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Sandeep Verma, *Life Cycle Costing in Defence Acquisition: The Challenges of Transforming Complex Aspirations into Factual Ground Realities*  
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## LIFE CYCLE COSTING IN DEFENCE ACQUISITION: THE CHALLENGES OF TRANSFORMING COMPLEX ASPIRATIONS INTO FACTUAL GROUND REALITIES

**SANDEEP VERMA\***

*Life cycle costing (LCC) is an extremely alluring procurement technique for government contracting professionals in developing countries, given its potential for reducing budgetary outgoes through lowered total cost of ownership during the entire life cycle of procured public assets. However, proper implementation of LCC in a public procurement context inherently requires strict cost visibility, verifiability and contracting discipline during comparative evaluation of proposals as well as during contract administration and implementation, making it an extremely difficult and challenging process, particularly in developing countries with relatively unskilled acquisition workforce and unresponsive legal systems as compared to developed country jurisdictions. Within this background, this short academic note explores certain LCC techniques employed under India's defence procurement procedures, while also attempting quick comparisons with NATO, US and Canadian guidance on the subject. The underlying intent is to use rigorous academic analysis for the purpose of formulating recommendations for suitable reforms in India that could perhaps also be useful for other developing countries interested in implementing LCC-based procurement for obtaining effectiveness and efficiency in their defence acquisition programmes.*

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\* The author is a civil servant and holds an LL.M. with highest honors, having specialised in Government Procurement Law from The George Washington University Law School, Washington DC. Views contained in this short academic paper are purely personal; and do not reflect the official position or policy of the Government of India or any of her departments or agencies. This note is based on a presentation especially prepared by the Author for background reading by IAS officers at a forthcoming mid-career training programme at LBSNAA (Mussoorie) to be used for classroom discussions exploring intersection of *procurement practices* and *public policy* in government programme design and implementation. E-mail: sandeep.verma@nic.in.

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## I. INTRODUCTION

As of August 8, 2014, the Indian Air Force ("IAF") was pursuing at least seven high-value global procurement cases based on "Life Cycle Costing" (LCC)—<sup>1</sup> a procurement technique that is universally recognised as perhaps the most complex and challenging technique anywhere in the world, particularly when applied in a public procurement context.<sup>2</sup> And yet, as analysed in this note, the IAF's Model seems to be in conflict with important requirements contained in India's Defence Procurement Procedure ("DPP") that governs capital acquisitions by the Ministry of Defence ("MoD"). What could be equally problematic are serious differences between the IAF's Model and international best practices on LCC,<sup>3</sup> particularly since the IAF adaptation was reportedly inspired by such international practices in the first place.<sup>4</sup> As examined later in this paper, critical deficiencies in the IAF's Model include: (i) reliance on an extremely small set of cost-elements for best-offeror (L1-vendor) determination in comparison to international best practices (as

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<sup>1</sup> Recent information available in the public domain points to seven cases being processed by the IAF and two cases being processed by the Indian Navy under the LCC approach, of which one case of basic trainer aircraft had been concluded by the IAF as in August 2014. See Press Release, Purchase of Def. Equip., Gov't of India Ministry of Def. (Aug. 8, 2014), available at <http://pib.nic.in/newsite/PrintRelease.aspx?relid=108399>.

<sup>2</sup> For an analysis of complexities with life cycle costing under EU Directives on public procurement, see Éric Van den Abeele, *The Reform of the EU's public Procurement Directives: A Missed Opportunity?*, ¶ 2.2, 33-34 (Eur. Trade Union Inst., Working Paper No. 2012.11, 2012).

<sup>3</sup> See, e.g., Altan Özkil, *Life Cycle Cost Procurement Techniques*, Paper presented at NATO's Research & Tech. Org. Systematic Analysis & Studies Symposium: Cost Structure & LCC for Military Systems (Oct. 24-25, 2001), available at [www.dtic.mil/get-tr-doc/pdf?AD=ADA418689](http://www.dtic.mil/get-tr-doc/pdf?AD=ADA418689) [hereinafter Özkil].

<sup>4</sup> Anil Chopra, *Life Cycle Costing: Value for Money*, SP-MAI, 2013, available at <http://www.spsmai.com/experts-speak/?id=51&q=Life-Cycle-Costing:-Value-for-Money> [hereinafter Chopra].

well as DPP requirements) on the full range of elements covered by life cycle costs, a situation that would most likely lead to misleading estimates used for contract award; and (ii) absence of any meaningful contractual provisions that could motivate successful contractors to actually deliver *stated* or *better-than-stated* cost performance at the time of contract execution vis-à-vis promises on support, operational and upgrade costs, if any, made at the time of bidding or during contract negotiations, thus potentially resulting in long-run inflation of contract costs borne by the MoD as is already being witnessed with cases of incomplete contracts in non-military procurement in India,<sup>5</sup> while also overturning LCC-based L1-vendor determination that would have been used to select the successful contractor in the first place.

Given that poor procurement processes—prior to contract award or in terms of post-award contract administration—are generally recognised as a major determinant of cost and time overruns in military procurement worldwide,<sup>6</sup> this short academic paper explores the existing framework for LCC-based defence acquisition in India practiced by the IAF, as well as its comparative evaluation with certain international best practices, viz. NATO, US and Canadian defence acquisition practices. The underlying objective of the exhaustive academic discussion presented herein is for assisting policy-makers in charting a clear path for suitable procedural and substantive reforms, as the existing contracting methodology that has hitherto been adopted may be largely incapable of protecting India's strategic and policy interests in terms of cost-effectiveness, contract efficiency and sustained indigenisation in military procurement.

## II. LCC UNDER THE DPP VERSUS LCC UNDER THE IAF MODEL DPP

The IAF is required to follow normal DPP provisions for defence acquisitions of a capital nature, tempered suitably with case-specific relaxations permissible with the approval of the competent authority—the Defence Procurement Board (DPB) in some cases, and the Defence Acquisition Council (DAC) in most.<sup>7</sup> Consequently, the existing guidance in the DPP on LCC-based procurement merits a first look for understanding how LCC-based procurements are progressed by the IAF. By

<sup>5</sup> Ram Singh, *Incomplete Contracts and Cost Overruns*, available at [http://chaire-eppp.org/files\\_chaire/Cost\\_Overruns-Ram\\_Singh1.pdf](http://chaire-eppp.org/files_chaire/Cost_Overruns-Ram_Singh1.pdf).

<sup>6</sup> *Transparency and Accountability in Military Spending and Procurement*, STOCKHOLM INT'L PEACE RESEARCH INST., <http://www.sipri.org/research/armaments/milex/transparency> (last visited Apr. 25, 2015).

<sup>7</sup> *Defence Procurement Procedure 2013: Capital Procurement*, MINISTRY OF DEF., GOVT. OF INDIA, ¶ 75, Chapter I, 27 (2013), <https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&uact=8&ved=0CCkQFjAC&url=http%3A%2F%2Fmod.nic.in%2Fwritereaddata%2FDPP2013.pdf&ei=LJQ6VeWMG8XyONPkgIAP&usq=AFQjCNGfBzyeaEW5l-tmkuF-CTsh0V4KlA&sig2=ruQ2TfFWTCj979chCuAUQ>.

itself, even though short on details, the DPP contains broad and invaluable guidance on LCC-based procurement; for instance, paragraph 15 of the “*Guidelines and Conditions for Establishing Maintenance Infrastructure with an Indian Firm*” requires an Original Equipment Manufacturer (OEM, a term left undefined in the main text of the DPP) to provide all details *like (emphasis added)* operating cost, maintenance cost, overhaul cost, training cost *etc. (emphasis added)* per squadron of aircraft required to estimate the LCC of an aircraft, while paragraph 15(d) of the “*General Guidelines for Transfer of Technology (SKD/CKD/IM Kit-based Manufacturing)*” require submission of factors *such as (emphasis added)* operational hours/year, MTBF, requirement of maintenance spares, mandatory replacement during preventive schedules *etc. (emphasis added)* that may be considered for arriving at LCC. Clearly, even though the two DPP formulations are neither exhaustive nor fully harmonised, the intent under the DPP is for including *all relevant costs* such as spares, repairs, maintenance, foreseeable (or planned) upgrades and modifications to arrive at overall life cycle costs for use during L1-vendor determination and subsequently for contract administration.

In actual practice, however, the IAF’s Model talks of a “Total Cost of Acquisition” (TCA) that includes only seven cost elements:<sup>8</sup> (i) the “Direct Cost of Acquisition” (DCA); (ii) Cost of “Total Technical Life” (TTL)-based reserves; (iii) Cost of “Time Between Overhauls” (TBO)/“Mean Time Between Failures” (MTBF)-based reserves; (iv) Cost of inspection-level servicing; (v) Cost of repair-level servicing and overhaul; (vi) Basic Operating Costs; and (vii) Cost of “Transfer of Technology” (ToT). The last element—*ToT Costs*—was apparently used only in the first TCA case by the IAF, being a “Buy & Make with ToT” category acquisition case; and ToT costs were excluded thereafter,<sup>9</sup> the successive cases perhaps being outright global purchases under “Buy(Global)” category. It also appears that the Cost of MTBF-based reserves was also discontinued after the first TCA case by the IAF,<sup>10</sup> for reasons such as “non-complexity” of platforms and fewer numbers and locations of usage, although neither of the grounds for exclusion of MTBF-costs finds any support from international best practices on LCC-based defence acquisitions.

It is not clear if “LCC” as defined under the DPP and “TCA” defined under the IAF Model are identical, since no information is available in the public domain on the definitions and scope of any of the seven cost elements of the IAF Model. *Prima facie*, the IAF’s TCA Model does not seem to unambiguously include all

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<sup>8</sup> Chopra, *supra* note 4.

<sup>9</sup> *Id.*

<sup>10</sup> *Id.*

relevant spares<sup>11</sup> and upgrade costs into account while computing LCC/TCA for selecting a platform/ weapon system on offer amongst competing bids,<sup>12</sup> and to make matters worse, it does not bind the successful contractor to costs of any of the spares (whether TTL-based or TBO-based or MTBF-based) while finalising contracts in actual practice:<sup>13</sup> a situation that could potentially conflict with the overall regulatory framework contained in paragraph 15 of the *Guidelines and Conditions for Establishing Maintenance Infrastructure with an Indian Firm* (Appendix E to Schedule I) and paragraph 15(d) of the *Guidelines for Transfer of Technology* (Appendix L to Schedule I) forming part of standard RFP conditions under the DPP, which, *inter alia*, require the OEM to mandatorily provide the estimated LCC of the product and the basis for arriving at the same. In fact, this IAF practice on non-binding spares' costs could be in conflict with a standard DPP-requirement under which an OEM needs to mandatorily provide a base price along with an escalation formula for future supplies for slab quantities against proprietary items which s/he may intend to discontinue at any stage of the contract.<sup>14</sup> It may also be potentially in conflict with yet another mandatory DPP-requirement that entrusts a *Contract Negotiation Committee* (CNC) to finalise "life-time purchases" (which should necessarily include spares' purchases) together with an illustrated (not "illustrative") spares price catalogue with base price and pricing mechanism for long-term purchases.<sup>15</sup>

Further, the non-inclusion of cost of planned upgrades while selecting L1-vendors based on TCA calculations<sup>16</sup> seems to be in conflict with various important provisions of the DPP, given that the latter at various places requires one or more of the following: (i) complete technical documentation in respect of all proprietary items to be made available to the Indian Production Agency (IPA) to enable indigenous manufacture or establish alternative routes for meeting military requirements, in case the OEM intends to discontinue the production of any proprietary items at any stage;<sup>17</sup> (ii) a base price for proprietary items which an OEM intends to discontinue manufacturing at any stage of the contract, along with an escalation formula for future supplies for slab quantities;<sup>18</sup> (iii) finalisation by

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<sup>11</sup> *Id.*, Costs of MTBF-based reserves were excluded by the IAF in all but the first TCA case.

<sup>12</sup> *Id.*

<sup>13</sup> Answer by Raksha Mantri to Lok Sabha Unstarred Question No. 585, (Nov. 26, 2012), available at <https://mod.nic.in/forms/List.aspx?lid=1666&Id=61> [hereinafter Answer to Lok Sabha].

<sup>14</sup> Ministry of Defence, *General Guidelines for Transfer of Technology (SKD/CKD/IM Kit-based Manufacturing)*, ¶ 1(k)(v) at 164 [hereinafter *Guidelines*].

<sup>15</sup> *Id.* ¶ 54 at 21.

<sup>16</sup> Answer to Lok Sabha, *supra* note 13.

<sup>17</sup> *Guidelines*, *supra* note 14.

<sup>18</sup> *Id.*

CNC with successful contractor issues of obsolescence management, life-time purchases and assured technical documentation (information) on product/technological improvement, modifications and upgrades.<sup>19</sup> Traditionally, obsolescence management in such long-term contracts necessarily includes foreseeable or planned upgrades and modifications,<sup>20</sup> and therefore, the IAF practice of excluding cost of such upgrades in the process of L1-vendor determination or for contract placement, notwithstanding the standard DPP-requirement for obsolescence management to be specifically addressed during CNC proceedings, could be problematic.

In terms of actual practice, the IAF seems to merely require the vendor to be bound by an “adequacy of spares” clause and a “buy back clause” in case of under- or over-assessment of required spares,<sup>21</sup> but these clauses cover only the spares’ availability issues in terms of quantity rather than pricing, without provisions for enforceable and binding costs of spares to be obtained from successful contractors. The latter costs are apparently governed by a “mutual negotiations” clause, stating that subsequent revenue contracts (presumably for spares, consumables and such like) would be mutually finalised (i.e. *negotiated* between the buyer and the seller) on the basis of reference costs and escalation formulae contained in the initial bid.<sup>22</sup> Thus, rather interestingly, the actual contract signed by the MoD does not contain any clause binding a supplier to the costs stated in its bid—a practice quite unusual in public contracting since in any case, “low bias” estimation of operating and support costs is a recurring and well-known feature of defence acquisitions worldwide.<sup>23</sup>

Another interesting twist in the IAF’s TCA Model is that while seven/five costs elements are used for determining the best-offeror (L1-vendor determination), the actual contract signed with the successful vendor only includes binding costs vis-à-

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<sup>19</sup> *Id.* ¶ 54 at 21. See also Ministry of Def., *Guidelines and Conditions for Establishing Maintenance Infrastructure with an Indian Firm*, ¶ 11, ¶ 17(a) at 124-125; *Guidelines, supra* note 14, ¶ 6, ¶ 8, ¶ 19(a) at 170-171, 174.

<sup>20</sup> See, e.g., *Four Obsolescence Management Myths That Kill Defence Programs*, Sept. 10, 2013, available at <http://mil-embedded.com/articles/four-myths-kill-defense-programs/>.

<sup>21</sup> Chopra, *supra* note 4.

<sup>22</sup> *Id.*

<sup>23</sup> Chris R. Price & James E. Coolahan, *Modeling of Life Cycle/ Operations & Support Costs: To What Degree is Commonality Achievable?*, N. Def. Industrial Ass’n Presentation (Feb., 2011), [http://www.ndia.org/Divisions/Divisions/SystemsEngineering/Documents/Committees/M\\_S%20Committee/Reports/LCC\\_Modeling\\_Report\\_\(2011-4-20\)\\_Marked\\_Final\\_Draft.pdf](http://www.ndia.org/Divisions/Divisions/SystemsEngineering/Documents/Committees/M_S%20Committee/Reports/LCC_Modeling_Report_(2011-4-20)_Marked_Final_Draft.pdf); see also Moshe Schwartz, *Defense Acquisition Reform: Background, Analysis, & Issues for Congress*, Congressional Research Service Report 7-5700, 19, May 23, 2014, available at <http://fas.org/sgp/crs/natsec/R43566.pdf>.

vis the first cost element, i.e. the direct costs of acquisition (DCA).<sup>24</sup> This difference between the basis for L1-vendor determination and the binding costs in concluded contracts could nullify the entire effort made by CNCs during contract negotiations, since *firstly*, MoD would not be protected against subsequent cost-deviations by the successful contractor to any of the non-DCA costs elements; and *secondly*, such post-award costs deviations could fundamentally alter the sequencing of L1-L2-L3 vendors undertaken by the CNC for selecting the successful contractor, raising concerns and attracting easy allegations about lack of probity and robustness with CNC proceedings.

A platform or a weapon system, once procured, would not work without any given spares, ammunition or consumables. Hence, the IAF would necessarily have to revert to the incumbent contractor for upgrades and modifications in the absence of acquisition of any intellectual property rights in the platform/ weapon system. Therefore, the IAF may be unlikely to wield any worthwhile negotiating strength *qua* (incumbent) successful contractors that could enable the IAF to arrive at a realistic pricing structure for spares, consumables, repairs, upgrades or modifications. Under the IAF's TCA Model, the buyer may therefore really be left with no option other than obtaining supplies and services at artificially inflated costs in the absence of any real negotiating strength, once a platform or a weapon system has been acquired, and once the buyer has been locked-in to using that platform or weapon system for decades altogether.

### III. INTERNATIONAL BEST PRACTICES ON LCC-BASED DEFENCE ACQUISITION

Amongst international LCC frameworks, the NATO, the US and Canada use LCC-based defence acquisition extensively, although the technique is generally applied *within a cost-reimbursement framework* with *domestic suppliers*—a situation that vastly differs from Indian applications where LCC has instead been applied to long-term defence contracts with foreign suppliers. As shown later in this note, the choice of whittled-down LCC as applied by the IAF to long-term and global defence contracts could therefore fail to yield equally satisfactory results on cost-effectiveness, contract efficiency and sustained indigenisation in military procurement as have been witnessed in other jurisdictions.

#### A. NATO's Executive Guidance on LCC in Defence Acquisition

NATO provides extensive guidance on the role of LCC in defence acquisition, particularly in the form of a document titled *Methods and Models for Life Cycle*

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<sup>24</sup> Chopra, *supra* note 4, with Answer to Lok Sabha, *supra* note 13.

*Costing*,<sup>25</sup> and applies LCC for a variety of purposes such as: (i) budgeting and future spending forecasts; (ii) examining comparisons between alternative solutions such as in-house manufacturing versus outsourcing or choosing between “make” and “buy” procurement decisions; and (iii) supporting the tender evaluation process in procurement situations.<sup>26</sup> LCC under NATO regulations is essentially defined in terms of “Program Life Cycle Costs” (PLCC) and includes initial construction costs, sail-away costs, design and development costs, software and technical data costs, support and training equipment costs, *initial (shore-based) spares’ costs*, facility construction costs, *operation and support costs (including planned upgrades)*, load-out items’ costs, and disposal costs.<sup>27</sup> NATO guidance also talks of “Total Life Cycle Costs” (TLCC), which is the sum of PLCC and linked indirect variable costs such as manpower recruiting, acquisition and training costs;<sup>28</sup> and “Total Ownership Costs”, which is the sum of TLCC and linked indirect fixed costs such as common support items and systems, as well as infrastructure costs for planning, managing, operations and execution.<sup>29</sup>

For use in competitive or single-source procurement, NATO requires complex LCC methodologies to be used in the process of initial procurement of a weapon system as well as in contractor logistic support contracts, particularly recognising: (i) the need for developing extensive cost databases;<sup>30</sup> (ii) identifying the types of studies to be undertaken at various stages of the contract;<sup>31</sup> (iii) clearly identifying elements of contract pricing;<sup>32</sup> and (iv) mechanisms for strict evaluation of contract performance in terms of agreed expectations,<sup>33</sup> potentially leading to contractor logistics support contracts with penalties and incentives for actual contract performance vis-à-vis initial cost estimates.<sup>34</sup>

In terms of actual practice, NATO uses a variety of LCC procurement techniques relating to source selection criteria, pre-award testing, design-to-cost/LCC design trade study requirements, reliability and maintenance acceptance criteria and LCC

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<sup>25</sup> N. Atl. Treaty Org., RTO Technical Report: Methods and Models for Life Cycle Costing, June 2007, U.N. Doc. AC/323 (SAS – 054) TP/51, *available at* [http://ftp.rta.nato.int/public//PubFullText/RTO/TR/RTO-TR-SAS-054//\\$\\$TR-SAS-054-ALL.pdf](http://ftp.rta.nato.int/public//PubFullText/RTO/TR/RTO-TR-SAS-054//$$TR-SAS-054-ALL.pdf).

<sup>26</sup> *Id.* ¶ 2.8 at 2-14.

<sup>27</sup> *Id.* Figure 2-3, ¶¶ 3.2.2 at 2-5.

<sup>28</sup> *Id.*

<sup>29</sup> *Id.*

<sup>30</sup> *Id.* ¶¶ 6.1-6.5 at 6-1 – 6-8.

<sup>31</sup> *Id.* ¶ 3.5.9 at 3-22 – 3-25.

<sup>32</sup> *Id.* Figure 3-14 at 3-27.

<sup>33</sup> *Id.* ¶ 3.5.9.4 at 3-25.

<sup>34</sup> *Id.* ¶ 3.8.4 at 3-40.

incentive provisions.<sup>35</sup> The *actual choice of specific contract provisions* by NATO procurement officials depends upon whether contract uncertainties are *within* or *outside* of a contractor's control: "award fee" and "value engineering" incentive provisions are favoured when uncertainties are great in areas *outside the vendor's control*; while more demanding incentive provisions such as "support cost" guarantees, "reliability improvement" warranties (the latter with or without an MTBF guarantee), "reliability demonstration" incentives, "fixed-price repair with incentives" and "design-to-cost" incentives are encouraged where the buyer has considerable experience with similar equipment and uncertainty primarily results from design and quality controls *within* a contractor's areas of influence.<sup>36</sup> Overall, NATO guidance places enormous significance on proper design of contractual provisions to strongly regulate operations and maintenance aspects of contractor behaviour during post-award contract implementation phase in defence acquisition – practices that are at stark variance with IAF's adaptations where the latter do not include spares and upgrade aspects in LCC calculations, let alone form part of the finally-awarded contract.

#### B. Acquisition Regulations and Executive Guidance on LCC in the United States

The general sense under US's Federal Acquisition Regulation ("FAR"),<sup>37</sup> as well as its Department of Defence ("DoD") Directives 5000.01,<sup>38</sup> 5000.02<sup>39</sup> and 5000.4-M,<sup>40</sup> is that LCC is *primarily* a requirement of the acquisition planning phase; and later during the contract execution and administration phase, the LCC estimates need to be used as *reference costs* for proper program monitoring and for ensuring adequate accountability and oversight in defence acquisition. Unlike the IAF's LCC model, LCC in the US is thus largely used for planning, budgetary and program monitoring, rather than being relied upon as a contracting technique for competitive procurements with LCC as the *sole price-related determinant* for contract award.

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<sup>35</sup> Özkil, *supra* note 3.

<sup>36</sup> *Id.*

<sup>37</sup> Federal Acquisition Regulation, *available at* <https://www.acquisition.gov/sites/default/files/current/far/pdf/FAR.pdf>.

<sup>38</sup> DoD Directive 5000.01, The Defense Acquisition System (U.S.D.A. 2003), *available at* <http://www.dtic.mil/whs/directives/corres/pdf/500001p.pdf> [hereinafter DoD Directive].

<sup>39</sup> DoD Instruction 5000.02, Operation of the Defense Acquisition System (U.S.D.A. 2013), *available at* [http://www.dtic.mil/whs/directives/corres/pdf/500002\\_interim.pdf](http://www.dtic.mil/whs/directives/corres/pdf/500002_interim.pdf) [hereinafter DoD Instruction].

<sup>40</sup> DoD 5000.4-M, Cost Analysis Guidance and Procedures (Dec., 1992), *available at* <http://www.dtic.mil/whs/directives/corres/pdf/500004m.pdf>.

Under the FAR, LCC is defined as “the total cost to the Government (of United States) of acquiring, operating, supporting, and (if applicable) disposing of the items being acquired”;<sup>41</sup> and the FAR requires management to achieve the best balance between life-cycle cost, acceptable performance, and delivery and operational schedule during the acquisition planning process while applying “design-to-cost” concepts.<sup>42</sup> In a defence acquisition context, LCC is defined<sup>43</sup> more specifically as inclusive of all “Work Breakdown Structure” (“WBS”)<sup>44</sup> elements; all affected appropriations; and encompasses the costs, both contractor and in-house effort, as well as existing assets to be used, for all cost categories. Thus, LCC is defined as the total cost to the Government for a program over its full life, including the cost of research and development, investment in mission and support equipment (both hardware and software), initial inventories, training, data, facilities, and the operating support, and, where applicable, demilitarisation, detoxification, or long-term waste storage costs. This definition of LCC is very similar to “Total Ownership Costs” (TOC)<sup>45</sup> mentioned in DoD instructions and the Defence Acquisition Guidebook, although TOC can be somewhat broader in scope and may include important relevant costs such as “support-to-equipment” costs and certain other infrastructure costs.<sup>46</sup>

DoD instructions require defence program managers to consider supportability, life cycle costs, performance, and schedule comparable in making program decisions.<sup>47</sup> In addition, subsidiary DoD directives/ instructions also require program managers to, *inter alia*, perform the following functions: (i) establish program goals for a *minimum number of costs parameters* describing the program over its life cycle, with *approved baseline parameters* serving as control objectives;<sup>48</sup> and (ii)

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<sup>41</sup>FAR ¶ 7.101, available at <http://farsite.hill.af.mil/reghtml/regs/far2afmcfars/fardfars/far/07.htm>.

<sup>42</sup> *Id.*

<sup>43</sup> DoD Instruction, *supra* note 39 ¶ C3.3.7 at 49.

<sup>44</sup> Work Breakdown Structure (WBS) elements consist of Prime Mission Equipment, System Engineering/ Program Management, System Test and Evaluation (except Operational Test and Evaluation funded from Military Personnel or Operation and Maintenance appropriations), Training, Peculiar Support Equipment, Data, Operational/Site Activation, and Industrial Facilities, DoD Instruction, *supra* note 39, ¶ C3.3.3.1 at 46.

<sup>45</sup> Def. Acquisition University, *Defence Acquisition Guidebook*, § 3.1.5 (July 29, 2011), available at <https://acc.dau.mil/CommunityBrowser.aspx?id=488333#3.1.5>.

<sup>46</sup> Bill Kobren, *Life Cycle Costs (LCC) and Total Ownership Costs (TOC): A Study in Contrasts*, DEF. ACQUISITION PORTAL – DEF. ACQUISITION UNIV. (Mar. 3, 2014), available at <https://dap.dau.mil/career/log/blogs/archive/2014/02/24/life-cycle-costs-lcc-and-total-ownership-costs-toc-a-study-in-contrasts.aspx>.

<sup>47</sup> DoD Directive, *supra* note 38, ¶ E1.1.29 at 10.

<sup>48</sup> *Id.* ¶ 4.3.4 at 3.

define exit criteria in relation to deviations from approved baseline criteria so defined.<sup>49</sup> Small business participation is an important objective to be kept in view during this process – program managers are required to structure acquisition strategies to facilitate small business participation, preferably directly, or where such participation may not be available, through teaming arrangements.<sup>50</sup> DoD instructions also require program managers to prepare Life Cycle Sustainment Plans (LCSPs),<sup>51</sup> and to ensure that three important processes—acquisition, requirements and budgeting—are all kept aligned while executing planned programs.<sup>52</sup> Planning for life cycle sustainment of proposed products occurs during the “Technology Maturation and Risk Reduction” phase,<sup>53</sup> where the underlying contracting rationale is described, including strategies for *maintaining competition throughout the program life cycle*, with a probable intention of continuous cost containment and reduction throughout programme lifetime.<sup>54</sup> Program managers are specifically tasked to develop proper acquisition strategies, using both direct competition at various levels and indirect means to create competitive environments that encourage improved performance and cost control. Within this context, specific acquisition strategies to be considered by program managers include one or more of the following:<sup>55</sup> (i) competitive prototyping; (ii) dual sourcing; (iii) open systems architectures that enable competition for upgrades; (iv) acquisition of complete technical data packages; (v) competition at the subsystem level; and (vi) providing opportunities for small businesses and organisations employing the disabled.

What is extremely interesting from contracting perspectives is that the DoD instructions require program managers to extensively use “Cost Baseline Controls” and “Should Cost” management approaches as management tools to control and reduce cost.<sup>56</sup> Program managers are thus required to proactively target cost reduction and drive productivity improvement into defence programs by identifying and achieving savings below budgeted most-likely costs. Further, DoD instructions also mandate use of “Should Cost” analysis during contract negotiations, particularly for sole source procurements, throughout program execution including sustainment. Program managers are also encouraged to proactively seek out and eliminate low-value added or unnecessary elements of program cost, to motivate better cost performance wherever possible, and to

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<sup>49</sup> *Id.*

<sup>50</sup> *Id.* ¶ E1.1.24 at 9.

<sup>51</sup> DoD Instruction, *supra* note 39 ¶ 5(a)(4)(f) at 4.

<sup>52</sup> *Id.* ¶ 5(b)(1) at 4.

<sup>53</sup> *Id.* ¶ 5(d)(4)(c) at 19.

<sup>54</sup> *Id.* ¶ 5(d)(4)(f)(1) at 19.

<sup>55</sup> *Id.* Enclosure 2, ¶ 7(c) at 76.

<sup>56</sup> *Id.* Enclosure 2, ¶ 9(c)(1) at 77-78.

reward those contractors that succeed in achieving those goals through appropriate design of contractual incentives and penalties.

*C. LCC under the Canadian “Next Generation Fighter Capability” Program*

One of the most important defence acquisition programmes in Canada has been its *Next Generation Fighter Capability* (‘NGFC’) Program for replacement of CF-18 Hornets; with its acquisition being handled by a dedicated Secretariat within the Canadian *Department of Public Works and Government Services*.<sup>57</sup> From a contracting perspective, LCC computations under the NGFC Program in Canada<sup>58</sup> include costs of related acquisition and sustainment contracts, as well as contract costs for sustainment and operations after program completion.<sup>59</sup> In program terms, the “LCC Estimate” (‘LCCE’) includes aspects such as development, acquisition, sustainment, upgrades, operation and disposal or decommissioning, including propulsion and mission software systems throughout the expected operational life of the Joint strike Fighters;<sup>60</sup> and much like the US system, LCCE in Canada is being largely used for supporting budgetary decisions, key decision points, milestone reviews and investment decisions.

Unlike the IAF position, the “upgrades” element of NGFC’s LCCE necessarily includes “mandatory” upgrades as well as “block” upgrades to maintain the NGFC capability within overall sustainment costs,<sup>61</sup> while future upgrades that would significantly alter the capabilities of the aircraft are unlikely to be considered as part of the LCC of current capability requirements. Similarly, the LCCE in Canada also includes support and maintenance costs, examples being costs of spares, consumables, repair parts, stores, reserves and support and test equipment,<sup>62</sup> thereby capturing sustainment and operations costs far more realistically as compared to the IAF’s LCC model which excludes these important cost elements both from LCC-based L1-vendor determination as well as from the finally contracted costs.

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<sup>57</sup> Canadian Armed Forces, *CF-18 Replacement Project*, available at <http://www.forces.gc.ca/en/business-equipment/next-gen-fighter.page>.

<sup>58</sup> For full details of the NGFC LCC Framework, see *Next Generation Fighter Capability: Life Cycle Cost Framework*, Treasury Board of Canada Secretariat, available at <http://www.tbs-sct.gc.ca/reports-rapports/ngfc-cng/lccf-cccvt/lccf-cccvtb-eng.asp>.

<sup>59</sup> *Id.* ¶ 3.3.1.

<sup>60</sup> *Id.* ¶ 3.2.

<sup>61</sup> *Id.* ¶ 5.1.2.

<sup>62</sup> *Id.* Annexure B: Program Cost Breakdown Structure.

#### IV. COMPARATIVE REVIEW OF THE IAF'S TCA MODEL WITH INTERNATIONAL BEST PRACTICES

As seen from the analysis contained in the previous sections, under prevailing international best practices, LCC is primarily applied to budgeting and planning, particularly for making comparative evaluations such as “buy” *versus* “make” in defence acquisitions, or in-house works *versus* outsourcing of administrative functions. Because of its inherent complexities, when applied to competitive contracting scenarios as in the NATO, proper use of LCC requires careful design of complex contractual provisions for awarding incentives and levying penalties on successful contractors, so as to maintain strict (or better) conformity with their promises on life cycle costs at the time of comparative evaluation of bidders’ responses. This important and critical requirement for successful use of LCC is missing in the IAF’s TCA Model, with the likely result that actually-experienced costs under the latter could be much higher than those used for comparative evaluation of bids, implying both misleading calculations on life cycle costs as well as misleading relative ordering of preferred bidders while entering into contract negotiations by the MoD. The regulatory controls are also capable of better enforcement under NATO, US and Canada’s LCC frameworks vis-à-vis the IAF’s TCA Model, given that the contractors are largely domestic under the former set of international practices, leading to better access to cost-related information and greater negotiating capabilities and legal authority for contract enforcement vesting with the contracting officers. This contracting discipline, particularly under the US LCC Model, is reinforced by complex regulatory frameworks such as the “Truth In Negotiations Act” (“TINA”) that offers contracting officers deep insights and significant negotiating authority over internal costs and pricing aspects of business performance of contractors, in addition to intrusive institutional capabilities residing with the “Defence Contract Audit Agency” (“DCAA”) <sup>63</sup> and the “Defence Contract Management Agency” (“DCMA”). <sup>64</sup>

An important but adverse implication of practicing an LCC-based procurement process with foreign contractors relates to the public policy issues surrounding vendor lock-in with a foreign vendor for three to four decades altogether, leaving no incentives for indigenous capacity building in terms of acquisition and development of domestic manufacturing and technological capabilities. In contrast to this practice of the IAF of using LCC techniques with foreign vendors, all of the three international frameworks studied in this paper—the NATO, the US, and the Canadian guidance—apply LCC within a *domestic contracting* framework, treating the acquisition program as one for acquisition of war-fighting capabilities rather than merely acquiring weapons and platforms without sustainable acquisition of

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<sup>63</sup> DEFENSE CONTRACT AUDIT AGENCY, <http://www.dcaa.mil>.

<sup>64</sup> *Id.*

strategic war-fighting capabilities as in the IAF's TCA Model. In fact, small business participation (either directly or through teaming arrangements) and maintenance of competition throughout the life cycle are important mandatory requirements under the US executive framework – elements that are simply missing from the IAF's TCA framework. To make matters worse, long-term contracting with foreign business entities could now carry significant risks for importing governments in the defence sector, specifically in the background of rapid enlargement of ITAR-type of international legal frameworks such as the *Arms Trade Treaty* that essentially enable business entities engaged in defence exports to leverage their proximity to host exporting governments to re-engage on contractual deliveries to importing countries, using ad-hoc and subjective assessments on human rights and poverty as cover for implicit technology and weapons denial regimes.

The following table contains a quick summary comparing the IAF's TCA Model with NATO, US and Canadian Guidance on LCC/ TCO:

**Table 1.1**

Program/ Contract Design Aspect	IAF' TCA Model	NATO's LCC Guidance	LCC/ TCO under US Defence Acquisition	LCC under Canada's NGFC Program
Contracting Environment	Competitive, Fixed-Price Procurement	Mostly Cost- Reimbursemen t/ Cost- Sharing Contracts; largely Single- Source Procurement	Mostly Cost- Reimbursemen t/ Cost- Sharing Contracts; largely Single- Source Procurement	Mostly Cost- Reimbursemen t/ Cost- Sharing Contracts; largely Single- Source Procurement
Nationality of Contractors	Foreign Contractors	Mostly European Contractors	Mostly US Contractors, limited to Sub- contracts with Entities in Strategically- aligned Countries	Mostly Canadian Contractors, limited to Sub- contracts with Entities in Strategically- aligned

Program/ Contract Design Aspect	IAF' TCA Model	NATO's LCC Guidance	LCC/ TCO under US Defence Acquisition	LCC under Canada's NGFC Program
				Countries
Purposes for which Used	Competitive Procurement	Primarily Acquisition Planning; Financial Forecasting and Ensuring Fiscal Discipline	Primarily Acquisition Planning; Financial Forecasting and Ensuring Fiscal Discipline	Primarily Acquisition Planning; Financial Forecasting and Ensuring Fiscal Discipline
Cost Elements considered for LCC/TCA	Very Limited Number of Cost Elements (Important Cost Elements such as Planned Upgrades and MTBF- based Reserve Costs not Included)	Near- Complete and Exhaustive	Near- Complete and Exhaustive	Near- Complete and Exhaustive
Differences between Cost Elements Considered for Vendor Selection and for Contract Award	Significant Differences Exist; Important Cost Elements left out as Non-Binding Costs in Finally- awarded Capital	Differences generally absent; Contracts follow all Costs Elements considered for LCC; Strict Enforcement through Incentive/	Differences generally absent; Contracts follow all Costs Elements considered for LCC; Strict Enforcement through Incentive/	Differences generally absent; Contracts follow all Costs Elements considered for LCC; Strict Enforcement through

Program/ Contract Design Aspect	IAF' TCA Model	NATO's LCC Guidance	LCC/ TCO under US Defence Acquisition	LCC under Canada's NGFC Program
	Acquisition Contracts	Penalty Provisions	Penalty Provisions	Incentive/ Penalty Provisions
Potential for Gaming during Vendor- Selection and Contract Award	High; Particularly in the Absence of Binding Contractual Provisions and the Absence of "TINA"- type of Costing and Audit Regulations	Low; Primarily Enforced through Proper Design of Contractual Clauses on Penalties and Incentives	Low; Primarily Enforced through TINA Authority coupled with Suitable Design of Contractual Provisions for Penalties and Incentives	Low

## V. CONCLUSIONS

As shown in this short paper, the TCA model adopted by the IAF appears to be a highly "whittled-down" LCC model, ignoring important costs elements such as spares' costs and the cost of planned upgrades while computing TCA for a best-offeror (L1-vendor) determination, quite contrary to the letter and intent of the Defence Procurement Procedure (DPP) in India. In addition, the absence of certain cost elements that are used for LCC-based L1-determination in the finally negotiated contracts is likely to lead to misleading results and award decisions in actual procurement experience, apart from leading to single vendor lock-in with foreign suppliers for decades altogether. The net result of the IAF practice would be an inability to attain important national objectives of self-reliance and value-for-money in defence procurement in India, and would thus be at complete variance with the stated objectives of using LCC in defence acquisition in the first place.

These problems with the IAF's Model as identified in this paper could be easily mitigated by the following measures: (i) aligning the details of the TCA Model to bring it in conformity with the overall guidance contained in the DPP; and (ii) simultaneously expanding current DPP's guidance beyond the existing minimalist provisions so as to provide clarity to various stakeholders in the defence

contracting process. This reforms process must necessarily include undertaking an in-depth refinement of the TCA model so that all relevant costs are fully captured in the L1-vendor determination process and also addressed during contract negotiations; and it may be useful to design binding contractual provisions with appropriate penalties and incentives in concluded contracts along prevailing international best practices on the subject. Such difficult albeit much-needed reforms will, in turn, ensure that MoD's interests are fully protected in terms of probity, contract efficiency and sustained indigenisation during the challenging process of awarding such high-value and inherently high-risk awards for acquisition of defence platforms and weapon systems in India.