezing level chart
   d. Winds-aloft chart
   e. Terminal forecast chart
   f. Constant-pressure charts
   g. Area forecasts
   h. In-flight weather advisories
   i. Severe weather forecasts
   j. Pilot reports
3. Indicate the transmission schedule for the following.
   a. Weather-depiction chart
   b. Radar-summary chart
   c. Freezing level chart
   d. Winds-aloft chart
   e. Constant-pressure charts
   f. Terminal forecast
   g. Area forecasts
   h. In-flight weather advisories
   i. Severe weather forecasts
   j. Winds-aloft forecasts

Visual Navigation

1. List seven features which are desirable to have in the construction of aeronautical charts.
2. Name the surface used in the projection of gnomonic, Mercator, and Lambert conformal charts.

Visual Navigation (cont'd)

3. Describe the major disadvantages of a Mercator and a Lambert conformal chart.
4. List and/or identify component parts of basic compass system.

Dead Reckoning

1. State the limits of the frequency spectrum of the ADF receiver and tell how the spectrum is utilized.
2. Locate and identify the four component parts of the VOR navigational system.
3. Name and describe the location of the component parts of a TACAN system.
4. Locate and identify the component navigational parts of the ID-249.
5. Locate and identify the component parts of the ADF receiver.

Electricity and Electronics

1. State the difference among the following conductors, insulators, and semi-conductors, in terms of:
   a. Valence electrons
   b. Free electrons
   c. Electrons in the valence shell
2. Define the forbidden band and describe its significance.
3. Describe the relative energy needed to cause current flow in conductors, insulators, and semiconductors.
4. State whether positive or negative charges move.
5. State the direction of current flow under given conditions.
6. State the theory of attraction and repulsion as it applies to negative charges.
7. Describe the difference between a photo cell and a photoelectric cell.
8. State the fundamental difference between a primary cell and a secondary cell.
9. Identify cells as to primary or secondary.
10. Describe the direction of apparent electron flow inside a chemical cell.
11. Define reluctance.
12. Discuss the properties of flux lines.
13. List three ways of increasing electrical production from a conductor moving past a magnet.

Electricity and Electronics (Cont'd)

14. Define each of the elements of the formula E=IR.
15. Name the two types of electromotive forces and describe the difference in current flow associated with each.
16. Name the three things which must be present to allow the conversion of mechanical energy to electrical energy to take place.
17. Name the two sources of magnetic fields which are used in the mechanical-to-electrical energy conversion.
18. State the advantages/disadvantages of each.
19. Define "thermionic emission."
20. Label the components of a diode vacuum tube and explain the function of each component during the tube's operation.
21. State the function of a rectifier and tell why a diode can be used to perform rectification.
22. Identify, from a schematic drawing, the elements of a triode vacuum tube.
23. Explain the function of each of the elements of a triode during operation.
24. Explain how a triode can amplify.
25. Demonstrate an understanding of the concept of gain by performing an applicable mathematical computation.
26. Identify, from a schematic drawing, the components of a cathode ray tube.
27. Explain the basic functions of the components of a cathode ray tube.
28. Define semiconductor.
29. Explain N-type material.
30. Explain P-type material.
31. Explain PN junction.
32. State the conditions necessary for current to flow in a PN function in terms of relative potentials or voltages on the two semiconductor materials.
33. Explain why there is only one possible direction for current to flow in a PN junction diode.
34. Define transistor.
35. Explain how the thinness of the center semiconductor material enables the transistor to function as an amplifier.

Electricity and Electronics (cont'd)

36. Describe the correct way to bias the elements of the NPN and PNP transistors.
37. Describe the current flow in the NPN and PNP transistors and explain why the flow is in this pattern.
38. State two advantages that vacuum tube circuits have over solid state circuits.
39. State three advantages that solid state circuits have over vacuum tube circuits.
40. Match the following terms with the correct definition of each:
    a. Sound
    b. Sound waves
    c. Frequency of sound waves
    d. Pitch
    e. Amplitude
41. Define "audio frequency range."
42. State the range of audio frequencies.
43. State the range of audio frequencies considered adequate for communications work.
44. Match the bands of radio frequencies to the appropriate range of frequencies.
45. Name the device used to generate a frequency.
46. State the definition of modulation.
47. State the two reasons why a modulated RF carrier is used instead of transmitting an audio wave directly.
48. Match pulse/CW, AM, and FM modulation with a given list of advantages and disadvantages.
49. Compute wavelength, when given frequency.
50. Describe the wave radiation pattern from a simple half-wave dipole antenna.
51. Explain why a "cone of silence" exists at the tips of a simple half-wave antenna.
52. Match the components of a radiated wave with the range of frequencies where they are used.
53. State the purpose of the oscillator.
54. State the purpose of the mixer in a receiver.
55. State the purpose of the detector in an AM receiver.

Electricity and Electronics (cont'd)

56. State the purpose of the discriminator in an FM receiver.
57. Match the various transducers with their primary advantages/ disadvantages from a given list.
58. Define each of the elements of the equation $\lambda = \frac{C}{f}$, and state the relationship which exists between frequency and wavelength.
59. Explain automatic volume control (AVC).
60. Define the term "transducer."
61. Define "frequency" as it applies to a.c.
62. Define generator.
63. Describe and give the two sources of magnetic fields.

Computer Systems

1. Solve problems of intermodular conversion between numbers of the binary, octal, decimal, and hexadecimal number systems.
2. Demonstrate the application of the "Law of Integral Powers" by direct conversion between binary, octal, or hexadecimal number systems.
3. State the four steps necessary to follow when writing a computer program.
4. Create an algorithm and from it construct a flowchart.
5. Label an analog triangle.
6. State the difference between machine language and compiler languages.
7. Apply the four steps of computer programming to an assigned problem.
8. Translate the flow chart steps into operating codes.
9. Demonstrate an understanding of the processing limits of the computer.
10. Label the major components of a representative transceiver block diagram.
11. Define the term "bilateral" as it relates to transceivers.
12. State the definition of the "radix" of a number system.
13. Convert a number in the decimal system to binary-coded decimal and vice versa.
14. Construct a flow chart for a program which might be used to compute the outputs required by the weapons system to drop a load of bombs.

Advanced Systems

1. Explain the necessity of mounting the inertial navigation system (INS) accelerometers on a gyro-stabilized platform.
2. State three factors affecting a gyro's rigidity.
3. Identify the three gyro axes on an illustration of a single-degree-of-freedom gyro.
4. Recognize what kind of torque is measured by a single-degree-of-freedom gyro.
5. Predict the direction of precession of a single-degree-of-freedom gyro, given the direction of rotation about the sensitive axis.
6. Explain the advantages of the flux valve over other types of magnetic indicating devices.
7. Explain how a Flight Reference Set (FRS) is constructed and operates.
8. State how many gyros are required to stabilize the flight reference system.
9. Explain how ILS localizer and glide slope information is generated.
10. Identify which type of hybrid system is used to correct for which type of error.
11. Define transport rate.
12. Write the equations for the transport rate corrections to the north-south and east-west gyros of the INS.
13. State the function of the Schuler loops.
14. State what is contained in each Schuler loop.
15. State when velocity and displacement errors will be maximum and minimum during the Schuler oscillation cycle.
16. Define earth rate.
17. Explain the effect of latitude on the earth rate signals to the north-south and vertical gyros.
18. Define azimuth torqueing.
19. Explain the effect of latitude and east-west velocity component on the azimuth torqueing signal to the vertical gyro.
20. Explain what occurs during gyrocompassing.
21. List the four INS errors which result in a position error which is periodically cancelled by the Schuler oscillations.
22. Define and give examples of a navigation update hybrid INS.

Radar Systems

1. Pulse Radar Transmitter

   a. State the functions of the two basic elements of the pulse radar transmitter.
   b. Identify the five basic elements of the pulse radar modulator.
   c. Describe the function performed by each of the five elements of the pulse radar modulator.

2. Pulse Radar Receiver

   a. State the three ways in which a radar receiver differs from a communication receiver.
   b. Label a block diagram of a radar receiver and state the function of each block.

3. Cathode-Ray Tube Indicators and Related Special Circuits

   a. Label a schematic representation of a cathode-ray tube and explain briefly its operation.
   b. Name the two types of radar cathode-ray tubes.
   c. Match a list of advantages and disadvantages with each of the major types of cathode-ray tubes.
   d. State the two types of modulation used to display a target on a cathode-ray tube.
   e. State which elements(s) of the CRT cause(s):
      (1) The appearance of targets on a screen
      (2) The electron beam to sweep
   f. State the function of the sweep resolver.

4. The Radar Synchronizer

   a. State the function of a synchronizer.
   b. Using a given list, label a block diagram of a typical synchronizer.
   c. Using a given list, label a chart of voltage waveforms generated by the synchronizer and its associated circuitry.
   d. Match a list of functions with the units which make up the synchronizer.

5. Frequency Modulated (FM) Radar

   a. Label a basic block diagram for an FM ranging system.

6. Moving Target Indicators (MTI)

   a. Define radial velocity.
   b. State the function of the COHO in the coherent MTI system.
   c. State the main difference between coherent and non-coherent MTI.

7. Radar Environment

   a. List the auxiliary equipment used by the ARTCC.
   b. List the characteristics of the more accurate radar of the two types used.

8. Special Systems

   a. Describe how electromagnetic radiation is amplified by stimulated emission.
   b. Explain the effect of absolute temperature emitted by a black body.

Electronic Warfare

1. Introduction to Electronic Warfare

   a. Anti-ESM
   b. Anti-ECM

2. Electronic Support Measures (ESM)

   a. State what type of emitter ESM operations are designed to detect.
   b. Name the United States Armed Forces which employ ESM operations.

3. ELINT Operations and Aircraft

   a. Explain limiting factor for ESM mission.
   b. Discuss the coordination of ELINT information by appropriate agencies.
   c. State the two basic elements in the automatic PESM system.
   d. State the characteristics and capabilities of the RA-5C which make it an excellent reconnaissance aircraft.
   e. Describe basically how the automatic PESM system operates.
   f. State the two main disadvantages of the RA-5C/IOIC system.
   g. State the major advantage of utilizing manual PESM aircraft (EP-3C, EC-121, EA-3B) for intercept search missions.

Radar Order of Battle (ROB)

1. Recognize conical and track-while-scan (TWS) scan patterns.

Fleet Orientation

1. Junior Officer Responsibilities

   a. Understand the duties of a division officer.
   b. Understand the duties of the squadron duty officer.
   c. Write an enlisted evaluation.
   d. Write an officer fitness report.
   e. Write an officer preference card.
   f. Recall the types of naval correspondence:
      (1) Official naval letter
      (2) Endorsements
      (3) Personal naval letter
      (4) Joint letter
      (5) Multiple-address letter
      (6) Business - form letter
      (7) Navy directive
      (8) Speedletter
      (9) Message
      (10) Memorandum
   g. Understand the Navy and Marine Corps directive system.

2. Flight Deck Procedures and Safety

   a. Recognize the physical layout of the flight deck.
   b. Understand the responsibilities of flight deck personnel and identify the flight deck jersey color scheme.
   c. Appreciate the complexity of aircraft movement and handling on a flight deck.

Fleet Orientation (Cont'd)

d. Explain the functions of the:

(1) Optical landing system
(2) Elevators
(3) Catapults
(4) Jet blast deflectors
(5) Arresting
(6) Barricade
(7) Refueling stations
(8) Fire fighting equipment

e. Recognize the usual signals used on the flight deck.

f. Appreciate the importance of teamwork during launch and recovery operations.

3. Communications system

a. Understand how naval messages are transmitted.
b. Understand the use of fleet broadcast.
c. Understand the concepts of tactical networks.

4. Naval Messages

a. Identify the precedence and date time group of a message.
b. Name the four types of messages.
c. Identify the originator, and action and information addresses of a message.
d. Explain the use of the prosign "BT."
e. Locate and identify the classification and precedence of a message.
f. Identify the reference line(s) in a message.
g. State the use of SECNAVINST 5210.11 (series) as it applies to messages.
h. State the normal drafting/releasing procedures within a squadron.

NATOPS SAFETY (T-39)

1. Introduction Description

a. Explain the purpose of the T-39-D at VT-10 and VT-86.
b. Know the general size and description of the T-39D.
c. List the basic A/C weight.
d. Explain the slats and flaps.

2. Hydraulic System

a. Explain the purpose of the hydraulic shutoff and start bypass valves.
b. Explain the landing gear system.
c. State the equipment operated by the normal system.

(1) Landing gear
(2) Main gear door
(3) Nose gear steering
(4) Speed brake
(5) Wheel brake

NATOPS SAFETY (T-39 cont'd)

(6) AC generator drive
(7) Emergency hydraulic power transmitter
(8) Radar antenna drive

3. State the equipment operated by the auxiliary system.

a. Speed brake
b. Wheel brake
c. Nose wheel steering
d. Emergency hydraulic power transmitter

4. Fuel System

a. Explain the fuel tank vent system to maintain satisfactory pressure with differing temperatures.
b. Explain the operation of the single point refueling vents and their location.

5. Engines

a. Describe the type and thrust of each T-39 engine.
b. Understand the differences between the compressor stages and reaction turbines.
c. Understand how they utilize bleed air for pressurization and anti-ice.
d. Explain the purpose of the probes in the intake and the exhaust.
e. Understand the purposes of the fuel control, starter-generator, and hydraulic and oil pumps.

6. Electrical System

a. Understand the 30 volt 300 amps engine driven starter generator.
b. Understand the 24 volt 22 amp hr nickel cadmium battery.
c. Understand the D.C. electrical system and its components:

(1) Battery bus
(2) Starter bus
(3) Paralleling bus
(4) No. 1 and 2 secondary bus
(5) D.C. essential bus

d. Understand the different A.C. buses:

(1) 115 volt secondary buses
(2) Instrument buses
(3) Indirect lighting buses

7. Communication/Navigation Equipment

a. Recall where this equipment is located in the aircraft.

b. Explain the capabilities of each equipment.

8. Servicing Requirements

a. Understand the external power needed for starts.

b. Explain the oxygen servicing system.

NATOPS SAFETY T-39 (Cont'd)

9. Flight Instruments

   a. Explain the directional indicating system.
   b. Understand the pitot-static system.
   c. Explain the flight director system:

      (1) ADI
      (2) HSI
      (3) BDHI
      (4) TACAN
      (5) VOR
      (6) ILS
      (7) RADAR ALT

   d. Understand the flight instruments:

      (1) VSI/VVI
      (2) BDHI
      (3) Altimeter
      (4) ADI
      (5) Airspeed

10. Environmental Systems

   a. Discuss the flow of air from the engine compressor to the air conditioning and pressurization outlets.
   b. State the number of pressurized seals, their location and which system inflates them.
   c. Discuss the two separate anti-ice systems incorporated in the engine inlet anti-ice.
   d. State the three reasons the front windshield anti-ice is always turned on in flight.

11. Operating Limitations

   a. State the four prohibited maneuvers.

12. Flight Control and Flight Characteristics

   a. State the method by which the flight controls are operated.
   b. Discuss the function of the bias bungee and the bob weight.
   c. State the three systems operated by the rudder pedals.
   d. State the trim rates for the horizontal stabilizer and what affects these rates.
   e. Discuss the safety feature incorporated in the flap system to prevent an asymmetrical flap extension.
   f. State the recovery techniques for spins.
   g. Discuss the effectiveness of using the ailerons for directional control on takeoff and landing roll.