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Computer Aided Instruction (CAI) for the Shipboard Nontactical ADP Program (SNAP)

Interim Report

Lynn D. Duncan
Charles E. Hammons
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OPERATED BY
MARTIN MARIETTA ENERGY SYSTEMS, INC.
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Energy Division

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CONTENTS

ABSTRACT

Oak Ridge National Laboratory is developing a prototype computer aided instruction package for the Navy Management Systems Support Office. This report discusses the background of the project and the progress to date including a description of the software design, problems encountered, solutions found, and recommendations.

The objective of this project is to provide a prototype that will enhance training and can be used as a shipboard refresher and retraining tool. The prototype system will be installed onboard ships where Navy personnel will have ready access to the training. The subsequent testing and evaluation of the prototype could provide the basis for a Navy-wide effort to implement computer aided instruction.

The work to date has followed a rigorous structured analysis methodology based on the Yourdon/DeMarco techniques. A set of data flow diagrams and a data dictionary are included in the appendices. The problems encountered revolve around requirements to use existing hardware, software, and programmer capabilities for development, implementation, and maintenance of the instructional software. Solutions have been developed which will allow the software to exist in the given environment and still provide advanced features not available in commercial courses.

1. BACKGROUND

In planning for the implementation and support of the Shipboard Nontactical ADP Program (SNAP), the Navy Management Systems Support Office (NAVMASSO) realized that training would be a critical factor to the overall success of the program. The large numbers of self-contained operational computer systems, the frequency of personnel rotation, and the shortage of training personnel led to the consideration of using computer based training (CBT). The objective of this project is to provide a computer aided instruction (CAI) prototype that will enhance SNAP-I implementation training and can be used as a shipboard refresher and retraining tool. The prototype system will be installed onboard ships where Navy personnel will have ready access to the training at any time. The subsequent testing and evaluation of the prototype could provide the basis for a Navy-wide CAI effort to augment all SNAP implementation.

1.1 PROJECT HISTORY

NAVMASSO contracted with Rehab Group, Inc., for the initial feasibility study of and approach for using CBT in the SNAP environment. NAVMASSO and Rehab determined that CBT would be a highly desirable alternative for solving training-related problems for SNAP.

Although the Rehab study recommended using microcomputers to deliver a majority of the training and analyzed the compatibility of Zenith microcomputers, the availability of Zeniths on board ship is limited at the present time and developmental programming was performed by NAVMASSO staff to demonstrate the possibility of implementing the training on the SNAP minicomputers. Software was written and demonstrated which proved that limited screen control and display features could be implemented in a COBOL program without use of additional software packages that create a heavy system overload.

In September 1984, NAVMASSO tasked the Oak Ridge National Laboratory (ORNL) to review the completed feasibility studies and the initial CAI development by NAVMASSO personnel and to provide a prototype course for SNAP-I. In December 1984, the Commander, Naval Supply Systems Command (COMNAVSUPSYSCOM) nominated the Material Request and Receiving Applications from the SNAP-I Shipboard Uniform Automated Data Processing System-Real Time (SUADPS-RT) as the target applications area for the prototype development, and a Plan of Action and Milestones (POA&M) was developed.

1.2 REQUIREMENTS AND RESTRICTIONS

The CAI prototype system is being developed to augment and/or replace the existing training curriculum that is currently being offered to Navy personnel for existing applications on existing computer hardware. It must operate within the given environment and provide, at minimum, the same level of training as current methods at a reduced cost in terms of time, people, and money. Ideally, it should improve the level of training delivered to the student population.

1.2.1 Audience

The target student audience for the CAI prototype system will be Navy storekeeping personnel. The CAI prototype will be used to train both the journeymen and the basic users

of the SUADPS-RT system. The scope of training for the journeyman is the entire course; the scope of training for the basic user is a subset of the journeyman training. It is assumed that students already know their jobs as storekeepers but have no experience in working with a computer.

1.2.2 Computer Environment

The SNAP-I computer environment consists of Honeywell DPS-6 minicomputers running the GCOS 6 MOD400 Release 3.0 operating system. The standard video terminals in use aboard ship are Honeywell VIP7809s. The standard programming language for SNAP-I application software is COBOL. The CAI prototype must be developed and implemented in this hardware/software environment. Additionally, the prototype will be developed so that the Honeywell's DPS-6 DSA Network Environment may be utilized. This method will allow execution of the CAI system from any terminal connected to the network. Because of space limitations on the ships, no additional equipment can be added to enhance the CAI. Supporting media such as audio cassettes, video cassettes, 35mm slides, or video disks were not considered.

The ORNL SNAP-I system has approximately 200 megabytes of on-line disk storage available for the CAI software and files; however, we do not expect the prototype to require near that amount of storage. The exact amount will be determined upon completion of the program development phase of the project.

2. PROGRESS TO DATE

ORNL staff have met with NAVMASSO staff on several occasions to discuss the needs and requirements of the CAI classes. ORNL developed an understanding of the target applications through attendance at SUADPS-RT Functional Area Supervisor courses, through discussions with trainers and implementors, and through analyses of existing curricula, the application system, software and documentation.

Based on this information, ORNL conducted a structured analysis of the NAVMASSO CAI Prototype System. Our methodology followed the Yourdon/Demarco structured analysis techniques in a fairly rigorous manner. In so doing, a large proportion of our time has been spent in the analysis stage of the project, and will benefit both the ORNL development team and NAVMASSO by requiring little or no redesign in the later stages of the project. The results of this analysis are represented by the context and data flow diagrams in Appendix B and the data dictionary in Appendix C. The diagrams represent (1) major functions or processes that constitute the CAI (which are depicted as circles), (2) the data requirements and outputs of each process (which are depicted as labeled vectors), and (3) the external interfaces with which the system and its processes must interact (depicted as rectangles). The data dictionary gives a detailed description of each data element used or created by the system. Because this is a prototype, an extremely flexible system design was sought in order to facilitate expansion and future enhancement. As further needs are determined, additional features can be easily added to the software.

A narrative description is provided in the following sections which summarizes the information presented graphically in Appendix B.

2.1 SOFTWARE DESIGN

ORNL is currently developing prototype software written in COBOL to run on the Honeywell DPS-6 computer to demonstrate the potential benefits of CAI. The software includes (1) student modules which provide the individualized teaching interaction for each student, and (2) instructor modules which provide monitoring and reporting functions for the shipboard instructor/course administrator.

2.1.1 Student Modules

The student modules will include (1) instruction covering the Material Request and Receiving functions of SUADPS-RT plus additional background material, (2) a "natural language" interpreter for conversing with the students, and (3) a security module for use in verifying that the person running the CAI is the person actually enrolled in the course.

2.1.1.1 Instruction

The prototype software will identify the student, introduce the course, give the student a proposed outline of material to be covered, allow the student to modify the sequence of lessons, enable the student to stop and restart at will, teach the required skills through presentation of information and opportunity for practice, administer and grade the tests, and keep records of lessons attempted and completed.

The instructional software modules will be developed in three units: (1) the Material Request functions of SUADPS-RT, (2) the Material Receiving functions of SUADPS-RT, and (3) background information that the student may need to complete either the Request or Receiving units. The lessons are as follows:

Background Unit

1. LOGON/LOGOUT
2. Basic Material File Query
3. Basic Requisition File Query

Material Request Unit

1. Requesting Material Issue: Total Quantity Issued
2. Print Picking Tickets
3. Warehouse Selection
4. Print Substitute Picking Tickets
5. Requisition Output

Material Receiving Unit

1. Receipt in Process
2. Receipt Processing/Receipt Processing (DTO)/Receipt in Process (Stock)
3. Return from AIMD
4. Stock Control Receipt Reversal
5. Suspense Processing

Each of these units will consist of (1) a pretest to check the student's prior knowledge of the subject, (2) the presentation of instructional material based on areas of weakness as determined by the pretest, and (3) a test of the material presented. The student will have control over his/her navigation through the CAI course and will be able to (1) select which instructional unit and which lesson within each unit to study next, (2) leave a lesson, even before finishing it, and resume studying that lesson at a later time, and/or (3) stop in the middle of a lesson to start another lesson before completing the first. The student will not be required to review or to be tested on topics in which the pretest indicates sufficient understanding; however, requests may be made to review any such topic.

There is one pretest phase for each instructional unit. Its purpose is to evaluate the student's prior knowledge of the material in that unit and to determine which lessons in the unit the student will be required to complete. For each lesson where the pretest indicates an acceptable level of proficiency, instruction and/or review of that topic will be optional, and

further testing is not available. For lessons where the pretest indicates that the student needs instruction, the software will present the material and give the student a chance to reinforce what he has learned through drill and practice. When the required lessons within a unit have been completed, a post-test will be administered. Questions for the post-test are drawn only from the lessons which the pretest phase determined were required for that student. For any lessons included in the post-test phase, if the student fails to answer a satisfactory proportion of the questions correctly, then the student is required to repeat the instruction in a remedial mode prior to attempting the test a second time.

The instructional material is being derived from existing course curricula and from the application software and manuals. These modules are specific to the information being taught and will be different for each application. A series of teaching screens will be used to present information to the student and to allow for student interaction. Numerous questions have been created to test the student's understanding of each objective of each lesson. The battery of test questions will be used in randomly generating both pre- and post-tests for the individual lessons. The teaching and testing screens form the basics of each CAI course. Even though the content of each instructional unit will be different, the manner of instruction, the types of displays, and the method for moving through each lesson or unit will be the same so that a stable environment will be provided for students.

2.1.1.2 "Natural Language" Interpreter

At any point during a CAI session, the student must be able to enter a free-form comment or question. The message might be a question about the course, a comment about something not understood, or any other communication that might be addressed to an instructor. Where possible, the CAI software will interpret the student's question or comment and respond directly to the student.

All instructional modules will use an interpreter to process and respond to questions and comments generated by the students taking the course. This capability is being provided so that students will not be strictly limited to choosing menu selections and answering multiple choice questions. Through this interpreter, the courseware itself will be able to interact with the student on a level that resembles "real life" student-teacher interaction. In those cases where the software can not interpret the student's question or comment, the message will be stored for subsequent response by the shipboard instructor/course administrator.

2.1.1.3 Security

The security software is generic and will be used by all instructional modules to gather information about the person interacting with the CAI. Since the students will be able to use the CAI in an unsupervised environment, it was considered important to be able to verify that a particular student actually took the instruction. Although the courseware does not prevent all forms of cheating, information collected will be available to the instructor/course administrator to determine if the person interacting with the CAI was the student enrolled.

The security of the environment in which the CAI examinations are given is also important, and may offer little opportunity for control and supervision. However, facilities will be available to have an oversized data base of test questions from which the system will randomly compose an individualized test for each test phase and each student.

2.1.2 Instructor Modules

Prototype monitoring software will also be developed for use with all student modules. The instructor module will allow a shipboard supervisor/administrator to (1) check the progress of any student enrolled in a CAI course, (2) print a report of summary statistics for each CAI unit/lesson, and (3) write a floppy diskette of a student's progress for a student transferred off the ship before completing the CAI.

2.1.2.1 Student progress

The first instructor report will give a detailed history of a particular student's progress through the CAI, including test results, a log of sessions, and security data. Although a student may complete CAI courses independently, an authorized person should review each student's progress during the course and upon completion to validate that person's achievement.

2.1.2.2 Course statistics

An additional feature of this software will be to maintain a course history for use by training developers in evaluating and improving course content. The second report is primarily for this purpose and should be forwarded back to the courseware developer. It provides summary information by instructional unit that may be used in verifying the effectiveness of the CAI. This report may serve as a basis for modifying instructional information, test questions, etc. in order to improve their overall effectiveness. It will also provide information useful in extending the verbal understanding of the "natural language" interpreter.

2.1.2.3 Student history

This software program will also be used for compiling the student's history of training. The information will be stored on a floppy diskette (instead of a printed report). The floppy diskette will serve as the medium for transmitting student record data from one ship to another. This method of data sharing will enable a student to begin a CAI course on one ship and continue instruction on another.

3. SIGNIFICANT FINDINGS

The prototype has been targeted to run on the SNAP-I computers and terminals, without the use of additional hardware, or special purpose software. In order to create and deliver CAI in such an environment, there were several obstacles to overcome. These include (1) authoring in COBOL instead of a specialized authoring language, (2) screen and cursor control without a specialized screen formatting utility, (3) development of an "intelligent" user interface without use of specialized AI tools.

3.1 AUTHORING LANGUAGE

A number of specialized authoring languages containing a significantly simplified method for designing and/or creating courseware for mainframe and microcomputers are readily available on the market. However, the options a course developer has in implementing application or installation dependent features are severely limited.

Some requirements of the NAVMASSO CAI prototype development that made off-the-shelf authoring software undesirable included the restriction to use only existing SNAP-I software, the desire to have programs that could be maintained by the existing staff of COBOL programmers, the need for heavy use of simulation for drill and practice, the need to provide instructor-like communications with students who were unfamiliar with computers and keyboards, and the need for security measures to ensure that the enrolled student was actually the one taking the course.

By writing the courseware in COBOL, the above requirements could be met even though the solutions were not always straightforward. Such an approach has increased the development time for this project, but by solving the problems once in the prototype courseware, they have been solved for any future courses that NAVMASSO may choose to develop. The student modules for each unit and lesson are necessarily different because of different lesson content and flow. However, these modules are being written in a standardized way, and future lessons may be patterned after those that are provided in the prototype. All other features of the prototype (user interface, security measures, screen control functions, monitoring, and reporting) are written generically so that they may be used in conjunction with any particular lesson.

3.2 SCREEN CONTROL

Although the SUADPS-RT applications use a specialized software package, VFORMS, for screen control, NAVMASSO personnel indicated that a great deal of system overhead could be avoided by programming the screen control directly from the COBOL programs and making use of the special features of the Honeywell VIP7809 display terminal. These features allow control of the size and intensity of displayed characters, regular or reverse video, blinking, and the use of limited graphic symbols for drawing boxes. Although these features did allow the placement of output at a desired location on the screen, placement of the cursor in variable locations for user input was not possible in a COBOL program.

To properly simulate the actual SUAPDS-RT screens, it was considered necessary to control cursor placement for both input and output. To provide such control, an assembler language routine has been written. The routine can be called from a COBOL program to

place the cursor at any location on the screen and to accept user input from that location. This capability was considered extremely important by the development staff. Without it, simulation of the SUADPS-RT screens for practice would have been limited to a static display of example screens. With it, simulation including user interaction with the practice screens will be possible and will be heavily used.

3.3 "INTELLIGENT" INTERFACE

Since the users of the CAI will be people without prior computer and/or keyboarding experience, it was deemed necessary to provide a friendly, "intelligent" interface that could respond to their questions and comments in a manner similar to a live instructor. It was considered unreasonable to restrict the students to controlled responses limited to a few choices from a menu, or selection of the correct answer from a list of choices. It was therefore determined that learning, and user interest, would be facilitated by providing an interface that could "understand" and respond to simple English statements that the student might make.

In general, specialized AI languages and tools would be used to construct the rules for implementing such an interface. However, we again determined that all processing would be done in COBOL, if possible. The COBOL program will accept free form user input, break the statement up into words, look the words up in a "dictionary", and then send a response to the user based on the combination of understood words. If the software is unable to respond, the message will be saved for instructor interpretation and the student will be informed that a response will be provided later. All questions and comments will be stored for review and those that were unanswerable by the software will serve as input in "teaching" the software to respond to a greater variety of words in the future. This "teaching" step will require intervention by a person; it will not happen automatically, but will provide a continually expanding "intelligence" in the CAI as seen by the student.

4. PLANS AND RECOMMENDATIONS

The ORNL prototype development effort will continue as planned. A demonstration of the first student module on the ORNL SNAP computer will be provided to interested NAVMASSO staff near the end of August. The exact day will be scheduled to allow for the greatest participation. A demonstration of the second student module will follow in late September. Along with this demonstration, ORNL will demonstrate the instructor modules.

By the end of October 1985, ORNL will deliver to NAVMASSO a working prototype of CAI for the Material Request and Receiving applications within SUADPS-RT. This course will run on the Honeywell DPS-6 computers using existing SNAP-I hardware and no specialized software except for routines written especially for the CAI and provided to NAVMASSO by ORNL.

The prototype will have been fully tested and verified on the ORNL SNAP-I computer. However, it is difficult to tell at this point how the prototype CAI will affect the day-to-day operating of a typical SNAP-I computer system. ORNL recommends that where CAI is installed, system loads should be carefully monitored. Significant impacts to on-line storage availability, response time or other measures of system loads, and/or the increased availability of microcomputers onboard ship may increase the desirability of moving some or all of the CAI off the Honeywell minicomputers.

Therefore, our development is being pursued in a way that makes the prototype as modular, standardized, and transportable as possible. By so doing, if it is determined that CAI puts too much of a load on the Honeywell DPS-6 computers, the existing prototype software can be moved relatively easily to a microcomputer. This flexibility will also be of benefit if NAVMASSO should ever have the opportunity to change the operating system software or basic hardware used for SNAP-I computing. A general constraint imposed by ourselves is that nothing in the CAI should limit future growth of SNAP.

After delivery of the complete prototype system, ORNL expects NAVMASSO to use, test, extend, and modify the system in any way desired. Now that our staff has developed a proficiency with the SUADPS-RT application and the CAI developed for it, we feel we can continue to support NAVMASSO as it extends the usage of CAI for other SNAP applications and elsewhere. Further tasking and commitments from NAVMASSO which enable a continuing relationship for consulting or development of additional CAI courses are invited.

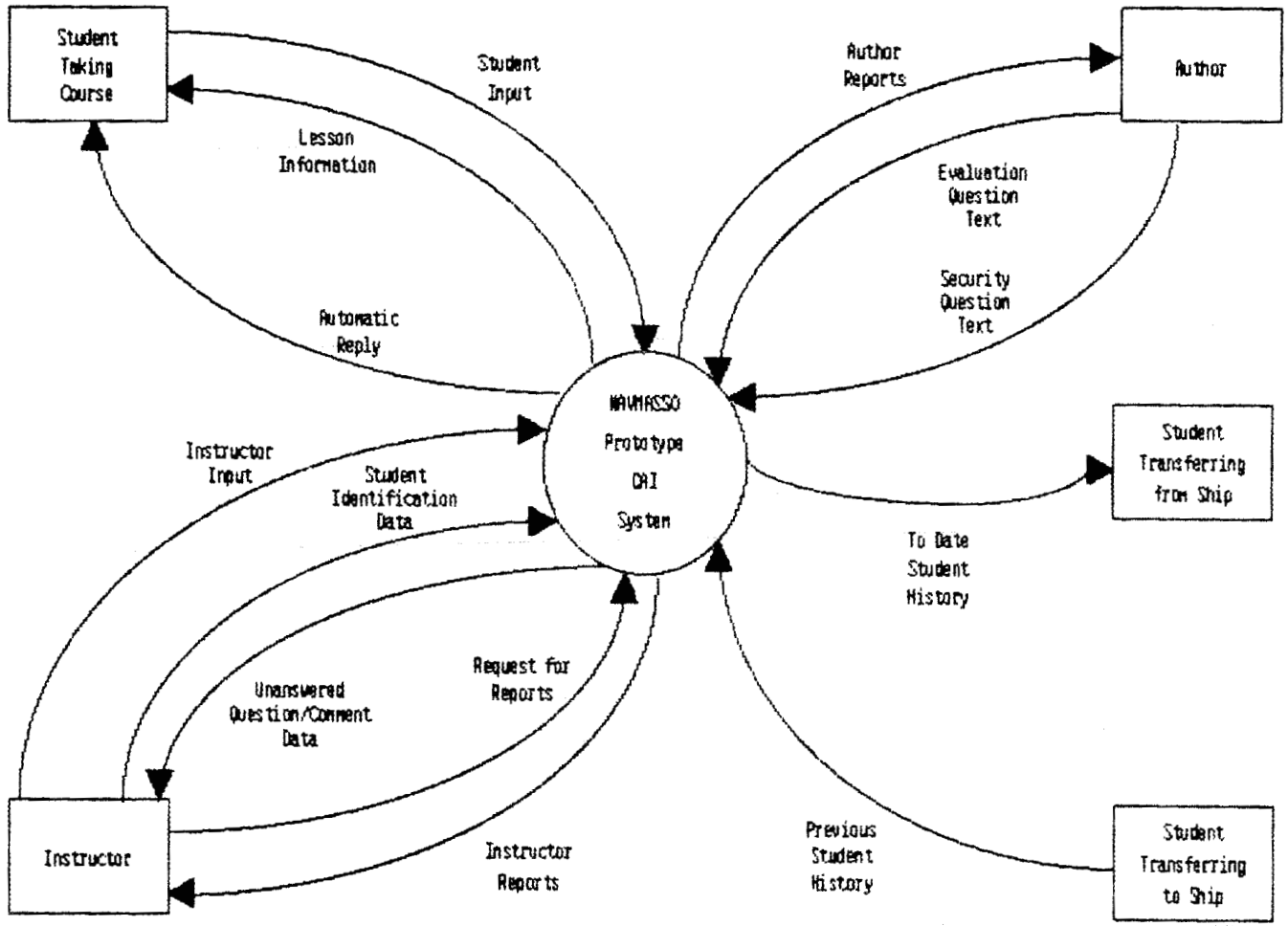
Appendix A

ACRONYMS AND ABBREVIATIONS

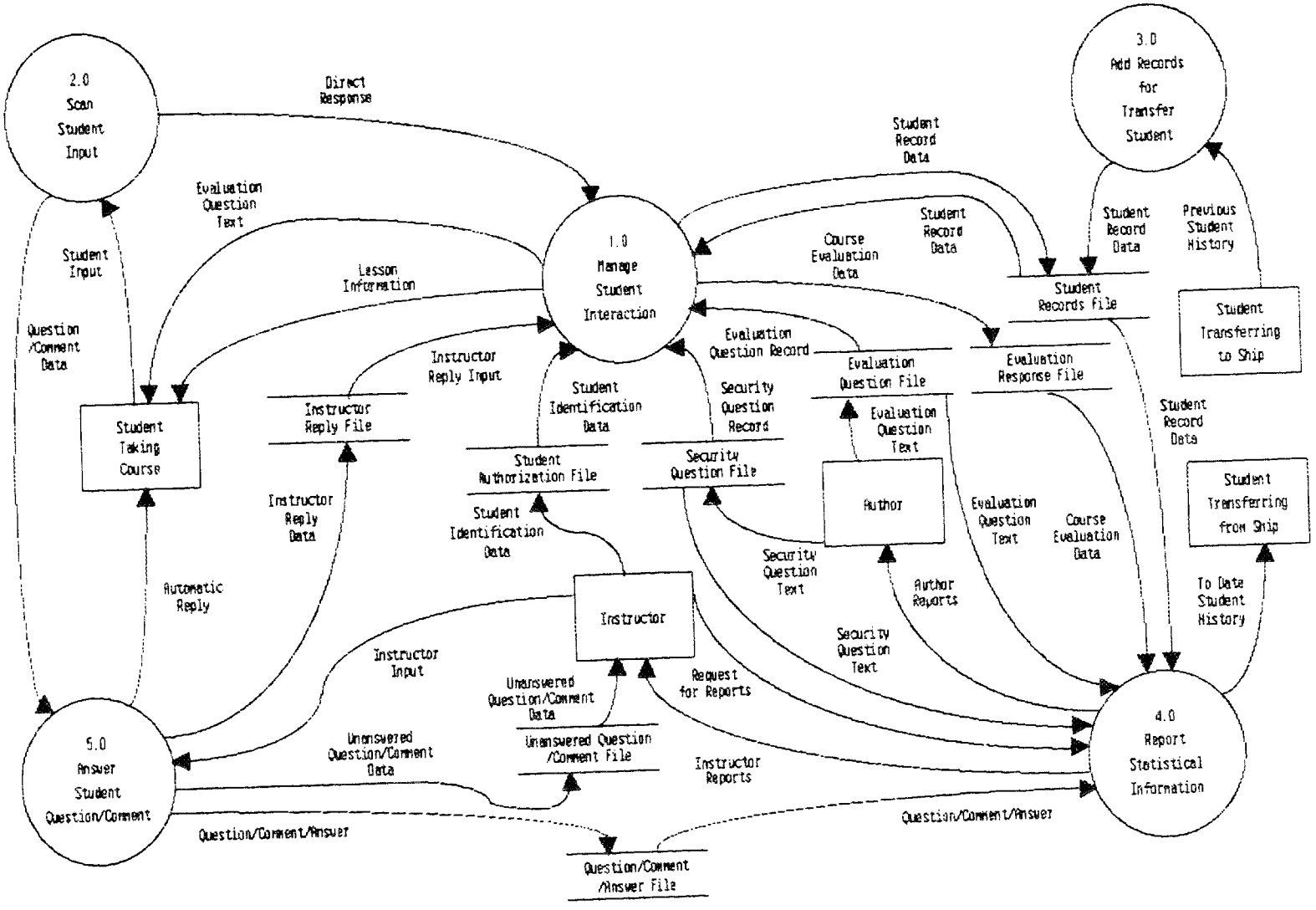
ADP	Automated Data Processing
AI	Artificial Intelligence
CAI	Computer Aided/Assisted Instruction (use of a computer system as a tutor in presenting information to and interacting with a student)
CBI	Computer Based Instruction (entire field of using computers to enhance instruction; includes CAI, CMI)
CBT	Computer Based Training (same as CBI)
CMI	Computer Managed Instruction (use of a computer system to control/monitor a student's progress through courses; may or may not have CAI components)
COMNAVSUPSYSCOM	Commander, Naval Supply Systems Command
DD	Data Dictionary
DFD	Data Flow Diagram
DOE	U.S. Department of Energy
NAVMASSO	Navy Management Systems Support Office
ORNL	Oak Ridge National Laboratory
POA&M	Plan of Action and Milestones
SNAP	Shipboard Nontactical ADP Program
SUADPS-RT	Shipboard Uniform Automated Data Processing System-Real Time
VFORMS	A specialized software package used for development of forms
DPS-6	A minicomputer produced by Honeywell
AIMD	Aircraft Intermediate Maintenance Department
DTO	Direct turnover

Appendix B

CONTEXT AND DATA FLOW DIAGRAMS

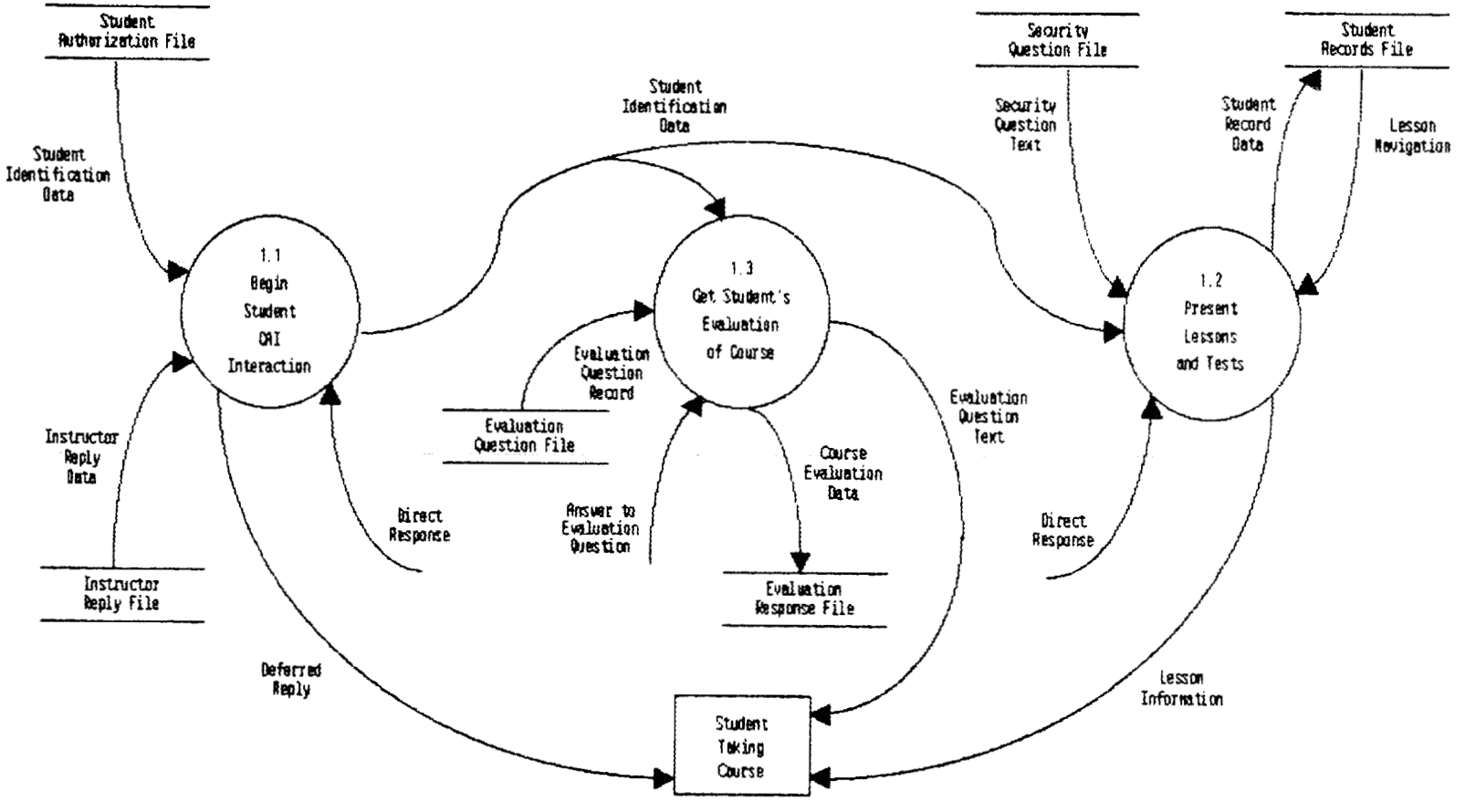


NAVMASSO CAI System Context Diagram



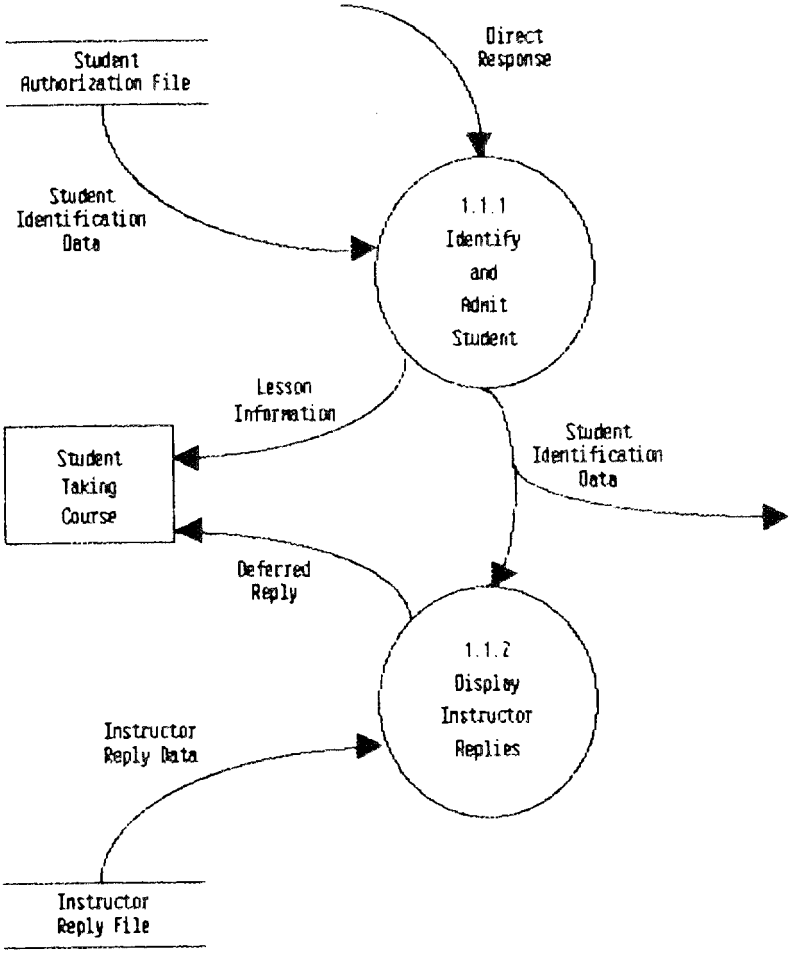
NAVMASSO CAI System Data Flow Diagram

6/13/85



6/13/85

1.0 Manage Student Interaction



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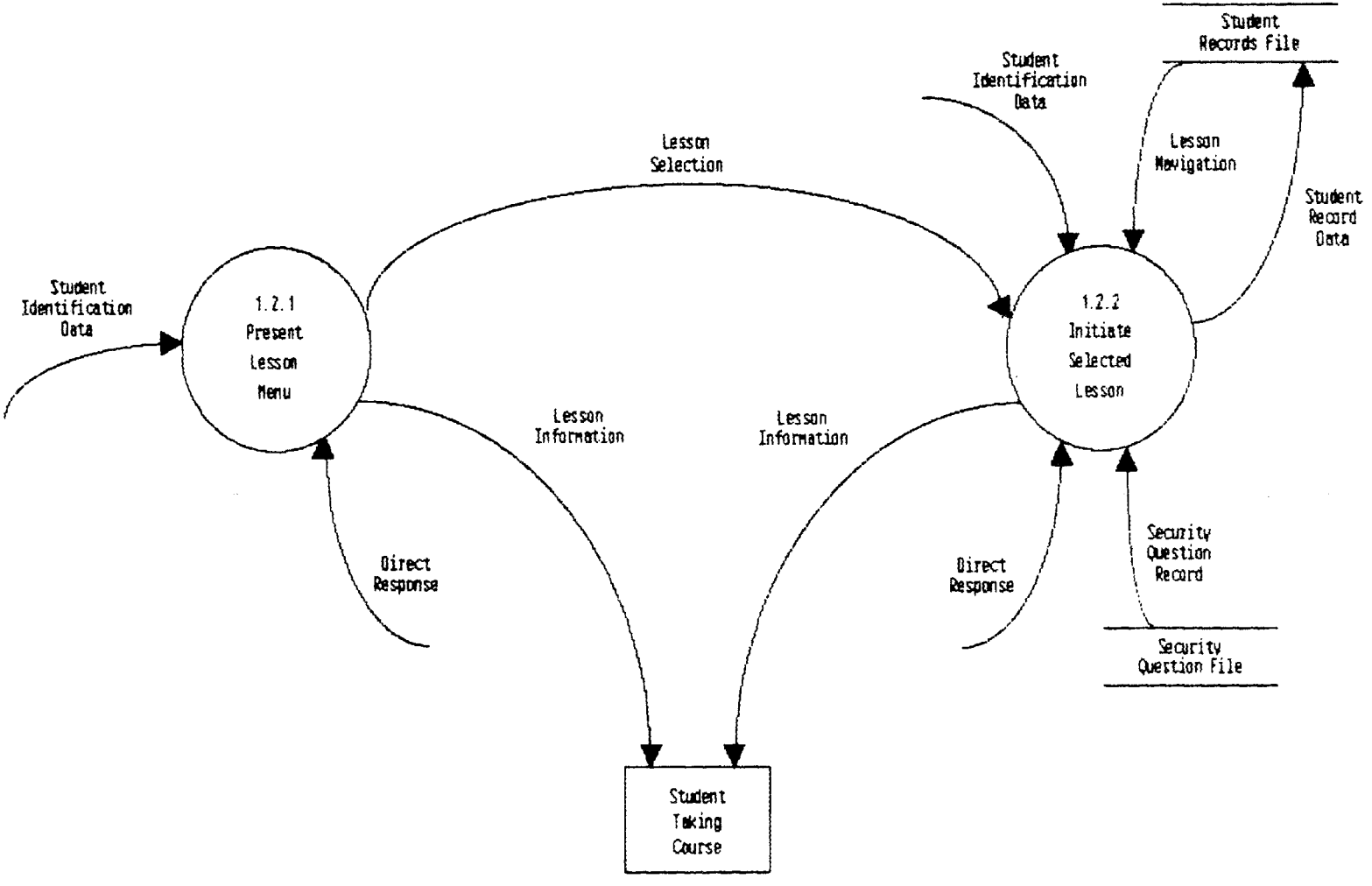
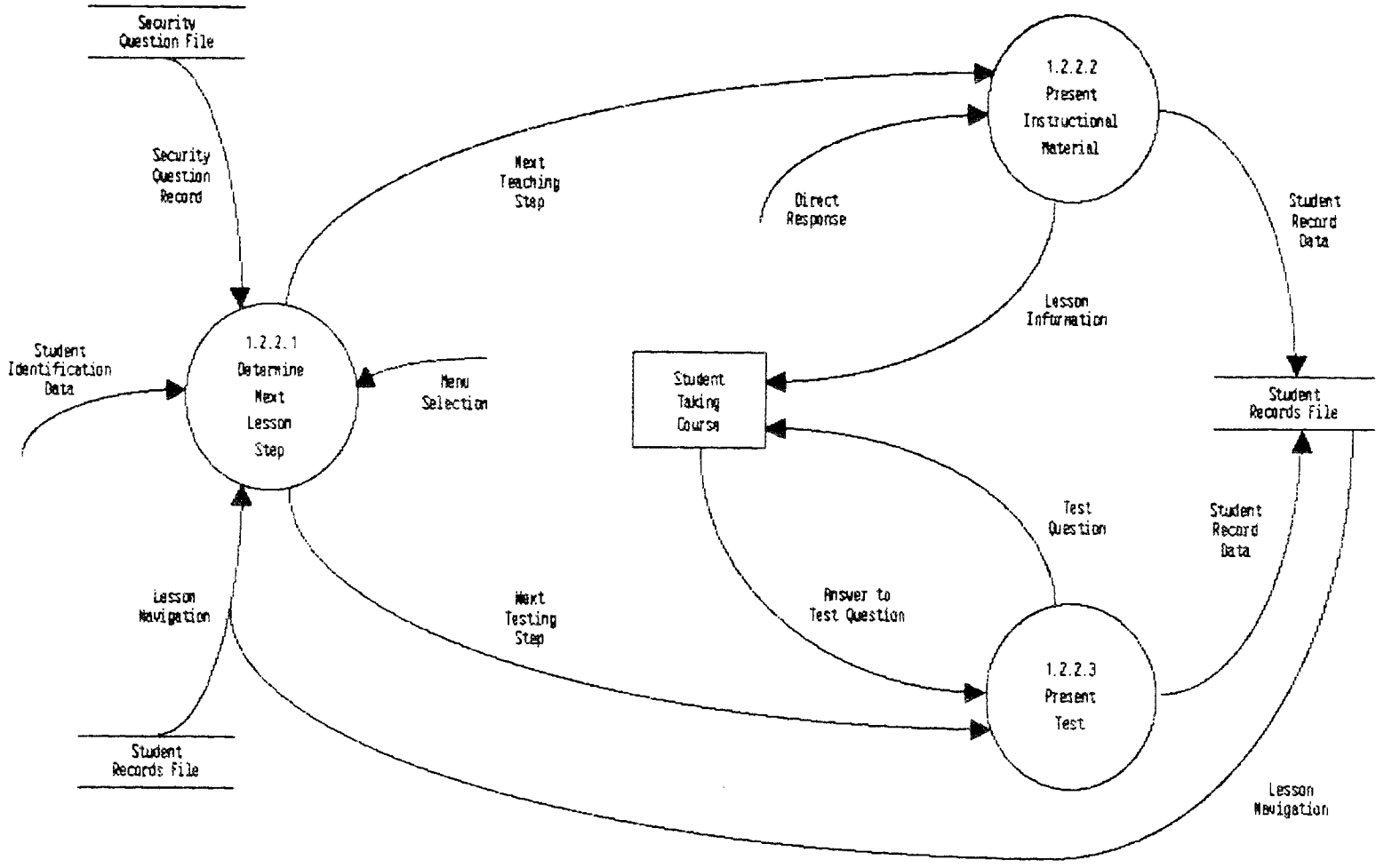
1.1 Begin Student CAI Session



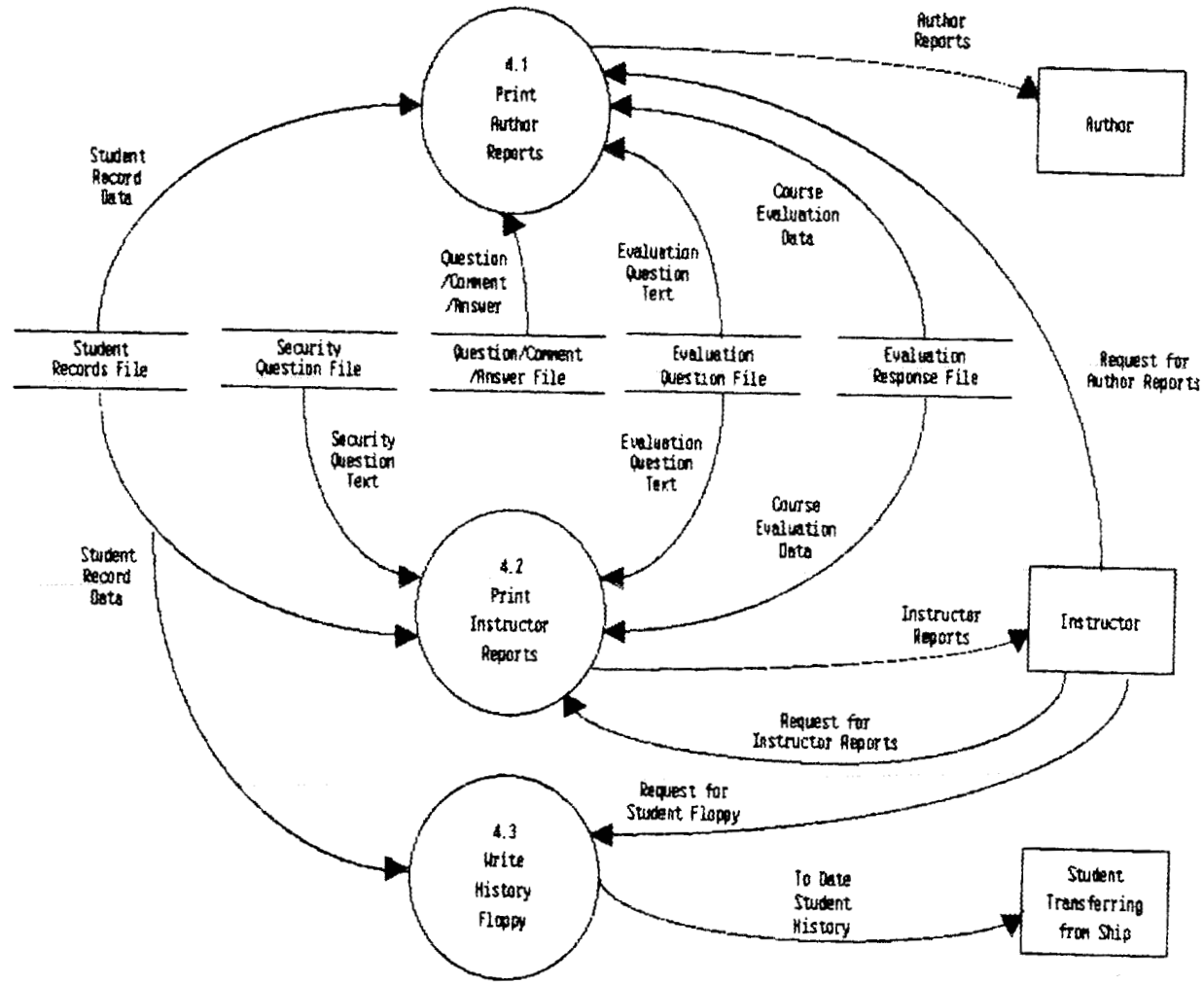
1.2 Present Lessons and Tests

6/13/05

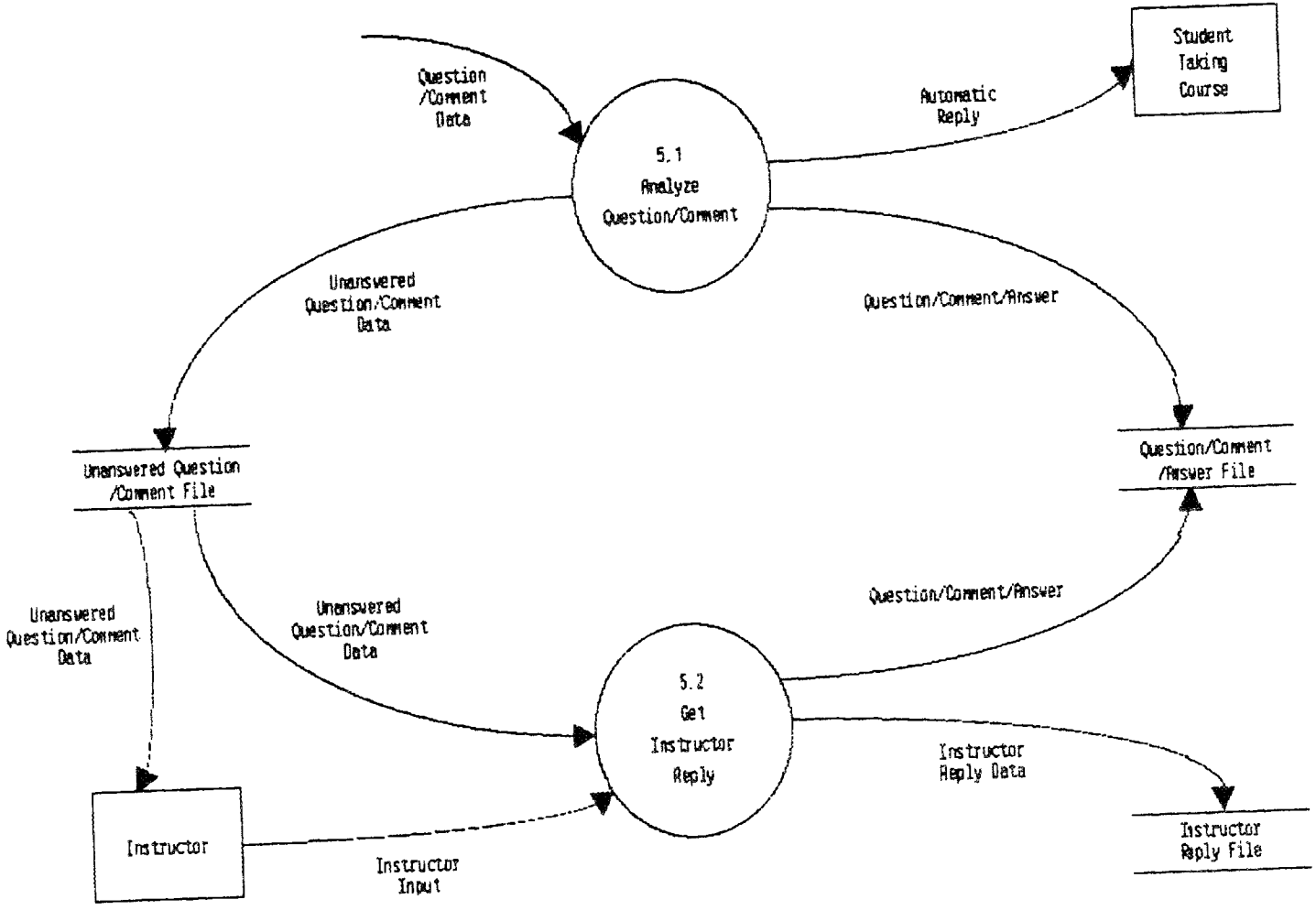


1.2.2 Initiate Selected Lesson

6/13/85

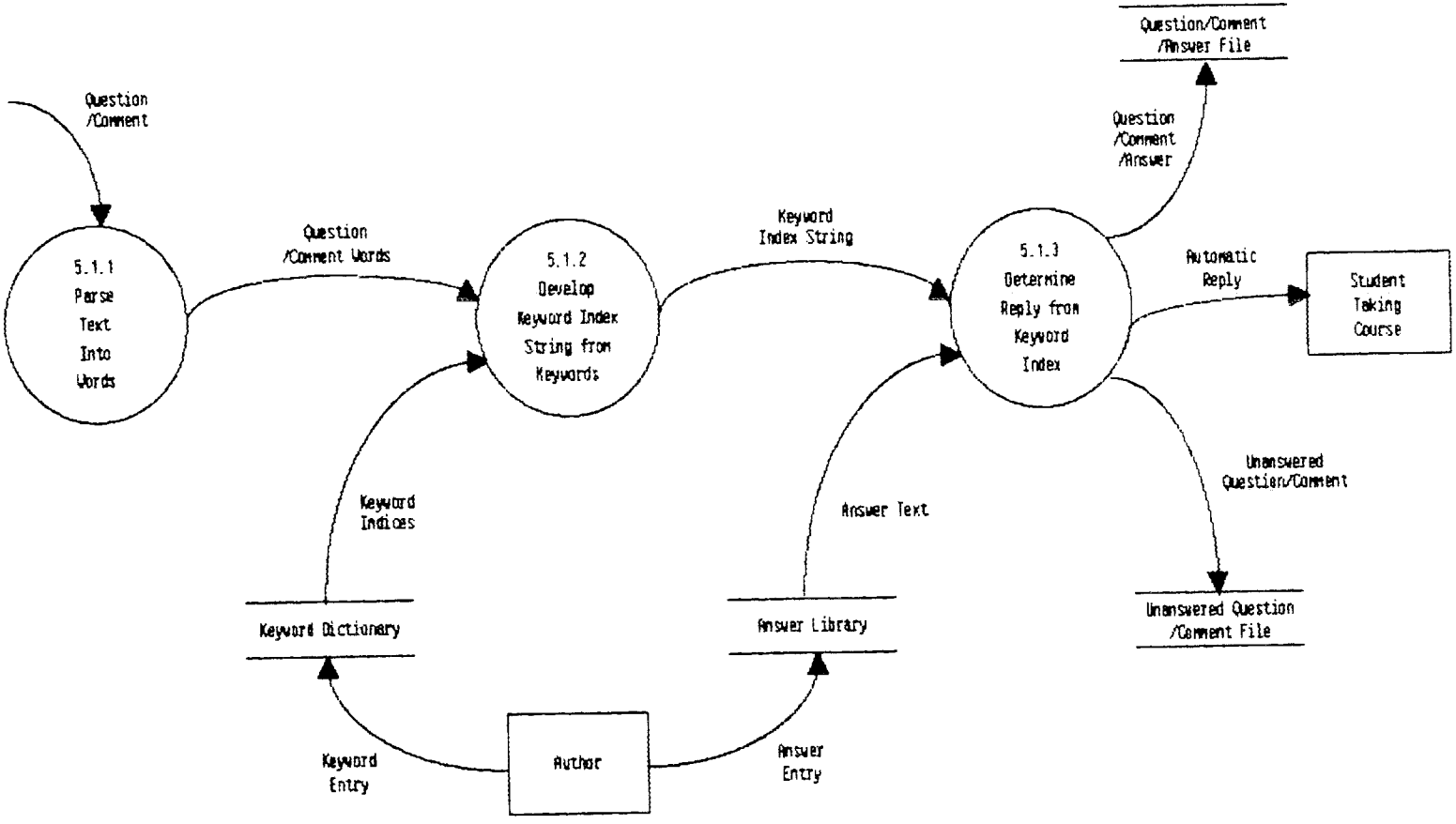


4.0 Report Statistical Information



5.0 Answer Student Question/Comment

6/13/85



5.1 Analyze Question/Comment

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Appendix C

DATA DICTIONARY

SNAP CAI Data Dictionary
June 11, 1985

Data Flow/Store/Element Name or Interface or Abbreviation	Description/Decomposition Cobol Name and Picture
1 A.R.	*Abbreviation for Author Reports*
2 A.R. Answer	*Specific answer to a student question or comment* ar-answer a(240)
3 A.R. Course Evaluation Answer	*Student's answer to the course evaluation question* ar-course-evaluation-answer x(160)
4 A.R. Course Evaluation Data	Iteration of: A.R. Course Evaluation Q/A
5 A. R. Course Evaluation Q/A	Combination of: A. R. Course Evaluation Question A. R. Course Evaluation Answer
6 A. R. Course Evaluation Question	*Question asked for the purpose of evaluation of the course* ar-course-evaluation-question x(240)
7 A. R. Lesson Completion Count	*The number of students completing a lesson by means of a specific method* ar-lesson-completion-count 9(4)
8 A.R. Lesson Completion Data	Combination of: A. R. Lesson ID A. R. Lesson Completion Method A. R. Lesson Completion Count
9 A. R. Lesson Completion Method	*Alias for S. R. Lesson Completion Method* ar-lesson-completion-method a(8)
10 A. R. Lesson ID	* Alias for Lesson Identifier* ar-lesson-id 9.9
11 A. R. Lesson Statistics	Iteration of: A. R. Lesson Completion Data
12 A.R. Question/Comment	*Alias for Question/Comment Text* ar-question-comment x(160)

SNAP CAI Data Dictionary
June 11, 1985
(Continued)

Data Flow/Store/Element Name or Interface or Abbreviation	Description/Decomposition Cobol Name and Picture
13 A.R. Question/Comment/Answer	Combination of: A. R. Question/Comment A. R. Answer A.R. Question/Comment/Answer Screen ID
14 A.R. Question/Comment/Answer Data	Iteration of: A.R. Question/Comment/Answer
15 A.R. Question/Comment/Answer Screen ID	*Identification of the screen displayed when the student generated a question or comment* ar-ques-comm-ans-screen-id x(6)
16 A.R. Right Answer Count	*Number of right answers given in response to a specific question* ar-right-answer-count 9(4)
17 A.R. Right Answer Percent	*Percent of right answers given in response to a specific question* ar-right-answer-percent 9(3)
18 A.R. Student Record Data	Combination of: A.R. Lesson Statistics A.R. Test Question Statistics
19 A.R. Test Question Data	Combination of: A.R. Test Question ID A.R. Testing Phase A.R. Right Answer Count A.R. Right Answer Percent A.R. Wrong Answer Count A.R. Wrong Answer Percent
20 A.R. Test Question ID	*Alias for S.R. Test Question ID* ar-test-question-id 9.9.99
21 A.R. Test Question Statistics	Iteration of: A.R. Test Question Data
22 A.R. Testing Phase	*Testing phase from which question statistics are drawn (pretest, posttest, composite)* ar-testing-phase a(9)

SNAP CAI Data Dictionary
June 11, 1985
(Continued)

Data Flow/Store/Element Name or Interface or Abbreviation	Description/Decomposition Cobol Name and Picture
23 A.R. Wrong Answer Count	*Number of wrong answers given in response to a specific question* ar-wrong-answer-count 9(4)
24 A.R. Wrong Answer Percent	*Percent of wrong answers given in response to a specific question* ar-wrong-answer-percent 9(3)
25 Answer Entry	Combination of: Keyword Index String Answer Text
26 Answer Library	Iteration of: Answer Entry
27 Answer Text	*A text string that can be used as a reply to a student's question/comment* answer-text x(80)
28 Answer to Criterion Question	*The student's direct answer to a criterion question which occurs within the teaching screens* answer-to-crit-question x(80)
29 Answer to Evaluation Question	*The student's direct answer to an evaluation question* answer-to-evaluation-question X(80)
30 Answer to Security Question	*The student's direct answer to a security question which occurs anytime during the course* answer-to-security-question x(80)
31 Answer to Student Question/Comment	Choice of: Automatic Reply Instructor Input
32 Answer to Test Question	*The student's direct answer to a pre- or post-test question* answer-to-test-question x(80)

SNAP CAI Data Dictionary
June 11, 1985
(Continued)

Data Flow/Store/Element Name or Interface or Abbreviation	Description/Decomposition Cobol Name and Picture
33 Author	*The person(s) responsible for writing and maintaining the course software; located ashore*
34 Author Report Course Name	*Name of course for which Author Report is produced* author-report-course-name x(20)
35 Author Report Date	*Date on which Author Report is produced* author-report-date 99/99/99
36 Author Report Detail Information	Combination of: A.R. Question/Comment/Answer Data A. R. Student Record Data A. R. Course Evaluation Data
37 Author Report Header Information	Combination of: Author Report Time Author Report Date Author Report Ship Name Author Report Course Name Author Report Unit Name
38 Author Report Ship Name	*Name of ship on which Author Report is produced* author-report-ship-name
39 Author Report Time	*Time at which Author Report is produced* author-report-time 99:99
40 Author Report Unit Name	*Name of instructional unit for which Author Report is produced* author-report-unit-name x(30)
41 Author Reports	Combination of: Author Report Header Information Author Report Detail Information

SNAP CAI Data Dictionary
June 11, 1985
(Continued)

Data Flow/Store/Element Name or Interface or Abbreviation	Description/Decomposition Cobol Name and Picture
42 Automatic Reply	*The reply to a student's question or comment generated automatically and displayed immediately* automatic-reply x(80)
43 Course Evaluation Data	Combination of: Evaluation Criteria Identifier Evaluation Criteria Response Evaluation Student ID
44 Criterion Question	*A question asked to the student while receiving instruction to measure understanding of the lesson* criterion-question x(800)
45 Deferred Reply	*The reply supplied by the instructor to a student's question or comment displayed at login time* deferred-reply x(80)
46 Departing Student's Name	*The name of a student who is transferring from the ship* departing-student-name x(20)
47 Direct Response	Choice of: Answer to Criterion Question Answer to Security Question Answer to Test Question
48 Displayed Lesson Text	*The instructional information displayed to the student* displayed-lesson-text x(1600)
49 Displayed Security Question	*Security question displayed on the terminal for the student* displayed-security-question x(80)
50 Evaluation Criteria Identifier	*Alias for Evaluation Question Number* evaluation-criteria-identifier 9(2)

SNAP CAI Data Dictionary
June 11, 1985
(Continued)

Data Flow/Store/Element Name or Interface or Abbreviation	Description/Decomposition Cobol Name and Picture
51 Evaluation Criteria Response	*Alias for Answer to Evaluation Question* evaluation-criteria-response x(80)
52 Evaluation Question File	Iteration of: Evaluation Question Record
53 Evaluation Question Number	*Number corresponding to specific evaluation question* evaluation-question-number 99
54 Evaluation Question Record	Combination of: Evaluation Question Number Evaluation Question Text
55 Evaluation Question Text	*The wording of the evaluation question evaluation-question-text x(160)
56 Evaluation Response File	Iteration of: Course Evaluation Data
57 Evaluation Student ID	*Alias for Serial Number* evaluation-student-id X(12)
58 I.R.	*Abbreviation for Instructor Report*
59 I.R. Course Evaluation Answer	*Alias for Evaluation Criteria Response* ir-course-evaluation-answer x(160)
60 I.R. Course Evaluation Data	Iteration of: I.R. Course Evaluation Q/A
61 I.R. Course Evaluation Q/A	Combination of: I.R. Course Evaluation Question I.R. Course Evaluation Answer
62 I.R. Course Evaluation Question	*Question asked for the purpose of evaluation of the course* ir-course-evaluation-question x(240)
63 I.R. Lesson Completion Method	*Alias for S.R. Lesson Completion Method* ir-lesson-completion-method a(8)

SNAP CAI Data Dictionary
June 11, 1985
(Continued)

Data Flow/Store/Element Name or Interface or Abbreviation	Description/Decomposition Cobol Name and Picture
64 I.R. Lesson ID	*Alias for Lesson Identifier* ir-lesson-id 9.9
65 I.R. Lesson Status	*Current status of specific lesson (completed/in progress)* ir-lesson-status a(12)
66 I.R. Lesson Status Data	Combination of: I.R. Lesson Completion ID I.R. Lesson Status I.R. Lesson Status Date I.R. Lesson Completion Method I.R. Posttest Score
67 I.R. Lesson Status Date	*Alias for S. R. Lesson Status Date* ir-lesson-status-date 99/99/99
68 I.R. Posttest Score	*Alias for S. R. Posttest Score* ir-posttest-score 9(3)
69 I.R. Security Answer	*Alias for Answer to Security Question* ir-security-answer x(80)
70 I.R. Security Data	Iteration of: I.R. Security Q/A
71 I.R. Security Q/A	Combination of: I.R. Security Question I.R. Security Answer
72 I.R. Security Question	*Question asked for the purpose of verifying the student's identity* ir-security-question x(80)
73 I.R. Session Duration	*Total logged-in time per session* ir-session-duration 99:99
74 I.R. Session End Date	*Ending date of each session* ir-session-end-date 99/99/99

SNAP CAI Data Dictionary
June 11, 1985
(Continued)

Data Flow/Store/Element Name or Interface or Abbreviation	Description/Decomposition Cobol Name and Picture
75 I.R. Session End Time	*Ending time of each session* ir-session-end-time 99:99
76 I.R. Session Number	*Running count of logged-on sessions* ir-session-number 99
77 I.R. Session Start Date	*Beginning date of each session* ir-session-start-date 99/99/99
78 I.R. Session Start Time	*Beginning time of each session* ir-session-start-time 99:99
79 I.R. Student Record Data	Iteration of: I.R. Lesson Status Data
80 I.R. Student Session	Combination of: I.R. Session Start Date I.R. Session Start Time I.R. Session End Date I.R. Session End Time I.R. Session Duration I.R. Session Number
81 I.R. Student Session Log	Iteration of: I.R. Student Session
82 Instructor	*The person on ship responsible for administering the course and providing assistance to the student*
83 Instructor Input	*The instructor's answer to a student's question or comment* instructor-input x(80)
84 Instructor Reply Data	Combination of: Instructor Reply Serial Number Instructor Reply Input
85 Instructor Reply File	Iteration of: Instructor Reply Data
86 Instructor Reply Input	*Alias for Instructor Input* instructor-reply-input x(80)

SNAP CAI Data Dictionary
June 11, 1985
(Continued)

Data Flow/Store/Element Name or Interface or Abbreviation	Description/Decomposition Cobol Name and Picture
87 Instructor Reply Serial Number	*Alias for Serial Number* instructor-reply-serial-number X(12)
88 Instructor Report Date	*Date on which instructor report is produced* instructor-report-date 99/99/99
89 Instructor Report Detail Information	Combination of: I.R. Course Evaluation Data I.R. Student Record Data I.R. Student Session Log I. R. Security Data
90 Instructor Report Header Information	Combination of: Instructor Report Time Instructor Report Date Instructor Report Student ID Data
91 Instructor Report Student ID Data	*Alias for Student Identification Data*
92 Instructor Report Time	*Time at which instructor report is produced* instructor-report-time 99:99
93 Instructor Reports	Combination of: Instructor Report Header Information Instructor Report Detail Information
94 Keyword Dictionary	Iteration of: Keyword Entry
95 Keyword Entry	Combination of: Keyword Text Keyword Index
96 Keyword Index	*A unique index number associated with each word in the keyword dictionary* keyword-index 9(4)

SNAP CAI Data Dictionary
June 11, 1985
(Continued)

Data Flow/Store/Element Name or Interface or Abbreviation	Description/Decomposition Cobol Name and Picture
97 Keyword Index String	*An ordered series of 1 to 3 keyword indices used to uniquely identify an appropriate answer* keyword-index-string x(12)
98 Keyword Indices	*See Keyword Index (plural form)*
99 Keyword Text	*The string of characters that make up a word "known" to the software* keyword-text X(10)
100 Lesson Identifier	*An indicator used to identify a specific lesson within a given unit* lesson-id 9(1)
101 Lesson Information	Choice of: Deferred Reply Criterion Question Test Question Displayed Security Question Displayed Lesson Text
102 Lesson Navigation	Choice of: Next Teaching Step Next Testing Step
103 Lesson Number	*A number which uniquely identifies a lesson and its unit* lesson-number 9.9
104 Lesson Selection	Combination of: Test/Lesson Identifier Screen Identifier
105 Menu Selection	*The student's choice of an option from a menu*
106 Next Teaching Step	*Alias for screen identifier* next teaching step
107 Next Testing Step	*Alias for screen identifier* next-testing-step

SNAP CAI Data Dictionary
June 11, 1985
(Continued)

Data Flow/Store/Element Name or Interface or Abbreviation	Description/Decomposition Cobol Name and Picture
108 Previous Student History	*The Student Record Data collected on another ship for a transfer student previous-student-history
109 Q/C Screen Identifier	*Alias for screen identifier*
110 Q/C Student Name	*Alias for Student Name
111 Question/Comment Data	Combination of: Q/C Screen Identifier Q/C Student Name Question/Comment Text
112 Question/Comment Keyword	*A key word extracted from a student's question/comment* qc-keyword x(10)
113 Question/Comment Text	*Text of a student's unsolicited, freeform question or comment which occurs anytime during the course* question-comment-text x(160)
114 Question/Comment Word Number	*A number indicating the order of words extracted from a student's qc-word-number 9(1)
115 Question/Comment Words	Combination of: Question/Comment Keyword Question/Comment Word Number
116 Question/Comment/Answer	Combination of: Answer to Student Question/Comment Question/Comment Data
117 Question/Comment/Answer File	Combination of: Question/Comment/Answer
118 Request for Author Reports	Iteration of: Unit Number
119 Request for Instructor Reports	Iteration of: Requested Student Name

SNAP CAI Data Dictionary
June 11, 1985
(Continued)

Data Flow/Store/Element Name or Interface or Abbreviation	Description/Decomposition Cobol Name and Picture
120 Request for Reports	Choice of: Request for Student Floppy Request for Instructor Reports Request for Author Reports
121 Request for Student Floppy	Iteration of: Departing Student's Name
122 Requested Student's Name	*The name of the student for whom statistical reports are requested* requested-student-name x(20)
123 S. R.	*Abbreviation for Student Report*
124 S. R. Lesson Completion Method	*Method by which the lesson was completed (pretest/posttest)* sr-lesson-completion-method x(1)
125 S. R. Lesson ID	*Alias for Lesson Identifier*
126 S. R. Lesson Status Data	Combination of: S. R. Lesson ID S. R. Lesson Status Date S. R. Lesson Completion Method S. R. Posttest Score Lesson Navigation
127 S. R. Lesson Status Date	a(**Date when current status was achieved* sr-lesson-status-date 9(6)
128 S. R. Posttest Score	*Student's overall score on a unit posttest* sr-posttest-score 9(3)
129 S. R. Progress Data	Iteration of: S. R. Lesson Status Data
130 S. R. Response Data	Combination of: S. R. Security Data S. R. Test Question Data
131 S. R. Security Answer	*Alias for Answer to Security Question*
132 S. R. Security Data	Iteration of: S. R. Security Q/A

SNAP CAI Data Dictionary
June 11, 1985
(Continued)

Data Flow/Store/Element Name or Interface or Abbreviation	Description/Decomposition Cobol Name and Picture
133 S. R. Security Q/A	Combination of: S. R. Security Answer S. R. Time/Date Stamp S. R. Security Question ID
134 S. R. Security Question ID	*Alias for Security Question ID Number* sr-security-question-id 9(3)
135 S. R. Session Data	Combination of: Session Number Session Start Time Session Start Date Session End Time Session End Date
136 S. R. Session Log	Iteration of: S. R. Session Data
137 S. R. Student Identification Data	*Alias for Student Identification Data*
138 S. R. Test Phase	*Testing phase in which question was asked (p=pretest, f=final/posttest)* sr-test-phase X(1)
139 S. R. Test Question Data	Iteration of: S. R. Test Question Detail
140 S. R. Test Question Detail	Combination of: S. R. Test Question ID S. R. Test Question Result S. R. Test Phase
141 S. R. Test Question ID	*Unit, Lesson and Test Question Identifier (i.e. 1.2.4)* sr-test-question-id X(6)
142 S. R. Test Question Result	*Indicates whether the student gave the right (R) or wrong (W) answer when answering the question* sr-test-question-result x

SNAP CAI Data Dictionary
June 11, 1985
(Continued)

Data Flow/Store/Element Name or Interface or Abbreviation	Description/Decomposition Cobol Name and Picture
143 S. R. Time/Date Stamp	*The current time and date when a security question was presented to the student* sr-time-date-stamp 9(10)
144 Screen Identifier	Combination of: Screen Type, Lesson Number, Screen Number
145 Screen Number	*A three digit number indicating which screen within a lesson* screen number 999
146 Screen Type	*m = menu, i = info, c = criterion, p = pretest, f = posttest (final), r = review, s = summary* screen-type a(1)
147 Security Question	*A question asked to the student to verify the identity of the student* security-question x(160)
148 Security Question File	Iteration of: Security Question Record
149 Security Question ID Number	*Number associated with security question* security-question-id-number 999
150 Security Question Record	Combination of: Security Question, Security Question ID Number
151 Serial Number	*Armed Forces identification number* serial-number X(12)
152 Session End Date	*The date the session was completed* session-end-date 9(6)
153 Session End Time	*The time the session was completed* session-end-time 9(4)

SNAP CAI Data Dictionary
June 11, 1985
(Continued)

Data Flow/Store/Element Name or Interface or Abbreviation	Description/Decomposition Cobol Name and Picture
154 Session Number	*A running count of logged on sessions for a user* session-number 999
155 Session Start Date	*The date the session was begun* session-start-date 9(6)
156 Session Start Time	*The time the session was begun* session-start-time 9(4)
157 Student Authorization File	Iteration of: Student Identification Data
158 Student Identification Data	Combination of: User Type Student Name Serial Number
159 Student Input	Choice of: Direct Response Student Question/Comment
160 Student Name	*Name of the individual user* student-name x(30)
161 Student Question/Comment	*Unsolicited, unformatted text string entered by student at any time during course* student-question-comment X(80)
162 Student Record Data	Combination of: S. R. Student Identification Data S. R. Response Data S. R. Progress Data Session Log
163 Student Record File	Iteration of: Student Record Data
164 Student Taking Course	*The person on ship interacting with the course software*
165 Student Transferring from Ship	*A new person on ship who began the CAI on another ship*

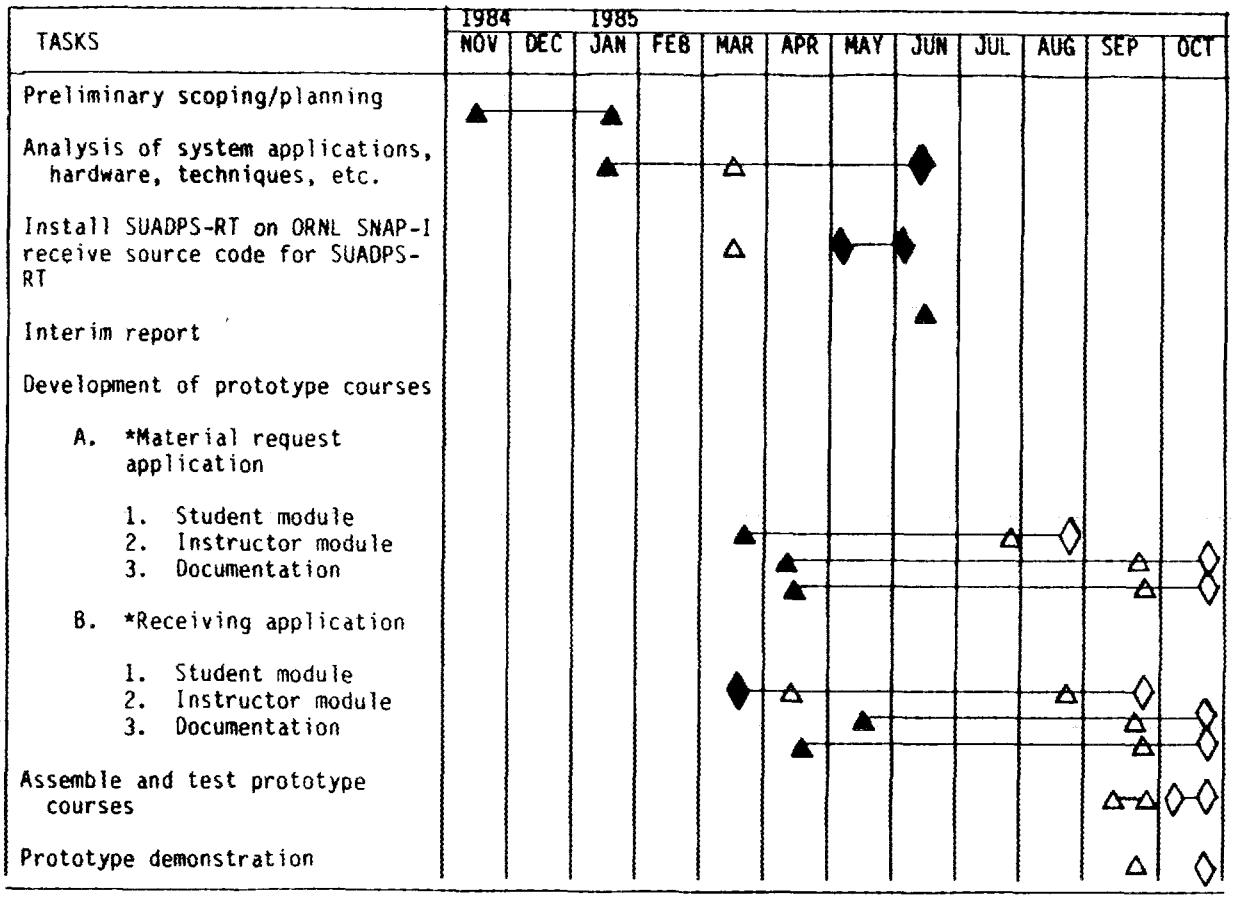
SNAP CAI Data Dictionary
June 11, 1985
(Continued)

Data Flow/Store/Element Name or Interface or Abbreviation	Description/Decomposition Cobol Name and Picture
166 Student Transferring to Ship	*A person leaving ship who has begun but not yet completed the CAI*
167 Test Question	*A question asked the student as a part of a formal test* test-question x(800)
168 Test/Lesson Identifier	*An indicator used to identify which lesson, pre-test, or post-test to administer next* test-lesson-id x(4)
169 To Date Student History	*The Student Record Data collected on this ship for a student transferring to another ship* to-date-student-history
170 Unanswered Question/Comment	*The text of a student's question or comment which could not be answered by the CAI software* unanswered-question-comment X(80)
171 Unanswered Question/Comment File	Iteration of: Unanswered Question/Comment Record
172 Unanswered Question/Comment Record	Combination of: Unanswered Student ID Data Unanswered Screen Identifier Unanswered Question/Comment
173 Unanswered Screen Identifier	*Alias for Screen Identifier*
174 Unanswered Student ID Data	*Alias for Student Identification Data*
175 Unit Number	*1=Background Unit, 2=Material Request Unit, 3=Material Receiving Unit* unit-number 9
176 User Type	*basic/journeyman* user-type a(10)

Appendix D

SHIPBOARD NONTACTICAL ADP PROGRAM (SNAP I)
COMPUTER AIDED INSTRUCTION (CAI)
PLAN OF ACTION & MILESTONES
JOB DURATION FROM NOV. 1984 TO OCT. 1985

Plan of Action & Milestones
Job Duration From Nov 1984 to Oct. 1985



△ - target milestone

▲ - completed milestone (on target)

◇ - revised milestone (explained in status report narratives)

◆ - completed revised milestone

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