RADARSAT, Missile Defense and the Holy Grail

In its annual report for fiscal year 1998-1999, Defence Research and Development Canada (DRDC), the Department of National Defence (DND) R&D agency, openly admitted that it was collaborating with the U.S. Ballistic Missile Defense Organization (BMDO) on space-related projects, including the "exploitation" of RADARSAT-2 images.

In a section called "R&D for the Canadian Forces and National Defence," the DRDC document had a subsection called "Major Initiatives." The first of seven "major projects" listed under the "Command and Control Information Systems Program," was called "CA/U.S. Co-operation on Military Space R&D." It begins by saying:

> "Negotiations were completed of a Project Arrangement on QWIP devices* with the Ballistic Missile Defense Office (BMDO). Two other topics (*RADARSAT data exploitation* and HF [High Frequency] Radar for ballistic-missile detection) are *covered under co-operation with BMDO's Joint National Test Facility*."[1]

These sentences contain important admissions on three examples of Canadian government complicity not only with regard to the ongoing militarisation of space but also Canada-U.S. government efforts to produce "missile defense" weapons-targeting systems.

When this Canadian government document was produced, all U.S. "missile defense" efforts fell under the command of the BMDO. This U.S. Department of Defense (DoD) agency was created in 1994, during President Clinton's presidency, to replace the "Strategic Defense Initiative Organization" which President Reagan had created in 1987.[2] In 2002, the agency was renamed again and is now called the Missile Defense Agency.[3]

DRDC admitted that "RADARSAT data exploitation" efforts were done "under co-operation" with the BMDO's Joint National Test Facility (JNTF). The JNTF mission is twofold:

- "Provide...computer modelling and simulation support for the development, acquisition and deployment of missile defense systems.
- Support warfighters with the capability to explore missile defense operational concepts and doctrinal requirements."[4]

The JNTF is at Schriever Air Force Base (AFB), Colorado, named for Bernard Adolph Schriever who

> "pioneered the development of the nation's ballistic missile programs and...is recognized as 'the father of the U.S. Air Force's space and missile program.'"[5]

Schriever's position on the Outer Space Treaty is worth noting. He said: "Space for peaceful purposes—what a bunch of goddamned bullshit that was."[6]

Schriever AFB is described as

> "home of the 50th Space Wing, Space Warfare Center and the Ballistic Missile Defense Organization"[7]

The former's "mission" includes a role of special significance to Canada's RADARSAT satellites, namely to "*operate a worldwide network to control* Air Force and other U.S. and *allied satellites*." (Emphasis added.)[8]

*For years, we have pursued the **holy grail** of space-based radar* (SBR).... New technologies...may permit an affordable SBR (the new term is *Ground Moving Target Indicator*.)"

U.S. Air Force General
Thomas S. Moorman, Jr.

* Stay Tuned!
QWIP Devices, HF Radar and the "Missile Defense" weapons

The next issue of *Press for Conversion!* will detail even more examples of Canada-U.S. government, corporate and military collaboration on "missile defense" including: (1) infrared sensors called Quantum Well Infrared Photodetectors (QWIP) which will be used as satellite-based "missile defense" weapons-targeting systems and (2) High Frequency Radar "for ballistic-missile detection."

RADARSAT-2 to be Launched Dec. 2006

After years of postponements, RADARSAT-2 is now scheduled to blast off in December 2006. The plan is to use a Russian Soyuz rocket to launch Canada's satellite from the Baikonur Cosmodrome in the Central Asian nation of Kazakhstan.

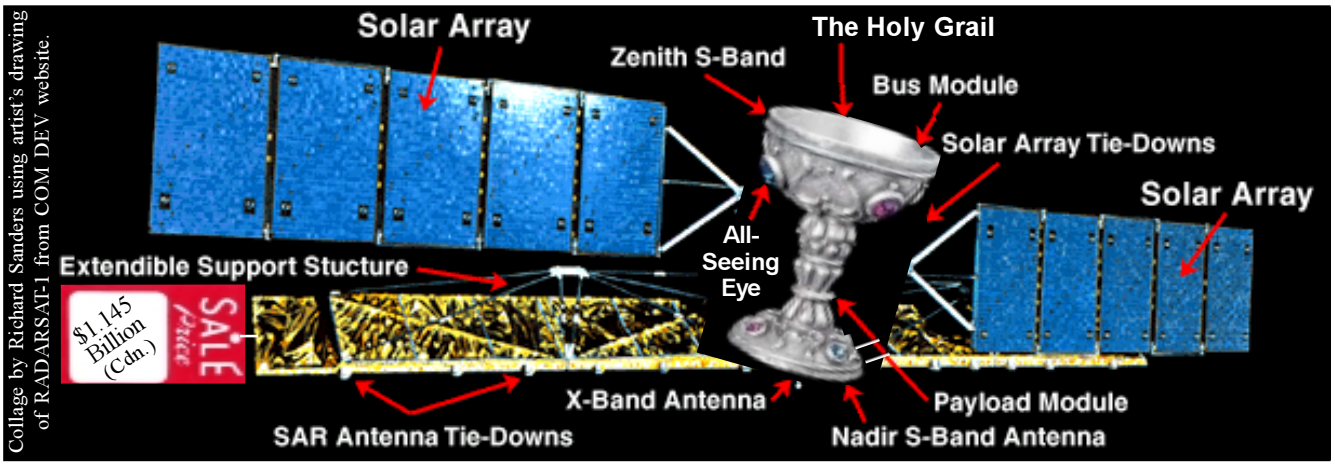
The contract for this launch was announced on January 9, 2006, by Starsem, a company whose shareholders include: Arianespace (France), European Aeronautic Defence and Space Company (Germany/France/Spain), the Russian Federal Space Agency and the Samara Space Center (Russia).[1]

A Soyuz launch from the Baikonur Cosmodrome, Kazakhstan.

According to a contract between Boeing and MacDonald, Dettwiler and Assoc. that was originally signed in 2000, RADARSAT-2 was to be launched by a Delta-2 rocket from California's Vandenberg Air Force Base.[2]

References

1. Starsem media release, "Soyuz to launch RADARSAT-2," Jan. 9, 2006. www.starsem.com/news/releases.htm# radarsat
2. "MDA shifts RADARSAT-2 launch to Soyuz," Jan. 10, 2006. www.spacetoday.net/Summary/3207



GMTI and the "Holy Grail"

A clue to RADARSAT's place in this configuration of U.S. military agencies concerned with space warfare and "missile defense" can also be found in DRDC's 1998/1999 annual report. It lists "Ground Moving Target Indication (GMTI) Surveillance" as a "Technology Demonstration project" that

> "will modify the design of RADARSAT 2...to add an experimental GMTI mode and *create the world's first space based radar with GMTI capabilities.*"[9] (Emphasis added.)

GMTI is a revolutionary warfighting technology giving militaries the ability "to detect, locate and track moving vehicles."[10] It is now used on specialised aircraft with Intelligence, Surveillance and Reconnaissance (ISR) roles, including uninhabited drones and warplanes, like the E-3 (Airborne Warning and Control System) and the E-8C with JSTARS (Joint Surveillance Target Attack Radar System). These electronic-warfare aircraft use Synthetic Aperture Radar (SAR) microwave-beaming sensors with GMTI abilities.

Some warfighters have fought to put these technologies in space. As retired U.S. Air Force General Thomas Moorman, Jr., said in early 1999, many:

> "in the Air Force believe that certain surveillance functions now done by aircraft...should more appropriately be done from space.... *For years, we have pursued the holy grail of space-based radar* (SBR).... New technologies in miniaturization, power and antenna design may permit an affordable SBR (the new term is *Ground Moving Target Indicator*)."[11] (Emphasis added.)

This "holy grail" of space-based radar is being sought for two main reasons: (1) when ISR aircraft are searching for targets—like missile systems that might defend against a "shock-and-awe" orgy of destruction waged by U.S. troops, tanks, warplanes or warships—they might just get shot down, and (2) Satellites, being higher up, can survey more of the battlespace. Dr. Daniel E. Hastings, the U.S. Air Force's chief scientist, recommended in his groundbreaking 1998 *Doable Space* report:

> "Move ground-based surveillance functions into space, where they command a far better view and make satellites more survivable against attack."[12]

Hastings was confident that building a space-based GMTI by 2012 was "easily doable." His report came soon after the U.S. Congress reduced from 33 to 19 the number of JSTARS warplanes with SAR/GMTI roles. Then came the 1997 *Quadrennial Defense Review* that cut back the JSTARS purchase by six additional warplanes. This

> "caused a perceived shortfall of valuable GMTI capability. It is partially because of this shortfall that the Air Force is interested in developing space-based GMTI. Another reason is that space-based GMTI is technically easier to accomplish, so it will provide a valuable stepping-stone to space-based AMTI [Air Moving Target Indication]."[13]

This was the context in which Canada's DRDC, began working with the U.S. and UK in the late 1990s to give RADARSAT-2 a GMTI capability:

> "Demonstration of a GMTI capability on Canada's RADARSAT-2 satellite received [Ministry of National Defence] approval in Feb. 1999 .... Co-operative activities with the UK and U.S. are proving to be extremely beneficial to all concerned."[14]

These Canadian contributions must have been greatly appreciated by U.S. space-warfighters and scientists in the late 1990s who were anxious to put SAR/GMTI technology into space:

> "USSPACECOM is laying the groundwork for space-based MTI with a number of internal documents. A *Concept of Operations for the Space-Based Moving Target Indicator System* co-written by USSPACECOM and Air Combat Command was approved in February 1998.... USSPACECOM and the USAF Space & Missile Center have also co-written a *Space-Based Moving Target Indicator Roadmap.*[15]

Canada's DRDC has been working with the U.S. military since 1999 to make RADARSAT-2 "the world's first space based radar with GMTI capabilities."

The U.S. Air Force Scientific Advisory Board released their "Space Roadmap for the 21st Century Aerospace Force" in November 1998. It described the importance of building "a Global, All-Condition, Intelligence/Surveillance/Reconnaissance Capability" to collect earth data in all-weather conditions, day-and-night. Such sensor satellites would "complement"

> "other space and air-breathing [aircraft-based] ISR platforms. The primary payload would be a space-based radar with synthetic-aperture radar (SAR) and ground moving-target indication (GMTI) modes."[16]

This report was described as "effusive in its praise"[17] for the idea of building 24 SAR satellites with GMTI capabilities. This was, it said, "the one major new system to which we believe the Air Force should commit itself."[18]

RADARSAT-2 as Prototype for Space-based GMTI

Canadian military scientists at DRDC were proud to collaborate with the U.S. "missile defense" agency to provide the world's very first space-based SAR radar with GMTI functionality. DRDC's 1999/2000 annual report said it was

> "seeking to expand collaboration with the U.S.. Our Technology Demonstration Program should provide especially good opportunities for collaboration.... *There is a high level of U.S. interest in the Space-Based Radar GMTI Project*."[19]

DRDC noted that other NATO states were also keen to use our technology:

> "An additional collaborative opportunity has been identified with the NATO Command, Control and Consultation Agency, under a technology demonstration project that will fuse inputs from different GMTI sources to provide an improved operational picture to the warfighter."[20]

This "collaborative opportunity" offering RADARSAT to NATO warfighters, was called CAESAR. (See pp.19-27.)

Always eager to please, Canada's budget for this 1999-2008 "RADARSAT 2 GMTI" Technology Demonstration Project was estimated in DRDC's 1999-2000[21] and 2002-2003[22] reports to be $24.6 million. In its 2003-2004 report, however, the total budget had grown to $29.9 million.[23]

DRDC-Ottawa has, in particular, been pulling its weight on this project. Among its space-warfare related facilities, this DND agency has a "Space-Based Radar Moving Target Indication Simulator." Their "digital simulator" has "a raw signal generator and a Ground Moving Target Indicator processor."[24]

A 2003 article says RADARSAT-2 is providing DRDC-Ottawa

> "with an opportunity to carry out a defence-related proof-of-concept experiment. Dr. Chuck Livingston heads a team of nine defence researchers that will use RADARSAT-2 data to detect and track moving vehicles on the earth's surface."[25]

GMTI and Theater Missile Defense

Any suggestions of a link between RADARSAT-2 and "missile defense" have been vehemently denied by Liberal and Conservative politicians, bureaucrats, corporate representatives, defence analysts and other apologists for our military-industrial complex.

Their standard response is always the same: since RADARSAT-2 cannot track missiles in flight, it cannot have a role in "missile defense." Such denials ignore the reality that R&D on RADARSAT-2's GMTI capability was conducted in collaboration with the U.S. Ballistic Missile Defense Organization. These denials also ignore the fact that a space-based platform with GMTI functions, like RADARSAT-2, is a highly-coveted prize that has been long sought after by those responsible for making "Theater Missile Defense" (TMD) operations a reality of the near future. (See "TMD: Coming to a Theatre Near You?," pp.24-25.)

The U.S. Air Force has focused TMD research and development on improving technologies in three areas:

- "*Sensors* ...(improved performance of AMTI, *GMTI*, and electro-optical/IR [Infrared] sensors),
- *Battle Management Command, Control and Communications systems*... (weapon control systems),
- *Weapons*...(air-to-air missiles... and laser weapons)."[1] (Emphasis added.)

While "missile defense" is often portrayed in terms of its "active defenses" component—namely "hitting a missile with a missile"—it is actually more than just that. Another important component of TMD "architecture" is called "counterforce operations." This refers to the use of

> "air-to-ground or ground-to-ground [weapons] systems to attack TBM infrastructure and transporter-erector-launchers [TELs]) before, during or after the launch of missiles."[2]

The RAND Corp.'s "Strategic Appraisal" of "U.S. Air and Space Power in the 21st Century" explains that there are two types of TMD "counterforce operations," and both use GMTI.

(1) Prelaunch counterforce

> "Prelaunch counterforce [Concepts of Operations] CONOPs involve sensors on...satellites, stand-off aircraft and UAVs—to find, identify, track and target mobile [Transporter Erector Launchers] TELs used to carry and launch TBMs [Theater Ballistic Missiles].... It implies multisource data fusion; close coordination and cueing between *ground moving target indication (GMTI)* and all- weather, day-and-night imaging systems, such as synthetic aperture radars (SARs)."[3]

The fact that the military's definition of "missile defense" operations also includes pre-emptive first strikes against ballistic missiles is also found in the "mission statement" of the Joint

> "As far as missile defence, I don't see any connection whatsoever with that.... I don't know that much about the whole missile defence thing, but it's looking at missiles coming in. There is no connection whatsoever.... I don't see any connection whatsoever.... Again, I will come back and say I really don't know much about this missile defence stuff or the connection here."
>
> John Hornsby, President, RADARSAT International (RSI)
> (Formerly RSI's Director of Worldwide Sales, Vice-President of Sales and Marketing, and Vice-President of business development for RADARSAT-2.)
> **Source:** Evidence, Standing Cttee., Foreign Affairs & International Trade, Feb. 3, 2005. <www.parl.gc.ca/infocomdoc/38/1/FAAE/Meetings/Evidence/FAAEEV20-E.HTM>

Here is how DRDC-Ottawa describes the RADARSAT-2 Moving Object Detection Experiment (MODEX):

> "[It] will develop, validate and demonstrate an experimental space-based...GMTI mode to routinely detect, measure and monitor vehicles moving on the Earth's surface.
>
> RADARSAT-2 will also carry an experimental moving object detection mode (MODEX) to investigate GMTI capability for future satellites.
>
> To date, the detection and tracking of moving targets from elevated platforms has been primarily a military concern, and is operationally supported by specialized airborne sensors. With the rapid evolution of radar technology, it is now economically feasible to build spaceborne sensors to perform moving target detection and measurement. From a military viewpoint, these spaceborne systems have the potential to significantly augment existing operational capabilities.
>
> The DND RADARSAT-2 GMTI Demonstration Project seeks to provide specifications for the MODEX mode of operation, to collaborate on its design, and to develop the ground processing and information extraction infrastructure."[26]

DRDC-Ottawa also describes "Business Opportunities" associated with their experiment, saying access to "this technology is available to government departments, allied nations, industry and academia through a variety of business models."[27]

While government support for the RADARSAT-2 GMTI program continued to grow in Canada, similar projects in the U.S. encountered setbacks. Congress felt the time had not yet come to launch this project. In 2000 and 2001, Congress cut and then cancelled their military's SAR/GMTI satellite program (Discoverer II) that started in 1997. They recoiled at the US$25-billion estimated, eventual cost for 24 satellites, when a single space-based radar prototype had yet to be launched.[29]

Just as many in Canada's mili-

Functional Component Command in charge of Integrated Missile Defence (JFCC-IMD). It states that the JFCC-IMD commander will

> "optimize the deployment and employment of global ballistic missile defense in support of the [global combatant commanders] and recommend the employment of strike forces to defeat limited ballistic missile attacks in all phases of flight or *prior to their launch* in order to defend the U.S., our deployed forces, friends and allies."[4] (Square brackets in original; emphasis added.)

RADARSAT International, the MDA-owned company that sells licensing rights for RADARSAT data, boasts that RADARSAT-2 is able to

> "Detect vehicles/pieces of equipment at a [Surface-to-Air missile] SAM [Surface-to-Surface missile], SSM, ABM [Anti-Ballistic Missile] fixed missile site."[5]

This means that in future wars, the U.S. military could "exploit" RADARSAT-2 GMTI data to target such missile sites. American weapons would then destroy such *potential* threats to their deployed armed forces in preemptive, first-strike attacks. TMD targets could include

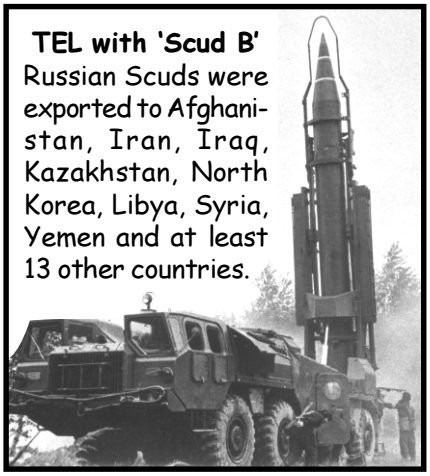
> "Syria or Iran or even China, all of whom have bought such missile technologies from Russia over the last several years."[6]

(2) Postlaunch counterforce

> "Postlaunch counterforce operations can take advantage of the cue from the missile launch detected by the Defense Support Program [DSP] infrared satellites or by its follow-on, the Space-Based Infrared System-High (SBIRS-High). This will allow operators to immediately focus intelligence, surveillance and reconnaissance and attack assets on a very limited area. GMTI and SAR capabilities will need to have improved... capabilities for this mission, as well as for the prelaunch mission."[7]

In the postlaunch operations, DSP (or SBIRS-High satellites) will detect missile launches and then signal a SAR satellite (like RADARSAT-2) to use its GMTI to track missile-transport and launch trucks, called TELs within a specific area. This is called cross-cueing. It is also referred documented in Multiservice Procedures for Joint Theater Missile Target Development:

> "Cross-cueing is very important to TM IPB [Theatre Missile Intelligence Preparation for the Battlespace] and target development. This can be especially true for locating FOLs [Forward Operating Locations] and FOBs [Forward Operating Bases]. For example, a TM launch location provided by Defense Support Program (DSP) satellite warning or "hit" can be cross-cued to a platform employing a ground movement target indicator (GMTI) or other applicable sensor system. This sensor would then monitor the TEL's [Transporter-Erector-Launcher] movement and track it back to the transloading site and then, in turn, track the ground support vehicles back to the FOL or FOB."[8]



References

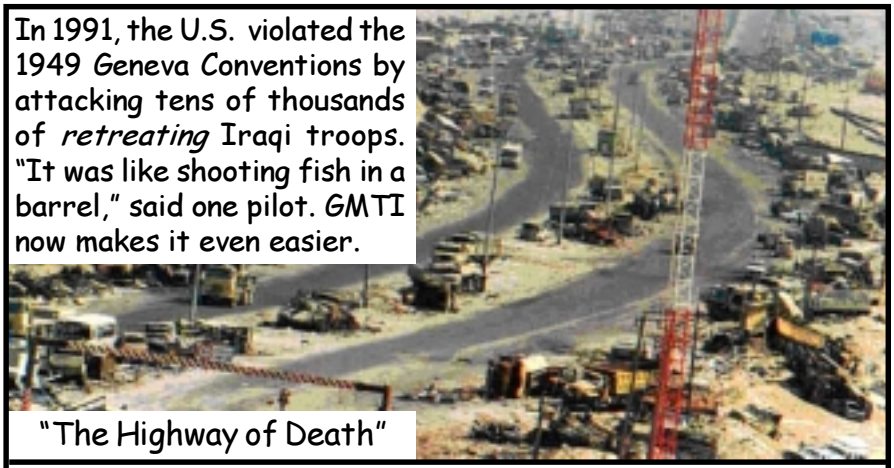
1. Naval Forces' Capability for Theater Missile Defense (2001). www.nap.edu/openbook/0309074266/html/112.html
2. Richard F. Mesic, "Countering Weapons of Mass Destruction and Ballistic Missiles," *Strategic Appraisal: U.S. Air and Space Power in the 21st Century.* rand.org/pubs/monograph_reports/MR1314/MR1314.ch8.pdf
3. Ibid.
4. Cited by Stephen Moore "C-25, RADARSAT-2 and BMD," March 13, 2005. *No BMD, eh?* nobmdeh.blogspot.com/2005_03_01_nobmdeh_archive.html
5. RADARSAT-2 Innovation in Earth Observation www.rsi.ca/products/sensor/radarsat2/rs2_overview_update.pdf
6. Moore, op. cit.
7. Mesic, Op cit.
8. Multiservice Procedures for Joint Theater Missile Target Development, October 1999 https://134.11.61.26/ArchivePub/Publications/DA/FM/FM%2090-43%2019991015.pdf

tary, industrial and scientific communities are keen to contribute to the U.S. war effort, many in the U.S. are grateful for Canada's munificent support. Canada has not only spent $1.145 billion to create and build the world's most advanced SAR satellites, it has added a GMTI capability that meets U.S. and NATO warfighting needs.

RADARSAT-2 is probably the most prized gift that Canada has ever given to the U.S. war machine. U.S. warfighters must be anxious to begin exploiting this unique new Canadian contribution. Because of this satellite's ability to generate higher resolution images, and its new GMTI capability, RADARSAT-2 will be far more useful to the Pentagon than is RADARSAT-1.

Not only will RADARSAT-2 provide ISR data for upcoming U.S.-led wars, including GMTI capability for "missile defense" operations, it will—perhaps most importantly—serve as a prototype for the "holy grail" of SAR/GMTI satellites that the U.S. military is seeking to launch.

In 1991, the U.S. violated the 1949 Geneva Conventions by attacking tens of thousands of *retreating* Iraqi troops. "It was like shooting fish in a barrel," said one pilot. GMTI now makes it even easier.



"The Highway of Death"

SAR/GMTI: A Revolution in Bombing Technology

Reconnaissance, surveillance and attack radars incorporating high resolution imaging Synthetic Aperture Radar (SAR) and Ground Moving Target Indicator (GMTI) techniques... promises to revolutionise battlefield and strategic bombing operations....

Combined with GPS guided bombs, this is a revolutionary capability, because it extends existing around-the-clock bombing capability to all-weather standoff bombing capability... SAR/GMTI capable radars and GPS guided weapons will allow any strategic target to be bombed under any conditions....

Attacks upon convoys and road and rail communications deep inside hostile airspace can be conducted under any weather conditions....

With a SAR/GMTI capable attack radar, a bomber can sweep highways and railroad lines for traffic and accurately engage that traffic.

Source: Excerpts, Carlo Kopp, *Australian Aviation*, 1997.
www.ausairpower.net/sargmti-intro.html

References

1. Defence R&D Cda, Annual Report 1998-99. dsp-psd.pwgsc.gc.ca/Collection/D1-14-1999E.pdf
2. U.S. Department of Defense, Directive Number 5134.9, June 14, 1994. www.dtic.mil/whs/directives/corres/pdf/d51349_061494/d51349p.pdf
3. Beginnings of Missile Defense www.pbs.org/wgbh/pages/frontline/shows/missile/etc/cron.html
4. LTC Rene Ramirez, "Joint National Test Facility," *Test Technology Symposium '98: Full Spectrum Testing* www.dtc.army.mil/tts/1998/proceed/ramirz98/sld002.htm
5. USAF media release, "Falcon Air Force Base renamed to honor space pioneer," June 5, 1998. www.fas.org/news/usa/1998/06/n19980605_980785.html
6. Jack Manno, *Arming the Heavens* (1983) cited by Bill Sulzman, "Star Wars, Tools of U.S. Space Supremacy," International Network of Engineers and Scientists Against Proliferation *Information Bulletin*, April 2004. www.inesap.org/bulletin23/art22.htm
7. Schriever AFB www.schriever.af.mil
8. Welcome to Schriever AFB www.schriever.af.mil/newcomer.aspx
9. DRDC Annual Report,1998-99, op. cit.
10. Martie Goulding, "Airborne GMTI Radar Development at MacDonald, Dettwiler," Vancouver Chapter, IEEE Aerospace & Electronic Systems, Geoscience & Remote Sensing Society, December 2002. www.ewh.ieee.org/reg/7/vancouver/grs/Pages/PastEvents.htm
11. Gen. Thomas Moorman Jr., Retired, "The Explosion of Commercial Space and Implications for National Security," *Aerospace Power Journal*, Spring 1999. www.airpower.maxwell.af.mil/airchronicles/apj/apj99/spr99/moorman.html
12. John Correll, "A Roadmap for Space," *Air Force Magazine*, March 1999. www.afa.org/magazine/march1999/0399space.asp
13. Maj. Kimberly Corcoran, "Higher Eyes in the Sky: The Feasibility of Moving AWACS and JSTARS Functions into Space," Thesis, School of Advanced Airpower Studies, October 1999. www.maxwell.af.mil/au/aul/aupress/SAAS_Theses/SAASS_Out/Corcoran/corcoran.pdf
14. DRDC Annual Report 1999-2000 dsp-psd.pwgsc.gc.ca/Collection/D1-14-2000E.pdf
15. Corcoran, op. cit.
16. *Space Roadmap for the 21st Century Aerospace Force*, November 1998. www.ws1fweb.org/docs/usg/afsabsprm.pdf
17. Peter Grier, "Aerospace World," *Air Force Magazine*, February 1999. www.afa.org/magazine/Feb1999/0299world.asp
18. *Space Roadmap*, Op.Cit.
19. DRDC Annual Report 1999-00, op. cit.
20. Ibid.
21. Ibid.
22. DRDC Annual Report 2002-03 Google cache: www.rddc.mdn.ca/publications/annual/0203/report_0203_e.pdf
23. DRDC Annual Report 2003-04. dsp-psd.pwgsc.gc.ca/Collection/D1-19-2004E.pdf
24. Radar, DRDC website www.ottawa.drdc-rddc.gc.ca/html/radar_e.html
25. RADARSAT 2: Canada Takes the Lead in Radar Remote Sensing Satellites www.shirleysbay.com/Articles/RADARSAT-2.htm
26. RADARSAT-2 Moving Object Detection Experiment (MODEX) www.ottawa.drdc-rddc.gc.ca/html/RS-336-RADARSAT_e.html
27. Ibid.
28. RADARSAT-2 directory.eoportal.org/pres_RADARSAT2.html
29. Richard H. Van Atta, et al, *Transformation and Transition: DARPA's Role in Fostering an Emerging Revolution in Military Affairs*, Volume 1, April 2003. www.darpa.mil/body/pdf/P-3698_Vol_1_final.pdf