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DOING THE RIGHT THINGS : LESSONS LEARNED IN TRIALS AND EVALUATIONS

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JCSP 45

Exercice Solo Flight

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TRIALS AND EVALUATIONS**

By Major Michael Chagnon

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DOING THE RIGHT THINGS: LESSONS LEARNED IN TRIALS AND EVALUATIONS

Testing doesn't cost, it pays.

– J. Michael Gilmore, Director, Operational
Test and Evaluation, 2011(US)

INTRODUCTION

The Canadian Army Trial and Evaluations Unit (CATEU) is a small organization that has made a number of changes since 2015 in order to provide more value to the Canadian Army Capability Development process. Prior to 2015, project teams were more likely to outsource the trials, often to the US as CATEU's trial planning process was very cumbersome, and required longer lead times. Moreover, the unit's scope to conduct major trials was limited, due to experience levels, number of qualified trial officers, the limited equipment available and the types of terrain available. Since 2015, the unit has significantly changed its processes, conducted more professional military education and training for its Trial Officers and has been trusted to conduct more important trials, including the User trials for the Tactical Armoured Patrol Vehicle (TAPV), the Medium Support Vehicle System-Standard Military Pattern (MSVS-SMP) and the Medium Range Radar (MRR).¹ As any learning institution, it behooves a unit like CATEU to continue to strive for improvement. All militaries conduct trials in one form or another as they introduce new capabilities and many, especially from NATO and ABCANZ, have adapted and improved their respective processes in recent years and have collected many lessons learned along the way. As the Canadian Defence policy: Strong, Secured, Engaged entails, there are

¹ Canadian Army CATEU Level 4 Operations Plan Fiscal Year 2017-2018, V2, Annex B.

many new capabilities being procured in the next few years² and CATEU must position itself to be able to support at maximum capacity and continue to evolve and learn along the way. Is the Canadian Army conducting Trials and Evaluations (T&E) in the best way possible? Are there lessons to be taken from how our allies conduct T&E? By employing lessons learned and best practices from Canada's allies, CATEU has the potential to improve its conduct of testing and trials, as well as reinforce the link between trials and requirements.

This paper will examine how the CA currently conducts T&E and compare this to the US Marines and UK Army. It will begin by reviewing the Canadian Army's direction on the conduct of trials, the Trial Process at CATEU, and the courseware used to prepare Trial Officers and staff at CATEU. Next, this paper will conduct a review of our allies' policies and roadmaps for the conduct of trials and will identify potential lessons that can be drawn from them. Within each Case Study, recommendations based on our allies' achievements and best practices will be made, in order to set CATEU up for success moving forward.

SECTION 1 – CANADIAN ARMY KEY DOCUMENTS AND THE TRIALS PROCESS

Operational trials and evaluations are an essential and critical element in the process of getting the right equipment to the soldier at the right time. T&E do not exist in isolation but contribute to the larger requirement that new or modified equipment can be delivered with the guarantee of its performance in Canadian service.³ Fundamentally, Canadian soldiers should not be committed to operations with equipment in which they lack confidence. Operational T&E encompass the range of user developmental testing, in-service troop trials and tests conducted in

² Department of National Defence, Strong Secure Engaged: Canada's Defence Policy (Ottawa: DND Canada, 2017).

³ Canadian Army, CATEU Trial Manual (Draft), 2017, Chapter 1.1.

realistic operational and training environments, with troops that are representative of those who will use, maintain and support the capability when fielded or deployed.⁴

User Trials explore the performance of the equipment in a service environment, in other words, to assess operational effectiveness and suitability. Trials are conducted in accordance with the appropriate accepted tactical doctrine and the Battlefield Day as specified in the SOR and follow a structured approach which achieves statistical, design and operational validity.⁵ A Battlefield Day represents the real-life conditions that a capability or piece of equipment would be expected to conduct during an average day on operations. For example, a logistics truck would drive 200 km/day on the road and 80km/day cross-country.⁶ The trials are conducted on late prototype or pre-production equipment which is as near as possible representative of the production equipment.

CATEU's mission is to "provide specialized trial expertise and unique trial support capabilities for the Commander of the Canadian Army and other Canadian Armed Forces agencies, by conducting objective trials and evaluations with a view to ensuring that the operational needs of the soldier are represented."⁷ CATEU provides a service to the project staff, namely the Project Director or the sponsor by alleviating the burden of having to plan the trial, using corporate knowledge and expertise. They also have the ability to interact with soldiers at the tactical level to get valuable feedback. The majority of the staff at CATEU, specifically the Trials Officers from each of the Combat Arms trades, has completed the Army Technical Staff Officer Program delivered at the Royal Military College of Canada. The year-long program integrates academics and training to develop critical-thinking, program management and

⁴ *Ibid.*

⁵ Canadian Army, CATEU Standard Operating Procedures, Chapter 1, 6.

⁶ Government of Canada, *Medium Support Vehicle System – Standard Military Pattern Statement of Requirements*, Annex B.

⁷ Canadian Army, CATEU Level 4 Operations Plan Fiscal Year 2017-2018. 3.

technology competencies and skills giving the students a solid science foundation in order to use the knowledge within a military staff and operational context.⁸

CATEU Trials Course

In 2015, CATEU instituted an Army Trials and Evaluation Officer (ATEO) course in order to standardize the quality of trials conducted by their staff. This course, comprising of 10 days of lectures for new Trials Officers and Master Gunners, provides them with additional knowledge on the trials process, to supplement what was taught on the ATSO/ATWO program. Subjects include understanding the trials environment, how to conduct a trial mission analysis, how to handle sensitive information, how to prepare and plan for a trial, and introductions to Human Factors, statistics and Data Collection methods.⁹ These last few subjects are not intended to make the Trials Officers experts but give them an overview of the topics and open the door for further educational opportunities. Lessons learned from recent trials are incorporated into the discussion and shared with the new staff. CATEU has focused considerable effort in the past year towards establishing a strategic plan with a view to improving operational relationships with parent stakeholders within the Army test and procurement community. These efforts have resulted in a restructuring of unit personnel and responsibilities and a renewed focus on establishing and maintaining a positive, supportive and responsive relationship with the project staffs at the Directorate of Land Requirements. The User Trial Manual has yet to be updated with the recent updates being used and taught on the ATEO but that is a priority of the unit staff this year. Currently, the Trials Officer Course is given by the more experienced members of the unit,

⁸ Royal Military College of Canada – Applied Military Science Department, last assessed 28 April 2019, <https://www.rmc-cmr.ca/en/applied-military-science/programmes-department-applied-military-science-royal-military-college>.

⁹ Lesson plans – CATEU ATEO Course, last assessed 30 April 2019.

although these may have as little as one or two years of experience working on trials as is the case with most officer postings.

SECTION 2 – CASE STUDY 1: US MARINES

While it may be considered more relevant to compare Army units with Army units, the US Army Test and Evaluation Command (ATEC) is on a different spectrum with respect to size, scope and mandate. The Command is made of up 11 unit test centers and proving grounds spread across the continental United States, led by a Colonel.¹⁰ The Marine Corps Operational Test & Evaluation Activity (MCOTEA), however, is closer in size and scope to CATEU, but their mandate includes naval and air requirements to be tested as well.¹¹ By examining the organizational structure, the process and document formats according to the MCOTEA manual, its feedback mechanism, and finally, by reviewing a recent trial conducted, lessons and best practices will be identified that could benefit CATEU.

MCOTEA exists to provide decision makers with information that is independent, objective, operational, and defensible to support resource decisions.¹² The unit independently plans, executes and evaluates new capabilities against approved warfighter capabilities/ requirements under prescribed realistic conditions and doctrine in order to determine operational effectiveness and suitability.¹³ MCOTEA fulfills this mission with teams of a total of 28 Marines and 56 government civilians with diverse backgrounds and specialties¹⁴ who work within and external to the Marine Corps to plan, test, and report using the MCOTEA Six-step process. It

¹⁰ U.S. Army Test and Evaluation Command, U.S. Army, last accessed 30 April 2019, <https://www.atec.army.mil/index.html>

¹¹ U.S. Marine Corps, MCOTEA Operational Test & Evaluation Manual, 4th Ed, Rev 1

¹² *Ibid.*, 25.

¹³ *Ibid.*, 1.

¹⁴ Warner, C. Report on the Test Science Roadmap for the Director, Operational Test and Evaluation, July 2013, 10.

should be noted that MCOTEA, the smallest Operational Test Agency (OTA), has fewer trials than other OTAs because the US Army and Navy manage and conduct T&E for numerous Marine Corps' large vehicle, weapon, and aircraft programs.¹⁵ In comparison, CATEU has 28 positions, including 10 officers and there are currently no civilian staff-members posted in full-time. While the unit's size may have been appropriate over the past few years with its pace of operations, the number of trials anticipated over the next few years with SSE projects would overwhelm it. It had been identified that CATEU was short of Army Technical Warrant Officer (ATWO)-qualified Master Gunners last year. Master Gunners can fill in as Trial Officers and are capable of planning, completing and reporting on trials while other Warrant Officers and Master Warrant Officers do not have the technical background or the mindset. While an interim solution was found with late changes to the posting plot, this should be a priority posting for newly qualified ATWOs. Additionally, US Marines have a number of government civilians permanently residing at MCOTEA, and moreover, they have recommended that their current numbers and level of education is not sufficient. In the US, it was specifically suggested that Trials units should consider employing or developing at least one, and preferably more, Ph.D.-level Science, Technology, Engineering and Mathematics (STEM) civilians to their workforce. Having a permanent civilian workforce with a wide spectrum of education and specialties is important as applying test science involves people with technical backgrounds and the ability to understand those systems being tested. Degrees in STEM, that most military members do not have, offer a solid understanding of the scientific method and the analytical skills important to rigorous T&E. Currently, when scientists and analytic specialists are required for a trial at CATEU, they are sourced from the Defence Research and Development Canada (DRDC) and the

¹⁵ *Ibid.*, 11.

Centre for Operational Research and Analysis (CORA) for the duration of the trial only. This limits continuity and the potential for cross training with the military staff.

Examination of MCOTEA Operational Test and Evaluation Manual

MCOTEA's new manual, published in 2016, was a major update from previous versions. While the Six-step process introduced in 2009 remained as the back-bone architecture for their process, specific processes, procedures and work instructions were removed in order to allow rapid evolution of procedures and policies to meet the ever-changing demands of the Marine Corps.¹⁶ The team at MCOTEA is separated into seven functionally-aligned test divisions focusing on Ground Combat, Combat Service Support, Marine Air-Ground Task Force, Expeditionary Operations, Cyber, Live Fire and Operational Test and Analysis.¹⁷ Each Trial team is directed by an Operational Test Project Officer (OTPO), who leads, task organizes, and manages a cross-functional team made up of Marines as well as Operations Research/Systems Analysts, Mathematical Statisticians, Data and Test Managers, Cyber Analysts and Live Fire Analysts who together provide evaluations of operational effectiveness, suitability, and survivability of assigned systems.¹⁸ CATEU has a similar structure based on Trials Officers leading teams for each of the Combat Arms, and Combat Support trades, although they do not have a Combat Service Support or Cyber team. The MSVS-SMP trial conducted at CATEU in 2016 was led by the Armoured Trial Officer, but would potentially have benefitted from some logistics expertise.

The MCOTEA Six-step Process is meant to be flexible and tailorable and is adapted from the Marine Corps Planning Process and the Scientific Method. While it follows the general

¹⁶ U.S. Marine Corps, MCOTEA Operational Test & Evaluation Manual, 4th Ed, Rev 1, 9.

¹⁷ *Ibid.*, 5.

¹⁸ *Ibid.*, 4.

concepts of the Marine Corps Planning Process, the specified mission effects are not being planned to win a specific battle, or war, but are instead being used to determine the generalizability of the capability being evaluated to win future battles and wars. Scientific Method for evaluations is important because the T&E must be based on evidence that is “sufficiently credible under scientific standards to provide a confident basis for action and to withstand criticism aimed at discrediting the results.”¹⁹ The first step is Evaluation and Assessment Planning, which starts with confirming which evaluation questions to ask and then how it will be measured to satisfy those questions.²⁰ Step 2 is Test and Event Concept Planning. Every trial event is different and a test is required to supply data for each question in Step 1. Step 3 is the Detailed Test and Event Planning. This involves the planning and execution of a test with enough detail to make it executable, transparent and repeatable. Logistics requirements, data collection methods, data reduction and analysis methods are confirmed during this stage. Step 4 is the Test and Event Execution. The test is normally a complex military operation involving operational units with appropriate combat equipment and supplies. The execution of a test or event often begins with operator and data collector training, site setup, data collection rehearsals, and practice runs of the plan. Step 5 is Data Reporting. This stage begins with reducing raw data from the start of the pilot phase and continues until the completion of the test/event. Finally, Step 6 is the Analysis and Evaluation or Assessment Reporting.²¹ The data must be thoroughly analyzed in order to gain a better understanding, while evaluation is then using that information to determine worth and value. As stated previously, the process is flexible and tailorable. It is flexible because the basic principles can be applied to just about any program or system that requires testing or evaluation and it is tailorable since MCOTEA can apply only the steps

¹⁹ Rossi, Peter H. et. al., *Evaluation: A Systematic Approach*, 7th Edition. 2004.

²⁰ U.S. Marine Corps, *MCOTEA Operational Test& Evaluation Manual*, 4th Ed, Rev 1, 11.

²¹ *Ibid.*, 12.

required to support the trial's goals.²² That being said, skipped steps should be assumed to have been completed by somebody else. CATEU's process is similar, without being labeled as a 'six-step process.' Each CATEU trial is based on a Mission Analysis and is conducted from first principles. They are already similarly tailorable and flexible, as required, therefore it is not recommended to make any changes to CATEU current trial processes.

Initial, Follow-on, and Multi-service Operational Test events are test events (i.e., field tests), "under realistic combat conditions, of any item of (or key component of) weapons, equipment, or munitions for use in combat by typical military users to determine whether systems are operationally effective and suitable."²³ Operational tests are subject to specific restrictions, which differentiate them from other types of MCOTEA events. MCOTEA uses a "mission-oriented context in operational testing to relate evaluation results to the impact on the Warfighter's ability to execute missions,"²⁴ similar to the Battlefield Day scenarios. Upon completion of the event, a number of reports are produced, including evaluation reports, assessment reports as well as the Test Data report which includes the compiled unanalyzed data.²⁵ These reports must be submitted directly to the Assistant Commandant of the Marine Corps within 90 days after the trial.²⁶ Lastly, observation reports are completed to document the adequacy of the test execution and test deviation for tests conducted by other agencies. CATEU had a similar deadline of 90 to 100 days for Trial report completion, review and publication.²⁷ With the recent review of their processes, CATEU has endeavored to reduce that timeline to 60 days in order for recommendations made to be incorporated earlier.

²² *Ibid.*, 16.

²³ *Ibid.*, 23.

²⁴ *Ibid.*

²⁵ *Ibid.*, 24.

²⁶ US DOD, USMC Integrated Test and Evaluation Handbook Version 1-2, 4.

²⁷ Canadian Army, CATEU Standard Operating Procedures, Chapter 2, 2.

The Department of National Defence (DND) and the US Department of Defense deal with Operational Deficiencies in a similar manner. During operational testing at MCOTEA, trial personnel will identify Operational Deficiencies that may impact the performance of the system under test, even though those deficiencies cannot be associated with a specific capability of the system under test. An Operational Deficiency is an issue with using the system under test in the expected operational situation, or a problem employing the system operationally as part of the larger Marine Corps or Joint war-fighting capability. System Deficiencies are those related directly with the system under test.²⁸ It is best when deficiencies are captured early in the process, either by the designer, the Acquisition Lead, or MCOTEA so that they can be corrected quickly and as inexpensively as possible.²⁹ The Project Manager (PM) is responsible for tracking all System Deficiencies identified for their system, while MCOTEA is responsible for identifying all Major System Deficiencies during operational testing. The PM shall monitor all Major System Deficiencies until they are fixed or accepted by either the MDA, or Gate Review action.³⁰ The PM from the Assistant Deputy Minister (Materiel) (ADM(Mat)) has the same process to work with industry, and Public Services and Procurement Canada (PSPC) to correct/resolve Operational and System Deficiencies.

Obtaining Marine Warfighter feedback is an important facet that will help all phases of the capability acquisition process to deliver the new equipment for the Marines, just as it is to have soldier feedback in Canada. It provides a complete assessment of the entire procurement process and allows the Triad of capabilities development, acquisition management and T&E to use the feedback to improve the operational effectiveness and practicality of new systems delivered to all soldiers around the world. Gathering feedback supports the process by

²⁸ US DOD, USMC Integrated Test and Evaluation Handbook Version 1-2, 70.

²⁹ *Ibid.*

³⁰ *Ibid.*, 71.

identifying any gaps in the capabilities of the system and determines potential areas of deficiency that may not have been identified during the event.³¹ For example, the feedback could indicate problems with a part of the system of interest after limited use. This therefore could suggest the need for additional testing during system development to detect failures related to fatigue, or it may suggest the use of poor materials were used by the development contractor.³² In both cases, the feedback would help the Acquisition Leads make changes before the contractor begins full production. All Warfighter feedback reports are completed within 30 days of the completion of the trial. At CATEU, individual interview, focus groups and questionnaires are used during and at the end of the trial to capture soldier feedback, particularly in areas that are difficult to measure.

Presently, there is no military handbook or other document that summarizes best practices and statistical methods for T&E in the US. A recommendation from the Test Science Roadmap suggests that a handbook on statistical methods for T&E should be developed.³³ This would a valuable benefit for CATEU to have as well, especially in the absence of statistics SMEs at the unit. Another recommendation was for DOT&E to host an annual conference on statistical methods for T&E. This conference would provide an opportunity for “presenting case studies, best practices, and lessons learned, and for providing training opportunities.”³⁴ This would be another excellent opportunity for Canada to be involved in. Currently, there is very little exchange of information with respect to trials with the US.

³¹ *Ibid.*, 75.

³² *Ibid.*

³³ Warner, C. Report on the Test Science Roadmap for the Director, Operational Test and Evaluation, July 2013, 45.

³⁴ *Ibid.*

Review of Recently Conducted Trials

The US Army and Marines conducted a series of joint trials in 2017 and 2018 for their new Joint Light Tactical Vehicles (JLTV) that will soon replace the aging Humvees.³⁵ According to the FY 2018 Annual Report from the Defense Department's Director for Operational Test and Evaluation, the trials put the vehicles through a series of simulated combat and wide-area security missions to assess their capabilities.³⁶ The assessments and recommendations painted a picture that the vehicles were not ready for delivery yet and further trials would be required. "All JLTVs are not operationally suitable because of deficiencies in reliability, maintainability, training, manuals, crew situational awareness, and safety," the report states. "JLTVs demonstrated less reliability than its requirement. The primary drivers of operational mission failures were engine wiring problems, flat and damaged tires, and brake system faults."³⁷ Moreover, the initial training and maintenance packages were not sufficient, and the report confirmed the plan to revise the maintenance course content, ensuring units receive more training. After many of the technical issues were corrected in 2018-19, the Program Manager for the Light Tactical Vehicles confirmed that further training was key allow the Marines to adjust to the new vehicle that is operated very differently than its predecessor.³⁸

It is clear that some sacrifices and trade-offs are allowed in the design of the new equipment such as the JLTV. All militaries, including Canada's, are looking at cutting costs where they can while still providing a capable fleet. What is paramount is that T&E must be detailed and comprehensive in order to ensure that the military understands how to best use the

³⁵ Matthew Cox, "Tech Issues Being Addressed as Marines Get First JLTVs, Official Says" Defense Tech-Military.com last assessed 28 April 2019. <https://www.military.com/defensetech/2019/02/27/tech-issues-being-addressed-marines-get-first-jltvs-official-says.html>.

³⁶ Behler, R. FY 2018 Annual Report, Director Operational Test and Evaluation, December 2018. 88.

³⁷ *Ibid.*, 89.

³⁸ Matthew Cox, "Tech Issues Being Addressed as Marines Get First JLTVs, Official Says", Defense Tech-Military.com, last accessed 28 April 2019, <https://www.military.com/defensetech/2019/02/27/tech-issues-being-addressed-marines-get-first-jltvs-official-says.html>.

equipment and what must be completed during its life to maintain it. Shortcuts should not be taken during trials.

SECTION 3 – CASE STUDY 2: BRITISH ARMY

The UK Army has recently seen an increase in the introduction of new capabilities. They want to ensure that new equipment is delivered to the right troops on time and all areas of acquisition and trials speak the same language, work closely together and follow a recognized process. In a similar manner to the previous section, the organizational structure, the process and document formats according to the UK Army Trials Policy, and its feedback mechanism will be examined. Finally, by reviewing recent trials conducted, lessons and best practices will be identified that could benefit CATEU.

Comparable to the Canadian hierarchy of DND, ADM(Mat) and CATEU, the UK system is based three organizations. The first is the Defence Equipment and Support (DE&S), which following the merger of MoD's Defence Procurement Agency and Defence Logistics Organization in 2007 manages the UK's defence procurement and support projects for all three services.³⁹ Next down is the Army Trials and Experimentation Planning Office (TEPO) which is responsible to Army Chief of General Staff through Brig Equipment Strategy (Army) for the coordination and planning of trials activities and the seven Trial and Development units (TDUs).⁴⁰ Their primary tasks are to consolidate, prioritize and coordinate all trial requests and allocate tasks to the TDUs. The TEPO also coordinates all external support for trials and directs/monitors training standards for trials staffs. The TDUs broadly mirror each of the Arms and Services Directorates and include the Armoured Trials and Development Unit (ATDU), the

³⁹ UK Ministry of Defence: Defence Equipment and Support, last accessed 28 April 2019, <https://www.gov.uk/government/organisations/defence-equipment-and-support>.

⁴⁰ UK Ministry of Defence, Army Trial Policy Equipment Directive 2012. 4.

Royal Artillery TDU, the Royal Engineers TDU, Communications & Information Systems TDU, Infantry TDU, Aviation TDU and Combat Service Support TDU.⁴¹ Other organizations that also conduct trials and evaluations are the Packaging Trials Team and the Ammunition School. These units are responsible for the testing, evaluation, trialing and developing of equipment, specifically by providing user advice and subject matter experts. At CATEU, their internal staff fulfills the role of coordinating and prioritizing trials, in consultation with the Canadian Army Headquarters, before assigning them to the sections. Each TDU in the UK is commanded by a Lieutenant Colonel and has an average of 40 members. TDUs are involved from the beginning of the procurement project and in every stage after, from suggesting comments on draft User Requirement Documents (URDs), which are equivalent to the Statement of Requirements (SOR) in Canada, to working diligently with the DE&S and industry during initial development all the way to post-production.⁴² Once the equipment is in service, it will then work closely with the appropriate Integrated Project Team. The ATDU, for example, has three major Trials planning teams, focusing on Weapons and Heavy Systems, Automotive and Light Systems, and Communications and Vehicle Systems.⁴³ Currently, Project Teams from the Directorate of Land Requirements (DLR) of the Canadian Army prepare the Statement of Requirements with some input from the user community during occasional working groups, but there is no constant link with CATEU. Those linkages are initiated when the project is its design stage. Often, the initial identification of trials requirements occurs within a year coordinated at the CA Equipment Working Groups. With the level of expertise in a number of army equipment fields at CATEU, this is an opportunity missed for Project Teams to tap into.

⁴¹ *Ibid.*, 5.

⁴² *Ibid.*, 9.

⁴³ Forces War Records, Unit History: ATDU (Armoured Trials and Development Unit), last accessed 27 April 2019, <https://www.forces-war-records.co.uk/units/4462/atdu-armoured-trials-and-developement-unit/>

Examination of Army Trials Policy –Equipment Strategy

Army Trials Policy –Equipment Strategy was reviewed in 2012 and incorporated some major changes to improve practicality. Similarly to the US Marines, the UK Trials process is broken down into 6 steps and begins immediately after the equipment project is identified. The steps are Authorization, Prioritization, Tasking, Planning, Conduct and Reporting.⁴⁴ Each step can be compressed if required by an Urgent Operational Requirement (UOR) trial but the process remains the same. The manual shows that each step has a checklist and forms required to prepare and complete. The TEPO will list the event on the Trials index after the Authorization stage whether it is initiated from higher or from the AS&D.⁴⁵ Once a trial has been authorized by the TEPO it will be given a priority based on the Review of Equipment Capability Priorities for the Army. Next, once the trial has been authorized and prioritized it will be tasked to the relevant TDU(s). This step is completed by the TEPO; the Project Teams cannot task a TDU directly. TDUs can also support Private Ventures (direct from Industry) and Developmental work (from a Project team) but these are lower priority than the Equipment Trials tasked by TEPO. CATEU also supports trials for innovation projects through Canadian programs such as Innovation for Defence Excellence and Security (IDEaS).⁴⁶ Some of the key considerations during the planning stage include the consideration of a Risk Assessment to ensure the safety of all participants, whether the activity has any potential ethical issues, environmental concerns, and finally Equality and Diversity. All trials which include equipment or clothing, used or worn by all Military members, must include 10% female soldiers in the trial troops.⁴⁷ This is one initiative

⁴⁴ UK Ministry of Defence, Army Trial Policy Equipment Directive 2012. 7.

⁴⁵ *Ibid.*

⁴⁶ Government of Canada, “Innovation for Defence Excellence and Security (IDEaS)” website, last assessed 4 May 2019, <https://www.canada.ca/en/department-national-defence/programs/defence-ideas.html>

⁴⁷ *Ibid.*, 8.

that the Canadian Army must absolutely adopt in order to ensure that the new equipment works for all soldiers.

The Trial Directive is the key planning document for the conduct of the trial. In the UK, it is the Project Team's responsibility to prepare and submit the Trial Directive to the TEPO, which is different than in Canada. The Directive gives the detail of the trial, including the test criteria, methodologies and conditions, based on the requirements identified in the User Requirement and System Requirement Documents. The Project Team is responsible for providing the equipment, book ranges, facilities and ammunition, and pay for all costs associated to the trial while at the same time, allowing the TDU to conduct the trial without interference. They also submit the request for Army support troops, ideally 18months in advance.⁴⁸ The TDU is responsible for producing the Plan of Tests and the Trial Plan, and then conducting the trial in a professional, objective, credible and independent manner. Finally, they will complete the report on the trial. While there is no set deadline for the report, it will be submitted within agreed time lines between both the TDU and the Project Team. The manual has examples and guidelines included to help complete the report and all other documentation. After comparing the UK Trials process and planning documentation to that of Canada, it is not recommended that any changes are required at this time. The Identification of Trial Requirements (IDTR) document initiates CATEU in the planning and conduct of a user trial or evaluation and is initiated by the requesting sponsor (ie Project Team). CATEU then proceeds with completing a Mission Analysis and Trial Estimate. These templates have been recently updated and include all of the required information to get the trial planning started. The documents are very similar to the UK templates. It would be recommended, however, that guidelines for completing the templates and examples of completed forms are including in the CATEU Standard Operating Procedures

⁴⁸ *Ibid.*, 13.

(SOPs) that are currently in the process of being updated. The guidelines and templates in the UK Manual were very useful and would greatly assist in completing the forms correctly, the first time.

The UK Trials Management course was developed for serving officers or senior NCOs and civilians who are involved or are likely to be involved, with trials. The course is appropriate for those who “hold trials appointments in trials units, experimental and research establishments or units responsible for conducting a trial.”⁴⁹ Its aim is “to provide an introduction to the management of trials, including some of the techniques used in the planning, conduct and analysis of trials.”⁵⁰ The objectives of the two week long course, conducted twice a year are to give students a basic understanding of the managing trials and to encourage the use of innovative management techniques in the “detailed planning, conduct, reporting and administration of trials,” to make students aware of the MOD trials planning environment, and to gain experience on the planning and conduct of trials from both service and commercial trials experts and through a “practical trials exercise.”⁵¹ Students are also given an introduction of the “application of statistical and operational analysis techniques which provide a numerate and objective foundation for planning trials and analyzing their results.”⁵² This course, or one similar, instructed by a civilian university would greatly benefit Canadian Trial Officers. While the CATEU course offers an introduction into Human Factors, Statistics and Data Collection Methods, it is taught by members of CATEU, who have limited education and experience in these subjects. Academics and civilian instructors working at a college or university generally have much more expertise in these areas.

⁴⁹ Defence Academy of the United Kingdom, Trials Management Course. Cranfield University, last accessed 30 April 2019, <https://www.cranfield.ac.uk/courses/short/defence-and-security/trials-management>.

⁵⁰ *Ibid.*

⁵¹ *Ibid.*

⁵² UK Ministry of Defence, Army Trial Policy Equipment Directive 2012. D-11.

While it is possible for officers and NCOs from different trades to be posted to a TDU and complete the Trials Management Course, the UK also has a separate Armed Forces Technical Officer trade which trains Technical officers for each service from the ground up. With most services requiring an engineer or science degree to apply, Army officers, once selected will be attend the officer training course at Royal Military Academy Sandhurst.⁵³ In their careers, Technical Officers would attend further professional courses at the College of Management and Technology, a college of the Defence Academy of the United Kingdom at Shrivenham, or other universities or colleges, depending on their specialty.⁵⁴ Through their careers, Army Technical officers would be responsible for maintenance and serviceability of land vehicles, with their associated weapons systems, act as project managers on a base, conduct research and development of new equipment and capabilities as well as conduct trials and tests. This is not currently an option in the Canadian Army. Technical Staff officers are not a separate trade, and are trained after years of experience. With current recruiting initiatives being examined in Canada, this could potentially open the door for direct entry Technical Staff officers, but the lack of field experience that these officers would arrive with would put them a step behind their peers.

As is expected in this field, there are commercial sensitivities with respect to the release of completed Trial reports, therefore the references were limited. The ADTU and RETDU were gracious enough to release three reports that were from trials initiated by Private Ventures. The aim of these trials were to gather evidence on each capability to inform the UK military on possible use of the system as part of future or ongoing major projects. The reports were very easy to follow and each had a number of recommendations to improve the proposed systems and

⁵³ Job profile: Armed forces technical officer; Prospects Website <https://www.prospects.ac.uk/job-profiles/armed-forces-technical-officer>.

⁵⁴ *Ibid.*

recommend possible future trials under different conditions. The analysis was very detailed in each report. In these cases, the trialed equipment was compared against either the status quo or against possible competitors in order to show advantages and disadvantages. Each report referred to compiled data sets that would form part of the final package.⁵⁵ As previously mentioned, the TDU and CATEU final reports are very similar in format and level of detail provided therefore no recommended changes are suggested at this time.

The processes and formats currently in use by the UK Army are similar to what the Canadian Army uses. This is aided by the close relation between CATEU and the ATDU; Canada has had an exchange posting at ATDU for many years. As well, both Trial Management courses are similar in scope, although the UK course is taught by academics and civilian subject matter experts. Canada should continue to monitor ATDU and other TDU's activities and best practices.

CONCLUSION

It is vitally important that CATEU remains relevant as a key enabler in support of the Canadian Army's capability development process. When new equipment is introduced into the Canadian Army without proper testing and trials, it is doomed to fail or can be very expensive to fix after it has been delivered. The upcoming projects identified in SSE have the potential to overwhelm CATEU if some major changes or slight adjustments are not made. Canada's allies are living the same new intensified levels of project introduction and have identified recommendations to improve. Canada should pay close attention to what they are doing and how they are doing it. Further to the recommendations made above, it is suggested that Canada attend working groups with its allies to further share information about trials processes. CATEU should

⁵⁵Gov't UK, Composite Rubber Track Trial Report, ATDU dated 29 Jan 2019 (Not for Release).

integrate with the US in terms of preparing development and documentation of case studies and best practices and then make these publically available online. Moreover, while some exchange postings do currently exist, with the UK ATDU for example, the Canadian Army should seek out more exchange opportunities in order to cross train and learn. Finally, it is suggested that other allies' trial units' best practices, such as Australia, France and Germany are examined as well.

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