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Supply Chain Management

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An empirical comparative assessment of Military Aircraft Sales programs

Konstantinos Sourkounis

Supervisors: Thomas Dasaklis

Konstantinos Tasias

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Abstract

The purpose of this thesis is to provide a comparative analysis of the two methods of procurement that are used by the purchaser nations. These methods are known as commercial sales and foreign military sales (FMS). The thesis investigates both the positive and negative aspects of each strategy and provides recommendations for nations seeking to increase their procurement of defense-related products and services in order to support their fleet. The FMS process is a government-to-government arrangement that enables foreign governments to purchase defense articles and services from the US Department of Defense. The defined procedures and standards of the FMS process enable interoperability with previously implemented logistics systems and offer access to more recent technological developments. On the other hand, the FMS process is widely recognized for being complex and inflexible at times, which may lead to longer wait periods and higher administrative costs. Commercial sales provide more options for suppliers and shorter wait periods for procurement, in addition to being more cost-effective and providing opportunities for customization of the product. However, commercial sales can also result in less standardization of products, the possibility of dealing with unreliable suppliers, restricted access to cutting-edge technology, and reduced interoperability with the current information and logistics systems of the purchaser's country. A statistical backdrop is also included in the thesis. This background consists of a descriptive analysis of the replies received from the experts via a questionnaire, a comparison of means using t-tests, and a regression study of the link between years of experience and responses for each set of questions. The findings of the statistical analysis not only provide further insights into the benefits and drawbacks of each method of procurement, but they also have the potential to assist in informing the decision-making processes of governments.

Keywords

Defense Procurement, Foreign Military Sales (FMS), Commercial Sales, t tests, regression analysis,

Περίληψη

Στην παρούσα διπλωματική εργασία πραγματοποιείται μία εμπειρική συγκριτική αξιολόγηση των κύριων πηγών προμήθειας στρατιωτικού αεροπορικού υλικού και υπηρεσιών από ανεξάρτητα κράτη. Αρχικά, εξετάζεται η θεωρητική πτυχή του θέματος, παρουσιάζοντας τα βασικά χαρακτηριστικά των δύο κυρίων πηγών ανεφοδιασμού, του προγράμματος πωλήσεων μέσω στρατιωτικών πηγών προέλευσης ΗΠΑ, (Foreign Military Sales) και του προγράμματος προμηθειών μέσω εμπορικών πηγών εξωτερικού (Commercial Sales). Η πρώτη μέθοδος με την ονομασία Foreign Military Sales (FMS), βασίζεται σε κυβερνητικές συμφωνίες μεταξύ ξένων κρατών και των Ηνωμένων Πολιτειών Αμερικής για την αγορά στρατιωτικών ειδών και υπηρεσιών από το Υπουργείο Άμυνας των ΗΠΑ. Το πρόγραμμα FMS διαθέτει προκαθορισμένες διαδικασίες και απαιτήσεις που διασφαλίζουν τη συμβατότητα με τα υπάρχοντα συστήματα και παρέχουν πρόσβαση σε προηγμένες τεχνολογίες. Ωστόσο, η διαδικασία FMS μπορεί να είναι περίπλοκη και σε πολλές περιπτώσεις χρονοβόρα, με δυνητική καθυστέρηση στην υλοποίηση των συμφωνιών και επιπρόσθετα κόστη. Η δεύτερη κύρια επιλογή που διαθέτει κάθε χώρα για να προβεί σε ανάλογες προμήθειες είναι μέσω εμπορικών συμφωνιών απευθείας με τις κατασκευάστριες εταιρίες (Commercial Sales). Οι υπόψη συμφωνίες προσφέρουν μεγαλύτερη ευελιξία στην επιλογή των προμηθευτών καθώς επίσης επιβαρύνουν τις χώρες με λιγότερα διοικητικά κόστη. Ωστόσο, οι εμπορικές συμφωνίες δύναται να οδηγήσουν σε πιθανή έλλειψη επαρκούς πληροφόρησης σε ορισμένα από τα στάδια της εφοδιαστικής αλυσίδας. Συγκεκριμένα, η έλλειψη προσαρμοστικότητας στα ξένα πληροφορικά συστήματα παρακολούθησης υλικού δύναται να επηρεάσει την ιχνηλασιμότητα του υλικού και γενικότερα την εύρυθμη εφοδιαστική ροή. Τέλος, η απευθείας προμήθεια αμυντικού υλικού από ιδιωτικές εταιρείες αυξάνει τον κίνδυνο επισφάλειας των προμηθειών λόγω μη παρέμβασης δεύτερου κρατικού φορέα στην συμφωνία.

Στη συνέχεια, παρουσιάζονται αναλυτικά τα πλεονεκτήματα και τα μειονεκτήματα των δύο προγραμμάτων, ενώ γίνεται σύγκριση μεταξύ τους στο πλαίσιο μίας περιγραφικής ανάλυσης. Παράλληλα μέσω ενός ερωτηματολογίου έχουν συλλεχθεί απαντήσεις ειδικών του χώρου της αμυντικής εφοδιαστικής αλυσίδας και με τη χρήση της στατιστικής μεθόδου t-test εξάγονται συμπεράσματα για τους τομείς τους οποίους εμφανίζεται συγκριτικά καλύτερη η μία από τις 2 επιλογές ανεφοδιασμού, βάση της ικανοποίησης των ειδικών όπως αυτή απεικονίζεται στα σχετικά ερωτήματα

Λέξεις κλειδιά

Αμυντικό υλικό, Προμήθειες μέσω Στρατιωτικών πηγών ΗΠΑ, Προμήθειες μέσω εμπορικών εταιριών, έλεγχος t test, ανάλυση παλινδρόμησης,

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1. Introduction

1.1 Background and context of the study

Each country has its own defense industry. Domestic sourcing of defense materiel has long been encouraged in most countries in the name of 'self-reliance' (1). However, the majority of the national industries cannot support the defense needs of their Air Force. Air Defense procurement deals with products that are highly differentiated, and its regulation is extremely complex(2). In addition, the costs of building each new generation of military hardware are rising in real terms at a rate that is faster than the rate at which defense expenditure is growing. Thus, national resources are proving to be insufficient for a widening number of programs, leading to costly delays and outright cancellations. As a result, the acquisition of its needed defense articles must be sourced from foreign defense industries that have this capability.

Since the start of the previous century, a few companies from the most powerful countries have sold their defense articles to other governments. More specifically, these types of contractors can sell defense articles and services to foreign countries without the direct involvement of governments. This type of transaction is typically referred to as a Commercial Sales (CS) (3). Under CS, the purchaser country may negotiate with the contractor and find the lowest fixed price, timely delivery, easier countertrade arrangements, and penalties for non-compliance with the provisions of the contract. However, a few obstacles over the years have reduced the efficiency of this project especially the after sales support (follow on support).

For this reason, the US. Government (USG) created in the middle 1960s a nonprofit organization named Foreign Military Sales (FMS) (4). The differentiation of this project is that both parties involved parties are state entities (USG and its ally). FMS is defined as the process through which eligible foreign governments purchase defense articles, services, and training from the USG. Initially, senior officials from both countries (US and its ally) contacted one another on a regular basis throughout the FMS case initiation process and contract negotiation process (5).

At this time, it should be mentioned that commercial companies in US are also free to sell their military aircraft equipment directly to foreign countries, without the FMS intervention. However, there are some obligations. Commercial companies are free to sell military aircraft equipment to foreign countries, but there are certain restrictions and requirements that must be followed. These restrictions are typically governed by export control laws and regulations, which are like the FMS process. One of the main ways that the United States regulates the sale of military aircraft equipment to foreign countries is through the use of export licenses (6). An export license is a document issued by the government that allows a company to export certain items to a specific country or end-user. There are different types of export licenses that may be required depending on the nature of the item being exported and the country to which it is being exported. In addition to export licenses, there are also other requirements and restrictions that must be followed when selling military aircraft equipment to foreign countries.

In today's world of economic crisis, there is an increasing need for the countries worldwide to ensure they obtain the best solution when procuring defense items and services either from FMS or commercially.

Commercial sales and foreign military sales (FMS) are two different methods of procuring military equipment. Commercial sales refer to the sale of military items to foreign governments or other organizations through commercial channels, such as arms manufacturers and defense contractors. These sales are typically conducted on a case-by-case basis and are subject to the laws and regulations of the country where the sale takes place.

Foreign military sales, on the other hand, are sales of military equipment to foreign governments that are facilitated by the United States government. The U.S. government acts as an intermediary between the foreign government and U.S. defense contractors, and is responsible for negotiating the terms of the sale, including the price and delivery of the equipment. FMS sales are also subject to the laws and regulations of the U.S. government, as well as any international agreements that may be in place. There are several key differences between commercial sales and FMS in terms of the procurement of military equipment and under the current dissertation i will try to analyze and clarify the 2 options.

1.2 The problem statement

The issue statement in this dissertation stresses the necessity for a detailed examination and comparison of the two procurement methods for military aircraft - FMS and commercial sales. Although significant research has been done on the subject, it has tended to concentrate on certain parts of the procurement process, such as cost or technology transfer, and does not give a comprehensive knowledge of all the essential variables that influence the choice of procurement technique.

The decision between FMS and commercial sales is a difficult one that is influenced by a variety of variables such as political concerns, cost-effectiveness, technology transfer, and military interoperability. The procurement choice may have substantial ramifications for both the purchaser government and the seller government or the contractor, since the selection of the wrong procurement technique can result in increased costs, delayed delivery, diminished capabilities, and other undesirable outcomes.

For instance, FMS transactions are subject to stringent rules and processes, which may make the acquisition process more time consuming and difficult. On the other hand, foreign governments may favor FMS deals because they place a higher importance on the engagement and help of the United States government in the procurement process. However, Commercial Sales may be more expedient and involve less red tape, but the purchasing procedure will be under more supervision of the foreign government, and the latter may not get the same degree of aid and support. Moreover, the manner of procurement that is chosen may have an effect on the transfer of technology as well as the degree of military interoperability that exists between the armed forces of a foreign nation and those of the United States.

Therefore, the lack of a comprehensive analysis and comparison of the FMS and Commercial Sales methods for the procurement of military aircraft is problematic because it limits the ability of policymakers, military leaders, and procurement professionals to make informed

decisions. This dissertation aims to address this gap in research by providing a comprehensive analysis and comparison of the two procurement methods and identifying best practices for future procurement projects.

1.3 Structure of the dissertation

The structure of the dissertation includes six chapters. Chapter 1 provides an introduction to the study, discussing the background and context of the research and outlining the problem statement. The chapter sets out the main research question and objectives of the study. The chapter also gives an overview of the literature review, which is the focus of Chapter 2. In this chapter, the previous research on the topic is analyzed, and the theoretical background of Commercial Sales and Foreign Military Sales is explored in depth. The chapter presents the policies, regulations, and logistics process of each method, highlighting their advantages and disadvantages. Chapter 3 examines the advantages and disadvantages of the two procurement methods, FMS and Commercial Sales, based on the literature review. This chapter provides a comprehensive overview of the benefits and drawbacks of each method, highlighting the factors that should be considered when selecting a procurement method. Chapter 4 describes the methodology used in the research, including the research design and data analysis techniques. This chapter outlines the questionnaire, which is included in Appendix A, used to collect data from experts in the field and explains how the data was analyzed using descriptive statistics, t-tests, and regression analysis. Chapter 5 presents the results and discussion of the research, including the descriptive analysis of the FMS and Commercial Sales responses, the comparison of means using t-tests, and the regression analysis of the relationship between years of experience and expert responses. This chapter provides a detailed analysis of the findings, highlighting the similarities and differences between the two methods and the impact of years of experience on expert responses. Chapter 6 concludes the dissertation by summarizing the main findings, drawing conclusions, and presenting limitations and suggestions for future research. This chapter provides a comprehensive overview of the research and its implications for the field, as well as suggestions for further research that could be conducted in this area.

2. Literature Review

This chapter presents an overview of the available literature on military aircraft procurement procedures, concentrating on FMS and Commercial Sales. The literature study will begin with an analysis of the available studies on the purchase of military aircraft, with a focus on comparing the two methodologies. Subsequently, an analytical description of the two methodologies will be provided, along with an overview of their main procurement-related concepts, such as supply chain management and logistical issues.

2.1 Analysis of previous studies and research

Many variables may impact the selection of an aircraft procurement strategy. In prior research, political concerns, cost-effectiveness, technological transfer, and military interoperability are often stated variables. Mark D. Greenly discovered that political factors, such as diplomatic ties between nations, might have a significant role in the selection of a procurement technique (7). Furthermore, a study on the effectiveness of foreign military sales based in Korea

mentioned that cost-effectiveness is often the most important factor for foreign administrations (8).

Undoubtedly FMS is a procurement method in which the U.S. government acts as an intermediary between the foreign government and the defense contractor. Several studies have examined the advantages and disadvantages of FMS as a procurement method for military aircraft. Wayne M. Herbert identified the advantages of FMS to include access to advanced technologies, standardization, and interoperability (9). However, some of the disadvantages of FMS highlighted in the literature include bureaucracy, limited flexibility, and long lead times. Furthermore, Remegio M. De Vera noted that the U.S. government's involvement in the procurement process can lead to political considerations, which may not always align with the foreign government's interests(10).

On the other hand Commercial sales is a procurement method in which the foreign government deals directly with the defense contractor. Several studies have examined the advantages and disadvantages of commercial sales as a procurement method for military aircraft. Remegio M. de Vera identified the advantages of commercial sales to include flexibility, speed, and low cost (10). However, some of the disadvantages of commercial sales highlighted in the literature include limited technology transfer, lack of standardization, and potential security risks. Furthermore, Remegio M. de Vera noted that commercial sales may not always result in the desired level of military interoperability (10).

This literature review has identified several key factors that can influence the choice of procurement method for military aircraft, as well as the advantages and disadvantages of each method. By understanding these factors and their impact on the procurement decision, policymakers, military leaders, and procurement professionals can make informed decisions about which method to use.

2.2 Commercial Sales (CS)

2.2.1 Intro

Procurement of military items directly from a contractor is a common practice that allows the military to obtain the equipment and supplies it needs in a timely and efficient manner. There are several steps involved in this process, which include identifying the specific items that are needed, sourcing potential contractors, evaluating their capabilities and prices, negotiating the terms of the contract, and monitoring the progress of the project to ensure that the items are delivered on time and meet the specified requirements.

2.2.2 Preparation prior the procurement process

SWOT Analysis

Initially, a SWOT analysis is prerequisite to be implemented in order to help the country to identify their strengths, weaknesses, opportunities, and threats (11). It can be applied to a variety of situations, including the procurement of military aircraft items commercially by a country (12). Here is a characteristic example of a SWOT analysis for a hypothetical country who is going to proceed accordingly.

Strengths:

- Strong defense budget: The country has a large defense budget, which allows it to purchase military aircraft items at a competitive price.
- Established relationships with manufacturers: The country has long-standing relationships with leading aircraft manufacturers, which may give it access to exclusive deals and discounts.
- Skilled workforce: The country has a skilled workforce with experience in repairing and maintaining military aircraft, which can help reduce the cost of ownership over the long term.

Weaknesses:

- Limited domestic production: The country does not have a strong domestic aircraft industry, which means it is reliant on foreign manufacturers for its military aircraft.
- Limited bargaining power: As a smaller country, the country may have limited bargaining power when negotiating with manufacturers, which could impact the price and terms of the procurement.
- Complex procurement process: The country's procurement process for military aircraft items may be lengthy and complex, which could slow down the acquisition process.

Opportunities:

- Increasing demand for military aircraft: The global demand for military aircraft is likely to increase in the coming years, which could present opportunities for the country to expand its fleet.
- Emerging technologies: The country may have the opportunity to incorporate new and emerging technologies into its military aircraft, which could give it a competitive advantage.
- Partnerships with other countries: The country may be able to form partnerships with other countries to pool resources and negotiate better deals on military aircraft procurement.

Threats:

- Competition from other countries: Other countries may also be interested in procuring military aircraft items commercially, which could increase competition and drive up prices.
- Economic instability: Economic instability in the country or globally could impact the country's ability to afford military aircraft procurement.
- Political instability: Political instability in the country or region could disrupt the procurement process or lead to changes in defense spending priorities.

Table 1 SWOT Analysis

Category	**Factor**
Strengths	1. Strong defense budget
	2. Established relationships with manufacturers
	3. Skilled workforce
Weaknesses	1. Limited domestic production
	2. Limited bargaining power
	3. Complex procurement process
Opportunities	1. Increasing demand for military aircraft
	2. Emerging technologies
	3. Partnerships with other countries
Threats	1. Competition from other countries
	2. Economic instability
	3. Political instability

Inventory Policy

Just-in-time (JIT) and Economic Order Quantity (EOQ) are the most common inventory management techniques that can be used by purchaser country to support its military inventory needs via commercial companies (13).

JIT is an inventory management strategy that aims to minimize inventory by only producing and ordering what is needed, when it is needed. This can help reduce the cost of storing and maintaining excess inventory, and also helps to reduce the risk of obsolescence. This can help to improve efficiency and reduce waste. JIT allows for more flexibility in responding to changing demands, as it is easier to adjust production and ordering in response to changes in demand. However, this process requires a reliable supply chain: JIT relies on the ability to quickly and reliably obtain materials and supplies as needed. If the supply chain is disrupted or unreliable, it can be difficult to maintain the necessary inventory levels. Also, under this technique the purchaser country increases risk of shortages. More specifically, JIT relies on just-in-time production and delivery, there is a risk of shortages if there are delays or issues in the supply chain. Taking into account the above parameters, implementing JIT requires careful planning and coordination to ensure that the right materials and supplies are available when

needed. In a military context, JIT can help to ensure that the right equipment and supplies are available when needed, without tying up resources in excess inventory.

EOQ is a model that helps country determine the optimal order quantity for inventory that minimizes the total cost of ordering and holding inventory. It takes into account the cost of placing an order, the cost of holding inventory, and the demand for the product. In a military context, EOQ can help to ensure that the right balance is struck between the cost of ordering and holding inventory, and the need to have the necessary equipment and supplies available when needed. It should be mentioned that EOQ is a simple model that can be easily implemented with basic data on demand, ordering costs, and holding costs. Also, EOQ helps to avoid ordering too much or too little inventory, which can help to reduce the risk of excess inventory and obsolescence. However, EOQ does not take into account the variability of demand, which can lead to shortages or excess inventory in certain situations and may not be the optimal solution in all situations, as it does not consider all of the possible costs and benefits of different inventory levels. Another prerequisite for the implementation of EOQ is the accurate data. EOQ requires accurate data on demand, ordering costs, and holding costs in order to be effective. If this data is not available or is not accurate, the results of the model may be unreliable.

Countries can support military inventory needs through the use of JIT and EOQ by working closely with military planners to understand their requirements and develop inventory management strategies that meet their needs. This may involve implementing sophisticated inventory management systems, developing partnerships with suppliers, and using data analytics to forecast demand and optimize inventory levels.

Overall, both JIT and EOQ can be useful tools for supporting the military's air forces, but they each have their own pros and cons and may not be suitable for all situations. It is important to carefully consider the specific needs and constraints of each situation when deciding which inventory management technique to use.

Identification of Need

Also, one of the initial issues in the procurement process is to identify the specific items that are needed. This typically involves working closely with military personnel to determine their requirements, including the type, quantity, and specifications of the items that are needed. This may involve identifying specific products or services that are required, as well as any other requirements, such as delivery schedules, payment terms, and quality standards.

The first sub-step in the assessment of requirement in procurement of aircraft items is the analysis of current inventory (14). The analysis of current inventory is an important step in the procurement process as it helps the agency to understand its current inventory status and identify gaps in its supply chain. By regularly analyzing its inventory, the agency can ensure that it has the right items in the right quantities to meet its operational needs. This sub-step involves the following:

- Inventory list: The military or procurement agency creates an inventory list of all aircraft items in its possession. This list should include details such as the item type, manufacturer, serial number, and date of acquisition.

- Condition assessment: The agency assesses the condition of each item on the inventory list to determine which items need to be replaced or repaired. This may involve physical inspections, analysis of maintenance records, or consultations with subject matter experts.
- Age analysis: The agency also analyzes the age of each item to determine which items are approaching the end of their useful life and need to be replaced. This is especially important for items such as engines, which have a limited lifespan.
- Usage analysis: The agency also analyzes the usage of each item to determine which items are heavily used and need to be replaced more frequently than others. This helps the agency to prioritize its procurement efforts and allocate resources more effectively.

The second sub-step in the assessment of requirement in procurement of aircraft items is the review of operational requirements (15). The review of operational requirements is an important step in the procurement process as it helps the agency to understand its future needs and plan its procurement activities accordingly. By regularly reviewing its operational requirements, the agency can ensure that it has the right items in the right quantities to meet its operational needs. This sub-step involves the following:

- Operational plans: The military or procurement agency reviews its operational plans to determine the types and quantities of aircraft items needed to meet future demands. This may involve consultation with operational units to understand their specific requirements.

- Mission analysis: The agency analyzes the missions that it will undertake in the future and identifies the types of aircraft items that will be needed to support those missions. For example, the agency may need specific types of weapons or electronic systems for specific types of missions.

- Force structure analysis: The agency analyzes its current and future force structure to determine the types and quantities of aircraft items that will be needed to support its operations. For example, the agency may need to procure additional aircraft or spare parts to accommodate an increase in its fleet size.

- Technology analysis: The agency analyzes the latest technology trends in the aircraft industry to determine the types of items that will be needed to keep its aircraft fleet modern and effective. For example, the agency may need to upgrade its avionics or weapons systems to keep pace with new developments.

The third step in the process of identifying the need for procurement of aircraft items is the preparation of specifications. This step involves the following sub-steps:

- Development of technical specifications (16): The military or procurement agency develops detailed technical specifications for the required aircraft items. These specifications should include information such as performance requirements, dimensions, weight, materials, and other relevant technical details.

- Review of industry standards: The agency reviews relevant industry standards, such as MIL-STD, to ensure that the specifications align with established norms and standards.
- Consultation with subject matter experts: The agency may consult with subject matter experts, such as engineers or pilots, to ensure that the specifications are realistic and achievable.
- Validation of specifications: The agency validates the specifications by conducting simulations or testing prototypes to ensure that they meet the required performance levels.

The fourth step in the process of identifying the need for procurement of aircraft items is the assessment of budget. The preparation of specifications is an important step in the procurement process as it ensures that the required aircraft items are of the right quality and meet the necessary performance requirements. By developing detailed technical specifications, the agency can ensure that the items procured are fit for purpose and will meet its operational needs. The assessment of budget is an important step in the procurement process as it helps the agency to determine the maximum amount that it can spend on aircraft items and the trade-offs that may need to be made between quality and quantity. By regularly assessing its budget, the agency can ensure that it procures the right items at a reasonable cost, while also ensuring that it has the resources to support its operational needs. This step involves the following sub-steps:

- Review of budget allocation: The military or procurement agency reviews its budget allocation for procurement to determine the amount of funds available for the procurement of aircraft items.
- Cost analysis: The agency analyzes the costs associated with procurement, including the costs of the aircraft items themselves, transportation, storage, and any additional costs such as warranties or maintenance.
- Comparison with market prices: The agency compares the costs with market prices for similar aircraft items to ensure that the procurement is being conducted at a reasonable cost.
- Assessment of trade-offs: The agency assesses the trade-offs between cost, quality, and quantity, and determines the optimal balance between these factors based on its budget constraints.

RFP & RFQ

Once the need has been identified, the country may then begin the process of identifying potential suppliers and evaluating their offerings in order to select a military aviation company that can meet their needs. This information is used to develop a request for proposal (RFP) that is sent to potential contractors or a request for quotation (RFQ) (17). The RFP is typically issued to a number of military aviation companies, inviting them to submit proposals outlining how they can meet the needs of the country. The RFP may include detailed specifications for the products or services being sought, as well as any other requirements, such as delivery schedules, payment terms, and quality standards. The purpose of the RFP is to provide military aviation companies with the information they need to understand the country's needs and to prepare proposals that will meet these needs. It is also designed to help the country evaluate the proposals of different companies and determine which one is the most qualified and offers

the best value. Once the RFP has been sent out, the next step is to evaluate the responses that are received from contractors. This typically involves reviewing their capabilities, including their experience, capacity, and track record in providing similar items to the military. However, to clarify the request an RFQ is prerequisite to be submitted. Within the context of the request for quotation, the technical demand is completely specified (or even additional criteria of a logistical nature), and the only thing that the country anticipate from vendors is to provide an accurate price (18). Because price is the sole variable in the competition, the selection process is, as a result, limited to a single criterion.

In addition, the prices that are offered by the contractors are also carefully evaluated to ensure that they are competitive and offer the best value for money. The review and evaluation process may involve a number of different steps, depending on the specific requirements of the RFP and the needs of the country. This may include reviewing the qualifications and experience of the military aviation companies, examining their proposals in detail, and comparing the prices and other terms and conditions being offered.

In general, selecting a supplier is a difficult decision-making challenge that involves several factors. Due to the many different factors that are in conflict with one another, the evaluation of suppliers on the basis of both quantitative and qualitative data becomes a difficult work for the people who make the decisions (19).

Supplier Selection

Qualitative approaches are known to be more subjective and to be susceptible to being impacted by human biases as well as inadequate data. However, qualitative methods are also known to give significant insights and information on prospective suppliers. As a consequence of this, quantitative procedures, which are founded on numerical data and statistical analysis, are likely to be more dependable and objective than these alternatives. Specifically, the majority of nations have, in accordance with the law that they have cited, developed a particular procurement procedure. This method permits only numerical data to be considered when making a final choice within the context of the defense purchase process.

The selection of suppliers for defense procurement is an essential duty for a Ministry of Defense, since it requires the expenditure of significant sums of money on a wide range of products, services, and equipment. It is essential, given the present state of the economy, to pick one's suppliers using procedures that are both more objective and more efficient financially.

In the majority of instances, the strategy that has been suggested is to make use of a combination of the Analytic Hierarchy Process (AHP) and Goal Programming (GP) in order to assess and choose the best providers and distribute the ideal order amounts among them. The AHP is a decision-making tool that helps to prioritize and weigh different criteria within a hierarchical structure (20), whereas the GP is a mathematical optimization technique that allows for the consideration of multiple conflicting objectives in a decision-making process (21). It is conceivable to take into account both cost and other competing variables when selecting suppliers for military procurement if these two strategies are combined. This strategy has been found to be successful in real-world circumstances, and it may result in cost reductions

while also taking into consideration a variety of competing criteria. Moreover, the effectiveness of this technique has been shown (22).

Below an example depicts of how the Analytic Hierarchy Process (AHP) and Goal Programming (GP) can be used to select suppliers for defense procurement:

Step 1: Define the criteria and objectives for the supplier selection process.

In this example, the Ministry of Defense is looking to procure a new type of military aircraft equipment. Some of the criteria and objectives that they might consider in the supplier selection process might include:

- Cost: The total price of the vehicles and any associated costs, such as maintenance and training.
- Quality: The reliability and performance of the vehicles.
- Delivery times: The speed with which the vehicles can be delivered and made ready for use.
- Technical expertise: The expertise and experience of the supplier in manufacturing and supporting the type of vehicle being procured.

Step 2: Utilization of the AHP to assign weights to the criteria and create a hierarchy.

The decision maker might use the AHP to prioritize the criteria and assign weights to them based on their relative importance. For example:

Criteria Weights

Cost: 0.4

Quality: 0.3

Delivery times: 0.2

Technical expertise: 0.1

Step 3: Evaluate the potential suppliers using the AHP.

Next, the decision maker would evaluate the potential suppliers based on the criteria defined in the AHP hierarchy. This might involve collecting data on the suppliers' prices, track record of quality and reliability, delivery times and technical expertise. The decision maker might then use this data to create a matrix like the one below:

Supplier A Supplier B Supplier C

Table 2 Supplier Selection/AHP

	Cost	**Quality**	**Delivery Times**	**Technical Expertise**
Supplier A	0,7	0,8	0,9	0,8
Supplier B	0,8	0,7	0,6	0,7
Supplier C	0,9	0,6	0,7	0,9

In this example, the values in the matrix represent the relative scores of the suppliers for each criterion. For example, Supplier A has a score of 0,7 for cost, indicating that they are relatively less expensive than Supplier B (score of 0,8) and Supplier C (score of 0,9).

Step 4: Utilization of the GP model to optimize the allocation of orders among the suppliers.

Finally, the GP model can be used to optimize the allocation of orders among the suppliers based on the weights assigned in the AHP and the specific objectives of the procurement process.

The Goal Programming (GP) model is a mathematical optimization technique that allows for the consideration of multiple conflicting objectives in a decision-making process. It can be used to optimize the allocation of orders among potential suppliers in the defence procurement process.

To use the GP model in this context, the decision maker would need to define the objectives and constraints of the procurement process, as well as the available data on the potential suppliers. This might include information on the prices, quality, delivery times, technical expertise, and other relevant criteria for each supplier.

Once the objectives and constraints have been defined, the GP model would use mathematical algorithms to find the optimal solution that maximizes or minimizes a particular objective subject to these constraints. For example, if cost is the most important criterion, the model might prioritize suppliers who offer the lowest prices. If quality is also a key objective, the model might consider the track record of the suppliers in delivering high-quality products.

To illustrate this process, here is an example of how the GP model might work in practice:

Objectives:

- Maximize cost savings
- Minimize delivery times

Constraints:

Total order quantity must be at least 1000 items

- Supplier A can supply a maximum of 500 items
- Supplier B can supply a maximum of 300 items
- Supplier C can supply a maximum of 200 items

Supplier A Supplier B Supplier C

Cost per item: $100 $110 $120

Average delivery time: 10 days 15 days 5 days

Table 3 Supplier Selection/GP

	Cost per item ($)	**Quality Rating (stars)**	**Average Delivery Time (Days)**	**Technical expertise**
Supplier A	100	4,5	10	3
Supplier B	110	4	15	2
Supplier C	120	4,8	5	3

Based on the data and the weights assigned in the AHP, the GP model suggests placing a larger order with Supplier C, which has relatively high costs but very fast delivery times, and smaller orders with Suppliers A and B to meet the constraint of at least 1000 vehicles. This solution minimizes delivery times while still maximizing cost savings. Therefore, the final decision might be to place an order for 600 items with Supplier C, 300 items with Supplier A, and 100 items with Supplier B, for a total of 1000 items. This allocation would meet the constraint of at least 1000 items and minimize delivery times while still maximizing cost savings.

Additionally, to begin the selection process, if the country needs to select only a single supplier, it would first use the AHP to prioritize and weigh the different criteria that are important to the state, as described earlier. Then, it is prerequisite to create a matrix to compare the criteria and their sub-criteria and use the AHP calculations to determine the weights for each criterion based on these comparisons.

Multiply the scores for each criterion by the corresponding criteria weight to get the weighted scores for each criterion. For example, the weighted score for the "cost" criterion for Supplier A would be calculated as follows: 0.7 x 0.4 = 0.28

Add up the weighted scores for each criterion to get the composite score for each supplier. For example, the composite score for Supplier A would be calculated as follows: 0.28 + (0.8 x 0.3) + (0.9 x 0.2) + (0.8 x 0.1) = 0.28 + 0.24 + 0.18 + 0.08 = 0.78

To determine the composite score for Supplier B, you would need to do the following:

1. Multiply the scores for each criterion by the corresponding criteria weight to get the weighted scores for each criterion. For example, the weighted score for the "cost" criterion for Supplier B would be calculated as follows: 0.8 x 0.4 = 0.32
2. Add up the weighted scores for each criterion to get the composite score for the supplier. For Supplier B, the composite score would be calculated as follows: 0.32 + (0.7 x 0.3) + (0.6 x 0.2) + (0.7 x 0.1) = 0.32 + 0.21 + 0.12 + 0.07 = 0.74

To determine the composite score for Supplier C, it is prerequisite to do the same calculation using the scores and weights provided for that supplier. The composite score for Supplier C would be calculated as follows: 0.36 + (0.6 x 0.3) + (0.7 x 0.2) + (0.9 x 0.1) = 0.36 + 0.18 + 0.14 + 0.09 = 0.68

Based on these calculations, the composite scores for the three suppliers are as follows:

- Supplier A: 0.78
- Supplier B: 0.74
- Supplier C: 0.68

Based on the data provided and the weights assigned in the Analytic Hierarchy Process (AHP), the best single supplier choice would be Supplier A.

Overall, this approach provides a structured and objective way to consider multiple conflicting criteria in the supplier selection process for defense procurement, leading to better decision-making and potential cost savings. It is generally advisable to select a supplier before negotiating with them. This allows you to have a clear understanding of the products or services that you need, as well as a list of potential suppliers who can provide them. This information can then be used as a starting point for negotiations, as you will be able to clearly articulate your requirements and compare the offerings of different suppliers.

Negotiation

Once a contractor has been selected, the next step is to negotiate the terms of the contract. This typically involves discussions with the contractor to determine the specific terms and conditions that will govern the procurement, including the price, delivery schedule, and any other requirements that must be met. In addition, the contract may also include provisions for performance incentives, penalties, and other clauses that are designed to protect the interests of both the military and the contractor.

This process involves discussing and agreeing on the specific terms and conditions that will apply to the contract, including the price, delivery schedule, payment terms, and any other conditions or requirements.

Negotiating the terms of the contract is an important step, as it helps to ensure that both parties have a clear understanding of their respective obligations and expectations (23). It is important for both the country and the military aviation company to carefully consider their needs and priorities, and to communicate openly and transparently throughout the negotiation process.

During the negotiation process, both parties (Country and Company) may make proposals or counterproposals in order to reach an agreement on the terms of the contract. This may involve discussing various options or alternatives, and working to find a solution that meets the needs and interests of both parties. For this reason an interest grid will be very useful to be implemented. Below, an example is depicted.

Table 4 Interest grid

Interest Category	**Company's (Seller) understanding of this issue**	**Country's (Purchaser) understanding of this issue**
Financial	High Cost of Production	High Cost of Purchasing
Timing	Ability to Meet Delivery Deadline	Need to Meet Delivery Deadline
Personal	Keep the profits at the same level	Keep the benefits of the potential agreement at the same level like the similar previous agreements
Reputational	Protect Business Reputation	Maintain Positive Reputation
Capacity	Restricted production capacity	Large demand for aircraft parts
Business cycle	Should follow the market demand	Should take into account the market demand
Environmental Requlations	Follow environmental legislation.	Follow environmental legislation.

It is obvious from the above Interest Grid that the parties have diverse perspectives on the negotiating problems. The company is worried about its high manufacturing costs and the need to safeguard its corporate brand. On the contrary, the Country is concerned with reaching its delivery date, and fulfilling its mild cement demand. Also the Country needs to reduce the purchasing cost. Each of the parties has an interest in complying with environmental standards and satisfying market demand. Generally, financial concerns, reputation, timeliness, personal profits, capacity, market demand, and environmental rules are among the different interests of the parties.

A purchaser nation that intends to fight back against any sort of power must demonstrate that its offer for goods or services is vital to the "powerful" corporation and that its offer is distinct from and superior to any potential competitors. The purchaser country may also fight back by strengthening its BATNA, which stands for "Best Alternative to a Negotiated Agreement." By doing this, the state will be able to generate alternatives and free itself from the influence of the other side. In the end, having a solid BATNA will be the most helpful in coping with any kind of power that a counterparty may bring (24).

When a vendor has been chosen and the details of the contract have been agreed upon, it is necessary to monitor the agreement throughout its entire lifespan to make sure each of the parties involved are adhering to the formal contract conditions. Pricing compliance, modifications to terms, volume discount thresholds, payment timetables, and due dates, as well as consequences for non-performance, have historically been obstacles for manual contract

management systems. With the capacity to gather data in real-time, dependable contract administration solutions offer the capacity to maintain these concerns updated.

The signing of the contract is a significant milestone in the process, as it signifies the formal commitment of both parties to the terms of the agreement. It is important for both the country and the military aviation company to carefully review the terms of the contract before signing it, to ensure that they fully understand and agree to the terms and conditions specified in the agreement. The contract should clearly specify the products or services being provided, the price, delivery schedule, payment terms, and any other specific requirements or conditions. It may also include provisions for resolving disputes or addressing any issues that may arise during the contract.

2.2.3 Contract Implementation

Given that the contract has been signed, the contractor is obligated, in accordance with the terms and conditions of the contract, to provide the country's fleet with all of the logistical assistance it requires. This assistance covers everything from the purchase of replacement components to the execution of preventative maintenance on objects that can be fixed, even via the outsourcing process. Additionally, throughout the process of implementation, the inventory policy that the purchaser nation is required to adhere to in order to acquire the commodities in a timely way should be taken into consideration and taken into account. During the process of transportation, the government and the contractor are responsible for coping with. Additionally, a crucial key to the reduction of uncertainty across the network and therefore a reduction in the need for additional inventory is the way of sharing information between the purchaser country and the contractor in the supply chain (25). More specifically, the manner in which both parties monitor the whole of the procurement process is one more aspect of the implementation supply procedure that is essential. During this chapter, we will discuss also warranties as well as allegations of discrepancies.

Procurement of aircraft parts

- Purchase Order

The purchase order phase is an important aspect of purchasing military aircraft items from a contractor. During this phase, the military organization prepares a comprehensive purchase order that outlines all of the specific requirements for the aircraft items, including quantities, delivery schedules, and any additional specifications. Before issuing the purchase order, the military organization reviews the contract with the contractor to ensure that it covers all requirements and meets all necessary regulations. The purchase order is then issued to the contractor, who acknowledges receipt and begins production. Throughout the production process, the military organization tracks the purchase order to ensure that the contractor is meeting delivery schedules and producing the items in accordance with the specified requirements. In case of any changes or modifications to the requirements, the military organization may need to renegotiate the terms of the purchase order with the contractor. Additionally, the purchase order should specify the payment terms for the aircraft items, including the amount, payment schedules, and any applicable discounts or incentives. It is the

responsibility of the military organization to administer the contract and ensure that the purchase order is executed in accordance with the specified terms and conditions.

A purchase order is a document that outlines the details of a purchase transaction between a buyer and a supplier. In the context of purchasing military aircraft items, a purchase order as a unique identifier assigned by the military organization includes the following information:

- Date of Issue: The date on which the purchase order was issued by the military organization.
- Supplier Information: The name and contact details of the contractor supplying the aircraft items.
- Item Description: A detailed description of the aircraft items being purchased, including quantities, specifications, and any other relevant information.
- Delivery Schedule: The dates on which the contractor is expected to deliver the aircraft items to the military organization.
- Payment Terms: The terms of payment for the aircraft items, including the amount, payment schedules, and any discounts or incentives that may apply.
- Special Requirements: Any additional requirements or conditions that the military organization has specified for the purchase, such as certifications or warranties.
- Signatures: The signatures of the parties involved in the transaction, including those of the military organization and the contractor, indicating their agreement to the terms of the purchase order.

The purchase order is a legally binding document that outlines the terms of the transaction and serves as a record of the agreement between the military organization and the contractor. It is an important tool for managing the production and delivery of the aircraft items and ensuring that they meet the specified requirements.

- Security of Supply

The security of supply requirements in the purchase order of military aircraft items are critical to ensure a smooth flow of products, services, and results. Firstly, the suppliers are required to inform the buyer about any limitations or commitments that may arise in the disclosure, transfer, or use of the products, repairs, and services, which are a result of export control or security arrangements. However, if the information is classified, the buyer may verify the existence of such restrictions through the relevant government authority of the supplier's country. Also, the suppliers are expected to have an integrated supply chain system that ensures the security of the supply of the items under the contract. They are also committed to ensuring that changes in the supply chain will not adversely affect the performance of their obligations under the contract. Additionally, the suppliers are encouraged to establish and maintain the capacity required to meet additional needs in case of a crisis, according to terms and conditions to be agreed. Furthermore, the contractors are required to exert effort to ensure the maintenance, modernization, or adaptation of the items to be carried out under the contract with a view to the security of supply. They must also promptly inform the buyer of any changes

in their organization, supply chain, or industrial strategy that could affect their obligations. Lastly, if the manufacturing of some products under the contract is stopped for any reason, the supplier is required to inform the buyer with sufficient notice and provide the opportunity to purchase the same or similar supply through a 'final buy order' with a defined quantity. The last buy order will become effective upon agreement between the buyer and the concerned supplier on its terms and conditions.

In conclusion, the security of supply is crucial in the purchase order process of military aircraft items, and suppliers are expected to meet these requirements to ensure a secure and uninterrupted supply of products and services to the buyer.

- Codification of Products

The NATO codification is a critical requirement for the products being supplied under the contract. The codification must comply with the NATO regulations, including STANAG 3150, 3151, 4177, 4199, and 4438, as well as the NATO manual on codification ACodP-1. The suppliers are working in cooperation with the French National Codification Bureau CIMD, which is responsible for the identification of defense materials.

In order to properly identify and manage the items according to the NATO Codification System (NCS), technical data such as drawings, specifications, lists, and other information related to the physical characteristics of the items is required. Each supplier is expected to make this technical data available to the Codification Authority within the prescribed time limits. This information can either be in hard-copy form or made available through electronic access, depending on the situation.

In addition to the initial provision of technical data, suppliers must also provide updated information in case of any changes during the validity period of the contract, such as modifications, design or drawing changes, or any other changes. The terms of the clause must be included in any sub-contracts to ensure the availability of technical data to the Codification Authority. If the technical data is dispatched from the sub-contractor or supplier, the supplier must provide the sub-contract numbers so the Codification Authority can approach them directly for the data. In the event that a sub-contract with a non-NATO country is involved, the supplier will be responsible for obtaining the necessary technical data from the sub-contractor/supplier and providing it to the buyer.

The technical data for codification purposes must include the name and address of the Design Control Authority, the design number or part number, standards/specifications reference number, and item name. If the supplier has already supplied technical data for the same items covered in this contract, they must state this fact and indicate to which Codification Agency they were supplied. The supplier is typically not required to provide this data again. Each supplier is advised to contact their respective Codification Authority for information on the NATO Codification System.

- Quality Assurance

This section of each contract outlines the requirements for quality assurance and control for the suppliers. The suppliers are expected to have established and documented a Quality Assurance

Reference System that meets the ISO 9001:2000 standards (26) and applies a referenced Quality Plan. The Suppliers must maintain this system for the duration of the contract.

The Products and Repairs must be checked and certified by the Supplier's quality assurance department using the Supplier's standard inspection and acceptance procedure. After the quality control tests are completed, the Supplier must issue a Certificate of Conformity/Inspection Release, certifying the conformity to the technical specifications of the Deliverables.

The Suppliers must ensure their qualifications by verifying and validating the conformity of new aeronautical Products, Parts, devices, and Services requested by the Buyer that are not included in the Technical Specification of the Weapon System. The new aeronautical Products, Parts, and devices that are not included in the Technical Specification of the Weapon System must be accompanied by a Certificate of Conformity issued according to the requirements to OEM qualification process. Additionally, the aeronautical Products, Parts, and devices provided must be of the aircraft type design and under the responsibility of the concerned Supplier.

- Lead Time

Lead time is one of the most crucial factors of the whole process, and denoted as the amount of time it takes for the supplier to manufacture, assemble, or procure the requested items and have them ready for delivery to the buyer. More specifically, It is an important factor to consider when making purchasing decisions, as it can affect the overall timeline for a project and the availability of the requested items. Below, a simple example is depicted:

FOS Item 1: $100 per unit, lead time of 3 months

FOS Item 2: $200 per unit, lead time of 5 weeks

In this example, the supplier is offering to supply FOS Item 1 for $100 per unit, with a lead time of 3 months. This means that it will take 3 months from the time the purchase order is issued for the FOS Item 1 to be delivered to the buyer. The supplier is also offering to supply FOS Item 2 for $200 per unit, with a lead time of 5 weeks. This means that it will take 5 weeks from the time the purchase order is issued for the FOS Item 2 to be delivered to the buyer.

Also, If the purchase country needs an item as soon as possible (ASAP), the supplier may be able to offer a shorter lead time in exchange for a higher price. In this case, the buyer would need to weigh the cost of expediting the order against the value of receiving the item sooner.

For example, if the buyer needs FOS Item as soon as possible, due to an AOG (Aircraft on Ground) situation, and the supplier is willing to deliver it within 2 weeks for an additional $50 per unit, the buyer would need to consider whether the extra cost is worth it in order to receive the item sooner. This decision will depend on factors such as the value of the item to the project, the availability of alternative sources, and the budget constraints of the buyer.

Repair process

The repair process through FMS has the ability to utilize the repair/replace process (27) and the repair/return process as well. On the contrary, in most of the cases the maintenance support,

directly via a commercial company does not give the potential of the repair/replace process. However, this partnership gives a few opportunities through the repair/return process.

The repair/return process is a maintenance strategy that involves sending faulty components back to the manufacturer or a third-party repair center for repair and then returning them to the equipment or system once they have been repaired. This process is often used when the maintenance team does not have the necessary resources or expertise to perform repairs within the equipment or system, or when the faulty component is not easily accessible or repairable within the equipment or system.

To initiate the repair/return process, the maintenance team or a maintenance support provider will first assess the faulty component and determine that it cannot be repaired within the equipment or system. They will then gather the necessary information about the component, including its make and model, serial number, and any identifying markings or labels. This information is typically used to help the repair center identify the component and determine the best repair method.

Once the necessary information has been gathered, the maintenance team or support provider will coordinate the transportation of the faulty component to the repair center. This may involve packing the component in a protective container and arranging for shipping or courier services to transport it to the repair center. In some cases, the component may need to be disassembled or partially disassembled to make it easier to transport.

Since the component arrives at the repair center, it will be inspected and tested to determine the cause of the fault and the most appropriate repair method. Depending on the complexity of the repair and the availability of parts and resources, the repair process may take anywhere from a few days to several weeks.

When the repair is complete, the repair center will test the component to ensure that it is functioning properly and meets all relevant specifications. If the component passes all tests, it will be prepared for return to the equipment or system. This may involve reassembling the component, if necessary, and packing it in a protective container for transportation.

The maintenance team or support provider will then coordinate the return of the repaired component to the equipment or system. This may involve arranging for shipping or courier services to transport the component back to the equipment or system, and scheduling a time for the component to be installed.

Once the repaired component is returned and installed, it will be tested and inspected to ensure that it is functioning properly and meets all relevant specifications. If the component passes all tests, it will be put back into service. If any issues are discovered during testing, the component may need to be returned to the repair center for additional repairs or adjustments.

The repair/return process can be an effective way to ensure that faulty components are repaired in a timely and cost-effective manner, even if the maintenance team does not have the necessary resources or expertise to perform the repairs directly. However, it may involve additional logistics and handling, and may result in longer downtime for the equipment or system if the

repair process takes longer than it would if the repairs were performed within the equipment or system.

Outsourcing

In general, a contract which includes an outsourcing option for the support of military aircraft is a legally binding agreement between a country, the contractor and a private foreign company that outlines the terms and conditions under which the company will provide maintenance, repair, and other support services for the aircraft. This type of contract is often used when the contractor does not have the necessary expertise or resources to procure, maintain and repair parts of the contract, and therefore must rely on another private company to provide these services.

In recent years, outsourcing has become a crucial concern for several businesses. The possibility for outsourcing has shifted from peripheral tasks like cleaning and catering to essential tasks like design and production (28).

Outsourcing in military aircraft support refers to the practice of a country, the contractor, and a private foreign company entering into a legally binding agreement for the provision of maintenance, repair, and other support services for the aircraft. The agreement outlines the responsibilities of each party, the payment and compensation arrangements, as well as the standards for quality control and performance. Outsourcing is often utilized in situations where the contractor lacks the in-house capability or capacity to deliver certain aspects of the contract, such as specialized repair and maintenance services. By outsourcing these tasks to a private company with the relevant expertise, the contractor can ensure that the aircraft receive the necessary support while freeing up their own resources to focus on other aspects of the contract.

It's important to note that outsourcing in the military aircraft support industry can have both benefits and risks. On one hand, outsourcing can bring new capabilities and expertise to the table, improve cost efficiency, and provide access to a wider pool of specialized talent. On the other hand, outsourcing can also result in reduced control over critical processes and may lead to a loss of institutional knowledge and expertise. Therefore, it's important for countries and contractors to carefully consider the terms and conditions of the outsourcing agreement to ensure that the benefits outweigh the risks, and that the agreement aligns with the objectives and goals of all parties involved.

Transportation

The transportation of military aircraft items from a military aircraft company to a foreign country is subject to various laws and regulations, depending on the specific circumstances of the transaction.

The International Traffic in Arms Regulations (ITAR), which is overseen by the U.S. Department of State (29), generally governs the export of military equipment, including aircraft, from the United States. This involves the transfer of goods from a military aviation firm to a foreign corporation. Under ITAR, the export of military aircraft and associated products is typically limited to "friendly" nations approved by the U.S. government. Such

exports may need a license from the Department of State and be subject to additional limitations and requirements.

The Export Administration Regulations (EAR), which are managed by the U.S. Department of Commerce, may also apply to the export of military aircraft and associated products. Certain dual-use goods, which have both military and civilian purposes, may be subject to the EAR. For the following, it is comprehended that the conditions for export permits are nearly identical to those for things acquired via the FMS channel.

In addition, if both the seller and the foreign corporation are situated in Europe, the transit of the products may be subject to European Union (EU) export and transfer laws for military equipment of the Council (30), which establishes common norms for the regulation of exports of military technology and equipment. This stance applies to all EU member states as well as those inside the European Economic Area (EEA). Under the Common Position of the Council, the export of military equipment from one EU member state to another EU member state or to an EEA country is generally permissible, provided that the exporting member state has determined that the equipment will be used for legitimate military or internal security purposes. The export of military equipment to other nations may be subject to extra limitations and regulations, as well as need a license from the exporting member state. The EU has established a number of additional measures to restrict the export of military equipment, including the EU Dual-Use Regulation, which applies to the export of dual-use products, and the EU Embargo Regulation, which puts an embargo on the sale of certain military equipment to designated countries.

It is crucial to note that, depending on the specifics of the transaction, the transfer of military aviation components from a military aircraft firm to a foreign corporation may be subject to extra rules and regulations. In order to guarantee compliance with relevant rules and regulations, companies engaging in such transactions should contact with legal advice and get the required permits and permissions.

Generally, it is the responsibility of each provider to ensure that any deliverables they are responsible for are prepared in accordance with the method of transportation specified in the (by air, surface etc). In the case that the method of transport is not specified, the deliverables must be developed in line with International Civil Aviation Organization (ICAO), so that they are acceptable for air transport. The marking must comply with MIL-STD-129P (Military Marking for Shipment and Storage) or an equivalent standard, and the packaging must meet the requirements of the cited regulation, such as the CLP EU Regulation (EU1272/2008), as well as ASTM-D-3951 (Standard Practice for Commercial Packaging) or an equivalent standard. Packaging, labeling, and labelling must conform with the Dangerous Products Regulations of the ICAO and the International Air Transport Association (IATA) when transporting dangerous goods (DG) or hazardous items (IATA).

In particular with regard to packaging, each Supplier is required to attach a label to the packaging of each item with the following information in English at a few different visible points (31) in most of the cases 5 to 8 points:

1. The Supplying Organization

2. The amount

3. Fragile/dangerous good, if appropriate

4. NATO Stock Number,

5. Description

6. Manufacturers Part Number (Part Number— P/N)

7. Bar Code Identification, if applicable.

8. the top priority In particular for things that are really important, the priority will be marked in a vivid color and with big letters so that it can be easily identified.

In most of the cases, the seller is responsible to send the following documentation. Most specifically, within the package containing the Item will be included with any parts that are sent from the Supplier to the Buyer country:

1. A dispatch note bearing the supplier's signature and indicating both the portioned and total cost of the Parts. In the event that the part number of the Product that has been delivered differs from the part number of the Product that has been ordered, the Supplier is obligated to include both the new part number and the part number of the Product that has been requested on the Dispatch Note.

2. The Certificate of Conformity, often known as the CoC.

3. Further information for potentially hazardous products, such as radioactive items, etc.

Finally, the implementation of the agreement regarding the means of transport and the delivery point are very crucial regarding the functionality of the partnership between the country and the contractor. Traditionally, transportation was seen as a derived demand, meaning that its importance was determined by the demand for goods and materials. However, with the increasing complexity and integration of logistical processes, transportation has become an integral component of the supply chain. This is because transportation is not only responsible for physically moving goods from one location to another, but it also impacts other logistical processes such as inventory management, warehousing, and order processing.

For example, transportation decisions can impact inventory levels, as delays in transportation can lead to stockouts and excess inventory. Similarly, transportation costs can impact pricing decisions and ultimately affect customer demand. Therefore, it is important to view transportation as an interdependent aspect of physical distribution and materials management and to integrate it into overall logistical planning and decision-making (32).

Below, are depicted the common types of deliveries for ships, planes, and trucks.

Ships:

Port-to-Port: The delivery is made from one port to another port, not including transportation from the sender's location to the port of origin or from the port of destination to the receiver's location.

Door-to-Port: The delivery is made from the sender's location to the port of origin and does not include transportation from the port of destination to the receiver's location.

Port-to-Door: The delivery is made from the port of origin to the receiver's location, including transportation from the sender's location to the port of origin.

Door-to-Door: The delivery is made from the sender's location to the receiver's location, including transportation from the sender's location to the port of origin and from the port of destination to the receiver's location.

Planes:

Airport-to-Airport: The delivery is made from one airport to another airport, not including transportation from the sender's location to the airport of origin or from the airport of destination to the receiver's location.

Door-to-Airport: The delivery is made from the sender's location to the airport of origin and does not include transportation from the airport of destination to the receiver's location.

Airport-to-Door: The delivery is made from the airport of origin to the receiver's location, including transportation from the sender's location to the airport of origin.

Door-to-Door: The delivery is made from the sender's location to the receiver's location, including transportation from the sender's location to the airport of origin and from the airport of destination to the receiver's location.

Trucks:

Terminal-to-Terminal: The delivery is made from one terminal to another terminal, not including transportation from the sender's location to the terminal of origin or from the terminal of destination to the receiver's location.

Door-to-Terminal: The delivery is made from the sender's location to the terminal of origin and does not include transportation from the terminal of destination to the receiver's location.

Terminal-to-Door: The delivery is made from the terminal of origin to the receiver's location, including transportation from the sender's location to the terminal of origin.

Door-to-Door: The delivery is made from the sender's location to the receiver's location, including transportation from the sender's location to the terminal of origin and from the terminal of destination to the receiver's location.

Monitoring via IT in procurement

The majority of organizations today understand the strategic value of procurement. As a result, procurement has switched its emphasis from a conventional, administrative, and transactional activity to a more strategic, value-adding one focused on partnerships and alliances across the supplier network. Adoption of e-procurement technology, particularly the use of integrated communication systems to manage a portion or all the various procurement procedures, has been a crucial feature of this transformation. These processes comprise a range of steps, starting

with the initial authentication of users and going through browsing, buying, ordering, and receiving goods and services, as well as monitoring post-procurement feedback (33).

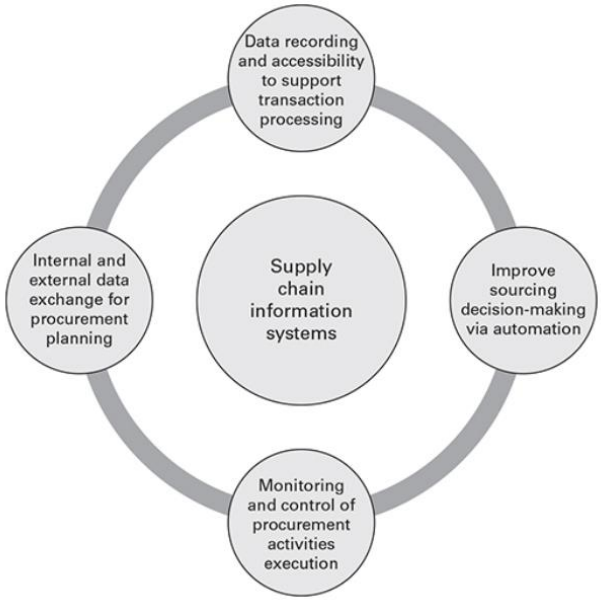


Figure 1 IT in Procurement (34)

Data exchange is crucial in the supply chain process as it enables effective communication and coordination among various functions, leading to improved efficiency and decision-making. It enables the smooth flow of information, from routine transactions to the implementation of advanced procurement strategies, which helps in reducing waste, minimizing risks, and optimizing resources. The use of data exchange technologies, such as electronic data interchange (EDI) and cloud-based platforms, has revolutionized the way supply chain functions operate, and has become an essential tool for businesses to stay competitive.

The implementation of IT in e-procurement systems may need significant modifications to the workflow of different organizational functions and trade partners. As a result, unlike the previous generation of dot-com companies, executives are now very cautious when developing a credible business case with demonstrable benefits and return on investments for IT-led projects designed to increase supply chain efficiency. Before introducing e-procurement systems and other web-enabled technologies, firms must review and evaluate not just their internal processes and activities – to ensure that they are effectively matched – but also suppliers and trade partners. This connection is the most difficult situation, because its country has its monitoring base, which is, in most of the cases, not functional with the company's monitoring system.

There are several e-procurement tools that can help military organizations to improve visibility of items throughout the transportation and procurement process. These tools can help to track the movement of goods and materials from suppliers to military organizations and can provide real-time updates on the status of orders and deliveries. Here are the most applicable of e-

procurement tools that can help to improve visibility in the transportation and procurement process:

Supply chain management (SCM) systems: These tools are used to manage the flow of goods and materials from suppliers to military organizations and can be used to track inventory and identify potential bottlenecks in the supply chain. SCM systems often include real-time tracking and visibility features, enabling military organizations to monitor the movement of goods and materials throughout the transportation process. An example of a supply chain management (SCM) system used in both military and private companies is SAP Ariba. It is a cloud-based platform that helps organizations manage their procurement and supply chain processes. SAP Ariba provides real-time visibility into the entire supply chain, from supplier selection and contract management to order tracking and invoicing. It enables companies to collaborate with suppliers, manage their spend, and make informed decisions to optimize their supply chain operations. With features such as real-time analytics, automated processes, and mobile access, SAP Ariba streamlines and simplifies supply chain management for both military organizations and private companies, helping them to drive efficiency, reduce costs, and improve overall performance.

Transportation management systems (TMS): These tools are used to plan, execute, and track the movement of goods and materials from suppliers to military organizations. TMS systems often include real-time tracking and visibility features, enabling military organizations to monitor the location and status of shipments in transit. Also, SAP through Transportation Management field could be used by both private companies and military government organizations. It provides end-to-end visibility and control over transportation operations, including planning, execution, and settlement. It also offers real-time tracking, which helps organizations monitor the status of shipments and make informed decisions.

Purchase order systems: These tools enable the creation and management of electronic purchase orders, which can be used to request goods or services from suppliers. Purchase order systems can often be integrated with other e-procurement tools (35), such as SCM and TMS systems, to provide a complete view of the procurement process from end to end. NetSuite is one of the best cloud-based solution that offers a range of e-procurement tools, including purchase order management. It enables organizations to streamline their procurement processes by automating the creation and management of electronic purchase orders and provides real-time visibility into the status of purchase orders and deliveries. Additionally, NetSuite can be integrated with other enterprise systems, such as accounting and inventory management systems, to provide a complete view of procurement operations.

Overall, these e-procurement tools can help military organizations to improve visibility and transparency in the transportation and procurement process, enabling them to track the movement of goods and materials and identify any potential issues or delays.

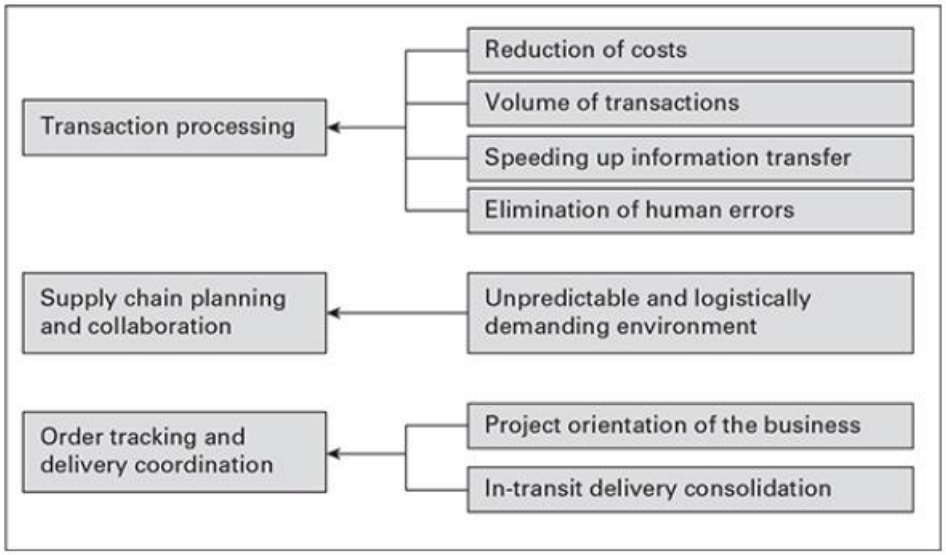


Figure 2 Drivers of IT in SCM (36)

Warranty & Discrepancy Reports

Warranty refers to a legal promise made by the supplier of a product or service to the buyer, guaranteeing that the product or service will meet certain standards. In the context of the document it is provided, the supplier is guaranteeing that its products and repairs will be free from defects in materials and workmanship and will meet their applicable technical specifications for a specified period of time, as outlined in the agreement between the purchaser country and the contractor (37). Discrepancy Report refers to a report that identifies a difference or a discrepancy between what was expected or required and what was actually delivered. In the context of the document, it is not explicitly mentioned, but a discrepancy report could be created by the buyer to report defects or deficiencies discovered in the products or repairs delivered by the supplier. The buyer is required to notify the supplier of such defects or deficiencies within specific days of discovery, as outlined in the agreement. More specifically, a group of professionals, comprising the Supplier's Quality control and the SCO, shall evaluate the warranty claim. investigation report shall be given by the Supplier to the Buyer within a certain timeframe (usually thirty (30) days). If a warranty claim is granted, the Supplier shall recover any deficiencies or non-compliance at no expense to the Buyer. The Supplier will inform the Buyer of the actions he will take to correct the defect or noncompliance or replace the equipment and will make all reasonable efforts to correct the problem and return the product or repair to the buyer within the standard repair time from the date the warranty claim is accepted. The vendor will bear the expenses of repair/replacement and shipment of the items or repairs. If the warranty is not accepted, the supplier will, in line with the terms of the relevant contract, repair or replace the defective product or failed repair at the cost of the customer.

Evaluate the performance of the contract

Finally, monitoring the progress of the project, to ensure that the items are delivered on time and meet the specified requirements, is very crucial for the whole process. This typically

involves working closely with the contractor to ensure that they are on track to meet the agreed upon delivery schedule, and to address any issues that may arise during the project. In addition, the military may also conduct regular inspections of the items to ensure that they meet the required specifications and are of the appropriate quality.

The country may establish a system for monitoring and evaluating the performance (38) of the military aviation company to ensure that they are meeting the terms of the contract and fulfilling their obligations. Monitoring and evaluating performance are important steps in the process of signing a contract between a country and a military aviation company. This can help to ensure that the company is meeting the terms of the contract and fulfilling their obligations and can also provide an opportunity for the country to identify any issues or problems that may arise during the course of the contract. These may include:

- Regular progress reports: The company may be required to provide regular reports to the country detailing their progress on the work specified in the contract.
- On-site inspections: The country may send representatives to the company's facilities to inspect the work being performed and ensure that it meets the standards specified in the contract.
- Performance metrics: The country may establish specific performance metrics that the company must meet in order to fulfill the terms of the contract. These may include measures of quality, efficiency, or customer satisfaction.
- Users' feedback: The country may solicit feedback from customers who are using the products or services provided by the military aviation company, in order to assess their satisfaction with the work being performed.

By monitoring and evaluating performance in this way, the country can ensure that the military aviation company is meeting the terms of the contract and fulfilling their obligations. It can also provide an opportunity for the country to address any issues or problems that may arise during the course of the contract.

Renew or terminate the contract: Once the contract period has ended, the country may decide to renew the contract with the same company or terminate the contract and seek new proposals from other military aviation companies. If the country decides to renew the contract with the same company, they may begin negotiations to finalize the terms of the new contract. This may involve reviewing the performance of the military aviation company during the previous contract period and discussing any changes or updates that may be necessary for the new contract. If the country decides to terminate the contract and seek new proposals from other military aviation companies, they may issue a new request for proposal (RFP) and follow the same process as before to evaluate and select a new supplier.

In either case, it is important for the country to carefully consider its needs and evaluate the proposals of different military aviation companies in order to select the best supplier for their needs. It is important for the military aviation company to fulfill their obligations under the contract in a timely and effective manner. This may involve coordinating with the country and

other stakeholders to ensure that the work is completed according to the agreed-upon schedule and specifications.

The military aviation company may also need to communicate with the country about any issues or challenges that may arise during the course of the contract. This could include delays, changes in the scope of the work, or other unexpected events. By working closely with the country, the military aviation company can help to ensure that the work is completed successfully and to the satisfaction of all parties involved.

Taking into account the above analysis, a typical procurement process through commercial sales is depicted below in the diagram:

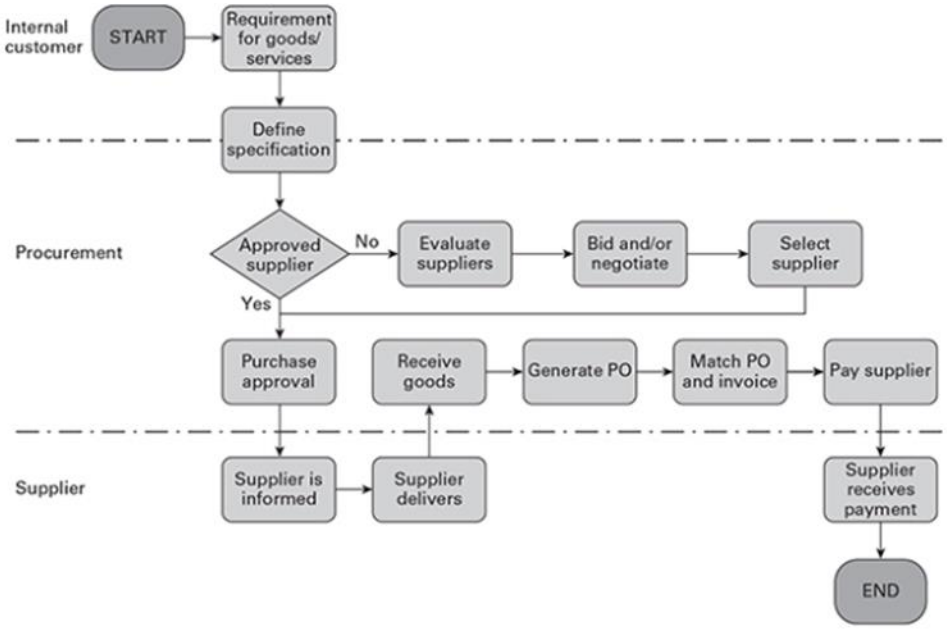


Figure 3 A typical procurement process (39)

2.3 Foreign Military Sale (FMS)

2.3.1 Definition

The Foreign Military Sales (FMS) program is part of the Security Assistance (SA) allowed by the Arms Export Control Act (AECA) and is a key weapon in US foreign policy. The United States may sell military products and services to foreign partners via this approach if the President of the United States determines that a potential international partner is eligible. FMS programs are carried out by legally binding contracts between the US government (USG) and an approved overseas partner. These government-to-government agreements to transfer military products and services from US to a foreign country are called FMS cases (40). When a qualified nation purchases weapons via the FMS program, it does not deal with the contractor or manufacturer directly (41). The foreign nation pays a surcharge on the sale to the United States Government, which is used to support transaction expenses. The obligation for

guaranteeing proper logistical support for systems supplied to FMS clients is a major aspect of the FMS program.

The Department of Defense (DoD) lacks a distinct logistical system to meet the needs of foreign armed forces. As a result, existing DoD logistics systems are used to meet these objectives. Logistics is a whole system, an integrated whole that consists of four components: acquisition, distribution, maintenance, and disposal. The FMS procedure is complicated and may take several years for a large military system sale. The FMS process's main important variables are defense acquisition, logistical, and financial elements. More particularly, the present dissertation will concentrate on the functional domains of transportation, maintenance, and supply in order to describe the FMS logistics process and compare it to that of Commercial Sales.

2.3.2 Basic Policies

Definition of Requirements/Initiation

The process of defining requirements can be easier through Foreign Military Sales (FMS) than when a country proceeds with the procurement process directly with a commercial company. This is because the FMS program offers several advantages, including standardized procedures, streamlined logistics, and well-established relationships with US government agencies and defense contractors.

Before a foreign government or organization may submit a request for Foreign Military Sales (FMS) through a Letter of Request (LOR) (42) they must first describe their criteria. This procedure normally comprises an evaluation of their defense requirements and capabilities, which is undertaken by the foreign government or organization's defense or military authorities. The evaluation takes into account present and anticipated threats, existing defense resources, financial limits, and other variables that may have an influence on their defense requirements. This approach is analogous to commercial sales and demonstrates each country's capacity to comprehend its own demands.

However, the FMS program provides a well-defined process for acquiring defense items, which can simplify the initiation of the procurement process for the foreign government or organization. More specifically, the US government handles many of the logistics, such as shipping and customs clearance, and provides training and support to the foreign military as needed. Additionally, FMS can often provide economies of scale and better pricing due to the larger purchasing power of the US government.

Based on this assessment, the foreign government or organization will then develop a list of their requirements, which could include defense articles, services, or training. The list is usually prioritized based on the urgency and importance of each requirement.

After the list is complete, the foreign government or organization may contact the US government to inquire about the availability, pricing, and technical specifications of the products on their list. This is referred to as a Request for Information (RFI) (43) and it assists the foreign government or organization in refining their requests depending on the information received. Upon completion of the RFI, the foreign government or organization may continue

to submit a formal LOR to the US government, outlining their particular needs and officially requesting a sale under the FMS program.

Letter of Request (LOR) – Channels of Submission

The Letter of Request (LOR) is a vital initial step in the procurement process, and it is required in the case of the Foreign Military Sales (FMS) program. The foreign government will utilize this document to declare their interest in acquiring defense items, services, or training from the United States of America.

The format of a LOR is not predetermined or standardized in any way. The provision of sufficient information to effectively express the needs of the foreign partner to the US Government is the essential component of a good letter of recommendation (LOR). To be more detailed, the letter of request (LOR) should contain as many specifics as possible about the goods or services that have been requested. These particulars should include specifications, quantities, and any needs that are particularly unique. To ensure that the Implementing Agency (IA) understands the needs and can deliver an accurate price, it is essential to be as precise as is possible feasible in the communication between the two parties.

A thorough and "actionable" LOR is required so that the IA may create the most accurate response to those requirements. A basic checklist outlining the areas of information that may need to be addressed in a LOR is provided below. Although not all of these categories apply to all LORs, the checklist gives useful insight into the sort of information the USG need in order to build an FMS case LOA document.

Services Considerations:

• Service description/type: This should provide a clear description of the services sought. It might be maintenance and repair services for a certain kind of equipment, or consultation services for a specific issue or problem.

• Performance period/location: This should include the projected time frame for the services as well as the location(s) where the services will be performed.

• DoD or US contractor: Indicate whether the services will be delivered by the US Department of Defense (DoD) or a US contractor.

• Case/program reviews: This should include information on any reviews or evaluations undertaken for the specific case or program.

Training Considerations:

• Training type and level: This section needs to include a clear description of the training type and level that is being sought.

• The number of employees who will get training and the degree of expertise they possess should both be specified here. This is the information that should be included.

This should specify the suggested site and dates for the training.

• Proposed location and dates: This should show the proposed location and dates for the training.

• DoD or U.S. contractor: This should indicate who will be providing the training.

• Concept of the training program: This section needs to include an overview of the training program idea, including any particular requirements or goals.

Support Considerations:

• Operations Concept: A summary of the operations idea, including any particular needs or goals.

• Maintenance Concept: This section should outline the maintenance needs for the desired equipment or services.

• Supply Concept: This section should outline the supply needs for the desired equipment or services.

• Initial Spares: Indicate if initial spares are necessary.

• Support Equipment: This section should include any essential support equipment.

• Facilities/Site Survey: Specify any needs for facilities or site surveys.

• Publications: This section should list any needed publications.

This section should include any warranty requirements.

• Follow-up Support: This section should outline any needs for follow-up help.

Delivery Considerations:

• Freight forwarder: Here is the section in which the freight forwarder that will be used should be specified.

• Pilot pickup: The value of this variable should indicate whether or not a pilot pickup is necessary.

• Defense Transportation System (DTS) Port of Debarkation (POD): This has to be specified as the Defense Transportation System (DTS) Port of Debarkation (POD).

• Movement of air or surface: This should define whether movement of air or surface is necessary.

General Info/Special Considerations:

• Purchaser: This section should include information on the group that is doing the buying.

• Relevant purchases/Memorandums of Understanding or Memorandums of Agreement: This should specify any relevant purchases that are connected, as well as any relevant Memorandums of Understanding (MOUs) or Memorandums of Agreement (MOAs).

• Transparency and special reports: This should state whether special reports or transparency are necessary.

• Interoperability: This should specify whether or not the capability to communicate with other pieces of hardware or services is necessary.

• Acceptance time period: Here is where you should provide the acceptable time range for acceptance.

Major Item Considerations:

• Quantity: The amount of the main item(s) required should be stated here.

The primary item(s) being sought should be specifically identified and described in this section.

• Intended end use: The primary item's intended end usage should be stated here.

• Model/configuration: The preferred model/configuration of the primary item should be stated here.

• Desired delivery date

Price and Availability (P&A) Data

The Pricing and Availability (P&A) procedure is normally the following step that takes place after the Letter of Request (LOR) has been filed via the Foreign Military Sales (FMS) system. At this stage, the United States government conducts an analysis of the LOR and gives a response to the nation that made the request. The answer contains details on the cost and availability of the products or services that were requested.

The P&A procedure requires the United States government to ascertain not only the cost of the goods or services that are being sought but also the amount of time necessary for their delivery. In most cases, the government of the United States will collaborate with U.S. contractors and suppliers in order to get the required information on cost and availability.

In addition to this, P&A data relates to an estimate known as a Rough Order of Magnitude (ROM), which reflects the estimated cost and availability of military goods and services that are included in a LOR. While responding to a P&A request, the IA will often make use of the financial and logistical information that is already available. But P&A is only meant to be used for planning reasons, and a prospective purchaser shouldn't utilize it for budgeting purposes because of its original function.

The Letter of Offer and Acceptance (LOA)

The Letter of Offer and Acceptance, abbreviated as "LOA," is a document that is used in the sale of defense-related goods and services from one government to another. The Letter of Offer and Acceptance (LOA) is issued by the United States government and acts as a contract between that government and the government of the country that is acquiring the military goods and services.

The phrase "contract" is generally considered to refer to a legally enforceable agreement that is reached by two or more parties and is intended to be mutually binding. The Federal Acquisition Regulation details the consistent rules and processes that must be adhered to when developing and carrying out the process of awarding contracts for the purpose of acquiring goods or services on behalf of the United States Government (FAR). The contract involving the FMS is not of the procurement kind and was not designed or carried out in accordance with

the FAR. An FMS case, on the other hand, is a one-of-a-kind agreement that is formed in accordance with the principles and procedures outlined in the Security Assistance Management Manual. This is done under the authority of the Arms Export Control Act (AECA), which was passed in the United States in 1976. (SAMM). The FMS case provides evidence of the government-to-government agreement reached between the United States Government and its overseas partner. In the letter of agreement (LOA), the United States Government (USG) makes a commitment to deliver particular defense goods or services, and the international partner makes a commitment in the document to adhere to particular terms and conditions associated with the sale and to make particular financial payments.

Six basic elements must be present for an agreement to be enforceable by law as a contract. These six contractual elements are present in each FMS case. This section highlights how these six contract elements relate to the FMS case process.

Offer

An offer is a proposition made by one party to another party to engage into a contractual relationship with that party. In order for a statement or communication to be considered an offer, the statement or communication in question must have been made with the intention of being an offer. The FMS procedure is significantly aided by the contribution of this component. An official offer by the United States Government (USG) to sell military goods or services is made to a potential foreign partner by providing a Letter of Offer (LOA) that is complete with the required USG signatures. In most cases, a Letter of Acceptance (LOA) will not be issued until a particular overseas partner has submitted a Letter of Request (LOR). Each of the available LOAs includes a reference to the LOR of the overseas partner. The offer included in the LOA is still valid up to the date specified there as the offer's termination. Following the date that the offer is valid for, the Letter of Offer and Acceptance (LOA) is no longer considered an offer and cannot be accepted until it is revived or reissued by the United States Government.

Acceptance

Acceptance expresses agreement with the contract offer. To be effective, the acceptance must be explicit, timely, and on the same conditions as the offer. This contract idea is critical to the FMS procedure. Notwithstanding the fact that an international partner filed a LOR for a LOA, the international partner is not required to accept the LOA given by the USG. Acceptance of the LOA is performed by an approved country representative signing the LOA prior to the offer expiry date, transferring the stated initial deposit, and returning the required number of signed LOA copies. Acceptance is contingent on the payment of the first deposit. The FMS case cannot be implemented until the first deposit is received. Moreover, the overseas partner notifies the USG of the appropriate mark for code, freight forwarder code, purchaser procurement agency code, and the name/address of their paying office throughout the acceptance procedure. The foreign partner enters this information at the bottom of the first page of the LOA.

Consideration

Consideration arises when one side offers anything of legal worth or advantage to another. Consideration is the monetary equivalent of the value of a promised action. In an FMS instance, consideration is the financial payment(s) made by the foreign government in exchange for defense products and services delivered by the USG.

Competent Parties

The phrase "competent parties" refers to both contract parties having the legal competence to engage into the contract. The approved USG and authorized country representatives who sign the LOA are the competent parties in the FMS case. Each LOA will be signed in writing/digitally by a representative of the implementing agency (IA) that created the LOA. In addition, each LOA will include an electronic countersignature indicating that the LOA has been examined and authorized by DSCA. Each foreign partner develops their own LOA evaluation and acceptance procedure. Receiving a signed LOA from the overseas partner, together with the initial deposit (which is generally large), confirms to the US that the person who signed to accept the FMS case is an authorized country representative of that particular government.

Lawful Purpose

A contract that violates laws is generally invalid and will not be enforced. Thus, before to providing or accepting a specific LOA, officials from both countries must check that it complies with their own laws and rules under the FMS procedure. The US Government must follow the Arms Export Control Act (AECA), the Foreign Aid Act (FAA), and other related laws. Also, foreign partners must ensure that their acts related to the LOA are compliant with their respective national laws.

Terms and Conditions

A contract must explicitly define the acts that each party has agreed to do. A contract that fails to specify who, what, when, where, how, at what cost, and under what circumstances these acts will take place may cause misunderstanding and be unenforceable. In this respect, each FMS LOA comprises a set of standard terms and conditions that apply regardless of whether they are physically tied to a specific instance. Nevertheless, the usual terms and conditions must be included in the original LOA that is forwarded to the overseas partner for evaluation and approval. The same set of standard terms and conditions apply to all FMS LOAs and are same for all overseas partners.

2.3.3 Foreign Military Sales Logistics Process

Defined Order Case

An instance of foreign military sales that is distinguished by orders for certain defense equipment and services that are listed as distinct line items on the letter of offer and acceptance (LOA) denoted as a Defined order case.

Cases involving Defined Orders are an essential component of Foreign Military Sales (FMS) and are used to cater to the particular requirements outlined by overseas partners. In the Letter

of Request (LOR), (44) the foreign country will detail the needed defense items, services, or trainings. The Implementing Agency (IA) (45) will then develop and submit requisitions (orders) for any Defined Order situations. The sale of big end products, such as Significant Military Equipment (SME) and Major Defense Equipment (MDE) (46), which call for more strict export and trade security controls throughout the FMS process, often takes place via these cases.

A data analysis of the LOA is part of the procedure for the Defined Order Case (47), which focuses on the individually deliverable LOA line items. This data analysis is being prepared by the IA in order to provide the foreign partner with the most accurate estimate of item prices and delivery dates that is possible within the allotted time limit for processing. The LOA data analysis provides information on delivery timelines, expected payments to contractors, and financial analysis for program milestones. It also includes information on payment schedules. While creating price for LOAs, historical data may also be utilized if necessary.

SME and MDE, explosives including munitions, classified and sensitive products, particular services such as transportation and aircraft ferrying, and Technical Data Packages (48) are the categories of military articles and services that are often offered via Defined Order Cases.

Blanket Order Case

A Foreign Military Sales (FMS) case is considered to be of the kind known as a Blanket Order case when the foreign partner acquires a category of commodities, services, or training at a predetermined dollar value ceiling without specifying the particular aircraft items that are wanted. In most cases, the dollar cap is decided upon by the overseas partner, and a data analysis of the LOA is not often necessary in order to formulate price for the LOA. As long as there are funds available for the case, national partners are allowed to file requisitions.

When the original support period for a significant item or weapon system has concluded, blanket order cases are often used for follow-on support and training for the item or system. As a general rule, the initial or concurrent support is included in the Defined Order Case of the original system sale as a component of the Total Package Approach (TPA) (49). Depending on the Implementing Agency (IA), a follow-up support case for a Blanket Order might be created for each type of item or service that is to be delivered, for each significant item or weapon system, or for the support of numerous systems.

Spares and repair parts, support equipment, publications, maintenance, repairable, technical assistance services, training, and training aids are the categories of military aircraft items, services, and training that are often offered through Blanket Order cases. Spares and repair parts are expendable and reparable components that, once used, get integrated into a more complex assembly. Equipment employed in direct or indirect support and maintenance of weapon systems or end goods may be categorized as support equipment. This category includes things such as specific tools, test equipment, vehicles, construction equipment, materials handling equipment, and other items. Forms, catalogs, manuals, stock lists, technical orders, engineering drawing specifications, reports, books, charts, and other materials are examples of the kind of things that might be classified as publications. Repairs, maintenance services, and renovations and modifications of a modest nature, as approved by the applicable IA, are all

included in maintenance. Items that are repairable are those that can be effectively returned to a state where they can be put to use via the processes of repair or overhaul, including the overhaul of individual components, or through other types of specialized maintenance procedures (50). Technical assistance services include site/system survey teams, the installation and testing of major items, the evaluation of systems, technical assistance teams, the advice of specialists, feasibility studies, the integration of systems, study groups to develop engineering requirements plans, and other services. The Department of Defense (DOD) and its components, private contractors, and correspondence schools may provide official or informal education to overseas students as part of their training programs. Items that are used to support training programs are referred to as training aids. Some examples of training aids include videotapes, DVDs, slide films, microfiche, transparencies, and other types of media.

There are several situations in which the processes for a Blanket Order case do not apply, and instead, products need to be ordered on a Defined Order case instead. These things include SME, including MDE, classified materiel (excluding classified publications), commercial commodities that are more easily available from inside the nation, technical data packages (TDPs), and ozone-depleting compounds. Classified publications are excluded from this category.

In conclusion, a Blanket Order case is a type of FMS case in which the international partner purchases a category of items, services, or training at a set dollar value ceiling without specifying the exact items or quantities desired. This can occur when the partner wants to acquire new skills or update existing ones. When the original support period for a significant item or weapon system has concluded, blanket order cases are often used for follow-on support and training for the item or system. Spares and repair parts, support equipment, publications, maintenance, technical assistance services, training, and training aids are all examples of the sorts of military items, services, and training that may be purchased via the use of Blanket Order cases. It is not possible to place an order for some products using the Blanket Order instance, and instead, it is prerequisite to utilize a Defined Order case.

Cooperative Logistics Supply Support Arrangement (CLSSA)

A CLSSA case is a sui generis process and intended to offer more prompt aftermarket spare parts support for US-made military weapons controlled by overseas partners. With the authority of the Military Security Cooperation Agency, IAs may propose such agreements. The purpose of a CLSSA is to promote cooperation and interoperability among military forces, as well as to reduce the logistical burden on the United States by sharing the responsibility of logistics support with partner nations. CLSSAs are typically negotiated on a case-by-case basis and are subject to specific terms and conditions agreed upon by both parties (51).

A CLSSA is made up of two sections. The first part is the Foreign Military Sales Order I (FMSO I) case, which is formed up front to purchase "equity" in the DOD's supply chain for DOD-stocked, non-SME products utilized on a recurrent basis by the overseas partner. This allows the DOD to supplement military supplies in advance of FMS needs, increasing the likelihood of spare and repair components being available for issuance from DOD stock. FMSO I, or the stock level scenario, establishes the FMS customer's investment for increasing DoD inventories and kicks off the arrangement. As a direct outcome of the FMSO I, no material

is passed to the consumer. The FMSO I will stay in place during the CLSSA. It may be renegotiated as needed when the investment level required to fund the country's real withdrawals changes. The following are the main important points of FMSO I:

- FMSO I Stock Level Value Computation

The stock level value is calculated by multiplying the Stock Level Quantity (SLQ) (52) by the FMSO I price. The greater the FMSO I price, the greater the FMSO I case value needed. When both the FMSO I price and the stock level quantity are high, the impact is amplified. Country Inventory Managers should be aware of the cost of the products and take it into account when considering whether to seek assistance via CLSSA, particularly if FMSO I funds are restricted.

- Eligible-to-Be-Programmed Quantity (EPQ) Computation

The global EPQ is used to code recurrent FMSO II requisitions (53) that are programmed (eligible for support from depot stock). If the request quantity is less than or equal to the global EPQ, the system will classify eligible requisitions as programmed. For each Investment Item (National Stock Number -NSN-), there is only one Global Repair EPQ and one Worldwide Procurement EPQ. Customers of CLSSA do not have their own EPQs. (To calculate the Global EPQ, the algorithm computes each nation SLQ quantities and then combines them together.) Every quarter of the year, the system recalculates SLQ and Global EPQ. Since EPQ serves global demand, unexpected increases in demand will diminish asset availability to satisfy scheduled needs. As a result, more EPQ may be accessible at the start of the quarter than at the conclusion. As a consequence, requisitions filed early in the quarter are more likely to be coded and programmed. The EPQ is calculated as the demand for one quarter plus any unused EPQ from prior quarters up to the total SLQ.

Table 5 EPQ & SLQ Example

Example	DMD/MO	PLT	SLQ	DMD/QTR	Unused EPQ	EPQ
1	1	24 Months	24	3	0	3
2	1	24 Months	24	3	2	5

In Example 1, the demand for three is equivalent to one quarter's worth. Due to the fact that there is no unused EPQ left over from the previous quarter, the system is able to code requisitions with a quantity that is programmed up to three.
Example 2 refers to the following quarter period: The system only got one recurring demand for quantity one during the preceding quarter, and it only utilized one of the EPQs available to it, leaving two of them unused. As a direct consequence of this, the EPQ for the current quarter is a total of 5 (3+2). As a result, the system is able to code requisitions with a quantity of up to five programmed into it.
During the previous quarter, the system received just one recurring demand for quantity one and utilized only one EPQ, leaving two unused. As a consequence, the EPQ for the current quarter is 5 (3+2). As a result, the system may code up to five programmed requisitions. Note Regardless of any unused EPQ from prior quarters, the EPQ cannot be more than the total SLQ. Requisitions for amounts more than the Daily calculated Global EPQ will be classified as non-programmed. The CLSSA client does not have access to the global EPQ. While submitting

requisitions, the client may refer to their SLQ as a guidance. Each requisition sizes should be limited in order to maximize the number of requisitions coded programmed, and requisitions should be filed as early in the quarter as feasible. If there is enough Global EPQ, each qualifying recurring FMSO II case request may be coded programmed. Customers who do not have an SLQ for a certain item might potentially acquire programmed assistance for their recurrent requisitions. It also enables clients to request sums in excess of their SLQ (in the event of unanticipated needs) and potentially get planned assistance. In each of these cases, the client should demand modest quantities in order to take advantage of accessible global EPQ. In both cases, the SLQ will be adjusted depending on the customer's recurrent requisitions.

The FMSO II case is the second portion of a CLSSA case. FMSO II is a Blanket Order CLSSA case used to demand such commodities by the foreign partner. Several foreign partners favor CLSSA cases for follow-on support since the advantages of FMS are more clearly illustrated in this example. In other words, FMSO II, also known as a requisition case, is a program that enables the FMS client to purchase spares and repair parts as they are used in order to replace in-country stocks. The customer's payments under the FMSO II program help to replace materials removed from DoD stockpiles and keep the FMS customer's investment in US DoD inventory stable.

The FMSO II case is used by the customer to requisition material for in-country stock replenishment. As a result, the CLSSA Program and the supporting data system names called as Security Assistance Management Information System (SAMIS) (54) are designed to support all CLSSA requisition requirements with a single case and line. The buying country may designate numerous cases for internal use, but the USAF, which is the main Implemented Agency (IA) for the aircraft procurement parts and repairable items, is under no obligation to follow such designations. Requisitions must be filed on a case-by-case and line-by-line basis, and if expedited processing is required, USAF maintains the right to reassign requisitions to any cases that do have the requisite money.

Processing of requisitions by the Source of Supply is determined by the amount of the item that is currently available, the priority level of the requisition, and whether or not the demand is Programmed or Non-programmed. Instead of submitting their requisitions in a pattern that peaks, the foreign nations should submit their requisitions in a pattern that is stable. This would allow the greatest number of requisitions to be coded and programmed. As requisitions for large quantities are more likely to go over the EPQ than requisitions for smaller quantities, it is imperative that several requisitions and returns be made in order to receive the total amount that is necessary. On the beginning day of each quarter, SAMIS will recalculate SLQ and EPQ. If an item does not have a stock level, SAMIS will either requisition a small quantity from the previous quarter or return an unserviceable.

Below the barrel depicts in one picture the whole philosophy of CLSSA case and especially how the submitted requisitions will be handle it.

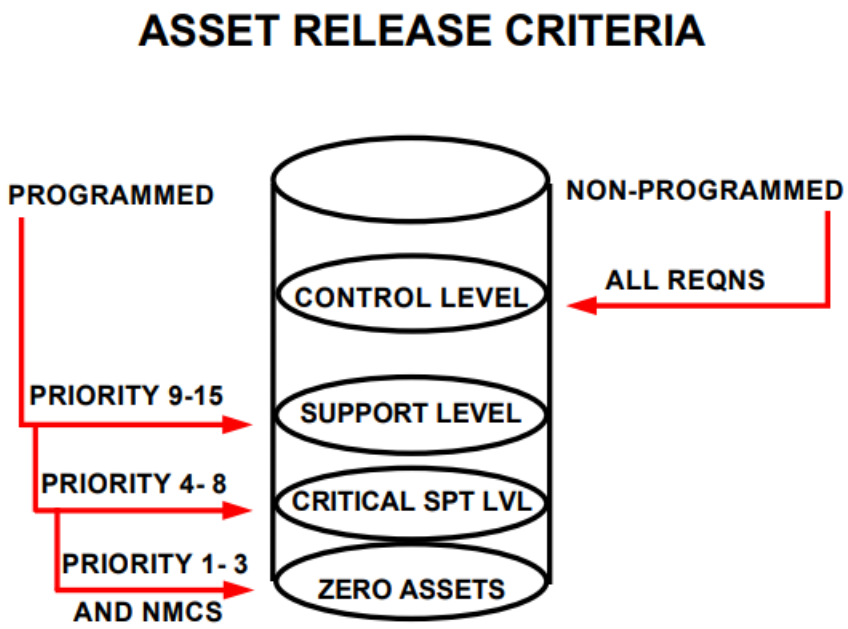


Figure 4 Asset Release Criteria (55)

• Programmed requisitions with priority 9–15 are eligible to be supplied from depot stock down to the support level. This applies to requisitions with lower support levels.
• Requisitions that have been programmed with priority 4–8 are eligible to have depot stock assistance provided for them and especially down to the critical support level.
• Programmed requisitions with priorities 1–3 and Not Mission Capable—Supply (NMCS) requisitions are eligible to be supported from depot stock down to the zero-asset level. This is because these requisitions have high priority than other requisitions.
• Any non-programmed requisitions will only be fulfilled using depot supplies when the stock is adequate to satisfy all programmed requisitions first.

PROS

The Parts and Repair Ordering System (PROS) is a major procurement system managed by the Air Force Security Assistance and Cooperation (AFSAC) Directorate, (56) to support logistics requirements for Foreign Military Sales (FMS) customers. PROS provides supply and maintenance support for a wide range of difficult-to-support aircraft items (57). The acronym "PROS" stands for the Parts and Repair Ordering System, which is a computerized logistics management system meant to simplify the process of placing orders for replacement parts and repair services for components used in military aircraft which are not feasible to be procured through USAF and other IA's channels. PROS is a system that was developed by the Department of Defense (DoD) of the United States. Its purpose is to ensure that parts and repair services are delivered to military units in an effective and timely manner, thereby improving the overall readiness and operational capabilities of the armed forces.

The outsourcing component of PROS is of the utmost importance; this component entails forming partnerships with third-party vendors and repair facilities in order to offer the required components and services. To be more particular, the management of external suppliers and repair facilities is an important part of the PROS and plays a significant role in the function that outsourcing plays. A database of certified suppliers and repair facilities is kept up to date

by the system. This database contains information about the facilities' capabilities, certificates, and performance records. This information is used to match orders with the suppliers that are the best fit for them. This helps to ensure that customers get high-quality components and services while keeping expenses to a minimum. In addition, the PROS is in charge of handling contract management with external suppliers and repair facilities. This includes negotiating contracts, defining price structures, setting performance benchmarks, and monitoring adherence to contractual conditions. It is necessary to have efficient contract administration in place in order to guarantee that outsourcing partnerships will provide the intended outcomes with regard to quality, cost, and timeliness.

Components of the Parts and Repair Ordering System (PROS):

• User Interface: The user interface is the major interaction point for military personnel, enabling them to search for components and repair services, make orders, and follow the progress of their requests. The interface is meant to be intuitive, facilitating access to pertinent information and reducing the need for lengthy training.

• Catalog Management: The PROS system includes a complete catalog of spare parts and maintenance services for a vast array of military equipment, vehicles, and aircraft. This ensures that consumers have access to the most up-to-date information.

• Inventory Management: The system keeps track of the available components and repair services at different supply depots, warehouses, and repair facilities. This information is utilized to improve the allocation of resources, reduce lead times, and guarantee the availability of components and services.

• Order Processing and Tracking: PROS automates order processing, including preparation of required paperwork, routing of orders to the right vendors or repair facilities, and tracking of shipments. Users may check the status of their orders in real-time, allowing for more efficient planning and execution of maintenance procedures.

• Supplier and Repair Facility Management: The system maintains a database of recognized suppliers and repair facilities, including their capabilities, certifications, and past performance. This data is utilized to match orders with the most relevant vendors, providing high-quality components and services at the lowest possible price.

• Financial Management: PROS interfaces with financial management systems to simplify spending monitoring, billing, and payment processing. This guarantees accurate financial reporting and allows users to monitor and manage expenses connected with the purchase of parts and maintenance services.

• Reporting and Analytics: The system offers a variety of data and analytics pertaining to parts procurement and repair services, offering insights into trends, performance, and future improvement areas. This data may be used to aid in decision-making and enhance logistical procedures.

Transportation

One crucial aspect of the FMS process is the transportation of purchased items, which ensures that defense articles are delivered to the purchasing country efficiently, securely, and in compliance with applicable regulations. This chapter explores the various modes of transportation involved in FMS, the planning and coordination required, transportation costs and logistics management associated with transportation in the FMS process.

I. Modes of Transportation in FMS:

The selection of the most appropriate mode of transportation in the FMS process is crucial for ensuring efficient and secure delivery of defense articles. Factors such as the size, weight, destination, urgency of the shipment, and infrastructure available at the point of origin and destination play a significant role in the decision-making process. The following modes of transportation are commonly used in the FMS process (58).

A. Air Transportation:

Military Air Cargo: The U.S. military operates a fleet of cargo aircraft, such as the C-17 Globemaster III and C-130 Hercules, capable of transporting large, heavy, and sensitive equipment. Military air cargo offers several advantages, including enhanced security, direct control over the shipment process, and the ability to access remote or restricted locations. However, military air cargo can be more expensive and may have limited availability due to competing priorities and mission requirements.

Commercial Air Cargo: Commercial air cargo involves using civilian airlines to transport FMS shipments. This mode of transportation is typically faster than sea or land transportation, making it suitable for urgent shipments or smaller items. Commercial air cargo can also be more cost-effective than military air cargo, especially for routine or non-sensitive shipments. However, commercial air transportation may have limitations in terms of cargo size, weight, and security measures, making it unsuitable for certain types of defense articles.

B. Sea Transportation:

Military Sealift: Military sealift involves using U.S. Navy or other allied military vessels to transport FMS shipments. This mode of transportation offers high security and the ability to transport large and heavy equipment, such as vehicles, helicopters, and major end items. Military sealift can also access restricted or remote locations, making it suitable for shipments to countries with limited port infrastructure. However, military sealift can be slower than air transportation and may have limited availability due to operational demands.

Commercial Sealift: Commercial sealift involves using civilian shipping companies to transport FMS shipments. This mode of transportation can be cost-effective, especially for large and heavy shipments that do not require the security and direct control offered by military sealift. Commercial sealift also offers flexibility in terms of scheduling and shipping routes. However, commercial sealift may be subject to geopolitical factors, such as trade restrictions or sanctions, and may have limitations in terms of security measures and port access.

C. Land Transportation:

Military Ground Transport: Military ground transport involves using U.S. military or allied military vehicles, such as trucks and trailers, to transport FMS shipments over land. This mode of transportation offers enhanced security and direct control over the shipment process but may be limited by factors such as road infrastructure, border controls, and the availability of military vehicles and personnel.

Commercial Ground Transport: Commercial ground transport involves using civilian trucking or rail companies to transport FMS shipments. This mode of transportation can be cost-effective and flexible, allowing for the transportation of a wide range of cargo types and sizes. However, commercial ground transport may be subject to border controls, infrastructure limitations, and security concerns, making it unsuitable for certain types of defense articles or shipments to high-risk regions.

II. Transportation Planning and Coordination:

Transportation planning and coordination are essential for ensuring that FMS shipments are delivered efficiently, securely, and in compliance with applicable regulations. Effective transportation planning involves identifying transportation requirements, selecting the most suitable transportation mode, and coordinating with relevant stakeholders. The following sections provide an analytical description of these processes:

A. Identifying transportation requirements:

To ensure the efficient transportation of FMS shipments, it is necessary to identify and understand the specific transportation requirements of each shipment. This involves analyzing the following factors:

Cargo characteristics: The size, weight, and nature of the defense articles being shipped will dictate the type of transportation needed. For instance, certain items may require specialized handling or packaging, while others may be subject to specific import/export regulations or security requirements.

Origin and destination: The locations of the shipping origin and destination will influence the choice of transportation mode, as well as the routing and scheduling of the shipment. Factors such as the availability of transportation infrastructure, customs procedures, and geopolitical considerations must be taken into account.

Time sensitivity: The urgency of the shipment will affect the choice of transportation mode, with air transportation typically offering faster delivery times than sea or land transportation. The required delivery timeline should be balanced against cost considerations and the availability of transportation resources.

Cost constraints: Budgetary constraints may influence the choice of transportation mode, as well as the scheduling and routing of the shipment. Decision-makers should consider both the direct costs of transportation and the potential indirect costs associated with delays, inventory holding, or other logistical factors.

Once the transportation requirements have been identified, decision-makers must select the most suitable transportation mode or combination of modes for each FMS shipment. This involves conducting a thorough analysis of the advantages and limitations of each transportation mode, taking into account the factors identified in the previous section. The following considerations should be taken into account when selecting the most suitable transportation mode:

- Cost-effectiveness: Decision-makers should weigh the direct costs of each transportation mode against the potential indirect costs associated with factors such as transit time, inventory holding, and logistical complexity. This may involve conducting a cost-benefit analysis to identify the transportation option that provides the best value for money.
- Speed and reliability: The time sensitivity of the shipment and the required delivery timeline should be balanced against the speed and reliability of each transportation mode. Air transportation may offer faster transit times but may be subject to delays due to factors such as weather, airspace restrictions, or capacity constraints. Sea and land transportation may be slower, but potentially more reliable and less susceptible to disruption.
- Security and control: The nature of the defense articles being shipped, and the associated security requirements should be considered when selecting the transportation mode. Military transportation options may offer greater security and direct control over the shipment process, while commercial transportation options may require additional security measures or coordination with civilian partners.
- Accessibility and infrastructure: The availability of transportation infrastructure at the origin and destination, as well as any intermediate transit points, should be considered when selecting the transportation mode. This may involve assessing factors such as port facilities, airport capacity, road and rail networks, and customs procedures.
- Geopolitical factors and regulatory compliance: The selection of transportation mode should take into account geopolitical factors and the need to comply with applicable regulations, such as import/export controls, trade restrictions, and sanctions. This may involve coordinating with relevant government agencies and other stakeholders to ensure that the chosen transportation mode complies with all legal requirements and minimizes the risk of disruption.

III. Transportation Costs and Financing:

Understanding and managing transportation costs and financing options are crucial for ensuring the success of FMS transactions. This section provides an analytical description of the estimation and allocation of transportation costs, as well as financing options available to purchasing countries.

A. Cost estimation and allocation:

Accurate estimation of transportation costs is vital for budgeting and decision-making purposes. Factors that influence transportation costs in the FMS process include:

Mode of transportation: As previously discussed, different modes of transportation have varying cost structures. Military air cargo or sealift may be more expensive than commercial options, while land transportation costs can be influenced by factors such as distance, road infrastructure, and border controls.

Cargo characteristics: The size, weight, and nature of the defense articles being shipped will affect transportation costs. Items that require specialized handling, packaging, or security measures may incur additional costs.

Routing and scheduling: The choice of shipping routes and schedules can impact transportation costs. Shorter or more direct routes may be more cost-effective, but may also be subject to capacity constraints, geopolitical factors, or other limitations.

Insurance and risk management: The cost of insurance and other risk management measures, such as contingency planning or security escorts, should be considered when estimating transportation costs.

Customs duties and fees: Import/export duties, taxes, and fees imposed by the countries involved in the FMS transaction can impact transportation costs and should be factored into cost estimations.

Allocating transportation costs in the FMS process typically involves assigning responsibility for these costs to either the purchasing country or the U.S. government, depending on the terms of the agreement. This may involve direct billing for actual transportation costs, the inclusion of transportation costs in the total FMS case value, or the use of a transportation cost-sharing arrangement.

IV. Shipment Tracking:

Shipment tracking in the FMS process involves monitoring the movement of defense articles from their point of origin to their final destination, ensuring that they are delivered on time and in good condition. Key aspects of shipment tracking include:

1. Visibility: Providing real-time visibility into the location and status of defense articles throughout the transportation process, using technologies such as GPS tracking, radio-frequency identification (RFID), and electronic data interchange (EDI) systems.
2. Performance monitoring: Tracking the performance of transportation providers, including on-time delivery rates, transit times, and other key performance indicators (KPIs), to identify areas for improvement and ensure that transportation providers meet their contractual obligations.
3. Incident management: Identifying and addressing issues that may arise during the transportation process, such as delays, damage, or security incidents, and implementing contingency plans to minimize the impact of these issues on the delivery of defense articles.

V. Delivery Term Code (DTC)

The DTC is a unique identifier for each FMS cargo that denotes the point in the transportation cycle at which the U.S. Department of Defense transfers responsibility for the actual movement of an FMS shipment to the purchaser. Typically, the LOA provides a delivery location for each line inside a case. The DTC states up to what point the U.S. will provide transportation, beyond which the customer is responsible for providing transportation. The below table depicts all the codes which indicate under which stage the US is responsible for inbound and outbound shipments.

Table 6 Delivery Term Codes (55)

Term Code	Definition
2	To a CONUS inland point (or overseas inland point when the origin and destination are both in the same geographic area).
4	Not applicable (Purchaser has full responsibility at the point of origin. Often forwarded collect to country freight forwarder.)
5	At the CONUS POE on the inland carrier's equipment
7	At the overseas inland destination on board the inland carrier's equipment
8	At the CONUS POE on board the vessel or aircraft
9	At the overseas POD alongside the vessel or aircraft
	Delivery Term Codes showing DOD transportation responsibility for repair LOAs are shown below. The LOA will provide a CONUS address for each item identified for repair. The Purchaser must assure this address is shown on all containers and documentation when materiel is returned.
A	From overseas POE through CONUS destination to overseas POD on board the vessel or aircraft (FMS customer responsibility equal to DTC 4 in both directions.)
B	From overseas POE through CONUS destination to CONUS POE on board the vessel or aircraft (Transportation is the same as DTC 9 for inbound materiel, and DTC 8 for outbound materiel.)
C	From CONUS POD on board the vessel or aircraft through CONUS destination to CONUS POE on board the vessel or aircraft (Transportation is the same as DTC 8 in both directions.)
D	From CONUS POD on board the vessel or aircraft through the CONUS destination to overseas POD on board the vessel or aircraft
E	Not applicable (Purchaser has complete responsibility.) (Transportation is the same as DTC 4 in both directions.)
F	From overseas inland point through CONUS destination to overseas inland destination (Transportation is the same as DTC 7 in both directions.)
G	From overseas POE through CONUS destination to overseas POD alongside vessel or aircraft (Transportation is the same as DTC 9 in both directions.)
H	(For classified items) From CONUS inland point to CONUS POE alongside vessel or aircraft (Transportation is the same as DTC 4 for inbound materiel and DTC 5 for outbound materiel.)
J	(For classified cryptographic items) From CONUS inland point to overseas inland destination (Transportation is the same as DTC 4 for inbound materiel and DTC 7 for outbound materiel.)

Discrepancy Reports

The management of discrepancies is an important aspect of the FMS program, as it helps to maintain transparency and accountability in the procurement of defense supplies and equipment. The process begins when the purchaser identifies an issue with the supplies received from the USAF (59). This could be due to missing items, damaged items, incorrect quantities, or any other discrepancies.

The supply discrepancy report (SDR) is an essential tool in the Foreign Military Sales (FMS) program for reporting and resolving issues with the supplies received from the supplier. Common issues that can be reported through the SDR process include mistakes, mishandling, documentation issues, mismatched documentation, missing documentation, delivery listing discrepancies, and supply discrepancies. Supply discrepancies are the most common issue reported through the SDR process. These discrepancies can be due to missing or damaged items, incorrect quantities, or other issues with the supplies received. The purchaser should document the issue and provide supporting evidence, such as photographs or serial numbers, to help the supplier investigate and resolve the issue.

Mistakes can happen during the procurement process, such as incorrect ordering, shipping, or handling of supplies. The SDR process provides an opportunity for the purchaser to report any mistakes to the supplier and to work collaboratively to find a resolution. If the purchaser identifies any mistakes in the supplies received, they should initiate the SDR process immediately by completing the SF364 form and providing a detailed description of the problem and any supporting documentation. The supplier is responsible for investigating the issue and providing a response within a specified timeframe. The response should include a detailed explanation of the cause of the mistake, any corrective actions taken or planned, and a timeline for resolution.

Mishandling can result in damages or discrepancies in the supplies received. If the purchaser identifies any mishandling of the supplies during transit or storage, they should document and report it through the SDR process. The purchaser should provide a detailed description of the problem and any supporting documentation to help the supplier investigate and resolve the issue. The supplier is responsible for investigating the issue and providing a response within a specified timeframe. The response should include a detailed explanation of the cause of the mishandling, any corrective actions taken or planned, and a timeline for resolution.

Documentation issues can cause discrepancies in the supplies received. For example, mismatched documentation, missing documentation, or delivery listing discrepancies can cause confusion and delays in the delivery of supplies. These issues can be reported through the SDR process by completing the SF364 form and providing a detailed description of the problem and any supporting documentation. The supplier is responsible for investigating the issue and providing a response within a specified timeframe. The response should include a detailed explanation of the cause of the documentation issue, any corrective actions taken or planned, and a timeline for resolution.

Packaging is an essential part of the delivery of supplies in the FMS program. However, issues with packaging can result in damages or discrepancies in the supplies received. Common

packaging issues that can be reported through the SDR process include improper packaging, overloaded containers, improper distribution of contents, improper preservation, corroded material, improper marking, no HAZMAT certification, improper unitization, skids or pallets omitted, and lack of dunnage or packing materials. Improper packaging can result in damages to the supplies during transit or storage. If the purchaser identifies any issues with the packaging, they should document and report it through the SDR process. For example, the packaging may be too loose, too tight, or inappropriate for the contents. Overloaded containers can also cause damages to the supplies during transit. If the container is overloaded, it can cause the supplies to shift, leading to damages or discrepancies. The purchaser should document and report any issues with overloaded containers through the SDR process. Improper distribution of contents within the container can also cause damages or discrepancies in the supplies received. If the purchaser identifies any issues with the distribution of contents within the container, they should report it through the SDR process. Improper preservation can cause the material to corrode or deteriorate, leading to damages or discrepancies in the supplies received. If the purchaser identifies any issues with the preservation of the material, they should report it through the SDR process. Improper marking, identification markings omitted, or no HAZMAT certification to the final destination can cause confusion and delays in the delivery of supplies. These issues can be reported through the SDR process, and the supplier can take corrective actions to resolve them. Improper unitization, such as skids or pallets omitted, or lack of dunnage or packing materials can also cause damages to the supplies during transit. If the purchaser identifies any issues with the unitization or lack of dunnage or packing materials, they should report it through the SDR process.

Once the SDR is initiated, the supplier should investigate the issue and provide a response within the specified timeframe. The response should include a detailed explanation of the cause of the discrepancy, any corrective actions taken or planned, and a timeline for resolution.

Once the purchaser has identified the issue, they will complete an SDR form, which includes a detailed description of the problem and any supporting documentation. This form is then submitted to the supplier, who is responsible for investigating the issue and providing a response within 30 days.

The USAF's response to the SDR which is always submitted through AFSAC tool should include a detailed explanation of the cause of the discrepancy, any corrective actions taken or planned, and a timeline for resolution. If the IA agrees with the purchaser's findings, they will typically offer to replace or repair the defective supplies or provide a refund or credit.

However, if the supplier disagrees with the purchaser's findings, they may provide additional information to support their position. At this point, the parties may need to negotiate a resolution to the issue.

The SDR process is designed to be collaborative, with both parties working together to identify and resolve any issues promptly. It is essential that the SDR process is followed correctly to ensure that both parties are meeting their contractual obligations and that the FMS program is successful.

The SDR-A tool enables users to electronically submit SDRs with attachments and track SDR responses. In addition, it provides the opportunity to see and print the SDR form (SF 364, Report of Discrepancy) and any attached documents. furthermore, SDR-A permits the purchasers countries to access the SDR Monthly Status Report via AFSAC Online at 'afsac.wpafb.af.mil'. It helps decrease wasteful paper flow, reduces processing times, and improves the user's SDR program's visibility. SDR-A enhances the efficacy and dependability of SDR data while minimizing the costs associated with the paper-intensive method. The SF364, Supply Discrepancy Report (SDR), is a comprehensive document that may be used to report nearly any issue pertaining to packaging, shipping, invoicing, quality, quantity, item expiry, wrong product receipt, and insufficient services. The SF364 offers a standard reporting and documentation format for supply inconsistencies. It has areas for identifying the item(s) in dispute, stating the discrepancy or problem, giving supporting evidence, and defining any required remedial measures(60).

Figure 5 Supply Discrepancy Report Automation (SDR-A) (60)

Requisitioning and Monitoring

Military Standard Requisition and Issue Procedures (MILSTRIP) is a system developed in the 1950s for requisitioning and issuing supplies in the US military forces and is utilized from the whole FMS community worldwide. The language of supply in MILSTRIP is characterized by a large number of codes (80), under which a requirement should be submitted. Without this process none of the requirements could be identified and fulfilled by the Implemented Agencies (IAs). MILSTRIP depicts a variety of supply-related tasks, including identification of the item, supply advice, supply status, materiel issue, materiel receipt, and materiel returns.

Requisitioning refers to the process of requesting supplies or equipment that are needed for a particular mission or operation. Supply advice involves providing information about the availability and status of requested supplies. Supply and shipping status involves tracking the progress of a requisition through the supply chain until the final destination.

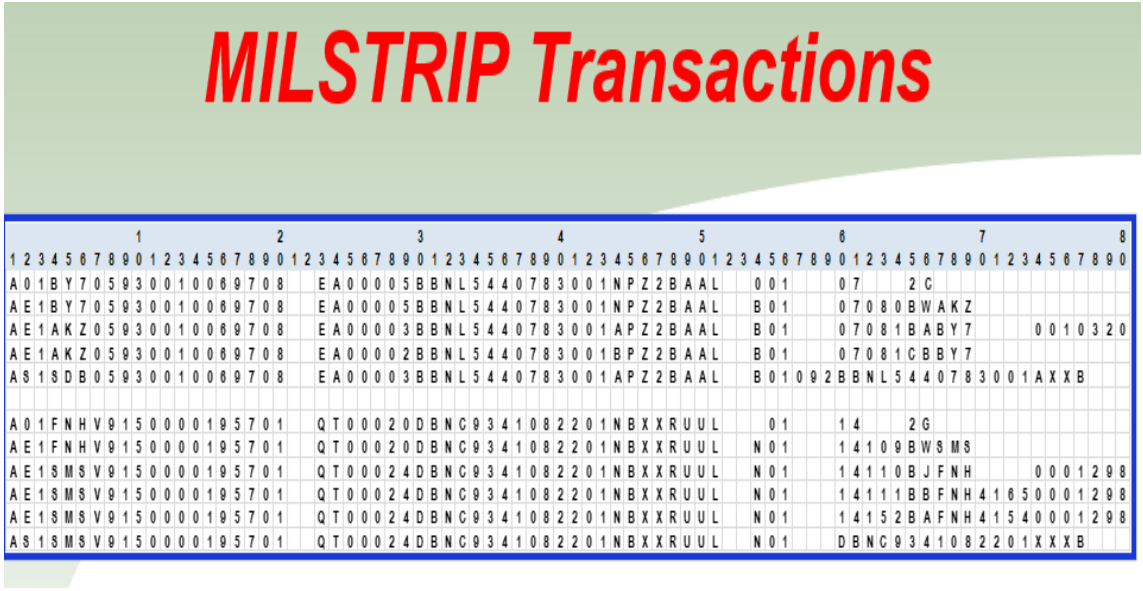
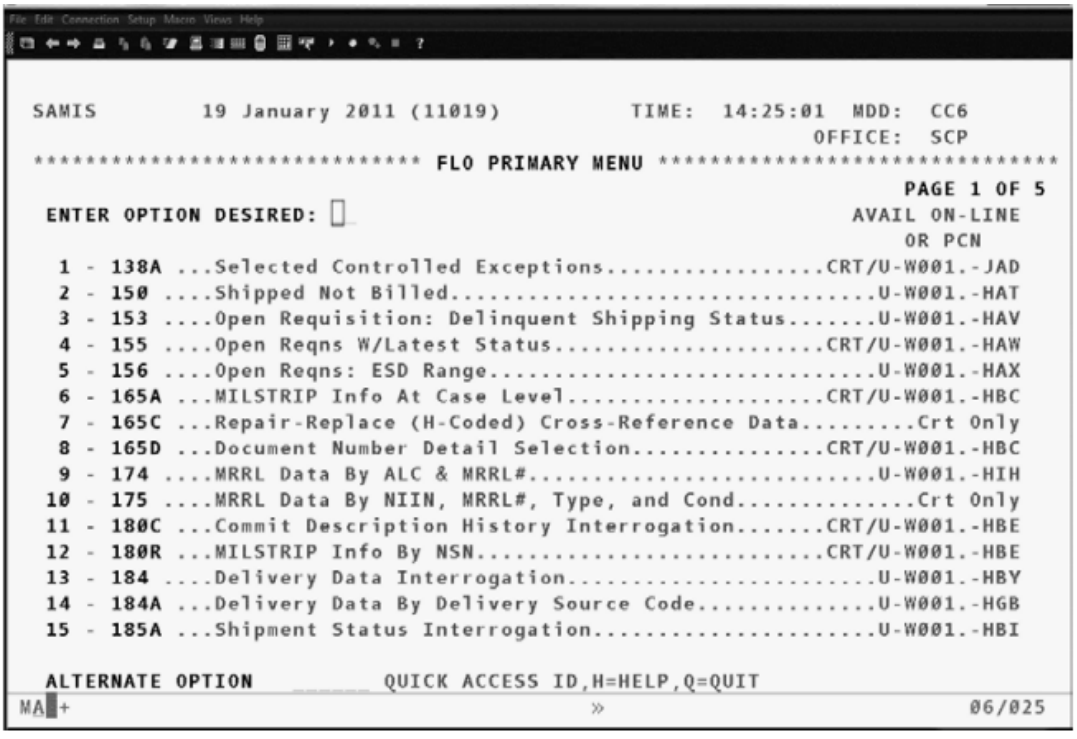


Figure 6 MILSTRIP Transactions (61)

The Air Force Security Assistance and Cooperation (AFSAC) Directorate has implemented a number of standardized application mechanisms for transmitting and receiving the aforementioned information directly and automatically by the purchasing nations.

Specifically, the Security Assistance Management Information System (SAMIS) is the primary application system via which purchaser nations submit all aircraft military requirements and access the numerous data.

Table 7 SAMIS Supply Reports (62)



In addition, AFSAC online is a well-supported computerized tool for monitoring the whole FMS process on behalf of the USAF and purchasing nations. Under this instrument, it is possible for the purchasing nation to submit, monitor, and inspect SDRs, repairable items, and the status of procurement items. Following is seen the first page of the AFSAC Online interface.

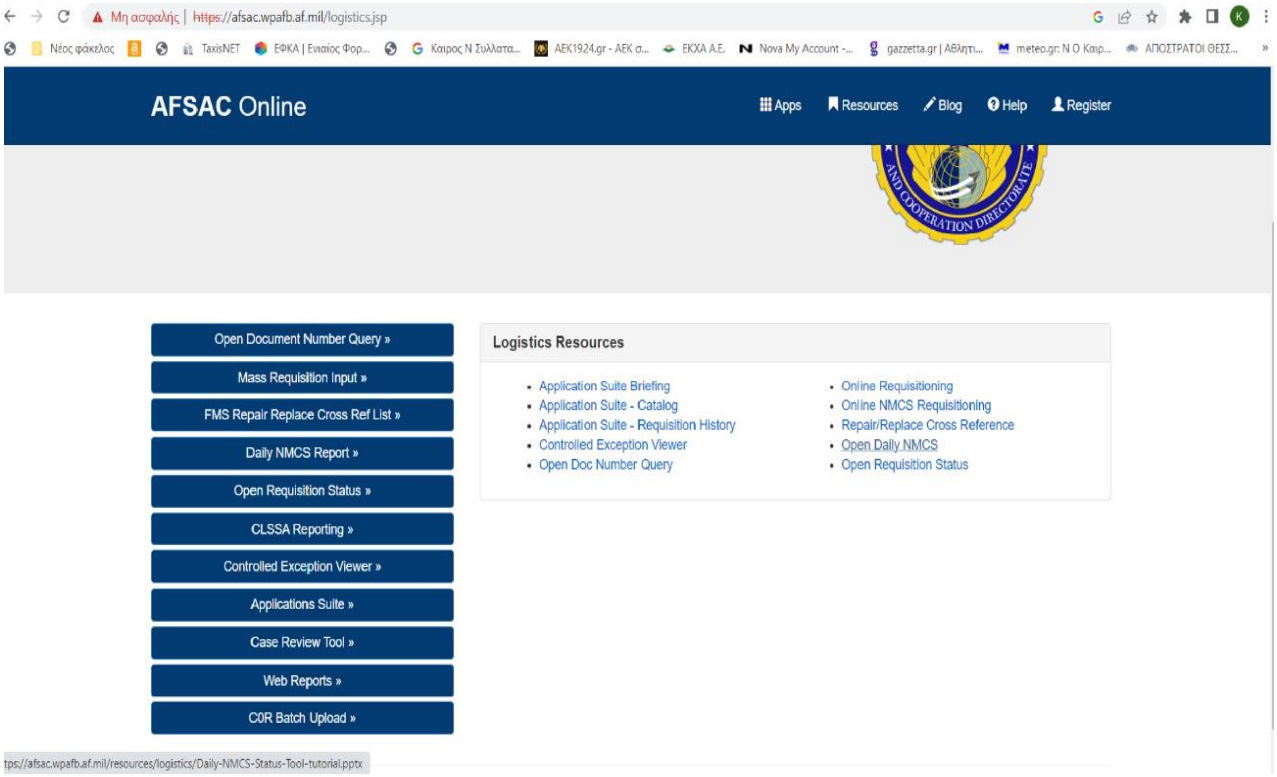


Figure 7 AFSAC Online (63)

3. Advantages and Disadvantages of the 2 Methods

Both the FMS and commercial sales processes have distinct advantages and disadvantages when it comes to the procurement of aircraft parts. The choice between the two methods will depend on the specific needs and priorities of the purchasing country. When a country needs to purchase aircraft parts, it generally has two main options: engaging in a Foreign Military Sales (FMS) process or utilizing commercial sales channels. Each method offers unique advantages and disadvantages, which need to be carefully considered based on the specific needs of the purchasing nation. Considering the above analysis of the logistical and supply aspects of the FMS and commercial sales processes, this part will examine the advantages and disadvantages of the two alternatives.

3.1 FMS/Advantages

Foreign Military Sales (FMS) offers several advantages for countries seeking to acquire defense articles and services. One of the key benefits of FMS is that it involves government-to-government transactions, which ensures greater transparency, reliability, and legal compliance. The FMS process is subject to strict regulations and oversight by the United States

government, which ensures that the transaction is conducted in a lawful and transparent manner. This can be particularly important for countries seeking to avoid political controversy or maintain positive relations with the United States.

Another advantage of FMS is its standardization. FMS typically follows standardized processes and requirements, which ensures that the purchasing country receives parts and services that are compatible with existing systems and meet the necessary quality standards. This is particularly important for countries that rely on complex defense systems and need to ensure that all components work together seamlessly.

Through FMS, countries can also gain access to advanced defense technologies that may not be readily available in the commercial market. The United States is a world leader in defense technology, and FMS provides an avenue for countries to acquire cutting-edge technology and equipment that can enhance their military capabilities.

Moreover, FMS encourages interoperability between partner forces. FMS enhances collaboration and coordination during joint operations by enabling access to shared platforms, systems, and components. Especially, the type of CLSSA case gives the same opportunity to help the fleets of allies such as the USAF. This may be crucial for nations that participate in joint military operations with the United States or other allies.

Finally, FMS can foster long-term relationships between countries and enhance trust. The FMS process involves ongoing communication and collaboration between the purchasing country and the United States government, which can lead to more effective collaboration and support in the future. This can be particularly important for countries that rely on the United States for defense assistance and support.

3.2 FMS/Disadvantages

Although FMS provides a few benefits, there are also possible downsides that governments should carefully examine before adopting this method to obtain defense-related goods and services.

The FMS's bureaucratic procedure is one of its disadvantages. Many federal departments may be involved in the FMS process, which may be complicated and time-consuming. This might possibly cause procurement delays, which can be especially troublesome for nations with pressing military requirements. Many government organizations may also make it challenging for nations to traverse the FMS procedure and comprehend their alternatives.

Another possible downside of FMS is its restricted supplier alternatives. The FMS process often prioritizes U.S.-based manufacturers and service providers, limiting the buying nation's alternatives. This might be especially troublesome if the nation seeks specialized equipment or technology that is not accessible via the FMS.

Political factors may also impact the FMS procedure, possibly resulting in transaction delays or even cancellations due to shifting political environments. Many government agencies and political concerns may render the FMS process unpredictable, making it difficult for nations to plan and budget for their military procurement requirements.

Lastly, FMS transactions may incur more expenses than commercial sales. This is a result of the extra administrative layers involved in the FMS process. Countries may be required to pay extra fees and administrative expenses, making FMS transactions more costly than commercial purchases (64).

3.3 Commercial Sales/Advantages

Flexibility is one of the primary benefits of commercial sales. The commercial sales procedure provides more supplier freedom, enabling governments to choose from a larger pool of manufacturers and service providers.

Moreover, commercial transactions often include less bureaucratic obstacles, which may result in faster delivery dates for aircraft components. This may be especially crucial for nations with pressing military demands that need rapid acquisition of equipment. By eliminating the various layers of government entities involved in the FMS process, private sales may be a quicker and more effective option for nations to obtain military goods and services.

Moreover, commercial sales might be more economical than FMS. This is due to fewer administrative levels and the ability to negotiate competitive prices directly with suppliers. In addition to offering additional potential for cost savings via bulk purchases and negotiated reductions, commercial sales may also provide more avenues for doing so.

In addition, nations may have more opportunity to tailor their orders or seek certain characteristics throughout the commercial sales process, since suppliers may be more likely to accommodate their special needs. This may be especially essential for nations with distinct military requirements or those wishing to modify their equipment to their unique operating demands.

3.4 Commercial Sales/Disadvantages

Prior to selecting whether or not to obtain defense-related goods and services via commercial sales, nations must weigh a number of possible disadvantages.

The possibility for reduced standardization and compatibility concerns is one of the major downsides of commercial sales. Less standardization may result from commercial sales, which may lead to compatibility concerns with current systems and possibly reduce the overall efficacy of military operations. This is especially troublesome for nations that depend on sophisticated military systems and must guarantee that all components function flawlessly together.

Another possible downside of commercial sales is the possibility of doing business with unreliable or less reputable suppliers in the commercial market. Nations run the danger of getting substandard components or insufficient after-sales service from untrustworthy vendors, which might compromise the efficacy of their military systems.

In addition, commercial sales may not provide the same degree of access to cutting-edge military technology as the FMS process. This may be especially difficult for nations attempting to obtain cutting-edge technologies to improve their military capabilities. The United States

Department of Defense may have more experience and access to cutting-edge technology than commercial providers.

Lastly, acquiring components via commercial sales might result in less interoperability with partner troops, impeding collaboration during joint military operations. This is especially troublesome for nations that conduct joint military operations with partner troops and must guarantee their equipment is compatible with that of their allies.

4. Methodology/Questionnaire

This chapter provides an overview of the technique, that was used in the study and makes a comparison between the Foreign Military Sales (FMS) approach and the commercial sales method for the procurement of military aircraft. The chapter begins with a concise introduction to the study design, which is then followed by a discussion of the data sources, variables, and analytic methods that were implemented. This chapter has outlined the methodology used to conduct the research via an appropriate questionnaire and compare the FMS and commercial sales methods for military aircraft procurement. The questionnaire approach used in this study aims to provide a comprehensive understanding of the logistics processes involved in each method, as well as a quantitative evaluation of the strengths and weaknesses of each method via the statistical analysis of the referenced data.

4.1 Research Design

The research strategy and technique for this study centers on the employment of a questionnaire, which is included in Appendix A, to collect data on the two procurement methods (FMS and commercial sales) used for military aircraft acquisitions. The overall goal of the research is to provide a comparative analysis of the two procurement methods in terms of their advantages, disadvantages, and effectiveness, based on the opinions and experiences of experts in the field.

The research design is primarily quantitative in nature and utilizes a cross-sectional survey design. The questionnaire was developed based on a review of the existing literature and theory related to military procurement, as well as consultation with subject matter experts in the field.

The questionnaire in Appendix A, consists of two sets of 19 questions, each set focusing on one of the two procurement methods. The questions are designed to gather information on a variety of topics, including procurement processes, transportation policy, maintenance, and monitoring. The questions are structured in a Likert-type scale, ranging from strongly agree to strongly disagree. Furthermore, the questionnaire was distributed to the participants via email, along with an explanation of the study and its purpose. Respondents were given a specific deadline to complete the questionnaire, and reminders were sent to non-responders to encourage participation.

To ensure the validity and reliability of the questionnaire, several steps were taken. First, the questionnaire was pre-tested with a small sample of subject matter experts to identify any potential issues or areas for improvement. Finally, the questionnaire was administered online via Google Forms, with measures taken to ensure the accuracy and completeness of the data,

such as requiring respondents to answer all the questions and including the year of experience of each of the experts.

The target population for the study includes government officials, industry experts, and military personnel with expertise in military procurement and aviation. To recruit participants, a purposive sampling method was used, with potential participants identified through professional networks and associations. The sample size was determined based on the available resources and the need to ensure statistical power for the planned analyses.

4.2 Data analysis techniques

The data collected from the questionnaire (Appendix A) will be analyzed using both descriptive and inferential statistics (65). The goal of the analysis is to provide a comprehensive and reliable analysis of the two procurement methods used for military aircraft acquisition, based on the opinions and experiences of experts in the field.

Descriptive statistics will be used to summarize the responses to each question and each set of questions. Descriptive statistics will include measures of central tendency, especially the mean, as well as measures of variability, such as standard deviation (66). The descriptive statistics will provide an overview of the distribution of the responses, allowing for a better understanding of the opinions and experiences of the experts.

Inferential statistics, including t-tests and regression analysis, will be used to compare the responses between the two sets of questions and to examine the relationship between the variables of interest, such as experience and opinions on procurement methods.

T-tests will be used to compare the responses to each question between the two sets of questions (FMS and commercial sales). This will allow for a comparison of the opinions and experiences of the experts regarding each procurement method. The t-tests will test the null hypothesis that there is no significant difference between the means of the two sets of questions.

Regression analysis will be used to examine the relationship between the dependent variable of years of experience and opinions on procurement methods. Regression analysis will allow for the examination of the relationship between years of experience and experts' opinions, while controlling for the effects of other variables. The regression analysis will test the hypothesis that there is a significant relationship between the years of experience and the experts' opinions.

5. Results and Discussion of the Research

5.1 Descriptive analysis of the FMS and commercial sales responses

The analysis will focus on the mean value as it is a commonly used measure of central tendency that provides insight into the average value of a set of data. The mean is one of the most used measures of central tendency in statistics. It is defined as the sum of all observations divided by the number of observations. In this case, the mean values for the FMS and Commercial Sales options have been calculated based on the responses of the 40 experts to 19 questions.

Utilizing the mean value is useful because it provides a single number that summarizes the responses of the experts for each option. This can be helpful for making comparisons between the two options, as well as for identifying any patterns or trends in the data. Additionally, the mean is a stable and robust statistic that is less sensitive to extreme values than other measures of central tendency, such as the median or mode.

By using the mean values, we can gain insight into how the experts rated each option overall, which can be informative for decision-making purposes. Furthermore, we can examine the differences between the mean values for the FMS and Commercial Sales options and perform statistical tests to determine if these differences are significant.

Table 8 FMS/Mean

FMS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Mean	3,950	7,375	7,650	4,700	8,525	7,675	5,400	4,725	7,200	8,175	8,450	8,150	6,225	6,525	7,325	7,975	8,225	8,025	7,900
Standard Deviation	0,422	0,375	0,290	0,378	0,179	0,274	0,402	0,500	0,215	0,250	0,186	0,283	0,327	0,282	0,373	0,285	0,204	0,288	0,343

Table 9 Commercial Sales/Mean

Commercial Sales	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Mean	7,225	3,725	5,575	7,300	8,000	7,425	7,175	7,125	6,125	7,775	4,875	8,025	6,100	6,450	5,200	5,375	5,650	5,400	5,225
Standard Deviation	0,333	0,419	0,291	0,294	0,226	0,279	0,367	0,381	0,287	0,274	0,412	0,239	0,290	0,251	0,256	0,305	0,303	0,375	0,380

Table 10 FMS-Commercial Sales/Mean

Question	FMS	Commercial Sales
1	3,950	7,225
2	7,375	3,725
3	7,650	5,575
4	4,700	7,300
5	8,525	8,000
6	7,675	7,425
7	5,400	7,175
8	4,725	7,125

9	7,200	6,125
10	8,175	7,775
11	8,450	4,875
12	8,150	8,025
13	6,225	6,100
14	6,525	6,450
15	7,325	5,200
16	7,975	5,375
17	8,225	5,650
18	8,025	5,400
19	7,900	5,225

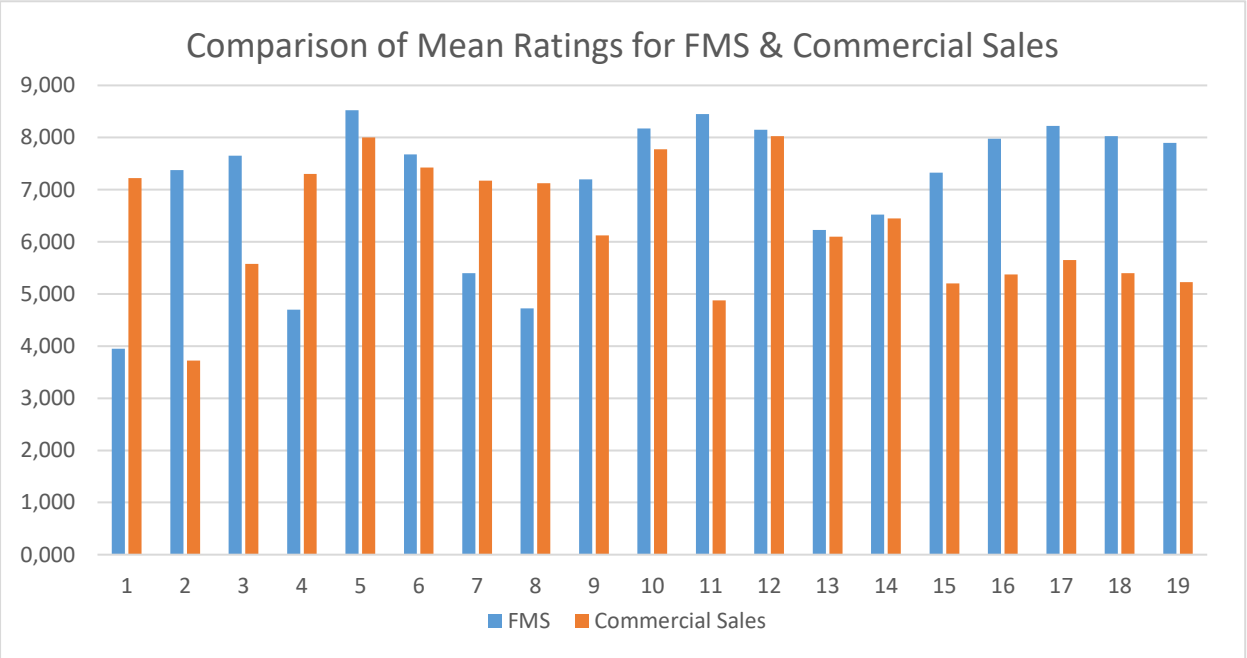


Figure 8 Comparison of Mean Ratings

The above table shows the mean scores for each of the 19 questions answered by 40 experts, divided into two groups: FMS and Commercial Sales. For FMS, the mean score ranges from 3.95 to 8.53, for Commercial Sales, the mean score ranges from 3.725 to 8.025.

Based on the mean scores, in general, the FMS option appears to be rated higher than the Commercial Sales option, as the mean scores for FMS are consistently higher than those for Commercial Sales. However, it should be noted that there are some questions for which the mean score for Commercial Sales is higher than that for FMS. For example, for question 1, the mean score for Commercial Sales (7.225) is higher than that for FMS (3.950). These deviations must be taken into account when interpreting the aggregate results. By recognizing this significant difference in mean scores, we can identify the specific areas where the Commercial Sales method outperforms the FMS and where the FMS method may require improvement, and vice versa.

More specifically, Commercial Sales has higher scores in questions 1,4,7 and 8, while FMS has higher scores in the remaining 15 questions. This suggests that overall, the experts tend to rate FMS more favorably than Commercial Sales. However, it is worth noting that the difference in mean scores between the two groups is relatively small. Therefore, further statistical analysis is needed to determine whether these differences are statistically significant.

Overall Mean & Standard Deviation

This type of descriptive statistics will allow us to comprehend the average rating for each option as well as the rating distribution for each option. More specifically, we can do so by taking the mean of all of the means and the standard deviation of all of the standard deviations. However, this method may not be appropriate if the questions have different weightings or importance. For this reason we are taking for granted that all the questions have same weightings and importance in order to compare the overall performance of the two methods.

Table 11 Overall Mean & Standard Deviation

FMS	***OVERALL/FMS***	***Commercial***	***OVERALL/ COMMERCIAL***
Mean	*7,062*	Mean	*6,303*
Standard Deviation	*0,308*	Standard Deviation	*0,314*

The given results show the overall mean and standard deviation for two different sets of data: FMS and Commercial Sales. For FMS, the mean is 7.062 and the standard deviation is 0.308. For Commercial Sales, the mean is 6.303 and the standard deviation is 0.314. These values were calculated by taking the average of 19 questions for each set of data.

The difference in means between FMS and Commercial indicates that, on average, the experts rated the FMS higher than the Commercial option. The difference in standard deviations is relatively small, suggesting that the variance in ratings was similar for both FMS and Commercial.

5.2 Comparison of means using t-tests

A t-test is required to determine whether there is a statistically significant difference between the mean levels of satisfaction for the two methods. The t-test will help us determine whether the difference in mean satisfaction levels is due to chance or can be attributed to the method itself.

Specifically, we conducted a two-sample t-test using Microsoft Excel to compare the means of the two alternatives for each of the 19 queries and determine whether there is a statistically significant difference between the two options, based on the responses of the experts.

1st question

On a scale of 1 to 10 (1 = very frustrated/high cost, 10 = very satisfied/low cost), how much additional cost (administrative fees, extra charges) did you incur from using services or products?

Table 12 t test/question 1

Two-sample t-test with assumed equal variances.		
	Q.1/FMS	***Q.1/Commercial***
Mean	3,95	7,225
Variance	7,125641026	4,43525641
Sample size	40	40
Median variance	5,780448718	
Hypothesized difference of means	0	
Degrees of freedom	78	
t	-6,091798447	
P(T<=t) one-tailed	1,98062E-08	
Critical t-value, one-tailed	1,664624645	
P(T<=t) two-tailed	3,96125E-08	
Critical t-value, two-tailed	1,990847069	

The mean additional cost for Foreign Military Sales is 3.95, with a variance of 7.1256, and a sample size of 40. The mean additional cost for Commercial Sales is 7.225, with a variance of 4.4353, and a sample size of 40. The assumed difference in means between the two groups is 0, and the median variance is 5.7804. The degrees of freedom for the t-test is 78.

The calculated t-value is -6.0918, which is lower than both the one-tailed and two-tailed critical t-values, indicating that the difference in means between the two groups is statistically significant at the 0.05 level of significance.

Also, the one-tailed p-value is 1.98062E-08, and the two-tailed p-value is 3.96125E-08, both of which are much smaller than the significance level of 0.05, further indicating that there is a significant difference in the means between the two groups. This means that according to the experts, commercial sales result in lower additional costs for the purchasing nation than the FMS process.

2nd question

On a scale of 1 to 10 (1=very frustrated, 10=very satisfied), how helpful are the financing options (grants, loans and other forms of credit) in reducing the overall cost of the purchase?

Table 13 t test/question 2

Two-sample t-test with assumed equal variances.		
	Q.2/FMS	***Q.2/Commercial***
Mean	7,375	3,725
Variance	5,625	7,025
Sample size	40	40
Median variance	6,325	
Hypothesized difference of means	0	
Degrees of freedom	78	
t	6,490491677	
P(T<=t) one-tailed	3,60787E-09	
Critical t-value, one-tailed	1,664624645	
P(T<=t) two-tailed	7,21573E-09	
Critical t-value, two-tailed	1,990847069	

The above table shows the results of a two-sample t-test with equal variances assumed, comparing the mean scores of question 2 between the FMS and Commercial Sales groups.

The mean score for question 2 in the FMS group is 7.375 and in the Commercial Sales group is 3.725, indicating a significant difference in means. The calculated t-value is 6.490491677 and the p-value is 3.60787E-09, which is much smaller than the level of significance of 0.05.

This means that there is strong evidence to reject the null hypothesis of no difference in means and conclude that the mean score for question 2 is significantly different between the FMS and Commercial Sales groups.

The degrees of freedom are 78, which is the sum of the sample sizes (40 + 40) minus 2. The critical t-value at the 0.05 level of significance with 78 degrees of freedom is 1.664624645 for a one-tailed test and 1.990847069 for a two-tailed test. The calculated t-value is much greater than these critical values, further supporting the rejection of the null hypothesis.

3rd question

On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how effective was the support and maintenance in reducing the cost of ownership for the product or service?

Table 14 t test/question 3

Two-sample t-test with assumed equal variances.		
	Q.3/FMS	***Q.3/Commercial***
Mean	7,65	5,575
Variance	3,361538462	3,378846154
Sample size	40	40
Median variance	3,370192308	
Hypothesized difference of means	0	
Degrees of freedom	78	
t	5,054820724	
P(T<=t) one-tailed	1,38906E-06	
Critical t-value, one-tailed	1,664624645	
P(T<=t) two-tailed	2,77812E-06	
Critical t-value, two-tailed	1,990847069	

The table shows the results of a two-sample t-test assuming equal variances between the means of question 3 in the FMS and Commercial Sales groups. The mean score for question 3 in the FMS group was 7.65 and in the Commercial Sales group was 5.575. The sample size for each group was 40 and the estimated variance was 3.3615 for the FMS group and 3.3788 for the Commercial Sales group.

The null hypothesis was that the difference between the means of the two groups was zero, and the alternative hypothesis was that the means were not equal. The t-statistic was calculated to be 5.0548, which indicates that the means of the two groups were significantly different. The p-value for the one-tailed test was 1.38906E-06, and for the two-tailed test was 2.77812E-06, both of which were less than the significance level of 0.05.

Based on these results, we can reject the null hypothesis and conclude that there is a significant difference between the mean score for question 3 in the FMS group and the Commercial Sales group. This suggests that the two groups may have different levels of expertise or perceptions in relation to the particular aspects of military procurement that are addressed by question 3.

4th question

On a scale of 1 to 10 (1 = very frustrated/high impact, 10 = very satisfied/low impact), how much did the product or service's lead time or delivery time impact the overall cost?

Table 15 t test/question 4

Two-sample t-test with assumed equal variances.		
	Q.4/FMS	***Q.4/Commercial***
Mean	4,7	7,3
Variance	5,702564103	3,446153846
Sample size	40	40
Median variance	4,574358974	
Hypothesized difference of means	0	
Degrees of freedom	78	
t	-5,436547968	
P(T<=t) one-tailed	3,01002E-07	
Critical t-value, one-tailed	1,664624645	
P(T<=t) two-tailed	6,02004E-07	
Critical t-value, two-tailed	1,990847069	

The above data represents the t-test for two independent samples assuming equal variances. The comparison is between the mean scores for question 4 in the FMS group and the Commercial Sales group.

The mean score for question 4 in the FMS group is 4.7 with a sample size of 40, and the mean score for the Commercial Sales group is 7.3 with the same sample size. The calculated t-value is -5.4365, which is less than the critical t-value at the 0.05 significance level, indicating a statistically significant difference between the means of the two groups. The p-value for the

test is less than 0.0001, which further supports the conclusion of a significant difference between the two means.

In other words, the mean score for question 4 in the Commercial Sales group is significantly higher than the mean score for the FMS group. The data also indicates that the variance for the FMS group is higher than the variance for the Commercial Sales group.

5th question

On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how skilled and experienced are the maintenance personnel?

Table 16 t test/question 5

Two-sample t-test with assumed equal variances.		
	Q.5/FMS	***Q.5/Commercial***
Mean	8,525	8
Variance	1,281410256	2,051282051
Sample size	40	40
Median variance	1,666346154	
Hypothesized difference of means	0	
Degrees of freedom	78	
t	1,818828244	
P(T<=t) one-tailed	0,036387893	
Critical t-value, one-tailed	1,664624645	
P(T<=t) two-tailed	0,072775786	
Critical t-value, two-tailed	1,990847069	

The t-test was performed to compare the means of two independent samples, the FMS and Commercial Sales groups, in terms of their responses to Question 5. The mean score for the FMS group was 8.525 with a variance of 1.281, while the mean score for the Commercial Sales group was 8 with a variance of 2.051. The calculated t-value was 1.818828244, which

corresponds to a p-value of 0.036387893 for a one-tailed test and 0.072775786 for a two-tailed test, both of which are lower than the significance level of 0.05.

The t-value indicates the difference between the means of the two groups in terms of the number of standard errors. The positive t-value suggests that the mean score for the FMS group is higher than that of the Commercial Sales group. The calculated p-value represents the probability of observing such a difference in means by chance alone assuming that the null hypothesis is true. Since the p-value is less than the significance level, we can reject the null hypothesis and conclude that there is a statistically significant difference between the means of the two groups in terms of their responses to Question 5. Therefore, we can infer that the FMS group has a higher mean score than the Commercial Sales group for Question 5.

6th question

How easy is it to schedule maintenance and repair work on a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied)?

Table 17 t test/question 6

Two-sample t-test with assumed equal variances.		
	Q.6/FMS	***Q.6/Commercial***
Mean	7,675	7,425
Variance	2,994230769	3,122435897
Sample size	40	40
Median variance	3,058333333	
Hypothesized difference of means	0	
Degrees of freedom	78	
t	0,639311619	
P(T<=t) one-tailed	0,26224669	
Critical t-value, one-tailed	1,664624645	
P(T<=t) two-tailed	0,524493379	
Critical t-value, two-tailed	1,990847069	

The above table shows the results of a two-sample t-test with equal variances for question 6 between the FMS and Commercial Sales groups. The mean score for FMS is 7.675, while the mean score for Commercial Sales is 7.425. The calculated t-statistic is 0.639 and the p-value is 0.262, indicating that there is no significant difference between the mean scores of the two

groups at the 0.05 significance level. The critical t-value for a two-tailed test with 78 degrees of freedom is ±1.990, which is higher than the calculated t-value of 0.639. Therefore, we fail to reject the null hypothesis and conclude that there is insufficient evidence to suggest a significant difference between the mean scores of the two groups.

7th question

On a scale of 1 to 10 (1 = very frustrated/very difficult, 10 = very satisfied/very easy), how easy is it to identify qualified vendors for outsourcing services?

Table 18 t test/question 7

Two-sample t-test with assumed equal variances.		
	Q.7/FMS	***Q.7/Commercial***
Mean	5,4	7,175
Variance	6,451282051	5,378846154
Sample size	40	40
Median variance	5,915064103	
Hypothesized difference of means	0	
Degrees of freedom	78	
t	-3,263875824	
P(T<=t) one-tailed	0,000816388	
Critical t-value, one-tailed	1,664624645	
P(T<=t) two-tailed	0,001632776	
Critical t-value, two-tailed	1,990847069	

The data shows the results of a two-sample t-test assuming equal variances for the means of two groups, FMS and Commercial, for the question 7. The null hypothesis is that there is no significant difference in the means of the two groups, while the alternative hypothesis is that there is a significant difference.

The data indicates that the mean score for the FMS group is 5.4, while for the Commercial group it is 7.175. The sample sizes for both groups are 40, and the assumed equal variances are 6.451282051 and 5.378846154 for FMS and Commercial, respectively.

The calculated t-statistic is -3.263875824, and the p-value for a one-tailed test is 0.000816388. Since the p-value is less than the significance level of 0.05, we reject the null hypothesis and conclude that there is a significant difference in the means of the two groups for question 7. Therefore, we can say that Commercial experts scored significantly higher than FMS experts on this question.

8th question

On a scale of 1 to 10 (1 = very frustrated/very low, 10 = very satisfied/very high), how flexible is the process in terms of allowing for the outsourcing of services for military aircraft?

Table 19 t test/question 8

Two-sample t-test with assumed equal variances.		
	Q.8/FMS	***Q.8/Commercial***
Mean	4,725	7,125
Variance	9,999359	5,804487179
Sample size	40	40
Median variance	7,901923	
Hypothesized difference of means	0	
Degrees of freedom	78	
t	-3,81821	
P(T<=t) one-tailed	0,000134	
Critical t-value, one-tailed	1,664625	
P(T<=t) two-tailed	0,000268	
Critical t-value, two-tailed	1,990847	

The two-sample t-test with equal variances was used to compare the means of two samples for question 8 between the FMS and Commercial groups.

The mean for the FMS group was 4.725 and the mean for the Commercial group was 7.125. The sample size for each group was 40, and the assumed equal variance was 7.902. The calculated t-value was -3.818, and the associated p-value was 0.000134.

Since the p-value is less than 0.05, we reject the null hypothesis that the means of the two groups are equal. Therefore, we can conclude that there is a significant difference between the means of the FMS and Commercial groups for question 8. Specifically, the mean for the Commercial group is significantly higher than the mean for the FMS group.

9th question

On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how well does the process support managing and overseeing outsourcing contracts for military aircraft items?

Table 20 t test/question 9

Two-sample t-test with assumed equal variances.		
	Q.9/FMS	***Q.9/Commercial***
Mean	7,2	6,125
Variance	1,856410256	3,291666667
Sample size	40	40
Median variance	2,574038462	
Hypothesized difference of means	0	
Degrees of freedom	78	
t	2,996511482	
P(T<=t) one-tailed	0,001830264	
Critical t-value, one-tailed	1,664624645	
P(T<=t) two-tailed	0,003660528	
Critical t-value, two-tailed	1,990847069	

This is a two-sample t-test assuming equal variances between two groups, FMS and Commercial, for the variable Q.9. The sample size for both groups is 40.

The mean for FMS is 7.2 and for Commercial is 6.125. The estimated population standard deviation is 1.856 for FMS and 3.292 for Commercial, and the median standard deviation for both groups combined is 2.574.

The null hypothesis is that the mean difference between the two groups is zero. The alternative hypothesis is that the mean difference is greater than zero.

The calculated t-value is 2.997 with 78 degrees of freedom. The p-value for a one-tailed test is 0.0018 and for a two-tailed test is 0.0037, both of which are less than the significance level of 0.05. Therefore, we reject the null hypothesis and conclude that there is a statistically significant difference between the mean scores of the two groups for the variable Q.9.

10th question

On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how is information about military aircraft items' location and procurement status tracked and managed?

Table 21 t test/question 10

Two-sample t-test with assumed equal variances.		
	Q.10/FMS	***Q.10/Commercial***
Mean	8,175	7,775
Variance	2,507051282	2,999358974
Sample size	40	40
Median variance	2,753205128	
Hypothesized difference of means	0	
Degrees of freedom	78	
t	1,078091704	
P(T<=t) one-tailed	0,142157831	
Critical t-value, one-tailed	1,664624645	
P(T<=t) two-tailed	0,284315662	
Critical t-value, two-tailed	1,990847069	

The data shows the results of a t-test for two samples assuming equal variances. The null hypothesis is that the means of the two populations are equal, and the alternative hypothesis is that they are different.

In this case, the two samples are from a FMS (Faculty of Management Studies) and a Commercial Sales, and the means are 8.175 and 7.775, respectively. The sample sizes are both 40, and the median variance is 2.753205128.

The calculated t-value is 1.078091704, and the corresponding p-value for a one-tailed test is 0.142157831. This means that if the null hypothesis were true, there is a 14.22% chance of obtaining a t-value as extreme as the one calculated. The critical t-value for a one-tailed test at a significance level of 0.05 with 78 degrees of freedom is 1.664624645. Since the calculated t-value is less than the critical t-value, we cannot reject the null hypothesis.

The p-value for a two-tailed test is 0.284315662, which means that there is a 28.43% chance of obtaining a t-value as extreme as the one calculated, assuming the null hypothesis is true. The critical t-value for a two-tailed test at a significance level of 0.05 with 78 degrees of freedom is 1.990847069. Since the calculated t-value is less than the critical t-value, we cannot reject the null hypothesis.

Therefore, we can conclude that there is not enough evidence to suggest that the means of the two populations are different.

11th question

On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how is the data about military aircraft items (e.g., location, status, history) made available to authorized personnel?

Table 22 t test/question 11

Two-sample t-test with assumed equal variances.		
	Q.11/FMS	***Q.11/Commercial***
Mean	8,45	4,875
Variance	1,382051282	6,778846154
Sample size	40	40
Median variance	4,080448718	
Hypothesized difference of means	0	
Degrees of freedom	78	
t	7,91474782	
P(T<=t) one-tailed	6,88061E-12	
Critical t-value, one-tailed	1,664624645	
P(T<=t) two-tailed	1,37612E-11	
Critical t-value, two-tailed	1,990847069	

The t-test compares the means of two samples to determine if they are significantly different from each other. In this case, the data represents two samples, FMS and Commercial, and the t-test assumes that their variances are equal.

For Q.11, the mean of the FMS sample is 8.45 and the mean of the Commercial sample is 4.875. The standard deviation of the FMS sample is 1.382051282 and the standard deviation of the Commercial sample is 6.778846154. Both samples have a size of 40. The hypothesized difference in means is 0.

The t-value calculated for this data is 7.91474782. The p-value for a one-sided test is 6.88061E-12, which is less than the significance level of 0.05. This means that we can reject the null hypothesis and conclude that there is a significant difference between the means of the two samples. The critical t-value for a one-sided test with 78 degrees of freedom is 1.664624645, which is much smaller than the calculated t-value. The critical t-value for a two-sided test with 78 degrees of freedom is 1.990847069, which is also smaller than the calculated t-value. Therefore, the result is significant both for a one-sided and a two-sided test.

12th question

On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how is the data about military aircraft items used to inform decision-making (e.g., to determine maintenance needs and to plan deployments)?

Table 23 t test/question 12

Two-sample t-test with assumed equal variances.		
	Q.12/FMS	***Q.12/Commercial***
Mean	8,15	8,025
Variance	3,207692308	2,281410256
Sample size	40	40
Median variance	2,744551282	
Hypothesized difference of means	0	
Degrees of freedom	78	
t	0,337434385	
P(T<=t) one-tailed	0,368347922	
Critical t-value, one-tailed	1,664624645	
P(T<=t) two-tailed	0,736695845	
Critical t-value, two-tailed	1,990847069	

In this t-test, we are comparing two samples with equal variances, labeled as FMS and Commercial. The sample means for FMS and Commercial are 8.15 and 8.025, respectively. The sample variances for FMS and Commercial are 3.207692308 and 2.281410256, respectively. Both samples have a size of 40. The assumed difference between means is zero. The degrees of freedom for the test is 78.

The calculated t-value is 0.337434385, which is less than the critical t-value of 1.664624645 for a one-tailed test with a 5% significance level and less than the critical t-value of 1.990847069 for a two-tailed test with a 5% significance level. Therefore, we fail to reject the null hypothesis that the means of the two samples are equal. In other words, there is not enough evidence to suggest that the means of the two samples are significantly different.

13th question

On a scale of 1 to 10 (1 = very frustrated/many, 10 = very satisfied/almost zero), are there any bottlenecks or delays in the procurement process?

Table 24 t test/question 13

Two-sample t-test with assumed equal variances.		
	Q.13/FMS	***Q.13/Commercial***
Mean	6,225	6,1
Variance	4,281410256	3,374358974
Sample size	40	40
Median variance	3,827884615	
Hypothesized difference of means	0	
Degrees of freedom	78	
t	0,285723257	
P(T<=t) one-tailed	0,387923753	
Critical t-value, one-tailed	1,664624645	
P(T<=t) two-tailed	0,775847505	
Critical t-value, two-tailed	1,990847069	

The data is from a t-test comparing two samples with assumed equal variances.

For the FMS group (sample 1), the mean is 6.225 and the variance is 4.281410256. For the commercial group (sample 2), the mean is 6.1 and the variance is 3.374358974. Both groups have a sample size of 40.

The median variance (pooled variance) is 3.827884615 and the hypothesized difference in means is 0. The degrees of freedom is 78. The calculated t-statistic is 0.285723257, which results in a one-tailed p-value of 0.387923753 and a two-tailed p-value of 0.775847505.

The critical t-values for a one-tailed test with alpha = 0.05 and 78 degrees of freedom is 1.664624645, and for a two-tailed test is 1.990847069. Based on the calculated t-value and p-values, we fail to reject the null hypothesis that there is no significant difference in means between the two groups.

14th question

On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how accurate and reliable is the delivery schedule?

Table 25 t test/question 14

Two-sample t-test with assumed equal variances.		
	Q.14/FMS	***Q.14/Commercial***
Mean	6,525	6,45
Variance	3,178846154	2,51025641
Sample size	40	40
Median variance	2,844551282	
Hypothesized difference of means	0	
Degrees of freedom	78	
t	0,198870047	
P(T<=t) one-tailed	0,421440935	
Critical t-value, one-tailed	1,664624645	
P(T<=t) two-tailed	0,842881869	
Critical t-value, two-tailed	1,990847069	

The data represents a t-test for two samples assuming equal variances. The test is used to compare the means of two samples, FMS and Commercial.

For Q.14, the mean of FMS is 6.525 and the mean of Commercial is 6.45. The sample size for both samples is 40, and the assumed difference in means is 0. The calculated t-statistic is 0.198870047 and the degrees of freedom are 78.

The p-value for the one-tailed test is 0.421440935, which is greater than the significance level of 0.05. Therefore, we do not reject the null hypothesis that there is no significant difference between the means of the two samples. The p-value for the two-tailed test is 0.842881869, which is also greater than the significance level of 0.05. Therefore, we cannot conclude that there is a significant difference between the means of the two samples.

15th question

On a scale of 1 to 10 (1 = very frustrated/almost zero, 10 = very satisfied/many), are there any measures to mitigate the impact of delays or issues in delivering military aircraft items?

Table 26 t test/question 15

Two-sample t-test with assumed equal variances.		
	Q.15/FMS	***Q.15/Commercial***
Mean	7,325	5,2
Variance	5,558333333	2,625641026
Sample size	40	40
Median variance	4,091987179	
Hypothesized difference of means	0	
Degrees of freedom	78	
t	4,697932798	
P(T<=t) one-tailed	5,54621E-06	
Critical t-value, one-tailed	1,664624645	
P(T<=t) two-tailed	1,10924E-05	
Critical t-value, two-tailed	1,990847069	

The data shows the results of a t-test for two independent samples with equal variances. The samples come from two populations, labeled FMS and Commercial. The null hypothesis is that the means of the two populations are equal.

The results show that the mean of the FMS sample is 7.325, while the mean of the Commercial sample is 5.2. The sample standard deviations are 5.558 and 2.626, respectively.

The calculated t-statistic is 4.698, with 78 degrees of freedom. The p-value for a one-tailed test is very small (5.546e-06), indicating strong evidence against the null hypothesis that the means are equal. Similarly, the p-value for a two-tailed test is also very small (1.109e-05).

Therefore, we can conclude that there is a statistically significant difference between the means of the FMS and Commercial populations.

16th question

How are deficiencies and warranties handled on a scale of 1 to 10 (1 = very frustrated,10 = very satisfied)?

Table 27 t test/question 16

Two-sample t-test with assumed equal variances.		
	Q.16/FMS	***Q.16/Commercial***
Mean	7,975	5,375
Variance	3,255769231	3,727564103
Sample size	40	40
Median variance	3,491666667	
Hypothesized difference of means	0	
Degrees of freedom	78	
t	6,222601042	
P(T<=t) one-tailed	1,13671E-08	
Critical t-value, one-tailed	1,664624645	
P(T<=t) two-tailed	2,27342E-08	
Critical t-value, two-tailed	1,990847069	

This is a two-sample t-test with equal variances assumed. The null hypothesis is that there is no significant difference between the means of two populations (FMS and Commercial) and the alternative hypothesis is that the means are significantly different.

For sample Q.16, the mean for FMS is 7.975 and for Commercial is 5.375, with sample sizes of 40 each. The pooled variance is calculated to be 3.491666667. The t-value is calculated to be 6.222601042 and the p-value is very small (less than 0.00001), which means that we can reject the null hypothesis at a significant level and conclude that there is a significant difference between the means of the two populations.

17th question

On a scale of 1 to 10 (1 = very frustrated,10 = very satisfied), how is the process for reporting and addressing deficiencies?

Table 28 t test/question 17

Two-sample t-test with assumed equal variances.		
	Q.17/FMS	***Q.17/Commercial***
Mean	8,225	5,65
Variance	1,666025641	3,669230769
Sample size	40	40
Median variance	2,667628205	
Hypothesized difference of means	0	
Degrees of freedom	78	
t	7,05065689	
P(T<=t) one-tailed	3,15425E-10	
Critical t-value, one-tailed	1,664624645	
P(T<=t) two-tailed	6,30849E-10	
Critical t-value, two-tailed	1,990847069	

This is a two-sample t-test with equal variances assuming that the population variances for both samples are equal. The null hypothesis is that there is no difference between the mean values of the two samples, while the alternative hypothesis is that the means are different.

The data provided is for two samples, FMS and Commercial, with sample sizes of 40 each. The mean value of FMS is 8.225 and the mean value of Commercial is 5.65. The median variance of the two samples is 2.667628205, while the hypothesized difference between the means is 0.

The t-statistic value is 7.05065689, and the degrees of freedom are 78. The p-value for a one-tailed test is 3.15425E-10, and for a two-tailed test, it is 6.30849E-10.

Since the p-value is much smaller than the significance level of 0.05, we can reject the null hypothesis and conclude that there is a significant difference between the mean values of the two samples.

18th question

On a scale of 1 to 10 ((1 = very frustrated,10 = very satisfied), how is the process for claiming warranties?

Table 29 t test/question 18

Two-sample t-test with assumed equal variances.		
	Q.18/FMS	***Q.18/Commercial***
Mean	8,025	5,4
Variance	3,307051282	5,630769231
Sample size	40	40
Median variance	4,468910256	
Hypothesized difference of means	0	
Degrees of freedom	78	
t	5,553202224	
P(T<=t) one-tailed	1,86961E-07	
Critical t-value, one-tailed	1,664624645	
P(T<=t) two-tailed	3,73921E-07	
Critical t-value, two-tailed	1,990847069	

The data corresponds to a two-sample t-test assuming equal variances between two groups labeled as FMS and Commercial. The test compares the means of the two groups based on their respective sample means, sample variances, and sample sizes.

In this case, for Group FMS, the sample mean is 8.025 and the sample variance is 3.307051282, while for Group Commercial, the sample mean is 5.4 and the sample variance is 5.630769231. The sample sizes for both groups are equal at 40. The assumed difference in means is zero.

The calculated t-statistic is 5.553202224, which is larger than the critical t-value at a significance level of 0.05 with 78 degrees of freedom (1.990847069), indicating a significant difference between the means of the two groups. The p-value for the two-tailed test is 3.73921E-07, which is less than the significance level of 0.05, also indicating a significant difference between the two groups.

Therefore, based on the results of the t-test, we can reject the null hypothesis that the means of the two groups are equal and conclude that there is a significant difference in means between the FMS and Commercial groups.

19th question

On a scale of 1 to 10 ((1 = very frustrated,10 = very satisfied), how responsive and timely is the FMS/Commercial Sales addressing deficiencies and honoring warranties?

Table 30 t test/question 19

Two-sample t-test with assumed equal variances.		
	Q.19/FMS	***Q.19/Commercial***
Mean	7,9	5,225
Variance	4,707692308	5,768589744
Sample size	40	40
Median variance	5,238141026	
Hypothesized difference of means	0	
Degrees of freedom	78	
t	5,226972207	
P(T<=t) one-tailed	7,00982E-07	
Critical t-value, one-tailed	1,664624645	
P(T<=t) two-tailed	1,40196E-06	
Critical t-value, two-tailed	1,990847069	

The t-test was performed to compare the means of two samples (FMS and Commercial) assuming equal variances. The data consists of the means, variances, and sample sizes of each group, as well as the assumed difference in means and the degrees of freedom.

For the Q.19 sample, the mean of the FMS group was 7.9, and the mean of the Commercial group was 5.225. The variances for the FMS and Commercial groups were 4.707692308 and 5.768589744, respectively, and the sample sizes were both 40.

The calculated t-value was 5.226972207 with 78 degrees of freedom. The p-value for a one-tailed test was 7.00982E-07, which is less than the significance level of 0.05. Therefore, we reject the null hypothesis that the means of the two groups are equal, and conclude that the mean of the FMS group is significantly larger than the mean of the Commercial group.

5.3 Regression analysis of the relationship between years of experience and responses for each set of questions

5.3.1 FMS Questions/Answers

Initially, it is required to construct the table shown below in Excel, which contains the expert responses to each of the referenced queries regarding the FMS procedure. Then, these responses will be used as the independent variable in the regression analysis, with years of experience working as the dependent variable. Specifically, at least two questions will be used for each unit of the questionnaire in the regression analysis, with a total of 16 of the 19 questions being utilized.

Table 31 FMS Questions & years of experience

How many years of experience do you have working in the field of military procurement?	Q.1/ FMS	Q.2/ FMS	Q.3/ FMS	Q.5/ FMS	Q.6/ FMS	Q.7/ FMS	Q.8/ FMS	Q.10/ FMS	Q.11/ FMS	Q.12/ FMS	Q.13/ FMS	Q.14/ FMS	Q.15/ FMS	Q.16/ FMS	Q.17/ FMS	Q.18/ FMS
7	8	9	9	8	9	8	9	8	9	9	9	8	9	9	8	9
20	8	7	7	7	7	7	8	7	8	8	4	7	5	6	7	6
3	1	10	3	5	6	6	1	2	6	2	3	3	3	4	6	3
3	4	3	7	8	6	2	6	8	9	9	2	4	4	7	8	8
22	8	9	9	10	9	9	9	8	8	9	8	9	8	8	10	9
25	6	8	8	7	7	7	8	8	7	7	6	7	6	7	7	6
11	7	7	8	10	8	10	6	10	10	8	9	9	8	10	10	10
29	9	9	9	8	6	9	8	6	8	8	8	8	6	7	8	8
19	7	8	8	8	5	6	6	8	8	7	5	6	9	10	9	9
8	6	6	7	9	9	9	9	10	9	9	7	8	6	9	9	9
7	8	3	7	7	7	7	7	8	7	7	8	9	9	7	7	7
24	3	5	5	8	9	1	4	5	4	2	6	4	3	6	7	7
11	8	5	8	10	6	9	10	8	8	8	7	8	6	9	9	9
20	3	6	8	8	4	7	5	8	8	5	2	3	3	7	7	8
40	1	1	5	10	3	1	4	5	10	10	1	3	1	1	5	1
20	6	8	7	8	9	6	7	8	8	7	6	7	7	8	7	7
25	6	7	6	8	4	9	10	9	9	10	3	8	8	9	9	9
26	4	1	1	8	5	9	10	7	7	8	2	2	2	5	9	9
38	9	9	9	9	9	8	8	9	9	9	8	7	8	8	8	8
4	3	3	4	8	7	7	7	7	8	8	5	5	7	6	7	7
11	5	8	9	10	8	7	8	10	10	9	9	9	9	9	8	7
3	4	6	8	7	7	7	6	8	8	7	7	8	6	8	5	6
26	1	8	8	8	8	3	1	8	8	8	6	6	8	8	8	8
27	2	9	9	9	9	4	2	9	9	9	7	7	9	9	9	9
28	3	10	10	10	10	5	3	10	10	10	8	8	10	10	10	10
29	1	8	8	8	8	3	1	8	8	8	6	6	8	8	8	8
30	2	8	9	8	9	3	2	8	9	8	7	6	8	9	8	8
27	3	8	8	9	9	3	3	10	8	10	6	8	9	8	10	10
31	3	8	8	8	8	3	1	9	9	9	6	6	9	10	10	10
26	2	8	8	10	10	3	2	9	9	9	6	6	8	9	8	8
29	1	8	8	8	8	3	1	9	9	10	8	6	8	8	8	8
28	2	9	9	9	9	4	2	9	9	9	7	7	9	9	10	8
30	3	10	10	10	10	5	3	10	10	10	8	8	10	10	9	9
26	1	10	8	10	8	5	1	8	10	8	8	6	10	8	10	8
26	1	9	8	9	9	3	2	9	8	9	7	6	9	10	9	10
25	2	9	9	8	8	3	2	9	9	8	7	6	9	9	8	10
23	1	8	8	8	8	3	1	8	8	8	6	6	8	8	8	8
21	2	9	9	9	9	4	2	9	9	9	7	7	9	9	9	9
22	3	10	9	10	9	5	3	10	9	10	8	8	10	9	9	10
25	1	8	8	9	8	3	1	8	9	8	6	6	9	8	8	8

Table 32 Regression statistics/FMS

Linear Regression Statistics	
Multiple R	0,796328
R Squared	0,634138
Adjusted R Squared	0,379625
Standard Error	7,568834
Sample Size	40

The above statistics are related to the regression model and the relationship between the dependent variable (years of experience) and independent variables (experts' answers). The multiple R is 0.796327715, which is a measure of the correlation between the dependent variable and the independent variables. It indicates a moderate to strong positive correlation between the dependent variable and the independent variables. The R-squared is 0.634137829, which represents the proportion of the total variation in the dependent variable that is explained by the independent variables. It indicates that the independent variables explain approximately 63.41% of the variation in the dependent variable. The adjusted R-squared is 0.379625015, which takes into account the number of independent variables and the sample size. It is a more conservative estimate of the proportion of variation in the dependent variable that is explained by the independent variables. The standard error is 7.568834483, which is a measure of the accuracy of the estimates of the coefficients. It indicates the average distance that the observed values are from the regression line. The sample size is 40, which represents the number of observations used to estimate the regression model.

Table 33 Analysis of Variance/FMS

VARIANCE ANALYSIS					
	Degrees of freedom (DF)	*SS*	*MS*	*F*	*F significance*
Regression	16	2283,768	142,7355	2,491575	0,022464822
Residual	23	1317,607	57,28726		
Total	39	3601,375			

Furthermore, the results of the analysis of variance (ANOVA) for the regression model shows the degrees of freedom for regression is 16 and for residual is 23, and the total degrees of freedom is 39, which is equal to the sample size minus one. The sum of squares (SS) for regression is 2283.768125 and for residual is 1317.606875. The total sum of squares is the sum of these two, which is equal to 3601.375. Also, the mean square (MS) for regression is 142.7355078 and for residual is 57.28725543. The mean square is calculated by dividing the sum of squares by the degrees of freedom. The F-value is 2.491575251, which is calculated by dividing the mean square for regression by the mean square for residual. The significance value for the F-test is 0.022464822, which is less than the commonly used threshold of 0.05. This means that the model is statistically significant at the 5% level, indicating that at least one of the independent variables has a significant linear relationship with the dependent variable.

Table 34 Coefficients/FMS

	Coefficients	Standard Error	t Value	P Value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	22,55368456	14,35951593	1,570644	0,129922	-7,151237351	52,25860648	-7,151237351	52,25860648
Q.1/ FMS	2,624127265	1,435578783	1,827923	0,080563	-0,34559371	5,593848239	-0,34559371	5,593848239
Q.2/ FMS	2,672362662	1,234488685	2,164753	0,041029	0,118628249	5,226097076	0,118628249	5,226097076
Q.3/ FMS	-0,014797929	2,006342353	-0,00738	0,994179	-4,165233306	4,135637448	-4,165233306	4,135637448
Q.5/ FMS	3,54335706	2,018303247	1,755612	0,092466	-0,631821311	7,718535431	-0,631821311	7,718535431
Q.6/ FMS	-2,096157064	1,50937764	-1,38876	0,17821	-5,218542606	1,026228479	-5,218542606	1,026228479
Q.7/ FMS	-0,50785593	1,422548591	-0,357	0,724343	-3,450621899	2,434910039	-3,450621899	2,434910039
Q.8/ FMS	-2,065877694	1,485596684	-1,3906	0,177655	-5,13906858	1,007313192	-5,13906858	1,007313192
Q.10/ FMS	3,542081007	2,358799633	1,501646	0,146794	-1,337467805	8,421629818	-1,337467805	8,421629818
Q.11/ FMS	-6,27813853	2,74090334	-2,29054	0,031488	-11,94812908	-0,608147977	-11,94812908	-0,608147977
Q.12/ FMS	4,491631325	1,815622809	2,473879	0,021177	0,735729383	8,247533266	0,735729383	8,247533266
Q.13/ FMS	1,184701716	1,603278483	0,738924	0,467427	-2,131932519	4,501335951	-2,131932519	4,501335951
Q.14/ FMS	-4,383700296	2,002816737	-2,18877	0,039027	-8,526842381	-0,240558212	-8,526842381	-0,240558212
Q.15/ FMS	-0,517974551	1,50018229	-0,34527	0,733026	-3,621338062	2,58538896	-3,621338062	2,58538896
Q.16/ FMS	-1,276502095	2,289147968	-0,55763	0,582483	-6,01196546	3,458961271	-6,01196546	3,458961271
Q.17/ FMS	0,722154047	2,305420194	0,313242	0,75692	-4,046970982	5,491279076	-4,046970982	5,491279076
Q.18/ FMS	-1,994328603	2,168970568	-0,91948	0,367387	-6,481186075	2,492528869	-6,481186075	2,492528869

Finally, based on the provided regression coefficients and their associated p-values, we can analyse the relationship between each of the independent variables "Q" (expert's answers) and the dependent variable (years of experience).

Q1: The coefficient for Q1/FMS answers is positive (2.62), indicating a positive relationship with years of experience. However, the p-value is only significant at the 0.08 level, which suggests some uncertainty in the relationship. Overall, there appears to be a weak positive relationship between the satisfaction of additional cost incurred and years of experience.

Q2: The coefficient for Q2/FMS is positive (2.67) and significant at the 0.04 level, indicating a positive relationship with years of experience. This suggests that as the helpfulness of financing options increases, so does the years of experience.

Q3: The coefficient for Q3/FMS is negative (-0.01), indicating a negative relationship with years of experience. However, the p-value is not significant, indicating that there is no evidence to support this relationship.

Q5: The coefficient for Q5/FMS is positive (3.54) and significant at the 0.09 level, indicating a positive relationship with years of experience. This suggests that as the degree of satisfaction regarding the skill and experience of maintenance personnel increases, so does the years of experience.

Q6: The coefficient for Q6/FMS is negative (-2.10) and significant at the 0.18 level, indicating a negative relationship with years of experience. This suggests that as the years of experience increases, the ease of scheduling maintenance and repair work decreases.

Q7: The coefficient for Q7/FMS (ease of identifying qualified vendors for outsourcing) is negative (-0.51) and not significant, indicating no relationship between this variable and years of experience.

Q8: The coefficient for Q8/FMS is negative (-2.07) and significant at the 0.18 level, indicating a negative relationship with years of experience. This suggests that as the years of experience increases, the flexibility of the FMS process for outsourcing decreases.

Q10: The coefficient for Q10/FMS is positive (3.54) and significant at the 0.15 level, indicating a positive relationship with years of experience. This suggests that as the years of experience increases, the ease of the tracking and management of information about military aircraft items increases.

Q11: The coefficient for Q11/FMS (is negative (-6.28) and significant at the 0.03 level, indicating a negative relationship with years of experience. This suggests that as the years of experience increases, the ease of the availability of data about military aircraft items to authorized personnel decreases.

Q12: The coefficient for Q12/FMS is positive (4.49) and significant at the 0.02 level, indicating a positive relationship with years of experience. This suggests that as the years of experience increases, the ease of the use of data about military aircraft items to inform decision-making increases.

Q13: The coefficient for Q13/FMS (bottlenecks or delays in the procurement process) is positive (1.18) but not significant, indicating no relationship between this variable and years of experience.

Q14: The coefficient is -4.3837 with a standard error of 2.0028. The t-value is -2.1888, which is significant at the 0.05 level, indicating that there is a relationship between the accuracy and reliability of delivery schedule and years of experience. The negative coefficient suggests that as the years of experience increase, the perception of accuracy and reliability of the delivery schedule decreases. However, the confidence intervals (-8.5268, -0.2406) suggest that the true coefficient may lie within this range. Therefore, it is possible that the relationship between the dependent variable and Q14 is not very strong or may not exist at all.

Q15: The coefficient is negative (-0.517974551) and the t-value is not significant (-0.345274407 with p-value of 0.733025885). This indicates that there is no statistically significant relationship between measures to mitigate the impact of delays or issues in delivering military aircraft items and years of experience.

Q16 asks how deficiencies and warranties are handled, and it has a negative coefficient of -1.2765 with a t-value of -0.5576 and a p-value of 0.5825, indicating that there is no significant relationship between the way deficiencies and warranties are handled and the years of experience of the participants.

Q17: The coefficient is 0.722, which indicates a positive relationship between reporting and addressing deficiencies and years of experience. However, the p-value of 0.757 suggests that this relationship is not statistically significant, meaning that we cannot confidently say that the

relationship is not due to chance. Overall, this suggests that there may be some relationship between the ease of reporting and addressing deficiencies and years of experience, but further research is needed to confirm this relationship.

Q18: The coefficient in the regression model is -1.994328603, which indicates a negative relationship between the process for claiming warranties and years of experience. However, the p-value of 0.367387045 is greater than the significance level of 0.05, suggesting that the relationship is not statistically significant. Therefore, we cannot conclude that there is a significant effect of the process for claiming warranties on years of experience.

5.3.2 Commercial Sales Questions/Answers

Again, it is required to construct the table shown below in Excel, which contains the expert responses to each of the referenced queries regarding the Commercial Sales procedure. Then, these responses will be used as the independent variable in the regression analysis, with years of experience working as the dependent variable. Specifically, at least two questions will be used for each unit of the questionnaire in the regression analysis, with a total of 16 of the 19 questions being utilized. The same 16 queries as the previous FMS process will be utilized.

Table 35 Commercial Questions & years of experience

How many years of experience do you have working in the field of military procurement?	Q.1/ Commercial	Q.2/ Commercial	Q.3/ Commercial	Q.5/ Commercial	Q.6/ Commercial	Q.7/ Commercial	Q.8/ Commercial	Q.10/ Commercial	Q.11/ Commercial	Q.12/ Commercial	Q.13/ Commercial	Q.14/ Commercial	Q.15/ Commercial	Q.16/ Commercial	Q.17/ Commercial	Q.18/ Commercial
7	8	9	9	9	8	8	9	8	9	8	9	8	9	8	9	9
20	4	6	6	7	6	6	5	6	7	6	5	5	3	6	6	7
3	10	1	9	7	5	3	5	5	2	10	2	7	5	2	7	9
3	4	8	7	8	8	7	6	7	8	8	3	3	5	4	5	7
22	8	4	7	8	7	8	6	7	6	8	5	6	7	7	7	7
25	5	4	4	4	5	3	3	5	7	4	5	5	5	6	6	6
11	5	1	3	8	5	7	7	7	7	7	6	5	5	6	6	8
29	7	6	8	8	8	9	6	9	9	9	8	8	7	8	9	8
19	5	5	6	7	9	8	9	8	9	10	9	10	7	8	7	9
8	7	7	7	9	9	8	7	7	7	6	4	6	6	7	8	7
7	5	5	5	8	5	8	1	7	7	7	7	7	7	9	9	9
24	5	5	6	5	7	4	2	2	2	3	5	5	5	5	4	3
11	6	10	10	9	6	7	8	7	7	7	7	9	7	8	8	9
20	2	3	5	3	4	3	8	8	2	7	6	7	7	4	5	7
40	5	5	5	10	5	1	5	10	6	8	1	6	6	1	1	1
20	5	6	6	7	6	7	6	7	7	7	5	6	6	7	8	8
25	4	5	4	9	3	2	3	9	8	8	4	7	8	7	7	6
26	8	1	1	8	5	4	2	3	3	7	2	2	5	2	2	2
38	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
4	9	9	9	8	8	9	9	9	8	9	8	8	5	9	8	8
11	4	6	6	8	6	4	4	7	8	7	7	7	7	7	8	7
3	7	3	7	7	7	7	7	7	8	8	7	8	7	7	7	7
26	8	1	4	8	8	8	8	8	2	8	6	5	3	4	4	3
27	9	2	5	9	9	9	9	9	3	9	7	6	4	5	5	4
28	10	3	6	10	10	10	10	10	4	10	8	8	5	5	5	4
29	8	1	4	8	8	8	8	8	2	8	6	5	3	4	4	3
30	9	1	5	8	9	9	9	8	2	9	7	6	3	4	5	4
27	9	3	5	10	8	9	9	9	3	10	7	6	5	4	5	3
31	8	1	4	8	8	8	8	8	2	8	6	5	3	5	5	4
26	8	2	4	8	9	8	9	10	4	8	6	8	5	5	5	4
29	8	1	4	8	8	8	8	8	2	8	6	6	4	4	4	3
28	10	2	5	9	9	9	9	8	3	10	7	7	4	4	4	4
30	10	3	6	10	9	10	10	9	4	8	8	8	5	5	5	3
26	8	3	4	8	10	8	10	10	2	10	6	8	3	5	4	4
26	9	1	5	9	9	8	9	9	4	9	7	6	4	4	5	4
25	9	2	5	8	8	9	9	9	2	9	6	7	4	4	4	3
23	8	1	4	8	8	8	8	8	2	8	6	5	3	4	4	3
21	9	2	5	9	9	9	9	9	3	9	7	6	4	5	5	4
22	10	2	6	9	10	10	9	9	4	9	8	8	5	4	4	4
25	8	1	4	8	8	8	8	9	2	9	7	5	4	4	4	3

Table 36 Regression statistics/FMS

Linear Regression Statistics	
Multiple R	0,748623
R Squared	0,560437
Adjusted R Squared	0,254654
Standard Error	8,296232
Sample Size	40

The above statistics are related to the regression model and the relationship between the dependent variable (years of experience) and independent variables (experts' answers). The multiple R is 0.748623292, which is a measure of the correlation between the dependent variable and the independent variables. It indicates a moderate to positive correlation between the dependent variable and the independent variables. The R-squared is the multiple correlation squared, indicating the percentage of variance in the dependent variable that is explained by the independent variables. In this case, the R squared is 0.560436833, indicating that 56% of the variance in the dependent variable is explained by the independent variables.

The adjusted R-squared is 0.254654, which takes into account the number of independent variables and the sample size. It is a more conservative estimate of the proportion of variation in the dependent variable that is explained by the independent variables. The standard error is 8.296232251, which is a measure of the accuracy of the estimates of the coefficients. It indicates the average distance that the observed values are from the regression line. The sample size is 40, which represents the number of observations used to estimate the regression model.

Table 37 Analysis of Variance/Commercial Sales

VARIANCE ANALYSIS					
	Degrees of freedom (DF)	*SS*	*MS*	*F*	*F significance*
Regression	16	2018,343	126,1465	1,832792	0,090030147
Residual	23	1583,032	68,82747		
Total	39	3601,375			

Additionally, the results of the analysis of variance (ANOVA) for the regression model shows the degrees of freedom for regression is 16 and for residual is 23, and the total degrees of freedom is 39, which is equal to the sample size minus one. The sum of squares (SS) for regression is 2018.343 and for residual is 1583.032. The total sum of squares is the sum of these two, which is equal to 3601.375. Also, the mean square (MS) for regression is 126.1465 and for residual is 68.82747. The mean square is calculated by dividing the sum of squares by the degrees of freedom. The F-value is 1.832792, which is calculated by dividing the mean square for regression by the mean square for residual. The significance value for the F-test is 0.090030147, which is more than the commonly used threshold of 0.05. This means that the

model is not statistically significant at the 5% level, indicating that none of the independent variables has a significant linear relationship with the dependent variable.

Table 38 Coefficients/Commercial Sales

	Coefficients	*Standard Error*	*t Value*	*P Value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	34,58847626	15,79748602	2,189492	0,038968	1,908886576	67,26806595	1,908886576	67,26806595
Q.1/ Commercial	0,75738714	1,6251496	0,466041	0,645569	-2,604490948	4,119265228	-2,604490948	4,119265228
Q.2/ Commercial	0,914893094	1,548711122	0,590745	0,560452	-2,288859954	4,118646143	-2,288859954	4,118646143
Q.3/ Commercial	-1,565077795	2,090352354	-0,74871	0,461618	-5,889301101	2,759145512	-5,889301101	2,759145512
Q.5/ Commercial	-1,633897453	1,853917261	-0,88132	0,387261	-5,469017504	2,201222598	-5,469017504	2,201222598
Q.6/ Commercial	-0,529614583	1,994132808	-0,26559	0,792924	-4,654792592	3,595563426	-4,654792592	3,595563426
Q.7/ Commercial	0,061344402	1,901542916	0,03226	0,974543	-3,872296823	3,994985626	-3,872296823	3,994985626
Q.8/ Commercial	-0,128470224	1,465912765	-0,08764	0,930923	-3,160941822	2,904001374	-3,160941822	2,904001374
Q.10/ Commercial	1,057705296	2,010873488	0,525993	0,603928	-3,102103448	5,217514039	-3,102103448	5,217514039
Q.11/ Commercial	0,3705186	1,352418511	0,273967	0,786555	-2,427172245	3,168209444	-2,427172245	3,168209444
Q.12/ Commercial	0,105722475	2,047238964	0,051641	0,95926	-4,129313988	4,340758938	-4,129313988	4,340758938
Q.13/ Commercial	0,388811296	1,708261517	0,227606	0,821963	-3,144996892	3,922619483	-3,144996892	3,922619483
Q.14/ Commercial	1,040227912	1,972108154	0,52747	0,602919	-3,039388629	5,119844452	-3,039388629	5,119844452
Q.15/ Commercial	0,414450792	1,625154077	0,255022	0,800972	-2,947436557	3,776338141	-2,947436557	3,776338141
Q.16/ Commercial	-0,654604088	2,966760693	-0,22065	0,827315	-6,791816174	5,482607997	-6,791816174	5,482607997
Q.17/ Commercial	1,006351276	3,177247686	0,316737	0,7543	-5,56628633	7,578988881	-5,56628633	7,578988881
Q.18/ Commercial	-3,735482362	2,596802175	-1,43849	0,163764	-9,107376943	1,63641222	-9,107376943	1,63641222

Finally, based on the provided regression coefficients and their associated p-values, we can analyse the relationship between each of the independent variables "Q" (expert's answers) and the dependent variable (years of experience) regarding the Commercial Sales process.

Q1: The coefficient for Q1/Commercial indicates that there is a positive relationship between the independent and dependent variable. However, the t-value is quite low and the p-value is quite high, which suggests that this relationship may not be statistically significant.

Q2: Similar to Q1, the coefficient suggests a positive relationship, but the t-value and p-value indicate that this relationship may not be statistically significant.

Q3: The coefficient indicates a negative relationship between the independent and dependent variable. However, the t-value and p-value indicate that this relationship may not be statistically significant.

Q5: Similar to Q3, the coefficient suggests a negative relationship, but the t-value and p-value indicate that this relationship may not be statistically significant.

Q6: The t-value and p-value indicate that the relationship between the independent and dependent variable may not be statistically significant.

Q7: For Q7 in the table, the coefficient is 0.0613 with a standard error of 1.9015. The t-value is 0.0323, with a corresponding p-value of 0.9745. The 95% confidence interval for the coefficient ranges from -3.8723 to 3.9949, which includes zero. This suggests that there is no statistically significant relationship between Q7 and the commercial outcome variable, as the p-value is much larger than the conventional significance level of 0.05. Additionally, the

confidence interval contains zero, which indicates that we cannot reject the null hypothesis that the coefficient is equal to zero.

Q8: For Q8, the coefficient is -0.128 with a standard error of 1.466. The t-value is -0.088 and the p-value is 0.931, which indicates that the coefficient is not statistically significant at a 95% confidence level. The 95% confidence interval for the coefficient ranges from -3.161 to 2.904, which includes zero. Therefore, we cannot conclude that there is a significant relationship between the independent variable and the dependent variable.

Q10: The null hypothesis is that there is no significant relationship between the independent variable and the dependent variable, while the alternative hypothesis is that there is a significant relationship. Since the p-value (0.604) is greater than the significance level (0.05), we cannot reject the null hypothesis and conclude that there is insufficient evidence to support the claim that there is a significant relationship between the rating of experts' answers and their years of experience, which is always the dependent variable.

Q11: For Q11, we have a coefficient of 0.3705186 with a standard error of 1.352418511, giving a t-statistic of 0.273967412 and a p-value of 0.786555118. The t-statistic indicates that the coefficient is not significantly different from zero at the 5% level of significance since the absolute value of the t-statistic is less than 1.96. The p-value of 0.786555118 confirms this since it is greater than the 5% level of significance. Therefore, we can conclude that the coefficient for Q11 is not statistically significant and we fail to reject the null hypothesis that there is no significant relationship between Q11 and the dependent variable.

Q12: For Q12, we have a coefficient of 0.1057, a standard error of 2.0472, and a t-value of 0.0516. The p-value is 0.9593, which is greater than the significance level of 0.05. Therefore, we fail to reject the null hypothesis and conclude that there is not enough evidence to suggest that there is a significant relationship between the predictor variable (marketing expenses) and the response variable (sales revenue) at the 5% significance level. The confidence interval at the 95% level for the coefficient is (-4.1293, 4.3408), which includes 0. This further supports our conclusion that the variable is not a significant predictor of sales revenue.

Q13: The coefficient of 0.388811296 indicates that there is a positive relationship between the dependent variable and the independent variable. However, given that the t-value is only 0.227606424 and the p-value is 0.821963364, we cannot conclude that this relationship is statistically significant.

Q14: For Q14, the coefficient is 1.0402 with a standard error of 1.9721. The t-value is 0.5275 and the p-value is 0.6029, which indicates that the coefficient is not statistically significant at the 5% level. The 95% confidence interval for the coefficient ranges from -3.0394 to 5.1198. This means that we cannot be sure that there is a true relationship between the independent and dependent variables. We need to conduct further analysis to determine whether this variable has a meaningful impact on the dependent variable.

Q15: The coefficient of 0.414 indicates that there is a positive association between the variable in question and the dependent variable, but the magnitude of the association is quite small. The t-value of 0.255 is relatively small, and the p-value of 0.801 indicates that this result is not statistically significant at the conventional level of 0.05.

Q16: or Q16, the coefficient is -0.6546 with a standard error of 2.9668, indicating that there is a negative relationship between the independent variable and the dependent variable. However, the t-value of -0.2206 is not statistically significant at the 0.05 level, with a corresponding p-value of 0.8273. The 95% confidence interval for the coefficient ranges from -6.7918 to 5.4826. Therefore, we cannot reject the null hypothesis that the coefficient is equal to zero, suggesting that there is no significant effect of the independent variable on the dependent variable.

Q17: For Q17, the coefficient is 1.006 and the standard error is 3.177, resulting in a t-value of 0.317 and a corresponding p-value of 0.754. The 95% confidence interval for the coefficient ranges from -5.566 to 7.579. Since the p-value is greater than 0.05, we fail to reject the null hypothesis that the coefficient is equal to zero. This means that there is no significant evidence to suggest that there is a linear relationship between Q17 and the dependent variable. Furthermore, the 95% confidence interval includes zero, which further supports the notion that Q17 does not have a significant effect on the dependent variable. Therefore, we can conclude that Q17 is not a significant predictor of the dependent variable in this regression model.

Q18: For Q18, the coefficient is -3.735482362, with a standard error of 2.596802175. The t-value is -1.438493235 and the p-value is 0.163763738. The confidence intervals show that with a 95% confidence level, the coefficient of Q18 can range from -9.107376943 to 1.63641222. This interval includes 0, which means that the coefficient is not statistically significant at the 5% level. Therefore, we cannot reject the null hypothesis that there is no significant relationship between Q18 and the dependent variable.

5.4 Summary of findings

In this study, we conducted a comparison of the FMS and commercial sales methods, as well as a regression analysis to examine the relationship between years of experience and responses to each set of questions.

To begin, we conducted a descriptive analysis, the results of which showed that the mean replies for the FMS technique were typically greater than those for the commercial sales method across all sets of questions, with the exception of Questions 1, 4, 7, and 8, for which the commercial sales method had higher means.

Then, we conducted t-tests to compare the means of the two methods, assuming equal variances. The results showed that only in Q1, Q4, Q7 and Q8, the means of the answers in commercial sales method were significantly higher than those of the FMS method. In Q6, Q10, Q12 the means of the FMS method were higher but the differences were not statistically significant. In all other questions, the means of the FMS method were significantly higher than those of the commercial sales method.

Analytically, the answers of the experts indicate that the additional costs (administrative fees, extra charges) associated with using services or products are substantially lower in Commercial Sales. Thus, Commercial Sales made these fees more affordable. In addition, the product or service's lead time has a lesser impact on the total cost when the purchasing country initiates the Commercial Sales process. The final sector in which experts believe the Commercial Sales process offers more advantages than the FMS is outsourcing. Specifically, according to the cited responses, under Commercial Sales it is simpler for the purchasing country to identify

qualified vendors, and this method provides greater flexibility. For every other answer, it need to be stated that, according to the responses provided by professionals, FMS trumps Commercial Sales. To be more precise, the experts in the FMS process report a substantially greater level of satisfaction in the areas of Maintenance and Repair Services, Visibility and Traceability of the goods, Lead Time & Delivery Schedule, and Discrepancies/Warranties than in the area of Commercial Sales.

The study also analyzed the relationship between years of experience and expert answers related to the 2 procurement processes. In terms of FMS, the findings demonstrated a positive correlation that ranged from moderate to high between the dependent variable and the independent factors. The variation in the dependent variable may be explained by the independent factors to about 63.41% of its total variance. The F-test was significant, indicating that at least one of the independent variables has a significant linear relationship with the dependent variable. Further analysis of the regression coefficients revealed that several independent variables had a significant relationship with years of experience, including helpfulness of financing options, satisfaction regarding the skill and experience of maintenance personnel, tracking and management of information about military aircraft items, and the use of data to inform decision-making. However, there were some relationships that were not statistically significant, including those related to the ease of scheduling maintenance and repair work, identifying qualified vendors for outsourcing, bottlenecks or delays in the procurement process, and the way deficiencies and warranties are handled. Overall, the study provides insights into the relationship between expert answers and years of experience in the context of the FMS procurement process. The findings could be useful for improving the system and enhancing the experience of personnel with varying levels of experience.

On the other hand, based on the data analysis regarding Commercial Sales, it can be concluded that there is a moderate to positive correlation between the dependent variable (years of experience) and the independent variables (expert's answers) with an R-squared value of 0.560, indicating that 56% of the variance in the dependent variable is explained by the independent variables. However, the adjusted R-squared value of 0.254 indicates that this relationship may not be statistically significant, and the ANOVA results suggest that the model is not statistically significant at the 5% level. Furthermore, the regression coefficients and their associated p-values reveal that none of the independent variables have a significant linear relationship with the dependent variable, except for Q1/FMS, which has a positive coefficient but a high p-value, indicating a non-significant relationship. Similarly, other independent variables, including Q2, Q3, Q5, Q6, Q13, Q15, Q16, Q17, and Q18, do not have a significant effect on the dependent variable. Therefore, it can be concluded that the independent variables do not have a significant impact on the dependent variable in the context of the Commercial Sales process.

6. Conclusions, limitations and suggestions for new research

6.1 Conclusions

Based on this thesis, we are able to combine the findings of the literature review and statistical analysis, and we can draw the conclusion that the method of Foreign Military Sales (FMS) has several advantages over the method of Commercial Sales. These advantages include reliability, transparency, standardization, access to advanced technologies, fostering long-term relationships, and satisfaction in several key areas, such as maintenance and repair services, visibility, and traceability of aircraft items. However, there are also drawbacks associated with the FMS, such as the bureaucratic process, the restricted alternative suppliers, the possible political influence, and higher expenses.

On the other hand, Commercial Sales provide more affordable additional costs, less impact of lead time on the total cost, and greater flexibility in outsourcing. However, Commercial Sales also have disadvantages in terms of reduced standardization and compatibility concerns, the possibility of doing business with unreliable or less reputable suppliers, limited access to cutting-edge military technology, and less interoperability.

The statistical analysis showed that years of experience have a significant impact on the expert's answers related to the FMS method, while there is no significant impact on the expert's answers related to Commercial Sales. This indicates that experience plays a significant role in the FMS procurement process, and efforts should be made to improve the system and enhance the experience of personnel with varying levels of experience.

The decision between FMS and Commercial Sales depends on the requirements and priorities of the procuring nation. If maintenance and repair services, visibility and traceability of products, lead time/delivery schedule, and defects/warranties are the primary concern, then the FMS method may be the best option. Alternatively, if the primary concern is the affordability of additional costs, the flexibility of outsourcing, and the reduced impact of lead time on the total cost, then the Commercial Sales method may be the more appropriate procurement option.

In the end, before making a decision, it is necessary to conduct a comprehensive analysis of the advantages and disadvantages of both approaches, as well as the country's unique requirements and priorities. Moreover, dependent on the specific circumstances, a combination of both methodologies may be the most efficient way to satisfy the procurement needs of a country's fleet.

6.2 Limitations and future research directions

There are several limitations to the methodology used in this study. The availability of information about military procurement programs is one restriction. Some information may be classified or not publicly available, which could limit the scope of the study. The possibility for bias in the information gathered via surveys is another drawback. Additional limitations of this study include the relatively small sample size and the fact that the study was conducted in a specific geographic location, which may limit the generalizability of the results to other contexts.

Future research directions could also explore the use of alternative research methods, such as case studies or interviews, to gain a more in-depth understanding of the factors that influence the success of military procurement programs. Additionally, further analysis could be conducted to identify any potential interactions between variables that were not accounted for in the current study.

Finally, the study only considered the impact of a limited set of factors on the dependent variable, and future research could investigate the influence of additional factors, such as organizational culture or political considerations, on the success of military procurement programs. This could provide a more comprehensive understanding of the factors that contribute to successful procurement outcomes and help identify areas for improvement in the procurement process.

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Appendix A: Copy of the questionnaire

Years of Experience
How many years of experience do you have working in the field of military procurement? (please write only the number of years)
FMS/Pricing (Section 1)
Q1: On a scale of 1 to 10 (1 = very frustrated/high cost, 10 = very satisfied/low cost), how much additional cost (administrative fees, extra charges) did you incur from using services or products?
Q2: On a scale of 1 to 10 (1=very frustrated, 10=very satisfied), how helpful are the financing options (grants, loans and other forms of credit) in reducing the overall cost of the purchase?
Q3: On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how effective was the support and maintenance in reducing the cost of ownership for the product or service?
Q4: On a scale of 1 to 10 (1 = very frustrated/high impact, 10 = very satisfied/low impact), how much did the product or service's lead time or delivery time impact the overall cost?
FMS/Maintenance and Repair Services (Section 2)
Q5: On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how skilled and experienced are the maintenance personnel?
Q6: How easy is it to schedule maintenance and repair work on a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied)?
FMS/Outsourcing (PROS) (Section 3)
Q7: On a scale of 1 to 10 (1 = very frustrated/very difficult, 10 = very satisfied/very easy), how easy is it to identify qualified vendors for outsourcing services?
Q8: On a scale of 1 to 10 (1 = very frustrated/very low, 10 = very satisfied/very high), how flexible is the FMS process in terms of allowing for the outsourcing of services for military aircraft?
Q9: On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how well does the FMS process support managing and overseeing outsourcing contracts for military aircraft items?
FMS/Visibility and Traceability of the items (Section 4)
Q10: On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how is information about military aircraft items' location and procurement status tracked and managed?

Q11: On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how is the data about military aircraft items (e.g., location, status, history) made available to authorized personnel?
Q12: On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how is the data about military aircraft items used to inform decision-making (e.g., to determine maintenance needs and to plan deployments)?
FMS/Procurement Lead Time & Delivery Schedule (Section 5)
Q13: On a scale of 1 to 10 (1 = very frustrated/many, 10 = very satisfied/almost zero), are there any bottlenecks or delays in the procurement process?
Q14: On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how accurate and reliable is the delivery schedule?
Q15: On a scale of 1 to 10 (1 = very frustrated/almost zero, 10 = very satisfied/many), are there any measures to mitigate the impact of delays or issues in delivering military aircraft items?
FMS/Discrepancies and Warranties (Section 6)
Q16: How are deficiencies and warranties handled on a scale of 1 to 10 (1 = very frustrated,10 = very satisfied)?
Q17: On a scale of 1 to 10 (1 = very frustrated,10 = very satisfied), how is the process for reporting and addressing deficiencies?
Q18: On a scale of 1 to 10 ((1 = very frustrated,10 = very satisfied), how is the process for claiming warranties?
Q19: On a scale of 1 to 10 ((1 = very frustrated,10 = very satisfied), how responsive and timely is the FMS addressing deficiencies and honoring warranties?
Commercial Sales/ Pricing (Section 7)
Q20: On a scale of 1 to 10 (1 = very frustrated/high cost, 10 = very satisfied/low cost), how much additional cost (administrative fees, extra charges) did you incur from using services or products?
Q21: On a scale of 1 to 10, how helpful are the financing options (grants, loans and other forms of credit) in reducing the overall cost of the purchase?
Q22: On a scale of 1 to 10, how effective was the support and maintenance in reducing the cost of ownership for the product or service?
Q23: On a scale of 1 to 10 (1 = very frustrated/high impact, 10 = very satisfied/low impact), how much did the product or service's lead time or delivery time impact the overall cost?

Commercial Sales/Maintenance and Repair Services (Section 8)
Q24: On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how skilled and experienced are the maintenance personnel?
Q25: How easy is it to schedule maintenance and repair work on a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied)?
Commercial Sales/Outsourcing (Section 9)
Q26: On a scale of 1 to 10 (1 = very frustrated/very difficult, 10 = very satisfied/very easy), how easy is it to identify qualified vendors for outsourcing services?
Q27: On a scale of 1 to 10 (1 = very frustrated/very low, 10 = very satisfied/very high), how flexible is the Commercial Sales process in terms of allowing for the outsourcing of services for military aircraft?
Q28: On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how well does the Commercial Sales process support managing and overseeing outsourcing contracts for military aircraft?
Commercial Sales/Visibility and Traceability of the items (Section 10)
Q29: On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how is information about military aircraft items' location and procurement status tracked and managed?
Q30: On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how is the data about military aircraft items (e.g., location, status, history) made available to authorized personnel?
Q31: On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how is the data about military aircraft items used to inform decision-making (e.g., to determine maintenance needs and to plan deployments)?
Commercial Sales/Procurement Lead Time & Delivery Schedule (Section 11)
Q32: On a scale of 1 to 10 (1 = very frustrated/many, 10 = very satisfied/almost zero), are there any bottlenecks or delays in the procurement process?
Q33: On a scale of 1 to 10 (1 = very frustrated, 10 = very satisfied), how accurate and reliable is the delivery schedule?
Q34: On a scale of 1 to 10 (1 = very frustrated/almost zero, 10 = very satisfied/many), are there any measures to mitigate the impact of delays or issues in delivering military aircraft items?
Commercial Sales/Discrepancies and Warranties (Section 12)

Q35: How are deficiencies and warranties handled on a scale of 1 to 10 (1 = very frustrated,10 = very satisfied)?
Q36: On a scale of 1 to 10 (1 = very frustrated,10 = very satisfied), how is the process for reporting and addressing deficiencies?
Q37: On a scale of 1 to 10 ((1 = very frustrated,10 = very satisfied), how is the process for claiming warranties?
Q38: On a scale of 1 to 10 ((1 = very frustrated,10 = very satisfied), how responsive and timely are the sellers addressing deficiencies and honoring warranties?

Appendix B: Glossary of Acronyms

AAC - Acquisition Advice Code: A code used to identify the purpose of a requisition.

AFSAC - Air Force Security Assistance Center: A US government organization responsible for managing the sale and transfer of military equipment to foreign governments.

ALC - Air Logistics Center: A US government organization responsible for providing logistics support for military aircraft.

AHP - Analytical Hierarchy Process: A decision-making tool that uses a hierarchy to structure and organize decision criteria and alternatives.

AOG - Aircraft on Ground: A term used in the aviation industry to describe a situation where an aircraft is grounded due to a mechanical issue.

CLSSA - Cooperative Logistics Supply Support Arrangement: An agreement between two or more countries to cooperate on logistics support.

COMSEC - Communications Security: Measures taken to secure communication systems and prevent unauthorized access to sensitive information.

CONUS - Continental United States: The 48 contiguous states of the United States.

CS - Commercial Sales: Sales of goods or services between private entities and purchaser countries

DCS - Direct Commercial Sales: Sales of defense articles or services directly to a foreign government or international organization by a US company.

DLA - Defense Logistics Agency: A US government organization responsible for providing logistics support to the military.

DSCA - Defense Security Cooperation Agency: A US government organization responsible for coordinating security cooperation activities between the US and foreign governments.

DTS - Defense Transportation System: A US government system responsible for transporting military personnel and equipment.

DWCF - Defense Working Capital Fund: A fund used to finance the acquisition and management of military goods and services.

EAR - Export Administration Regulations: US government regulations that control the export of goods and technology that have potential military uses.

EEA - European Economic Area: A geographic area consisting of the European Union and certain other European countries.

EOQ - Economic Order Quantity

EPQ - Eligible-to-be-Programmed Quantity: The quantity of an item that is eligible to be included in a program or budget.

ERRC - Expendability, Recoverability, Reparability, and Cost: A set of factors used to evaluate the cost-effectiveness of military equipment.

FAA - Foreign Aid Act: US legislation that authorizes foreign aid programs.

FMS - Foreign Military Sales: Sales of US military equipment and services to foreign governments.

FMSO - Foreign Military Sales Order: An order placed by a foreign government for US military equipment or services.

FOS - Follow-on Support: Maintenance and support provided after the delivery of a product or service.

GP - Goal Programming: A decision-making technique used to optimize multiple conflicting objectives.

GSA - General Services Administration: A US government agency responsible for managing government buildings and property.

G2G - Government-to-Government: A relationship between two or more governments.

HAZMAT - Hazardous Material: A substance that poses a risk to health, safety, or the environment.

I&S - Interchangeability and Substitution: The ability to replace one item with another without affecting performance.

ICAO - International Civil Aviation Organization: A UN organization responsible for promoting safe and efficient air travel.

IATA - International Air Transport Association: A trade association for the airline industry.

ILCS - International Logistics Command System: A logistics management system used by NATO.

ISO - International Organization for Standardization: An international standard-setting body.

ITAR - International Traffic in Arms Regulations: US government regulations that control the export of defense articles and services.

JIT - Just in Time: A manufacturing and inventory management strategy that seeks to minimize inventory levels by producing goods only when they are needed.

KPIs - Key Performance Indicators: Measures used to evaluate the success of an organization or project.

LAC - Latest Acquisition Cost: The cost of acquiring an item at the most recent time it was purchased.

LOA - Letter of Offer and Acceptance: A document used to formalize the sale of

LOR - Letter of Request: A document used by a foreign government to request US military equipment or services.

MDE - Major Defense Equipment: Equipment that is specially designed for military use and has a high acquisition cost.

MMC - Materiel Management Code: A code used to identify the category of an item in a logistics system.

MMAC - Management Aggregate Code: A code used to identify the management responsibility for an item in a logistics system.

MOA - Memorandum of Agreement: A document used to establish an agreement between two or more parties.

MOU - Memorandum of Understanding: A document used to establish a mutual understanding between two or more parties.

MRRL - Materiel Repair Requirements List: A list of items that require repair or maintenance.

NATO - North Atlantic Treaty Organization: A military alliance consisting of North American and European countries.

NCS - NATO Codification System: A system used by NATO to standardize the identification and classification of military equipment.

NIMSC - Non-consumable Item Materiel Support Code: A code used to identify non-consumable items in a logistics system.

NSN - National Stock Number: A unique identifier assigned to each item of supply in a logistics system.

NVG - Night Vision Goggles: Goggles that allow a user to see in low-light conditions.

OEM - Original Equipment Manufacturer: A company that produces equipment or components that are used in other companies' products.

P&A - Price and Availability: Information on the cost and availability of an item.

PO - Purchase Order: A document used to request the purchase of goods or services.

POD - Port of Debarkation: The port where military personnel or equipment departs for a mission.

PROS - Parts and Repair Ordering System: A system used to order parts and repairs for military equipment.

QAID - Quick Access Identification: A system used to quickly identify items in a logistics system.

RIC - Routing Identification Code: A code used to identify the transportation route for an item.

RFID - Radio Frequency Identification: A technology used to track and identify items using radio waves.

RFQ - Request for Quotation: A document used to request a price quote from a supplier.

RFP - Request for Proposal: A document used to request a proposal from a supplier.

ROM - Rough Order of Magnitude: A rough estimate of the cost or effort required for a project.

SA - Security Assistance: Assistance provided by the US to foreign governments to support their security needs.

SAMIS - Security Assistance Management Information System: A system used by the US government to manage security assistance programs.

SAMM - Security Assistance Management Manual: A manual used by the US government to provide guidance on security assistance programs.

SCM - Supply Chain Management: The management of the flow of goods and services from the source of production to the point of consumption.

SLQ - Stock Level Quantity: The quantity of an item that is held in inventory.

STANAG - Standardization Agreement: An agreement between NATO countries to standardize military equipment.

SWOT - Strengths, Weaknesses, Opportunities and Treats

TAA - Technology Transfer Agreements: Agreements between the US and foreign governments to transfer technology.

TMS - Transportation Management System: A system used to manage transportation logistics.

TPA - Total Package Approach: A method used to provide a comprehensive package of goods and services to a customer.

UMMIPS - Uniform Movement and Materiel Issue Priority System: A system used to prioritize the movement of military equipment.

USAF - United States Air Force: The aerial warfare branch of the US military.

USG - United States Government: The government of the United States.

Author's Statement:

I hereby expressly declare that, according to the article 8 of Law 1559/1986, this dissertation is solely the product of my personal work, does not infringe any intellectual property, personality and personal data rights of third parties, does not contain works/contributions from third parties for which the permission of the authors/beneficiaries is required, is not the product of partial or total plagiarism, and that the sources used are limited to the literature references alone and meet the rules of scientific citations.