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Canadian Unmanned Aerial Vehicles at the Tactical Level

Command and Control by the Army

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Abstract

The Canadian Army has adopted a totally new approach to war fighting, as illustrated in the milestone document *The Force Employment Concept*. This new approach requires an increased emphasis on sensors to shape the battlefield. One of the sensors acquired by the Army in order to increase its capability to "sense" the battlefield is the Tactical Unmanned Aerial Vehicle (TUAV). Yet, its fielding is being delayed over the issue of ownership. This paper addresses the matter and argues that, within the framework of *The Force Employment Concept*, the Army must retain full control of this asset.

This paper examines the pre-existing capabilities of the Army and describes the successful deployment of a TUAV in Afghanistan. The issue of Airworthiness is being explained, focussing on the fact that the existing process is sufficiently robust to handle the employment of TUAVs by the Army. The experience of other users is reviewed as most NATO countries already possessing TUAVs have them integrated in their land component structure. Finally, a very pragmatic approach is presented which sees the Army own its TUAV under the standardization of the Air Force. This paper clearly establishes that the Army is well suited for the immediate integration of the TUAVs and that it is in the best interest of both the Army and the Air Force to support this approach.

INTRODUCTION

"Under most conditions, it will be the norm to lead with sensors, follow-up with effects and exploit with soldiers".[1] With these clear words in its milestone document *The Force Employment Concept for the Army* (FE Concept), the Canadian Army described the importance of situational awareness for future operational deployments. Not only is the enemy encountered on the battlefield today different from conventional warfare but, even more importantly; the battlefield itself has changed. The carnage and destruction of Europe in 1918 and 1945 will not be tolerated by the modern western civilizations. Rather, they expect a clean conduct of military operations in strict accordance with the laws of armed conflict, minimizing casualties while causing as little collateral damage as can be inflicted in order to achieve a military objective.[2] The expected norm is precision strikes conducted based on timely and accurate information.

Our military forces need to adapt in order to face this new reality. The Canadian Army must be capable of engaging enemy forces with accuracy, in the midst of civilian population and allied formations. In this type of operational reality, mistakes are not acceptable.[3]

This is why the Army has put so much emphasis on the Intelligence Surveillance Target Acquisition and Reconnaissance (ISTAR) aspect of the future FE Concept.[4] What

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[1] Department of National Defence, *The Force Employment Concept for the Army* (Ottawa: DND Canada, 31 March 2004), 10.

[2] Elinor C Sloan, *The Revolution in Military Affairs: Implications for Canada and NATO* (McGill-Queen's University Press, Montreal & Kingston – London – Ithana, 2002), 4.

[3] *Ibid*.

[4] Department of National Defence, *The Force Employment…*, 10.

the Army is promulgating is in fact a system of systems where sensors and delivery means both contribute equally to the effect expected on the enemy or in the theatre of operation.

To meet the requirements of this new environment, the Army has adopted five operational functions: Act, Shield, Sustain, Sense and Command (the focal point). This is depicted in the following diagram:

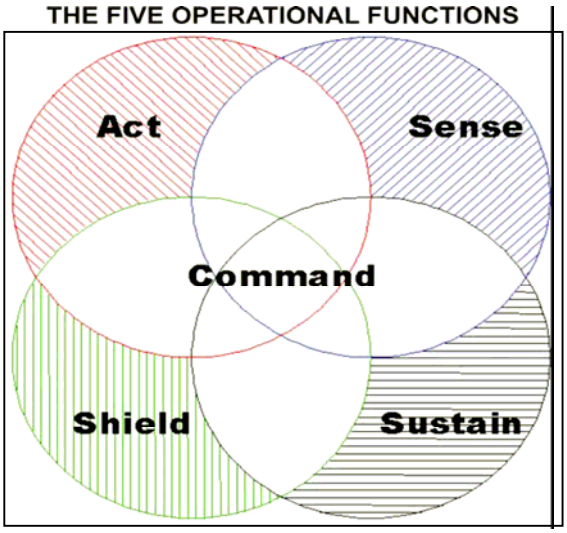

Figure 1: The Five Operational Functions
Source: *The Force Employment Concept.*[5]

For the Army to succeed in this challenging but necessary series of changes, it requires the "Sense" function to be fulfilled in the most complete and accurate manner as possible. The sensor and the "shooter"[6] must be closely linked, providing the tactical commander the ability to respond to the information without delay, and therefore influence events in a timely fashion. Retired Major-General Robert Scales Jr. from the

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[5] *Ibid.*, 13.

[6] "Shooter" designates here the mechanism used to deliver the effects on the battlefield, being lethal or non-lethal. "Shooter" could be a weapon system or other mechanisms used to affect events.

US Army expressed this concept perhaps in the clearest language by saying: ". . . the same advantage of standoff killing power and pinpoint precision now enjoyed by air forces must be made available to tactical ground forces as well."[7]

Tactical level Unmanned Aerial Vehicles (TUAVs) are an integral part of "Sense". These small, unmanned aircraft can provide the ground tactical level commander with a key asset that increases his situational awareness and his ability to shape the battle. The importance of TUAVs in the new FE Concept and in the new reality of the battlefield for the Army cannot be underestimated.

Unfortunately, the fielding of this tool is being delayed due to technical disagreements between the Air Force and the Army over issues of ownership.[8] There are at this time, in broad terms, three options available to the Canadian Forces: leave the command and control (C2) of the TUAVs to the Army, transfer the C2 to the Air Force, or make them a joint asset controlled by the Deputy Chief of Defence Staff (DCDS).[9]

This paper demonstrates how Tactical level Unmanned Aerial Vehicles, an important asset for future Army operations, should remain under its C2 structure to fulfil its role. The Army has the momentum, the ability and the will to make it work without

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[7] Major General Robert Scales, *Warfare in the American Age*. (Chapter 9 in *Towards the Brave New World — Canada's Army in the 21st Century*) (Eds. Bernd Horn and Peter Gizewski. Kingston, ON: Directorate of Land Strategic Concepts, 2003), 118.

[8] LGen K.R. Pennie, *Command and Control of UAVS* (11500-UAV-1 (D Air Sp), 23 August 2004.

[9] These three options are the main ones that have been discussed so far. The Army being the principal force behind the acquisition of the Sperwer, as discussed later in this paper, presently owns this TUAV and the status quo is one option. The second option would be to transfer this responsibility to the Air Force, but the details have yet to be published (including where the Person Years would come from). Finally, a third option of keeping the TUAVs as a Joint asset under the DCDS has been discussed and is a possibility, although it has been pointed out that the responsibility of the DCDS is for force employment, and not force generation.

delay. Although other options exist, they would only decrease the operational effectiveness of such a force multiplier, delay the fielding process and reduce the Army's ability to fully realize the objectives set in the FE Concept.

The paper begins by the review of some basic doctrine. The requirement and capabilities of the Canadian Army regarding TUAVs are explained followed by a synopsis of the employment of Sperwer (a Canadian owned TUAV) in Afghanistan by the Army in 2004. The very important issue of airworthiness will be addressed before a review of how foreign military are using their TUAVs in support of their Army. Before concluding, a proposed solution is presented. After reviewing the argument, the reader should conclude that the Canadian Army is well prepared and capable of immediately integrating this new and powerful force multiplier into its C2 structure.

DOCTRINE

Before the issue of ownership is addressed, it is important to establish what a UAV and a TUAV are by definition. A UAV is defined as follows:

> An unmanned (uninhabited) aerial vehicle (UAV) is defined as a powered, aerial vehicle that does not carry a human operator, uses aerodynamic forces to provide vehicle lift, can fly autonomously or be piloted remotely, can be expendable or recoverable, and can carry a lethal or non-lethal payload. Ballistic or semi-ballistic vehicles, cruise missiles, and artillery projectiles are not considered unmanned aerial vehicles.[10]

The range of capabilities of these UAVs already varies tremendously and will continue to expand in future years. There is currently no overarching doctrine on UAV in

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[10] Department of National Defence, *UAV Capability Development Plan* (Ottawa: DND Canada, Draft version dated 10 March 2005), 1.

the CF, but the definitions provided in the draft version of the CF UAV Capability Development Plan (CDP) will be used:

CANADIAN UAV DEFINITION AND CLASSIFICATION		
Tier 1	Strategic/National	Operating Altitude: Up to 65,000 Ft Range: Unlimited
Tier 2	Operational/Theatre	Operating Altitude: Up to 40,000 Ft Range: Unlimited
Tier 3	Tactical/Formation	Operating Altitude: Up to 5,000 Ft Range: Max 70 Km
Tier 4	Tactical/Unit	Operating Altitude: Up to 1,000 Ft Range: Max 50 Km
Tier 5	Tactical/Sub-Unit	Operating Altitude: Up to 1,000 Ft Range: Max 20 Km
Tier 6	Tactical/Platoon/Section	Operating Altitude: Up to 200 Ft Range: Max 5 Km

Table 1: Canadian definitions and classification of UAVs.[11]
Source: *UAV Capability Development Plan* (Draft dated 10 March 2005).

This paper addresses the command and control of Tier 3 to 6 UAVs, referred to as Tactical Unmanned (uninhabited)[12] Aerial Vehicles (TUAVs). It does not address the issue of higher level UAVs (also referred to as strategic and operational (Tiers 1 and 2)), as the responsibility for the C2 of these assets undoubtedly belongs to the Air Force. This has never been disputed by the CF Army or Navy. This paper focuses on the issue of C2 of the TUAVs, because they are designed to support tactical level formations.

[11] *Ibid*., 18.

[12] Some documentation will use "uninhabited" rather than unmanned, but the definition remains the same.

ARMY REQUIREMENT AND CAPABILITY

The first question to address is why it is so important for the Army to command and control its own TUAVs? Why not just let the Air Force manage it on its behalf? The Air Force already owns all air vehicles in the CF, including those dedicated to aviation units.[13] After all, TUAVs would be made available when required, right? This is probably the most critical issue in many people's minds. It would probably be simpler for the Army to leave this matter to others and concentrate on the many challenges it is already facing. To understand why this is problematic, one must read and understand *The Force Employment Concept of the Army*.[14] This keystone document establishes how the Army will rely less on massive firepower and more on accuracy and knowledge of the battlespace to succeed:

> One of the defining characteristic of many of the new concepts that we are beginning to embrace is the increasing use of information and knowledge to create situational awareness and understanding.[15]

It is important to come to terms with this statement in order to understand the complete shift in paradigm for the Canadian Army. The Army will not possess the mass it used to employ or project during the Cold War.[16] Moreover, as the loss of human lives during a conflict could be the strategic centre of gravity[17] of western nations like Canada, close combat must be avoided as much as possible. For example, reconnaissance

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[13] LGen K.R. Pennie, *Command and Control of UAVS. . . ,1.*

[14] Department of National Defence, *The Force Employment…*

[15] *Ibid.,*10.

[16] *Ibid.,* 4.

[17] The Centre of Gravity is that characteristic, capability, or locality from which a military force, nation or alliance derives its freedom of action, physical strength, or will to fight. Definition from: Canada, Department of National Defence, B-GJ-005/FP-000 CF *Operational Planning Process* (Ottawa: DND Canada, 2003), G1.

functions have historically been very costly in human lives. They involved close combat in order to find and fix the enemy until a force with more combat power was made available to deal with it. Major-General Scales explained the contemporary needs for reconnaissance as follows:

> . . . in the future, the extremely dangerous reconnaissance function must increasingly be performed whenever possible by surrogates, either from unmanned aerial or ground mounted sensors.[18]

The Army will meet the requirement of the new battlefield by acquiring knowledge about the enemy and engaging it with deadly precision strikes without risking costly collateral damage. At the very least, it will possess sufficient knowledge to better prepare itself for a close engagement if that is required. Army formations will be dependant on their sensors in order to make use of their long range weapons and provide information to their tactical units. This new Army is a system of systems and every piece must be aligned to ensure the success of this concept. The TUAV, in this system, becomes the eye of the Army.[19] It is hard to ask the Army to rely on somebody else to provide these eyes. The issue is as simple as asking one soldier to aim a rifle while another soldier uses the scope to guide him. Colonel John Kelleher from the office of the assistant secretary of the US Army explained it in these plain terms:

> Obviously, we have less capability than the Air Force's Global Hawk and the Predator [those are considered Tier 1 and 2 UAVs], but in many ways we have more capabilities, because these [TUAVs] travel along with the brigade, with

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[18] Major General Robert Scales Jr. (USA, Retired), "Checkmate with Operational Maneuver: Warfare in the American Age…, 118.

[19] Henry S Kenyon, "Silent Eyes Guard Peacekeepers", *Signal,* Falls Church Vol. 59, Iss.1 (Sep 2004), 2.

> the tactical commander . . . We have operational control of what we want to do and what we want to see.[20]

These words from a senior officer of an Army with so much operational experience with TUAVs must be well understood. One should carefully reflect on these two segments: "travel along with the brigade, with the tactical commander" and "we have operational control of what we want to do and what we want to see". Integral control and complete command is what makes the difference for the Army between Tactical (its own) and higher level UAVs (which belong to the Air Force). Moreover, while Col Kelleher discusses brigade level operations, the same is applicable to lower levels like units and sub-units. The US Army is well underway to employ tactical UAVs at these levels.[21]

One additional reason why the Army should insist on retaining C2 of these TUAVs is that, when deployed on operations, the only assets one can rely on are those that one controls, as experienced recently by the US Marines in Iraq:

> After crossing the Line of departure, the Division received very little actionable intelligence from external intelligence organizations. The Division had to assemble a coherent picture from what it could collect with organic and DS [direct support] assets alone. . . . This made the Division almost exclusively reliant on organic or DS collection assets. The Division found the enemy by running into them, much as forces have done since the beginning of warfare. The Pioneer [a TUAV] worked great when the bureaucracy between the VMU and the Division G-2 could be negotiated, but the lack of a habitual relationship and adequate rehearsal time limited our ability to do so. A superb example of a successful UAV system was the Dragoneye [a mini, or sub-tactical UAV], which was fielded to selected Battalions and allowed to collect against the

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[20] Roxana Tiron, "Army Unmanned Air Vehicles Proliferate in the Battlefield", *National Defense* Vol. 88, Iss. 606 (May 2004): on line: http://proquest.umi.com/pqdlink?index=8&did=638936131&SrchMode=3&sid=3&Fmt=4&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1111326161&clientId=13664&aid=329-31 ; Intranet: accessed on 15 December 2004; 2.

[21] *Army*, "Unmanned Aerial Vehicles". Arlington: Vol. 54, Iss. 10 (Oct 2004): 286-288; on line: http://proquest.umi.com/pqdlink?index=73&did=718379711&SrchMode=3&sid=1&Fmt=4&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1112452421&clientId=1711&aid=1; Intranet: accessed on 20 December 2004; 3.

> commander's priorities, locations, and schedule without interference from higher headquarters. The best possible employment option is to push more assets in DS [in direct support] to the lowest tactical level and increase available organic collections.[22]

This related experience of the US Marine Corps is from Operation Iraqi Freedom, where they rely more and more on TUAVs. In fact, without UAVs in Iraq, officers expect that casualties would be significantly higher.[23]

The Air Force's proposal that TUAVs be embedded in their Tactical Aviation Squadrons is probably the most viable alternative to Army ownership, but still falls short of being the optimum solution.[24] Although the Air force may find the linkage between these squadrons and the Army as sufficient, it is not so. Tactical Aviation Squadrons belong to the Air Force, under priorities set by the Air Force and are available for Army Training only once higher priorities have been fulfilled. A simple scenario can be anticipated where these squadrons have to support an operational deployment. Obviously, the operational capabilities of more important assets, namely helicopters, will be met first, and only if manpower remains available will the TUAV be deployed. This would leave the tactical commander blind and vulnerable. The Army requires its TUAVs to be readily available for training and deployment when they are required, at formation and unit level.

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[22] Anthony H. Cordesman, "The Intelligence Lessons of the Iraq War(s)", *Center for Strategic and International Studies*, Second Rough Working Draft: August 6, 2004. On line; available from http://csis.org/features/iraq_intelligenceiraqiwar.pdf; Internet; accessed on 11 December 2004, 70.

[23] *Associate press*, "Save Soldiers by Remote Control", on Line; available from http://www.wired.com/news/technology/0,1282,65627,00.html; Internet; accessed on 20 December 2004.

[24] LGen K.R. Pennie, *Command and Control. . .*, 3.

One of the most misunderstood issues concerning the fielding of the TUAVs in the Canadian military is the determination the Army has and will continue to put behind this project and its integral capabilities. The Army acquired a TUAVs (Sperwer) in a matter of months and has already demonstrated its willingness to reduce its fire-power in order to divert person years (PYs)[25] towards the creation of Surveillance and Target Acquisition Batteries.[26] As an initial stage, 1st Regiment Royal Canadian Horse Artillery would go from three Field Artillery Gun Batteries to two, and create this new organisation.[27] The Royal Canadian Artillery is highly supportive of this project and recognizes the importance of the sense function:

> Indeed, the Sense systems such as TUAV, CBTA [Counter Bombardment and Target Acquisition], the FEV [Fire Effect Vehicle] and the MMEV [Multi-Mission Effect vehicle] form a central component to the Army ISTAR system on which the complete doctrine and tactics of the Canadian Army will depend.[28]

Moreover, the Artillery has created a TUAV sub-MOC within its ranks, it has prepared a career path and it is willing to continue the participation of selected Warrant Officers and Captains to the Advanced Surveillance and Target Acquisition Course in the United Kingdom.[29] These individuals, known as Instructors-in-Gunnery (IG) and

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[25] This is the definition used by the military to describe where each soldier will be employed. For example, a unit may be allocated 450 PYs, meaning that they are entitled to 450 soldiers, all rank. When a new responsibility is given to an organization, new PYs are expected to be created. This is a very difficult process as human resources are extremely limited and PYs difficult to obtain, for budgetary reasons.

[26] Department of National Defence, *Artillery Position Paper – Version 7 (Final Version)* (Royal Canadian Artillery School 1470-1 (Deputy Director of Artillery) 22 October 2004), 14.

[27] The creation of this new Target Acquisition Battery would accommodate more than TUAV. Other sensors would be employed, including counter-battery radars and sound ranging equipment. The argument is simply made here that the Army is willing to sacrifice fire power (field artillery gun batteries) to fulfill the role of sense (TUAVs, radars and sound ranging equipment).

[28] Department of National Defence, *Artillery Position Paper. . .*, 4.

[29] *Ibid.*, Annex F.

Assistant Instructors-in-Gunnery (AIG) Locating, have already been employed during the acquisition, preparation and the first deployment of Sperwer for the Army.[30]

One more argument brought forward in the past year is the inability of the Canadian Army to manage the airspace above its units and formations. Indeed, airspace coordination is one of the most complicated and challenging undertakings on the battlefield. But, due to a lack of joint training at the tactical level in the past 15 years, it is little known that the Air Defence component of the Artillery already possesses an in depth knowledge of military airspace coordination. For years, air defence officers and Warrant Officers have manned the Airspace Coordination Centre (ASCC) at battalion, brigade and division level in accordance with both Canadian Army doctrine[31] and NATO Airspace Control Doctrine.[32] Doctrine stipulates that it is the responsibility of the land subordinate commander to establish an airspace control organization and "co-ordinate his requirements for use of Airspace with the ACA [airspace control authority] /SACA [Sub-Area Airspace Control Authority]."[33] The ASCC coordinates the employment of Field Artillery, mortars, ground based air defence weapon systems, aviation resources and air force assets providing close air support; they all require the use of airspace and must be coordinated with other users included in the Airspace Control Orders (ACO) and regulated in the Airspace Control Plan (ACP). The ASCC is inter-connected with the theatre airspace control system through electronic means (links 11 and 16, as required). The training of the ASCC personnel includes de-conflicting integral TUAV assets within

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[30] *Ibid.*, 12.

[31] Department of National Defence, B-GL-300-7/FP-001 *Firepower*, (19 August 1998), 99.

[32] NATO, ATP – 40(B) *Doctrine for Airspace Control in Times of Crisis and War* (May 1998).

[33] *Ibid.,* 4.

the Airspace Control System and their inclusion in the Air Tasking Order. The first two rotations of Operation Athena in Afghanistan included an ASCC provided by the Army's air defence units and the Royal Canadian Artillery School. Their initial deployment was quite difficult as they had to establish this ASCC in a very complex and poorly organized airspace coordination system. They succeeded nevertheless, through hard work and perseverance.[34]

The ASCC is already formed, trained and equipped to request and manage the airspace required by the manoeuvre commander to support TUAV operations in accordance with NATO doctrine.[35] The Artillery is committed to this capacity and will continue to provide the ASCC as requested by the Army.[36]

One additional aspect of Army doctrine that is important to understand is that the ASCC is an integrate component of the Fire Support Coordination Centre (FSCC). The FSCC is a very important part of a battle group command post and formation headquarters. Its role is to advise on the employment of all indirect fire support.[37] This includes the integration of Close Air Support, Attack Helicopters, Mortars, Artillery, Naval Gun Fire Support, etc.[38] The ASCC and the FSCC work hand in hand with the Artillery intelligence Officer and ISTAR organization at all levels.[39] The FSCC already

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[34] Major M.F. Noraro, "Airspace Coordination in Afghanistan", Army Lessons Learned Centre: *The Bulletin*, Volume 10, No 6, (November 2004).

[35] NATO, *Procedures for Land Component Tactical Unmanned Aerial Vehicle* (Study No 2250, Edition 1, Studydraft 7), chapter 4.

[36] Department of National Defence, *Artillery Position Paper* …, Annex A, page 4.

[37] Canada, Department of National Defence, *Field Artillery Doctrine* (B-GL-371-001/FP-001, 22 June 1999), 34.

[38] *Ibid.,* 18.

[39] *Ibid.,* 3.

includes a cell from the Air Component and from the Aviation Component. This configuration guarantees perfect coordination of all resources in a very safe environment.

Moreover, this type of integration guarantees the shortest possible link between the sensor and the shooter at the tactical level. The sensor, if owned by the formation or unit, can be directed to a specific area or target without delay. The shooter, again owned by the same formation or unit, can be aimed at this same area or target in order to engage, when required, time sensitive targets with accuracy. [40] This produces provides a rapid and accurate responses to the intelligence gathered in the formation or unit area of operations.

OPERATIONAL DEPLOYMENT IN AFGHANISTAN

The Air Force has pointed out problems that occurred during the deployment of Sperwer as a TUAV in support of the Army during Operation Athena (in Afghanistan).[41] During this first ever operational deployment of a UAV by the CF in 2003, problems occurred and TUAVs were lost and damaged. The Sperwer was under the operational responsibility of the Army and, according to the Air Force, many of the problems were caused by human errors.[42] There were, is fact, a total of seven incidents causing damage to the air vehicle in Afghanistan where a total of 83 missions were flown. Three of these incidents were caused by human errors, including one caused by Air Force maintenance

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[40] A sensor described here can be a TUAV, but also a sound-ranging radar, a counter-bombardment radar or others. The shooter can be an artillery unit, a close air support mission, an attack helicopter mission, etc. However, artillery is likely to be used, when in range, against time sensitive targets

personnel. It is also important to point out that for this first operational deployment, an Air Force Captain was the in charge of the flights. Most problems occurred due to the fact that the Sperwer operated in a hostile environment, at the extent of its technical capability and the fact that the training was fast tracked to allow the deployment for this very important operational mission. These risks had been highlighted before the deployment and had been accepted by the CF's leadership.[43]

This was the first ever acquisition and deployment of a UAV in the CF, and it obviously became an important pool of lessons learned for observers and doctrine writers. Contrary to the Air Force, the Army saw this deployment as a success. In less than six months, the acquisition program of this TUAV was initiated, personnel were trained and deployed, and the Sperwer was in a theatre of operation. Moreover, this TUAV was successfully employed in support of many tactical tasks as well as the overall operation. The Army was the driving force behind the acquisition of the Canadian Forces' first UAV.[44]

More than the sole technical achievement of such a rapid fielding of new equipment, the Army concluded the experiment with a forthright statement: "Undeniably, the Sperwer saved lives in Afghanistan".[45] Technical incidents did occur, but crashes are inherent part of UAV operations and occur in every unit, even with the most experienced

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[43] Major Jacques Gobin, Deputy Project Manager Land Force Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) and Technical Authority for the CF on the contract for the Sperwer, telephone conversation with author, 10 April 2005. All data provides in this paragraph were collected during this conversation. Maj Gobin has reviewed this paper and confirmed that this information, collected during the telephone conversation, was accurate. He also provided flight data on the flights in Afghanistan and clarifications on the cause of the crashes.

[44] UVS Canada, "UAVs in Canada 2004 Update", http://www.uvscanada.org./documents/UAVsInCanada2004.pdf; Internet; accessed on 15 November 2004.

[45] MGen J.H.P.M Caron, *CLS Position on UAV C2* (Ottawa: file 11500-UAV-1 (DLSP 3-3)), 8 September 2004, 2.

operators.[46] This is confirmed by the US Office of the Secretary of Defence in his report on UAV operations in 2002. Through their own evaluation of technical incidents, 17% remained related to human factors[47]. Figure 2 depicts the cause of technical incidents in percentage for all UAF operations in the US during the year of the report.

Analysis on the cause of Mishaps in 2002

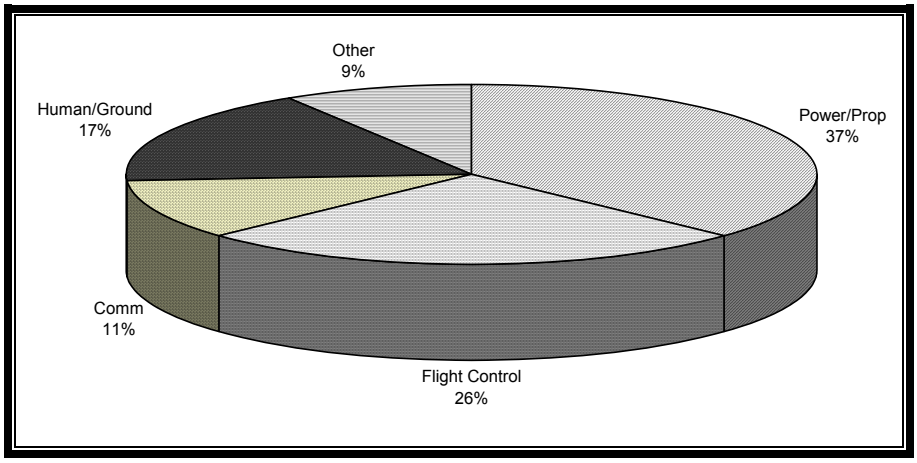

Figure 2: DoD UAV Mishaps causes in 2002.
Source: *Unmanned Aerial Vehicle Road Map 2002-2027 (US)*. [48]

The alternative to the deployment of Sperwer on Operation Athena was a lower level of situational awareness for the tactical commander, likely resulting in more casualties for our ground forces.

AIR WORTHINESS

Another issue pertains to airworthiness, or simply put, the assurance that an air vehicle is safe for its occupants, the operators, the people and infrastructures over which

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[46] Major D.J. Cushman, *CFLO Int Periodic Report 03* (Fort Huachuca, Arizona: file 2525-10 (CFLO-Int)), 25 July 2003, 6.

[47] This includes flight of Tier 1 and 2 UAVs, manned by the US Air Force. As demonstrated in this graphic, 1 out of 5 incidents (17%) are caused by human errors.

[48] United States of America, Office of the Secretary of Defence, *Unmanned Aerial Vehicle Road Map 2002-2027*, http://www.acq.osd.mil/usd/uav_roadmap.pdf; Intranet; accessed on 25 January 2005, 51.

it flies and the other air vehicles sharing the same airspace. In the CF, this is an Air Force responsibility.[49] Airworthiness is in fact a very complex and thorough program managed by 1 Canadian Air Division (1 CAD).[50] In an age where all military expenses must be justified, the duplication of airworthiness programs would represent a waste of resources and efforts if only to accommodate the fielding of TUAVs for the Army. The Air Force is correct in pointing this out as a very important issue.[51] However, there is nothing that prevents the Air Force from managing the airworthiness of an air vehicle controlled by the Army.

It is important to first review the main objective of the CF airworthiness program:

> . . . to achieve an acceptable level of aviation safety for Canada's civil and military aviation activities. Aviation safety involves many areas including design, manufacture, maintenance and operation of aeronautical products, the control of Canadian airspace, the control and operation of airports, aviation-related facilities and services and aviation security.[52]

The Army repeatedly acknowledged that the authority of the Air Force on this matter is not disputed[53], so has the Chief of the Navy Staff.[54] There is no discussion or plan to duplicate this responsibility, as feared by the Air Force.[55] Rather, the position of the Army is simply that the air worthiness authority of the Air Force does not preclude

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[49] Department of National Defence, *Defence Administration Orders and Directives 2007 – Safety,* on line; available from http://www.admfincs.forces.gc.ca/admfincs/subjects/daod/2007/0_e.asp; Internet; accessed on 22 December 2004.

[50] Department of National Defence, *Operational Air Worthiness,* (1 Canadian Air Division Orders, Vol 1, 1-623. No date), 2.

[51] LGen K.R. Pennie, *Command and Control. . .*, 3.

[52] Department of National Defence. *Operational Air Worthiness. . .*, 1.

[53] MGen J.H.P.M Caron, *CLS Position on UAV C2. . .*, 8.

[54] VAdm M.B. MacLean, *CF UAV Way Ahead* (Ottawa: file 11500-UAV (DJFC)), 19 Jul 04.

[55] LGen K.R. Pennie, *Command and Control. . .*, 1.

other CF elements from using equipment managed under this program. Just as the Infantry School is the Centre of Excellence for Advance Anti-Armour instruction and Tactics, Training and Procedure development, this responsibility does not preclude other units from using these weapons.

A simple approach has the Air Force establish the air worthiness regulations for every TUAV owned by the other services. Simply put, the Air Force manages the prerequisites for the operators, the training requirement, the rules to maintain the operators' currency, inspection and maintenance programs, etc. The Air Force retains full authority and audits the units and training institutions involved with TUAVs, imposing the standard to be met and maintained.

Such is the approach taken by the military forces of The Netherlands. The Royal Netherlands Air Force (RNLA) retained total control of the air worthiness program, while the Army is the user of the TUAVs.[56] The operators are all in 101 RPV Company and the 320 Maintenance Company, all Army Units.[57] Their program establishes that while 101 RPV Battery is the user, the RNLAF retains the responsibility for air worthiness;

> There is a strong need for an independent control organization, therefore the RNLAF will be the air worthiness authority for the RNLA UAV system Sperwer.[58]

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[56] The Netherlands. Royal Netherlands Air Force. *Air Worthiness Operations - Operations for the Unmanned Aerial Vehicles system SPERWER within the Royal Netherlands Army* (KLu - LE - OPS_UAV (SPERWER) Versie: 2.1.14 dd 080403),April 2003.

[57] *Ibid.*

[58] *Ibid.,* 3.

Through cooperation, such a program could be established for the CF. The Army would provide the operators who require similar skills to those soldiers in the Combat Arms. The Army would also continue to provide control mechanisms such as the FSCC and the ASCC. The Air Force would maintain airworthiness authority. This way, the CF would be able to rapidly field this new capability in support of the Army or the DCDS, while maintaining the spirit of the Canadian Forces airworthiness program:

> An effective air worthiness program: (a) establishes independence between the regulator (individual who makes the rules or "rule-maker") and the implementers (individual who conducts the aviation activity or "doer"); (b) controls the design, manufacture, maintenance, materiel support and operational usage of aeronautical products . . . .[59]

TUAVS IN FOREIGN MILITARIES

The Canadian Air Force argued in a paper addressed to the Deputy Chief of Defence Staff that aviation professionals are required to fly TUAVs. [60] This statement may not only be inaccurate, as will be demonstrated in this section, but could mislead the CF in under-employing highly qualified personal, more suited for technically complex tasks, than the simple duties of flying TUAVs. Examining the experience of other countries will help us better understand this issue.

The United States is an important user of TUAVs. Their Army will soon have up to 200 mini and TUAVs integral[61] to their units of action.[62] These units will also

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[59] Department of National Defence. *Operational Air Worthiness*. . ., paragraph 5.

[60] LGen K.R. Pennie, *Command and Control*, 3.

[61] Sandra I. Erwin, "Army to Field Four Classes of UAVs", *National Defence,* Vol. 87, Iss. 593 (April 2003): 33.

[62] The equivalent to a brigade group in the Canadian Forces doctrine. For more information, see: Global Security, "Brigade Unit of Action," http://www.globalsecurity.org/military/agency/army/bua.htm; Internet; accessed on 2 April 2005.

possess their own integral TUAV[63], down to platoon level.[64] In fact, during Enduring Freedom, each brigade (unit of action) was ordered to deploy with integral TUAV support.[65]

The United States has created a trade for its UAV operators with five skill levels – 96U – Tactical Unmanned Aerial Vehicle Operators.[66] They are part of the Army and the most basic skill (level 1) requires that the private be employed as a payload operator, conducts operator maintenance, and prepares and conducts air reconnaissance missions.[67]

Moreover, due to increase demands in Iraq for TUAV support, the US Army has begun to train National Guard soldiers, from the intelligence community, to fly its Shadow TUAVs.[68] Due to the important demand, they are trained in 16 weeks rather than the normal 23 weeks.[69] As of early 2004, 24 soldiers from 629th Military

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[63] LCol M.J. English, "The US Army Modular Force" (Fort Leavenworth, Kansas: file 2525-17 (CFLO CAC)), 15 May 2004. (15 May 2004), 12.

[64] *Army*, "Unmanned Aerial Vehicles", Arlington: Vol. 54, Iss. 10 (Oct 2004): 286-288; http://proquest.umi.com/pqdlink?PMID=26822&TS=1111323495&SrchMode=3&SrtM=0&PCID=13886951&VType=PQD&VInst=PROD&aid=1&clientId=13664&RQT=572&VName=PQD&firstIndex=70; Intranet: accessed on 20 December 2004; 2.

[65] *Army*. "Future Combat System Unmanned Aerial Vehicle Systems (UAVS)". Arlington: Vol. 54, Iss. 10 (Oct 2004) 288-289: http://proquest.umi.com/pqdlink?index=31&did=718379331&SrchMode=3&sid=1&Fmt=3&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1111323769&clientId=13664&aid=1; Intranet; accessed on 20 Dec 2004.

[66] About.com. http://usmilitary.about.com/od/enlistedjobs/a/96u.htm (search for 96u); Internet; accessed on 1 February 2005.

[67] *Ibid*.

[68] Cahlink, George, "Changing of the Guard", *Government Executive,* Washington: Vol. 36, Iss. 6 (15 Apr 2004): 44-49; http://proquest.umi.com/pqdlink?index=4&did=627753751&SrchMode=3&sid=2&Fmt=4&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1111324122&clientId=13664&aid=2. Intranet: accessed on 5 November 2004.

[69] Nato's Nations and Partners for peace. "Army Guards Units to fly Tactical Unmanned Vehicle". Uithoorn: 2004.Vol.47, Iss. 3; pg. 208, 2 pgs: http://proquest.umi.com/pqdlink?index=1&did=676257171&SrchMode=1&sid=1&Fmt=4&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1111324375&clientId=13664 ; Intranet: accessed on 20 Dec 2004.

Intelligence Battalion (National Guard) and 20 soldiers from 56th Infantry Brigade were training as UAV pilots and maintainers to deploy in Iraq.[70]

The US Army has established that piloting a TUAV is not a complex task requiring skills like those of fighter, helicopter, surveillance or transport aircraft pilots. They have also recognized that conventional pilot skills are not required to fly LUNA (a TUAV)[71] and that these systems are easy to operate as the software does most of the work.[72]

The US Army Mission Training Manual for the Corps Aerial Reconnaissance Company makes reference to airspace coordination and air traffic,[73] but makes no reference to the requirement for air crew skill set. In fact, the entire publication refers to skill set requirements much closer to the infantryman and other combat arms enlisted personnel than to those of air crew personnel. One of those skills is what is called "ground sense", or the understanding of what the tactical commander requires and what he intends to do with it. The TUAV operator should work directly for his master and understand the ground effect required in order to search and identify the relevant information and communicate it without delay to the appropriate agency.

But one must be careful when making arguments and drawing conclusions solely based on the experience of the US. Using data from this country alone would

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[70] *Ibid.*.

[71] Henry S. Kenyon, "Silent Eyes Guard Peacekeepers", *Signal* Vol. 59, Iss. 1 (Sep 2004); 51-55, 2.

[72] *Ibid.*

[73] United States, US Army. ARTEP 34-414-30-MTP *Mission Training Plan for the Aerial Reconnaissance Company(Aerial Exploitation (Corps)*, Headquarters, Department of the Army. (Washington, DC, 2 December 2002).

certainly undermine the argument of this paper as many would rightly point out that the CF does not possess the level of resources to keep up with the US. It is more appropriate to look at the experiences of other nations with comparable means and capabilities.

The Australian Defence Force (ADF) size, capability and resources are quite similar to those of the CF. The Australian Army deployed its first TUAV in operations in August of 2003 to the Solomon Islands.[74] The aircraft was owned and operated by an army unit, the 131 Surveillance and Target Acquisition Battery.[75] In the summer of 2004, Australia announced that it would equip f

own the Sperwer, the same system acquired by the Canadian Army to support Operation Athena.

TUAV IN THE ARMY – NATO COUNTRIES
Belgium (B-Hunter (3))
Bulgaria (Yastreb-2S)
Czech Republic (Sojka III)
Denmark (Sperwer)
France (Fox AT; CL-289 (4); MART (1); Crecerelle (2, + 1 EW); Hunter (1); Pointer (1))
Germany (Camcopter; CL-289 (11); LUNA X-2000 (evaluation); Taifun (evaluation); KZO/Brevel (16 ordered))
Greece (Sperwer)
Italy (Mirach)
Netherlands (Sperwer)
Romania (Tu-143)
Spain (ALO)
Turkey (Dogan (evaluation); Kirlangiç (evaluation); Gnat 750; Harpy (more than 100 aircraft ordered))
United Kingdom (Phoenix)
United States (Camcopter (3); Hunter; Shadow 200 (4 ordered); Pointer; Exdrone; Sentry; SASS-LITE; LASS)

Note 1: Canada and Norway are indicated in Janes with a question mark.
Note 2: No info-Estonia, Hungary, Iceland, Latvia, Lituania, Luxembourg, Poland, Portugal, Slovakia, Slovenia.

Table 2: NATO countries TUAV ownership.[80]
Source: *Janes Unmanned Aerial Vehicle and Targets*.

Out of 26 NATO countries, Janes Defence Weekly concluded that 14 had TUAV deployed under the command and control structure of their Army. Janes provided no data for 10 countries (minor military powers), while indicating Canada and Norway as a question mark (see Table 2). This demonstrates that most allied military forces have

[80] Source of data: Janes Unmanned Aerial Vehicles and Targets. *Worldwide UAV and Target Operators*. DWAN: accessed on 30 January 2005 (accessed restricted to DWAN).

already decided, through independent evaluation, that the responsibility of the C2 of TUAVs should reside with their Army.

PROPOSED WAY AHEAD

A simple solution to the issue would help CF in continuing to progress quickly towards the fielding of this important asset. The Army should retain C2 of their TUAVs, under strict control of the Air Force's airworthiness program. The ASCC and FSCC should continue to fill their role as the coordinator of sensors and shooters for units and formations and should participate in joint training with the Air Force to ensure the homogeneity of the airspace users. If the source of the problem is the potential of the Sperwer, i.e. it has more potential than what is required by the Army[81], a different system should be obtained for employment at the tactical level. However, there is a lot of potential savings in training, acquisition and maintenance when sharing a similar platform for multiple functions. If Sperwer is to be kept for Army and Air Force dual use, a single centre of excellent should be established, under the lead of the Air Force to ensure a common standard in operator training and employment. What is important is that the Army's units train and deploy with integral assets manned by soldiers capable of surviving on the battlefield.

This option also ensures that highly qualified aircrews are not under-employed in the day-to-day management of a simple tool such as a TUAV. The danger in setting the bar so high as asking for Air Force trained pilots and aircrew to man the Army's

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[81] Sperwer has a range of up to 75 Km, an endurance of 5 hours and a maximum ceiling of 3,500 m (sources: data from the Royal Canadian Artillery School). This represents a capability higher than the definition of a TUAV provided in this paper and makes the Sperwer able to perform well at the tactical level, and to perform some duties at a higher level.

TUAVs is that they may not be available for training or even operational deployment as more important tasks requiring their skills may need to be filled in priority.

Finally, the most important stakeholder in the process, the Army, would retain ownership and responsibility to ensure the fielding of their own tool. The importance of the ownership cannot be understated. Those who would benefit the most of the fielding of TUAVs should remain in control of its future development in order to ensure that what is required is fielded and resources are not wasted in developing capabilities beyond the requirement of the Army.

CONCLUSION

As the Army continues its transformation, it has to place as much emphasis on the acquisition, development, command and control of its sensors as it has historically placed on its fire power assets. The Army is now engaged on a new path and has accepted that its future capabilities depend as much on sensors as on firepower. The Army FE Concept establishes an increased reliance on "sense".[82] The acquisition of TUAVs and their inclusion in this "system of systems" is a sign that the Army is rapidly adapting to the new battlefield environment.

A point has been made in this paper that although the Air Forces already owns all air vehicle in the CF, it could be more efficient for both services to leave the C2 of its TUAVs to the Army. The fact that so many of our allies use this structure should be an indicator of its efficiency. The simplicity of the system should also be an indicator that important and highly skilled aircrew personal should be oriented towards more important

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[82] Department of National Defence, *The Force Employment. . .*

tasks. This paper also demonstrates that the Army already has a structure that allows it to control the activities of its assets in its airspace. Finally, it has explained how the airworthiness program of the CF would not need to be duplicated in order to accommodate the arrival of TUAV in the Army.

TUAVs represent an important stake in the future of the Canadian Army. As we follow technological developments, an increased number of TUAVs will be fielded to support operations in every possible scenario, from fighting in complex terrain to assistance to civilian authorities. It is importance that a robust and lasting C2 system for TUAVs, supportable in the long term by both the Army and the Air Force, be implemented to avoid wasting time and resources both now, and in the future. The lives of many of the Army' soldiers depend on it.

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