Background

Knowledge management (KM) and active learning are core competencies for an effective organization, especially if the organization is as heavily technology dependent as the Royal Canadian Air Force (RCAF). Lessons learned (LL) are, in reality, a subset of the broader knowledge-management area and have been a particular niche for militaries for many years. Perhaps more so than other government organizations, militaries exist in constantly evolving strategic and operational environments, and for them to be successful, managing accumulated knowledge and learning from the full range of experience should be considered a mandatory competency.

Perhaps not surprisingly then, the RCAF has repeatedly had a stated vision/objective of “being a learning organization.” And indeed, the latest version of the RCAF strategic plans, Air Force Vectors, once again includes the following statements under the “Strategic Objectives – Agile, Learning Organization” heading:

**Intent.** The Air Force will enhance or develop means to gather, analyse, and integrate lessons learned throughout the organization, to reward innovation, to better manage knowledge and corporate memory, and to promote formal and informal learning and professional development.

**Description.** The Air Force has some elements of a learning organization—for example, a maturing lessons-learned process—but no systematic means of measuring progress, and few of the foundations such as sound knowledge-management practices. A learning organization is one that can modify its behaviour through the practice of adaptive team learning, underpinned by such processes as lessons learned, after-action reviews, and knowledge management. A learning organization also “facilitates the learning of all its members and continuously transforms itself.”
The stated goals for this objective under the heading “Develop Knowledge Management Standards and Practices” are:

**Intent.** The Air Staff will analyse and support the introduction of new processes and practices to identify and capture knowledge, know-how, expertise, and other intellectual capital, and to make that knowledge available for transfer and reuse across the organization.

**Description.** Underpinning organizational and individual agility as well as accountable governance, management, and learning, is knowledge management. The knowledge management system is described by the DND [Department of National Defence] and the CF [Canadian Forces] as comprising a “range of practices used by organizations to identify, create, represent, and distribute knowledge for reuse, awareness and learning across organizations.”

Similarly, for more than six years, the CF and DND have intended to be a learning organization. The stated goals of the latest Vice Chief of the Defence Staff–approved “Department of National Defence & Canadian Forces Organizational Learning Strategy” are as follows: to enhance collaboration, to manage content effectively, to learn from our own experience, to learn from other organizations, to leverage our knowledge and to foster a culture of continuous learning and innovation.

**Knowledge management in a military context**

Much good theoretical work has been done on the subject of knowledge management. One of the more germane articles to our discussion is “Knowledge Management in the Military Context” by S. G. McIntyre, M. Gauvin and B. Waruszynski. Rather than re-word their work, we have chosen to quote the article at length.

“Knowledge management is a multi-disciplinary field that draws from theories in economics, sociology, philosophy and psychology and then combines them with applied disciplines such as information technology and library science. KM is intended to be more than a theoretical concept. It should reflect a pragmatic approach that is concerned with real solutions and the ability to accurately analyse and measure applications.

Knowledge is defined as “the fact or condition of knowing something with a considerable degree of familiarity through experience, association or contact.” It has also been defined as “a dynamic human process of justifying human belief toward the truth.” [More than] forty years ago, Michael Polanyi provided an explanation of knowledge upon which models of knowledge creation have been built. He differentiated between explicit, tacit and implicit forms of knowledge. Explicit knowledge is that which is stated in detail and leaves nothing merely implied. It is termed “codified” or “formal” knowledge because it can be recorded. Tacit knowledge is that which is understood, implied and exists without being stated. It is informal, experiential, and difficult to capture or share. It is knowledge that cannot be expressed. For example, an individual knows how to reach with his arm to grasp an object, but cannot describe how he knows how to do it. Implicit knowledge is that which could be expressed, but has not been. It is most often thought of as existing within the minds of individuals or in social relationships.
[Proponents of knowledge-management techniques have argued] that effective organizational knowledge creation occurs best through the spiral process where knowledge is converted from tacit to explicit in a continuous and dynamic cycle

---

[—the Nonaka model] … . It is when tacit knowledge and explicit knowledge interact that innovation occurs. Knowledge creation is facilitated by deliberately managing the cycle. Organizational knowledge creation begins with socialization, where individuals share experience and mental models. It develops into externalization when individuals use metaphors or analogies to articulate hidden tacit knowledge that is otherwise difficult to communicate. It moves into the combination phase for knowledge to be articulated, shared and expounded. Finally, individuals learn by doing and internalizing the new knowledge. The spiral begins again as the experience-based operational knowledge learned in the first cycle provides a larger knowledge base for continuous innovation and growth. It is this model that demonstrates how knowledge is actioned [and how lessons are learned].

[This model has been further combined] with two other strategic information processes to create … the “knowing organization” [concept] … . Initially, through sense-making, an organization interprets the ongoing environmental data and establishes a shared understanding. If the experience is routine and known, then the organization can go directly into the process of decision-making. In this stage, the organization searches for more information and selects alternatives.

[The knowledge-creation model] is engaged when the sense-making process has determined that new knowledge is required or that the situation is novel and requires new responses. After the sense-making process, the organization then calls upon a knowledge-creation process that will give it additional input to move into the final stage of decision-making.
This cyclical model is reminiscent of the command and control OODA loop (Observe, Orient, Decide, and Act) in which information and then knowledge are transformed into action. …

**Knowledge-management cycle**
How knowledge processes in a KM environment are managed to convert knowledge for action and to achieve the desired results of increased value in an organization or specific operation [is referred to as the knowledge-management cycle] … . There are three general perspectives on this cycle: management, application and people:

- **Management** focuses on capturing, organizing and facilitating knowledge. Many of these activities span the externalization and combination quadrants of the Nonaka model.

- **Application** focuses on effective retrieval of relevant content through advanced searches and mining to conduct knowledge-related work and tasks and on the use of the results for discovery. It relies on the knowledge combination portion of the model.

- **People** focuses on learning, sharing and collaboration. This is the education component of the cycle that is within the internalization quadrant, moving into the socialization portion. …

A [past] study within the Department of National Defence suggested that [while] knowledge management in the military [does not vary much] in premises or theory from corporate versions, [it does vary significantly] in terms of context, content and pace. Whereas corporate KM tools can depend on a more sedentary infrastructure, military operational settings require mobile solutions with corresponding issues of security, bandwidth, robustness and reliability. The content varies as well, often more targeted to the particular operation. Finally, most corporate situations do not need the comparable, quick reaction time required in conflict situations.
KM in the military context [consequently] requires:

- knowledge processes that are robust and reliable within operational contexts;
- knowledge content and intellectual assets that are focused, precise, reliable, with suitable recall levels; and
- knowledge creation and conversion processes that match the pace of operations. …

Knowledge management and the knowledge cycle within the context of military operational environments, therefore, require emphasis on these additional requirements of robustness, content and speed.9

The hard reality in all this, however, is that real knowledge management is mostly about people and getting individuals both to learn and also to pass their hard-earned knowledge to someone else in the most efficient and effective means possible. This is very easy to say and very challenging to accomplish.

Current status

Our objective assessment of both the CF knowledge-management programme and the stated goal for the RCAF to be a learning organization is that, despite repeated emphasis on the subject from senior management and the commitment of considerable time and resources, neither DND/CF nor the RCAF have made any substantive (or even measurable) progress in having a viable knowledge-management programme or in truly becoming a learning organization.

Generally speaking, at the present time, the RCAF has not developed a broad-based “learning” organizational culture; although, considerable efforts are being made at the tactical level to formalize the Air Force Lessons Learned Programme (AFLLP).

Without recognizing it as such, the irony is that, in at least two specific areas, the RCAF has already developed very effective knowledge-management approaches—the Flight Safety (FS) Program10 and the AF9000 Program, an engineering and maintenance quality-management system. In spite of these notable successes, the general approach to learning in the RCAF is very short term and based largely on individual experience—an approach that is vulnerable to the creation of significant knowledge gaps if experience levels fall. Overall, with the exception of operational lessons at the tactical level, the RCAF approach to knowledge management can be characterized as one of missed opportunities in failing to recognize, understand and formally pass on the valuable knowledge gained from experience. This is a pronounced gap in the Air Force’s ability to manage change intelligently and to be agile.

A flourishing knowledge-management process relies first and foremost on the organizational culture, recognizing the necessity of carefully observing how the organization functions across the entire spectrum of activities.11 Secondly, based upon the knowledge assimilated from that experience, behaviour must be altered. In essence, in order to successfully become the “learning organization” that the senior leadership desires that it be, the RCAF must fully develop the ability to observe, analyse and implement changes based on experience across the full spectrum of force generation, force employment, force development and governance activities.
While force-employment lessons observed in the tactical environment—particularly during operations and exercises—are often noted and analysed and changes are subsequently implemented, this seldom happens at higher levels. Indeed, even knowledge gained at the local level is seldom shared across the RCAF. This area of lessons learned will improve significantly with the introduction and maturation of the AFLLP under the leadership of the Canadian Forces Aerospace Warfare Centre (CFAWC), provided senior-level support for the programme continues. However, at the operational level of the Air Force, there is a less rigorous approach to lessons learned, and at the strategic level, no substantive formal process exists. In order to thrive in demanding and rapidly changing times, the RCAF needs to become a genuine learning organization at all levels; a culture change that would have a major positive impact on the entire RCAF.

To achieve a successful organizational culture change in any environment, the transformation must begin at the top, and that is particularly true in the military. Simply issuing direction to change will not achieve the goal of changed behaviour. Despite the Chief of the Defence Staff emphasizing lessons learned as a priority for the CF12 for several years and the Commander RCAF doing the same, knowledge management / lessons learned have not progressed substantially in either the CF or the RCAF. Ultimately, recognizing that resources are an essential component of authority, until sufficient resources are dedicated to knowledge management and lessons learned and the process formalized through explicit direction, the approach will remain sporadic.

The RCAF “Annual Planning Directive” acknowledges the role of the AFLLP in focusing planning efforts; however, the AFLLP has not yet matured to the point where the process is fully functional. As indicated by individual experiences from recent air operations that were described during the research for the Optimize Air Force Phase III project, integrating lessons learned is simply not yet part of the Air Force culture—nor will it be until it is resourced and supported by the senior leadership.

During the research conducted for a case study on the Libyan operation, it was evident that many of the command and control (C2) lessons observed during Operation MOBILE were very similar to those observed during the Kosovo air campaign and the first Gulf War. Indeed, some of them were virtually word for word. Given the less-than-positive assessment of the approach to the AFLLP within Task Force Libeccio, it is probable that the products of the AFLLP from Op MOBILE may not prove to be any more enduring.

By contrast, the FS Program ensures that the RCAF leadership does not tolerate the same flight-safety mistake being made time after time. Similarly, the AF9000 Program reduces the chance that the same maintenance error will be repeated. Obviously, the RCAF knows how to integrate these lessons learned into the way it operates. A similar approach to the remainder of the RCAF’s force-generation and force-development business, including at the operational and strategic levels, would help create a truly learning organization.

A viable and effective lessons-learned approach is beneficial not only in the traditional fields of operations and exercises but also in the framework of how the staff functions in Ottawa and Winnipeg. For example, we have observed that a systematic method to capture, analyse and integrate lessons learned based on staff experience is almost entirely lacking within the Air Staff. An example that is particularly troublesome is the loss of practical lessons learned from major capital projects, when individual project personnel are transferred or replaced, virtually all of their expertise goes with them.
Understandably, given the shortage of people to handle the urgent daily pressures on the staff, the reason that lessons learned are not collected is primarily a lack of capacity. However, neither the lack of a simple methodology nor the availability of dedicated personnel lessens the reality that problematic issues recognized during normal or operational activities and exercises are not consistently identified and analysed, and opportunities to integrate changes into ongoing and future staff activities and operations are lost. As a result, the RCAF foregoes opportunities to enact positive change and enhance both effectiveness and efficiency.

While this situation reflects the generally less-than-rigorous knowledge-management and lessons-learned culture in the CF as a whole, it is both inefficient and ineffective from an organizational learning perspective. It leads to the same or similar problems resurfacing and creates significant frustration for both the staff and senior leadership.

From the perspective of application, there is currently no efficient approach within the RCAF to access databases or to collate information. The previous, highly structured approaches to paper-based filing systems have, for the most part, been superseded by largely haphazard electronic documentation, websites, “sharepoints” and databases with widely varying degrees of version control, data capture and even access. Similarly, anyone who has recently used the Canadian Forces Knowledge Management System database on the Defence Wide Area Network (DWAN) will recognize its lack of user-friendliness and slowness, which frustrates users and complicates the retrieval of relevant material.

Previous attempts to routinely capture best practices in areas such as project management and other strategic-level programmes have largely been overtaken by events and particularly by recent cutbacks in staff levels and/or reprioritization of activities within National Defence Headquarters. Similarly, mentoring and coaching programmes are sporadic at best and/or suffering from a lack of funding.

**Gaps**

From our study, the gaps that have been identified in the knowledge-management and lessons-learned approach currently in use in the RCAF are:

a. The RCAF has **not** developed a broad-based “learning” organizational culture, despite senior direction to do so (recognizing that efforts at introducing lessons learned at the tactical level are now being undertaken).

b. The RCAF does **not** have a coordinated and consistent approach to knowledge management and lessons learned at the strategic, operational and tactical levels.

c. At the strategic level, the RCAF has no substantive formal process in place to capture the experiences, best practices and lessons learned in the governance, force-development or force-generation processes and **no** personnel resources identified to improve the status quo.

d. The RCAF has **no** consistent programme in place to capture existing personnel expertise or to mentor inexperienced personnel.

e. The RCAF lacks a simple methodology to rapidly identify, analyse and integrate changes into staff activities and operations.
The RCAF lacks available, trained and dedicated personnel to consistently populate the lessons-learned process during normal activities as well as for operational and exercise activities.

An “optimized” approach

As mentioned earlier, a notable KM exception within the RCAF is the FS Program—a mature, effective methodology to collect, analyse and implement change when it impacts the safety of flight. Similarly, the AF9000 Program has been improving the quality management of aerospace engineering and maintenance since 1996. The RCAF—having developed, nurtured and resourced these programmes—has an excellent model to build upon in order to move towards becoming a learning organization, and with the stand-up of CFAWC, it also has an organizational means to oversee such a move. However, as with any major cultural change, developing a learning culture within the RCAF will require senior leadership to become champions of knowledge management.

Although the LL concept has traditionally been applied to operations and exercises, in knowledge-based organizations—such as the RCAF strives to become—lessons can be drawn from virtually any activity the Air Force is involved in, assuming an appropriate degree of preparation and planning precedes the activity. For example, the potential value added to the Air Force by adopting a KM approach to strategic-level interactions between the Air Force staff and, in particular, the central staffs cannot be overstated. Both the central staff and the Air Force would benefit if this relationship and approach didn’t have to begin anew every posting cycle.

Frequently, a major impediment to the successful adoption of changes associated with lessons learned is the reality that organizations and agencies beyond those under the control of the RCAF are often involved in approving and implementing them. One very simple method that is useful in reducing the impact of this problem is simply classifying issues according to the degree of control or influence that the Air Force has over them—an approach illustrated in Figure 1.

![Figure 1. Categorization of issues](image-url)

Once a determination has been made that an issue falls into the control, influence or inform area, a somewhat different mechanization process is necessary for each category. In the case of issues that are fully within the authority of the RCAF to control, the Air Force process could be run internally (at the tactical, operational or strategic level), resulting in an action plan that outlines the change management, validation and promulgation requirements. In the case of issues where the RCAF can influence other organizations and agencies, they can be processed...
in a joint or interdepartmental environment (through an issue-focused seminar, for example), resulting in an action plan that feeds the follow-on stages. In the circumstance where the RCAF has little influence to effect change, these issues can be passed with as much information as appropriate to the external agency or organization.

Perhaps most importantly in the area of application, the introduction of the Air Force Integrated Information and Learning Environment (AFIILE) into the training environment means there is now potential to literally reach all Air Force personnel at the desktop level with simple, easy-to-use, distributed learning tools, databases, targeted training, best practices and shared intent/knowledge.

**Recommendations**

In order to optimize the RCAF of the future and build towards establishing a mature knowledge-management culture, it is essential that:

a. A knowledge-management champion be identified from within the senior leadership of the RCAF who would become actively involved in the lessons-learned process.

b. The RCAF continue to evolve the AFLLP through CFAWC and broaden its scope to include a wider range of Air Force activities, including at the operational and strategic levels.

c. Resources be earmarked at all levels to populate an effective lessons-learned process.

d. The RCAF consider moving Air History and Heritage either to CFAWC or to the Air Staff and task it (authority and responsibility) with capturing “strategic issues” and strategic lessons learned.19

e. The RCAF institute a process (or perhaps even “hire consultants”) to debrief project staff to capture lessons learned / best practices for each major Crown project and other selected projects as required.20

f. Interview all key/experienced staff (colonels, chief warrant officers and selected others21) as they retire or relinquish key appointments to capture observations, best practices and recommendations.22

g. Leverage AFIILE to assist with knowledge management for all Air Force personnel and to capitalize on KM and LL.

h. Use AFIILE-based version 2.0 “architecture” for user-friendly KM and LL databases.23

i. Review all C2, support and communications lessons, in particular, from the previous Gulf War as well as the Aviano and Libyan operations and create an action plan.24

Brigadier-General (BGen) G. E. (Joe) Sharpe joined the RCAF in 1965, graduated from the Royal Military College in 1969 with a degree in Applied Science and trained as an air navigator on CF101 Voodoo aircraft. He served in the CF for the next 32 years in various operational, instructional, Air Force and joint staff positions. He graduated from the Aerospace Systems Course and the Canadian Forces Command and Staff College and was a distinguished graduate from the National Defence College. Post-retirement, BGen Sharpe (Ret’d) served as a special...
advisor to DND/CF Ombudsman on operational stress injuries and as the deputy chair of the Afghanistan Detainee Board of Inquiry. He works with Dr Allan English on research into command and control, leadership and military culture. He chaired the CF / Veterans Affairs Canada / Royal Canadian Mounted Police Mental Health Advisory Committee and currently advises Veterans Affairs Canada on mental health issues. He is currently the Colonel Commandant of the CF Military Police Group.

During a distinguished 35-year career as an aerospace engineer in the Royal Canadian Air Force, Brigadier-General Terry Leversedge enjoyed multiple command tours. His career highlights include serving as the Program Manager for the Incremental Modernization Program for the CF18 Hornet, being the Chief of Staff for the Director General Aerospace Engineering and Program Management Division, being a deputy commander in 1 Canadian Air Division Headquarters and serving as the Chairman of the NATO Flying Training in Canada programme. He is currently an aerospace and defence consultant and an associate editor at Airforce magazine. BGen Leversedge (Ret’d) graduated as a mechanical engineer from the Royal Military College and also holds a master’s degree in Aircraft Design from the Cranfield Institute of Technology in the United Kingdom. He is a graduate of both the Advanced Military Studies Course and the National Securities Studies Course at the Canadian Forces College. He is an honorary Snowbird and a commercially published author on Canadian military aviation subjects.

**Abbreviations**

AFIILE  Air Force Integrated Information and Learning Environment  
AFLLP  Air Force Lessons Learned Programme  
C2  command and control  
CF  Canadian Forces  
CFAWC  Canadian Forces Aerospace Warfare Centre  
DAR  Director Air Requirements  
DND  Department of National Defence  
FS  flight safety  
KM  knowledge management  
LL  lessons learned  
NATO  North Atlantic Treaty Organization  
RCAF  Royal Canadian Air Force

**Notes**

1. The official Canadian Forces definition of knowledge management is: “An integrated systematic approach which when applied to an organization enables the optimal use of timely, accurate and relevant information; it also facilitates knowledge discovery and innovation, fosters the development of a learning organization and enhances understanding by integrating all sources of information, as well as individual and collective knowledge and experience.” *Defence Terminology Bank*, record 18879.


3. Ibid., 38.

4. Ibid., 39.


8. Ibid.

9. Ibid.

10. The Flight Safety Program has been listed as an example of a successful coherent approach both to knowledge management and lessons learned in various CF academic papers and articles.

11. This involves observing activities from the tactical through to the strategic level as well as operational, support, training and programme management activities.

12. See for example, 3120-2 (D Air SP), 30 June 2011, Commander Air Command Annual Planning Directive, 6/37, accessed April 9, 2014, http://airforce.mil.ca/caf/vital/dairsp/dmcs27462_annual_planning_directive_pdf_-_adobe_reader.pdf. This document includes the Chief of Defence Staff’s direction for managing change. The third of four lines of operation was “institutionalize Lessons Learned and associated capabilities.”

13. For examples see, Ibid., 3/37, “We must be clear on what core capabilities and characteristics we wish to retain, and take active steps to secure that base, and be equally clear on how we should change to meet new challenges, or to leverage emerging opportunities using the principles of continuous improvement and the Air Force Lessons Learned Program (AFLLP).” and 21/37, “An institutionalized lessons learned program is essential in a military organization focussed on continual improvement.”

14. From 1630-1 (Comd TF LIB), 7 November 2011, End of Tour Report – Task Force Libeccio, Annex O, Lessons Learned (labelled Annex N), O-2/7, http://kms.mil.ca/kms/FileView.aspx?id=4687&fulltextid=5861, “The release of this directive [LL directive for TF LIB] met with mixed reaction from subordinate Comds as they had little or no knowledge of the Air Force Lessons Learned Program (AFLLP) and their force structure establishments had not been manned to support the requirements outlined in the directed program.”

15. When the incumbent Director Air Requirements (DAR) assumed his position, he had approximately eight hours of handover with his predecessor to capture the major issues. There were no written lessons learned or best practices passed on. Interview with current DAR, December 13, 2011. Subsequent discussions with past DARs also indicated that this is the norm.

16. There is, in fact, a lessons-learned approach within the Assistant Deputy Minister (Materiel) organization with respect to programmes; although, it does not appear to be comprehensive or well established.

17. The Deputy Project Manager for the Next Generation Fighter Capability observed that all of his approximately 10 years of project experience had been gained through on-job training. He also acknowledged not writing down notes or lessons learned in his current job due to the fast pace of activities. Interview with Deputy Project Manager, Next Generation Fighter Capability, January 18, 2012.

18. See the Change Management section of Chapter 4 of B-GA-005-780/AG-001, Air Force Lessons Learned Programme Manual.

19. This would mirror the Royal Canadian Navy’s current approach, in which the Command Historian (based in Ottawa) is involved in strategic-level activities providing corporate memory and strategic advice.

20. The absence of any effective lessons-learned process in project management is particularly glaring. Staff handovers
are haphazard; best practices are non-existent, and previous LL efforts are defunct or badly out of date. Recent personnel cuts suggest that alternative service delivery means to capture this information will need to be used. Project funds could also be used to hire the requisite assistance in this regard.

21. Another example of individuals with potentially key information and best practices are those officers and non-commissioned members serving in exchange/liaison billets with allies. In current practice, very little information is drawn from these staffs.

22. The wealth of information garnered by staff at these rank levels is precious and often unique. Efforts at mentoring, best practices and skills development would each be enhanced by the adoption of this practice and the development of a practical programme for information dissemination.

23. The existing knowledge-management database for lessons learned is not user-friendly, as it is difficult to access, navigate and modify. AFIILE’s desktop-compatible open architecture should provide a much better approach.

24. Key lessons for deployed operations in these areas, in particular, are constantly being relearned despite comprehensive after-action reports. An action plan to quickly institutionalize the best approaches to C2, communications as well as close and integral support should be undertaken.