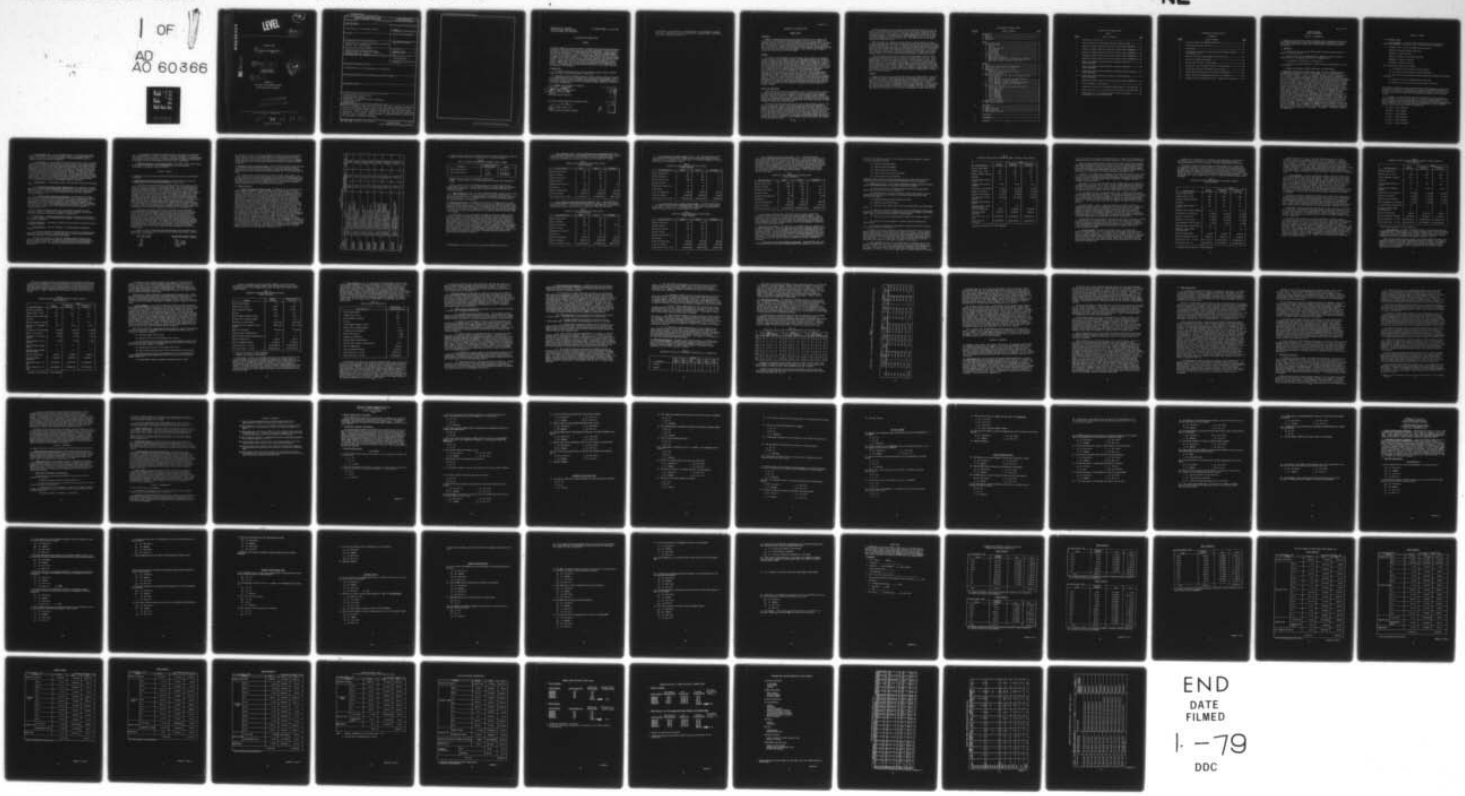
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USAF SCHOOL OF APPLIED AEROSPACE SCIENCES

KEESLER AIR FORCE BASE, MISSISSIPPI

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

From 10 November 1975 to 4 June 1976, the MODIA (Method of Designing Instructional Alternatives) programs were installed and operated on a Honeywell 6060 computer at Keesler AFB, and data were collected. This report presents results and conclusions regarding MODIA's cost, validity, effectiveness, usefulness, and limitations, and identifies needed changes.

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DEPARTMENT OF THE AIR FORCE
KEESLER TECHNICAL TRAINING CENTER
KEESLER AIR FORCE BASE, MISSISSIPPI

ATC PROJECT REPORT 1 30 July 1976

EVALUATION OF THE MODIA SYSTEM

ABSTRACT

The Keesler USAFSAAS was tasked to evaluate an automated course planning tool developed by Rand known as MODIA (Method of Designing Instructional Alternatives). ATC/XPT chaired a working group composed of HQ ATC, Rand, and Keesler representatives to develop evaluation objectives for this project. From 10 November 1975 to 4 June 1976, the MODIA programs were installed and operated on Keesler's Honeywell 6060 computer, and data were collected to address the evaluation objectives. This report presents results and conclusions regarding MODIA's cost, validity, effectiveness, usefulness, limitations, and identifies needed changes. The data were sufficient to conclude that MODIA has the potential to be an effective planning tool whose use could lead to more cost-effective technical training courses. However, this study did not determine the procedures by which MODIA would be operated in the USAFSAAS, thus leaving unanswered questions as to the control and value of the system to SAAS management.

RECOMMENDATIONS

a. Recommend the Rand Corporation, with assistance from Keesler, modify the MODIA programs to resolve the problems discussed in this report.

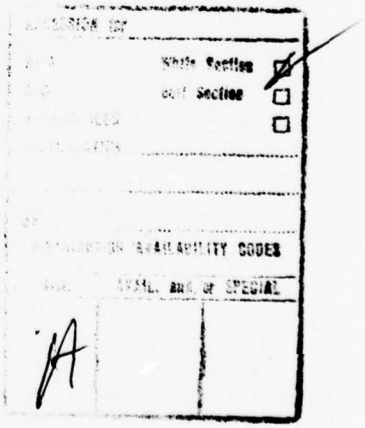
b. Recommend the Keesler USAFSAAS be tasked to conduct a Phase II follow-on evaluation of the MODIA System using the 24 electronics courses associated with Hasty Spark. This evaluation will establish both the procedures and organizational configuration necessary to support MODIA planning, and using realistic management problems, establish the utility of the system to SAAS management.

This report has been reviewed and is approved.

LOUIS P. CYR, Colonel, USAF
Commander
USAF Sch of Applied Aerosp Sci

This PR has been reviewed and is approved by HQ ATC.

SAMUEL E. SHRUM, Colonel, USAF
Director
Training Systems Development, DCS/Plans



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EVALUATION OF THE MODIA SYSTEM

SUMMARY REPORT

OBJECTIVES:

MODIA, or the Method Of Designing Instructional Alternatives, is a computerized course planning tool designed by the Rand Corporation for Air Training Command. It was evaluated in an ATC technical training environment to determine the validity of the course operation and course cost data it generates, to assess its effectiveness as a planning tool, to determine its implementation and potential operating costs, and to determine to which types of formal technical training the system can be applied. An additional objective of this evaluation was to determine what changes, if any, should be made to MODIA to improve its overall utility in this environment.

APPROACH:

Six courses, five from Keesler and one from Lowry, were selected for involvement in the service test. To assess MODIA's validity, ISD teams representing each of the Keesler courses in conjunction with a MODIA Interface Team used MODIA to design their respective courses. The simulated course operation provided by MODIA was then compared for congruity with known information about the existing courses. MODIA's effectiveness as a planning tool was evaluated by having the ISD teams design two alternatives to each existing course. These alternatives were then compared with the existing course on factors such as course cost, resource utilization, student queuing, facility and equipment requirements. Costs associated with full MODIA implementation and operation were estimated from cost data collected during the service test. From this figure was subtracted the estimated cost of the conventional planning process to give a rough estimate of the increased cost of MODIA. To determine MODIA's applicability and usefulness for planning Types 1-6 courses, the scope and purpose of each type of planning was compared to MODIA's capability. Further, a survey of the course planning done at this center from 1970-1975 was conducted to estimate the magnitude of the planning effort which could be supported by MODIA. Finally, interviews were conducted with the participating ISD teams to assess any perceived limitations with the system and to determine the overall reactions of planners to MODIA.

RESULTS AND CONCLUSIONS:

Course operation and course cost parameters for four of the five courses simulated with MODIA were very close to the parameters of the actual ongoing courses. The one discrepancy occurred when planners attempted to simulate Keesler's Course 3AQR30020-1, Electronic Principles. Because this course is so large, the MODIA system could not accommodate all the planning factors and full simulation of course operation was not achieved. However, based upon MODIA's performance with the other four courses, evaluators concluded that MODIA's outputs are accurate and valid.

For three of the five Keesler courses which were revised with MODIA, projected five-year cost savings were realized. These savings ranged from $48,100 for 3ABR30434 to $173,300 for 3ABR30331. Results of the study support many of the Rand claims for MODIA. Planners were able to rapidly manipulate many design factors to create alternative courses which could then be compared on dimensions such as overall cost, resource utilization, trainer requirements and so forth. Planners were very effective in eliminating any wait for resources and yet reducing overall course costs. Because MODIA provides the impact of a design decision on all other decisions, evaluators concluded that MODIA stimulates more thorough and innovative approaches to course design and thus makes possible the creation of more cost-effective courses.

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Concerning system usefulness, evaluators concluded that MODIA could not be used for Types 1, 5, and 6 planning, would have limited use for Types 2 and 4 planning, and could be used extensively for Type 3 planning. Based upon data collected during the service test, Keesler revises and implements on the average approximately 42,500 hours of Type 3 instruction annually. This figure equates to approximately 80% of all the course hours revised and implemented at this center each year. Thus, MODIA could be a very useful technical training planning tool.

MODIA first-year cost, determined from the cost data collected during the service test and projected to the population of 42,500 hours of Type 3 instruction, was estimated at approximately $800,000. This figure includes computer charges for planning two complete course revisions plus personnel costs. The cost of conventional planning for the analogous portion of the ISD process was estimated at $312,000 for the same number of course hours. This latter figure suffers from unreliability, and the report discusses reasons for the large difference. Nevertheless, evaluators concluded that the increased cost of MODIA would be offset by the savings accrued from more cost-effective instructional systems.

Interface Team observations and interviews with ISD team members identified several changes which should be made to MODIA to improve its acceptance and efficiency. These changes range from minor modifications, such as not having the option to cancel certain MODIA printouts, to three relatively major changes. First, MODIA occasionally garbled certain inputs which forced planners to repeat certain phases of the design process, and this problem needs to be eliminated. Second, MODIA program limitations prohibit planners from designating more than 31 resource groups, and several ISD team members believed this number should be increased. Finally, MODIA users requested a program change to permit the calculation of resource utilization when a course revision is implemented for a program which is already in progress.

ADOPTION:

Because of the narrow focus of the service test plus the limited number of courses to which MODIA was applied, system adoption cannot be recommended at this time. Questions remain as to how School policies and objectives will be incorporated into the planning effort, who will make the choice among the alternatives designed, and how resource distribution across a group of homogeneous courses can be accomplished. Further, although the study implied that MODIA planning might lead to manpower reductions, the procedures and organizational configuration necessary to support MODIA planning were not addressed. More extensive and realistic use of the system is recommended to answer these questions.

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EVALUATION OF THE MODIA SYSTEM

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MODIA EVALUATION
SERVICE TEST PROGRAM

SECTION A - INTRODUCTION

1. Authority: This evaluation program was conducted under the authority of the Plan for Evaluating the MODIA System, 6 April 1976 and ATC/XP letter to Keesler/XR, 10 October 1974, Support Requirements for Evaluation of MODIA (Method of Designing Instructional Alternatives).

2. Objectives:

a. Determine the cost of using the MODIA System for planning training courses in a technical training environment.

b. Assess the validity of the MODIA System to determine the degree to which the system and each of its components does what it is supposed to do.

c. Assess MODIA's effectiveness as a planning tool.

d. Determine the potential usefulness of MODIA in terms of planning Types 1,2,3,4,5, and 6 courses.

e. Determine what changes to MODIA might improve its effectiveness.

3. Background: The Method of Designing Instructional Alternatives (MODIA) System was developed by Rand Corporation for Air Training Command. It is a tool designed to faciliate course planning. Its aim is to provide a systematic process for planning the mix of students, instructors, materials, equipment and facilities,and procedures by which all of these elements work together to effect student mastery of the subject matter, and to provide planners with consistent estimates of the cost and performance of alternative plans for a training course. A critical design review of the MODIA System was conducted during October 1973. The purpose of that review was to have technical training planners try out the preliminary MODIA System model so that Rand designers could gain the insights necessary to develop the final operational system. Keesler and Lowry personnel participated in that review and furnished information since used by Rand to accomplish system changes which are considered sufficient to satisfy Air Training Command needs. Four major steps embraced the MODIA project at Keesler: (1) installing and debugging the MODIA System computer programs in the H-6060 computer at Keesler, (2) training the MODIA Interface Team members and evaluation team members, (3) shaking down the system, and (4) evaluating MODIA. Rand personnel installed and debugged three MODIA System computer programs in the Keesler H-6060 computer during the period 10 November - 20 November 1975. These programs were installed in an operational configuration which required them to be operated on a time-sharing basis with WWMCCS programmer and operator courses during the service test period. Training of the MODIA Interface Team was conducted during the period 1-12 December 1975. Shakedown of the MODIA System was subsequently accomplished by exercising MODIA on Courses 3ABR32831 and 3ABR30430. The requirement to train the ISD teams for these two courses, in addition to affording shakedown data, enabled Interface Team members to gain proficiency in using MODIA. The shakedown of MODIA was completed on 5 March 1976.

SECTION B - METHOD

4. Experimental Design:

a. Course Selected: Six courses (five from Keesler and one from Lowry) were selected for involvement in the service test. Specific courses selected were:

3ABR32834, Avionic Inertial and Radar Nav Sys Specialist

3ABR30434, Ground Radio Equipment Repairman

3ABR30331, ATC Radar Repairman

3ABR30333, Automatic Tracking Radar Repairman

3AQR30020-1, Electronic Principles

3AIR75100-X, Instructor Training

Course selection was based on the following:

(1) Each needed critical review of cost effectiveness.

(2) Low, medium, and high student loads were represented.

(3) Basic electronics and principles-centered electronic technology training were represented.

(4) Different instructional approaches were represented.

(5) Stability of materiel varied from rapid changes to long life.

The assumption was that these courses reflected the best planning possible through conventional means, a prerequisite deemed necessary to compare the conventional approach with the MODIA System. Keesler courses selected had progressed through all steps of the 5-Step ISD Model. The Lowry Course (3AIR75100-X) had progressed through Step 3 of the 5-Step ISD Model.

b. ISD Team: Six ISD teams were identified to participate in the evaluation as course planners. Each ISD team was comprised of a curriculum training specialist, branch training specialist, resource training specialist, and subject matter specialists. Also School Headquarters staff participants (Plans and Resources Branch staff personnel) provided inputs as required. Each ISD team provided the planning factors to exercise the MODIA System during the service test. Specific ISD teams were:

ISD Team A - Course 3ABR32834

ISD Team B - Course 3ABR30434

ISD Team C - Course 3ABR30331

ISD Team D - Course 3ABR30333

ISD Team E - Course 3AQR30020-1

ISD Team F - Course 3AIR75100-X

c. MODIA Interface Team: The Interface Team served as an interface between MODIA and the course planners. They operated the MODIA System, assisted course planners in studying alternatives, and aided course planners in interpreting MODIA outputs to determine the best instructional alternatives.

d. Data Collection: To evaluate MODIA, performance data (results of exercising MODIA to develop instructional alternatives for the courses selected for the study) and participant opinions collected by structured interviews were analyzed. Two different interview questionnaires, one for Interface Team members and one for the ISD teams, were utilized. Supplemental cost data were collected from the five Keesler service test ISD teams which reflected the best estimate of the cost of planning manually. With these data, planning costs for the MODIA and conventional approaches were compared. Structured interviews were conducted at the end of the evaluation period. The performance data were collected by observations and by analyzing MODIA outputs while using the system to achieve assigned planning tasks. Further, data reflecting the number of course hours that had been revised and/or newly prepared at Keesler during the period 1970-1975 were collected from the files of the Plans Branch (TTOX) to assess MODIA's potential usefulness.

e. Questionnaires: The questionnaires used in the structured interviews are discussed below:

(1) Interview Questionnaire for the Interface Team: This questionnaire solicited the opinions of MODIA Interface Team members concerning the ease or difficulty of operating MODIA, the ease or difficulty of interpreting MODIA outputs, and MODIA's effectiveness as a planning tool. A sample copy of this questionnaire (with raw data summaries) is contained in Appendix 1.

(2) Interview Questionnaire for the ISD Teams: This questionnaire solicited the opinions of each ISD team concerning the ease or difficulty of providing the planning data for exercising MODIA, the ease or difficulty of interpreting MODIA results, the ease or difficulty to plan different approaches to instruction, the completeness and comprehensiveness of the information provided by MODIA, acceptance of MODIA as a planning tool, and the type courses to which MODIA planning could be applied in a technical training environment. A sample copy of this questionnaire (with raw data summaries) is contained in Appendix 2.

Data contained in the questionnaires were consolidated and analyzed to compare participant acceptance of MODIA with the conventional mode of planning; also, the data were used to assess the effectiveness of MODIA as a planning tool.

f. History Sheet: A background questionnaire provided the evaluation team with the skill level and experience of the service test participants. A copy of this questionnaire is contained in Appendix 3.

5. Analysis Procedures: The procedures employed to analyze the data collected during the study were as follows:

a. MODIA System Cost: The cost of MODIA as a planning system was determined as follows:

(1) Data had already been collected from each of the service test ISD teams which reflected the manhours expended in completing that part of Step 4 of the ISD Model (for which MODIA was applied) in planning the current courses.

(2) Data reflecting cost in facilities, equipment, manhours, materials, and funds was summarized to determine the USAF cost for implementing and operating MODIA at Keesler during the service test. The MODIA implementation cost was prorated against all applicable Keesler courses. The operating cost was extrapolated to the five service test courses.

(3) Acceptance: Structured interviews were used to collect data for determining MODIA acceptance by course planners in a technical training environment. A Chi Square test was used to analyze the data to determine if there was a difference in the participants' opinions about the use of MODIA versus the conventional mode of planning training courses. The acceptance of any real difference was at the .05 level of significance.

d. MODIA System Changes to Improve Effectiveness: Participant opinions were collected by structured interviews to solicit recommended changes for improving MODIA effectiveness in a technical training environment.

SECTION C - RESULTS

6. General: This section summarizes the data collected during the service test (8 March - 4 June 1976).

7. MODIA System Problems/Constraints Encountered: During the shakedown period, the following system limitations were discovered through trial and error:

a. The design of the User Interface (UI) program permitted only 20 objectives to be used at any one time in planning an instructional program. This limitation caused the planners to design the courses on a block-by-block basis rather than the entire course on one run of the MODIA UI program. Also, resource specifications limited planners to identifying 21 special (equipment, etc.) and 10 other (instructors, rooms, etc.) resources. To work around this limitation, course planners and Interface Team members had to group equipment for each student laboratory position. Rand designers were advised of these limitations during January 1976 and were requested to furnish the MODIA Interface Team the limitations and specifications on all phases of the User Interface (UI) program so that MODIA could be exercised with greater efficiency during the service test period. The MODIA Interface Team also requested Rand personnel expand the number of objectives that could be applied to the User Interface (UI) program to 250 and increase the quantity of resources that could be assigned during instructional alternative design. The limits on entries to the UI were furnished by Rand in February 1976 and the program changes were incorporated in April 1976 which allowed course planners to use 250 objectives.

b. During the early part of the service test, Interface and ISD team members experienced garbling (malassignment) of resources when these resources were allocated to learning events during the MODIA resource contraints phase of the instructional design. To work around this, course planners and Interface Team members had to try, through trial and error, various combination of numbers for resources allocated to learning events until a number was found that the User Interface program would accept. When the correct number was accepted, the computer would assign the resources correctly to the appropriate learning events. This problem persisted occasionally throughout the service test program. The inability of course planners to enter discretionary numbers for resources was frustrating at times and forced them to go through the resource constraint phase two or three times to secure the proper assignment of resources to learning events.

c. Another occasional problem which persisted throughout the service test was that user entries at the keyboard were misread by the User Interface (UI) program. Examples of this error are as follows:

INPUT FROM TERMINAL	COMPUTER READ (TERMINAL PRINTOUT)
168	10
143	Error in Entry
243	Error in Entry
1680	Error in Entry
111/222	1114222

This type error was not as serious as the garbling of resources since it did not affect the assignment of resources to learning events or have any serious effect on course design. When the errors occurred, users were able to correct them later in the course design when asked at the end of the UI if there were any changes to be made. Therefore, this malfunction was not a serious hindrance during the service test period of 8 March - 4 June 1976.

8. Background of Service Test Participants: Table 1 provides the grade, present position, curriculum and teaching experience in a technical training environment, and years in present position for the service test participants. The average time spent in present position and the average curriculum and teaching experience for all participants are also shown.

The instructors and instructor supervisors served as subject matter experts. The training specialist provided guidance on school policy regarding training for each of the Air Force specialties selected for involvement in the service test. The MODIA Interface Team members served as an interface between MODIA and the course planners, operated the system to assist course planners in studying alternatives, and aided course planners in interpreting MODIA outputs to determine the best course design.

9. MODIA System Cost:

a. Comparison of MODIA and Manual Planning: The MODIA System was exercised on five Keesler courses to determine its cost as a planning tool related to the cost of the current planning system. To accomplish this, data (facilities, equipment, manhours, and material) reflecting the USAF cost incurred in operating MODIA (see Appendix 5) during the planning of each Keesler course were collected and compared with data (manhours and materials) reflecting the cost of manually planning the last revision to each course (see Appendix 4). No data exist on the cost of doing Step 4 under the ISD process. Therefore, the manhours attributed to the manual planning process were derived from professional estimates by personnel directly responsible for the last revision of each Keesler course selected for the service test. In spite of the subjectivity of the data gathering process, the general uniformity of the data from five separate ISD teams lends considerable creditability to it. Further, the number of hours used to design an instructional alternative using MODIA does not include the number of hours to input the baseline program (present instructional system). The baseline courses were entered into the computer by course planners during MODIA familiarization sessions. With baseline data established, course planners were able to compare existing instructional alternatives with MODIA-developed alternatives. However, in normal operation, course planners could get cost factors for existing courses from the comptroller and might not need to establish a baseline in MODIA for comparison purposes. Thus, the manhours for MODIA planning reflect the creation of one alternative but not the establishment of the baseline. Also, MODIA Interface Team member manhours were charged against the MODIA planning process. This was done because the plan called for them to work with each ISD team and operate MODIA to plan instructional alternatives. Based upon data in Appendices 4 and 5, the number of manhours required to plan each hour of instruction and the cost per hour of planning effort were arrived at and are depicted in Appendices 7 and 8.

TABLE 1
BACKGROUND OF PARTICIPANTS

N=27

Team Membership	Grade	Position	Years Experience		Years In Present Position
			Curriculum	Teaching	
Interface Team	GS-13	Principal Instructor	16.0	4.0	1.00
	GS-12	Training Specialist (Electronics)	14.0	8.0	4.00
	E-7	Technical Writer (Electronics)	4.0	7.0	2.00
ISD Team A	E-7	Instructor Supervisor (Electronics)	5.0	5.5	5.00
3ABR32834	GS-11	Training Specialist (Electronics)	18.0	6.0	16.00
	GS-9	Instructor (Electronics)	1.0	7.0	7.00
	GS-9	Instructor (Electronics)	1.0	14.0	14.00
ISD Team B	E-6	ISD Technician	4.0	2.0	4.00
3ABR30434	GS-11	Training Specialist (Electronics)	3.5	13.5	3.00
	GS-9	Instructor (Electronics)	1.0	10.0	10.00
	GS-9	Instructor (Electronics)	3.0	15.0	15.00
ISD Team C	E-6	Instructor (Electronics)	0.0	5.0	5.00
3ABR30331	GS-11	Training Specialist (Electronics	7.0	6.0	4.00
	GS-9	Instructor (Electronics)	5.0	17.0	10.00
ISD Team D	E-7	Instructor Supervisor (Electronics)	10.0	10.0	3.00
3ABR30333	E-6	Instructor (Electronics)	2.0	3.5	3.50
	GS-11	Training Specialist (Electronics)	16.0	7.0	8.00
	GS-11	Training Specialist (Electronics)	12.0	13.0	3.00
ISD Team E	GS-11	Training Specialist (Electronics)	7.0	17.0	1.25
3AQR30020-1	GS-11	Training Specialist (Electronics)	10.0	20.0	5.00
	GS-11	Training Specialist (Electronics)	7.0	2.0	13.00
	GS-9	Instructor (Electronics)	3.0	11.5	11.50
	GS-9	Instructor (Electronics)	0.0	4.0	4.00
ISD Team F	E-7	ISD Technician	9.0	1.0	9.00
Lowry AFB	GS-13	Training Research Specialist (AFHRL)	6.0	0.0	3.50
	GS-12	Supervisory Training Specialist	4.0	0.0	4.00
	GS-7	Instructor-Writer	0.0	5.0	2.00
Average			6.33	7.91	6.32

Table 2 provides a comparison of the average cost of planning each hour of instruction with MODIA and the average cost of planning each hour of instruction manually.

TABLE 2
COST OF PLANNING ONE INSTRUCTIONAL ALTERNATIVE, MODIA VS MANUAL

Category	Average Cost/Hour Planning Effort	Range
Manual Course Revision	$7.33[1]	$6.62-$8.11
MODIA Course Revision	$3.79[1] $8.33[2]	$3.46-$4.04 $6.72-$10.22

[1] Manhour cost only (excludes administrative support cost).
[2] Manhour + computer support cost (excludes administrative support and implementation cost).

Results indicate that the total MODIA planning cost is slightly higher than the current manual planning cost. However, MODIA affords a significant reduction in manhours required (lower manhour cost) when planning one alternative design from an existing instructional system.

b. MODIA Implementation Cost: The cost of implementing MODIA in support of the service test is shown in Appendix 6. This cost, $36,080.25, includes USAF cost incurred in facilities, equipment, materials, computer operation, and manhours during: (1) installation and debugging of the system on the H-6060 computer, (2) training of the MODIA Interface Team, and (3) shakedown of the system.

10. MODIA System Validation: The MODIA System was exercised to measure both its utility as a planning tool in a technical training environment and the fidelity of its products as compared to actual operating courses. Utility was gauged by the ability of MODIA to accept and process all the factors needed to plan and construct a technical training course within ATC policies and regulations. Members of all five ISD teams found that the data needed to plan courses could be accommodated by MODIA in a systematic fashion and no gaps existed in the programs.

To assess MODIA's validity, ISD teams and the MODIA Interface Team compared salient aspects of five operating courses at Keesler with identical aspects of these courses as simulated by MODIA. For each course, teams exercised MODIA using actual student entry data, rate of student failures, quantity of resources (instructors, rooms, hardware, and test equipment), and time of achievement for learning objectives based upon one year's operation of the actual course. As can be seen from Tables 3 through 7, MODIA utilized this data to produce courses with parameters very similar to those of the operating courses. The three cost figures for the ongoing courses - Cost Per Student Week, Cost Per Graduate, and First Year Cost of Course[1] - were obtained from the Keesler Comptroller. Based upon their recommendation, cost data provided by MODIA is considered sufficiently valid if it is within ±10% of the comptroller's cost figure. Paragraphs associated with each table discuss the cost differences experienced.

1. See Appendix 9 for definition of cost factors used to determine course cost.

a. Course 3ABR32834, Avionic Inertial and Radar Navigation System Specialist: This is a group/lock-step instructional system employing 510 hours of instruction. Table 3 reflects results obtained by ISD Team A. System fidelity, as evidenced by data comparisons, is satisfactory, and MODIA cost information is within ±3% of the comptroller's figure.

TABLE 3
COMPARISON OF MODIA PREDICTIONS WITH ACTUAL RESULTS
(COURSE 3ABR32834)

Data Description	MODIA	Actual	Difference
Annual Student Entry	316	316	
Annual Graduates	214	214	
Average Course Hours	510	510	
Annual Failures	6	6	
Resource Utilization (%)	60.2	62	1.8
Instructors	28	28	
Cost Per Student Week	$399.53	$411.94	$12.41
Cost Per Graduate	$6,792.01	$7,002.98	$210.97
Total Course Cost (1 Year)	$1,453,490.10	$1,498,637.70	$45,147.60

b. Course 3ABR30434, Ground Radio Equipment Repairman: This is a self-paced instructional system comprised of 420 instructional hours for this course. Table 4 shows results obtained by ISD Team B. System fidelity, as evidenced by data comparisons, is satisfactory and MODIA cost data are within ±7.5% of the comptroller's figure for this course.

TABLE 4
COMPARISON OF MODIA PREDICTIONS WITH ACTUAL RESULTS
(COURSE 3ABR30434)

Data Description	MODIA	Actual	Difference
Annual Student Entry	746	746	-
Annual Graduates	532	534	2
Average Course Hours	453.4	420	33.4
Annual Failures	6	4	2
Resource Utilization (%)	65	65	-
Instructors	25	25	-
Cost Per Student Week	$335.62	$333.11	$2.51
Cost Per Graduate	$5,034.30	$4,663.54	$370.76
Total Course Cost (1 Year)	$2,678,247.60	$2,490,330.30	$187,917.30

c. Course 3ABR30331, ATC Radar Repairman: This is a lock step instructional system comprised of 690 instructional hours. Table 5 reveals results obtained by ISD Team C. System fidelity, as indicated by data comparisons, is satisfactory and MODIA cost data are within ±2.9% of the comptroller's figure.

TABLE 5
COMPARISON OF MODIA PREDICTIONS WITH ACTUAL RESULTS
(COURSE 3ABR30331)

Data Description	MODIA	Actual	Difference
Annual Student Entry	261	261	-
Annual Graduates	242	248	6
Average Course Hours	691.5	690	1.5
Annual Failures	4	3	1
Resource Utilization (%)	28	30	2
Instructors	23	23	-
Cost Per Student Week	$434.98	$413.45	$21.53
Cost Per Graduate	$10,026.29	$9,509.35	$516.94
Total Course Cost (1 Year)	$2,426,362.10	$2,358,318.80	$68,043.30

d. Course 3ABR30333, Automatic Tracking Radar Repairman: The instructional design is lock-step with a total of 570 instructional hours. Table 6 reflects results obtained by ISD Team D. System fidelity, as evidenced by data comparisons, is satisfactory and MODIA cost data are within ±5.5% of the comptroller's figure.

TABLE 6
COMPARISON OF MODIA PREDICTIONS WITH ACTUAL RESULTS
(COURSE 3ABR30333)

Data Description	MODIA	Actual	Difference
Annual Student Entry	155	155	-
Annual Graduates	96	93	3
Average Course Hours	576	570	6
Annual Failures	7	10	3
Resource Utilization (%)	33	34	1
Instructors	14	14	-
Cost Per Student Week	$374.80	$413.45	$38.65
Cost Per Graduate	$7,483.51	$8,174.53	$691.02
Total Course Cost (1 Year)	$718,416.96	$760,231.29	$41,814.33

e. Course 3AQR30020-1, Electronics Principles: This is a modular/self-paced instructional system comprised of 450 hours of instruction. Due to the large student flow, bulk of planning data, and the contraints in the Resource Utilization Model (RUM) program, the MODIA operators and course planners could only simulate 600 hours of course operation. Thus, MODIA results (annual graduates, average time to graduate, and student failures) were estimated for one year based on the results for the 600 hours of course simulation. However, the MODIA Cost Model (MODCOM) was exercised with data for predicting cost for one year. This was possible because the MODCOM can be operated apart from the MODIA User Interface (UI) and Resource Utilization Model (RUM) computer programs. Table 7 reflects results obtained by ISD Team E.

TABLE 7
COMPARISON OF MODIA PREDICTIONS WITH ACTUAL RESULTS
(COURSE 3AQR30020-1)

Data Description	MODIA	Actual	Difference
Annual Student Entry	6,687	6,687	-
Annual Graduates	5,980	6,315	335
Average Course Hours	273	450	177
Annual Failures	493	390	103
Resource Utilization (%)	21.45	35	13.55
Instructors	194	201	7
Cost Per Student Week	$375.89	$310.25	$65.64
Cost Per Graduate	$3,420.60	$4,653.75	$1,233.15
Total Course Cost (1 Year)	$20,455,188.00	$29,388,431.00	$8,933,243.00

The large difference between the actual course cost for one year and that cost calculated by MODIA (30.39%) does not invalidate the MODIA computer programs. Linear projection of a year's operation (1,500 hours) based on 600 hours of simulation may have been inappropriate. The congruity between actual and projected costs for the other four courses substantiates MODIA's validity. However, the system limitation experienced with Course 3AQR30020-1 does point out one deficiency with the current programs - the inability to handle very large, complex courses.

11. MODIA System Effectiveness: The effectiveness of the MODIA System as a planning tool was measured in two ways. First, ISD teams were acquainted with the MODIA System by requiring them to develop the current designated service test course as described by the Plan of Instruction (POI). Having been trained how to operate the system with the help of the MODIA Interface Team, each team was then challenged to consider instructional alternatives which might produce a more cost-effective course. Each ISD team developed at least two alternatives. The effectiveness of MODIA as a planning tool was further pursued by asking ISD team members specific questions designed to determine the system's strengths and weaknesses.

a. Instructional Alternative Development by ISD Teams: Having developed each course through application of Instructional System Development (ISD) methodology, each team was

made aware that MODIA was designed to assist planners only after completion of Steps 1, 2, and 3 of the 5-Step ISD Model:

(1) Analyze system requirements.

(2) Define training requirements.

(3) Develop objectives and tests.

(4) Plan, develop, and validate instruction.

(5) Conduct and evaluate instruction.

MODIA was used by the teams to complete the planning phase of Step 4 by aiding them in sequencing learning activities and selecting instructional methods and resources.

b. MODIA Design Process: For each course, team members used the following procedures and factors to plan and develop instructional alternatives with MODIA:

(1) Select the sequencing of teaching objectives and assign subject matter types, resources, and time to teach the objectives.

(2) Determine where in the course any tests, reviews, and critiques are to be administered and assign special resources to tests and reviews plus the time these activities will require.

(3) Determine method(s) by which students are taught.

(4) Determine instructional design.

(5) Determine annual student input, size of the entering group, and time between entries.

(6) Specify the length of training day, section size (maximum and minimum number of students in the group instructed), teaching agent (instructor or student), and teaching format (simple, recitation, group-interactive or response-paced).

(7) Specify test details by designating the proportion of students allowed to fail.

(8) Identify the type and quantity of resources needed for teaching each learning event.

(9) Specify the maximum and minimum number of students that may form a section be be handled by each unit of resources.

In planning instructional alternatives, the teams were allowed to vary all planning factors except the annual student input and the student failure rate. This was decided because course planners felt that these were two factors over which they had no control. Thus, the annual student input and failure rate used in the MODIA design process were the established annual Trained Personnel Requirement (TPR) and failure rate respectively for each course selected for the service test. The impact of alternative course designs considered by the planners are presented and discussed for each course.

c. Course 3ABR32834: The present instructional design is group/lock-step with 510 instructional hours, an annual entry of 316 students (entry rate of 10±2 students every 30 hours). Further, the present instructional system is designed for each instructor to be assigned 10±2 students during classroom theory and 5±1 students during equipment performance. The course is structured so that theory of equipment operation is presented

TABLE 8
COMPARISON OF MODIA PLANNED ALTERNATIVE AND MANUAL ALTERNATIVE (COURSE 3ABR32834)

Data Description	Manual Lock-Step	MODIA Alternative 1 Lock-Step	MODIA Alternative 2 Lock-Step
Course Length (Weeks)	17	14	13
Student Input (1 Year)	*316	*316	*316
Annual Graduates (Average)	*214	226	231
Failures	*6	13	12
Current Number Students in Course	96	77	73
Average Time to Graduate (Weeks)	17.58	14.95	13.21
Instructors (% Utilization)	28 (62%)	30 (66%)	33 (59%)
Rooms (% Utilization)	17 (75%)	22 (66%)	22 (90%)
Hardware (% Utilization)	56 (35%)	84 (29%)	84 (80%)
Test Equipment (% Utilization)	208 (39%)	312 (29%)	312 (80%)
Resources Queue (Average Hours)	1.4	-	-
Queue for Other Students (Average Hours)	-	1.25	-
Cost Per Student Week	$518.77	$1,584.00	$1,668.68
Cost Per Graduate (Average)	$9,120.00	$23,682.24	$22,043.29
Total Course Cost - 1st Year	$1,951,700.00	$5,068,000.00	$5,092,000.00
Total Course Cost - 5 Yr Cum	$7,063,600.00	$10,473,000.00	$10,394,200.00

* Obtained from the I&M Unit in TCHTG 3380/TAVI.

in one room, additional lecture on equipment operation is presented in the laboratory, and unguided practice on the equipment in the same laboratory is supervised by one instructor.

When team members exercised MODIA to develop baseline data, they found that students were queuing for equipment and/or instructors due to two or more student groups requiring use of these resources at the same time. Based on experience, course planners felt that guided and unguided practice learning events for each unit of hardware could be combined and the time for accomplishing these events decreased (if each class was divided into two equal groups with one instructor assigned per group during performance time).

Alternative 1 was created with a group/lock-step instructional design, an annual entry of 316 students, and decreased student performance time. Here, one instructor with the capacity to teach 10±2 students was allocated to the theory classroom and two instructors with the capacity to teach 10±2 students were allocated to the equipment laboratory to accommodate student performance.

Alternative 2 explored a self-pace approach with an annual entry of 316 students and a student entry rate of 2±1 every six hours. Further, student performance time was kept the same as for Alternative 1 (.4-1.7 of the average time to complete a learning event), each theory classroom was assigned a capacity of 10±2 students with one instructor, and each equipment room was assigned a capacity of 10±2 students with two instructors.

For both alternatives plus the manually planned course, the MODIA System projected resource requirements to support the courses. The planning strategy used by the ISD teams was to determine the effects the above changes in Alternative 1 and Alternative 2 would have on: (1) average time for students to graduate, (2) quantity of resources and percentage resources utilization, (3) student queue time for resources and other students, and (4) course cost. Table 8 depicts data as a basis for comparing the MODIA and manual planning results.

The data presented in Table 8 reveal the following: (1) Students were able to graduate approximately three and four weeks earlier in Alternatives 1 and 2, respectively, compared to the present course; (2) Additional resources were required in both MODIA alternatives compared to the present instructional system; however, the increase in resources eliminated student queuing on resources; (3) First year total and five year cumulative course cost is considerably higher for both MODIA alternatives as compared to the manually planned system, and (4) Because of decreased course length, both Alternatives 1 and 2 could accommodate more students per year than the existing course.

The cost data indicate that neither of the alternatives chosen for simulation surpassed the existing course in cost-effectiveness. Reduction in course length and increased resource utilization do not appear to be worth the extra cost. This does not imply that a more cost-effective alternative does not exist; however, using what were considered to be logical approaches to course revision, the planners were unable to develop less costly alternatives with MODIA.

d. Course 3ABR30434: The present instructional design is self-pace with a duration of 420 instructional hours, an annual TPR of 696 students, and a student entry rate of 2±1 students every hour. In the present course, equipment limitations cause students to spend an extreme amount of time waiting to participate in hands-on performance. Due to queuing on hardware, it takes the students an average of 14.75 weeks to graduate. Taxed with an annual TPR of 696 students, course planners were challenged to consider instructional alternatives which might alleviate resource queuing and at the same time reduce course operating cost.

Alternative 1 was examined with a self-pace instructional design, an annual TPR of 696 students, and a student entry rate of 2±1 every hour with MODIA projecting the resource requirements to support the approach to prevent student queuing on resources.

Alternative 2 explored a group/lock-step instructional design with a student entry rate of 15 every 30 hours, an instructor capacity of 15 students for lecture/discussion, six students for laboratory performance and four students for troubleshooting and aligning equipment, and a room capacity of 15 students for all learning events. In this approach, the time allotted for student achievement of learning events was the same as listed in the present POI. Also, course planners allowed MODIA to project resource requirements to support this alternative. Table 9 presents data as a basis for comparing MODIA and manual planning approaches.

TABLE 9
COMPARISON OF MODIA PLANNED ALTERNATIVES AND MANUAL ALTERNATIVE
(COURSE 3ABR30434)

Data Description	Manual Self-Pace	MODIA Alternative 1 Self-Pace	MODIA Alternative 2 Lock-Step
Course Length (Weeks)	14	14	14
Student Input (1 Year)	*980	*980	*980
Annual Graduates (Average)	*696	696	711
Failures	*26	26	27
Current Number Students in Course	258	258	242
Average Time to Graduate (Weeks)	14.75	13.7	14.58
Instructors (% Utilization)	22 (46%)	18 (85%)	30 (61%)
Rooms (% Utilization)	18 (70%)	19 (62%)	14 (73%)
Hardware (% Utilization)	9 (42%)	18 (41%)	16 (83%)
Test Equipment (% Utilization)	1 (42%)	1 (41%)	1 (83%)
Resources Queue (Average Hours)	52.8	0	0
Queue for Other Student (Average Hours)	0	0	7.8
Cost Per Student Week	$318.34	$338.88	$451.29
Cost Per Graduate (Average)	$4,698.70	$4,642.67	$6,579.95
Total Course Cost - 1st Year	$3,270,300.00	$3,231,300.00	$4,678,200.00
Total Course Cost - 5	$9,218,600.00	$9,170,500.00	$10,708,300.00

* Obtained from the I&M Unit in TCHTG 3410/TCSTI.

Results indicate that students in both the MODIA alternatives and the manual alternative graduate in approximately the same time, but Alternative 2 requires an overall increase in resources (+8 instructors, +7 pieces of hardware, -4 classrooms). On the other hand, Alternative 1 calculated by MODIA requires four fewer instructors and only one additional classroom to eliminate the long wait for resources and graduate students in approximately 1.06 fewer weeks. These data indicate that students matriculating in MODIA Alternative 1 can graduate at approximately $65.03 less than in the present instructional program. Thus,it appears that the planners for Course 3ABR30434 were able to structure a course using MODIA which is more cost-effective than the current instructional system.

e. Course 3ABR30331: The present instructional design is group/lock-step with 690 instructional hours, an annual TPR of 140 students, a student entry rate of 11±1 students every 90 hours, and a failure rate of three percent. In the present course, about 332 hours are allotted for student performance with the remaining 358 hours used for classroom theory. Due to queuing for resources and other students (student groups having to wait until resources become available and washbacks having to wait for a class),it takes an average of 24 weeks for students to graduate in the present course as calculated with MODIA. Further, based on experience, course planners felt that the same student proficiency level could be obtained if the performance time was reduced by one-half. They were also of the opinion that queuing for resources and other students could be decreased if the quantity of resources were increased and the student capacity each could handle was decreased.

Alternative 1 examined a group/lock-step design with an annual TPR of 140 graduates, a student entry rate of 11±1 students every 90 hours, and a failure rate of three percent. The planners also assigned the following capacities: (1) Instructors: 11±1 students for lecture/demonstration and 5±1 for student performance, (2) Rooms: 11±1 students each, and (3) Hardware and Associated Test Equipment: 5±1 students each during performance time. Further, 332 hours and 358 hours were allotted to student performance and classroom theory respectively with MODIA projecting resource requirements to support the approach.

Alternative 2 explored a group/lock-step design with total course hours reallocated so that 181.5 hours were devoted to student performance and 508.5 hours devoted to classroom instruction. Student input and the number of students assigned to each resource were the same as for Alternative 1, and MODIA projected resource requirements to support the approach. Table 10 depicts key planning results as a basis for comparing MODIA and manual planning effectiveness.

The figures listed in Table 10 indicate that Alternative 1 graduates students in approximately the same length of time as the present course, reduces queuing time, decreases percentage of resource utilization, and increases the cost to graduate the 140 students due to the increase in the quantity of resources required to support this approach. Conversely, Alternative 2 allows students to graduate on an average of 3.9 hours sooner than the present course. Further, the number of instructors required is reduced by two and three additional units of hardware reduced resource queuing to zero and queuing for other students by 19 hours. The data imply that the increase in cost for the additional hardware is not offset by a decrease in both the number of instructors and the average time to graduate and results in an overall increase in course operation cost as compared to the present instructional system for the first year. However, over a five year period, Alternative 2 appears to be the better course.

TABLE 10
COMPARISON OF MODIA PLANNED ALTERNATIVES AND MANUAL PLANNED ALTERNATIVE
(COURSE 3ABR30331)

Data Description	Manual Lock-Step	MODIA Alternative 1 Lock-Step	MODIA Alternative 2 Lock-Step
Course Length (Weeks)	23	23	23
Student Input (1 Year)	*248	*248	*248
Annual Graduates (Average)	*140	140	140
Failures	*4	4	4
Current Number Students in Course	104	104	104
Average Time to Graduate (Weeks)	24	24.67	23.87
Instructors (% Utilization)	32 (45%)	34 (36%)	30 (32%)
Rooms (% Utilization)	8 (44%)	8 (49%)	8 (82%)
Hardware (% Utilization)	15 (39%)	26 (25%)	18 (29%)
Test Equipment (% Utilization)	12 (39%)	12 (25%)	12 (29%)
Resources Queue (Average Hours)	24	0	0
Queue for Other Students (Average Hours)	21	7	2
Cost Per Student Week	$686.33	$3,213,56	$969.45
Cost Per Graduate (Average)	$16,472.86	$79,278.57	$23,140.71
Total Course Cost - 1st Year	$2,306,200.00	$11,099,000.00	$3,239,700.00
Total Course Cost - 5 Yr Cum	$11,143,700.00	$20,295,800.00	$10,970,400.00

* Obtained from the I&M Unit in TCHTG 3395/TEOTI.

f. Course 3ABR30333: The present instructional design is group/lock-step with 570 instructional hours. Planning factors in its design included an annual TPR of 96 graduates, a student entry rate of 10±2 students every 120 hours, a failure rate of 4.5%, two units of hardware and associated test equipment, and six rooms. Results of the manually planned instructional alternative, as calculated with MODIA, are shown in Table 11.

Holding the above planning factors constant, the ISD team developed Alternative 1 by decreasing the quantity of available resources and assessing the impact on percentage of resource utilization, queuing time, average time for students to graduate, the number of graduates, and the course operation cost. This approach was used because of the low student flow and course planners' belief that they could fulfill the annual graduate requirment with less hardware.

Alternative 2 assessed the impact on instructor and room requirements by exploring a group/lock-step approach with an increase ir hardware and instructors and the remaining planning factors held constant. Course planners used this approach because they had two additional hardware units on hand and wanted to determine if using three hardware units would decrease the length of the course sufficiently to offset the added maintenance and instructor costs. Table 11 presents data which compares the MODIA and manual planning results.

TABLE 11
COMPARISON OF MODIA ALTERNATIVES AND MANUAL PLANNED ALTERNATIVE
(COURSE 3ABR30333)

Data Description	Manual Lock-Step	MODIA Alternative 1 Lock-Step	MODIA Alternative 2 Lock-Step
Course Length (Weeks)	19	26	17
Student Input (1 Year)	*155	*155	*155
Annual Graduates (Average)	*96	98	102
Failures	*7	7	7
Current Students in Course	52	70	46
Average Time to Graduate (Weeks)	19.77	26.98	17.48
Instructors (% Utilization)	14 (75%)	12 (78%)	18 (68%)
Rooms (% Utilization)	6 (53%)	5 (60%)	6 (47%)
Hardware (% Utilization) MSQ-77	2 (73%)	1 (78%)	3 (35%)
Test Equipment (% Utilization)	2 (73%)	2 (78%)	2 (35%)
Resources Queue (Average Hours)	0	0	0
Queue for Other Students (Average Hours)	1.3	4.1	1.3
Cost Per Student Week	$443.22	$368.60	$648.80
Cost Per Graduate (Average)	$8,762.50	$9,944,90	$11,328.43
Total Course Cost - 1st Year	$841,200.00	$775,702.68	$1,155,500.00
Total Course Cost - 5 Yr Cum	$1,804,600.00	$1,738,602.68	$2,113,900.00

* Obtained from the I&M Unit in TCHTG 3395/TEOTI.

For Alternative 1, course operation cost is less compared to the present course. However, it requires students longer to graduate since students who fail a block of instruction must wait for a class to form before retaking the subject material. Thus, the data imply that the initial savings for Alternative 1 would have been greater if a slightly higher student entry rate could have been postulated. As with the two preceeding courses, planners used MODIA to develop an instructional alternative which appears to be more cost-effective than the present course.

In Alternative 2, student graduation time was less than the present course. However, this time saving was offset by the salaries of the additional instructors and the cost of maintaining the additional hardware used to build this alternative. Therefore, as compared to the present manual course, the data indicate it would initially cost more to increase instructor and hardware requirements to graduate students an average of 2.29 weeks sooner.

g. Course 3AQR30020-1: This course incorporates a modular/self-pace instructional design comprised of 450 instructional hours. The present instructional program was planned with a TPR of 4,073 graduates, a student input rate of 12±11 students every six hours, and an established failure rate of five percent. Also, students entering this course are assigned to four different categories representing four AFSC's. Given these planning factors and the remaining data per present POI, MODIA was exercised to calculate the baseline data which was then used to compare the results of planning instructional alternatives with MODIA. Because of the tremendous quantity of planning data, large student flow, and the constraints in the Resource Utilization Model (RUM) program, team members could only simulate 600 hours of course operation to develop the baseline data. Thus, the results of manual planning as shown in Table 12 were estimated for one year based on the results of 600 hours of course simulation. However, as in the validation phase, course planners were able to use the present POI planning data and operate the Cost Model (MODCOM) to get the cost of the present system apart from course operation simulation.

Faced with not being able to adequately plan and simulate this course with the present quantity of planning data, team members used the following design strategy to plan one instructional alternative with MODIA:

(1) Specified student input at 5,908.

(2) Specified entry rate of 7±2 students every six hours.

(3) Used tracking for course diversification in which students are divided into four categories with each category of students designated to skip certain learning events and take learning events common to all students.

(4) Packaged learning events to stay within the 250 limit.

(5) Used the same instructor ranks (civilian and military) as present course.

(6) Resequenced learning events from present Plan of Instruction (POI) which allowed students to take common subject matter first then branch off to take material common to their AFSC.

(7) Allowed MODIA to generate resources to support the course design.

In generating the MODIA alternative, planners attempted to eliminate resource bottlenecks in an effort to graduate students sooner and thus produce a cost savings in course operation. Table 12 shows data as a basis for comparing the MODIA and manual planning results.

TABLE 12
COMPARISON OF MODIA AND MANUAL PLANNED ALTERNATIVES
(COURSE 3AQR30020-1)

Category	Manual Self-Pace	MODIA Alternative Self-Pace
Course Length (Weeks)	15	15
Student Input (1 Year)	*5,908	*5,908
Annual Graduates (Average)	*4,073	**4,224
Failures	*301	310
Current Number Students in Course	1,534	1,354
Average Time to Graduate (Weeks)	12	12.4
Instructors (% Utilization)	**178 (59%)	**168 (50%)
Hardware and Test Equipment (% Utilization)	**810 (5%)	**819 (6%)
Rooms (% Utilization)	**65 (42%)	**65 (44%)
Resources Queue (Average Hours)	1.5	0
Queue for Other Students (Average Hours)	0	0
Cost Per Student Week	$312.50	$293.75
Cost Per Graduate (Average)	$4,062.44	$3,642.46
Total Course Cost - 1st Year	$16,546,300.00	$16,458,600.00
Total Course Cost - 5 Yr Cum	$56,865,900.00	$52,362,100.00

* Obtained from I&M Unit in TCHTG 3395/TEOTI.
** Estimated from a 600-hour RUM simulation.

Results shown in Table 12 for the MODIA alternative are estimated from 600 hours of course simulation. As can be seen from Table 12, students take .4 weeks longer to graduate in the MODIA alternative as estimated from the 220 who graduated during the 600 hours simulation. Although this alternative indicates a savings in the number of instructors utilized, the total savings in instructor usage is offset somewhat by an increase in the number of hardware units required to decrease resource queue time to zero. Finally, the initial and five-year course operation costs for the MODIA alternative are less than the present course costs; however, this figure is based on estimates and is not necessarily reliable.

h. Course 3AIR75100-X: This is a new course which was developed to train technical instructors how to teach in a self-pace environment. The instructional design is a self-pace/group-pace combination to accompany four categories of students (slow group-pace, slow self-pace, fast group-pace, and fast self-pace). Prior to entering the course, students are administered a test to determine to which category they will be assigned. Table 13 shows the results of Course 3AIR75100-X as designed by Lowry course planners using the MODIA System. There are no data for comparing these results since this is a new course. The course planners designed the instructional program using the following planning factors: (1) a TPR of 529 graduates, (2) an entry rate of 2±1 students every six hours, (3) a three percent failure rate, (4) four different categories of students, (5) content diversification for each category, (6) six instructors, (7) three rooms, and (8) three hardware units.

TABLE 13
COURSE 3AIR75100-X, COURSE DESIGN

Data Description	MODIA Output Self-Pace/Group-Pace
Course Length (Weeks)	4
Student Input (1 Year)	544
Annual Graduates (Average)	529
Failures	15
Current Number Students in Course	0
Average Time to Graduate (Weeks)	3.4
Instructors (% Utilization)	9 (27%)
Rooms (% Utilization)	3 (96%)
Hardware (% Utilization)	3 (16%)
Resources Queue (Average Hours)	9
Queue for Other Students (Average Hours)	5.33
Cost Per Student Week	$508.79
Cost Per Graduate (Average)	$1,729.87
Total Course Cost - 1st Year	$915,101.23
Total Course Cost - 5 Yr Cum	$4,225,400.00

Four different alternatives were attempted using MODIA; however, Lowry planners were of the opinion that the results shown in Table 13 would provide an optimum instructional program for Course 3AIR75100-X. The average time for all students will be 3.4 weeks. The slow group-pace students and slow self-pace students will graduate in 3.93 and 3.02 weeks respectively. The fast group-pace students and the fast self-pace students will graduate in 3.68 and 2.97 weeks respectively. Further, student queue for resources and other students is very high. The waiting for resources is mainly due to self-pace students having to wait to gain access to hardware. One specific unit of hardware which caused the majority of resource queuing was a visual trainer used with the computer for particular learning events. The majority of student queuing is for student washbacks in the group-pace categories having to wait to join a class.

One problem encountered by Lowry course planners was that they were unable to use MODIA to simulate students skipping learning events due to resource unavailability and then returning to those events when the resources become available. During actual course operation, this flexible scheduling will be used, and the Lowry planners believe actual resource queue will be nearly zero.

i. Structured Interview: Another means to determine the effectiveness of MODIA as a planning tool was to assess the reactions of service test participants (by structured interview) to planning instructional alternatives with MODIA. Personnel involved in the service test were able to achieve a satisfactory level of expertise in MODIA and discovered many strengths and weaknesses of the system during the service test. At the completion of the evaluation period, members of the MODIA Interface and ISD teams were individually interviewed to determine their perception of MODIA's value as a planning tool and to identify factors affecting its effectiveness (see Appendices 1 and 2). Assessments to team member responses are provided below:

(1) MODIA Value as a Planning Tool: Team members were of the opinion that MODIA will enable users to accomplish the following:

(a) Accurately plan new and revised courses. ISD team members believed that the courses simulated by MODIA were accurate or valid in the sense that the computer-generated courses had a great deal of fidelity to the actual courses. With this accuracy, planners could have confidence in the products generated by MODIA during course planning.

(b) Rapidly plan instructional alternatives once planning data have been collected and worksheets prepared. It required, on the average, three days of intense over-the-shoulder guidance by the MODIA Interface Team for each ISD team to collect and translate course planning data to MODIA parameters for system operation. However, collecting planning data, preparing worksheets, and planning one instructional alternative were all accomplished in about one-fourth the time required to plan one instructional alternative manually.

(c) Rapidly compare the consequences and costs of alternative decisions concerning an instructional system. Examples of this procedure are identified in paragraphs 11c through 11g above where team members planned two alternatives for Courses 3ABR32834, 3ABR30434, 3ABR30331, and 3ABR30333. From MODIA printouts, team members were able to identify areas of a course (especially in resource utilization) that could be improved. Although the planners had to use their own judgment to devise the changes that might improve the course, MODIA rapidly gave the planners feedback on the consequences of these changes. Therefore, in an operational environment, planners could again and again modify the simulated course until an optimum mix of instructors, materials, equipment, facilities, and sequence of learning events were found given the entry rate and ability level of the student population.

(d) Systematically design a course by providing guidance to planners which assists them in making the major course design decisions. Planners felt that this is accomplished by the MODIA technique of using highly detailed, branching questionnaires to guide planners in considering school policies, teaching techniques, resource constraints, and training content in the instructional design process.

(e) Consider many options in planning instructional alternatives. Examples of this are: (1) content diversification where different students are instructed in different skills and/or knowledges, (2) tracking where students are divided into two or more groups that are instructed separately, and (3) grouping where trainees are separated into groups on the basis of some important characteristic.

(2) MODIA Effectiveness Limitations: The MODIA Interface Team and ISD teams experienced some difficulties which they believe hindered the effective use of MODIA in planning instructional alternatives. Based on their findings during the service test, team members reached the following conclusions:

(a) Due to built-in program limitations and computer core requirements, MODIA cannot be used effectively to plan a very large course with many planning factors. For example, Course 3AQR30020-1 team members had to package resources to keep the total resources within the program limitation (31 resources). During course operation simulation, the computer failed to keep track of all students; also,it required an extreme amount of time (approximately 1.5 hours) to simulate 600 hours of course operation. Thus, team members estimate that it will require in excess of three hours to simulate one year's course operation for any course similar to Course 3AQR30020-1. Further, in its present state, MODIA requires that approximately 70k to 90k bytes of sequential file storage be available before course operation simulation begins. The system was evaluated using the H-6060 computer where a total of 110k bytes had been dedicated to time-sharing operations. Thus, MODIA planners were competing with ongoing computer training courses for this file storage and experienced long delays for the computer to become available.

(b) MODIA terminology is not consistent with ISD terms and was confusing to course planners. Some MODIA terms which caused confusion are listed below:

1. Presentation/demonstration and group discussion are called "learning event types" in MODIA; whereas, ISD terminology uses types of instruction.

2. Teaching format determines the extent to which the instruction is explicitly structured to student needs. Team members had difficulty in determining what teaching format to select for specific learning events because the definitions in the MODIA literature are not sufficiently explicit to aid in selecting the most appropriate teaching format for their subject content.

(c) A well trained, highly motivated MODIA team is needed as an interface between the MODIA system and course planners. MODIA is out of the ordinary because it requires what is now an unfamiliar approach to the planning process. Thus, team members feel that for some time people will have to be trained to use the system because they will first need training to understand its purpose. Further, because MODIA is fairly complex, expertise is required to maximize system effectiveness. One operating concept recommended by participants was to establish a team of three or more people at each center who are both expert in the operation of MODIA and familiar with course planning and school policies. This team could work with ISD teams and plan a revision/new course when required.

(d) The occasional garbling of resources when allocating resources to learning events in the resource constraints phase of course design prevented team members from assigning specific numbers to designate quantity of resources allocated. Thus many times course planners had to alter their resources so that the computer would accept a number. For example, when planning Course 3ABR30434, Alternative 2 (group/lock-step), team members could not assign 18 resources to learning events because this became scrambled. However, they added one more classroom and entered 19 resources and the resource assignment was printed out satisfactorily. Course planners feel that this is a serious system deficiency.

(e) The inability to backtrack to a point within a phase of the design process without signing off from the computer causes instructional planning delays. Because of time-sharing, planners were often unable to get back on-line without a substantial delay. Changes recommended by team members to remove this limitation plus other delays are listed below:

1. Assignment of special resources could be moved from the "I Phase" of the User Interface (UI) program and assigned in the "R Phase" (Describe Resources) during course design. As MODIA is now developed, resources are first assigned by name to learning events (I Phase) then later by quantity (R Phase). Team members believe that a tremendous amount of time could be saved in designing instructional alternatives if both assignment and quantity of resources were designated simultaneously for each learning event.

2. Revise "P Phase" (where teaching policies are described) to add a correction option at the final listing of learning events. At present, to make a change in teaching policies, users must sign off the computer and sign back on and ask for the MODIA program to begin at the "P Phase" of the design process. As noted above, signing back on-line to make a change could take from 5-15 minutes.

3. Revise "C Phase" (summary of resource constraints) to make optional the receipt of a hard copy printout of learning event completion times and group section size assignment. The printout is merely a reproduction of what planners typed for entry into the computer. Many times team members did not desire to see a printout which included some 150 to 250 learning events which required an extreme amount of time. At present, a summary of resource constraints is automatically printed at the remote terminal whether users require it or not.

(f) The "RUM Phase" (Describe RUM Parameters) should be changed to give course planners the option to start course operation simulation with students in the course (course revision) or with the first student/student group that enters (new course). This would enable planners to get a more accurate representation of resource utilization for an instructional alternative for a revised course. At present, the Resource Utilization Model (RUM) simulates course operation as if each course is a new program (i.e., with the first student/student group that enters).

12. MODIA System Acceptance: To measure course planner acceptance of the MODIA system, replies of ISD team members to specific questions (Appendix 2, Questions 12,18,23,28, 36,38, and 42) were collapsed into positive and negative responses with positive responses indicating acceptance of various phases of MODIA. The frequency of these responses by each ISD team is depicted in Table 14.

TABLE 14
FREQUENCIES WITH WHICH ISD TEAM MEMBERS ACCEPTED MODIA AS A PLANNING TOOL

Categories	Group					
	ISD Team A (N=2)	ISD Team B (N=4)	ISD Team C (N=3)	ISD Team D (N=4)	ISD Team E (N=2)	ISD Team F (N=4)
Positive	10	27	18	9	8	23
Negative	4	1	3	19	6	5

Most teams felt positively about MODIA and would accept the system as a planning tool in a technical training environment. However, significant difference in opinions does exist ($X^2 = 34.71$, $P \leq .001$). During the structured interviews, members of ISD Team D expressed the opinion that MODIA was of limited utility to a course planner. They felt that at their level, they only get involved with planning a POI, not determining course operating cost, available facilities, pieces of equipment. Further, the two members of ISD Team E -- the team which was unable to simulate the large 3AQR30020-1 course - felt neither strongly positive nor negative about MODIA. However, the four remaining teams clearly supported the MODIA System.

13. MODIA System Usefulness: The usefulness of the MODIA System as a course planning tool is a function of the recurring requirement to plan new courses and revise existing ones. At Keesler, this is represented by Types 2,3, and 4 course planning efforts. Type 1 courses are formal training contracted with civilian industrial or educational institutions; Type 5 courses are special or regular formal training conducted for the USAF by the Army, Navy, DOD, other Government agencies, or Air Force agencies other than ATC,and Type 6 courses are regular training conducted by civilian educational institutions; therefore, the instructional programs for Types 1,5, and 6 courses normally are not planned by course planners at Air Training Command Centers.

In order to obtain an estimate of the annual planning requirement, Keesler USAFSAAS Plans Branch files were reviewed to determine, by type, how many courses were in existence, how many new courses were implemented, and how many were revised during calendar years 1970-1975. Existence of training plans and/or new Plans of Instruction (POI's) served as criteria for identifying relatively major planning efforts only. Appendices 10 and 11 present these data plus the number of course weeks revised as well. Table 15 provides a summary of course planning efforts by type during the period 1970-1975.

TABLE 15
KEESLER SAAS TYPES 2,3, AND 4 COURSE PLANNING DURING THE PERIOD 1970-1975

	Type 2				Type 3				Type 4			
Year	No. Courses	No. Courses Rev	Imp	Percent	No. Courses	No. Courses Rev	Imp	Percent	No. Courses	No. Courses Rev	Imp	Percent
1970	94	7	9	17%	195	57	4	31%	33	13	11	72%
1971	99	13	5	18%	200	71	5	38%	53	21	16	70%
1972	105	17	6	22%	208	102	8	53%	69	34	30	93%
1973	112	46	7	47%	216	151	8	74%	106	41	37	74%
1974	122	18	10	23%	243	97	27	51%	129	25	23	37%
1975	126	8	4	10%	247	43	4	19%	179	67	50	65%
Avg	110	18	7	22.8%	218	89	9	44.3%	95	33	28	68.5%

Although the percentages fluctuate widely from year to year, the table reveals that on the average 23 percent of the Type 2, 44 percent of the Type 3, and 69 percent of the Type 4 courses are either revised or newly implemented each year at Keesler.

To better grasp the magnitude of the course planning effort, Table 16 depicts the actual number of course days either newly planned or revised by the type for the same six year period (see page 26 for Table 16).

TABLE 16
KEESLER TYPES 2, 3, AND 4 COURSE PLANNING IN TERMS OF COURSE-DAY INVOLVEMENT DURING THE PERIOD 1970-1975

Year	Type 2			Type 3			Type 4		
	Total Course Days	Course Days Revised (%)	Course Days Implemented (%)	Total Course Days	Course Days Revised (%)	Course Days Implemented (%)	Total Course Days	Course Days Revised (%)	Course Days Implemented (%)
1970	2,439	140 (6)	354 (15)	12,848	4,774 (37)	97 (.7)	496	267 (54)	229 (46)
1971	2,523	195 (8)	84 (3)	13,032	6,144 (47)	184 (1)	884	318 (36)	258 (29)
1972	2,695	481 (18)	172 (6)	13,816	6,660 (48)	784 (6)	1,049	498 (47)	398 (38)
1973	2,865	1,293 (45)	169 (6)	14,502	10,589 (73)	692 (5)	1,662	793 (48)	669 (40)
1974	3,524	524 (15)	659 (19)	15,949	7,786 (49)	1,446 (9)	1,796	352 (20)	360 (20)
1975	3,755	360 (10)	230 (6)	16,079	3,218 (20)	129 (.8)	2,397	867 (36)	601 (25)
Average	2,966	498 (17)	278 (9)	14,371	6,528 (46)	555 (3.7)	1,380	515 (40)	419 (33)

With these data, one can calculate the percentage of course days revised or newly implemented for each year. For instance, during 1975, 24 percent of the total Types 2,3, and 4 course days in existence were either revised or newly planned and implemented. However, these figures fluctuate greatly from year to year. During 1974, the corresponding percentage was 52 percent. To make this figure more reliable, six-year averages were used, and it was found that for any one year Keesler is likely to be involved in planning approximately 47 percent of the total number of days of instruction for all Types 2,3, and 4 courses. However, out of this total planning effort, only 11 percent is allocated to Type 4 courses and nine percent to Type 2 courses. Thus, fully 80 percent of Keesler's planning effort is devoted to revising and implementing Type 3 courses.

For each Type 2,3, and 4 course, course planners use the planning factors needed to construct an instructional program within ATC policies and regulations. However, when planning for Type 4 courses, course planners are able to use up to two-thirds of existing Plans of Instruction prepared for Type 2 courses. This results in a reduction in the amount of major planning effort for new Type 4 courses. Further, Type 4 courses are revised for only two reasons: (1) when an evaluation reveals the appropriate level of training is not being conducted, and (2) when reimplemented from standby status after a modification in the equipment taught. Type 2 courses require major planning when being implemented. However, revisions are minor unless a major equipment modification is made during the training which requires a major POI change. Also, the general procedure for Type 2 courses is that training will be incorporated in Type 3 basic or supplemental courses once the special training is completed. On the other hand, Type 3 courses are normally long (average about 66 course-days per course), high-flow courses which require major planning efforts when implemented or when an evaluation shows that a major revision is required.

Thus, it appears that the MODIA System has limited applicability to Types 2 and 4 courses. However, results cited earlier indicated that MODIA can be used effectively to plan Type 3 courses. Since approximately 80 percent of all the days of instruction which are planned or revised at Keesler each year belong to Type 3 courses, one can conclude that MODIA is useful in this training environment.

SECTION D - DISCUSSION

14. General: In most respects, the results of this service test support the MODIA System. From the comparative data plus the comments of the ISD teams and the MODIA Interface Team, it is evident that MODIA provides a valid, thorough, and systematic approach to course planning. Conversely, the programs in their current state do have several deficiencies, some serious enough to limit the general applicability of the system (see para 11i). However, the acid test for MODIA revolves around the answer to one question: Will the increased cost of the computerized planning system be offset by more cost-effective technical training courses?

15. MODIA System Cost: The cost differential between the MODIA approach and the current planning system was calculated from data collected during the service test. To begin with, this center experienced a one-time MODIA implementation cost of $36,080. This total is the sum of personnel and hardware costs associated with installing/debugging the programs, training a team of MODIA experts (the Interface Team), and shaking down the system on the Honeywell computer (see Appendix 6 for costs attributed to personnel and hardware categories). With the experience gained in this effort, Rand could probably accomplish these tasks with less time and difficulty at other centers. However, because of the special conditions associated with this service test - special arrangements for computer access and personnel assignment - this cost may not be representative.

For the five Type 3 courses examined during the service test, evaluators determined that the average cost per course hour for computerized planning of two complete instructional alternatives was $17.65 (see Appendix 8). Since no Type 2 or 4 courses were revised during the service test, no cost figure was available for this type of planning. Therefore, determination of MODIA planning cost was limited to Type 3 courses only. Table 16 reveals that on the average, 7,083 Type 3 course days are revised and implemented each year. This figure equates to 42,498 course hours. Multiplying per hour cost by the number of hours yields a maximum theoretical annual MODIA planning cost for Type 3 courses of approximately $750,000. When the $36,000 implementation cost is added plus the additional salary required to support a two-person (GS-12, E-7) Interface Team for one year, the total is approximately $802,000.

As with all projected cost figures reported in this section, this cost can be considered only the roughest of estimates. To begin with, it is based on data collected from but five courses, a small and possibly unreliable sample. Second, the per hour cost of $17.65 is accurate for the service test, but planners were simulating complete revisions and experimenting with the system. These activities would not be representative of normal revision requirements once such a novel system had become familiar. Finally, as mentioned above, the implementation cost might not be representative.

From this MODIA planning cost must be subtracted the cost of manual planning or the cost of the current planning methodology. This cost is almost entirely personnel cost. Unfortunately, no accountability system exists to keep track of the manhours expended in Step 4 of the ISD process. Therefore, the manhours devoted to this effort and the corresponding personnel cost had to be estimated. As mentioned previously in this report, the manual cost of planning was calculated at $7.33 per course hour. This figure obviously suffers from questionable reliability. Nonetheless, it serves to illustrate that the personnel costs of the current system nearly equal the total MODIA cost for planning one complete revision ($8.33, see Appendix 8), including charges for computer usage.

Again, multiplying per hour cost by 42,498, the average number of Type 3 course hours revised and implemented annually, yields a figure of $311,510. Subtracting this cost from the MODIA cost produced a $490,490 differential in favor of the current system for the first year of operation.

Several comments need to be made with respect to this cost difference. First, it is only as accurate as the manual manhour estimates. The evaluators, based on their experience in a technical training environment, believe these estimates are reasonable but certainly there is a considerable margin for error. Second, the MODIA planning cost is based on construction of two complete instructional alternatives whereas the manual cost is based on one conventional course revision. This is because under the current system, the perceived single best course design is pursued from the beginning. Minor modifications as necessary are made along the way. This is somewhat analogous to generating one alternative with MODIA, but the product is the course, not a design to be compared to other designs. Since the major purpose of MODIA is to stimulate the creation of alternatives, the cost to produce two alternatives is presented here. Although no data were gathered to support this point, it is likely that the first MODIA alternative will take the most personnel and computer time and thus be the most expensive. As the critical areas of the simulated course are identified, it should become progressively easier and quicker to make changes which will improve the course. Finally, the total MODIA planning cost for one year ($802,000) represents the cost of very extensive planning. This is because the per hour cost of $17.65 was gathered during a period when planners were challenged to experiment with innovations to completely redesign their courses. The manual planning cost per hour, on the other hand, represents varying degrees of revision but almost always less radical than the MODIA approach. All of these factors taken together tend to explain some of the great difference between the MODIA and manual planning cost.

16. MODIA Effectiveness:

a. One measure of planning effectiveness is instructional system cost. As reported in the Results Section of this report, planners used MODIA to revise three of the five existing Type 3 courses to produce a theoretical cost savings. The magnitude of these savings differed widely. Course 3ABR30434, a self-pace program of 420 instructional hours was revised resulting in a five year savings of $48,100. On the other hand, 3ABR30331, a group/lock-step course of 690 instructional hours was revised and produced a savings of $173,300 over a five year period.

With such a limited sample plus the myriad of factors which determine the cost savings possible from any given course revision, it is impossible to project savings in instructional system cost through the use of MODIA. Certainly the service test courses have demonstrated that cost reductions are possible and that the magnitude of these reductions for all Type 3 courses may be formidable. These cost figures must be interpreted with caution; however, Course 3ABR30331 has not been revised, implemented, and operated for five years at $173,000 less than the ongoing instructional system. Rather, when planning factors for both the existing course and the MODIA alternative were manipulated by the Cost Model, the alternative, which teaches the same subject matter to the same level of proficiency to the same number of students, was found to be less expensive. If the MODIA process is valid, and evidence indicates that it is, it follows that this cost difference is valid.

Another point should be made concerning the cost differential between the ongoing courses and the MODIA alternatives. Where the MODIA alternatives were considerably more expensive than the current system, such as in Course 3ABR32834, the increased cost was due primarily to the procurement and maintenance of additional pieces of hardware and test equipment. For local training managers, trainer procurement cost is very real and tangible. For two of the three MODIA alternatives which were shown to be less expensive than the current courses, the savings were realized from slightly shorter course length and decreased instructor manning. Shorter course length decreases student pay, allowances, and support costs attributed to the course. Decreased instructor manning levels decrease course cost in the same manner. These savings, while real in terms of the total Air Force cost for technical training, are considerably less tangible and possibly less meaningful to local planners. To use an extreme but illustrative example, Keesler is now conducting a 6-hour Mission Application Seminar program for all non-prior service airmen who attend training programs at this center. During a year's time, approximately 17,000 airmen will complete this training. Using an E-1 salary figure of $3.00 per hour, this program will cost $306,000 per year in student salaries alone (17,000 X 6 X $3.00). Reducing this course to five hours would reduce the student salary contribution to annual course cost to $255,000 (17,000 X 5 X $3.00). Obviously, this $51,000 "savings" has little meaning in this context. However, if the one hour reduction did reduce the required number of classrooms, instructors, media devices, and so forth, then meaningful and more tangible savings would be realized. Thus the nature of cost savings for various alternatives must be investigated. Also, it is possible that incentives to plan courses which decrease costs in these less tangible areas might be less powerful than incentives to cut the inventory of expensive trainers.

b. Effectiveness of a planning system can be assessed in other areas as well. Can use of the system produce course designs which will operate under budget ceilings, or graduate students in a fixed period of time, or insure little wait for training resources? Evidence from the service test indicates that courses can be designed to meet criteria in these dimensions of course operation. Planners were very effective in designing alternatives that eliminated student queuing for resources. Given other criteria such as the TPR and an established failure rate plus a constraint on the duration of the course, the evidence indicates that an alternative could be designed to meet the stated requirements.

Although courses can be designed to operate in any manner desired, cost is always a salient factor. Can courses be designed to meet operating criteria and still be realistic in cost? Again, evidence from the service test indicates MODIA can lead to optimum course designs which balance cost against the criteria. For instance, Alternative 2 generated for Course 3ABR30331 reduced the wait for resources from 24 hours to 0 and the wait for other students from 21 hours to 2 and still was projected to cost approximately $173,000 less over a five year period.

Of course, MODIA did not design the optimum configuration for 3ABR30331. Planners did. Using experience and logic, planners put together an instructional system they thought would be effective. MODIA manipulated the planning factors and produced a simulated course and its associated cost. Based on these findings, a second instructional system was designed, simulated, and priced. Selecting an optimum instructional design would require the evaluation of both alternatives to determine the one which would meet the needs of the planners, be it lowest cost, greatest student capacity, shortest wait for instructors, or a combination of all factors. Thus, the effectiveness of MODIA in constructing better courses is both maximized and limited by the talent, ingenuity, motivation, and analytical ability of the MODIA Interface Team and the course planners.

c. To return to the original question in this section, "Will the increased cost of the computerized planning system be offset by more cost-effective technical training?," a tentative answer can now be given. Including the cost for computer usage, MODIA is definitely more expensive than the current planning system. However, the magnitude of the cost difference cannot be assessed reliably due to the method of collecting the manual planning cost data. From the small sample of courses examined during the service test, it is evident that planners were able to generate alternatives with MODIA which were both less costly and more effective in several operating dimensions. Extrapolating to the large number of Type 3 courses revised and implemented annually, one can conclude that MODIA's cost could be offset by the more cost-effective courses which should result. However, it should be stressed that the projected cost reductions may occur in many areas of course operation, and the utility of these reductions would have to be examined with respect to other course operating criteria.

d. Another indication of MODIA planning effectiveness is the number of manhours required to support a given planning effort. As depicted in Appendices 4, 5,7, and 8, the number of manhours allocated to MODIA planning during the service test was considerably lower than the estimated number of hours required to do the same planning under the conventional approach. Depending upon the procedures and organizational configuration established to support MODIA, these manhour savings could be quite large. However, the service test did not attempt to establish necessary procedures or configurations, and the potential savings in this area are thus unknown.

17. MODIA System Limitations:

a. Although the products of MODIA - the alternative course designs - are very satisfactory, the planning system itself has some limitations which degrade its acceptability to course planners. Some of these limitations are minor, such as not having the option to cancel certain printouts or being forced to go off-line and then return to make certain corrections to inputs. Others are more serious, such as the garbling of resources discussed earlier. Rand personnel researched this problem using their own IBM 370/158 computer and concluded that the garbling was external to the MODIA programs. Regardless of the source, the problem could have serious consequences. During the service test, the planners were motivated to repeat those phases of course design where the garbling occurred until the problem cleared up. During normal operation, this persistence might not be in evidence. This frustrating problem needs to be solved.

Another more serious problem concerns program limitations. In its current version, MODIA permits planners to designate only 31 resources (21 "special" and 10 "other"). As already pointed out, for very large courses, such as 3AQR30020-1 where many trainers are located in dozens of classrooms, this limitation prohibits planners from simulating the entire course. The course can be simulated by blocks of material, however, but this is a very lengthy process.

This resource limitation is also a problem for the standard "sets" or equipment courses. For instance, planners for Course 3ABR30434 identified approximately 125 different pieces of hardware used to teach this 14-week course. Since many of these pieces of equipment are always used together, they were packaged together as one resource. Through this procedure, the planners were able to exercise MODIA to simulate course operation using 18 resource groups. As might be expected with this procedure, the percentage of resource utilization given by MODIA is somewhat in error. Pieces of equipment within each of the 18 resource groups are not used at uniform rates. However, planners believe the utilization rates provide sufficient accuracy for planning purposes.

Many planners felt that this program limitation was a real hindrance to planning. They either could not package resources logically or failed to identify the strategy which would permit them to do so. Moreover, the actual number of special resources available to a planner is further reduced by the manner in which a given resource is used to support more than one learning event.

For example, to generate a MODIA alternative for Course 3ABR30434, planners had to designate one resource by two labels; the AN/GRC-27 Radio Set was designed as both a transmitter/modulator (Lab 3A) and a receiver (Lab 3B). Block XIII of this self-paced course was broken down into 14 separate units of instruction. These 14 units alternated between theory (self-study) and practice (lab exercises), the latter performed on either the transmitter/modulator or the receiver where both can be operated independently. Since both Lab 3A and Lab 3B can handle two students at a time, each complete Radio Set Trainer can handle four students at one time. For this alternative, Lab 3A (the xmtr/md) supported Learning Events 35, 37, and 39; Lab 3B (rcvr) supported Learning Events 41,43,45, and 47.

By breaking the Radio Set Trainer into two resources, the planners enabled MODIA to corrently determine the number of trainers required to eliminate student queuing. If the trainer had been entered into MODIA as one resource with a capacity of four students, MODIA would have erroneously programmed four students per trainer for all the learning events, although the trainer capacity for the identified learning events is actually two. If the resource had been treated as a single unit, which it is, MODIA would have projected lower equipment requirements than are actually required to handle a given student flow.

b. The final limitation deals with the availability of computer hardware to support MODIA. Rand Working Notes have stressed that if MODIA is to be a viable system for course planners, it should be both responsive and accessible. The latest Work Note[2] even establishes time standards for various phases of MODIA operation, contending that if these standards are not met "the interactive, iterative nature of the design process will be destroyed." The same Working Note argues for the use of one or more remote terminals located in a working area away from the computer center and near materials relevant to course planning.

During the service test, MODIA was exercised through a remote terminal and on many occasions the response standards discussed by Rand were achieved. However, because of MODIA's considerable core requirements, very tight scheduling was necessary between the MODIA planners and the other users of the H-6060 computer. When the Interface Team realized a certain phase of MODIA simulation would not be completed during the allotted time, a telephone call was made to the computer center to request a time extension. In this manner, other programs did not "dump" MODIA off-line prior to closing a file.

Because MODIA was being exercised during a service test - a service test which had considerable priority - other users of the Honeywell computer made accommodations to the MODIA planners. Without these accommodations, MODIA would have been neither accessible nor responsive. Finally, to the extent that comparable and available computer hardware is not available at the other centers, MODIA cannot be operated under the same concept as it was operated at Keesler.

2. MODIA: A Tool for Planning the Use of Air Force Training Resources - Vol 1, Overview, June 1976.

c. Although the MODIA approach to course planning looks promising, it must be remembered that these conclusions are based upon rather limited planning exercises. ISD teams were not guided by the policies now receiving priority from training managers: 1) Achievement of a 10% reduction in instructor manning, 2) Reduction of staff overhead, 3) Energy conservation, 4) Elimination of low flow courses, and 5) Reduction of course length via the Hasty Spark Program. Rather, ISD teams were challenged to experiment in course design to maximize course operation in whatever dimension they chose. Further, with the exception of the Lowry planners, these teams knew that the courses they designed would not be implemented and no actual procurement or transfer of resources would be required. Finally, again it should be pointed out that these conclusions are based upon planning only six courses, one of which could not be completely simulated.

In addition, the service test pointed out that MODIA's value as a planning tool could be reduced without overall direction and control by management. With a "course perspective", planners might be tempted to implement designs which optimize dimensions of course operation important to them but degrade overall management efficiency. For example, planners for Course 3ABR30333 found that reduced hardware improved resource utilization, reduced operating cost, but extended course length. If this design were implemented, instructors would be dedicated to the course for a longer period of time and thus less available to support the new "family grouping" concept for instructor manning. Thus, maximization of MODIA will depend upon sound management of the system; however, the service test did not attempt to establish how this system should be managed.

SECTION E - CONCLUSIONS

18. Based on the findings from this service test, the following conclusions can be drawn:

a. MODIA System Cost for Course Planning: Counting computer operation costs, the MODIA approach to course planning is more expensive than the conventional manual approach. However, from the limited data collected, it appears that planning with MODIA can result in more cost-effective instructional systems than conventional planning. Further, these potential savings, when projected to the population of courses to which MODIA can be applied, appear to be greater than the operational cost of MODIA.

b. MODIA System Validity: MODIA programs address all the planning factors which must be addressed during course revision/implementation. The programs can be utilized on a computer system with characteristics similar to the Honeywell H-6060. When compared to parameters of actual ongoing courses, the Resource Utilization Model (RUM) and the Cost Model outputs possess a great deal of fidelity. Both ISD team members and Interface Team members were confident that simulated course operations and functional/program cost printouts were accurate.

c. MODIA System Effectiveness as a Planning Tool:

(1) Results indicate that planning with MODIA will enable course planners to accomplish the following:

(a) Rapidly design many instructional system alternatives.

(b) Identify critical elements of a given course design and revise the design to assess the impact on these elements.

(c) Optimize a given course design with respect to cost, number of students trained, instructor overhead, resource uitilization, student queue, proficiency level of training, and so forth.

(d) Examine the impact of innovations in course design.

For instance, different approaches to instruction such as group-pacing or self-pacing or variations in content treatment can be simulated. Conservative planning and reliance on previous methodologies need not take precedence.

(2) For very large courses with several planning factors, such as Keesler's 3AQR30020-1, Electronic Principles Course, MODIA RUM limitations prohibit simulation of course operation. However, such courses can be simulated by blocks of instruction.

d. MODIA System Usefulness: Technical training center personnel could not use MODIA to plan Types 1, 5 and 6 courses since these courses are planned and conducted by agencies other than the centers. Further, because of their duration, supporting equipment, and purpose, Types 2 and 4 courses would be only partially amenable to the MODIA approach.

However, MODIA is well suited to planning and revising Type 3 courses, and since the majority of planning at a center deals with Type 3 courses (80% at Keesler) MODIA would have considerable utility.

e. MODIA System Acceptance: Although some ISD team planners did not approve of MODIA and several felt system changes were required to make MODIA more efficient, most participants in the service test reacted very favorably to MODIA. However, it is apparent that enthusiastic support for MODIA will evolve only if a competent and innovative Interface Team exists to explain the system, provide guidance and insights, and interpret the computer products.

f. Proposed Changes to Improve MODIA Effectiveness: Based on interviews and observation, the Interface Team identified several changes needed to improve MODIA's effectiveness. In the area of program design, the team felt that MODIA terminology needs to be better aligned with ISD terminology and several options need to be placed in the User Interface (UI) program to facilitate input changes and eliminate unnecessary printouts. Further, the team and many of the service test participants concluded that the UI limitation of 31 resources constrained course design. In the area of course operation simulation, service test participants felt that an additional option needs to be placed in the RUM. This option should allow planners to determine the percentage of resource utilization for a given revision when the revision is implemented with students already in the existing course. In the area of program operation, the garbling of certain letters and numbers degraded system usage.

g. MODIA Adoption: The data which resulted from this limited tryout of MODIA are insufficient to recommend adoption at this time. It has not yet been determined how SAAS policies and objectives will be integrated into MODIA planning, at what level the products of MODIA will be used in decision making, and how course-by-course MODIA planning can be meshed to achieve resource allocation across a homogeneous group of courses. Further, neither operating procedures nor the necessary operational configuration to support MODIA planning have been determined. "When these questions have been resolved, it appears that SAAS management will be able to show that MODIA can improve resource management in a technical training environment."

SECTION F - RECOMMENDATIONS

19. The following actions are recommended:

a. Recommend the Rand Corporation, with assistance from Keesler, modify the MODIA programs to resolve the problems discussed in this report.

b. Recommend the Keesler USAFSAAS be tasked to conduct a Phase II follow-on evaluation of the MODIA System using the 24 electronics courses associated with Hasty Spark. This evaluation will establish both the procedures and organizational configuration necessary to support MODIA planning, and using realistic management problems, establish the utility of the system to SAAS management.

SECTION G - REFERENCES

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STRUCTURED INTERVIEW FOR MODIA INTERFACE TEAM
USAF SCHOOL OF APPLIED AEROSPACE SCIENCES

SERVICE TEST OF THE MODIA
SYSTEM

A. General Instructions for Interviewers:

Interview MODIA Interface Team as a group. Be friendly but objective. Do not judge or give advice. Stick to the format. Probe as necessary to obtain a full answer. Record all information on interview sheet. Key your notes to the question asked. Be sure the interviewees understand the purpose of the interview. Read and explain to them the instructions in Part B.

B. Instructions to be Read to Interviewees:

You have participated as members of the MODIA Interface team responsible for guiding and assisting selected ISD teams in providing course planning data for you to exercise MODIA as a tool for course planning. Accordingly, you are in the best position to make a number of assessments concerning MODIA operation. This interview is for the specific purpose of eliciting your responses to some specific questions aimed at determining whether the MODIA System should be adopted for use at Air Training Command Technical Training Centers. We'd appreciate your coopenation. Your voluntary conscientious response, with those of other personnel, will be processed for statistical summaries without reference to individuals. Failure to provide the requested information will not be used as cause for adverse actions. Are you willing to participate in this interview? (If interviewees are willing to participate, proceed to the series of questions. If they have any objections, terminate the interview).

C. Structured Interview Sheet:

USER INTERFACE

1. Did the program properly demonstrate the impact of different sequences on student flow and resource use?

__2__ (a) Yes

_____ (b) No

_____ (c) Uncertain

2. Did the UI give appropriate estimates of the effects of teaching method diversification on student flow through the course and on requirements for training resources?

__2__ (a) Yes

_____ (b) No

_____ (c) Uncertain

3. Did the UI give appropriate estimates of the effects of content diversification on student flow through the course and on requirements for training resources?

2 (a) Yes

___ (b) No

___ (c) Uncertain

4. Was a total resource assignment report displayed when you assigned and identified all resources to learning events?

2 (a) Yes

___ (b) No

5. One of the claims of the designers of MODIA is that the only way to validate MODIA's usability is to see if the intended user can operate it. Were you able to operate the MODIA System?

2 (a) Yes

___ (b) No

6. Was the User Interface Guide helpful to you?

___ (a) Very much so

___ (b) Somewhat

2 (c) Very little

___ (d) Not at all

7. Could parts of the User Interface Guide be left out?

2 (a) Yes

___ (b) No

8. If your answer to question 7 was yes, what portion(s) do you feel is (are) irrelevant?

9. Was the User Interface Guide terminology clear and concise?

___ (a) Yes

2 (b) No

10. Were difficulties encountered in assigning special resources to objectives, test or reviews?

___ (a) Very much so

2 (b) Somewhat

___ (c) Very little

___ (d) Not at all

11. Did the amount of time spent in planning the course using MODIA deter you from trying alternative methods of course design?

___ (a) Very much so

___ (b) Somewhat

___ (c) Very little

2 (d) Not at all

2

12. Do you think the work sheets were useful in planning the course?

___ (a) Very much so ___ (c) Very little

___ (b) Somewhat 2 (d) Not at all

13. Would a revision of the work sheets make the UI easier to use?

2 (a) Very much so ___ (c) Very little

___ (b) Somewhat ___ (d) Not at all

14. Did the program allow for the breakdown of objectives in as small increments as you desire?

2 (a) Very much so ___ (c) Very little

___ (b) Somewhat ___ (d) Not at all

15. Do you think the User Interface was useful to you in designing a training course?

___ (a) Very much so ___ (c) Very little

2 (b) Somewhat ___ (d) Not at all

16. Do you feel that you became better at using the User Interface as you practiced more?

2 (a) Very much so ___ (c) Very little

___ (b) Somewhat ___ (d) Not at all

17. Additional Comments:

RESOURCE UTILIZATION MODEL (RUM)

18. Were sections formed when the specified number of students required were assembled?

2 (a) Yes

___ (b) No

___ (c) Uncertain

19. Was student flow sequential from the first to last learning event as programmed?

2 (a) Yes

___ (b) No

___ (c) Uncertain

20. Did the RUM simulate instantaneous acquisition of resources as they were needed?

2 (a) Yes

___ (b) No

___ (c) Uncertain

21. Were all five Recap Reports printed?

2 (a) Yes

___ (b) No

22. Is Recap Report 5 unnecessary since it is a summary of the information given in Report 4?

___ (a) Yes

2 (b) No

___ (c) Uncertain

23. Were all five outputs useful to you during the service test?

2 (a) Very much so

___ (b) Somewhat

___ (c) Very little

___ (d) Not at all

24. Did you have difficulty in interpreting the data in the RUM outputs?

___ (a) Very much so

2 (b) Somewhat

___ (c) Very little

___ (d) Not at all

25. Could any of the Simulation Reports be omitted?

___ (a) Yes

2 (b) No

___ (c) Undecided

26. If your answer to question 25 was yes, what reports in your opinion could be omitted?

27. Could any of the data be omitted from the reports?

___ (a) Yes

__2__ (b) No

___ (c) Undecided

28. If your answer to question 27 was yes, what data in your opinion could be omitted?

29. Does any additional information need to be given in the output reports?

___ (a) Yes

__2__ (b) No

___ (c) Undecided

30. If your answer to question 29 was yes, what additional information do you feel should be given in the output reports?

31. Did the working note for the Resource Utilization Model give an accurate description of the unit and provide sufficient depth to permit implementation and use at Keesler?

___ (a) Yes

__2__ (b) No

___ (c) Undecided

32. Do you think the RUM was useful in simulating the conducting of an instructional program?

__2__ (a) Very much so

___ (b) Somewhat

___ (c) Very Little

___ (d) Not at all

33. Do you think other course planners would benefit from using the RUM?

__2__ (a) Very much so

___ (b) Somewhat

___ (c) Very little

___ (d) Not at all

34. Additional Comments:

COST MODEL (MODCOM)

35. Were the input requirements and available options sufficient for the operation of the MODCOM?

2 (a) Yes

____ (b) No

____ (c) Undecided

36. Did the instructions in the MODCOM Manual help you to program correct data input on each format for proper operation of MODCOM?

2 (a) Very much so

____ (b) Somewhat

____ (c) Very little

____ (d) Not at all

37. Can the Cost Model be operated independent of the other components of the MODIA System?

2 (a) Yes

____ (b) No

____ (c) Undecided

38. Were all five outputs produced by the Cost Model in accordance with program specifications?

2 (a) Yes

____ (b) No

39. Did you use the output from the RUM as the input to the MODCOM?

2 (a) Yes

____ (b) No

40. Did the output of the MODCOM give an estimate of the total course costs for a time frame up to five years?

2 (a) Yes

____ (b) No

41. How long did it take you to prepare the data input on the Format Cards?

___ (a) 1 to 3 hours

_x_ (b) 3 to 5 hours

___ (c) 5 to 7 hours

___ (d) Other (specify the number of hours)

42. Do you think the MODCOM is useful for determining the costs of a specific instructional system?

_2_ (a) Very much so

___ (b) Somewhat

___ (c) Very little

___ (d) Not at all

43. Additional Comments:

OVERALL EVALUATION OF MODIA

44. Does MODIA give an accurate estimate of the resources required for a course?

_2_ (a) Very much so

___ (b) Somewhat

___ (c) Very little

___ (d) Not at all

45. Does the MODIA process encourage trying alternative course designs?

_2_ (a) Very much so

___ (b) Somewhat

___ (c) Very little

___ (d) Not at all

46. Did MODIA allow you and the ISD team to rapidly plan the training course?

_2_ (a) Very much so

___ (b) Somewhat

___ (c) Very little

___ (d) Not at all

47. Are opportunities available for MODIA use when planning a training course in a technical training environment?

_2_ (a) Yes

___ (b) No

___ (c) Undecided

48. If your answer to question 47 was yes, what instances do you feel MODIA would be most applicable in planning training courses and the specific type courses (i.e., Types I, II, III, IV, V, and VI)?

49. Did MODIA encourage you and the planners to consider the implications of the subject matter for requirements of training resources and teaching strategy?

2 (a) Very much so ___ (c) Very little

___ (b) Somewhat ___ (d) Not at all

50. Do you think MODIA helps a planner to better manage his training resources?

2 (a) Very much so ___ (c) Very little

___ (b) Somewhat ___ (d) Not at all

51. Do you think using MODIA unduly complicates the planning process?

___ (a) Very much so ___ (c) Very little

___ (b) Somewhat 2 (d) Not at all

52. Are the data required to operate MODIA easy/difficult to obtain?

2 (a) Very easy ___ (c) Difficult

___ (b) Easy ___ (d) Very difficult

53. Do you think special skills/knowledges are required to operate MODIA?

2 (a) Very much so ___ (c) Very little

___ (b) Somewhat ___ (d) Not at all

54. If you think special skills/knowledges are required, what are they?

55. In comparison to the conventional mode of planning, did you feel better able to plan training courses when you were using MODIA.

2 (a) Very much so ___ (c) Very little

___ (b) Somewhat ___ (d) Not at all

56. Do you feel planning a training course can be done equally as well using conventional means as using MODIA?

___ (a) Very much so 2 (c) Very little

___ (b) Somewhat ___ (d) Not at all

57. Did you feel confident in the results obtained by MODIA planning?

2 (a) Very much so ___ (c) Very little

___ (b) Somewhat ___ (d) Not at all

58. Given a choice of selecting MODIA or the conventional method for planning a training course, which would you use to plan the course?

2 (a) MODIA

___ (b) Conventional mode

59. Do you think planning a training course will be more enjoyable when you are using MODIA?

2 (a) Very much so ___ (c) Very little

___ (b) Somewhat ___ (d) Not at all

60. Should you feel that MODIA can be used effectively for planning training courses, which organization should implement and operate the system?

___ (a) Training Plans Branch at the Tech School

___ (b) Training Groups of the School

2 (c) A specially trained team operating out of Tech School

61. If your answer to question 60 was "c," what should be the makeup of the MODIA team, what areas of expertise are required and at what levels within the Technical School may they be found?

62. In comparison to the conventional mode of planning, was course design time reduced using MODIA?

___ (a) Very much so ___ (c) Very little

2 (b) Somewhat ___ (d) Not at all

63. In comparison to conventional planning, did planning by MODIA enable you to consider more alternatives?

2 (a) Yes

___ (b) No

64. List any changes to MODIA you feel might improve its effectiveness.

65. In comparison to using MODIA in planning the revision of an existing course, do you feel that it can be used as effectively in planning a new course?

2 (a) Very much so ___ (c) Very little

___ (b) Somewhat ___ (d) Not at all

66. Other Comments: Please provide any additional comments you feel will aid the evaluators in assessing the value of MODIA in a technical training setting.

DEPARTMENT OF THE AIR FORCE
KEESLER TECHNICAL TRAINING CENTER
KEESLER AIR FORCE BASE, MISSISSIPPI

STRUCTURED INTERVIEW FOR ISD TEAMS
USAF SCHOOL OF APPLIED AEROSPACE SCIENCES
SERVICE TEST OF THE MODIA SYSTEM

A. GENERAL INSTRUCTIONS FOR INTERVIEWERS: Interview ISD team members as a group in their respective team. Be friendly but objective. Do not judge or give advise. Stick to the format. Probe as necessary to obtain a full answer. Record all information on interview sheet. Key your notes to the question asked. Be sure the interviewees understand the purpose of the interview. Read and explain to them the instructions in Part B.

B. INSTRUCTIONS TO BE READ TO INTERVIEWEES: You have participated as members of an ISD team in providing course planning data for the MODIA interface team to exercise the MODIA System in planning your training course. Accordingly, you are in the best position to make a number of assessments concerning MODIA requirements for operation. This interview is for the specific purpose of eliciting your responses to specific questions aimed at determining whether the MODIA System should be adopted for use at Air Training Command Technical Training Centers. We'd appreciate your cooperation. Your voluntary conscientious response, with those of other personnel will be processed for statistical summaries without reference to individuals. Failure to provide the requested information will not be used as cause for adverse actions. Are you willing to participate in this interview? (If interviewees are willing to participate, proceed to the series of questions. If they have any objections, terminate the interview.)

C. STRUCTURED INTERVIEW SHEET:

USER INTERFACE (UI)

1. Did the program allow for as many teaching methods as you would like to use?

12 (a) Very much so

5 (b) Somewhat

1 (c) Very little

1 (d) Not at all

2. Were you able to assign all training content of your training course to the subject matter types given in the User Interface program?

13 (a) Very much so

4 (b) Somewhat

1 (c) Very little

1 (d) Not at all

Appendix 2

3. Did the program allow you to designate the required resources for objectives, tests and reviews with subject matter types?

5 (a) Very much so

12 (b) Somewhat

2 (c) Very little

___ (d) Not at all

4. Did the UI provide sufficient options for you to describe student arrivals in your training course in order to measure significant effects on the use of training resources?

10 (a) Very much so

7 (b) Somewhat

2 (c) Very little

___ (d) Not at all

5. Was the UI useful in giving appropriate estimates of the effects of teaching method diversification on student flow through your course and on requirements for training resources?

6 (a) Very much so

8 (b) Somewhat

1 (c) Very little

___ (d) Not at all 4 N/A

6. Was the UI useful in giving appropriate estimates of the effects of content diversification on student flow through the course and on requirements for training resources?

5 (a) Very much so

8 (b) Somewhat

___ (c) Very little

___ (d) Not at all 6 N/A

7. Did the amount of time spent in planning your course using the UI deter you and the interface team from trying alternative methods of course design?

6 (a) Very much so

5 (b) Somewhat

2 (c) Very little

6 (d) Not at all

8. Did the UI work sheets have to be revised for you to provide the appropriate data to exercise MODIA?

3 (a) Very much so

6 (b) Somewhat

8 (c) Very little

2 (d) Not at all

9. Can you suggest additional work sheets that would make the UI easier to use?

10. Did you have difficulty in providing the appropriate planning factors required to exercise the UI program?

4 (a) Very much so

5 (b) Somewhat

1 (c) Very little

9 (d) Not at all

11. Did the UI program allow you to break your course objectives in as small increments as you desire?

8 (a) Very much so

11 (b) Somewhat

___ (c) Very little

___ (d) Not at all

12. Do you think the User Interface was useful to you in designing your training course?

8 (a) Very much so

5 (b) Somewhat

___ (c) Very little

6 (d) Not at all

13. Did you learn anything useful from using the User Interface?

10 (a) Very much so

5 (b) Somewhat

4 (c) Very little

___ (d) Not at all

14. Would you like to make any additional comments concerning the User Interface component?

RESOURCE UTILIZATION MODEL (RUM)

15. Was simulation of your training course terminated after a specified number of course hours and specified number of student graduates?

16 (a) Yes

3 (b) No

16. Is Recap Report 5 necessary since it is a summary of the information given in Report 4?

11 (a) Yes

7 (b) No

1 (c) Uncertain

17. Are all five outputs necessary?

14 (a) Yes

5 (b) No

___ (c) Uncertain

18. Were the data in the RUM outputs easy to interpret?

7 (a) Yes

~~12~~ (b) No

19. Do you think the RUM was useful in simulating your training course?

7 (a) Very much so

8 (b) Somewhat

__ (c) Very little

4 (d) Not at all

20. Additional Comments:

COST MODEL (MODCOM)

21. Do the instructions in the MODCOM Manual need to be revised in order for you to provide correct data input for each format?

3 (a) Very much so

3 (b) Somewhat

5 (c) Very little

__ (d) Not at all 8 N/A

22. How long did it take to collect the data required for inputs to the Format Cards?

__ (a) Less than 1 hour

4 (b) 1 to 3 hours

2 (c) 3 to 5 hours

__ (d) 5 to 7 hours

~~13~~ (e) Other (specify the number of hours) (9 to 40 Hours)

23. Do you think the MODCOM is useful for determining the costs of an instructional system?

10 (a) Very much so

6 (b) Somewhat

3 (c) Very little

__ (d) Not at all

24. Make any other comments you would like to about this component and give to the interviewer.

OVERALL EVALUATION OF MODIA

25. In your opinion, does MODIA give an accurate estimate of the resources required for a course?

8 (a) Very much so

7 (b) Somewhat

2 (c) Very little

2 (d) Not at all

26. Does the MODIA process encourage trying alternative course designs?

8 (a) Very much so

6 (b) Somewhat

2 (c) Very little

3 (d) Not at all

27. Does MODIA allow the user to rapidly plan his training course?

10 (a) Yes

9 (b) No

28. Are opportunities available for MODIA use when planning a training course in a technical training environment?

13 (a) Yes

4 (b) No

2 (c) Uncertain

29. If your answer to question 28 was yes, list as many instances that you feel MODIA would be most applicable in planning training courses and the specific type courses (i.e., Types I, II, III, IV, V, and VI).

30. Does MODIA encourage a planner to consider the implications of the subject matter for requirements for training resources and teaching strategy?

5 (a) Very much so

1 (b) Somewhat

3 (c) Very little

10 (d) Not at all

31. Does MODIA allow a planner to better plan his training resources?

10 (a) Very much so

4 (b) Somewhat

1 (c) Very little

4 (d) Not at all

32. Does MODIA unduly complicate the planning process?

5 (a) Very much so

7 (b) Somewhat

6 (c) Very little

1 (d) Not at all

33. Did you have difficulty in gathering the data required to operate MODIA?

4 (a) Very much so

6 (b) Somewhat

2 (c) Very little

7 (d) Not at all

34. Do you think special skills/knowledges are required to operate MODIA?

7 (a) Very much so

11 (b) Somewhat

1 (c) Very little

_ _ (d) Not at all

35. If you answered a or b to question 34 what, in your opinion, are the skills/knowledges?

36. In comparison to the conventional mode of planning, do you feel better able to plan training courses using MODIA?

5 (a) Very much so

5 (b) Somewhat

5 (c) Very little

4 (d) Not at all

37. Do you feel planning a training course can be done equally as well using conventional means as using MODIA?

6 (a) Very much so

9 (b) Somewhat

2 (c) Very little

2 (d) Not at all

38. Do you feel confident in the results obtained by MODIA planning?

6 (a) Very much so

10 (b) Somewhat

3 (c) Very little

___ (d) Not at all

39. Should you feel that MODIA can be used effectively for planning training courses, which organization should implement and operate the system?

___ (a) Training Plans Branch at the Tech School

3 (b) Training Groups of the School

16 (c) A specially trained team operating out of Tech School

40. If your answer to question 39 was "c," what should be the makeup of the MODIA team, what areas of expertise are required and at what levels within the Technical School may they be found?

41. List any changes in your opinion which might improve MODIA's effectiveness:

42. In comparison to using MODIA in planning the revision of an existing course, do you feel that it can be used as effectively in planning a new course?

12 (a) Very much so

4 (b) Somewhat

3 (c) Very little

___ (d) Not at all

43. Other Comments: Please provide any additional comments you feel will aid the evaluators in assessing the value of MODIA in a technical training setting.

HISTORY SHEET

A. INTRODUCTION: You have participated in the evaluation of the MODIA System at Keesler during the period 8 March - 4 June 1976; therefore, you are in the best position to make a number of assessments concerning the usefulness of MODIA as a tool for planning a training course. This historical sheet has been designed to assist you in furnishing us with specific information relative to your background. Please answer each question and return the history sheet to the project monitor.

B. BACKGROUND:

1. Sex: Male_____ Female _____
2. Grade/Rank: _____
3. Education: ____ Years High School _____ Years College

   Degree (Indicate Type) _____
4. Group Membership: _____
5. What is your job/position title? _____
6. How long have you worked in your present or similar position?_____Years
7. Experience:

   a. Training Course Planning: _____Years

   b. Instructor: _____Years

   c. Other: _____
8. Total Years: _____ Federal Service ____ At Keesler AFB

ESTIMATED COST FOR MANUALLY PLANNING FIVE KEESLER
COURSES SELECTED FOR THE SERVICE TEST

COURSE 3ABR32834

No. Course Hours = 510

Grade	* Manhours Expended	Rate	Cost
GS-11	11.0 Hrs	$ 9.12/Hr	$ 100.32
GS-11	35.5 Hrs	$10.16/Hr	$ 360.68
GS-11	26.0 Hrs	$ 9.38/Hr	$ 243.86
GS-11	66.9 Hrs	$ 9.64/Hr	$ 636.24
GS-12	12.0 Hrs	$12.12/Hr	$ 145.44
E-7	94.0 Hrs	$ 6.90/Hr	$ 648.60
E-7	94.0 Hrs	$ 6.90/Hr	$ 648.60
E-7	94.0 Hrs	$ 6.90/Hr	$ 648.60
E-6	250.0 Hrs	$ 5.93/Hr	$1,482.50
E-6	250.0 Hrs	$ 5.93/Hr	$1,482.50
E-6	250.0 Hrs	$ 5.93/Hr	$1,482.50
Total	994.5 Hrs	-	$6,582.64

* No. manhours expended are professional estimates of personnel directly responsible for the last revision of Course 3ABR32834.

COURSE 3ABR30331

No. Course Hours = 690

Grade	* Manhours Expended	Rate	Cost
GS-11	120 Hrs	$ 9.64/Hr	$1,156.80
GS-11	4 Hrs	$ 9.64/Hr	$ 38.56
GS-11	4 Hrs	$ 9.38/Hr	$ 37.52
GS-11	320 Hrs	$ 8.68/Hr	$2,835.20
GS-9	320 Hrs	$ 7.99/Hr	$2,556.80
GS-12	4 Hrs	$11.18/Hr	$ 44.72
E-7	320 Hrs	$ 6.90/Hr	$2,208.00
E-7	20 Hrs	$ 6.90/Hr	$ 138.00
Total	1,112 Hrs	-	$9,015.60

* No. manhours expended are professional estimates of personnel directly responsible for the last revision of Course 3ABR30331.

COURSE 3ABR30333

No. Course Hours = 570

Grade	* Manhours Expended	Rate	Cost
GS-11	50 Hrs	$ 9.64/Hr	$ 482.00
GS-11	8 Hrs	$ 9.64/Hr	$ 77.12
GS-11	8 Hrs	$ 9.90/Hr	$ 79.20
GS-11	25 Hrs	$ 9.38/Hr	$ 234.50
GS-12	15 Hrs	$11.80/Hr	$ 177.00
E-6	50 Hrs	$ 5.93/Hr	$ 296.50
E-6	440 Hrs	$ 5.93/Hr	$2,609.20
E-6	440 Hrs	$ 5.93/Hr	$2,609.20
Total	1,036 Hrs	-	$6,564.72

* No. of manhours expended are professional estimates of personnel directly responsible for the last revision of Course 3ABR30333.

COURSE 3ABR30434

No. Course Hours = 420

Grade	* Manhours Expended	Rate	Cost
GS-12	4 Hrs	$10.56/Hr	$ 42.24
GS-11	120 Hrs	$ 8.86/Hr	$1,063.20
GS-11	8 Hrs	$ 9.64/Hr	$ 77.12
GS-11	8 Hrs	$ 8.86/Hr	$ 70.88
GS-12	8 Hrs	$10.87/Hr	$ 86.96
GS-12	8 Hrs	$11.49/Hr	$ 91.92
GS-11	16 Hrs	$ 8.60/Hr	$ 137.60
GS-11	16 Hrs	$ 8.60/Hr	$ 137.60
GS-9	140 Hrs	$ 7.13/Hr	$ 998.20
GS-9	140 Hrs	$ 7.78/Hr	$1,089.20
GS-11	60 Hrs	$ 9.64/Hr	$ 478.40
E-7	16 Hrs	$ 6.90/Hr	$ 110.40
E-7	16 Hrs	$ 6.90/Hr	$ 110.40
E-6	140 Hrs	$ 5.93/Hr	$ 830.20
Total	700 Hrs	-	$5,424.32

* No. of manhours expended are professional estimates of personnel directly responsible for the last revision of Course 3ABR30434.

COURSE 3AQR30020-1

No. Course Hours = 540

Grade	* Manhours Expended	Rate	Cost
GS-11	304 Hrs	$ 8.86/Hr	$ 2,693.44
GS-11	20 Hrs	$ 9.64/Hr	$ 192.80
GS-11	20 Hrs	$ 8.86/Hr	$ 177.20
GS-12	20 Hrs	$10.87/Hr	$ 217.40
GS-12	20 Hrs	$11.49/Hr	$ 229.80
GS-12	10 Hrs	$10.56/Hr	$ 105.60
GS-11	153 Hrs	$ 9.64/Hr	$ 1,474.92
GS-9	303 Hrs	$ 7.13/Hr	$ 2,160.39
GS-9	303 Hrs	$ 7.78/Hr	$ 2,357.34
GS-11	82 Hrs	$ 8.60/Hr	$ 705.00
E-7	82 Hrs	$ 6.90/Hr	$ 656.80
E-6	303 Hrs	$ 5.93/Hr	$ 1,796.79
Total	1620 Hrs	-	$12,676.68

* No. manhours expended are professional estimates of personnel directly responsible for the last revision of Course 3AQR30020-1.

USAF COST INCURRED TO OPERATE MODIA DURING SERVICE TEST

COURSE 3ABR32834

No. Course Hours = 510 No. Manhours Expended = 484

Category		Factor	Rate	Cost
Computer Utilization		3,030 Min	$1.59/Min	$4,817.70
Personnel Usage	GS-13	2 Hrs	$12.48/Hr	$24.96
	GS-12	4 Hrs	$10.56/Hr	$42.24
	E-7	121 Hrs	$6.90/hr	$834.90
	GS-12	2 Hrs	$10.56/Hr	$21.12
	GS-12	2 Hrs	$10.16/Hr	$20.32
	GS-12	2 Hrs	$10.16/Hr	$20.32
	E-7	80.0 Hrs	$6.90/Hr	$552.00
	GS-9	194.5 Hrs	$7.56/Hr	$1,470.42
	GS-9	60.5 Hrs	$7.78/Hr	$470.69
	GS-11	8 Hrs	$10.16/Hr	$81.28
	E-7	4 Hrs	$6.90/Hr	$27.60
	E-7	4 Hrs	$6.90/Hr	$27.60
Supplies Used	1 Part Paper	1 Case	$20.00/Case	$20.00
	Thermographic Paper	5 Rolls	$5.00/Roll	$25.00
Bell 103A Data Set Rental		0.6 Mo	$53.92/Mo	$32.35
		*Total Cost		$8,488.50

* Cost for preparing two alternatives.

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COURSE 3ABR30434

No. Course Hours=420 No. Manhours Expended=569.5

Category		Factor	Rate	Cost
Computer Utilization		3,153 Min	$1.59/Min	$5,013.27
Personnel Usage	GS-13	10 Hrs	$12.48/Hr	$124.80
	GS-12	120.0 Hrs	$10.56/Hr	$1,267.20
	E-4	1.5 Hrs	$4.34/Hr	$6.51
	E-7	7.0 Hrs	$6.90/Hr	$48.30
	GS-12	2.0 Hrs	$10.56/Hr	$21.12
	GS-12	2.0 Hrs	$10.25/Hr	$20.50
	E-9	7.0 Hrs	$9.15/Hr	$64.05
	E-6	149.0 Hrs	$5.93/Hr	$883.57
	GS-11	3.0 Hrs	$8.60/Hr	$25.80
	GS-11	68.5 Hrs	$8.86/Hr	$606.91
	GS-9	91.0 Hrs	$7.13/Hr	$648.83
	GS-9	4.5 Hrs	$7.35/Hr	$33.08
	GS-9	104.0 Hrs	$7.78/Hr	$809.12
Supplies Used	1 Part Paper	1 Case	$20.00/Case	$20.00
	Thermographic Paper	4 Rolls	$5.00/Roll	$20.00
MODEM Rental		0.6 Mo	$53.92/Mo	$32.35
		* Total Cost		$9,645.41

* Cost for preparing two alternatives

COURSE 3ABR30331

No. Course Hours = 690 No. Manhours Expended = 458.50

Category		Factor	Rate	Cost
Computer Utilization		4,055 Min	$1.59/Min	$6,447.45
Personnel Usage	GS-13	3.0 Hr	$12.48/Hr	$37.44
	GS-12	1.0 Hr	$10.56/Hr	$10.56
	E-9	1.0 Hr	$9.15/Hr	$9.15
	E-7	124.0 Hrs	$6.90/Hr	$855.60
	E-6	111.0 Hrs	$5.93/Hr	$658.23
	GS-9	134.0 Hrs	$7.99/Hr	$1,070.66
	GS-11	56.5 Hrs	$9.64/Hr	$544.66
	E-7	20.0 Hrs	$6.90/Hr	$138.00
	GS-11	8.0 Hrs	$8.86/Hr	$70.88
Supplies Used	1 Part Paper	1.0 Case	$20.00/Case	$20.00
	Thermographic Paper	4.0 Rolls	$5.00/Roll	$20.00
MODEM Rental		0.6 Mo	$53.92 Mo	$32.35
			* Total Cost	$9,914.93

* Cost for preparing two alternatives.

COURSE 3ABR30333

No. Course Hours - 570 No. Manhours Expended = 600.5

Category		Factor	Rate	Cost
Computer Utilization		2,024 Min	$1.59/Min	$3,218.16
Personnel Usage	GS-13	2.0 Hrs	$12.48/Hr	$24.96
	GS-12	1.5 Hrs	$10.25/Hr	$15.38
	GS-12	144.0 Hrs	$10.56/Hr	$1,520.64
	E-7	150.0 Hrs	$6.90/Hr	$1,035.00
	GS-11	60.0 Hrs	$9.64/Hr	$578.40
	E-6	150.0 Hrs	$5.93/Hr	$889.50
	GS-11	60.0 Hrs	$9.38/Hr	$562.80
	E-7	30.0 Hrs	$6.90/Hr	$207.00
	E-7	3.0 Hrs	$6.90/Hr	$20.70
Supplies Used	1 Part Paper	1.0 Case	$20.00/Case	$20.00
	Thermographic Paper	5.0 Rolls	$5.00/Roll	$25.00
MODEM Rental		0.6 Mo	$53.02/Mo	$32.35
			* Total Cost	$8,072.54

* Cost for preparing two alternatives.

COURSE 3AQR30020-1

No. Course Hours = 450 | No. Manhours Expended = 693.27

Category		Factor	Rate	Cost
Computer Utilization		5,585 Min	$1.59/Min	$8,880.15
Personnel Usage	GS-13	2.00 Hrs	$12.48/Hr	$24.96
	GS-11	1.25 Hrs	$9.90/Hr	$12.38
	GS-12	1.5 Hrs	$10.56/Hr	$15.84
	E-7	230 Hrs	$6.90/Hr	$1,587.00
	GS-11	23.0 Hrs	$8.86/Hr	$203.78
	GS-11	1.0 Hr	$9.12/Hr	$9.12
	GS-11	1.0 Hr	$8.86/Hr	$8.86
	GS-11	1.0 Hr	$8.60/Hr	$8.60
	GS-11	1.5 Hrs	$9.64/Hr	$14.46
	GS-9	218 Hrs	$7.13/Hr	$1,554.34
	GS-9	213 Hrs	$6.48/Hr	$1,380.24
Supplies Used	1 Part Paper	1.5 Cases	$20.00/Case	$30.00
	Thermographic Paper	6 Rolls	$5.00/Roll	$30.00
MODEM Rental		0.6 Mo	$53.92/Mo	$32.35
		* Total Cost		$13,792.08

* Cost for preparing two alternatives.

COURSE 3AIR75100-X (Lowry)*
(* Not Used in Analysis Because of No Comparative Data)

No. Course Hours = 100 No. Manhours Expended = 216

Category		Factor	Rate	Cost
Computer Utilization		1,881 Min	$1.59/Min	$2,990.79
Personnel Usage	GS-13	36 Hrs	$12.11/Hr	$435.96
	GS-12	36 Hrs	$10.25/Hr	$369.00
	GS-12	36 Hrs	$10.56/Hr	$380.16
	GS-11	36 Hrs	$5.31/Hr	$191.16
	E-7	36 Hrs	$6.90/Hr	$248.40
	E-7	36 Hrs	$6.90/Hr	$248.40
Supplies Used	1 Part Paper	0.5 Case	$20.00/Case	$10.00
	Thermographic Paper	1 Roll	$5.00/Roll	$5.00
MODEM Rental		.25 Mo	$53.92/Mo	$13.48
			Total Cost	$4,892.35

NOTE: 1. Manhours expended per hour of course length = 2.16.

2. Cost per hour of planning effort = $22.65.

COST DATA FOR MODIA IMPLEMENTATION

Category		Factor	Rate	Cost
Computer Utilization*		11,901.27 Min	$1.59/Min	$18,923.02
Personnel Usage	GS-13	10 Hrs	$12.48/Hr	$124.80
	GS-12	459 Hrs	$10.56/Hr	$4,847.04
	E-7	464 Hrs	$6.90/Hr	$3,201.60
	E-6	336 Hrs	$5.93/Hr	$1,992.48
	E-5	283 Hrs	$5.07/Hr	$1,434.81
	E-4	1 Hr	$4.35/Hr	$4.34
	E-4	1 Hr	$4.34/Hr	$4.34
	GS-9	320 Hrs	$7.99/Hr	$2,556.80
	GS-9	320 Hrs	$7.78/Hr	$2,489.60
Supplies Used	Computer Paper*	7.0 Cases	$20.00/Case	$140.00
	Thermographic Paper	10 Rolls	$5.00/Roll	$50.00
Non-Recurring Charge for MODEM Installation**		1 MODEM	$105.00/MODEM	$105.00
MODEM Rental **		3.5 Mo	$53.92/Mo.	$188.72
Telephone Installation **	Wire		$3.00	$3.00
	Instrument		$14.70	$14.70
Total Cost				$36,080.25

* Provided by Data Automation Branch (Keesler/ACD).
** Provided by Keesler/2052 CG.

Appendix 6

MANHOUR EFFORT PER HOUR OF COURSE LENGTH

1. Manual Planning:

Course Identity	Course Length (Hrs)	Manhours/Hr Course Length	*Average Effort/ Hr Course Length
3ABR32834	510	1.95	
3ABR30434	420	1.67	
3ABR30331	690	1.61	
3ABR30333	570	1.82	
3AQR30020-1	540	3.00	
		10.05/5 = →	2.01

2. MODIA Planning:

Course Identity	Course Length (Hrs)	Manhours/Hr Course Length	**Average Effort/ Hr Course Length
3ABR32834	510	0.95	
3ABR30434	420	1.36	
3ABR30331	690	0.66	
3ABR30333	570	1.05	
3AQR30020-1	450	1.54	
		5.56/5= →	1.11

* Planned one instructional alternative.
** Planned two instructional alternatives (0.55 manhours per hour course length for one alternative).

Appendix 7

AVERAGE DOLLAR COST TO SUPPORT ONE HOUR OF PLANNING EFFORT

1. Manually Planning:

Course Identity	Total Manhours Planning Effort	Total Planning Cost	Cost/Hour Planning Effort	*Avg Cost/ Hour Planning Effort
3ABR32834	994.5	$6,582.44	$6.62	
3ABR30434	700.0	$5,424.32	$7.75	
3ABR30331	1,112.0	$9,015.60	$8.11	
3ABR30333	1,036.0	$6,564.72	$6.34	
3AQR30020-1	1,620.0	$12,676.68	$7.83	
			$36.65/5 =	$7.33

2. MODIA Planning (Includes Computer, Facilities, Manhours, and Supplies Cost):

Course Identity	Total Manhours Planning Effort	Total Planning Cost	Cost/Hour Planning Effort	** Avg Cost/ Hour Planning Effort
3ABR32834	484.00	$8,488.50	$17.54	
3ABR30434	569.50	$9,645.41	$16.96	
3ABR30331	485.00	$9,914.93	$20.44	
3ABR30333	600.50	$8,072.54	$13.44	
3AQR30020-1	693.27	$13,792.08	$19.89	
			$88.27/5 =	$17.65

* Planned one Instructional Alternative.

** Planned two Instructional Alternatives ($8.83 per hour planning effort for one alternative).

Appendix 8

FUNCTIONAL COST FACTORS CONSIDERED BY COURSE PLANNERS*

Courseware Procurement

- Printed Media
- Display Media
- Software

Hardware Procurement

- Media Hardware
- Special Equipment
- Overhead Hardware

Facility Construction

Pay and Allowances

- Students
- Instructors
- Curriculum Personnel
- Hardware Maintenance Personnel
- Facilities Maintenance Personnel
- Training Administrative Personnel
- Base Operating Support Personnel
- Medical Personnel

PCS Costs

- Students
- Instructors

TDY Cost

- Transportation
- Destination Per Diem

Instructor Training

- Factor Training of Initial Instructor Cadre
- Education Training

Miscellaneous Operating Costs

- Computer Service Charges
- Hardware Replenishment Repair Parts
- Miscellaneous Supplied

* Adapted from RAND Publication MODIA: The Cost Model, April 1975, RAND Corporation, R-1704, MODIA.

KEESLER SAAS COURSES REVISION DURING THE PERIOD 1970-1975

Course	Total Number Courses						Number Courses Revised						Total Course Weeks						Number Course Weeks Revised					
	1970	1971	1972	1973	1974	1975	1970	1971	1972	1973	1974	1975	1970	1971	1972	1973	1974	1975	1970	1971	1972	1973	1974	1975
3ABR	42	42	45	47	53	53	15	30	18	41	35	10	1039	1039	1134	1167	1288	1288	394	754	562	977	958	207
3AAR	4	4	4	4	4	4	-	-	2	2	1	2	121	121	121	121	121	121	-	-	71	73	13	49
3AQR	9	9	9	11	12	12	1	5	-	8	4	1	106	106	106	155	165	165	10	65	-	86	53	10
3ALR	10	10	12	14	14	14	2	2	5	8	8	6	173	173	202	236	236	236	48	40	86	147	102	106
3AZR	86	90	92	94	102	106	16	20	59	59	29	16	545	575	589	608	703	729	103	132	360	363	237	117
Sub-Total	141	155	162	170	185	189	34	57	84	118	77	35	1984	2014	2152	2287	2513	2539	555	991	1079	1646	1363	489
30BR	14	15	15	15	17	17	14	5	10	15	7	7	312	318	318	318	354	354	312	97	187	318	69	151
30AR	3	3	4	4	4	4	-	2	-	1	3	-	100	100	120	120	120	120	-	80	-	20	77	-
30ZR	19	19	19	19	29	29	2	2	6	7	7	1	101	101	101	101	129	129	28	20	60	60	15	4
30LR	7	7	7	7	7	7	6	5	2	7	2	-	44	44	44	44	44	44	31	41	7	44	5	-
300R	1	1	1	1	1	1	1	-	-	1	1	-	29	29	29	29	29	29	29	-	-	29	29	-
Sub-Total	44	45	46	46	58	58	23	14	18	33	20	8	586	592	612	612	676	676	400	238	254	471	195	155
Type 3 Total	195	200	208	216	243	247	57	71	102	151	97	43	2570	2606	2764	2899	3189	3215	955	1229	1333	2117	1558	644
2ASR	88	93	97	102	112	116	7	12	17	42	15	8	469	486	511	541	673	719	27	36	96	245	87	72
20SR	6	6	8	10	10	10	-	1	-	4	3	-	19	19	28	32	32	32	-	3	-	14	17	-
Type 2 Total	94	99	105	112	122	126	7	13	17	46	18	8	488	505	539	573	705	751	27	39	96	259	104	72
4AST	14	32	45	75	91	112	8	18	31	33	16	29	49	121	146	245	304	380	28	57	89	136	52	118
40ST	19	21	24	31	38	67	5	3	3	8	9	38	50	55	64	88	55	100	25	7	11	23	19	55
Type 4 Total	33	53	69	106	129	179	13	21	34	41	25	67	99	176	210	333	359	480	53	64	99	159	71	173

Appendix 10

KEESLER SAAS COURSES IMPLEMENTED DURING THE PERIOD 1970-1975

Course	Number Courses Implemented						Number Course Weeks Implemented					
	1970	1971	1972	1973	1974	1975	1970	1971	1972	1973	1974	1975
3ABR	-	-	3	2	6	-	-	-	59	35	64	-
3AAR	-	-	-	-	-	-	-	-	-	-	-	-
3AQR	-	-	-	2	1	-	-	-	-	35	11	-
3ALR	1	-	2	2	-	-	5	-	39	35	-	-
3AZR	3	4	2	2	8	4	15	28	39	35	86	26
Subtotal	4	4	7	8	15	4	20	28	137	140	161	26
30BR	-	1	-	-	2	-	-	7	-	-	21	-
30AR	-	-	1	-	-	-	-	-	20	-	-	-
30ZR	-	-	-	-	10	-	-	-	-	-	107	-
30LR	-	-	-	-	-	-	-	-	-	-	-	-
30QR	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	-	1	1	-	12	-	-	7	20	-	128	-
Type 3 Total	4	5	8	8	27	4	20	35	157	140	289	26
2ASR	9	5	4	5	10	4	71	17	23	24	132	46
20SR	-	-	2	2	-	-	-	-	11	10	-	-
Type 2 Total	9	5	6	7	10	4	71	17	34	34	132	46
4AST	6	14	27	30	16	21	21	47	71	113	59	76
40ST	5	2	3	7	7	29	25	5	9	21	13	45
Type 4 Total	11	16	30	37	23	50	46	52	80	134	72	121

SCHEDULE OF TASK FOR MODIA SERVICE TEST - 8 MARCH THRU 4 JUNE 1976

Date	MODIA Operator & ISD Team	Task	Course(s)
8 Mar-12 Mar	MSgt Hodge, Mr Jordan and all five ISD teams	Validate MODIA	3ABR32834, 3ABR30434, 3ABR30431, 3ABR30433, 3AQR30020-1
15 Mar-19 Mar	MSgt Hodge, ISD Team A	Prepare baseline data and alternatives	3ABR32834
22 Mar-26 Mar	Mr Jordan, ISD Team B	Prepare baseline data and alternatives	3ABR30434
29 Mar- 2 Apr	MSgt Hodge, ISD Team C	Prepare baseline data and alternatives	3ABR30431
5 Apr- 9 Apr	Mr Jordan, ISD Team D	Prepare baseline data and alternatives	3ABR30433
12 Apr-16 Apr	MSgt Hodge, ISD Team E	Prepare baseline data and alternatives	3AQR30020-1
19 Apr-23 Apr	MSgt Hodge, ISD Team A	Revise alternatives and select most feasible	3ABR32834
26 Apr-30 Apr	Mr Jordan, ISD Team B	Revise alternatives and select most feasible	3ABR30434
3 May- 7 May	MSgt Hodge, ISD Team C	Revise alternatives and select most feasible	3ABR30431
10 May-14 May	Mr Jordan, ISD Team D	Revise alternatives and select most feasible	3ABR30433
17 May-21 May	MSgt Hodge, ISD Team E	Revise alternatives and select most feasible	3AQR30020-1
24 May- 4 Jun	Mr Jordan, MSgt Hodge Lowry ISD Team F	Plan training course for Lowry AFB	3AIR75100-X