PROCURING A MILITARY TRAINING SYSTEM IN THE COMMERCIAL MARKET: LESSONS LEARNED

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Abstract

This paper will describe the experiences and lessons learned of the C-130J Maintenance & Aircrew Training System (MATS) team in procuring a military training system in the commercial market. When procuring military products that are similar to those offered on the commercial marketplace, using a commercial contract can save the government time and money. However, the benefits of using commercial procedures to buy a training system must be weighed against the risks of purchasing items that require modification or do not exactly meet the customers needs. The lessons learned by the C-130J MATS team have wide application across other military training system acquisitions in the commercial market.

Procuring a training system as a commercial item can be particularly difficult because the system can be composed of many dissimilar elements such as training devices, courseware, and operations that may or may not have a commercial equivalent. The commercial designation has presented several unique challenges for the C-130J MATS team. The commercial market provides similar products for portions of the training system, especially aircraft flight simulators. However, it is much more difficult to find commercial equivalents to military maintenance training devices. While the C-130J MATS will reap some benefits of a commercial acquisition, not all expected benefits will be realized. The pros and cons of acquiring a typical military training system on the commercial market will be discussed, along with lessons learned and recommendations for improvement.

Biographical Sketch:

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BACKGROUND

The C-130J Maintenance and Aircrew Training System (MATS) provides the United States Air Force (USAF) with a long-term training solution for the C-130J aircraft. The C-130J MATS is unique because it is the first known government-owned, contractor-operated training system procured as a commercial item under Federal Acquisition Regulation (FAR) Part 12 by the USAF. The USAF has procured training systems under FAR part 12 but they were fee-for-service contracts. Under fee-for-service contracts, the government buys a service, such as device usage time, but does not own the equipment.

The aircrew portion of the C-130J MATS will provide ground training and simulator flight instruction to C-130J aircrew members and engine run technicians. The C-130J MATS contractor will provide aircrew training devices with associated data, aircrew courseware and instruction. The contractor will also provide operation and maintenance of the training sites to include the operation of a training system support center (TSSC). The TSSC is the center of operation for all aspects of the C-130J MATS to include student operations and maintenance of courseware, technical data, software, and hardware. Concurrency upgrades for both aircrew and maintenance devices will be provided.

The maintenance training part of the system will provide organizational maintenance training support with hands-on maintenance training devices to support aircraft maintenance technician training and certification. Courseware development and instruction will be provided by the Air Force and were not included in the acquisition.

As a commercial contract, all items have firm fixed prices. The basic contract will procure a weapon system trainer, courseware, and related support. Yearly options for the remaining devices and support elements are included in the contract through FY06.

PURPOSE

The purpose of this paper is to describe the experiences of the C-130J MATS team in procuring a military training system using commercial practices. The lessons learned by the C-130J MATS team have wide application across other military training system acquisitions in the commercial market.

OVERVIEW OF TRAINING MARKETS

Commercial aircrew training market

The strong demand for commercial air transportation has fueled a continuing need for commercial aircrew training. In response, several options exist for procuring aircrew training in the commercial market.

Aircrew training may be procured directly from or through the aircraft manufacturer. Normally, smaller air carriers and other customers that don't have resources to perform in-house training buy training time from the aircraft manufacturer. For example, the Boeing Company and FlightSafety International formed FlightSafetyBoeing Training International as an independent company to provide commercial aircraft training. FlightSafetyBoeing offers courses for several aircraft variations at its

training centers located around the world. Airbus also operates its own training centers for its customers around the world.

Training may be provided in-house by the airlines themselves. Due to economies of scale, large commercial carriers typically train their own crews and maintain their own training facilities. Flight simulators are the primary training media, along with courseware and computer based training, for providing aircrew training. Delta airline owns and maintains a training facility for its aircrews. By operating its own facility, Delta is able to control all aspects of crew training including the number of students trained, course content, and pace of training. Delta also offers its training services to third party customers on a fee-for-service basis. Pilot ground school and flight training including flight simulator time as well as training for in-flight, maintenance and airport customer service personnel is available through Delta.

Military aircrew training market

The methods of obtaining training for military aircrews of large cargo and tanker aircraft are similar to those on the commercial market, but there are differences. The two primary differences are: 1) the military contracts out the operation and maintenance of the training system, and 2) the market for military aircrew training is much smaller than the commercial training market due to the specialized nature of the military customer base. Although there are differences, the commercial market can meet military training requirements, with minor adjustments, especially in the area of aircrew training. Recognizing the similarities, the military has increasingly looked to the commercial market for procurement of training systems. No longer tied to military directives requiring the use of organic logistics support and government specifications, the military customer can take advantage of training methods and acquisition practices of the commercial market.

COMMERCIAL PRODUCTS DEFINED

The government definition of a commercial product is found in FAR part 2.101. The C-130J training system was determined to be a commercial item because it fit within the following definition: "Any item, other than real property, that is of a type customarily used for **nongovernmental** purposes." A survey of the civilian airline industry found that the same **types** of items are procured by non-government agencies. Simulators, flight training devices, part task trainers, and training services are offered for the civil aircraft market. Custom-tailored maintenance trainers are also offered for all types of civilian aircraft. Therefore, it was determined that the type of training system for the C-130J was not exclusive to the government.

Another applicable portion of the commercial item definition applies to minor modifications. The USAF C-130J aircraft has features not common to the general public. For example, the C-130J aircraft is equipped with a defensive system suite and flies military missions such as low-level flight, combat delivery, airdrop operations, and weapons transport. These differences will not alter the essential physical characteristics of the C-130J training system, and they were considered minor when compared to the overall system.

ACQUISITION REFORM AND COMMERCIAL BEST PRACTICES

The C-130J MATS program instituted many acquisition reform initiatives to streamline the acquisition process and institute commercial practices. For example, many FAR clauses were eliminated and all military specifications and standards, except for MIL-STD-882, System Safety Requirements, were eliminated. The Pre-Award Information Exchange System (PIXS), an electronic data exchange system, was used to speed up information flow between the government and contractors during the request for proposal phase of the program.

The C-130J MATS team performed market research to determine what private sector practices could be applied to the contract to improve the acquisition process. Three commercial practice initiatives which were applied to the C-130J MATS contract are described below.

Payment Procedures: Market research found that while payment methods varied, event-based payments were commonly used in commercial training contracts. The C-130J MATS team adopted event-based payments for non-service

type products. Payment events are based on milestones identified by the contractor in the integrated master plan. The payment events include entrance and exit criteria so that the contractor is paid by successfully passing performance milestones. This provides a unique structure for government controls and disbursement points directly related to contractor performance and promotes an incentive based system. In contrast, many military contracts contain progress payments. Progress payments are paid at intervals and are not based upon meeting milestones. Although the government loses some ability for oversight of the contractor under a commercial contract, performance based payments provide a great incentive for the contractor to perform with less government oversight.

The percentages paid at each milestone were negotiated based on commercial practice and FAR limitations. Service types of tasks, such as logistics support, instruction, and operation of the training system support center, are paid on a quarterly basis. Tasks that require an up-front investment for equipment and material, such as site activation, provide an initial partial payment upon exercise of the contract line item.

Commercial Data: The government intends to compete follow-on operation and support of the training system. In order to hold a competition, technical data is required from the MATS contractor in sufficient detail to allow another party to assume operation and support in a follow-on contract. Under the provisions of FAR 12.211, Technical Data, the government may only acquire technical data and the rights to that data customarily provided to the public with a commercial item. Market research found that technical data is customarily provided for operation and maintenance of training systems. Rather than dictate technical data requirements, the team provided a performance-based statement and allowed the contractor to determine what data would be required. As a result, the contractor included a technical data package in the contract that is typically provided to other commercial customers which will allow maintenance and engineering personnel, under the current and follow-on operations and support contracts, to operate, maintain, and update the training system.

Commercial Upgrades: In the commercial market, companies must improve their products on a continuous basis to stay competitive. Under typical government procurements, specifications are defined such that only a single product developed specifically for the government can satisfy the requirement, and any changes or product improvements are directed and paid for by the government. As a commercial acquisition, the C-130J MATS was able to benefit from a commercial improvement on the visual system in the weapon system trainer. An upgraded version of the image generation system was released which offered improved performance over the existing system. The government was able to benefit from this upgrade without directing the change or incurring the direct cost of the improvement.

PROGRAM LESSONS LEARNED

Data Acquisition

On commercial trainer procurements, the customer typically negotiates the use of the data during the aircraft procurement. The data required to build, test, and qualify civil aircraft simulators is identified in the International Air Transport Association (IATA) Flight Simulator Design & Performance Data Requirements document. The IATA document provides a standard describing the data necessary for simulators to meet qualification levels as defined in the FAA Advisory Circular 120-40B. The IATA document also defines the processes for obtaining and maintaining the data. When an aircraft is bought on the commercial market, all data that is required for building a simulator is addressed in the contract between the aircraft manufacturer and the customer that buys the aircraft and/or licenses the data package. The aircraft manufacturer is required to have a system in place to ensure all data required for production of flight simulators provided and kept up to date.

The aircraft data required to build the C-130J MATS was subject to the terms of an “enabling” agreement on the aircraft contract. Under the terms of the agreement, the C-130J aircraft manufacturer would attend industry orientation

sessions to provide aircraft information to potential trainer system contractors. The agreement further required the C-130J aircraft manufacturer to negotiate terms and conditions with the winner of the training system contract for use of aircraft data required to build the MATS. Unlike commercial practice where the data is supplied to the aircraft customer under the terms of the aircraft buy, potential C-130J MATS contractors were required to negotiate directly with the C-130J aircraft manufacturer for procurement and use of the C-130J data.

The intention of the enabling agreement was to ensure that the aircraft data required to build a training system would be made available to potential training contractors. The agreement was meant to both provide data and foster competition among potential training system contractors. The agreement was also intended to keep the government out of the data exchange business and allow the contractors to negotiate terms and conditions for use of the data. However the agreement proved to be less than effective for ensuring the data required to build a training system was available to prospective bidders. The difficulty in obtaining data resulted in limited competition.

Data Acquisition Lesson Learned

The aircraft training system or the data needed to build a training system should be negotiated under the terms of the aircraft contract when the customer has greater leverage. The government chose to postpone buying the training system or the data required to build a training system to a separate, future acquisition. When negotiating the higher priced aircraft contract, the customer has greater leverage to negotiate favorable terms and conditions for trainers and/or data required for training.

While the IATA process and FAA documents provide specific requirements for data gathering and device definition for civil aircraft simulators, they do not adequately define the data or device requirements for military simulators. The flight test data required to model unique military missions in simulators are not addressed in sufficient depth in FAA documents. The enabling agreement was intended to provide contractors access to the data required to emulate the unique military missions of the C-130J; however, it did not adequately address the process for gathering that data. Some combination of the requirements and processes contained within IATA and FAA documents and the enabling agreement would be desirable to ensure the data required to provide a military simulator was made available to prospective bidders.

Training Device Acquisition

Aircraft simulators are the primary training media for commercial aircrew training and several companies offer their products on the commercial market. The same types of aircrew training devices being procured for the C-130J program are also offered for sale in the commercial marketplace. Commercial training simulators are built to meet the FAA Circular 120-40B Level A (least fidelity) to Level D (most fidelity) qualification levels.

The mission of the C-130J aircraft includes combat delivery, low level flying, weapons transport, low-intensity conflict, survivability and threat operations. Because C-130J aircrews must be trained on those missions, the training devices procured must include those capabilities. The primary aircrew training device being procured for the C-130J aircraft is a weapon system trainer (called a “simulator” on the commercial market), see Figure 1 below. In addition there is a cockpit procedures trainer equivalent to FAA AC120-45A level 6 flight training device and an avionics systems management trainer that provides training in the operation and control of C-130J communications, navigation, identification, flight management, and display systems.

Figure 1. C-130J Simulator

Photo provided by BAE Systems

The C-130J weapon system trainer will satisfy the performance requirements of FAA AC 120-40B Level D as well as provide training for airdrop, night vision, and combat operations. Each WST will have a six degree-of-freedom hydrostatic motion system and a five-channel image generation system. The WST includes a full color day/dusk/night computer-generated visual system with a Field-Of-View (FOV) of 200 degrees horizontal by 50 degrees vertical. Included with the WST are a loadmaster station and a total of four landmass databases. The databases will include air bases at Pope, Little Rock, and Keesler. The database will include all scene features, cultural details, and moving models in the source data in order to train specific military missions.

In contrast, commercial simulators do not usually require large visual fields of view or databases because the mission of a typical commercial airliner is to take off and land with fairly steady flying in between. While there has been recent interest in the civil aircrew trainer market to increase size, the typical FOV on a commercial trainer for large aircraft is 150 degrees horizontal by 40 degrees vertical. On commercial training devices, the visual databases must provide adequate terrain detail primarily at take-off and landing sites only. Of course, commercial simulators do not usually have defensive avionics suites and loadmaster station equipment. Because of the need to train these specific military missions, military training devices are more complex as compared to commercial devices. This can present some real challenges to the government office responsible for purchasing a military simulator using commercial procedures.

The first challenge is to adequately specify requirements in the request for proposal documents. The simulator specifications in a commercial contract are usually minimal in comparison to military requirements documents. When purchasing a military simulator using commercial procedures the government has to be able to adequately define the requirements for the military mission without over specifying basic simulator characteristics. The government can and should use performance-based specifications under a commercial FAR 12 acquisition to define the requirements for the military training system.

The second challenge is for the government to realize that there is less oversight on a commercial contract than a military contract. Market research indicated that preliminary design reviews, critical design reviews, and configuration audits were part of normal commercial processes. However, the government does not control the design of the product and is in a participatory status during the reviews.

The last challenge is determining a fair and reasonable price for the simulator. Under FAR part 12 the contractor does not have to provide certified cost and pricing data. The preferred method of pricing is to use historical data or data from comparable systems. Our experience shows that there is so much variation in simulator design that it is difficult to do an adequate price comparison. For example, two Level D simulators for similar aircraft may have very different visual fields of view and image generation capability. These differences have a significant impact on price. When adding modifications for a loadmaster station, visual databases, and defensive avionics it becomes even more difficult to perform a commercial price comparison.

Training Device Acquisition Lessons Learned

While the same types of training devices being bought for the C-130J aircraft are available for commercial aircraft, the features and capabilities of the devices vary greatly. These differences must be considered when procuring military training devices on the commercial market. While the military-specific features of the devices are considered minor modifications in accordance with FAR Part 12 because they don't alter the essential nature of the device, the differences may significantly affect device specifications, which in turn has an effect on the price of the system.

Training System Requirements Analysis (TSRA)

A TSRA is a systematic process used by the government to define key components, interrelationships, and requirements of a training system. It is based upon an integrated instructional systems development/systems engineering process that develops data items to

document the training and preliminary system requirements. It can be used to address components of training (e.g. a device) or the total training system for either weapons systems operations or maintenance training applications. TSRAs are usually done in the developmental phase of a program to define the training requirements (including courseware) prior to production. The results determine the types and quantities of training resources and infrastructure to acquire. Requirements analyses are usually conducted for commercial training systems. However, TSRAs for military aircraft or commercial aircraft used in a military environment are usually more complex and involved than those for strictly commercial aircraft.

Early in the acquisition, there was some question as to whether a TSRA was required on the C-130J MATS. The argument for not having a TSRA was that the C-130J MATS is a commercial system and as such, should already have all training requirements defined. In addition, a training equipment requirements document (TERD) had been prepared under the C-130J aircraft contract. The TERD focused on the media needed to perform hands-on training. However, the combination of the commercial requirements analysis and TERD was not sufficient to identify all the military training requirements.

It was decided than an abbreviated TSRA would be performed using the TERD as a basis. While the TERD defined types and numbers of devices, we discovered that the courseware requirements to train the military mission were not defined. An abbreviated TSRA was necessary to identify courseware requirements and ensure that all C-130J MATS elements interface effectively.

TSRA Lessons Learned

Even though an aircraft and corresponding training system may be considered commercial, if it has a military mission, a TSRA should be conducted. The unique military missions are not likely to have been included in existing analysis on commercial systems. These unique missions may drive training tasks and courseware required for military applications.

Optimally, a TSRA should be conducted early in the program. The TSRA will help the government identify courseware and other program requirements up-front in the acquisition process.

Maintenance Training

The maintenance training concept of the MATS is to provide a system that uses actual hardware components or sub-systems so that a student can be certified to perform maintenance training tasks without supervision prior to working on the aircraft. The requirement to perform certification drives the C-130J maintenance devices to be high fidelity. Fidelity is the level of replication of physical (size, weight, location) and functional characteristics of aircraft components and systems. Accurate or high fidelity in each task performance area is critical to training and certification utilizing the training device.

The maintenance training segment of the MATS includes an integrated cockpit systems trainer (ICST), contractor logistics support, and concurrency management (evaluation of aircraft changes for their impact on training) for the training devices. The ICST is a high fidelity maintenance training device that will simulate the flight station structure and avionics systems of the C-130J aircraft. It will be used to certify Air Force mechanics and provide training in organizational maintenance skills as well as techniques to maintain the aircraft systems.

Maintenance training devices are used by commercial airlines for maintenance training. However, the airlines typically use aircraft maintenance trainers to teach the functionality of aircraft systems or subsystems and are not used for hands on training. The main reason is that the airlines do not certify their technicians on the training devices and rely more heavily on on-the-job training. A common commercial maintenance training device could be a computer-based device that does not resemble the aircraft equipment. Avionics trainers seem to be the most common type of maintenance training device in the airline industry. The avionics trainers are used for fault isolation, insertion and evaluation training. Although airlines have different training techniques, most of the technicians receive training in theory and fundamentals of aircraft systems and work their way up through the ranks. The differences in

training concept between commercial airlines and the military make it difficult to find commercial maintenance training that will satisfy the needs of the military.

Maintenance Training Lessons Learned

Maintenance training devices are sold in the commercial market, but it is nearly impossible to find a commercial maintenance training device that meets military requirements. The training devices required by the military are generally unique to the aircraft and require some development. It is difficult for the government to specify the requirements and determine a fair and reasonable price for something that is one of a kind. In turn, it is difficult for contractors to bid a firm fixed price for an item that requires some development effort.

Historically it has been difficult to define and specify the requirements to build a maintenance training device that has enough fidelity so that training certification can be accomplished. The lack of definition on other maintenance training programs has resulted in numerous changes leading to significant cost increases. The commercial nature of the C-130J MATS makes it even more difficult to make changes after contract award. There have been many concerns from industry about bidding training devices that have a certification requirement on a firm fixed price basis.

Application of Lessons Learned

The C-130J MATS program is unable to quantify any tangible savings from the application of commercial practices. The problems described in the lessons learned section offset the expected benefits. However, the next commercial training system acquisition should result in quantifiable cost and time savings if the lessons learned from the C-130J MATS program are applied.

SPECIAL CONTRACT INITIATIVES

The C-130J MATS contract contains some unique contract provisions that may be applicable to other training contracts. Changes occurring on the aircraft, funding fluctuations, facility schedules, and evolving Air Force needs affect the C-130J training system. The C-130 MATS team developed some contract initiatives to mitigate the impact of change to the contract. The initiatives reduce the workload on the acquisition team by reducing the need for future contract modifications and preventing schedule disruptions. The initiatives include an option matrix, use of a delivery window for the first training device, and special procedures to ensure the trainer remains concurrent with the aircraft.

Option matrix: Funding uncertainties and fluctuating user needs made it difficult for the C-130J MATS team to define with certainty the option exercise dates for all of the training devices. For example, the C-130J aircraft program is subject to congressional funding additions, which are not identified in budget planning documents. Increases or decreases in the number of aircraft procured may change training requirements that could affect the requirements in the C-130J MATS contract. To accommodate uncertainty, the C-130J MATS contract contains an option matrix with prices for three consecutive years: the target year, the following year, and the year after that. Each of the three option years is priced. The government has the right to exercise an option by 31 Dec of the respective fiscal year. By having three priced options for each device, the government is able to buy the device in any one of three years depending on funding availability and user needs.

Simulator Delivery Window: The C-130J MATS request for proposal provided the bidders a 10-month window for delivery of the first weapon system trainer. A not-earlier-than date of 1 Jan 02 and a not-later-than-date of 31 Oct 02 was given. The contractors were allowed to propose a firm delivery date within that window to be included in the final contract. The delivery window was offered because we expected the bidders to have different production schedules and the user's need date to begin training was flexible. In addition, the completion date of the facility to house the WST was uncertain at proposal release; therefore, a not-earlier-than date was needed to ensure the facility would be available. This gave the contractors some flexibility for production scheduling.

Concurrency: Maintaining training systems to reflect the concurrent change activity of the parallel aircraft development has always been a challenge. One approach used by the government is to wait for the engineering

change proposal (ECP) from the aircraft manufacturer and pass the ECP information to the training system contractor. This is usually too late in the process for the training system contractor to incorporate modifications into the training system prior to the aircraft modification. The C-130J MATS program has established associate contractor agreements between the aircraft OEM and simulator supplier. In addition, a full-time concurrency manager is assigned by the training system contractor to evaluate potential changes to the training system. The concurrency manager will evaluate changes resulting from aircraft mission changes enhancements due to training technology and aircraft configuration changes. Having a close working relationship between the aircraft OEM and a dedicated concurrency manager will ensure that the changes are evaluated early in the process so that the training system contractor will have advance notice of the changes and be involved during the development phase.

CONCLUSION

The C-130J MATS is the first known government-owned, contractor-operated training system procured as a commercial item under Federal Acquisition Regulation (FAR) Part 12 by the USAF. If applied correctly, commercial practices can reduce acquisition time and save money. While we consider the acquisition a success, the team encountered some obstacles that should be noted by other military customers seeking to procure training systems in the commercial market. In summary, we learned: 1) Without the aircraft data needed to build the training system, competition will be limited. Obtaining adequate data for competition is best addressed in the aircraft contract when the government has sufficient leverage. 2) The differences between the maintenance training concept of the military and civil worlds limit the market for military customers. One should be cautious about trying to procure military maintenance training devices using FAR 12 commercial practices. 3) Military customers should understand that the unique features required of military aircrew devices are not readily available on the commercial market, and as a result they can be difficult to define and will add cost above what the commercial customer would pay.

REFERENCES

Adams, R. G. (1999 October). Developments in Visual Display Technology, Deeper and Wider. CAT Magazine, 18-23.

International Air Transportation Association. (5th Edition, 1996). Flight Simulator Design and Performance Data Requirements (ISBN 92-9035-891-2). Montreal – Geneva.

Prew, Sarah-Jane (1999 October). Delta Air Lines, The Jewel of Georgia. CAT Magazine, 8-15.

U.S. Department of Transportation Federal Aviation Administration. (1991). Airplane Simulator Qualification (Advisory Circular 120-40B).

Galloway, R. Thomas, Richard F. Settle, Anthony F. Maggio, Jr. (Naval Air Warfare Center Training Systems Division), "Flight Fidelity Validation: Military Applications and Commercial Practices," Proceedings of IITSEC, Orlando, FL, 199X.

FlightSafetyBoeing – Company Information. Available: <http://www.flightsafetyboeing.com/company/company.html> (2000, May 15).

AIRBUS Customer Service. Customer Services – Helping to Keep the Fleet Flying. Available: http://www.airbus.com/customer_service.html (2000, May 15).