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Research paper



Military Capability Sustenance: Providing Effective Supports Through Lifespan

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Abstract

The focus of this paper is to evaluate the implementation of Integrated Logistics Support (ILS) in the Malaysian Armed Forces (MAF). ILS is a disciplined and structured analysis approach, encompasses of management and technical activities, aimed to identify and improve supportability to achieve reliability and availability at optimising life-cycle costs (LCC) in the defence capability development processes. The Logistics Support Analysis (LSA) is use to evaluate the ILS activities implemented for armoured vehicles. Improper implementation would result inefficient and ineffective whereby the assets cannot be sustained which eventually lead to low level of operational readiness. Therefore, a unique MAF process needs to be developed, adapted and properly applied with the ILS principles in all phases of the development process.

Keywords: *Military Capability; Support throughout Life; Integrated Logistic Support; Logistic Support.*

1. Introduction

The Malaysia Armed Forces (MAF) faces major challenges to ensure the military asset capabilities [1] are serviceable, reliable and ever ready to perform any action when needed. MAF requires effective and efficient support of assets and this comes with financial costs. Failure to meet the above stated requirements can affect the duty of the MAF in defending the nation's sovereignty. If such problem is ignored, it will lead to even more failures, additional resource requirements to address the problem, the total accumulated costs will be higher, overall budget plans would be affected, lack of funding and financial management problems that in turn, will affect the sovereignty and the nations' economic reputation [2, 3].

Although ILS came about in the early 90s, after nearly three decades, not much of impact could be seen especially on the implementation of ILS. Although, the introduction of ILS is not new to the MAF, it remains to be more theoretical rather than practical implementation. There has not been concrete results so far. Successful in implementation of ILS is yet far to be seen. It has long been lingering for MAF to adapt or implement ILS across the organisation [2, 3]. This research intends to provide an effective support system that can maintain the level of readiness of operational assets used. This can be a reality if the MAF is serious, firm and proper in adapting the concept of ILS in the development of the military capabilities.

1.1 Problem Statement.

It is desired of the military capabilities of MAF to be fully supported in order to maintain the level of serviceability of a lifetime at minimum cost (cost effective), where military capabilities are always available, maintainable and reliable as intended, hence ready for any eventuality or conflict in any part of the world [2, 3].

Implementation of ILS in the past was both inefficient and ineffective, therefore, failing to provide the intended impact and the assets cannot sustain and operate in accordance to the specifications (operational/user requirements) which caused low level of operational readiness [2, 3, 5]. Hence, the need to evaluate the implementation and find solutions to overcome weaknesses.

1.2 Aim.

The aim of this research is to investigate the current practice of military capability development process in the MAF and generate effective solutions to overcome weaknesses.

1.3 Objective.

The objective of this paper is to evaluate the implementation of ILS in the MAF.

1.4 Research Questions.

In investigating the current practice of military capability development process, several initial questions have been identified as follows:

1. Does MAF have adequate and complete policies, standing orders, guidelines, procedures, processes to implement the ILS?

2. What are the steps and efforts to enhance the successful implementation of ILS?

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3. Does it improve the operational readiness?

2. Literature Review

Many studies related to ILS are found in 90s and the focus are more into supporting of an individual system or equipment and not on how of an organisation or military organisation to practice ILS. In recent years (2000 and beyond) the studies are more about supply chain which relate the logistics into the commercial practices. The focus of this study is on the development and implementation of an effective and efficient maintenance and support structure and all the activities related to the military capability of MAF should have and practice.

2.1 Threats vs. Capability.

The growing complexity and unpredictability of the global security environment have led to the military readiness more challenging than ever. Besides traditional threats, there were other arising issues such as international terrorism that could be seen continuously adapted and mutated. Another threat is cyber-attacks and technology-related that poses a potentially devastating impact. All these threats require an approach that develops MAF to anticipate and respond to evolving forms of terrorist attacks. Such an ability rests on understanding social, cultural and political contexts.

Today systems are inherently complex [8] due to a number of reasons, such as software and systems integration between subsystems, systems of systems and networked systems of systems. This level of complexity introduce a number of challenges during the system development stage and the overall life cycle [9]. Hence, provides new insights and understanding, along with the development of critical abilities especially in military capabilities development.

Webster defines logistics as "the branch of military science and operations dealing with the procurement, supply, and maintenance of equipment, with the movement, evacuation, and hospitalisation of personnel, with the provision of facilities and services, and with related matters" [4]. In the commercial sector logistics can be defined as "that part of supply chain process that plans, implement, and control the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customers' requirements" [5]. ILS [6] is the disciplined and unified management of all activities necessary to produce a supportable system design and a reasonable support capability to achieve a predetermined set of measureable objectives within an acceptable cost of ownership. Logistics have been defined in many ways, has many different answers and it can be concluded that logistics is a broad subject. Since logistics is a broad subject, it can defined in the context of definers' concept of applications. Depending on the need and the roles are in life, logistics can be defined in an infinite number of ways [7]. An overview of ILS is depicted in Figure 1:

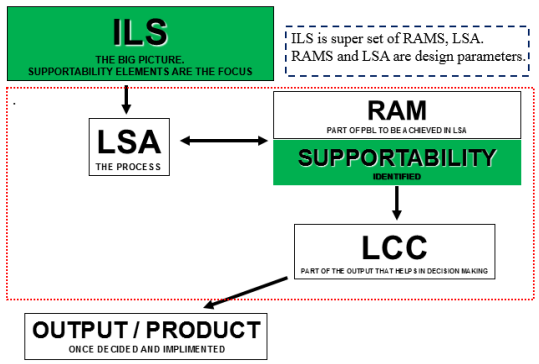


Fig. 1: An Overview of ILS. (Source: Defence Logistics Division (DLD), MAF Headquarters)

2.2. ILS Process and Logistics Support Analysis (LSA).

In the ILS process there are two major activities involved in achieving its goals and actions, comprising management activities and technical activities [1, 6]. These activities are accomplished through the performance of Logistics Support Analysis (LSA). LSA includes the use of analytical tools and models to develop and evaluate alternative support elements, measure the life cycle cost impact of material and support system and provide a force for integrating support elements with each other and the design process. A very important outgrowth of the LSA process is the LSA Record (LSAR). The LSAR is part of the LSA documentation consisting of detailed data pertaining to the logistics support resource requirements of the system. The LSA tasks can be tailored into type of capability development program either fully developmental or non-developmental program. The LSA task section is as below and the LSA tasks flow as described in Figure 2:

1. **Task Section 100**. Program Plan and Control.
2. **Task Section 200**. Mission and Support System Definition.
3. **Task Section 300**. Preparation and Evaluation of Alternatives.
4. **Task Section 400**. Determination of Logistic Support Resource Requirements.
5. **Task Section 500**. Supportability Assessment.

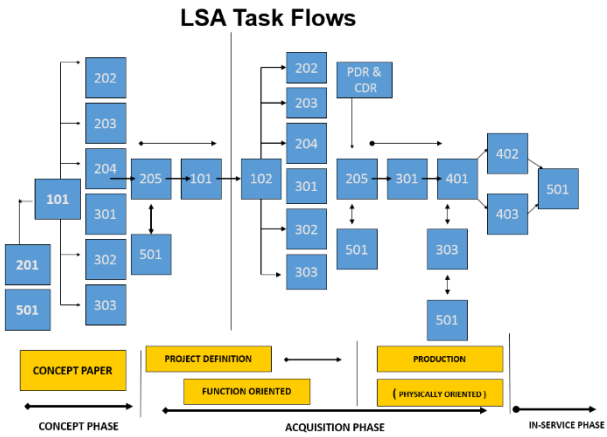


Fig. 2: Classical View of LSA Tasks. (Source: Defence Logistics Division (DLD), MAF Headquarters)

2.3 ILS Elements.

The management activity will deal with the identification and management of the ILS elements. The consideration of these support resources must influence the material system requirements and design throughout the acquisition process, so that, these resources are defined, acquired and provided to the field. The elements are as follows [3]:

1. Engineering support.
2. Maintenance planning.
3. Manpower and personnel.
4. Supply support, facilities.
5. Support equipment.
6. Training and training support.
7. Technical data.
8. Computer resources Support.
9. Design interface.
10. Packaging, handling, storage and transportation.

2.4 Reliability, Availability and Maintainability (RAM).

Reliability, Availability and Maintainability (RAM) parameters are to ensure that the design meets the required operational performance targets, both at acceptance and throughout its lifespan. RAM is important because Reliability, Maintainability and the logistic support system are major determinations of Availability which itself influences military capability [1,6]:

2.4.1. Reliability.

The probability that an item will perform its specified function(s) for a specified interval under specified conditions.

2.4.2 Availability.

The measure of the degree a system is in the operable and committable state at the start of a mission when the mission is called for at a random point in time.

2.4.3 Maintainability.

The ability of an item to be returned or retained in an operable state. This includes the duration it will take to fix an item when it fails.

2.5 RAM: Systems Effectiveness and Supportability.

The integrated approach also focuses on the system effectiveness rather than any one individual element of the system support. System effectiveness [1, 6] is the probability that a system can successfully meet an operational demand within a given time when operated under specified conditions. Systems effectiveness is the combination of three probabilities, see Figure 3.

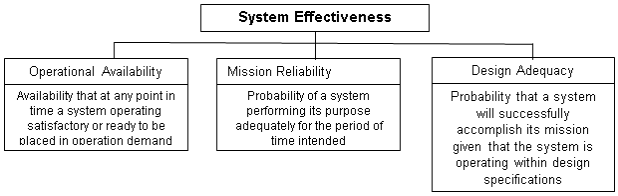


Fig. 3: System Effectiveness Concept (Source: Defence Logistics Division (DLD), MAF Headquarters)

2.5.1 Operational Availability (OA).

OA is the probability that, when used under stated conditions and the actual support environment, items will operate satisfactorily at any time. It includes the delays caused by scheduled maintenance activities, part and workforce shortages, and administrative paperwork.

$$Ao = \text{UP TIME / TOTAL TIME (What operator need)}$$

$$Ao = \frac{OT+ST}{(OT+ST)+(TCM+TPM+ALDT)} = MTBM/(MTBM+MDT)$$

OT = Operating time per year, TSM = Time corrective maintenance
ST = Standby time per year, TPM = Time preventive maintenance
ALDT = Administrative logistics delay time, MTBM= Mean time between maintenance
MDT = Mean down time

2.5.2 Mission Reliability.

The probability of a system performing its purpose adequately for the period of time intended.

2.5.3 Design Adequacy.

The probability that a system will successfully accomplish its mission given that the system is operating within design specifications.

2.6 Life Cycle Cost (LCC).

ILS is aimed to minimise the costs. ILS ensures that all necessary support resources are identified, analysed, optimised and are consistent with each other, to reduce cost drivers for in-service support and reduce Life Cycle Cost (LCC), thus will improve supportability and availability. The bottom-line is to reduce to the Whole Life Costs (WLC) or the ownership cost [1, 6, 9].

The modernisation programmes affect the responsibilities of logistic organisations into being more challenging and complex, as such, requires stern actions to be placed in-line with the programmes. Logistic organisations should be capable and competent to provide support to enable the military hardware to be at the desired performance and output. Logistics management has been an important domain in the military, allowing for the maximisation and sustainability of equipment. High technologies, emphasis on money value over effectiveness and complexities of material systems have increased the importance of logistics management, see Figure 4.

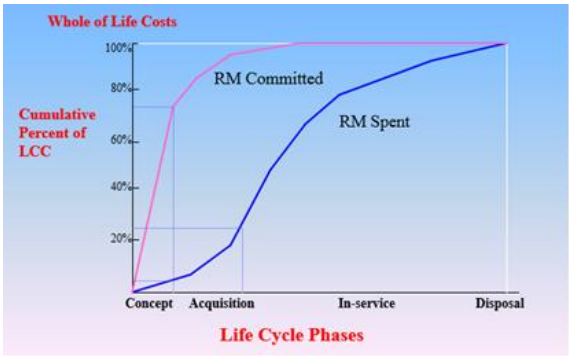


Fig. 4: Life Cycle Costs Commitment (Source: Defence Logistics Division (DLD), MAF Headquarters)

It is crucial to determine the capabilities developed are in accordance with the operational need and comply with the requirements of users, can be maintained and can confidently be used in accordance with predetermined specifications. Even more important is the cost of ownership over the life of a reasonable and at an affordable cost, illustrated in Figure 5. Therefore, the financial implications are important factors to be considered in the development of military capabilities as it is one of the main sources that determines the level of preparedness of weapons systems used during its lifetime.

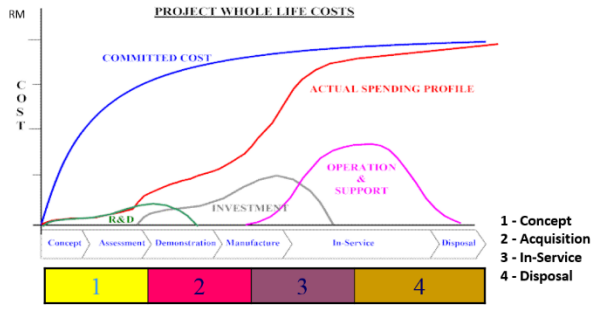


Fig. 5: System Life Cycle adapted from Development of LCC Profile [5]

3. Methodology

In evaluating the current practice of ILS for MAF defence capabilities development process, the research areas cover ILS activities within MAF as follows:

3.1 Data collection within the MAF and to look into strategy, policy, instructions, procedures and processes relation to ILS. This is

to evaluate whether the MAF have adequate guidance to implement ILS.

3.2 The Logistics Support Analysis (LSA) will be used to evaluate the MAF activities and process.

3.3 In order to get a clearer picture of the purpose of this research, the researcher must understand the organisational structure, roles and functions of the entities involved in implementing the ILS within the MAF. The process flow conducted for this research is depicted in Figure 6.

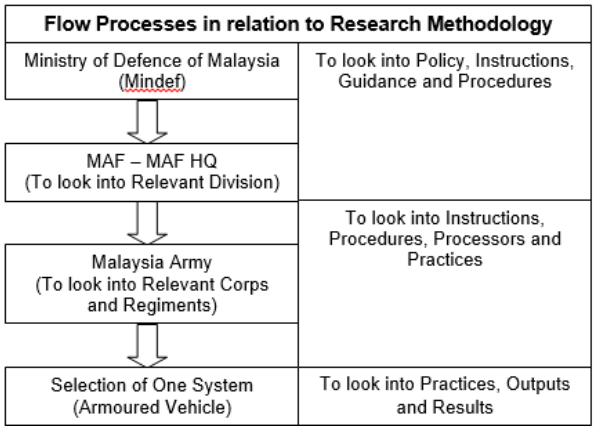


Fig. 6: Process Flow for Evaluation Method

4. The Implementation of ILS, Findings and Proposed Solutions

ILS goal is to sustain fully supportable material systems in current and projected environments that meet established operational and system readiness. The aim is to seek the highest system effectiveness and efficiency at the lowest life cycle costs.

4.1 Malaysian Main Battle Tank.

Main Battle Tank (PT-91) named as PENDEKAR came into MAF inventory in 2005. The tanks were built in Poland and were commissioned into the 11th Royal Armour Regiment. MAF have adopted ILS principles in the development of the PENDEKAR [10]. In Fig. 7 below depicted the status of operational readiness (BT) indicates the level capability for Fighting of PENDEKAR through the year of 2008 until the end year of 2017. The graph indicates the level of operational readiness continue declining, where as the set target for operational readiness by the Malaysian Army is 80% [11].

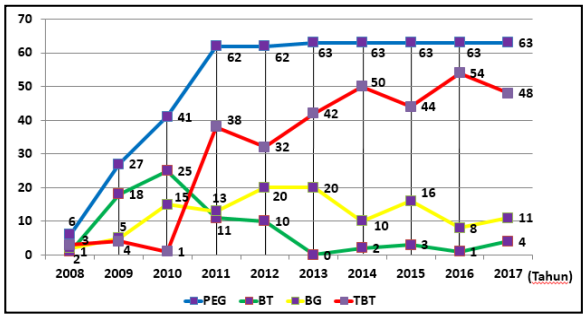


Fig. 7: PENDEKAR Operational Readiness. (Source: Mechanise Infantry Brigade Annual Audit Report, 2007, Army Headquarters, Ministry of Defence, Malaysia.)

4.2 ILS Policies, Manuals, Instructions and Procedures.

The MAF has issued out the documents (policy, manuals, instructions and procedures) pertaining ILS in each individual Service. Some of the documents were dated in 1995 and, this to show the MAF is serious of implementing the ILS, however its progress was rather slow, especially in the aspect of endorsement and the enforcement of ILS activities to take on. Currently the manuals are not well elaborated and detailed enough, as such unable for any user to use and apply the ILS processes in a right order and discipline.

It is proposed the MAF to review on the contents of the documents. As the contents have to be updated and keep current in relation with the organisation structures, environment, situation and other relevant policies from higher authorities.

4.3 ILS Working Committee.

Malaysia Armed Forces Headquarters (MAF HQ) has established an ILS working committee which was formed in 1998. The committee is chaired by the Director of Logistics, Computer System Cell in the Defence Logistics Division (DLD-MAF HQ). The committee is answerable to the Assistant Chief of Logistic (ACL) of DLD MAF HQ and their duties are to discuss on coordination, planning, development, controlling, monitoring, training and progress on all ILS matters under Ministry of Defence (Mindef):

It is proposed that the committee should be upgraded and chaired by Assistant Chief of Logistic (ACL) of DLD MAF HQ. The idea of upgrading would give strength and more power (credibility) to drive the implementation of ILS in Mindef. This will help smoothing the implementing process and provide rapid progression on ILS.

4.4 Logistics Support Analysis (LSA) Guide.

The guarantee for a successful of ILS programme is depending on the success of applying the LSA processes and documenting into the Logistics Support Analysis Record (LSAR). Thus, this is also to prove the project has practiced ILS and the document will be the source of reference. The MAF has not yet established LSA for its own use. To prove that one project has implemented ILS, is that, the development proses must do the LSA tasks and to document all processes into the LSAR. It is believed without this LSA till then MAF cannot implement ILS properly. The table below shows that the MAF does not perform LSA, for simple reason they do not have the LSA guidance.

Table 1: Comparison of LSA Tasks Practiced by MAF

LOGISTICS SUPPORT ANALYSIS ACTIVITIES VS IMPLEMENTED											
LSA Tasks Section	Task Analysis	Type of Development		Life Cycle Phase							
				Concept Phase		Acquisition Phase		In-Service Phase		Disposal Phase	
		Full Development	Non-Development	LSA Tasks	Implemented	LSA Tasks	Implemented	LSA Tasks	Implemented	LSA Tasks	Implemented
101	LSA Strategy	√	√	√		√					
102	LSA Plan	√				√					
103	Management and Analysis Reviews	√						√			
201	Use Study	√	√	√	√						
202	Standardization Opportunities	√		√		√					
203	Comparative Analysis	√	√	√		√					
204	Technological Opportunities	√	√	√		√					
205	Functional Requirements Definition	√	√			√					
301	Functional Requirements Identification	√	√	√		√					
302	Support System Alternatives	√	√	√		√					
303	Requirements Evaluation and Trade-offs	√	√	√		√					
401	Definition of Resource Package	√									
402	Transition Analysis	√									
403	Post Production Support Analysis	√									
404	Disposal Analysis	√									
501	ST&E Strategy	√									
502	Evaluation of Functional Requirements	√									
503	Verification of Physical Characteristics and Resources	√									
504	In-Service Supportability Assessments	√									

So far, no LSAR (ILS documentation) has been produced on any project. Failing to do LSA will defeat the purpose of practicing ILS in any project. The LSA tasks and LSAR can be contract out and monitored by the project team.

It is proposed the MAF to develop its own LSA guides. The content of the LSA must be tailored into Malaysian environment and must be able to be applied into the Malaysian scenario.

4.5 Project Team.

On another aspect, the MAF has established the project team for their capital asset procurement. This project team would be established for the approved procurement either before or upon the contract signed. As the term of reference the project team was normally focusing during the acquisition phase ensuring all deliverables were in accordance to the contract clauses. Therefore it is proposed that all LSA and LSAR requirements to be included in the contract.

4.6 Training and Training Support.

The challenge faced by the MAF is to educate the people with the knowledge related to ILS. A continuous training is vital for the MAF in order to preserve and progressing ILS knowledge and skills through time. It is proposed that MAF to enhance the training and courses through collaboration with the local institutions or universities to obtain proper qualifications and accreditations.

5. Conclusion

The decision whether the approach is going to be 'womb to tomb' or 'cradle to grave' will depend on the capability of the organisation implementing the ILS. In MAF, the implementation of ILS is more towards designing the support system rather than the design of the prime equipment. Factors to be considered are based on the ability of the MAF in terms of manpower, knowledge and skill, and the logistics considerations. Whichever approach adopted, it is important to ensure that the established supporting systems or material systems are suitable and workable for the equipment. Therefore, the investment in weapon system is preserved and the designed tools can be used to manage the in-service support. This will benefit MAF in analysing the impact of the weapon system efficiencies and as points of argument in the case of budget requirement.

For the MAF, where most equipment were purchased through off-the-shelf, will apply the same ILS principles to achieve the same result. However, because MAF does not have the same opportunities as the United State (US) to influence weapon system design, therefore a unique MAF process needs to be developed, applied and adopted in all phases by all involved.

Future study needs to explore into the implementation of ILS at various services Army, Navy and Air Force and its impact. Need to explore configuration management in MAF to see the commitment to improve operations and supports. In addition, it should also look into the involvement and commitment of local defence industries for national defence and security and its opportunities for national economy. It is hoped that the proposals would help the MAF.

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