THE ROLE OF THE PRIME AIRFRAME MANUFACTURER AS AN INSTRUCTIONAL SYSTEMS DEVELOPER

Dr. Jay R. Swink, Branch Chief
Richard T. Goins, Training Analyst
Stanley M. Aronberg, Training Specialist
Instructional Systems Development
Human Factors Engineering
Douglas Aircraft Company
Long Beach, California 90846

ABSTRACT

Instructional Systems Development (ISD) in the military has traditionally either been performed in-house or by an independent contractor. Historically, prime airframe manufacturers have neither had the interest nor the technical capabilities to provide this service. Based strictly upon the technical requirements for conducting ISD for an emerging weapon system, however, the airframe manufacturer is in a unique position to concurrently design and develop training in parallel with the aircraft. He has ready access to the technical data, engineering specification and design inputs much earlier than any outside agency. His ability to collect performance data and determine system configuration can expedite the development of training devices specifications thus insuring that devices are delivered in time to begin initial aircrew training. Additionally, training requirements can be considered early enough to be integrated into the design process and actually impact the final system configuration. With the emergence of a "total systems approach" mandated by OMB Circular A109 and DOD 5000.1 and .2, this ISD capability is being developed by the airframe industry and should be considered as an integral part of the prime's responsibility during Full Scale Development.

INTRODUCTION

Traditionally, the role of the airframe manufacturer in instructional systems development has been limited to support of the process through providing technical data and documentation on the system configuration and performance. As part of contractual obligation during Full-Scale Engineering Development (FSED), he is typically required to develop a human factors task analysis for system operators and logistic support analysis for maintenance functions. In addition, he is required to develop Type 1 training and identify training equipment needed to support Operational Testing and Evaluation (OT&E) for the initial cadre of system operators and maintainers. In this role, little of what he does is immediately applicable to the formal Instructional Systems Development (ISD) process required to analyze, design and develop aircrew and maintenance training programs for operational personnel. Recent modifications to the system acquisition process (e.g., OMB A-109 and DOD 5000.1 and .2), which dictate a total systems approach, are realigning these traditional roles and placing the prime contractor in the forefront of the analysis process to insure that training and personnel requirements are appropriately addressed from the outset of system conceptualization. These changes, requiring the prime contractor to be heavily involved in the front-end analysis, provides an opportunity for him to contribute significantly to the design and development of training early in the system acquisition process. In fact, it makes him the logical candidate to perform ISD in parallel with the design and development of the air vehicle.

There are those, of course, who would argue with this conclusion. The view is held by many that the ISD requirement is best satisfied by anyone <u>but</u> the prime airframe manufacturer. This opinion is predominately shared by those whose main product line is training support and services, as well as a few skeptical military customers. The reasons given cite the opinion that most airframe manufacturers do not have sufficient technical expertise nor an adequate background and/or involvement in training technology research and development to remain current. They, also, point out that a prime contractor's main responsibility is the air vehicle and that everything else is secondary; hence, manpower, budgets, and schedules will not receive sufficient management priority in the training areas. In essence they maintain there are too many competing elements to allow training to receive the attention it deserves. This may be true in some instances but this problem is not unique to airframe manufacturers. The lack of a proper management commitment to training is an institutional and organizational problem, not a technical problem, and thus can be solved through enlightened management and program supervision supported by corporate policy. Those who maintain that the prime contractor should not perform ISD, however, will also be the first to admit that ISD <u>cannot</u> be performed without the prime contractor. Hence, we have a classic dilemma as to what his proper role should be?

INSTRUCTIONAL SYSTEMS DEVELOPMENT BY THE PRIME

The prime normally conducts the initial task analysis as part of the human factors design activities. Rather than being a legitimate task analysis it is typically a task inventory or listing instead of a complete analysis of the tasks and their behaviorial requirements. However, if properly conducted and performed in light of future ISD requirements, this initial task analysis can be expanded to include performance conditions and standards; task frequency, criticality and difficulty; task initiation and termination cues; crew and crew coordination responsibilities; and system/subsystem interfaces. The addition of this analytic data to the task inventory can then be directly applied to subsequent ISD activities and the development of functional specifications for training devices in a more timely and logical manner. In the early stages of system engineering and design, the prime airframe manufacturer is the

only one who has access to adequate technical data to perform such a detailed analysis. Thus, he can conduct the initial ISD step (analysis of job performance requirements) much earlier than either independent contractors or the military using command's in-house staff.

More critical than the early ISD analysis step is the ability to expedite the identification and definition of training device requirements so that long lead time items required to develop training equipment can be adjusted to match aircraft delivery schedules. Historically, the ISD process, which strives to optimize training resources, is inhibited or constrained by training equipment which does not adequately address training requirements or is not available in time to be integrated into the training program at Ready for Training (RFT) dates. There are several factors contributing to this situation. (1) The ISD process is not initiated early enough to impact training device design, (2) Training devices are designed by engineers with insufficient data concerning training needs, and (3) Training device manufacturers must rely upon technical data from the airframe contractor which is typically not timely nor sufficiently detailed. All three of these factors can be eliminated or minimized if the airframe manufacturer, as the instructional systems designer and developer, is also responsible for the detailed functional specification of device characteristics and performance. ISD personnel can be integrated directly into the airframe design process where they have access to current technical data and documentation and are able to influence the aircraft design in areas that could effect training and ultimately system effectiveness.

The prime contractor designs and develops Type 1 training as part of his FSED contract. Normally, this training does not follow the systematic and orderly process of ISD and, hence, is not adequate in content or format for formal operational training. If, however, the airframe manufacturer was also responsible for the ISD of aircrew and maintenance training programs, Type 1 training materials and equipment could be designed and developed using standard ISD methodology so that it could be integrated into follow-on training programs. This approach would not only be more effective and efficient in terms of time, resources and costs but it would also provide an opportunity to validate the training during OT&E and make required revisions prior to Initial Operational Capability (IOC) and/or RFT. In addition, actual training equipment required for operational training could be prototyped and tested simultaneously with the aircraft, by the Test Forces during Type 1 training, allowing RFT certification prior to starting operational training. Not only would this procedure insure that the devices met the training requirements but it would also insure that the full suite of devices are in place, providing a totally integrated training system, for formal training which is something that has not been possible to date.

SUMMARY

The prime manufacturer's extensive involvement in the "front-end" analysis, mandated by the new procurement procedures, will increase his knowledge and understanding of operational requirements needed to design hardware to meet mission needs. His primary concern must be with a total system concept, not just meeting hardware and software specifications. Personnel and training requirements are an integral part of the total system and, hence, must be integrated into the prime contractor design and development process from the outset. Thus, airframe manufacturers must develop the technical capabilities to deal with these expanded areas of responsibility. Given this changing set of conditions for doing business with the military customer and the need to broaden technical expertise to include state-of-the-art training technology, the airframe manufacturer is now in a position to assume the role of an instructional system designer and developer in addition to being the designer and developer of the aircraft. He has immediate access to all the prerequisite technical data and documentation. ISD can be integrated with system engineering and delivery schedules for the air vehicle. His subject matter experts (SME's) will be system engineers and test pilots with detailed knowledge of system components and operations. He has access to SME's from the outset, hence facilitating his ability to complete early analysis of system requirements. These capabilities, combined with the requirements for a total systems approach, logically argues that the system and all its constituent elements should be derived from a common source—the prime contractor. Otherwise, instead of a totally integrated system, the results will continue to be a series of subsystems, each independently optimized for its own unique function resulting in suboptimization. This is clearly not the goal of the more effective and efficient system procurement processes being developed. The time has come for training to become an integral part of the system and for the prime contractor to assume the role and responsibility for ISD just as with any other element of the systems. In an age of shrinking budgets and escalating costs, this is the only solution which makes sense either in terms of system effectiveness or efficiency. The airframe industry is prepared to meet the challenge for total system responsibility and accountability, including all the elements of personnel and training required to support that system.

DR. JAY R. SWINK is Instructional Systems Development Manager assigned to the VTXTS program for Douglas Aircraft Company. He is primarily responsible for the instructional system analysis and design efforts for all training system components except the aircraft. Prior to joining Douglas Aircraft, he was Program Manager for Instructional Systems Development at Logicon. Dr. Swink has spent 12 years in industry focusing on the areas of aircrew training and performance measurement. His Ph.D. degree is in experimental psychology from Kansas State University and he is a former Naval Aviator with 1200 hours in carrier-based fighter interceptors.

MR. RICHARD T. GOINS is an Instructional Systems Training Analyst assigned to the VTXTS program and is responsible for training analysis and curriculum development. Retired from the U.S. Air Force, he served as a Radar-Navigator Bombardier in B-52 and FB-111A aircraft. He held the position of Chief, FB-111 Instructional Systems Development Division for a two-year period immediately before his retirement. Dr. Goins has an A.S. degree from the University of the State of New York.

MR. STANLEY M. ARONBERG is an Instructional Systems Training Specialist currently responsible for front-end analysis and synthetic training devices on the VTXTS program for the Douglas Aircraft Company. Retired from the U.S. Air Force where he served as Curriculum Development Manager for Boom Operator Training, Mr. Aronberg was also involved with the development of training devices while employed as a Sales Engineer for the Farrand Optical Company, Inc. Mr. Aronberg received a B.A. degree from Chapman College.