The Role of Life Cycle Cost in Defence Procurement

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Introduction

In the current geopolitical scenario, the acquisition and or development of state-of-the-art weapons systems has become necessary to maintain or change power dynamics and deterrence in one's favour. These systems, though, are costly. They compel governments to deliberate on their purchase carefully before signing orders and investing in new systems and technology only after thorough review and tests and within budgets that are finite and, at times, constrained.

Currently, the lowest vendor method, L1 is the most dominant way of defence procurement whereby the vendor, who offers the lowest cost for a particular equipment, is selected. While seemingly cost-effective, this method has flaws. For example, metrics like the average life cycle of the system, differences in capabilities and wartime attrition, and operating and maintenance costs do not figure in the L1 equation. Yet, these characteristics are vital in assessing the cost-effectiveness of a weapons system and can provide a far better analysis of the system's efficiency.

Consequently, there has been a debate around the L1 concept, and policymakers are developing new parameters for evaluating bids for procurement. In August 2021, then Indian Army Chief General M.M. Naravane called for a rethink of L1 altogether.[1] Beyond defence procurement, the L1 vendor method has been replaced by other parameters. For instance, in November 2021, the guidelines on procurement and project management issued by the Ministry of Finance (MoF) noted that L1 would not be the only method to select winning bids for non-consultancy services or standard or routine works. Instead, proposals will also be evaluated on the Quality-cum-Cost Based Selection method.[2]

In the defence sector, an alternative to L1 is the concept of Life Cycle Cost (LCC), which is the total cost incurred to develop, induct, operate, maintain, and dispose of a weapons system.[3] This enables the defence planners to consider the long-term resources needed for effectively using a system over its lifetime and consider current and future defence expenditure. So far, however, India's experience in integrating LCC analysis into its acquisition process has not been consistent. Although the concept was introduced into the Defence Procurement Procedure (DPP) of 2006, calculating these costs has proved difficult and complicated.

How best can the LCC be included in the Indian defence acquisition process? What components should defence planners consider while calculating the LCC? And what can be done to make sustainment more consistent and predictable for both user and the industry? This study examines the role of LCC in defence acquisition and understands the challenges in its implementation in the Indian context. The analysis builds on ideas shared during a series of workshops convened by the Observer Research Foundation (ORF) under the Chatham House Rule,[a] which brought together stakeholders from the Indian military, Ministry of Defence (MoD) bureaucracy, industry, and the think tank community. The participants deliberated on issues related to the upkeep of military platforms and the role of LCC in defence planning and procurement, and explored ways to ensure military readiness through optimised sustainment.

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LCC in Military Acquisition: A Conceptual Overview

A military system generally comprises a "system of systems", i.e., several sub-components that function together to support the particular defence equipment or system. This analogy of a military "system of systems" makes any procured product dependent on a series of processes that are part of the more extensive process called the "management of the life cycle support system".

In the United States (US) and the European members of the North Atlantic Treaty Organization (NATO), the concept has become intrinsic to every defence acquisition—whether the transaction is between industry and the government, or government-to-government. Being almost universal in scope, the LCC concept has come to be known by various names such as Whole Life Cost, Cost of Ownership, or Total Ownership Cost (TOC). Among these, LCC remains the most comprehensive term, which helps to explain the processes, phases, and other variables involved in the lifetime of a system.

The LCC can be defined as the "total cost to the government of a programme over its full life, including costs for research and development, testing, production, facilities, operations, maintenance, personnel, environmental compliance, and disposal."[4] In other words, it caters to the accounting of the cost of a system right from its conception in the form of modelling and designing to the operational phase, and up to the point where it is reduced to waste.

Using a life-cycle costing framework is essential to successfully implement and manage any defence programme and its acquisition. The primary objective of adopting the LCC method is to ensure coordinated support to the processes by which the best decisions out of available alternatives can be arrived at. The parameters and driving factors for availing any optimum option in the case of Life Cycle Costing (as per the methodology adopted by NATO) are based on an assessment of the expenditure which may go into the maintenance of a particular system, for comparison among the available alternative solutions, to manage the demands vis-a-vis existing budget, options for acquisition, and assessment of cost reduction opportunities.[5]

In terms of user-industry relations, life-cycle costing can help develop a model for affordability assessment and determining the cost drivers, which are evaluated in the light of the users' requirements against the system's performance.[6] NATO technical reports characterise LCC as a benchmark to measure the "value for money" both during the acquisition or production phase and when the system is in service.

Components of the LCC model

The LCC comprises several components throughout conceptualisation and implementation.

1. **Specifics of the programme by considering various options:** It deals with the cost element of the system, which broadly decides the user base and profitability of the system from an industry-centric perspective.

2. **Assumptions:** This component includes assigning specific hypothetical scenarios to improve processes where no such concrete data is available.

3. **Deployment, operationality, and user requirements:** It considers the operational parameters, which include the deployment in varying situations, and plays a crucial role in assigning the function to the system. The maintenance cost is determined per the system's operational deployment and use.

4. **Risk issues:** A feedback loop is added in the series of processes involved to avert or adjust any programme to the non-accounted exigencies or circumstances. This includes pointing out potential risk issues and an input/output mechanism to facilitate the process.

The LCC gives leverage to both user and the industry to decide among many options involved in the forecasting of the cost element, a comparison between the alternative solutions (in the form of alternative assets, design trade-off, and supply chain, among others) and to suit the often complex details of the tender evaluation process.[7]

The LCC is meant to provide the industry and users with the data (though not precise), which helps policymakers in decision-making. It gives details of in-service costs that make calculating expenditure more convenient for the different stakeholders. Therefore, it helps in doing the following:

- analysing the differences between forecasting and actual costs;
- identifying potential areas of cost saving;
- feeding cost databases;
- determining cost drivers;
- implementing management control;
- planning to phase out the system and reduce stockholding.

Critics have argued, however, that LCC is not an exact science and cannot provide precise figures for the cost to be utilised in the process. In other words, it remains only an estimation or near probability of events or processes if led in an ideal way under the ideal circumstances. In terms of circumstances, it does not account for other intervening variables like time delay in acquisition due to political decision-making.[8]

Performance-Based Logistics

Performance-Based Logistics (PBL) is one model for executing LCC Support. A PBL is an outcome-centric approach: describing the desired result rather than how the work is to be performed.[9] It is the performance measure where the verifiability of the quality is ensured through measures like achieving a specific target level (system, subsystem, or component) of availability.[10]

Most prominently in the aviation sector, the industry has been using PBL-based strategies to deliver "power by the hour," in which the customer pays only for the specified target level in terms of operational flying hours and the payment is made accordingly.

The PBL-based Life Cycle Support framework is one of the most cost-efficient ways to implement the LCC. It also provides adequate commercial protections catering to buyers' needs and drives the correct behaviour in the industry delivering their services to the military. As a result, PBL contracting allows the user side to increase weapon system performance while simultaneously reducing cost compared to traditional product support strategies.[11] The Indian Air Force (IAF) C-130 fleet's maintenance is a good example of implementing PBL-based life cycle support management.[12]

The Indian Context

LCC was introduced in India under the DPP 2006. It mentioned that the Original Equipment Manufacturer (OEM) "shall provide all the details like Operating cost, Maintenance cost, Overhaul cost, training cost etc. per squadron of aircraft, required to estimate the Life cycle cost of the aircraft."[13] In addition, it stated that factors such as operational hours/year, Mean Time Between Failure (MTBF), the requirement of maintenance spares, and mandatory replacements during preventive maintenance schedules, may be considered for arriving at LCC.

LCC was initially used to procure 75 trainer aircraft in 2011 for the IAF.[14] The Request for Proposal (RFP) instructed the interested equipment manufacturers to specify the costs of buying, maintaining and flying their respective aircraft over a 30-year service life.[15] The vendor with the lowest LCC was expected to be declared the L1 vendor. Eventually, based on the proposals received, Swiss aerospace manufacturer Pilatus was declared the L1 vendor with a declared LCC of INR 4,160 crores (approximately US$ 523 million).[16]

However, MoD's subsequent cost estimation of the Pilatus deal revealed that 88 percent of the acquisition cost over 30 years would be incurred in less than a decade because of "inbuilt flaws" in the bid submitted by Pilatus. Reportedly, nine components that were part of the IAF proposal to pay Pilatus under the maintenance head had not been calculated as part of the LCC during the RFP stage.[17] The Pilatus later demanded an additional INR 507 crores (approximately US$ 73 million) for a "Follow on Support (FOS) Contract" to cover repair and maintenance over five years after the initial two-year warranty period—a demand accepted by the IAF.[18] This figure was reportedly three times the cost of repairs and maintenance estimated during the L1 evaluation. The Pilatus attributed this cost increase to factors such as supply chain administration and publication updates, which had not been considered during the RFP stage. The subsequent Comptroller and Auditor General's report in 2019 also pointed out that the company had failed to commit to the transfer of technology for maintenance and offer spare parts on a timely basis.[19]

This first chequered experience naturally raised scepticism within the Indian defence establishment on the LCC concept.

India's subsequent bumpy LCC experience was with the purchase of 126 medium multi-role combat aircraft (MMRCA). In 2012, Indian policymakers, with the intent of choosing an affordable fighter aircraft to buy, fly, maintain and overhaul over a 30- to 40-year service life and not just the lowest price, selected Dassault Aviation as the lowest bidder for its Rafale jet.[20] Three years later, however, it emerged that Dassault had submitted "a sketchy commercial bid" based on which the Rafale aircraft was wrongly adjudged to be cheaper than it was.[21] Moreover, the chief negotiation committee's cost calculations showed that the actual costs for Rafale were significantly higher than the original calculations at the time of bidding. Subsequently, the MMRCA tender was withdrawn in 2018.[22] The government then negotiated an inter-governmental agreement with France to buy 36 Rafale aircraft in fly-away conditions.[23]

These bitter experiences notwithstanding, Indian policymakers understand the benefit of the LCC analysis as they continue to incorporate its various elements in subsequent acquisitions. For instance, when the IAF was considering the purchase of a multi-role tanker transport (MRTT) aircraft, Airbus' A330 MRTT was twice chosen over the Russian IL-78, as the former's life cycle costs were lower, even as the latter's acquisition cost was lower.[24] The purchase, however, was eventually cancelled over costing issues and amidst a debate on whether direct acquisition costs or LCC should be calculated to select the most economical option. This highlighted that the concept of LCC is yet to get enough traction within the defence establishment.

Now the Defence Acquisition Procedure (DAP) of 2020 has recommended FOS for capital acquisitions alongside the main L1 procurement, which is a path to eventually including the PBL and the FOS into the RFP stage.[25] Service headquarters have been directed to ensure that product support requirements for at least three to five years beyond the warranty period are procured along with the main equipment to sustain and support the platform/equipment through its operational life cycle. These Life Cycle Support Contracts will hopefully not only improve a system's long-term performance but also provide realistic estimates of its future support costs that can be considered before finalising an acquisition. It should be noted, though, that due to anticipated strong performance of a young aircraft fleet, a three- to five-year window may still be insufficient to drive realistic estimates. A longer time horizon of five to 10 years for initial PBL cost estimates will likely drive more reliable inputs.

Indeed, both Air Force and the Navy have included LCC considerations in their procurement processes, but never in a manner that materially impacts procurement decisions.

Challenges in Implementing LCC

The series of roundtables convened by the ORF on the theme of the LCC in the Indian context brought forth diverse perspectives from the key stakeholders. The following paragraphs highlight the key takeaways from the discussions.

There was near-consensus on the lack of balance between the efforts put into procuring defence equipment, and those for sustaining such equipment. The issue is exacerbated by how current budgeting procedures place sustainment costs under revenue, and procurement under capital spending. Moreover, between FYs 2011-12 and 2021-22, the share of capital outlay for defence in total government capital expenditure decreased from 41 percent to 23 percent.[26] Some of the stakeholders noted, however, that when it comes to sustainment, the issue was often procedural and not necessarily the lack of funds. Therefore, there was a need to streamline the processes or shift to better and more efficient means. Other participants highlighted the weakness resulting from having divergent sources of supply. For example, the three services have PBL in place for certain platforms but lack it for others. And in all cases and across services, there are differently structured arrangements.

The discussions further noted a disconnect between the source of finance (MoF), the user (MoD), and the supplier regarding the sustainment issue. The acquisition and sustainment stages are not contractually linked, which is the primary reason for the disconnect. It was also revealed during the discussions that the MoF has concerns about holding bidders accountable for proposed sustainment plans. The Air Force and the Navy have raised similar concerns about the inability to enforce accountability with vendors.

Moreover, experience with defence contracting suggests that the Indian system enforces contractual provisions through penalties rather than incentives. Incentives, however, are a harder sell in general. Formalising incentives means introducing cost variation in the upward direction, whereas penalties are viewed as a recovery of funds by the Indian government.

Some of the specific obstacles mentioned during the workshops include the following: too many variables to be narrowly defined under typical RFPs; mismatches between user and vendor models; opportunity cost (in either direction); and concerns about variable operational tempo and peacetime vs conflict sustainment efforts. On the mismatch between user and vendor models, several stakeholders flagged MoD's assessment model of the LCC costs, which also includes upgrades in the LCC costs, creating an unrealistic assessment of LCC.

For the IAF, the most troublesome part is working out granular operation or sustainment costs at per-hour or per-sortie levels, out to 30-year horizons and beyond, accounting for parts and support availability or feasibility of upgrades on similar time scales.

Many stakeholders also pointed out that LCC is essentially a Western concept, where it is designed for budgetary planning, programme implementation, and a confirmatory check (i.e., a decision support factor) which contrasts with the Indian model. Moreover, as opposed to the concept of the United States or the NATO countries, which utilise LCC as a decision-making tool for inputs sourced from their domestic industry, India is looking at LCC as a tool for foreign equipment procurement. By getting into a long-term agreement with a foreign vendor (a long-term PBL), India may be locking itself in an obligation with the foreign OEMs.

Moreover, adopting global LCC models and updating, improving or replacing domestic models will not change the fact that all LCC calculations serve up notional costs. But the Indian government acquisition processes are "not mature enough" to deal with notional figures.

Many stakeholders underlined that, as seen earlier, vendor-supplied LCC information that is shared in bad faith can skew procurement with the absence of accountability. On paper, contractual PBL solves this, but in practice, there is nothing that prevents vendors from accepting that penalties will be paid and thus recovering these costs elsewhere in the programme. This particularly applies to Russian-origin aircraft where platform costs are usually significantly lower than Western counterparts, allowing for significant headroom to recover the costs of PBL-related penalties.

Yet most agreed that LCC is a desirable concept and that some form of LCC or TOC must be a deciding factor in procurement. User services, however, highlighted that despite existing approved models for calculation, there are too many variables to include LCC or TOC at the Qualitative Requirements or RFP stage.

The Way Ahead

There was broad consensus in the ORF roundtables about the desirability of LCC and PBL-based contracting. An advantage of PBLs highlighted by user services is the fast turnaround of parts and consequent higher availability, as against ad-hoc legacy methods with slow turnaround both due to contracting processes and vendors' own lead times.

From the Air Force's perspective, the LCC represents an evolution from the existing model, as it considers the cost that is likely to be incurred by the user over the lifetime of the equipment. This is relevant to equipment with long life and recurring cost of operation and maintenance, which could be considerably higher than the original base per cost of the equipment. In such cases, the LLC model results in considerable savings. The IAF is therefore trying to pursue five- to seven-year PBLs for all upcoming contracts as a balance between flexibility and cost and as a means of gathering reliable data to inform future sustainment decisions. One of the key issues here is thus of identification and verifiability of costs.

From the workshop discussions, it was clear that a "one size fits all" formula cannot be used for LCC. For every acquisition programme, an LCC model has to be developed, deciding which elements to be taken into account and which others to omit. A key consideration will be the MTBF, which should be defined beforehand to the vendors. The second factor is verifying the costs. Since the costs presented may differ across vendors, it is ideal that a cost accountability team that will specialise in defence procurement be established to formulate the LCC model. The next challenge will be to make all the vendors agree to one LCC model for a particular acquisition that has been worked out. Accordingly, industry participation is necessary to avoid objections from vendors.

Arriving at these costs may extend the already delayed acquisition process. Therefore, it is advisable to focus on simpler acquisitions that are more amenable to the LCC model than complex acquisition, which is challenging to implement. Another possible approach could be to implement LCC for proven equipment with an established record of the OEM in supporting the equipment after acquisition. This will give confidence to not just the services but also the ministries to support the LCC model.

Another way to make the LCC palatable is to look at shorter periods holding the OEM accountable for a reasonable time that can be manageable and calculable within the vision of what is doable and what is not. A possible practice could be enforcing LCC only for major servicing as it will give insights on the costs: of acquisition, maintaining the aircraft, and overhauling. The PBL can be from the period beginning when the warranty is no longer valid till a major servicing. In a case where one competitor has no pre-scheduled major servicing indicated, the previously noted longer time horizon of five to 10 years could be used to standardise inputs. By doing so, the OEM is locked in at a certain price level.

The foreign OEMs have posited that long-term PBLs benefit both user and vendor, providing enough visibility to the latter to offer competitive prices to the former. A binding PBL element at the RFP level would perhaps allow both user and vendor to hold each other accountable. Taking examples from the United States and NATO, a legal framework and agreement must be incorporated for the contractors in LCC for procurement.

Finally, India will have to evolve a model considering two persistent trends: procurement from foreign vendors for advanced systems, and procurement from the rapidly developing domestic defence industry. It is the right time for India to understand the concept and make the industry aware and adapt to it by looking at the next one and a half decades.

Conclusion

Considering the likely growth rate of the Indian economy and the vagaries that could impact it, the imperative is to include the financial implications of a sustenance package for a germane period in considering the L1 while acquiring any military platform. At present, acquisition tends to take precedence over sustainment in defence procurement. Since sustainment costs represent two-thirds of the entire weapon system LCC, this mindset needs to change. LCC and PBL-based contracting are one way to ensure this change happens and that the services, the MoD, and industry have visibility beyond the acquisition. They offer a well-established solution to these key stakeholders.

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