

14<sup>th</sup> ICCRTS

“C2 and Agility”

Title:

**A Summary of the Conclusions from the 2008 Defence Science and Technology Symposium: Understanding the Human Dimensions in 21<sup>st</sup> Century Conflict**

Submission # 070

Topic 4: Collective Endeavors

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## Abstract

In keeping with the ICCRTS's theme of 'C2 and Agility', the following paper discusses the main findings of the 2008 *Defence Science & Technology (S&T) Symposium: Understanding the Human Dimensions in 21<sup>st</sup> Century Conflict*.<sup>1</sup> The overarching aim of the Symposium was to present leading research efforts that are beginning to resolve the many human-centric issues of the current and future security environment.

The Defence S&T symposium was divided into several main parts: 1) The Future Security Environment; 2) The S&T Challenges of 21<sup>st</sup> Century Conflict; 3) Adversarial Intent; 4) Understanding the 'Influence' Battlespace; and, 5) Human Complexity.

By the end of the two-day event three common themes were identified:

- 1) Human-centric conflict requires an **adaptive** military and whole-of-government approach;
- 2) S&T must be an enabler of a **comprehensive approach** to address complex human-centric challenges; and,
- 3) The **operationalizing** of ideas and concepts is tantamount.

In order to further address these three elements, the next Defence S&T Symposium will focus on agility and S&T in support of the Frontline.<sup>2</sup>

This paper highlights leading-edge human-centric research. In the end, it emphasizes the importance of establishing synergies between theory and practice as essential for achieving effective change in a complex environment.

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<sup>1</sup> This paper is based largely on the official Symposium Report entitled "**Colloque S&T Symposium 2008: Understanding the Human Dimension in 21st Century Conflict/Warfare: The Complexities of Human-with-Human Relationships**" *coauthored* with Sofi Blazeski, DRDC Toronto and Peter Tikuisis, DRDC Toronto. DRDC Technical Report 2008-004. August 2008.

<sup>2</sup> While the 'Frontline' conjures up the traditional image of military personnel in close combat with the adversary - frequently referred to as the 'pointy-end of the stick' - it is increasingly recognized that the resolution of current and future conflict requires more than a military solution.

## Introduction

The focus of this year's ICCRTS Symposium is "C2 and Agility". As stated in the call letter, Agility is a key property in the 21<sup>st</sup> Century; especially since military forces are working with an increasing number and variety of partners in carrying out a wide range of missions. In the case of the Canadian Forces, Canada and its allies are engaged in expeditionary operations around the world, ranging from peace-keeping missions to counter-insurgency and stabilization operations, such as those in Afghanistan. These types of missions present challenges that include:

- Determining the underlying dynamics of irregular warfare and how to succeed;
- Recognizing of the importance of the human terrain in conflict, for all parties;
- Understanding how advances in complexity can be applied to expeditionary operations; and,
- Deciding how to develop defence capabilities to meet these challenges.

The following paper discusses the main findings of the 2008 *Defence Science & Technology Symposium: Understanding the Human Dimensions in 21<sup>st</sup> Century Conflict/Warfare* in order to flesh out the complexities associated with these types of operations. *Please note that the opinions and discussions as represented in the paper are non-attributable due to confidentiality issues.*

As part of a three-year series of events, co-sponsored by Chief of Force Development and Assistant Deputy Minister (S&T), this year's Defence S&T Symposium explored the complexities of human conflict – an unavoidable element of expeditionary missions. In 2007, the Defence S&T Symposium set the stage for the theme of the 'Human Dimension in 21<sup>st</sup> Century Conflict' by challenging the S&T community to address several, seemingly intractable human-centric issues that defined the problem space. These issues were captured instructively within the three themes of Person-versus-Person, Person-versus-Nature, and Person-versus-Self. Added to the list, the 2008 Symposium explored the theme of Human-with-Human Relationships – the dynamics of the human dimension.

The overarching aim of the 2008 Defence S&T Symposium was to 'peel back the onion' and present leading research efforts that are beginning to resolve the many human-centric issues of the new and future security environment. In order to do so, the symposium was divided into several main parts: 1) The Future Security Environment; 2), The Science and Technology Challenges of 21<sup>st</sup> Century Conflict; 3) Adversarial Intent; 4) Understanding the 'Influence' Battlespace; and, 5) Human Complexity.

By the end of the two day symposium, three themes emerged that captured the overarching findings of the presentations. These included the following:

- 1) Human centric conflict requires an **adaptive** military and whole of government approach that can respond to conflict amongst the people;
- 2) A rich set of ideas and concepts emerged that now need to be **operationalized**; and,
- 3) Science and Technology (both hard and soft sciences) must be part of a **comprehensive approach** to address complex challenges that the human battlespace entails.

As a result of these findings, the next Defence S&T Symposium in April 2009 will focus on agility and S&T: ‘Taking Care of the Frontline’<sup>3</sup>.

As the ICCRTS call letter articulates and as was discussed at the 2008 Defence S&T Symposium, it is increasingly recognized that the resolution of current and future conflicts will require more than a military solution. Instead, it will require a comprehensive approach that entails a much broader interpretation than previously conceived; one that includes diplomacy and development in addition to defence and security through the engagement of other government departments, non-governmental organization, academia, and industry. In the case of collective endeavors, this requirement is even more demanding due to the multinational aspects of current operations.

A presentation that discusses the main findings of the 2008 Defence S&T Symposium, as well as the 2009 Symposium, and their implications under the topic area ‘Collective Endeavors’ will serve to inform the desired objectives of the ICCRTS symposium. It will do so by laying a foundation upon which the research community can build when addressing the challenges associated with the complex human dimensions of 21<sup>st</sup> Century Operations.

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<sup>3</sup> **Please note** that at the time of writing this draft, the 2009 Defence S&T Symposium will have not taken place. The intent for this paper’s final submission is to capture and integrate the findings in the context of complex endeavors. Please see Annex A for a synopsis of the symposium to be held April 21-23 2009.

## **The Future Security Environment and the S&T Challenges in the 21st Century**

The symposium was co-chaired by the Chief of Force Development (CFD) Major General (MGen) Michael Ward and the Assistant Deputy Minister, Science and Technology (ADM S&T) Robert Walker. In the opening presentations on the Future Security Environment (FSE)<sup>4</sup> and the S&T Challenges of 21<sup>st</sup> Century Conflict, Dr Walker examined how the future is unknown and difficult to predict in large part because of the inherent uncertainty (complexity) of human interactions. To address the challenges that will arise in the future security environment, he posited two questions for discussion: “What is the next shock (e.g., the next 9/11) that is going to radically change our life, environment, and our ability to move forward?” and “How will the world react?” The consequences of the shocks are driven by the interconnectedness at many levels throughout the world: nations; groups; and, even individuals. The science that must be conducted will need to provide future field commanders with the appropriate tool sets to respond to the unpredictable shock(s). This science cannot be conducted in isolation and must involve CF collaboration with the S&T community to build resilience and adaptiveness into CF capabilities, in addition to developing concepts that are tangible to shape CF doctrine for the FSE.<sup>5</sup> Both Dr Walker and MGen Ward agreed that the FSE can no longer be thought of as linear. There are many complex factors interacting in a combination of ways that make the future difficult to predict. Technological solutions were sought in the past, but “Technology is only part of the solution.” The human dimensions (character, culture, disease, migration, population imbalance), economic and social factors, environmental and resource trends, science and technology trends, and military and security trends all need to be considered. Every aspect that is explored must be viewed through a lens that considers the impact to the human, and vice-versa. Therefore, it is not

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<sup>4</sup> The FSE 2008-2030 is a strategic document written by the Chief of Force Development. Its purpose is to explore the future security environment in order to provide those responsible for force development the necessary background to ensure that the Canadian Forces can set and maintain a coherent force structure strategy for what lies ahead. The trends characterizing the future security environment fall into a wide variety of categories: geopolitical, economic and social, environmental and resource, science and technology, military and security.

<sup>5</sup> Most of the symposium presentations suggested that the current/future battlespace for the CF is typified by the kind of conflict being experienced in Afghanistan. This is generally the accepted view for the type of conflict that the CF would be expected to engage in internationally. However, in the domestic and continental context, this is not indicative of the anticipated CF roles.

enough to think about the adversary's intent, those in theater must also be clear of their own intent.

MGen Ward stressed that the military must work with all existing and potential stakeholders to explore how all combinations of factors interact in order to assess, in the defence context, their current and future capabilities. This will inform capability-based planning so that it can be built upon and strengthened, especially when timelines shorten, to ensure that adequate training is provided to CF members and the best possible recommendations are given to senior leaders. The evolving complexity of the FSE will require the CF to take on a more comprehensive, integrated, and cooperative approach that is networked with all disciplines of knowledge, be they governmental, non-governmental, scientific, academic and/or multinational. To accomplish this, the CF leadership has developed the Integrated Capstone Concept (ICC)<sup>6</sup> that goes beyond the 3D (defence, development and diplomacy) and Whole-of-Government approaches. It is intended to ensure that several capability options have been considered before moving forward. In the end, he stressed that. "Complexity demands a comprehensive integrated, adaptive and networked focus ..."

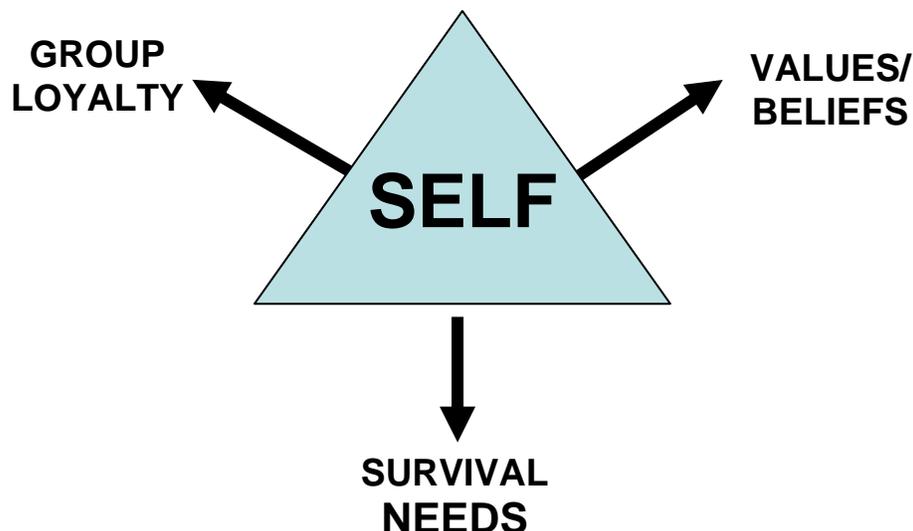
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<sup>6</sup> The Integrated Capstone Concept is an overarching high-level conceptual document aimed at informing all the other unifying concepts about the direction DND/CF should take in the development and sustainment of its capabilities for the next fifteen years ahead. The evolving complexity in terms of the number of new problem sets and also the number of intervening actors demands a comprehensive, integrated cooperation between defence and security partners, adaptiveness at the individual and organizational levels, and a networked focus in the application of the national intent. Networked refers to more than just technology, it included military, political, economic, cultural, organizational and social networks that, "Complexity demands a comprehensive integrated, adaptive and networked focus in the application of national intent."

## Ingar Moen Memorial Lecture <sup>7</sup>

**Recipient: Lieutenant General (LGen) Michael L. Jeffery (Ret.)**

The recipient of the 2008 Ingar Moen Memorial Lecture was LGen Mike Jeffery <sup>8</sup>. His presentation was entitled, “Human Centric Conflict.” The foundation of LGen Jeffrey’s talk was the recognition that all conflict is human and thus begins with an individual at the centre of the conflict dynamic. A better understanding of the individual must therefore take place to deconstruct the conflict environment. For instance, what are the key drivers that motivate an individual’s actions in that conflict environment? He suggested that Maslow’s hierarchy of needs provides a good starting point but when humans are faced with conflict, they are driven by three hierarchical factors: survival needs; values and beliefs; and, group loyalty, as depicted in the diagram below.



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<sup>7</sup> In June 2006, friends and colleagues both in Canada and internationally, were saddened by the passing of Ingar Moen, one of DRDC's most influential scientists. In the corporate office, Dr. Moen was the key driver of the S&T Policy directorate; he was the original thought that drove the first and future S&T Symposia since 2000. He chaired the Disruptive Technology Working Group that has become the generator of ideas for many areas of science policy in the Agency, including the annual symposium. Ingar was key to the development of many strategic documents and activities including the Technology Investment Strategy (TIS) and "*Looking Forward, Staying Ahead*". At the Defence S&T Symposium 2007 the first S&T Symposium keynote lecture was dedicated to Ingar’s memory/legacy. It was determined to make this an annual award entitled the ‘Ingar Moen Memorial Lecture.’

<sup>8</sup> In 1996, Lieutenant General Jeffery was appointed Commandant of the Canadian Land Forces Command and Staff College. In 1997, he was appointed Commander of the 1st Canadian Division and Army Training Authority. In 1999 Lieutenant General Jeffery was appointed Joint Task Force Commander for Operation ABACUS and oversaw the transition of the Division HQ to the CF Joint HQ. On promotion to Lieutenant General on 1 May 2000, he was appointed to the Reserve Restructure Project. Lieutenant General served as Chief of the Land Staff from 8 August 2000 to 30 May 2003. He retired from the CF on 1 August 2003.

When an individual's survival is in question, he/she will often subordinate their other needs until the threat to their survival has been removed. Once removed, the other factors become dominant in shaping behaviour. Values and beliefs are the essence of culture, and an individual is naturally drawn to other people sharing similar values and beliefs; especially in a conflict environment. Joining a group enhances an individual's survival, and confirms one's beliefs and values, which in turn reinforces a person's loyalty to the group. A cooperative relationship, based on mutual beliefs, will then likely develop. Yet, if an individual loses connectivity with the group because of diminishing survival security and/or diverging values and beliefs, loyalty to the group is likely to suffer and the individual may seek different group membership.

LGen Jeffery went on to ask what the framework for understanding adversarial intent meant for the Canadian Forces and the S&T community. He suggested that it means the following: We must have a clear recognition of what motivates others and what this means for group cohesion. We also have to understand relationships within the group and how they will respond. Lastly, we have to determine how to compare factors that guide group cohesion or lack thereof.

The question that arises, therefore, is whether the scientific community can determine how these needs interact to influence an individual, the members of a group, and their actions. One of the audience members commented that ideas cannot be fought with bullets; we need bullets to fight bullets, but we need ideas to fight ideas. How then can the CF use social science knowledge from the scientific community to influence individuals in a group and actions? Ideally, a framework needs to be developed to apply such knowledge in order to predict how the various actors in the conflict environment (belligerents, neutrals, allies) perceive and react to CF presence. This will help provide commanding officers with the most effective ways of implementing a comprehensive approach.

## **Adversarial Intent**

*“The enemy advances, we retreat; the enemy camps, we harass; the enemy retreats, we pursue.” Mao Tse-tung*

Theme: The provision of safe havens for terrorists in failed and failing states, and the promulgation of extremist messaging via mass media characterize some of the current challenges. Further, the media’s immediate and microscopic coverage of unintended actions (e.g., collateral damage) disproportionately undo great deeds in a ‘Hearts and Minds’ campaign. A successful strategic response compels us to understand the adversary and his environment. This strategy must not only anticipate the adversary, it must influence his intent. The art of influence has evolved over millennia; the science of influence could take us much further. Devising a strategy in the ideological battlespace obliges us to look inward to understand ourselves and our intentions in relation to our adversary(s).

### **Panel Members:**

Session Chair: Dr. James Moore, DRDC Toronto

Panelists:

Keynote Speaker: Dr. Martin Rudner, Distinguished Research Chair Emeritus, Carleton University

BGen David A. Fraser, Commandant, Canadian Forces College, DND

Carol McCann, DRDC Toronto

Dr. Walter Dorn, Canadian Forces College, Toronto

Dr. Laure Paquette, Associate Professor, Lakehead University

During the introduction of the adversarial intent panel, MGen Ward set the stage for the panel by emphasizing that a wide area of study will have to be undertaken to understand and address adversarial intent. The Future Security Environment involves new operations, combinations of operations, and new actors. During the Cold War the enemy was predictable but this has now changed and the CF needs doctrine that can address change at the tactical, operational and strategic levels. ‘The adversary ain’t what it used to be’, captures this notion very well. He went on to say that at the core of the Comprehensive Approach lays an effects-based approach to operations (EBAO). This means that there is a need for both quantitative and qualitative analysis because attrition models do not work in the current operational environment.

Dr Martin Rudner opened the panel with his keynote talk entitled, “Inter-Terrorism in Asia: Trends, Targets and Objectives.” His key message was that we need to understand our adversaries

and develop cultural sensitivities. He cautioned that terrorist will attack any weak links in the chain and the members of the cadre are highly educated with advanced degrees in computer science, medicine and engineering as well as philosophy and literature. He went on to argue that the development of science and technology which can address the complexities of adversarial intent is highly necessary to address the challenges, but, technology is not the only tool.

The panel members agreed that the world has witnessed a cultural shift in conflict since the Cold War. The Cold War was characterized by a well-defined enemy whose intent was well understood, which allowed the CF and its allies to prepare for a conflict whereby manoeuvre was largely predictable. As a result, research efforts and CF training focused on kinetic, technological, and engineering solutions to provide the forces with tactical, operational, and strategic advantage. Research involving the social sciences for intelligence and influence operations in the field was secondary. The paradigm has reversed and now the social sciences are recognized as key to ensuring success in the FSE.

The CF has and will continue to interact with multiple actors, many of whom are non-state, with various motivated intentions and grievances that will challenge the CF's ability to identify and respond to adversaries. As BGen Fraser said, understanding human geography and the adversary's worldview must be part of the solution. Identifying the adversary's grievances, be they religious, political, economic or others, such as fanaticism, must also be part of CF training in order to fully appreciate and understand the battlespace so that appropriate influence operations can be implemented to counter the adversary's intent.

This view was expanded upon by one panelist who stated that the battlespace is about people, and not only those that the CF has been tasked to fight and help, but also those back at home. It is important then to understand and apply the nation's intent through a comprehensive approach that includes the CF to deliver the desired effect in theatre and back at home. The role of the front-line soldier has consequently become much more complex, where tactical decisions can have strategic implications. This raises the question of not whether, but how the human dimension can be incorporated into existing CF doctrine to prepare soldiers for interaction with adversaries having an asymmetrical advantage.

The panel members agreed that a greater emphasis on the social sciences, intelligence capabilities, and lessons learned needed to be incorporated into a soldier's professional military

education and to be considered at the beginning of the operations planning process. Several theories and models were discussed by the panel members in the context of adversarial intent including Just War Theory, Underdog Theory, Reasoned Action Approach, and Command Based Models. Certain of these and others are part of the expanding social sciences curriculum at academic defence institutions such as the Canadian Forces Staff College and the Royal Military College.

One panelist stressed the importance of reviewing past conflict terminology. The panelist explained that many historical terms had roots in kinetic force and effects that can have quite different meanings today. For instance, an adversary was defined as a person and/or group with the potential to use kinetic force. Today's adversary can achieve considerable effect via non-kinetic means (e.g., use of the Internet to promulgate hostile intent). As force can take on many forms be they physical, virtual, cyber, and even perceptual, so can adversaries change over time from hostile to neutral to allied.

A comprehensive approach is essential to succeed in the FSE characterized by the dynamism described above. The comprehensive approach can be facilitated by creating a common understanding of language amongst partners. It would also benefit from a more diverse incorporation of social sciences (e.g., anthropology) and partners (e.g., think tanks, academics and UN expertise).

## Understanding the “Influence” Battlespace

Theme: There is no more important resource in the profession of arms than the human. Yet, the challenge of recruiting, training, and retaining a professional military is accentuated due to multiple demands. Today’s military professionals must adapt and perform with multi-functional skills (i.e., from negotiator to applicator of lethal force), in multi-dimensional roles (e.g., 3 block war), and under multiple environmental stressors (both physical and psychological). This challenge is compounded by ensuring moral and ethical decision-making in the face of atrocities and cowardly behaviour (e.g., use of humans as shields). The military professional must not only be **agile** and resilient, but continue to be objectively and emotionally battlespace-mature.

### Panelists:

Session Chair: Catherine Campbell, Director Military Personnel Operational Research and Analysis, Section Head, DND

### Panelists:

Keynote Speaker: MGen Stuart. A. Beare, Chief of Force Development

Keith Stewart, DRDC Toronto

Dr. Megan Thompson, DRDC Toronto

Dr. Derek Gregory, Professor, University of British Columbia and Cambridge University

MGen Beare set the context for the panel “Understanding the Influence Battlespace”. He pointed out that today the battlespace is all about people, “Perception drives attitude, attitude drives behaviour.” In the case of ‘war amongst the people’, influencing perception and attitude in the battlefield is key and this will require a whole-of-government approach. In keeping with this, Keith Stewart pointed out that, “... the ‘target’ is the mind(s) of the relevant individual or group; therefore, psychological and physical effects should be integrated during the planning process.”

Since the end of the Cold War, moral and ethical dialogue has become more acceptable and common practice in CF culture. Indeed, the CF has recognized the need to change training doctrine to ensure that the social sciences and non-kinetic operations are incorporated into the training mix for the Rules of Engagement (ROE). To meet the challenge of “making the extraordinary, ordinary”, the military needs to place a greater emphasis on improving its human intelligence/surveillance capabilities. For example, a better understanding of human geography and of the enduring perceptions and attitudes that drive behavior are training elements that will empower CF members on the ground. Developing non-intermediated communication skills with locals is also recognized as valuable training.

Asymmetric threats in the new conflict environment are particularly challenging to CF members who are faced with moral and ethical challenges in theatre. Training in moral and ethical decision making is currently taught at Gaagetown and Wainwright Canadian Forces Base, and at the Canadian Forces College (Toronto), where much of the doctrine is simulation and lecture-based. A valid concern is whether this adequately prepares CF members to confidently make the right decision when faced with an asymmetric threat, that is, when the Rules of Engagement (ROE) might not necessarily reflect the reality on the ground. Furthermore, what is the impact on the individual that experiences trauma during engagement and what are the resources available to help that individual reconcile strained decision making? One panelist suggested that group discussion and integrated field training before deployment were valuable preparatory options. Another panelist agreed that dialogue needed to occur amongst all soldiers, regardless of rank. In essence, greater emphasis during training needs to be placed on mental rehearsal, open communication (e.g., story telling, dissecting experiences), and human-centric lessons learned.

Every action has a reaction. The CF's presence and actions in the battlespace influence the environment and the people around them, whether intended or not. This can be especially problematic if the second-and-third order effects from these actions were overlooked or unforeseen in the planning process. Hence, finding a way in the planning process to predict these higher order effects is crucial, which would allow planners not only to avoid unintended effects, but also to exploit potentially desired effects to operational advantage. Various methodologies were proposed including probability state modeling of event evolution, post-hoc analysis of event deconstruction, and influence reconstruction.

# Human Complexity

Theme:

*"It's an illusion to think that there is a military solution for Afghanistan."*

This remark exemplifies the need for a non-hierarchical 'whole of government approach' and the increasing reliance on multi-national efforts in response to foreign conflicts. While collaborative efforts promote legitimacy and efficiency, there are many obstacles to ensuring effectiveness. Creating trust and encouraging decision-sharing among peers, superiors, coalition partners, target populations, other government departments, and non-government organizations is a key challenge.

Session Chair: Dr. Jacques Lavigne, Director S&T Human Performance, DRDC

Keynote Speaker: Major General Vincent Desportes, Général de division, l'Armée de Terre de France <sup>9</sup>

Panelists:

John Verdon/Lieutenant Commander (LCdr) Bruce Fraser, Chief of Military Personnel

Dr. Phil Farrell, Defence Science Support Team, DRDC Ottawa

Paul Comeau, DRDC-CORA, Director S&T Integrated Capabilities and Personnel, DND

Keynote speaker, General Vincent Desportes, (French Army) set the stage for the panel on Human Complexity in his talk about conflicts, new tasks and new soldiers. Given the new operational environment, the General suggested that we need to rethink our view of warfare. He noted that, "The forms of war have fundamentally changed and the role and necessary form of the military have changed with them." He argued that increasingly the ground environment (where the population resides) is, and will be in the future, the centre of gravity. In this context, he argued that technology superiority is not an end in itself and it cannot be sufficient, in and of itself, to solve the problem of war. Moreover, he suggested that we must rethink our relationship with technology because technology in and of itself has only rarely decided the outcome of a confrontation – it is only one dimension of conflict. To deal with the various aspects of conflict requires all dimensions of political actions including the ability of operate across all spectrums of conflict and to pay close attention to lessons learned in the field.

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<sup>9</sup> Vincent Desportes is a Major General with the French Army. He is the author of the award-winning book "La guerre probable - penser autrement." The writer of several documents on issues of tactics and strategy, in this book General Vincent Desportes analyzes the evolution in the circumstances of conflict and describes the conditions of the new military efficiency.

Following Gen Desportes's presentation, the panel went on to acknowledge that in order to respond to the complex demands that are upon military operations today, and which will be faced in the future, a broadened approach must be considered that incorporates all of the dimensions of military actions, while considering all of the resources available to the adversarial community. Human complexity entails uncertainty and no matter how well-prepared one is or how well understood one's adversary is, human behaviour is complex and the resultant interaction amongst humans evades certainty of outcome. Two factors currently working against defeating the adversary are its unpredictability and the 'top-down' structure of military command that makes it difficult to react with agility when faced with uncertainty. The military needs to find ways to work across these hierarchical levels to react quickly, but flexibly, to changing circumstances while keeping as many people as necessary, adequately informed and in-the-loop. Given the emergence of the whole of government approach, it is also essential that quicker and easier communications be established to ensure the success of a comprehensive approach. Establishing effective modes of communication as well as the rules, regulations and policies between and among organizations will be the challenge.

Adversaries are also adept at change and they have embraced communications technology to their advantage. For example, their use of the Internet to distribute information and to recruit new members has allowed them to network as strongly or loosely as required, or to re-configure into smaller entities if necessary. One panelist suggested that this use of Internet technology has brought the battlespace into the home front. It has also introduced the notion of 'the death of distance' and changed the time constraints for taking action. Changes to military doctrine have been initiated to respond to this new reality. These changes are aimed at developing inter-force synergies, improving participation in multinational operations, and advancing forms of information technologies. However, as our technological capabilities advance, so too do those of the adversary. Infiltration of the adversary's communication capabilities remains key to mission success.

Another panelist suggested that the military needs to fine-tune its procedures and incorporate the digital environment and associated technologies into CF doctrine. Social networks in a nonhierarchical social environment have done this successfully. Could this be built into a military context under the concept of 'Responsible Autonomy', which begs the question "can this be done without having someone in charge"? The belief is that responsible autonomy comes with accountability since everything in the digital world is recordable and thus transparent. Yet another

panelist commented that everything does not necessarily get recorded on the Internet, and hence accountability is not assured. However, a sense of responsibility develops once relationships are established. Ultimately, the former panelist rebutted that there were two positive dimensions to transparency via electronic networking: 1) it brings accountability, which reinforces the internalizing of professionalism, and 2) it facilitates an agile response. Responsible autonomy in a non-hierarchical military network should work because CF personnel believe in service before self and work for altruistic ends, which reflect the essence of internalized Canadian values and military professionalism.

## **Conclusion**

Based upon the panels, presentations and discussions over the two-day event, several broad conclusions were gleaned. The battlespace is no longer about winning the next high intensity conflict; it is about establishing the conditions for self-sustaining stability. Military operations in the FSE will have to incorporate the human centric aspects of war to successfully empower the front line to dominate and influence human geography. Although doctrine has been slow to change, Canadian military leaders have acknowledged this change in the battlespace and are preparing the forces by stressing the importance of relationships and integrating lessons learned. “A new idea can take up to 15 years to work through the military system.” is how Dr. Walker expressed the evolution of a capability. So how can science and technology continuously progress and be accomplished faster to ensure our forces are prepared for the FSE? The Defence S&T Symposium signaled the way ahead with the need for an agile comprehensive approach. The recommendations that came out of the three thematic sections were: 1) the CF must become more agile and adaptive in its response to the evolving battlespace; 2) a rich set of emerging concepts and theories is developing that can enable this change; and 3) the S&T community must be part of the comprehensive approach.

The post Cold War era has witnessed a shift away from the use of distant kinetic force and the shift towards the close war among the people. The current and FSE battlespace is about people and establishing the conditions for self sustaining stability. To understand the human is to have enormous opportunity to influence behaviour and to ideally achieve desired effects without actually exercising explicit power. By working towards the development of models and concepts to better understand and influence the human in the battlespace, the S&T community will be well placed to enable an agile and adaptive CF. However, this effort cannot be accomplished

independently. The scientific community has been called upon to collaborate with other government departments, non-state actors and other nations to establish the means to facilitate the comprehensive approach.

Among the rich set of concepts and theories discussed at this year's symposium is the suggestion that 'it is not enough to think about what the adversaries intent is; we need to be clear on what our intent is'. To do so would provide a perspective for truly understanding and successfully influencing the adversary. The CF must not view the adversary through a one-way lens but rather consider how its actions will impact and influence his behaviour. The importance of understanding the adversaries' intent underlines how the CF devises, develops and executes influence operations.

Time horizons have shortened. Operational tempo is such that the CF is often in uncharted territory and its operations sometimes become experimental. There is a need to accelerate the rhythm of S&T, to develop and provide more actionable concepts, models and theories so that they can be exploited by the CF on the ground without delay. The commitment of the 'system' to actually exploit results is a great challenge. As Dr. Walker emphasized, the challenge is not generating the next bright idea and engineering it for use, but rather the commitment of the system to exploit that idea. Open and clear communication must be established between all stakeholders to continuously progress and communicate concerns in order to positively make a difference to empower our soldiers on the front lines.<sup>10</sup>

## **The Way Ahead: Taking Care of the Frontline**

The Defence S&T Symposium 2009 will continue to focus on the human dimension of conflict and explore ways to operationalize the rich set of concepts and theories identified in this year's symposium. To truly make a difference for the CF in the FSE, the following two themes will be explored further: 1) empowerment of the front lines; and, 2) realizing the comprehensive approach through an **agile** military and government.

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<sup>10</sup> Again, as mentioned at the outset, at the time of writing this draft, the 2009 Defence S&T Symposium will have not taken place. The intent for this paper's final submission is to capture and integrate the findings in the context of complex endeavors. Please see Annex A for a synopsis of the symposium to be held April 21-23 2009.

## Annex A

### ABSTRACT

Defence S&T Symposium 2009, April 21-23

## Understanding the Human Dimension in the 21st Century Conflict/Warfare *Taking Care of the Front Line*

The Defence S&T Symposium 2009 is the last of a three-year series of symposia to explore the complexities of human conflict in the new and future security environment. In 2007, the first symposium set the stage for “The Human Dimension in 21<sup>st</sup> Century Conflict/Warfare” by challenging the S&T community to address several, seemingly intractable human-centric, conflict issues that define the problem space. In 2008, the second explored these challenges further by exposing the rich and novel set of scientific concepts encapsulated by three themes: 1) adversarial intent; 2) the battlespace of ideas and influence; and 3) the complexity of human behaviour.

In order for the numerous concepts and ideas that emerged around the previous themes to truly make a difference for the Canadian Forces (CF) and its partners in the future, they must be implemented, or, as envisaged by the symposia sponsors, “operationalized.” Under the theme, “Taking Care of the Frontline”, the achievement of this objective is the focus of Defence S&T Symposium 2009.

The “Frontline” conjures up the traditional image of military personnel in close contact with the adversary, frequently referred to as the “pointy-end”. However, it is increasingly recognized that the resolution of current and future conflict requires more than a military solution. It requires a “whole-of-government” approach (together with multiple external players) that entails a much broader interpretation than previously conceived. Such a concept includes diplomacy and development, in addition to defence and security, through the engagement of other government departments, non-governmental organizations, academia and industry, collectively termed the “Comprehensive Approach”. The “Canada First Defence Strategy (CFDS)”<sup>11</sup> states the requirement:

*“...for the Canadian Forces to support the Government’s broader national security and foreign policy objectives by maintaining the ability to deliver excellence at home, be a strong and reliable partner in the defence of North America, and project leadership abroad by making meaningful contributions to operations overseas...”*

This mandate cannot be effectively achieved in isolation of diplomatic and development efforts. Indeed, the Department of National Defence (DND) is a valued contributor in these domains and a leader in many of its endeavors. Notwithstanding the criticality of the “frontline of defence and security”, success in the “frontlines of diplomacy and development” can help alleviate the need for the former. There may, in fact, be only one “frontline” – a complex mixture of all elements.

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<sup>11</sup> See Annex B

Diplomacy is a crucial activity of negotiations that occurs preceding conflict and it continues, to varying degrees, during and post conflict. From an S&T perspective, diplomacy calls for the application of scientifically-validated technologies in the realms of intelligence and influence, where the complexities of human conflict are most evident. Forecasting conflict (“early warning”), strategic war-gaming, cultural mapping, influence psychology, future scenario development, etc., are amongst the many pertinent applications of science in this domain.

Development efforts involve a variety of personnel directly engaged in activities ranging from humanitarian relief to construction projects in conflict-torn regions. This diversity exemplifies the requirement for a “Comprehensive Approach” perhaps more than either diplomacy or defence and security given the mix of external players that co-exist in theatre including the local population. As recent operational experience has demonstrated, developmental efforts in a complex, hostile environment are reliant on extremely difficult security arrangements that require a long time horizon and a multi-dimensional, multi-pronged approach. Relevant S&T efforts in support of “frontline” activities in development apply to command and control for achieving common intent, collaborative partnerships, influence operations, and cultural awareness as well as others.

The dimension of defence and security brings us back to the “pointy-end”. “Taking Care of the Frontline” demands attention to the operational spectrum, from performance to protection, during the entire “pre-, during, and post-deployment” cycle. This requirement goes beyond force employment; it also involves force generation and force development, collectively covering training, readiness, and re-integration, to ensure the physical, mental, and emotional well-being of the “frontline”. The challenge of recruiting, training, and retaining a professional “frontline” military is accentuated by the expectation that these professionals must adapt and perform with multi-functional skills in multi-dimensional roles (i.e. from negotiator to applicator of lethal force) under multiple environmental pressures (e.g. psychological, as well as physical). Dedicated S&T efforts are varied and numerous (e.g. stress inoculation and management, moral and ethical decision-making, combat casualty care, advanced weapons, communications, and decision aids, etc) to ensure optimized performance and protection.

The lessons learned and the wealth of experience gained in recent counterinsurgency operations put the CF in a strong position to set into practice these lessons and experience in the form of doctrine, concept of operations, social/psychological understanding of the precepts and practices of the adversary, etc., in various defence and security environments. “Operationalization” of S&T expertise in support of these efforts will permit the partners in the “Comprehensive Approach” to respond more effectively and efficiently to the strategic, operational, and tactical challenges in the future.

The Defence S&T Symposium 2009 will conclude the series of symposia that explored the “Human Dimension in 21<sup>st</sup> Century Conflict”. It will examine the “operationalization” (implementation) of significant, innovative, and scientifically-validated technological advancements that can enable those in the “frontline” of diplomacy, development, and defence and security in the effort to achieve a “Comprehensive Approach” to operations. Attendees will be invited to share their experience to discuss and to probe how to “operationalize” ideas and concepts under the integrated thrusts of ‘protecting the “frontline” and “achieving the Comprehensive Approach”. This task may seem relatively straight-forward; however, upon closer analysis, “Taking Care of the Frontline” is, according to Sherlock Holmes “...a three-pipe problem” and exceedingly complex.

The Defence S&T Symposium series was created to explore new frontiers in science and technology and within this event we will have a session dedicated to explore the “super empowered individual”. This session will help set the scene for 2010 where we will return to exploring emerging and potentially disruptive science and technology in the human, information and cognitive domains.

## **Annex B**

### **Canada First Defence Strategy<sup>12</sup>**

**May 12, 2008**

The future security environment calls for a combat-capable, flexible, multi-role military. Recognizing this, the Canada First Defence Strategy sets out a vision for future operations as well as the funding required to support it. This vision, coupled with committed long-term funding, will allow the Canadian Forces to maintain excellence in operations at home, be a solid partner in continental defence, and fulfill a leadership role abroad.

The continued effectiveness and sustainability of the Canadian Forces requires a long-term framework to address demand across the four “pillars” upon which military capabilities are built – personnel, infrastructure, readiness and equipment. Military capabilities are developed over long periods of time and are the product of continued investment in the four key pillars.

To support its Canada First Defence Strategy, as proposed in Budget 2008, the Government is establishing predictable, long-term funding to expand the Canadian Forces, modernize CF capabilities, increase CF readiness and ensure the viability of infrastructure, striking the right balance among the four pillars on which military capabilities are developed. All of these investments will guarantee that the Canadian Forces can meet Canada’s future defence and security requirements, and ensure both the enhanced security of Canadians at home and a stronger voice for Canada on the world stage.

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<sup>12</sup> *Canada Defence First Strategy* backgrounder is available at: <http://www.forces.gc.ca/site/news-nouvelles/view-news-afficher-nouvelles-eng.asp?id=2648>

## **Executive summary**

### **Defence S&T Symposium 2008: The Complexities of Human-with Human Relationships**

Approximately 200 participants took part in the Defence S&T Symposium 2008 held in Ottawa on 20-21 May. This was the eighth Symposium, and the second co-sponsored by the Chief of Forces Development, DND and DRDC. The purpose of Defence S&T Symposium 2008 – part two of a three year series - was to further explore human-centric conflict issues. The 2007 Symposium challenged the S&T community to address these issues, which were captured within three conflict domains: *Person-versus-Person*, *Person-versus-Nature*, and *Person-versus-Self*. The opening remarks by the Symposium Moderator (DRDC Chief of Staff) reflected upon the past symposia and noted that this year the symposium came together to explore the human dimension of conflict and the complexities of human-with-human relationships. This symposium was intended to ‘peel back the onion’ and present leading research that is beginning to resolve human-centric issues in the new and future security environment. The CF have an unfamiliar adversary in a battlespace largely governed by ideology, thus we have an urgent requirement to improve the preparedness and protection of our frontline combatants. Moreover, an actionable understanding of the multi-organizational response to conflict is needed. In order to structure discussions, the Symposium was organized along the following three themes: Adversarial Intent; Understanding the ‘Influence’ Battlespace; and, Human Complexity.

The Chief of Force Development in the opening presentation on the Future Security Environment (FSE), addressed the emerging strategic capability planning processes and results for the CF. The FSE 2008-2030 is a strategic document whose purpose is to explore the future security environment, in order to provide those responsible for force development the necessary background, to ensure that the CF can set and maintain a coherent force structure strategy for what lies ahead. He explained that the trends characterizing the future security environment fall into a wide variety of categories: geopolitical, economic and social, environmental and resource, science and technology, military and security. More than ever before the battlefield is complex; therefore, he stressed that the military must work with all existing and potential stakeholders to take on a more comprehensive, integrated and cooperative approach. In order to do so, the CF has developed an overarching strategic concept that is called the Integrated Capstone Concept.

In his follow-on presentation, ADM (S&T) discussed the associated S&T challenges in the future security environment. The two key challenges he raised included our ability, or lack thereof, to determine the next radical shock and how the community react to it. He also noted that the unpredictability (complexity) of human interactions requires an accelerated rhythm of S&T, so as to give the CF the necessary toolkit to operate effectively in the current battlespace.

The Adversarial Intent panel emphasized the need to be better able to understand our adversaries and their intent. However, intent is often very difficult to determine and, without knowing intent, it is very hard to defend against. Moreover, it is necessary to recognize that ‘war amongst the people’ is the current operational reality; terrorists will attack any weak link in the chain, so appropriate S&T is essential for protective security. More emphasis on social science, intelligence capabilities and lessons learned need to be integrated into a soldier’s professional development and training. Combating our adversaries will entail a comprehensive approach that goes well beyond the military.

The session on Understanding the ‘Influence’ Battlespace built upon the previous session’s theme. Understanding that the battlespace is all about people is crucial, since “perception drives attitude and attitude drives behaviour”. The CF presence in and actions on the battlespace influence the environment and the people around them, whether this influence is intentional or not. More and more, CF members are faced with moral and ethical decision-making in the field. Given this reality, finding a way in the planning process to predict higher-order effects is crucial. This would allow planners not only to avoid those higher-order unintended effects, but also to exploit potentially desired effects.

The last theme to be addressed was Human Complexity. As ADM (S&T) remarked at the outset, there is a difference between complicated and complex. When things are complicated, they can be broken down into pieces and be understood. However, when things are complex, they are neither predictable nor easily understood. Human behaviour is complex and the resultant interactions evade certainty of outcome. Our adversaries are adept at change and as our technological capabilities advance, so too do those of our adversaries. Panelists identified two factors currently working against our ability to defeat the adversary: 1) the unpredictability of the adversary; and, 2) the ‘top-down’ structure of military command which makes agility difficult.

ADM (S&T) and the CFD wrapped up the symposium noting that a rich set of ideas and concepts emerged during the two days. It has become clear that CF doctrine has changed, not just conceptually but in reality. War has become 'war amongst the people;' the end goal is not to win the last battle, but to establish the conditions for self-sustaining stability. The ability to influence has become as important as kinetic effects and, notably, science can enable this ability. The science and technology community must be part of the comprehensive approach that includes other government departments, non-governmental organizations and academia, in order to influence the system. Next year's symposium will continue to 'peel back the onion'. The challenge will be to move from theory to practice in order to operationalize the concepts that emerged from this year's Symposium. Ultimately, the requirement will be to 'Enable the Frontline'. Whilst the focus of the Symposium was largely on the Challenges for the CF, it was recognized that these challenges are made ever the more complex in a multinational operating environment.

## **List of symbols/abbreviations/acronyms**

3D Defence, Diplomacy, and Development

ADM Assistant Deputy Minister

BGen Brigadier General

CF Canadian Forces

CFB Canadian Forces Base

CFD Chief of Force Development

DRDC Defence Research and Development

DND Department of National Defence

EBAO Effects Based Approach to Operations

FSE Future Security Environment

ICC Integrated Capstone Concept

LCdr Lieutenant Commander

MGen Major General

NRC National Research Council

ROE Rules of Engagement

SCR Strategic Capability Roadmap

S&T Science and Technology

TIS Technology Investment Strategy

UN United Nations

iv | October 2008 | Ground-level ozone in the 21st century. The Royal Society. 11 Conclusions and recommendations. 11.1 Ground-level ozone as a global pollutant 11.2 Ground-level ozone chemistry – relevance to ozone control 11.3 Ground-level ozone in the future 11.4 The effects of climate change on future ozone concentrations 11.5 Impacts of ozone on human health 11.6 The environmental impacts of ozone 11.7 Improving ozone policy 11.8 Science and research.Â Chair of Environment and Human Health Peninsula Medical School (Universities of Exeter and Plymouth) and Member of the Royal Commission on Environmental Pollution, UK. Professor Dick Derwent OBE. The paper thus enriches the understanding of the processes used to establish common ground in a NEC context, based on an inductive methodical approach. This approach could be particularly valuable for further organizational development based on empirical descriptions and analysis of the current state of coordination among military units and services.Â A Summary of the Conclusions from the 2008 Defence Science and Technology Symposium: Understanding the Human Dimensions in 21st Century Conflict. O. White. ICCRTS. 2009. VIEW 1 EXCERPT. Multiple Group Coordination in Complex and Dynamic Task Environments: Interruptions, Coping Mechanisms, and Technology Recommendations.