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AEROSPACE INFORMATION REPORT

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A GUIDE FOR TRAINING EQUIPMENT DEVELOPMENT

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Revised

1. **INTRODUCTION** - The increasing use of complex and expensive training equipment has called attention to the need for careful planning not only in the selection of training equipment but of the entire training plan. Training experts have in recent years researched this subject, and a large number of documents exist describing the process which will produce sound training programs. This AIR briefly describes the major elements of the process and provides a list of significant references with the purpose of encouraging a systematic and sound educational approach to the design of training equipment. The primary purpose of a training program is to teach the trainee the attitudes, knowledge, and skill he must possess to effectively perform his job. Training equipment is employed in the program to facilitate the learning process, to bring about the desired changes in the student's performance. The selection of specific training equipment depends, therefore, on:
 - a. Analysis of the real task in order to define critical, trainable elements.
 - b. Determination of training equipment characteristics.
 - c. Engineering feasibility study and establishment of design specifications.
 - d. Design and fabrication of training equipment.
 - e. Introduction of training equipment to the user.
 - f. Field evaluation.
2. **ANALYSIS OF REAL TASK** (References: 1, 3, 4, 9, 11, 15)
 - 2.1 In this phase, the real task for which training is required must be thoroughly analyzed. An appropriate task analysis technique should be employed whereby all of the elements in the task are brought to light. Once this is accomplished, it is the job of the analyst to extract critical, trainable sub-tasks from the task-at-large and to determine the existing knowledge and skills of the trainees.
 - 2.2 Critical sub-tasks should first be extracted. These are the sub-tasks which, in the judgment of the analyst¹, contribute most to the difficulty of the whole task, or those which if mastered will play the most important role in over-all task performance proficiency.

¹Analyst: a person qualified by training in psychology/education, experience in the techniques of task analysis, and experience in operational training.

The analyst's judgment will be based upon the data of past and operational experience, design information and scientific data. Once critical sub-tasks are extracted and defined, it must be determined which of these are trainable, i.e., which may be profitably pursued or learned via training equipment. It is well known that certain skills by their nature are not most efficiently learned via simulation techniques. Skills of a more intellectual nature are initially best learned in a classroom.

- 2.3 Since in many cases trainees already possess certain of the skills required to perform the task, the design objective of the training equipment should not be to reteach these skills. Redundant teaching of isolated known skills incurs unnecessary equipment expense, too often sanctioned on the grounds that it adds "realism" to the product.

3. DETERMINATION OF CHARACTERISTICS OF THE TRAINING EQUIPMENT

(References: 10, 13, 15, 20) - Following the extraction and definition of critical and trainable sub-tasks, the analyst establishes the type (slide, model, part-task trainer, etc.) of training equipment that will accomplish the training objective. The training equipment must be psychologically similar² to the real product or some aspect thereof, but with special emphasis on critical trainable sub-tasks. If at all possible, the simulation of such sub-tasks should not be compromised in the equipment design. If compromises must be made, they should be limited to non-critical associated sub-tasks. On occasion some non-critical sub-tasks will be included in the design for several reasons: (1) for purpose of realism, a characteristic which may increase acceptability and promote motivation; (2) because such tasks are sometimes closely associated with critical tasks; and (3) because a critical task may be composed of several non-critical sub-tasks. It is easily seen that the effects of a decision to compromise must be carefully weighed. The efforts of this section results in a report which relates the tasks to be learned (paragraph 1) to training equipment. It specifies not only the format but the characteristic of the training equipment. In the case of complex devices this includes performance accuracy or "fidelity". In short, this report is a functional specification.

4. ESTABLISHMENT OF DESIGN SPECIFICATION (References: 7, 8, 10, 12, 14, 15)

- 4.1 The previous phases will have produced a training equipment design concept which, in the judgment of the analyst, best suits the training needs in terms of its embodiment of means for teaching critical and trainable sub-tasks, and in terms of its "psychological simulation"² of the tasks being considered. Until now, the engineering feasibility of the design concept has not played a role. The analyst and training equipment engineer must at this point cooperatively evaluate the entire design concept.

²Psychological simulation: the fidelity with which the functional rather than the physical elements themselves are simulated