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DND's Intelligence, Surveillance and Reconnaissance (ISR):

"Eyes and Ears" for Canada

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Abstract

"Sovereignty is a vital attribute of a nation-state. For Canada, sovereignty means ensuring that, within our area of jurisdiction, Canadian law is respected and enforced." To ensure that the law is enforced, the government must know what is happening throughout their area of jurisdiction in a timely enough fashion to enable an appropriate response. While DND has a significant role to play in providing modern ISR capabilities for the support of government requirements, the department is hampered by a surveillance policy vacuum and the results of nearly a decade of budgetary reductions. Nevertheless, DND has provided leadership and significant expertise in a variety of forae to the benefit of the nation. DND continues to lead in protecting our sovereignty through the creation of a strategic framework for, and investment in, the development of modern ISR capabilities, thus providing "eyes and ears" for Canada.

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INTRODUCTION

"Sovereignty is a vital attribute of a nation-state. For Canada, sovereignty means ensuring that, within our area of jurisdiction, Canadian law is respected and enforced." [1] To ensure that the law is enforced, the government must know what is happening throughout their area of jurisdiction in a timely enough fashion to enable an appropriate response. This requires that the relevant government departments and agencies (Solicitor General, Royal Canadian Mounted Police, Canadian Security Intelligence Service, National Defence, Customs and Revenue Agency, Justice, Transport Canada, Environment Canada, Fisheries and Oceans, etc) conduct surveillance throughout their areas of jurisdiction to ensure compliance with the laws and acts that they are charged to enforce, and that they keep the government informed of illegal activities in, and challenges to, our territory. The Department of National Defence (DND) plays a key role in providing surveillance for the nation:

> "The provision of surveillance and control is an integral part of the Forces' activities in Canada…. Responsibility for many of the Government's activities in the surveillance and control of Canadian territory, airspace and maritime areas of jurisdiction lies with (other government departments and agencies)…. The Canadian Forces, however, make a valuable contribution to this demanding task, which often requires capabilities of greater readiness and reach than those available to (the other government departments and agencies)."[2]

It also requires coherent governmental direction, resources and oversight to ensure that the required surveillance occurs in an efficient and coordinated fashion. A policy vacuum currently exists in that the Canadian government has neither a national security strategy[3] nor national surveillance strategy for either the coordination of departmental surveillance efforts or the sharing of surveillance information.[4] The result is that government departments and agencies

are left to unilaterally interpret their obligations and set priorities for acquisitions and operations within their budgets. More importantly, they are largely left to unilaterally prioritize what they will no longer do when faced with budget reductions, such as those experienced by most government departments through the 1990s. DND's response to the surveillance policy vacuum and their budgetary reductions was to identify Intelligence and Information as one of eight "capability areas" for prioritization and development within a future-focused departmental strategic capability framework.[5] The strategy, "Shaping The Future Of The Canadian Forces: A Strategy For 2020," also acknowledges that defence is a component of national security and that DND is responsible for supporting other government departments in achieving national goals.[6] Accordingly, DND's focus on developing modern ISR capabilities for future military operations will be of great benefit for Canada in that these capabilities will be available for use domestically in support of national requirements.

DND IN DOMESTIC SURVEILLANCE

Canada is an immense nation that both occupies a strategic geographical position in relation to the United States and has a rich wealth of natural resources. Our geography attracts international attention for a variety of reasons, not the least of which include American security concerns. Our natural resources increasingly attract the interest of other nations. Their interests range from energy resources to eco-tourism, and they generate concerns for Canada over such activities as terrorism, illegal or unauthorized entry into Canadian territory, poaching of our wildlife and fish stocks and pollution of our maritime habitats. DND will increasingly be capable of providing significant ISR capabilities in support of other government department's (OGD) stewardship of resources within the 10 million square kilometers of landmass, over 10 million square kilometers of ocean and the related airspace that Canada claims as territory.[7]

During the past fifty years Canada has experienced a variety of challenges to both our territory and resources. North American security concerns during the Cold War era were based largely upon the threats posed by Soviet ICBMs, manned bombers and submarines. At least two Soviet ice stations drifted through the Canadian arctic in the early 1960's,[8] and they created a significant security concern for Canada and the United States, once they were discovered. These ice stations were capable of conducting under-ice research and surveillance, and they had operational runways for re-supply from the USSR. Canadian sovereignty claims over the Northwest Passage became an issue with the transit of the American oil tanker Manhattan in 1969.[9] The issue of sovereignty over the passage remains unresolved today, and interest in the Northwest Passage grows as it becomes increasingly accessible, and therefore commercially beneficial, for longer periods of the year.[10] Concerns regarding the smuggling of illegal immigrants into Canada were heightened in August of 1986 when lifeboats full of illegal Tamil immigrants were discovered off Newfoundland, and again in July of 1987 when illegal Tamil immigrants were discovered ashore near Lockeport, Nova Scotia.

The 1990s were the beginning of the post-Cold War era, and they were characterized by significantly reduced, but evolving threats to Canada and the United States. Boatloads of illegal Chinese immigrants were discovered off Vancouver Island by patrolling Auroras in July and August of 1999, and there were credible indications that more were planned. Canada became a popular offload destination for aerial and maritime drug importation due to the effectiveness of the American efforts to counter them. Anecdotal evidence of poaching of Canadian wildlife on Ellesmere Island exists, and DND ships and aircraft maintain a constant vigil for commercial

vessels that pump their oily bilges in the sensitive ecological areas of our maritime approaches. These unlawful activities continue to occur despite the Canadian and international regulatory frameworks that are in place to control them. The increasing presence of commercial and research vessels, eco-tourists and airline passengers in the Arctic also represent a growing Search and Rescue (SAR) challenge for DND, which is responsible for Canada's SAR response. The other significant surveillance challenge of the 1990s was the government's focus on deficit reduction, and the resultant decrease in DND's surveillance capacity from budgetary reductions between 1994 and 2000. More on this later.

There were no significant changes to the resource allocations for domestic maritime surveillance as DND entered the twentieth century. September 11th, 2001, ("9-11") saw an immediate increase in the ISR focus of NORAD as the United States and Canada responded to the attacks on New York and Washington. The same increase occurred for DND's intelligence and information (the "I" component of ISR) activities, while maritime surveillance and reconnaissance activities remained relatively unchanged in the absence of an immediate maritime threat. A subsequent reduction in domestic surveillance capacity occurred in 2002 as Auroras were deployed to contribute to the war on terrorism in Operation Apollo, and again as aircraft were removed from operational availability as the Aurora modernization project scaled up.

Prior to talking further about reductions in DND's surveillance capacity it is useful to consider the question of "how much surveillance is enough." The "right amount" of surveillance is determined by what a nation is prepared to invest to guard against whatever the assessed threat

is. Whether or not there was enough military surveillance capability during and after the Cold War is open to debate. Arguably, Canada had "enough" as we were effective contributors to the NATO efforts widely credited with ending the Cold War, and we have not been irreparably damaged as a nation by unidentified activities in our territory. The government either felt that there was "too much," or that they could take greater risk by having less military surveillance capability in order to provide revenues for other concerns during the 1990s. Regardless of the reason, the impact of defence budget reductions on surveillance capability apparently did not influence their decisions. In any event, there were large tracts of Canadian territory and maritime approaches that were not surveilled for extended periods of time during and after the Cold War, and perhaps Canada was lucky in some regards. Nevertheless, it is difficult to objectively identify what the "right" amount of military surveillance is in the absence of a national policy that defines DND's responsibilities in terms of quantity, quality or time. In any event, maritime surveillance is currently one of the key topics of discussion for the Canadian-United States (CANUS) Bi-National Planning Group in Colorado Springs,[11] and whether or not Canada now has "enough" maritime surveillance capability may well become a topic of discussion.

The post-Cold War geo-strategic environment, budgetary constraints and lack of national surveillance direction in the late 1980s and1990s resulted in the Canadian Forces termination of an underwater surveillance program, elimination of the coastal patrol surveillance capability represented by the CP-121 Tracker and CC-144 Challenger, [12] cancellation of a Coastal Patrol Aircraft project A2497,[13] the reduction by almost 50 percent of the long range patrol (LRP) maritime surveillance hours provided by the

CP-140 Aurora to the navy and the virtual cancellation of LRP arctic patrols during the mid-to late 1990s.[14] On the plus side, surveillance of Canadian airspace, conducted by the bi-national North American Aerospace Defence command (NORAD), survived relatively intact. This last point is significant in that most, (not all), internal concerns regarding DND's domestic surveillance capability from the mid-1990s onwards relate to the arctic and maritime areas of responsibility, those areas affected by the surveillance policy vacuum. Put another way, resources were made available where policy and plans for surveillance existed. DFO offers another example of the importance of having departmental surveillance strategies. They began contracting for commercially available aerial surveillance in 1989 when they found they could no longer rely on support from DND.[15] Unlike DND, DFO had a well-defined fisheries surveillance strategy, and the government acknowledged both its existence and importance with additional funding post "9-11." This support enabled them to "expand their aerial surveillance program….(to) an enhanced level to gather information for security purposes, in addition to increased fisheries enforcement and pollution detection,"[16] support which was formerly provided by DND on behalf of DFO, Transport Canada and Environment Canada prior to the fleet and budgetary reductions of the 1990s.

So what does this all mean with regards to DND's current role in, and capabilities for, domestic surveillance and the related security of Canada? Prior to the "9-11" attacks it appears that the department was able to respond adequately to the surveillance challenges they faced within Canada's area of jurisdiction. There were no incursions into Canadian airspace that the Canadian Region of NORAD (CANR) was not able to deal with, and there were no known incursions into our territory or maritime areas of jurisdiction that were not responded to. That is

not to say that nothing happened in the arctic, or that no illegal activities occurred in the maritime areas of jurisdiction formerly patrolled by DND. We simply do not know as DND's aerial surveillance activities were reduced, and no comparable technologies were put in their place.

The navy, on behalf of National Defence, was also engaged in the Inter-governmental Program Coordination and Review Committee (IPCRC).[17] Their participation led to their development of the Canadian Maritime Network (CANMARNET) and the associated procedures for the gathering and sharing of maritime surveillance data with other government departments. The Navy's leadership and progress in developing data fusion centers, and their work on a next generation Maritime Information Management and Distribution Exchange (MIMDEX),[18] represents a significant contributions to developing interdepartmental cooperation and capability in maritime security on behalf of DND.

DND AND INTERDEPARTMENTAL COOPERATION

Military assessments of the "dangerous and unpredictable world"[19] and the growing importance of information proved to be prescient in light of the "9-11" attacks on the United States. As mentioned earlier, Strategy 2020 acknowledged that DND is responsible for supporting other government departments in achieving national goals. Consequently, there is an implicit requirement for defence information and intelligence to draw from, harmonize with and contribute to national information and intelligence as it cannot be effectively acquired, interpreted and employed in isolation. This, in turn, requires that defence information systems and procedures be compatible with national and international systems and procedures. While this appears to be an obvious statement, the reality is that interdepartmental and agency

cooperation remains constrained by both legislation and departmental cultures that endure from the pre-"9-11" era. A senior naval officer identifies that the exchange of information in maritime security is limited, and that while coordination between departments works for specific issues, the day-to day coordination for surveillance needs to be "greatly improved."[20] Two examples of this are the vulnerability of CSIS intelligence sources to legislation governing evidence used in RCMP criminal investigations[21] and the iterative process, and time, required for the navy to gain access to DFO surveillance data on the east coast, notwithstanding their work together in the IPCRC.[22] In the first example, the legal requirements for the RCMP to reveal evidence and sources in criminal proceedings would expose any CSIS sources that may have assisted in identifying and stopping criminal activity. This legal requirement is counter-productive to CSIS' work and creates barriers to CSIS cooperation with the RCMP in the interest of public security. Amendments to Canadian law are required if the nation is to be better protected through the improved sharing of information between these two agencies. In the second example, the navy's access to DFO information on the east coast was limited to a subset of DFO's surveillance data for their shared areas of interest for an extended period of time. While the situation has now improved, this example is illustrative of a cultural barrier to sharing information based upon resource issues, and not the good of the nation. DFO limited DND's access to their data in part due to reductions in DFO's access to LRP surveillance hours, (resulting from defence budget reductions), and in part because the data came from a commercial contract paid for exclusively by DFO.

Nevertheless, interdepartmental cooperation has improved post "9-11" due to the government's revitalized focus on security issues through the Cabinet Ad Hoc Committee on

Public Security and Anti-terrorism (PSAT).[23] September 11th, 2001 caused a re-awakening in government departments and agencies to the need for greater collaboration in developing their interoperability and in the sharing of information. The PSAT now provides a forum for governmental analysis of risks versus threats, and the assessment of resources and options available to conduct the desired surveillance. Upon identifying a security threat that spans the jurisdiction of more than one department or agency, PSAT takes steps to identify a lead department and provides the necessary direction, and resources when necessary, to address the concern. The continuing challenge before them is how to regenerate any required surveillance capabilities lost through the 1990s, and how to generate any new capabilities required for the new security environment in a coherent and effective fashion.

The PSAT is supported in part by the Interdepartmental Committee on Security and Intelligence (ICSI). Chaired by the Clerk of the Privy Council Office (PCO),[24] ICSI meets to coordinate and ensure the effective acquisition and sharing of information amongst the Canadian intelligence community, which includes the DND. While the PSAT is a step in the right direction, the cultural and legal challenges remaining within the larger intelligence community cause doubt for some that the ministerial policy coordination of the PSAT will be reflected in the functional coordination at the operational level.[25] Regardless, there is anecdotal information from those involved that this coordination is improving as a result of ICSI's work. The Interdepartmental Maritime Security Working Group (IMSWG),[26] chaired by Transport Canada, was also formed post-"9-11" to coordinate maritime security activities and information sharing, (as opposed to IPCRC's focus on departmental programs). One of the major achievements of the IMSWG was the preparation of an inaugural marine security plan for the PSAT, which was

approved by Cabinet in December of 2002. The plan prioritizes security gaps in existing security systems and processes, identifies solutions and allocates resources to solve them.[27] As with the IPCRC, the navy is fully engaged in the IMSWG on behalf of DND. Indeed, it is quite likely that the navy's continued work in developing Measurable Maritime Surveillance Requirements and their own ISR Blueprint[28] was fundamental to the development of the IMSWG's marine security plan.

WHITHER DND

As a government department that remains charged with national surveillance responsibilities, DND must develop modern ISR capabilities to meet its defence mission. One of the fundamental issues that needs to be resolved to succeed in this is the identification of what DND is actually responsible for doing in terms of domestic surveillance. In the absence of national policy, and to help identify the military capabilities that are required, the air force has undertaken to define national surveillance requirements on behalf of DND and the government.[29] In assuming this lead, DND will not only identify the military surveillance capabilities to be developed, but also a surveillance framework from which the government may begin to develop national guidance and departmental surveillance capability plans.

In the meantime, DND's Strategy 2020 provides the framework for development of the department's ISR initiatives. The Deputy Chief of the Defence Staff (DCDS) and the Associate Deputy Minister Information Management [ADM (IM)] are assigned specific responsibility for executing the departments "change objectives" related to ISR capability development. [30] While not specifically mentioned, it is important to identify that Defence Research and Development Canada (DRDC) plays a significant role in providing scientific support to the DCDS and ADM

(IM) for their ISR initiatives. There are many surveillance related projects underway within DND,[31] so this section will be limited to identifying the key ISR projects related to Strategy 2020.

Intelligence, Surveillance and Reconnaissance (ISR)

ISR capabilities comprise a variety of functional components and processes. The output of ISR operations is information, data that must be converted into knowledge and advice for decision-making. A general overview of how ISR data "becomes" knowledge for decision-making follows. At the front end are the sensors that gather the data, and they may range anywhere from satellite-based sensors to the human eye. Sensor data must be stored and/or transmitted via a communications link to a collection and interpretation process for the fusion of new data with other current and historical data. [32] The fused data is then analysed and interpreted to develop knowledge, from which advice to government or military commanders (police, military, Coast Guard, etc) may be formulated for their decision-making. The sensors, communications links, fusion and analysis capabilities and command and control systems used to pass knowledge and advice may belong to a group of government departments and agencies, or be shared amongst allies. DND's initiatives in developing modern ISR capabilities for military operations are designed to ensure their compatibility with OGD systems and processes. This is consistent with, and instrumental in enhancing, the interdepartmental coordination required by the PSAT for domestic security. Equally, these capabilities will be designed to be interoperable with allies' systems for coalition operations.

Beginning with sensor capabilities, DND has several modernization, R&D or experimentation projects underway with other departments, agencies and nations. They include

the Aurora modernization program, designed to provide Canada with a flexible and responsive airborne surveillance and command and control platform for use at home or abroad in support of government requirements. Research and development (R&D) and experimentation are also underway on the use of uninhabited air vehicles (UAVs) and to develop Canadian access to space-based capabilities (Directorate of Space Development's "Joint Space Project") as alternative sensor platforms for surveillance and reconnaissance operations.

Data collection, fusion and analysis centers are the collection points for turning sensor-generated data into knowledge and advice. At present this is done by four independent operations / data fusion centres at the CF Joint Operations Group (CFJOG) in Kingston, the navy's two operations centres in Halifax and Esquimalt and at 1 CAD HQ/CANR in Winnipeg.[33] A fifth centre is planned to support NDHQ in Ottawa. R&D projects to further develop these centre's data fusion capabilities include the Joint Intelligence Information Management System (JIIMS) and Joint Information and Intelligence Fusion Capability (JIIFC) Project. R&D initiatives to develop a Coalition Aerial Surveillance and Reconnaissance capability (CAESAR) and a Common Operating Picture (COP 21) are planned to provide a comprehensive display of activities in a theatre of operations from the fused data.[34] This work addresses, in part, the requirement to "create an integrated situational awareness capability that supports all levels of command."[35]

Finally, the control of government and Canadian Forces (CF) operations requires the effective distribution of knowledge, advice and direction amongst government leaders and military commanders. Programs to upgrade military command and control systems include

NORAD's Regional/Sector Operational Control Centre (ROCC/SOCC) modernization project and the creation of a single CF Command System (CFCS – formerly the Joint Command, Control and Intelligence System [JC2IS]) to replace the various different and incompatible systems in place today.

All of the above combine to form a matrix of capabilities and processes that represent a C4ISR (Command, Control, Computers, Communications, Intelligence Surveillance and Reconnaissance) concept that is increasingly becoming known as a "system of systems." The concept calls for a matrix of C4ISR components and processes, combined in whatever combination that best suits the situation, available resources and the desired information to support a commander's decision-making requirements. It may be adapted as needs or issues arise, and the system of systems allows for technological advances in any component as it is the information flow, and not necessarily the sensor, platform or network that matters to the outcome. DRDC Valcartier is currently conducting research on a Technology Demonstration Project (TDP) that is designed to aid in the definition and development of a "system of systems" approach to the Coalition Integrated Air Picture and UAV projects. [37]

Conclusion

National surveillance capabilities are important for the enforcement of laws in the protection of sovereignty, and DND has a significant role to play in providing modern ISR capabilities for the support of government requirements. This responsibility is complicated by the fact that the Canadian government does not have a national surveillance plan and does not provide departmental direction or guidance on surveillance priorities. It is further complicated by the overall reduction in DND surveillance capability that occurred as a result of defence

budget reductions through the 1990s. Nevertheless, DND tackled these challenges by participating in interdepartmental committees and by providing leadership and expertise in the development of interdepartmental cooperation. The need to move forward was also recognized, and DND responded to the national policy vacuum by developing environmental surveillance strategies and a framework for developing ISR capabilities. The resultant modernization, research and development and experimentation initiatives will greatly enhance the quality of the knowledge and advice available for the commander's decision-making in CF operations. They will also represent a tremendous increase in CF capability to support other government departments in the monitoring and enforcement of Canadian law. DND's innovation and leadership in developing modern ISR capabilities through the Strategy 2020 framework will ensure that we will provide excellent eyes and ears for Canada.

Endnotes

1. "Providing for the Defence of Canada and Canadian Sovereignty." 1994 White Paper on Defence. p. 15
2. *1994 White Paper on Defence, "Providing Peacetime Surveillance and Control." p.15.*
3. Macnamara and Fitz-Gerald identify that it is now widely acknowledged, both inside and outside of government in Canada, that there is no national security framework or clear and distinct national security policy as such. Macnamara, W.D. and Fit-Gerald, Ann. "A National Security Framework for Canada." Policy Matters-IRPP. 3.10 (2002). p.7.
4. Research by Director General Joint Force Development staff in 2003 revealed that, notwithstanding over 50 studies and papers on surveillance in the past decade, no documentation could be identified that referred to a national surveillance strategy or policy on surveillance of Canadian territory. A study was subsequently commissioned by DND to "identify and evaluate Canada's national surveillance requirements based on a national perspective." Memorandum. 1150-1 (JFC 3-3-3) 20 Jan 03. National Surveillance Policy.
5. The strategic capability framework comes from "Shaping The Future Of The Canadian Forces: A Strategy For 2020," and is available at <www.vcds.forces.gc.ca/dgsp/pubs/dda/strat/ chap5_e .asp>. Information and Intelligence is rated as an "H" in recognition that the CF seeks a High degree of capability in it.
6. *Shaping The Future Of The Canadian Forces: A Strategy For 2020. Ottawa: Department of National Defence, 1999. p.2*
7. *1994 White Paper on Defence, "Providing Peacetime Surveillance and Control." p.15.*
8. Report on Personnel extraction capabilities for Operation Coldfeet. 23 May 2003. www.terrorism.net/ Pubs/csi/lea.html
9. Excerpt from Independence and Internationalism "A Northern Dimension for Canada's Foreign Policy", p. 127-135. < http://www.carc.org/ pubs/v14no4/6.htm>
10. The Northwest Passage route saves roughly 7,800 kilometers, or more than 10 days of sailing at 15 knots, over the Panama Canal route between Tokyo and London, for example. "Stopping Canadian Sovereignty From Melting Away." < http://temagami.carleton.ca/jmc/cnews/ 01022002/connections/ c3.html>

11. Speaking Notes for the MND At a 9 Dec 02 Joint Press Conference to announce the Canada-US Joint Planning Group. <www.forces.gc.ca/site/Newsroom/ view_news_e.asp?id=473>
12. Information related to fleet retirements is widely available on a variety of internet sites.
13. The existence of this project may be confirmed at www.dnd.ca/admfincs/ ati/arch99_e.asp, ATI request # A99-0221
14. Maritime Air Group Headquarters and 1 Canadian Air Division - Maritime Air Component (Atlantic) data and analysis of LRP hours for the period from 1990 to 2002.
15. Provincial Airlines Limited History. 12 Jun 2003. < http://www.maritimesurveillance. com>
16. Highlights of New Marine Security Initiatives. 25 May 2003. < www.tc.gc.ca/mediaroom/ backgrounders/ b03-gc001.htm> p.1..
17. IPCRC was established by the government after the release of the 1990 Osbaldson Study on how the federal government operated and maintained its Defence, Coast Guard and Fisheries fleets. As reported in the transcripts of the 12 May 2003 Standing Senate Committee on National Security and Defence.
18. DGPA Transcript # 03040705 dated 7 April 2003 regarding a Senate National Security and Defence Committee Meeting on a National Security Policy for Canada. p.24
19. Department of National Defence. Strategic Assessment 2002, Ottawa, 2002, p.17.
20. Avis, Peter. "Surveillance and Canadian Maritime Domestic Security." Canadian Military Journal, Spring 2003. p.10.
21. An issue briefed to the National Security Studies Course by CSIS and the RCMP during 24/25 April 2003 visits.
22. Canada. The Senate of Canada. "Issue No. 15, Nineteenth meeting held 28 April 2003." Proceedings of the Standing Senate Committee on National Security and Defence. Ottawa: Canadian Government Publishing, 2003. p.15:47.
23. Government response to the "9-11" attacks was to establish an Ad Hoc Committee of Ministers on Public Security and Anti-terrorism to provide the necessary oversight for rapid implementation of a range of national security initiatives. Canadian Security and Military Preparedness: Government's Response to the Report of the Standing Senate Committee on National Security and Defence. October 2002. p.2.17.
24. Canada. Privy Council Office. The Canadian Security and Intelligence Community: Helping Keep Canada and Canadians Safe and Secure. Ottawa: Her Majesty the Queen in Right of Canada, 2001. p.13.
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26. "Canadian Security and Military Preparedness: Government's Response to the Report of the Standing Senate Committee on National Security and Defence." October 2002. 25 May 2003. <www.sgc.gc.ca/ publications/national_security/pdf/Kenny_report_e.pdf> p.4
27. Avis, Peter. "Surveillance and Canadian Maritime Domestic Security." Canadian Military Journal, Spring 2003. p.11.
28. Measurable Maritime Surveillance Requirements and navy's ISR strategy or blueprint was outlined in a CMS / DMRS briefing note for the C4IR Oversight Committee. 2000-1(DMRS 2-2) Briefing Note for the C4ISR Oversight Ctte – Measurable Surveillance Requirements dated 3 December 2003.
29. The undertaking of this study by CAS/D Air Strat Plans is identified in a memorandum dealing with national surveillance policy issues. 1150-1 (JFC 3-3-3) 20 Jan 03. National Surveillance Policy.
30. DPG 2001 - Change objective 3 (CO3) tasking to develop an enhanced ISR capability.
31. Memorandum. 1150-1 (JFC 3-3-3) 20 Jan 03. National Surveillance Policy. p.1.
32. NATO Pub AAP 31 defines fusion as "The process of evaluation, correlation and combining data from multiple sources to establish the most conclusive data." Issue #16 from the 3 March 2003 (Draft) Defence Intelligence Review. A U.S. National Government Data Center definition of data fusion is the seamless integration of data from disparate sources, integrated across data collection "platforms" and geographic boundaries, and blended thematically. 12 June 1003. <www.ngdc.noaa.gov/seg/tools/gis/ fusion.shtml>
33 Defence Intelligence Review, 3 March 2003 – Issue # 16 (Draft).
34. Knowledge Management for National Security and Counter-Terrorism: Avoiding Surprise. 10 June 2003. <www.drdc-rddc.gc.ca/publications/issues/issues13_e.asp>

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36. The Director DST CCIS described several DRDC R&D ISR initiatives in a 24 March 2003 e-mail response to the author's request for information on the subject.

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