PROFIT RESPONSIBILITIES IN THE SIMULATION AND TRAINING EQUIPMENT INDUSTRY

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ABSTRACT

The objective of increased readiness through training can be enhanced through mutual military/industry efforts to support a viable earnings position. Strong financial health of companies competing in the market provides the resources, knowledge and systems that supply advanced technology and products that meet military training objectives.

Government agencies can contribute by providing clear definitions of the product needed, by imposing only specifications necessary to meet acceptable quality, and by contracting provisions commensurate with program risk. With firm product goals and applicable specifications, industry can minimize risk through sound planning and stable performance.

Industry can contribute by developing resources and systems that are efficient and effective in providing training products. Capability growth fosters innovativeness in advanced planning and productiveness, which are significant to providing quality products on schedule at the lowest cost possible. Industrial growth to bring this about is possible only if industry is in a strong financial position.

The government's goal is to obtain the best training possible for the dollars they spend. Industry must work with government agencies and together establish how to reach these common goals and find the most cost- and training-effective solution to each training need.

The government's needs are defined by specifications, statements of work, funding availability and weapon IOC dates. Industry is constrained by the resources, systems, knowledge, and innovativeness they have at their command. For these factors to culminate in systems that provide increased readiness through training, a significant amount of planning and preparation must occur.

To compete in the simulation and training equipment field, industry must make the investment necessary to develop the skills, provide the facilities and the design, production and management systems to effectively plan, execute, and control complex programs. These attributes are assembled over a long period of time at considerable expense. This expansion of resources and systems evolves from financing through contracted products and industry investments in research and development.

Contracted work is all important, for it not only is the source of monies to build and sustain capability, but it provides the incentive to pursue further simulation and training equipment business. Industry must see profit opportunities on current contracts and an expectation of continuing contracts to aggressively compete in the market. Profit opportunities result from a well conceived plan to produce a defined product. Ingredients of the plan include a thorough description of the objective (product), a sound conceptual approach, a complete schedule plan, reasonable cost targets and definition of potential risks. With a sound plan and good management, a reasonable profit can be achieved.

Industry investment in research and development provides the baseline knowledge to nourish the innovations that make needed products cost- and training-effective. It gives substance to the premises presented as solutions for development and design of the product. The payoff is in enhanced operational readiness resulting from advanced technology and effectual products.

The objective of training is to maintain the level of performance demanded by modern high technology. The government's tasks of defining training equipment to meet this objective continues to increase in difficulty. In the Summer 1982 DoD Acquisition Improvement Program Special Issue edition of "Concepts,"[1] authors Lieutenant Colonel Garcia E. Morram and Dr. Jules J. Bellaschi point out that, "The United States has concentrated on producing sophisticated weapon systems that have been reactive to changes in threat and technology." This approach has been maintained by using high risk technologies in the development process. An alternative that minimizes the resulting cost and schedule risk is the use of ". . . relatively mature technology and planning for the incorporation of advanced technologies after the system is developed."

Both of these approaches present problems in the definition of configuration, capability and quantities of traning devices to be employed. As the weapon system undergoes rapid design and technology changes, the government and contractors are faced with incorporating appropriate changes and reflecting actual operation of the aircraft in the simulator design. The simulation environment is impacted by more complex logistics and the probability of decreased equipment availability through changes and failures. Sophistication and longevity extends the commitment of the government and/or the contractors. This commitment represents risk that each seeks to avoid and that must be equitably shared to achieve the desired objective.

In the Calspan B-1 Systems Approach to Training Technical memo Analysis,[2] of "Implications for B-1 Aircrew Training," it is stated that ". . . another important concern in establishing training device requirements is that the devices, irrespective of their capabilities, are used to their maximum effectiveness. As Micheli (1972) states in his analysis of trainer fidelity and training transfer . . . training effectiveness is more a function of the manner in which the trainer is used than of the fidelity of the trainer." The relationship of weapon system sophistication and training equipment definition is stated in this writing as ". . . A common misconception with respect to training is that the sophistication of the operational system and the duration of training (along with the complexity of training devices) are positively correlated. Logically, one would then expect there to be an inverse relationship between training time and degree of sophistication (i.e., automation) of the operational system."

With the obvious significance of the need for early and complete definition of simulator application and capability, it is interesting to note that the Calspan B-1 SETA Technical Memorandum,[3] "B-1 Aircrew Instructional System Development Final Report," states, "In the past there has been little interaction between the engineers who design the simulator systems, the instructional systems development personnel who design the instructional system, and the instructors who will eventually use the system."

Training device definition also should incorporate features employed by the instructor to facilitate greater efficiency in the learning task and maximize the transfer of simulator training to the operational aircraft. Subsequent to initial student training, simulators are also used to maintain crew proficiency. Definition of application is significant to the design of capabilities that maximize the equipment's effectiveness.

Interaction of these key factions must be encouraged to

successfully fulfill the DoD D-5000.2 objective contained in the section on Manpower and Training, "New systems shall be designed to minimize both the numbers and skill requirements of people needed for operation and support, consistent with system availability objectives . . . manpower and personnel considerations. . . ." Government encouragement for the early involvement of industry in the acquisition cycle enhances the application of new technology in the final product. Early interaction gives industry an opportunity to examine their options to be creative, to establish a sound resources plan, to give more realistic direction to their research projects and to develop an effective product plan that reduces industry risk.

The benefits realized by the government from early industry involvement can go beyond reduced risk. The capability of industry is expanded through each commercial application of training equipment. When the definition of training requirements permit the use of commercially developed and applied technology, government costs are reduced. Reduced costs of basic simulator subsystems such as linkage or motion bases makes available more money to fund DoD special needs. Analysis of basic training needs identifies the training objectives that require high fidelity subsystems. Savings resulting from application of commercially available systems can then be utilized in the development of, for instance, Digital Radar Land Mass Systems (DRLMS), weapon system delivery systems, etc., that represent military special needs.

Use of commercial technology can be encouraged through eliminating or waiving specifications and statement of work elements that limit or prohibit its application. The 1982 Defense Science Board,[4] during its Summer Study, concluded that, "... one particular training device has 176 top level military and Federal specifications and 954 second level specifications, whereas if it were bought to Commercial Practices, some 10-12 specifications apply." Such a proliferation of regulations is expensive to administer, may eliminate prospective contractors or subcontractors, may not be cost-effective to apply to commercial products and will complicate the contracting process. Interaction of government and industry can arrive at an acceptable compromise consistent with developing cost- and training-effective equipment.

An Air Force Systems Command analysis of the effects of cost growth on system acquisition identified factors that historically contribute to this growth. Of the five most significant, technical problems and impact of technical advancement have declined in severity. Technical complexity, as a factor, has grown only slightly with less growth in the 1970s as systems become increasingly more sophisticated. The analysis concluded that ". . . The big surges since the days when systems cost less and were fielded sooner have come in external management impact and in funding instability."[5]

This study indicates that government and industry effort to define the desired product has shown progress but other disruptions have accelerated. These disruptions represent a significant risk to both the short- and long-term profit objectives of industry. Sound product planning and stable performance is jeopardized and capital investment is less attractive when there is insecurity in the market. Unfortunately, these are factors normally beyond the control of government agencies responsible for systems procurement but they must be recognized and dealt with to minimize the impact whenever possible.

In order to establish the capability to bid on government procurements as a prime contractor, members of industry must invest in capital equipment, research and development, personnel and operating systems. Skills required to develop, design, produce and deploy an efficient device are diverse and can be obtained only through training, experience and current state-of-the-art knowledge. Dr. Andrew P. Mosier in his article "Enhancing Productivity Through Increased Capital Investment,"[6] states, ". . . internal cash flows are the main source of funds available to defense contractors for financing investments in new technology and capital equipment. Experience has shown that unless total cash flows from long-term defense contracts cover a substantial portion of the operating costs, few contractors will make capital investments to improve their productivity on defense programs." Both, new technology, especially in the areas of DoD special needs, and efficient productivity, are necessary for a firm to be sufficiently competitive to secure and maintain a military contract baseline. This process, shown in Figure 1, expands beyond a regenerative cycle as more funds become available to invest in advanced simulator technology, new manufacturing processes and modern equipment.

As a firm's baseline position gains strength, its competitive proficiency increases. As the contractor's baseline and cash flow grows and as he anticipates his share of the long-term training equipment market to expand, the firm will optimistically make the long-term investments needed to solidify their competitive position. When competition sharpens, the government benefits in a number of

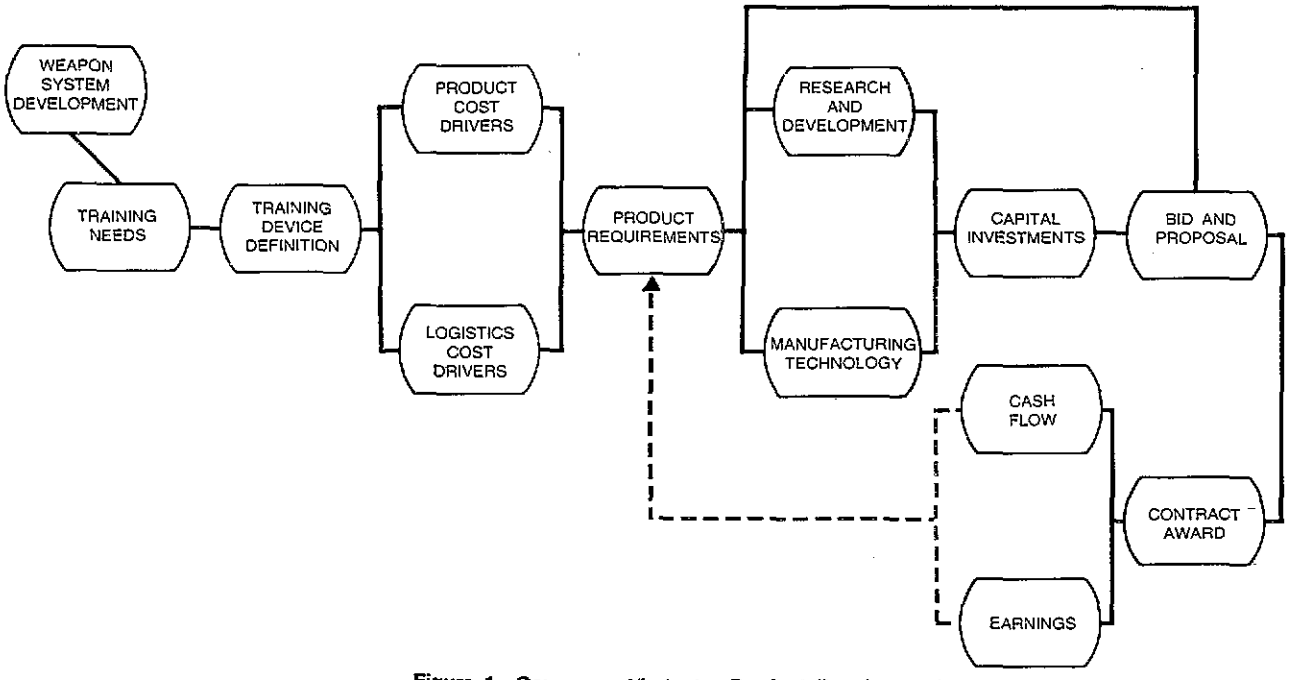

Figure 1 Government/Industry Product Development

ways. In writing about "Increasing Competition in the Acquisition Process,"[7] John C. McKeown notes this scope as, "For DoD, the benefits of competition extend beyond just cost reduction to include stimulation of innovation not only in technological and design areas, but also manufacturing, lower unit costs, satisfactory technical performance (and also quality), and a strengthened industrial base."

Contract commitments are another key consideration for industry in their pursuit of military simulator business. Specifications, statement of work and schedules establish the parameters that define the degree of risk a project represents. Contract terms and conditions determine the government/industry participation in that risk. Total risk, represented by a project, can be minimized by both participants through early preparation. The cost of initial preparation and development is a small portion of a training device. Government/industry interaction to mutually define the expanse of the program and funding, state-of-the-art technology and schedule limitations will provide the framework for a strong competition and a sound and attainable project.

Identifying risk and contractor investment associated with a project gives a firm basis for establishing a profit objective and contract type. As risk is reduced, the contract type should move from cost reimbursement toward fixed price. A profit objective should be structured to recognize assumption of risk, contractor investment and performance. Defense Acquisition Regulation (DAR) Guidelines set forth ground rules for the application of specific contract types.

The contract type should be selected to provide a maximum incentive for the contractor to perform to the desired level in the most economical manner commensurate with the circumstances of the particular procurement (Figure 2). Fixed price contracts normally provide the most incentive for contractor performance. However, degree of effective competition, extent and nature of contract performance, level of contractor experience, relationship of contract requirements to state-of-the-art, perceived accuracy of the quoted price, degree of financial risk and financial position of the contractor can influence the decision to select a contract type other than firm fixed price.

While the profit motive induces contractors to commit resources, cash flow makes these resources available. Cash flow comes from progress payments and sales. Recently, the government has recognized the contractor's need for cash flow relief. Provisions have been made for increased progress payments. When applicable, flexible progress payments can be implemented and milestone billings may be used to supplement progress payments. These cash flow reducing techniques also have aided contractors in reducing the amount of interest expense, an unallowable cost, they accrue in performing government contracts. These provisions should be a significant element in the contracting process and must be applied in an effective manner to maintain the financial health of military contractors.

In conclusion, the interfaces required to produce and maintain training devices for high technology systems are numerous and complex. Mutually acceptable results only come through the extensive effort of government and industry management in close interaction. Explicit definition of a training devices application and capabilities must be thoroughly prepared by the government. Specifications must be tailored where commercial off-the-shelf products will meet performance and maintainability requirements, or where special/specific capabilities need to be emphasized to meet training requirements. Industry can help identify such areas and aid in the most effective use of available funds if brought into the procurement cycle early enough. Timeliness of funding by the government motivates industry to respond with innovation and cost-saving productivity to provide state-of-the-art training devices while maintaining earnings at an acceptable level. Industries that are not making a profit will not make the long-term investments in technology and facilities that are necessary to support government agencies in their effort to gain increased readiness through training.

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RISK	PROGRAM CONDITIONS							CONTRACT TYPE
LOW	COMPETITIVE	WELL DEFINED CONTRACT REQUIREMENTS	HIGH CONTRACTOR EXPERIENCE BASE	CONTRACT REQUIREMENTS WITHIN STATE-OF-THE-ART	COST PRICE VARIATIONS ANTICIPATED TO BE MINIMAL	LOW CONTRACTOR FINANCIAL RISK	SOLID CONTRACTOR FINANCIAL BASE	FIXED PRICE
MODERATE	SOME COMPETITION	GENERALIZED CONTRACT REQUIREMENTS	VARIED CONTRACTOR EXPERIENCE	MODERATE TECHNOLOGY ADVANCEMENT	COST/PRICE VARIATIONS ANTICIPATED	MODERATE CONTRACTOR FINANCIAL RISK	VARIED CONTRACTOR FINANCIAL BASE	FIXED PRICE INCENTIVE
HIGH	SOLE SOURCE OR LIMITED COMPETITION	VAGUE CONTRACT PERFORMANCE	LIMITED CONTRACTOR EXPERIENCE	DEVELOPMENTAL OBJECTIVES	ACCURACY OF QUOTED PRICE UNCERTAIN	HIGH CONTRACTOR FINANCIAL RISK	LIMITED CONTRACTOR FINANCIAL BASE	COST PLUS

Figure 2 Contract Selection Considerations

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