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TEST MANAGER'S OPERATIONAL GUIDE

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**TRAINING SYSTEMS DIVISION
Brooks Air Force Base, Texas 78235-5601**

August 1990

Final Technical Paper for Period August 1985 - February 1990

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LABORATORY

AD-A225 449

**AIR FORCE SYSTEMS COMMAND
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REPORT DOCUMENTATION PAGEForm Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE August 1990		3. REPORT TYPE AND DATES COVERED Final - August 1985 to February 1990	
4. TITLE AND SUBTITLE Test Manager's Operational Guide				5. FUNDING NUMBERS C - F33615-84-C-0059 PR - 2557 TA - 00 WU - 02	
6. AUTHOR(S) Jeffrey A. Hays					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Training Systems Division Air Force Human Resources Laboratory Brooks Air Force Base, Texas 78235-5601				8. PERFORMING ORGANIZATION REPORT NUMBER AFHRL-TP-90-21	
9. SPONSORING/MONITORING AGENCY NAMES(S) AND ADDRESS(ES)				10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES					
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.				12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) The test manager's guide is a combination of sound advice, lessons learned, and past history derived in part from the year-long system level testing and evaluation (SLT&E) of the Advanced On-the-job Training System (AOTS). The basic principles of project management form the core of this paper.					
14. SUBJECT TERMS test manager's guide, advanced on-the-job training system, Job Training				15. NUMBER OF PAGES 16	
				16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified		18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified		19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	
				20. LIMITATION OF ABSTRACT UL	

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This publication is primarily a working paper. It is published solely to document work performed.

SUMMARY

Managing a test and evaluation (T&E) of a development system is a challenge. Every system is unique and has different requirements. However, there are certain global issues that pertain to each and every T&E. Among these are defining objectives, keeping the T&E as simple as possible, creating a dynamic test plan, and ensuring open communication between the involved personnel. While these items do not ensure a successful test, ignoring them will almost guarantee a failure.

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A TEST MANAGER'S OPERATIONAL GUIDE

I. INTRODUCTION

For over 10 years the Air Force has recognized deficiencies in the existing enlisted on-the-job training (OJT) system. The Air Force Human Resources Laboratory (AFHRL) conducted a study of the OJT system in 1975, and the Air Force Inspector General (IG) performed a functional management inspection (FMI) of OJT in 1977. Both efforts produced similar results: the OJT system was seriously deficient in training definition, delivery, evaluation, administration, and personnel utilization. As part of a series of Air Staff-directed initiatives designed to correct these deficiencies, a follow-on study outlined the functional and automation requirements for Air Force OJT, developed a system specification, and picked a site for the design, development, test, and evaluation of an Advanced On-the-job Training System (AOTS).

Beginning in 1985, the team of AFHRL, Douglas Aircraft Company (DAC), and Ball Systems Engineering Division (BSED) began designing the prototype AOTS at Bergstrom AFB, Texas. A system level test and evaluation (SLT&E) followed the successful completion of the development work in August of 1988. The SLT&E lasted for 1 year; results indicated that the work center users of the AOTS liked it, thought it was easy to use, felt it solved the deficiencies of the existing OJT system and could be effectively used in the operational environment, and felt it would improve the performance of individual trainees and the whole OJT system over time. The test was a success.

But a successful T&E does not just happen, and a T&E will not run itself. There are always too many people to lead, too many measures or instruments to create, and too many last-minute schedule crises to overcome. A test manager is needed to guide the effort so that each system is evaluated properly, results are produced, and the T&E is conducted within time and dollar constraints. Based on the experience gained during the AOTS SLT&E, a test manager should use the following principles as a basic recipe for the successful planning and execution of a T&E.

II. OBJECTIVE

In the test and evaluation (T&E) of any system, the most important step is defining the T&E objective. There may be multiple objectives, but these should be kept to a manageable number (four or less). The act of unambiguously defining the overall test objectives will focus the efforts of all those involved, acting as unifying principles throughout the test. Muddled, vague, or poorly defined objectives will result in similar test results and conclusions.

A critical prerequisite to defining test objectives is learning as much as possible about the system to be tested. Since T&E strategy definition begins early in the development of a system, this is necessarily an ongoing process. Only when the system is fully understood can precise, quantifiable measurement and testing of its capabilities be planned, designed, and performed.

An important distinction to make is that between the testing of the functions and capabilities of a system versus the evaluation of the effect the system has upon the users and their environment (physical environment, procedures, job or time requirements, support, etc.). Both aspects are important in testing a system, but confusing the two during the planning and evaluation processes will produce data that is difficult to distill and analyze meaningfully.

Teamwork and team building are essential. Try to get people on the T&E team that want to be on it. Air Force, contractor, user, and all other involved personnel must be active participants in defining and achieving the objectives of the test program. When all parties are

involved in the planning phase, the test becomes theirs, and interest in successfully completing the test will be greater.

III. GUIDANCE

Seek guidance from above. Regulations governing T&E (AFR 80-14, AFTECR 55-1, DOD Directive 5000.3, etc.) cannot and should not be ignored. Most T&Es have requirements commensurate with the stage of development of the system. Regulations, binding or not, often contain excellent suggestions and methods for planning and conducting a T&E and form a good foundation for the T&E program. Look for lessons learned from other similar programs; avoid past mistakes and improve future test performance and results.

Many systems will also have political, cost, or performance constraints and goals attached. These guides and constraints, such as the Program Management Directive (PMD), Statement of Need (SON), or Statement of Work (SOW), must be considered an integral part of the T&E development process. Priority should be given to "answering the mail," especially if the constraints and goals are imposed by the future users of the system.

IV. TEST PLANNING

The Keep It Simple, Stupid (KISS) principle should permeate the entire T&E. Obviously, T&E requirements must be satisfied with the appropriate level of complexity--you cannot measure a hypervelocity weapon with a wristwatch. However, a test objective hierarchy should be formulated, starting with the basic, fundamental questions (Does it work?; Do the users like it?; etc.) and branching outward and downward. The fundamental questions should have priority in the planning and execution of the T&E. Only when the basic questions are addressed should you move on to greater levels of detail (critical issues, critical questions, specific measures, etc.).

After test objectives are defined (again, an evolutionary process), the next step is to perform long-ranged planning steps. The first of these steps is to create a T&E-specific work breakdown structure (WBS) to organize at a high level the work to be done before, during, and after the test. The WBS should be defined down to a level of detail where the lowest category requires no more than 15 or so discrete tasks to complete it. Refer to Appendix A for the WBS used on the AOTS project.

These discrete tasks should be defined for each final WBS unit; specificity is the rule here. Each task should have a definite beginning and end, and be the responsibility of one person. One way to organize the tasks is to devote a separate sheet of paper to each final-level WBS element. The tasks needed to accomplish each element are then listed on that sheet, along with the person responsible for the task, duration of the task, resources necessary to perform the task, any time constraints, and other relevant information.

The next step is to network the tasks. The networking process involves assigning responsibility for each of the tasks to a single point of contact (POC) and deciding which tasks should precede the others. A white board and either Post-itTM notes or paper and tape are ideal for this sequencing exercise. After assembling the prototype network, a list of tasks and their successors should be created. Loading the task data and the predecessor-successor lists into a network analysis and planning software package such as the Primavera Project PlannerTM (P3) or the Computer-Supported Network Analysis System (CSNAS) is a good idea. Large T&E efforts are easier to manage using the Program Evaluation Review Technique (PERT) charting, critical path analysis, resource tracking, and follow-up capabilities of packages such as these.

First, check the predecessor-successor logic of your network by producing a logic diagram unconstrained by dates. The next product should be a time-constrained logic diagram, showing all the tasks, relationships desired, and any absolute "drop-dead" dates. Careful study of these products will give managers a good idea whether or not the plan, as designed, will meet schedule constraints. A tool such as this is ideal for playing "what if?" scenarios and determining the best sequence of events. Always remember that these are merely tools; they will not make decisions and are only as good as the information loaded in them.

At this point, the test manager has objectives, critical issues, sub-objectives, networks, and charts, to name but a few things. These are the heart of the T&E master plan. The main point to remember about the plan is that it will constantly change, and that change needs to be controlled. One effective way of controlling the change is to segment the plan into logical sections, each with its own page number sequence. Thus, each change might only affect a small section, not a whole test plan. Approved changes to the plan should be registered in pen in the test manager's copy. This is the master copy of the plan. Change sheets can then be issued periodically to others having copies of the plan.

V. TEST EXECUTION

The project planning and analysis tools are also helpful in the "follow-up" aspect of test execution. Task listings, ordered by POC and scheduled dates, are extremely helpful to the individuals responsible as reminders of when tasks need to be finished, thus establishing periodic, achievable goals for those individuals. They are also good for the manager as monthly "to do" lists and reminders to communicate directly with the POCs. Other products such as PERT charts, GANTT charts, etc. are helpful in that they keep individual POCs aware of their role in the overall T&E team effort.

As the test is being executed, periodic get-togethers of the involved parties (Air Force, contractor, user) will help the team members remain committed, increase communication, and improve the overall effort. One successful strategy was having the main T&E representatives from each group (Air Force, contractor) meet each Monday morning to discuss the upcoming week's activities and to address unresolved issues. This small group (two-three people) would solve those problems they could solve personally, delegate or team up on solvable problems requiring more expertise, and defer to the weekly test working group those problems requiring higher level (program manager) involvement. An important point is not to rely on meetings to discuss and solve problems. Foster initiative by delegating and creating teams to solve problems. And limit the size of meetings, unless they are strictly informational. A large group discussing problems usually gets very little done.

No matter what the item to be tested, be it a missile or an automated training system, you must keep a running account of the context in which and the process by which the test was executed. These include the physical and regulatory environments, internal and external changes to the project and the test, human factors information regarding the participants, and descriptions of how the test played itself out, to list a few. These data will be essential in interpreting the test and analysis results; often times meaningful conclusions are impossible without these context and process data.

VI. CONCLUSION

The preceding recommendations are not intended to be an all-inclusive cookbook for a perfect T&E. The main points of objectives, simplicity, planning, and control will help any future manager get the T&E started correctly and will guide the test team to a successful conclusion.

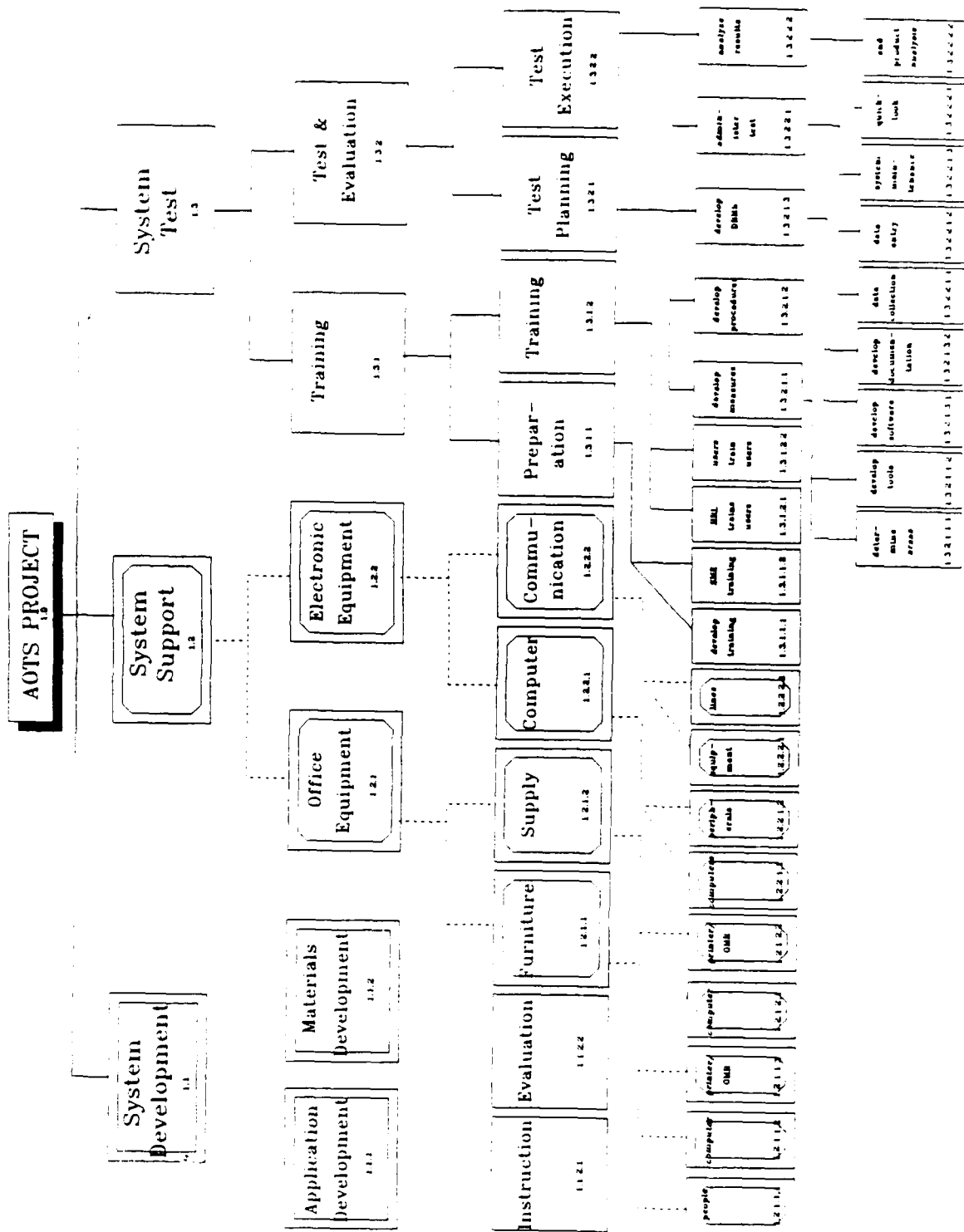
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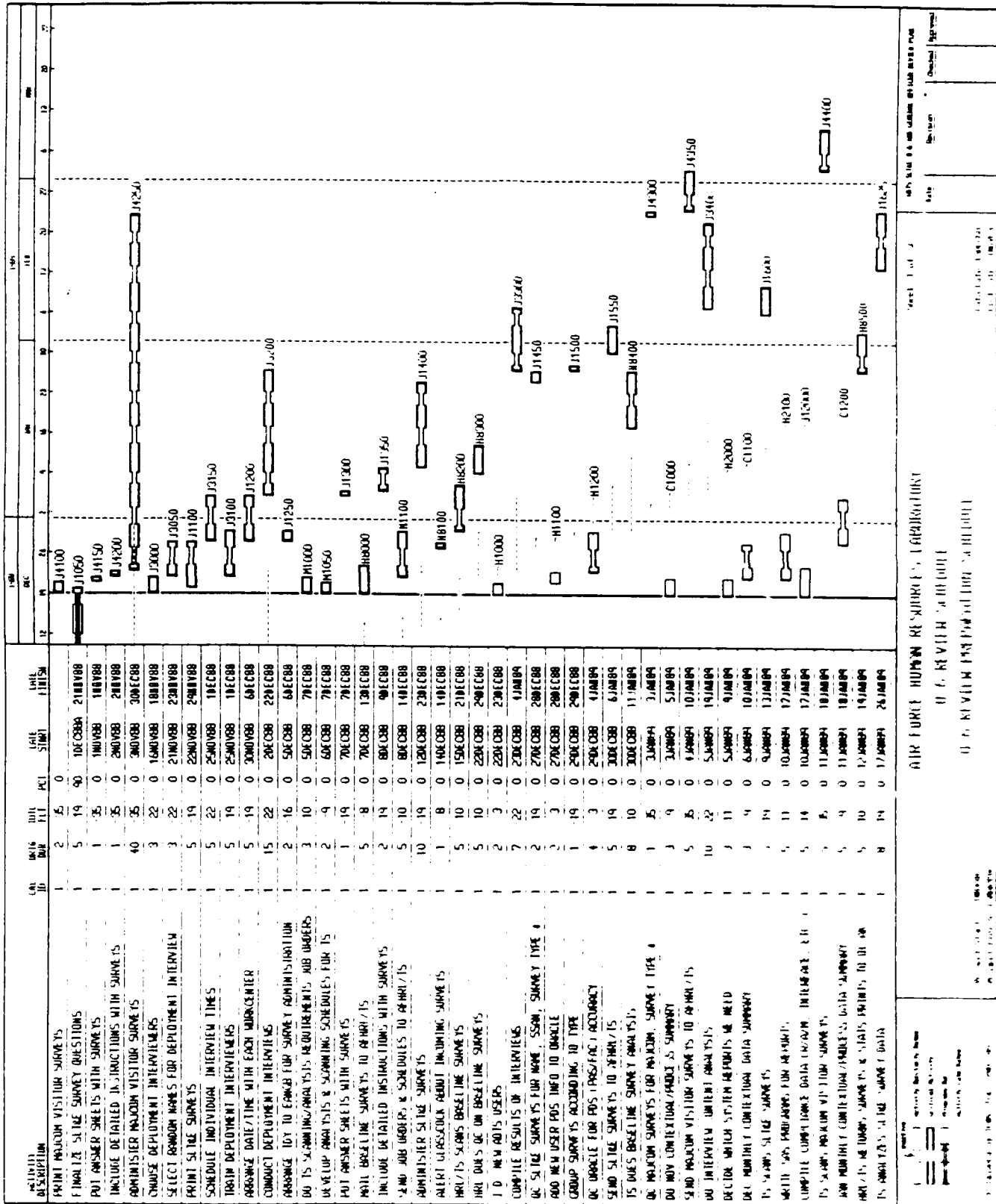
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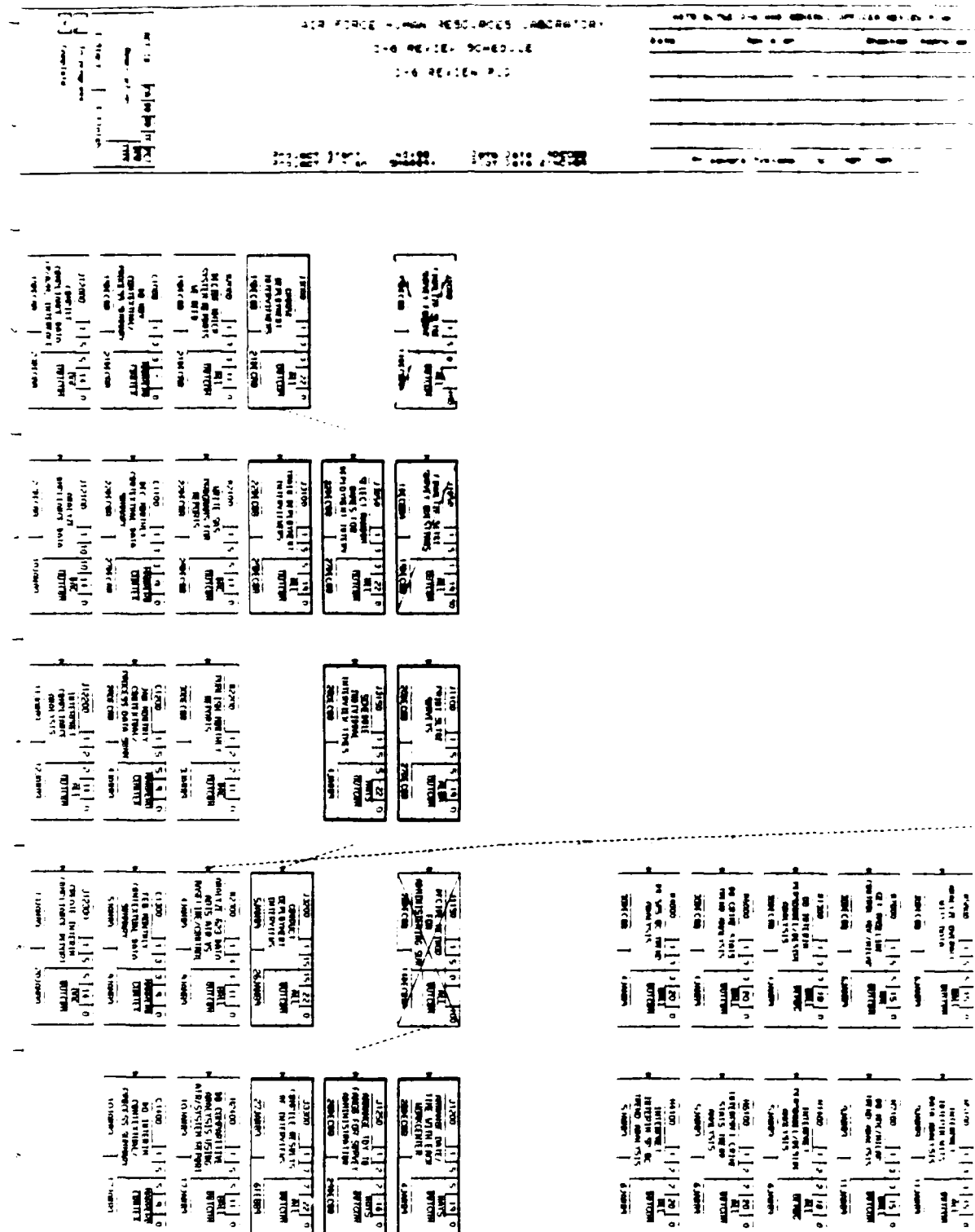
APPENDIX A: AOTS Work Breakdown Structure



APPENDIX B-1: Primavera Pure Logic Diagram



APPENDIX B-2: Primavera Time-Scaled Logic Diagram



APPENDIX B-3: Primavera Bar Chart

