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F-16 AIRCREW TRAINING DEVELOPMENT PROJECT

Contract No. F02604-79-C8875

DATA BASE UPDATE
PROCEDURES REPORT

DEVELOPMENT REPORT No. 10
March 1981

Prepared in partial fulfillment of CDRL nos. B015 and B051

by

S.J. Rolnick
D. Mudrick
Courseware, Inc.

E.A. Thompson
Hughes Aircraft Company

COURSEWARE, INC.
10075 Carroll Canyon Rd.
San Diego, CA 92131
(714) 578-1700

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PREFACE

This report was created for the F-16 Aircrew Training Development Project contract no. F02604-79-C8875 for the Tactical Air Command to comply with the requirements of CDRL nos. B015 & B051. The project entailed the design and development of an instructional system for the F-16 RTU and instructor pilots. During the course of the project, a series of development reports was issued describing processes and products. A list of those reports follows this page. The user is referred to Report No. 34, A Users Guide to the F-16 Training Development Reports, for an overview and explanation of the series, and Report No. 35, F-16 Final Report, for an overview of the Instructional System Development Project.

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F-16 AIRCREW TRAINING
DEVELOPMENT PROJECT REPORTS

Copies of these reports may be obtained by writing the Defense
Technical Information Center, Cameron Station, Alexandria,
Virginia 22314. All reports were reviewed and updated in March
81.

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Rolnick, S.J., Mudrick, D., Gibbons, A.S. & Clark, J. F-16 task
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Schmidt, R.F., Gibbons, A.S., Jacobs, R. & Faust, G.W. Recommendations for the F-16 performance measurement system (F-16 Development Report No. 14). San Diego, Calif.: Courseware, Inc., October 1978, March 1981.

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O'Neal, A.F., & Kearsley, G.P. Computer managed instruction for the F-16 training program (F-16 Development Report No. 17). San Diego, Calif.: Courseware, Inc., July 1978, March 1981.

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O'Neal, A.F., & O'Neal, H.L. F-16 pilot media selection (F-16 Development Report No. 26). San Diego, Calif.: Courseware, Inc., March 1979, March 1981.

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    training development reports (F-16 Development Report No.
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    Report No. 35). San Diego, Calif.: Courseware, Inc.,
    January 1981, March 1981.

EXECUTIVE SUMMARY

This report describes procedures for updating the following five major ISD data bases:

1.   Pilot task analysis.

2.   Goal analysis.

3.   Criterion-referenced objectives (CROs).

4.   Objectives hierarchies. and

5.   Program reports.

These data bases are divided into two types which require updating; interdependent data bases and isolated data bases.

The interdependent data bases include the task listings, CROs, and objective hierarchies. Because these lists are highly interrelated changes in one listing requires changes in the other two lists. As an example, changes in the heads-up display (HUD) of the aircraft might require that all HUD related tasks are examined for updating. Changes in the task listing may require changes in the objectives hierarchy and the CROs involving the HUD. Thus, changes in an interdependent data base require changes in related data bases.

Isolated data bases such as reports, i.e., the target population study, can be changed and updated without affecting other data bases. Isolated data bases are independent and changes in one data base will not require the updating for rewriting of other data bases.

Changes to these data bases arise from two sources; external and internal. External changes derive from sources outside the ISD process such as equipment modifications, changes in tactics, or different student entry skills. Internal changes are those revisions which derive from the ISD process itself such as a need for changes as pointed out by a program evaluation.

The process of changing the data bases starts when a member of the contractor staff or OTD team becomes aware of the need for a change to data base documents or reports. A hard copy of the pertinent data is obtained by that person and proposed changes are inserted into these printouts and the appropriate revision forms. The changes are reviewed by appropriate personnel and if approved all areas affected by the change are noted and the

change is incorporated into the appropritate document/report data
bases.   The procedure described is a general overview of the data
update procedures.   The report includes specific steps for
updating both interdependent and isolated bases as well as the
task revision and report revision forms to be used.

CONTENTS

DATA BASE UPDATE
PROCEDURES REPORT

1.0 INTRODUCTION

1.1 Statement of Work Requirements

This report is in response to the contract requirement to
update and automate the task and goal analyses (CDRLs B015 and
B051). The contractor is further required to ensure that all
documentation, data, and deliverables are updated for accuracy,
currency, and comprehensiveness prior to end-of-phase reviews
(CDRLs B023, B052, and B061). Procedures are described in this
report to facilitate these updates, by contractor and USAF
personnel. At present this report takes the form of a project
working procedure paper. At a time in the future when the USAF
assumes full responsibility for the operation of F-16 instruc-
tional systems functions, this report will become an important
system operation plan document describing procedures for a
critical periodic update activity.

It should be noted that this document describes the
mechanics of document update, not the significance of the changes
made. For example, changes to the task analysis are described in
terms of a revision form to be completed and a monthly re-drawing
of affected sections of the hierarchy. There is no discussion of
the impact of hierarchy changes on lesson development, instruc-
tional sequencing, or syllabus modification. Such discussions
are beyond the scope of this report, which limits itself to the
update of the data bases, not the update of the instructional
system as a whole. Updating and revising the instructional
system is discussed in Report No. 18, F-16 Implementation and
Management Plan Report.

1.2 Report Contents

The contents of this report describe the procedures for
collecting and posting changes to the following F-16 instruc-
tional system development (ISD) data base documents and reports:

1. F-16 pilot task analysis (CDRL B012)

2. F-16 goal analysis (CDRL B014)

3. F-16 pilot criterion-referenced objectives (CROs) (CDRL
   B019)

4. F-16 pilot objectives hierarchies (CDRL B013)

5. Selected program reports

Update procedures for additional data bases will be added to this report as they are developed.

The documents listed above include data that must be continually updated and maintained to ensure a current F-16 instructional system. The update procedures consist of a process for identification of changes occurring in the F-16 that necessitate related changes in the data base documents to make those documents a reflection of the current F-16 situation. These changes arise from two sources: (1) those _external_ to the ISD process, such as changes in hardware, tactics, or entry skills of incoming students, and (2) those _internal_ revisions arising out of the ISD process itself.

1.3 Rationale

In the design of the data base input, storage, retrieval, and update procedures, the approach taken was to keep the system as simple and as straightforward as possible so that a minimum of training would be required on the part of USAF personnel using and maintaining the system after the contractor leaves the F-16 program.

There are two types of data bases that need to be updated: (1) interdependent data bases and (2) isolated data bases. Changes to items in interdependent data bases require changes to be made to items in a related data base. Examples of interdependent data bases are the task listing, CROs, and objectives hierarchies. Isolated data bases (e.g., target population study data) are those which can be changed without directly affecting other data bases. There are separate procedures for updating these two kinds of data bases.

1.3.1 Interdependent Data Base Structure

An understanding of the nature of the task listing, CROs, and objectives hierarchies and the relationships among them is an important part of the rationale for the procedures for updating interdependent data bases described in this paper. The current F-16 task listing contains about 1,000 tasks. Bottom level tasks from the task listing and certain tasks at upper levels are converted into CROs through the addition of conditions, a standard of performance, an extensive data set, and a list of steps to be performed. The CROs are subsequently broken down into training objectives, usually several per task. These objectives, combined with the original task listing, constitute the objectives hierarchies.

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Since these lists are highly interrelated, a change in one list usually requires that the other two lists be revised. The necessity of revising and renumbering tasks, CROs, and objectives during updating thus creates a tremendous bookkeeping load merely to post the changes and reorganize the data appropriately. For example, changes in the heads-up display (HUD) of the aircraft may require that all tasks related to the use of the HUD be checked for possible updating. Such a change in the task listing may require a redesign of the objectives hierarchies as well as the rewriting of CROs involving the HUD.

In an emerging weapons system, such changes can be expected in high volume. Changes must be made quickly and accurately and with no information misplaced or important data linkages lost. This type of revision process would be very difficult and inconvenient to handle manually. Therefore, the F-16 tracking system and update procedures make extensive use of automatic data processing (ADP) support through a word processing system.

1.3.2 Isolated Data Bases

Isolated data bases such as reports need merely to be rewritten to include up-to-date information. Although this can be accomplished without ADP support, the use of word processing makes the procedure more efficient and convenient. Corrections may be inserted on-line into the stored text and then printed out without requiring the entire document to be retyped manually.

1.4 Manual/Automated Recordkeeping Requirements

The procedures developed and established for update of F-16 data base documents and reports involve the use of both manual and automated recordkeeping.

The word processing system presently in operation at the F-16 project office is used to support the update system. This self-contained microprocessing system has list processing capabilities that facilitate the renumbering and reordering of tasks. In addition, all documents and reports are stored on the system and can be called up for line, paragraph, or page changes. Additions and deletions may be made as required, and printouts received of the document or report update(s). Interface with the system is direct through a keyboard, eliminating the need for punched cards. A cathode ray tube display augments the printout capability. All work is performed on-line so that turnaround time is immediate.

A further advantage of the word processor is that it does not require the use of a complicated programming language and, therefore, the operator need not be a programmer. A secretary or data entry clerk can become skilled in using the system after about a month of training and practice.

1.5 Definition of Terms

As used in the context of this report, the terms Project Technical Director, Data Base Manager, and Author are defined as follows:

1. <u>Project Technical Director</u>: The project technical director is the on-site contractor representative assigned over-all technical responsibility for all contractor efforts/tasks in the F-16 Aircrew Training Development Project. The Operations Training Development (OTD) team chief will assume this function upon contractor withdrawal.

2. <u>Data Base Manager</u>: The data base manager is the person assigned by the project technical director or OTD team chief to be the one person responsible for maintaining data base currency and the accomplishment of timely updates to the data base files, documents, and reports.

3. <u>Author</u>: The author can be either the USAF or contractor person who originally prepared the data base file, document, or report entered and stored on the word processor or a USAF or contractor team member who has recognized a need for update of the data base and authored a recommended data base change for review and consideration for implementation (change author).

2.0 SPECIFICATIONS OF DATA BASES

A description of the data base files and their contents are presented in this section.

2.1 Task Listing

The task listing data file is stored on the word processor; updated versions for use by the contractor and USAF OTD team personnel will be printed regularly as updates occur according to the procedure set forth in Section 3.2. Each task listed will have a numbr indicating its position in the hierarchy and an associated behavior statement.

2.2 Goal Listing

The goal listing data file is an integral part of the Goal Analysis Report which is stored on the word processor. The goal listing includes the defined goals, indicator behaviors, and characteristics of the instructional system. This listing file will also be updated and printouts developed for use by the F-16 team as updates take place.

2.3 CROs

Those tasks which have been designated as CROs have been established in the task listing data file and stored on the word processor. The listing for those tasks which have been designated as CROs includes entries for the additional data fields (conditions, standards, etc.) described in Section 1.3.1.

2.4 Objectives Hierarchies

The objectives hierarchies are presntly in graphic form and therefore cannot be stored on the word processor. Eventually, as training objectives are expanded to include specific content, the objectives hierarchies will also be stored on the word processor in the form of a numbered listing. At that time the update procedures will be revised accordingly.

2.5 Program Reports

Reports that were updated for accuracy, currency, and comprehensiveness include the following:

Program Work Plan, F-16 Aircrew Training Development Project
        Report No. 1.

Data Collection and Management Forms Report, F-16 Aircrew Train-
   ing Development Project Report No. 3

F-16 Task Analysis, Criterion-Referenced Objective, and
   Objectives Hierarchy Report, F-16 Aircrew Training Develop-
   ment Project Report No. 6

Goal Analysis Report, F-16 Aircrew Training Development Project
   Report No. 9

Data Base Update Procedures Report, F-16 Aircrew Training
   Development Project Report No. 10

F-16 Media Selection and Utilization Plan Report, F-16 Aircrew
   Training Development Project Report No. 20

F-16 Training Media Mix, F-16 Aircrew Training Development
   Project Report No. 31

   The procedure for updating these reports is described in
Section 3.3. The F-16 student training goal listing is incor-
porated into the project goal analysis report (Report No 19).
Changes in the goal listing are made in accordance with the pro-
cedure for updating isolated data bases.

2.6 Updating the Update Procedures

As additional data bases and reports are generated which require updating, the current report will be revised to include specific procedures for updating these documents. Data bases to be added include the following:

- Criterion-referenced tests

- Media selections

- Syllabi

- Instructor pilot task listing, CROs, and objectives hierarchies

- Instructional materials and aids

3.0 DATA BASE UPDATE PROCEDURES

3.1 Update Procedure Overview

Changes are initiated when a member of the contractor staff
or OTD team becomes aware of a valid change to be made to data
base documents or reports. That person obtains a hard copy of
the pertinent data from the data base manager. Proposed changes
are inserted on these printouts as well as on the appropriate
revision form. The changes are then reviewed by the OTD team
chief, the project technical director, and other selected members
of the OTD and contractor teams. If approved, all areas that the
change affects are noted and the change is entered in the
appropriate document/report data bases. The updated
documents/listings/ reports are posted on a regular basis, or as
required by the contract, as in the phase updates.

3.2 Updating Interdependent Data Bases

The following are the specific steps to be taken in updating
interdependent data bases:

Step 1: Determining When Changes Are Necessary

Changes to the data bases come from two general sources.

1. <u>External inputs</u> may prompt changes such as

    a. Changes in technical orders including the flight
        manual (T.O. 1F-16-1) and technical manuals (e.g.,
        T.O. 1-F16A-34-1-1).

    b. Changes in the General Dynamics F-16 Task Analysis.

    c. Changes in the 50-60 series AF/TAC regulations.

    d. Higher headquarters directed changes.

    e. Changes in the aircraft mission and tactics.

    f. Time compliance technical orders.

    g. Changes in the student population entry level
        characteristics (e.g., changes in the lead-in
        syllabus).

    h. Information from the Operational Testing and
        Evaluation (OT and E) team.

    i. Information from subject-matter experts (SMEs).

j. Information from the System Program Office (SPO).

k. Validation information from initial courses.

2. <u>Internal revisions arising from the ISD process</u> may also promopt changes from three sources.

a. Contractor personnel.

b. OTD team reviews.

c. Suggestions from SME reviewers other than those on the OTD team.

These inputs could be translated into changes of several types, including the following:

A. Adding

- A previously undiscovered substantial task.

- Additional tasks required by unusual conditions specified in a CRO.

- Missing subtasks (e.g., expanding a list of subtasks if it is determined that after having mastered all given subtasks the student would be unable to perform the major task without more than a few simple instructions).

- Previously undiscovered yet necessary instructional objectives

B. Deleting

- A task which duplicates one listed elsewhere.

- A task that is included in another subtask on the list.

- Subtasks not essential to performance of the super-ordinate task.

- Tasks that are impractical to actually perform during a training program because they would be extremely hazardous or would demand unavailable instructional resources. (These must be replaced with appropriate training tasks, however, see project report no. 8, "Objective Hierarchies Analysis Methodology Report.")

C. Making modifications such as

- Fragmenting overly large tasks.

- Rearranging tasks that are at the same level but are not independent of each other (i.e., some are found to be superordinate or subordinate to others).

- Regrouping tasks into different categories.

- Rewording tasks and components of objectives for consistency.

Step 2: Accomplishing Task Revision Form

When a change has been identified, the change author first enters the proposed revision on the Task Revision Form (Figure 1). This form is used to record changes to the task listing, objectives hierarchies, and CROs.

The author fills in the date and his name or initials. He then determines whether the change affects the task listing, CROs, or objectives hierarchies or any combination of these, and checks the appropriate column under "Change to:". Under the "Action to Task" heading, he checks whether the change is an addition (A) of a new task or a deletion (D) or modification (M) of an existing task. If the task already exists, its number is recorded. If the task is being added, there may not be any task numbers unless placement in the task listing has been determined. (Renumbering will be accomplished later by the data base manager.) A proper entry in the "Description of Change" column should ensure that the changes are accurately described. For a new task or a task being changed, the latest form of the description is entered. The "Reason for Change" column is completed next. A preliminary indication is then made of which aircraft systems are likely to be affected by the change. This process is repeated for each change input.

Step 3: Executing Changes on Posted Task Listing

If a change affects the task listing, the author locates the posted printout of the latest task list. All proposed changes are written out in red pencil on this printout and are initialed by the author.

Step 4: Executing Changes on CRO Printouts

The author obtains from the data base manager a printout of all CROs affected by this change. (The list of CROs affected is compiled by the data base manager using the word processor search capabilities as well as advice from system staff.) The author executes and initials the proposed changes in red pencil and posts these revised CROs where they can be examined by the rest of the OTD and contractor team.

TASK REVISION FORM

Date	Change Author	Change to: TL CRO OH	Action to Task A D M	Task Number	Description of Change	Reason for Change	Systems Affected	Approved

Figure 1--Task Revision Form.

Step 5: Executing Changes in Objectives Hierarchies

If any changes are to be made in the objectives hierarchies, a photocopy of the affected phase or subphase of the hierarchy map is made by the author. The proposed change is marked in red pencil on the copy, which is then posted.

These procedures are repeated for each change as necessary and are carried out at the same time as Step 2 above.

Step 6: Review Process

On a weekly basis, the project technical director and OTD team chief or their designated reviewers look over the revision forms and the posted changes. A meeting is then called of all appropriate, available members to the OTD and contractor teams to discuss these changes. If a change is approved, the technical director and OTD team chief initial the appropriate line on the revision form. If not, a conference is scheduled, if necessary, with the change author.

Step 7: Processing and Printout of Revised Task Listing

Following the weekly review meeting, the data base manager examines the revision forms and notes which changes to the data base have been approved. The posted listing is then consulted to determine the specific content of each change, and approved changes are entered into the data base on the word processor by the data base manager. Several copies of the revised listing bearing the date of revision on the revised page are printed out by the data base manager. One is filed for archival purposes. Another is posted as the now current version for subsequent review/revision. Additional working copies are made for the use of team personnel.

Step 8: Processing and Printout of Revised CROs

Also following the review meeting, the data base manager determines from the Task Revision Form which of the changes to the CROs have been approved and obtains the annotated copies of these pages. These changes are then entered into the CRO data base and the revised CRO pages printed out with the revision date. The data manager then inserts the updated CROs in the CRO book, removing the outdated CROs and placing them in a separate file.

Step 9: Updating the Objectives Hierarchies

Because the objectives hierarchies are in map form, they are time consuming to draw; therefore, they will be updated on a

monthly basis. An instructional technologist notes approved changes to the objectives hierarchies on the Task Revision Form and locates them on the posted objectives hierarchies. The appropriate sections of each objectives hierarchies chart affected are redrawn, and the outdated originals are filed for historical purposes.

3.3 Updating Isolated Data Bases and Reports

Isolated data bases and reports may be updated individually without requiring extensive cross-referencing to other documents. The following steps outline the procedure to follow:

Step 1: Determining When Changes Are Necessary

The need for revision of an isolated data base or report may arise at any time and from several sources, such as following a change in system personnel or organization, after input from the quality control system on the efficiency of a particular component of the training system, or at regular intervals specified in system opeeration plans.

Step 2: Completing Report Revision Form

The change author fills in the date and his name or initials on the Report Revision Form (Figure 2). Next, he enters the title/number of the report being changed. He then determines how the report is affected--whether the change is an addition, deletion, or modification--and checks the appropriate box under the "Action" column. In the next column he enters a description of the change and then describes the reason for the change in the next column. This process is repeated for each change for a particular stored project report.

Step 3: Executing Changes on Reports

When a change affects an F-16 project report, the change author obtains the latest updated copy of the report from the data base manager. He then executes and initials the proposed changes in red pencil and posts the revised section where it can be reviewed by the OTD and contractor teams.

Step 4: Review Process

There are two methods of reviewing proposed changes to reports. If there is a need for an immediate revision, the project technical director will submit the proposed changes to the OTD team chief for approval. Otherwise, the proposed changes will be reviewed jointly by the project technical director and the OTD team chief at the regular weekly meeting.

REPORT REVISION FORM

Date	Change Author	Report Title/Number	Action A D M	Description of Change	Reason for Change	Approved

Figure 2--Report Revision Form.

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Step 5: Revision and Printout of Revised Reports

The procedure for printing out revised reports is the same as that described in Step 7 of Section 3.2.

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