TRAINING SYSTEMS VIA "NEW WAY" BEST VALUE CONTRACTING AND MIL-STD-1379D

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ABSTRACT

In 1993-1994, STRICOM formed a team to acquire the AGTS (Advanced Gunnery Training System). The team developed a "new way of doing business" which synthesized a number of concepts--best value source selection; emphasis on processes and metrics and total quality leadership; concurrent engineering; integration of MIL-STD-1379D and the systems approach to training; application of the Fixed-Price-Incentive (Successive Targets) contract type; range pricing; and a uniquely structured Request for Proposal. This "new way of doing business is described and lessons learned are presented.

ABOUT THE AUTHORS

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INTRODUCTION

In simplified terms, acquisition of a training system may be viewed as having three phases: (1) Development and release of a Request for Proposal (RFP) built from the user's requirements, (2) Proposal evaluation and contract award, and (3) Government and awardee accomplishment of the development, testing, fielding, and life cycle support of the system. The Advanced Gunnery Training System (AGTS) program has completed phases one and two, with some significant accomplishments and lessons learned.

BACKGROUND

The AGTS program will provide training systems to support individual, crew, section, and platoon gunnery training for Army personnel who operate the M1A1 and M1A2 Abrams tank, the M2/M3A3 Bradley vehicles, and the Armored Gun System.

THE "NEW WAY OF DOING BUSINESS"

As the scriptures tell us, there is really nothing new under the sun. The AGTS approach synthesizes many concepts which may be familiar: best value source selection, processes and metrics and continuous improvement; concurrent engineering (CE); integration of MIL-STD-1379D and the systems approach to training (SAT); application of the Fixed-Price-Incentive (Successive Targets) (FPIS) contract type; range pricing; and a uniquely structured RFP package. It was the synthesis of these elements which resulted in a new paradigm and a new attitude.

"BEST VALUE" SOURCE SELECTION

Creech (1992), noting that best value source selection has "been around since the forties," describes it as follows: "A process based upon the use of reasoned judgement in selecting for contract award that firm whose proposal reflects the optimum combination of functions, features, performance, and price...." (p. 2).

Glennon and Fagan (1984) pointed out a natural affinity between the best value approach and the front end analysis required to support the development of a training system:

> The Best Value Acquisition Strategy includes the goal to specify at a relatively high level of abstraction. Therefore, once the decision is made to avoid specification in equipment terms (how), the specification writer has no choice but to concentrate intently on the results of Front-End Analysis. In other words, the Best Value Strategy provides a forcing function for a thorough Front-End Analysis and a clear definition of the training problem and associated constraints. (p. 182)

Certainly, the AGTS team found this statement to be correct. The AGTS approach, however, went further: Analysis was viewed as a continuing, not just a "front end" requirement, due to the evolving nature of the vehicles and tasks involved, and a need to continuously insert improving technology, including instructional technology. Additionally, best value was seen as providing an impetus to continuous incorporation of all phases of the SAT, not just the analysis phase.

PROCESSES AND METRICS

One clear link between the AGTS RFP and the literature of total quality leadership (TQL) is the importance of the concepts of **process** and **metrics**.

These two concepts appear throughout the AGTS RFP. For example, the instructions related to the SEMS (Systems Engineering Master Schedule) stated "The SEMS shall at a minimum consist of the offeror's tasks, major subcontractors' tasks, milestones and criteria (measurable metrics) for acceptable accomplishment at each milestone." Similarly, the evaluation factors for award included the following: "Each proposal will be evaluated from the standpoint of adherence to sound practices...(and the) extent to which the offeror has developed measurements to track the process, eliminate errors, remove slack, reduce variation, and plan for continuous improvement."

It was the desire of the AGTS team to achieve the effect summarized by Commander John Langford:

> Processes, measures, customer focus, teaming, and empowerment are all necessary for laying a foundation for continuous improvement...The criteria for empowering a team is fairly straightforward: The team must fully understand customer requirements; understand and accept their responsibilities, authorities, and accountabilities; have the processes, metrics and requisite skills necessary to perform their tasks; and have the full support of upper management. (1994, p. 1)

CONCURRENT ENGINEERING (CE)

Another concept which appears as a requirement in the RFP is CE. CE emerged as a named concept in 1988, as a result of efforts by industry and Government personnel to overcome two weaknesses in traditional systems engineering: the sequential, linear nature of the process; and the proliferation and

isolation of specialists. Linton (1991) explains CE in the following terms: "CE involves a product development infrastructure that fosters a unified, collaborative approach that integrates inputs from business, engineering and management specialists across the traditionally segregated phases of product development (p. iv)."

MIL-STD-1379D

Just as there is a close affinity between the "new way of doing business" and TQL, so there can be a mutually supportive relationship between both of these and a careful application of MIL-STD-1379D, Military Training Programs.

In the AGTS RFP, the Government included two products from MIL-STD-1379D as mandatory requirements: the Training Situation Analysis and the Training System Alternatives Report. Otherwise, the RFP allowed each offeror great freedom:

> Describe the strategy for applying the SAT and MIL-STD-1379D in the analysis, design, development, implementation, and evaluation of courseware for AGTS... The offerors shall provide a Data Item Description for each proposed item of courseware...Offerors are invited to propose substitutions or exceptions to the Work Statement and contract data requirements list (CDRLs).

In response to this empowerment, each offeror, in a variety of approaches, performed some or all of the following tasks: analyzed anticipated AGTS program requirements; selected and tailored tasks and DIDs from MIL-STD-1379D; prepared CDRLs; integrated the tasks and data products into the SEMS and Systems Engineering Master Plan (SEMP); provided additional process information, if needed; and provided appropriate metrics. The results (the submitted proposals) were much more satisfactory than the results of many a Government "CDRL-scrub."

SYSTEMS APPROACH TO TRAINING (SAT)

For the Army, the SAT is defined primarily in TRADOC Regulation 350-7. The model presented has five interrelated, nonlinear phases: analysis, design, development, implementation, and evaluation.

The SAT links well to the "new way of doing business," for several reasons: It integrates systems engineering approaches into training system development, and provides the framework within which MIL-STD-1379D can be applied. Its iterative nature provides for continuous reexamination and improvement of the training system development. Finally, the regulation itself is based on baseline processes and metrics: for each phase, key processes and minimum essential requirements (MERS) are identified.

BUSINESS AND CONTRACTUAL ASPECTS

The selection of the AGTS contract type arose from a desire to synthesize the ideas above into a "new way of doing business." The train of thought went something like this:

* First was the desire to use the SAT as the core concept of contract performance.

* CE would be required to implement the concept.

* For CE to work, the contractor had to be pursuing **his** solution that he believed in. The Government had to cease dictating solutions and aproaches.

* The contract had to support and satisfy multiple users with diverse needs over a lengthy period of time.

* Access to technology insertions and business flexibility was needed.

* The use of other than Firm-Fixed-Price together with the desire that the contractor be executing his concept, led to the "best value" source selection method.

All the requirements had to be achieved under competitive conditions, leading to a "program friendly" production contract that was an attractive business arrangement for industry. Where development is not pushing the state of the art, the use of a production contract form lends program stability (through budgeting certainty), and allows for a lengthy contract, giving the contractor some assurance of future business base.

The need for flexibility and equity led to a selection of range pricing and the little used FPIS contract type.

FPIS is a standard Federal Acquisition Regulation contract type (FAR 52.216-17). Fixed Price Incentive (FPI) contracts are characterized by three things: (1) A ceiling price that is not subject to change, hence "fixed price"; (2) A target price that is the anticipated price of performance; (3) An overrun/underrun cost share ratio (which may be different for overruns and underruns), hence the "incentive."

All FPI contracts provide for the negotiation of final firm fixed prices. The successive target type is distinguished from the fixed target type by provision for an interim negotiation at a specified milestone which will convert the contract to either a Fixed Price Incentive (Firm Target), [the successive target] type; or a Firm Fixed Price type, with the latter preferred. The FPIS type also typically has a higher ceiling and a larger Government share than the FPIF type. Both types are designed for an equitable division of risk between the contractor and the Government.

In summary, the FPIS contract type allows for the equitable sharing of cost risks early in the contract when there are many unknowns, and provides for negotiation of fixed prices reasonably early in the contract after the principal risks are known.

Range pricing is simple in concept. The contractor proposes different unit prices for different ranges of option quantities. In AGTS the range pricing table included in Section B of the RFP was quite complex because it allowed for ordering almost any mix of twelve different configurations

delivered to any of ten destinations, with unit prices for quantity ranges of 1, 2-4, 5-8, and 9-24. This provided the Government with immense flexibility in exercising options.

RFP STRUCTURE

Like contract type, RFP structure was selected to reflect the "new way of doing business." The unique aspects of key sections of the AGTS RFP are discussed in the following paragraphs.

Section L

Sections L was written to require the offerors to build their proposals as follows: Volume I, Past Performance; Volume II, Requirements Evolution; Volume III, Integrated Management; Volume IV, Supportability; Volume V, Affordability; and Volume VI, Administrative.

The use of a Past Performance volume reflected a best value source selection concept. This volume was analyzed by a separate evaluation group, using data provided by each offeror on Government contracts worked as a prime or subcontractor during the past three years.

Volume II, Section L, Requirements Evolution, required the offerors to fully lay out their pre-contract and post-contract approaches for integrating systems engineering processes with the SAT and MIL-STD-1379D:

> Show how the results of the integrated systems engineering/training system requirements analysis process will lead to major system/subsystem functional requirements and to the overall training system requirements.
>
> Discuss the strategy for applying the systems approach to training and MIL-STD-1379D in the analysis, design, development, implementation, and evaluation of courseware for AGTS.
>
> The offerors shall provide a Data Item Description for each proposed item of courseware as an annex to Volume II (exempt from page limitation).
>
> Explain the analysis and design methods which will be used to translate training requirements to performance and finally to a visual system design.

Volume III, Section L, Integrated Management, placed two primary requirements on the offerors, in an effort to seek implementation of the "new way of doing business." These two requirements were (1) SEMP; (2) SEMS.

The SEMP was to synthesize what would normally be separate specialty plans into a coordinated master plan for the integration of all program efforts. The SEMP was to describe, via text and diagrams, proposed processes and procedures to accomplish AGTS.

The SEMS was to consist of the offeror's tasks, major subcontractor's tasks, milestones, and **criteria (measurable metrics)** for acceptable accomplishment at each milestone.

Section M

Section M was written to clearly reflect best value source selection concepts. For example, the relative importance of the areas was as follows: the Requirements Evolution volume (which contained most of the material on the SAT and MIL-STD-1379D), along with the Integrated Management volume (which contained the SEMP and SEMS, with their emphasis on processes and metrics) were rated as most important. Affordability, along with Supportabilty, was rated as less important than the two top areas, and more important than Past Performance.

Work Statement

For AGTS a very minimal (20 page) Work Statement was developed. The offerors were given full freedom to propose changes to the work statement and submit them as part of the Administrative volume. During the pre-proposal briefing it was made clear to the offerors that MIL-STD-1379D did not contain all necessary processes and metrics required to develop AGTS and that therefore the offerors would have to take action to insert necessary processes and metrics into their proposals.

The following statements were used in the AGTS Work Statement, in regards to SAT and 1379D:

> The contractor shall perform the trade off studies necessary to determine the training strategy and then finalize the system design.
>
> The contractor shall conduct a training situation analysis of the types and levels of training.
>
> IAW Task 206, MIL-STD-1379D, the contractor shall identify the various elements, such as alternative features, capabilities, and characteristics, of the AGTS training system and analyze the effectiveness in meeting the training requirements (DI-ILSS-81086).

Specification Guide

The AGTS RFP did not contain a specification. Instead, each offeror was required to deliver a "starting point" specification as part of the proposal. A brief (11 page) specification development guide was provided. The Guide stated "To the extent that it is known, provide information that defines the proposed system and quantifies the performance level proposed...." During the face-to-face discussions, each offeror was cautioned not to build a specification which was prematurely detailed; any design decisions described had to be supported with training requirements analysis and trade study data.

System Requirements Document (SRD)

An SRD was developed by the AGTS team, based on meetings with the users and on the user-developed requirements documents.

Requirements statements in the SRD were limited to the top level of detail; for example: "The system shall provide the capabilities to monitor and evaluate the individual's, crew's, section's, and/or platoon's duties in response to fire commands, in a realtime manner." Thus the SRD allowed

for contractor innovation, technical and instructional effectiveness breakthroughs, full implementation of the SAT, meaningful trade off analyses conducted through concurrent engineering and participation with the user, and an evolutionary approach to AGTS design.

EVALUATING PROCESSES AND METRICS, USING MIL-STD-1379D AND THE SYSTEMS APPROACH TO TRAINING

In order to evaluate each offeror's application of MIL-STD-1379D and the SAT, the instructional systems specialists on the AGTS team applied analysis of AGTS requirements, along with the DID selection and tailoring guidance in Appendix A of MIL-STD-1379D and the minimum essential requirements in TRADOC Regulation 350-7. The results were identification of two sets of "core" tasks and DIDs from MIL-STD-1379D. One set related to the application of SAT and MIL-STD-1379D in support of the development of the AGTS simulation system hardware and software components, e.g. the visual system, computational system, crew stations, instructor-operator station, and exercise generation system. A second set related to support of AGTS courseware, e.g. the gunnery exercises in the instructional subsystem, and the courseware for training of the instructor-operators and the scenario-generation personnel.

A similar "starting point" Government analysis was made to identify critical processes and metrics for the core DIDs. An example is shown in the following excerpt (metrics are in **bold**):

1. TRAINING ANALYSIS PROCESS:

a. Training Situation Analysis (TSA):

(1) The TSA **process** must be **complete:** MIL-STD-1379D subtasks 101.2.1, 101.2.2, 101.2.3 required.

(2) **Completeness** of the TSA **product**, is required, according to the tailoring requirements on the CDRL.

(3) TSA **scope** and **iterative schedule** (as shown on CDRL and SEMS) must reflect the variety and changing nature of the training situations.

(4) **User coordination.**

(5) **Multidimensionality**, that is, alternative problem solutions must be compared on all critical dimensions: training effectiveness, cost, schedule risk, engineering, risk, MANPRINT, supportability, maintainability, reliability, and others as required.

Similar analyses were made to examine the tailoring of the actual DIDs from MIL-STD-1379D. None of these Government analyses were considered to be THE answer, but a starting point for discussion.

LESSONS LEARNED

Create Operational Definitions

Process and metrics were two

central concepts of the AGTS RFP. Communicating precisely the meaning of these concepts, however, proved to be a task of great difficulty. During AGTS RFP development and proposal preparation and evaluation the Government and contractor AGTS teams repeatedly grappled with trying to achieve and communicate a common understanding of these two terms. For example, in an attempt to be more clear, other terms were used to amplify the meaning of "process," words like "approach," "methods," "strategy," and "practices." In retrospect, however, these amplifications probably just increased the communication problem.

Dr. Deming was certainly familiar with this problem, and proposed a solution, the operational definition:

> Meaning starts with the concept, which is in somebody's mind, and only there: it is ineffable ....An operational definition puts communicable meaning into a concept...An operational definition is one that people can do business with (Deming, 1986, pp. 276- 277).

One lesson learned, therefore, was to include in future RFPs operational definitions of key concepts, and to seek meaningful discussions of these concepts as early as possible.

Improve Preproposal Conference

For the AGTS program, discussions at the pre-proposal conference were superficial. In contrast, the face-to-face discussions of clarifications and deficiencies were extraordinarily open and useful for both the Government and the offerors. A way must be found to have this meaningful and open discussion at the pre-proposal conference, or during RFP development, or at some other early point in the process.

Early discussion should contain expanded and clear presentations by each Government functional representative concerning what they will be looking for, perhaps on a factor by factor level. The focus should be on "sound practices" and appropriate metrics, not on design solutions for the particular program. The discussions should include a communications check, whereby industry presents their understanding of what was said, with follow-on Government-industry clarifications. This type of communication of expectations would reduce the hours devoted to writing and resolving clarifications and deficiencies, which were a large part of the cost of AGTS proposal evaluation. Needless to say it would also reduce the rework of the bidders.

Clarify Requirement for Metrics

The Government should clarify that metrics include much more than a software tool, or a list of products and dates for accomplishment. Metrics also include measurements of quality, communication, coordination, and impact/traceability. For example, it does not matter if a visual fidelity analysis is done on time if it is of poor quality or if it is not communicated in a timely manner to the various functional areas within the offeror's team, or if once communicated it is not used.

Emphasize Plans, Processes, Metrics

A clear requirement and methodology must be developed to ensure that the offeror's proposed processes and metrics are placed in the contract in a clear and consistent manner. The original intention for AGTS, with its brief Work Statement, was that the offerors would have two avenues for inserting their desired processes and metrics: first, inclusion in the SEMS and SEMP, which were to become part of the contract; second, as changes to the Work Statement. Neither of these approaches worked satisfactorily. The offerors placed their processes and metrics primarily in Volume II, Requirements Evolution, and Volume III, Integrated Management. As a result, the Government decided to incorporate the entire proposal into the contract. This is a less than ideal solution, due to the fact that it is inevitable that there will be inconsistencies between the various parts of the proposal. Lesson learned: at the pre-proposal conference, place much more emphasis on the importance and the role of the SEMS and the SEMP. Another approach might be to eliminate the Work Statement from the RFP and have the offerors submit a Work Statement of their own which must match the approaches described in the technical and management volumes, and must be consistent with the SEMS and SEMP.

SUMMARY

For the AGTS program a "new way of doing business" was used by the RFP preparation team and was embedded into the RFP and the proposal evaluation process. This new approach synthesized elements of a variety of concepts, approaches, and tools: best value contracting, processes and metrics, continuous improvement, MIL-STD-1379D, the systems approach to training, concurrent engineering, Fixed Price Incentive (Successive Targets) contract approach with range pricing, and an innovative RFP structure. The results of this new approach were thoughtful, innovative, affordable proposals designed to meet the Army's evolving needs for advanced gunnery training now and in the future.

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