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]

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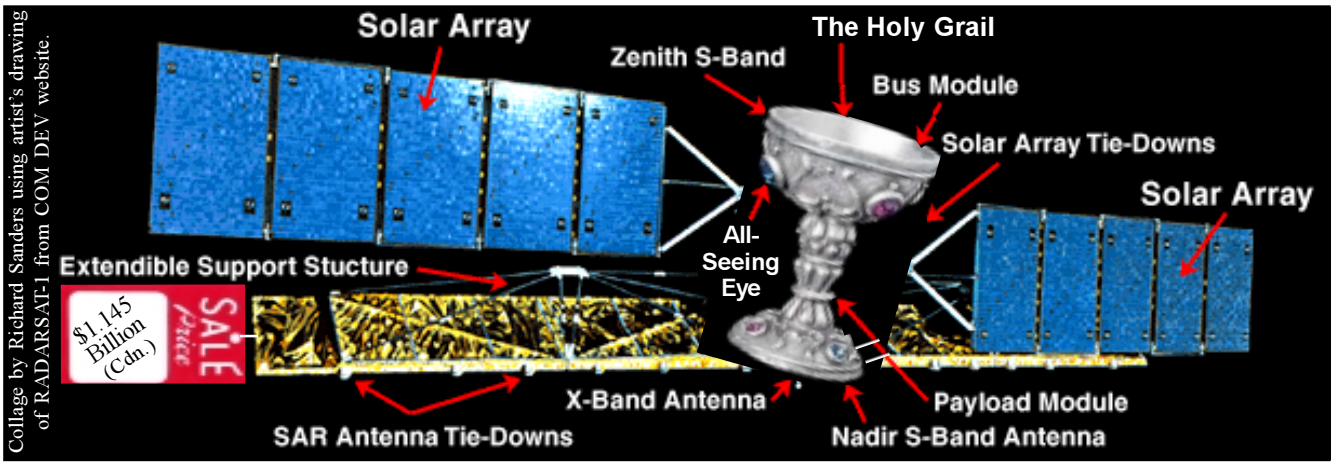


GMTI and the "Holy Grail"

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

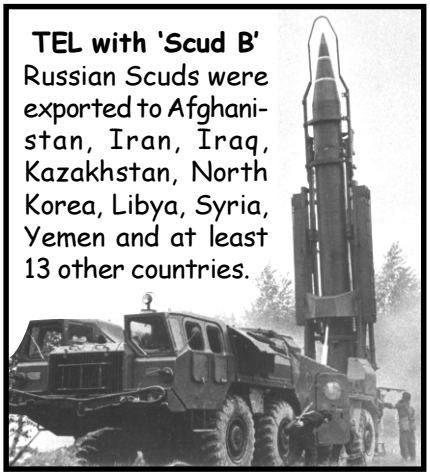
> "Syria or Iran or even China, all of whom have bought such missile technologies from Russia over the last several years."[6]

(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]



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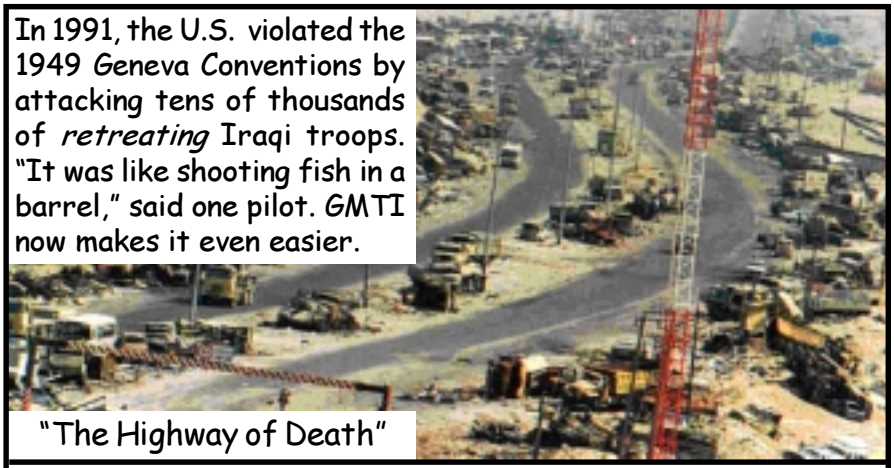
tary, industrial and scientific communities are keen to contribute to the U.S. war effort, many in the U.S. are grateful for Canada's munificent support. Canada has not only spent $1.145 billion to create and build the world's most advanced SAR satellites, it has added a GMTI capability that meets U.S. 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.
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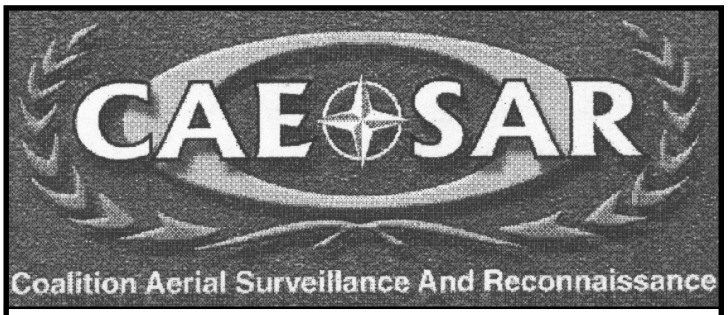
From CAESAR to MAJIIC:
How RADARSAT plugs Canada in to future NATO-led wars

For about ten years now, a NATO-led coalition of countries have been pooling their technical and human resources to improve their ability to wage war using new Aerospace Ground Surveillance and Reconnaissance (AGSR) technologies. These emerging technologies include sophisticated sensor systems aboard platforms high in the sky that collect images and data about movements either on, or just above, the earth's surface.

"AGSR assets are part of an overall Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) Architecture. ISTAR architectures can include a variety of platforms supporting sensor[s] that make use of a wide range of the electromagnetic spectrum, from optical wavelengths to radar."[1]

What's in a Name?

The project came to be known by the aptly-crafted acronym, CAESAR. To aficionados of the program, this stands for Coalition Aerial Surveillance and Reconnaissance. Using the title of the Roman empire's supreme ruler (a term whose meaning has since broadened to refer to any emperor, autocrat or absolute dictator), symbolically reflects the importance that participating states attribute to this project. CAESAR was seen as crucial to NATO's ability to rule future battles from on high and thus to command and control the business of waging and winning wars.



CAESAR had its origins in 1995 (the year RADARSAT-1 was launched) when a few NATO members began integrating their SAR and GMTI technologies for effective use during Theater Missile Defense operations of the near future.

At first, the participating states focused on the task of integrating two particular AGSR technologies; Ground Moving Target Indicator (GMTI) and Synthetic Aperture Radar (SAR). SAR is a sensor hardware that uses microwaves, instead of electro-optical light-sensing devices, to generate photo-like images of the earth's surface. Although SAR sensors can be placed on platforms at sea, or on the ground, the scope of this project was to use SAR sensors based on platforms flying high above the earth.

The other ingredient in this lethal mix, GMTI, is a process that uses mathematical algorithms to track the changed location of objects, like vehicles, that are detected by airborne or space-borne sensors.

Although these two newly-emerging military assets are certainly of overall assistance to NATO's Intelligence, Surveillance and Reconnaissance (ISR) efforts, the nations collaborating on this effort hoped to use their new technologies for specific warfighting purposes, including the creation of a working Theater Missile Defense (TMD) system. (See pp.24-26.)

After researching TMD for at least ten years, NATO finally announced its intentions to spend 650 million euros to build its own

"deployable theatre missile defense capability to give protections to troops against incoming missiles."[2]

NATO sees the use of AGSR assets as central to its goal of making TMD a standard operating procedure in battlefields of the near future.

Military leaders have long recognised the crucial importance of gathering information, particularly about enemy strengths and movements. The need for such intelligence has lead to increasingly elaborate military sensors placed aboard "platforms" like specialised warplanes and small uninhabited drone aircraft. (See pp.3-9.)

In 1995, NATO's Supreme Headquarters Allied Powers Europe, through the NATO Consultation, Command and Control Agency (NC3A), created an Advanced Capability Testbed in The Hague, Netherlands.[3] (That was the year Canada's SAR-equipped satellite, RADARSAT-1, was launched.)

By that time, the U.S. and France had developed their own independent airborne intelligence-gathering systems with SAR/GMTI capabilities, while Italy and Britain were not far behind. Meanwhile, Germany and Norway had been busily developing ground stations to process and exploit this kind of sensor data.

These nations came together in the NC3A laboratory as a first step toward achieving interoperability. They wanted to ensure that their military personnel could all function together as efficiently as possible when using these new airborne sensor technologies to gather data and then relay it to command centres and weapons systems. At first, scientists from the six participating nations held lab exercises using electronic simulations to set the stage for real use of SAR and GMTI in future wars.

Emerging from the Lab

Military scientists and soldiers were, however, soon moving their research efforts into the light of the real world. They moved out of the "testbed" and began integrating their experiments into "live-fly" military exercises that used warplanes and uninhabited aerial vehicles. During such wargames as the Paris Interoperability Experiment (1997),[4] Central Enterprise (1998),[5] Joint Project Optic Windmill/ Clean Hunter (2000),[6] a mix of computer-simulated data and actual sensor

data from warplanes and drones, was used.

One of the most important functions of these exercises was to prepare NATO forces to engage in Theater Missile Defense operations in future wars. Scientists tested their SAR/GMTI equipment and military users learned and practised new skills by operating the systems in phoney war scenarios.[7,8,9]

SAR and GMTI systems were so new that participants had to create user-friendly protocols for warfighters to exchange

> "ISR data and information ...[via] local and wide area networks, tactical data link, instant messaging and storage/retrieval from web-enabled data bases."[10]

One of the project's central goals was to enhance the "interoperability" of the equipment and its users. Because the state members of CAESAR had independently developed their own individual SAR sensors and GMTI processing systems, they needed to create new rules and routines for getting these various pieces of equipment, and their operators, to work seamlessly together as one integrated, cohesive warfighting whole.

By 1999, seven nations (Canada, France, Germany, Italy, Norway, the UK and U.S.) were working closely together "to achieve operational and technical interoperability among the MTI and SAR platforms."[11]

For the next two years, each of these governments engaged teams of lawyers to develop a legal framework for CAESAR. The result was a Memorandum of Understanding with two side documents: a Project Arrangement and a Technical Agreement. These covered the project's purpose, timeframe, what each nation would contribute, and the delicate issue of transferring technology between nations and corporations. The NC3A managed the project and allowed members to use its labs.[12]

Collage by Richard Sanders.

Many Eyes in the Sky

Because air-to-ground sensors are positioned high above the earth, they occupy the most strategic positions possible. They can oversee multiple battle zones and conduct intelligence gathering operations that are essential for many reasons, not least of which is the targeting of weapons systems.

NATO does not yet possess its own air-to-ground surveillance systems. It is however planning to purchase such technology and expects "an initial operational capability" by 2010.[13]

To bridge the gap, NATO's CAESAR project pulled together the national assets of seven countries. Each of these states had already excelled in the research, design and production of some unique sensor or sensor-data processing system. This was in fact a condition of their membership in the CAESAR project. Only nations with some SAR/GMTI technology to contribute were allowed to join the club.

Some nations provided CAESAR with powerful sensor systems aboard aircraft or drones (France, Italy, UK and U.S.). These are the airborne eyes and ears of the modern warfighting machine. Others, like Germany and Norway, provided mobile "exploitation stations" designed to receive, process and transmit sensor data for use by weapons systems.

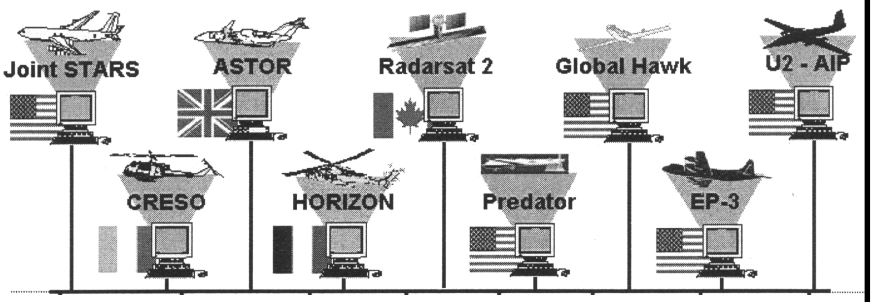
However, only one nation provided CAESAR with a space-based sensor. That nation was Canada!

Canada's Gift to CAESAR

Canada's part in this NATO effort to perfect specialised ISR technologies for warfighting and "missile defense" operations of the 21st century, was very significant indeed. Being an ever-loyal and leading partner in this alliance of the world's richest and most militarily powerful nations, Canada generously provided what can be described as the jewel in the apogee of CAESAR's crown. The Canadian asset is a unique sensor system whose platform rides at altitudes far higher than any other in the CAESAR pantheon.

Canada's gifts unto CAESAR were listed under "Participating Sys-

Of the seven participating nations, only four had air-based sensor systems to offer CAESAR. However, only one nation supplied a space-based sensor. That nation is Canada.



Graphic source: Joseph Ross, Table 5, 2002 (see Reference 5).

CAESAR has now grown into an even bigger NATO-led coalition called MAJIIC which is integrating several new ISR sensors systems. Canada's contribution has also grown.

tems" by Stephen Bond in the *Military Intelligence Professional Bulletin*:

> Canadian Radar Satellite (RADARSAT) system and associated ground stations. RADARSAT 1 is an operational commercial satellite providing 7- to 100-meters resolution SAR imagery, depending on the radar beam mode and incidence angle. RADARSAT 2 is currently in development; when operational, it will provide radar images at better than 3-meter resolution and have an experimental ground MTI capability.[14]

Other military sources clarify that Canada provided CAESAR with "live" RADARSAT-1 data and "simulated" RADARSAT-2 GMTI data.[15]

As Bond mentioned, Canada's contribution also included "associated ground stations." MacDonald, Dettwiler and Assoc. has built or upgraded RADARSAT ground stations in many countries, including: Brazil, Canada, China, Italy, Korea, Saudi Arabia and Thailand.[16] There are also five U.S. military "Eagle Vision" stations that directly control RADARSAT operations and downlink its data. (See pp.36-38.)

During the CAESAR project (2001-2005), various national assets took part in huge annual NATO air force exercises, including Clean Hunter (2001) and Strong Resolve (2002). (See pp.24-27.) RADARSAT-1 was used in these war games that involved hundreds of warplanes and ground vehicles, tens of thousands of troops and preparations for future TMD operations.

Meanwhile, CAESAR work also continued with "simulation exercises" such as Dynamic Mix 2002, and TMD-focused Cannon Cloud 2002.[17]

Besides personnel, Canada contributed simulated RADARSAT-2 data for integration into weapons-targeting systems for computer simulations, like SIMEX 2003[18] and Technical Interoperability Experiment (TIE) 2004.[19] These exercises are in preparation for the day when RADARSAT-2 will give data to U.S. and NATO forces engaged in war.

A 2003 talk by Dr. Judith A.Daly, director of NC3A's Operations Research Division, noted that Canada's RADARSAT-2 data had been used by CAESAR in "Four major Military Utility Assessments since 2000. Two live-fly [and]...two simulation."[20] She also listed some military "firsts" achieved by CAESAR. Primary among these was that for the first time ever, a "Space Based MTI sensor (Canada)" was used "in a NATO exercise."[21]

The Canadian government's perception of the CAESAR project and its place in NATO's vision of wars to come, is enlightening. The government's Science and Technology Report for 2002, which then-Industry Minister Allan Rock said "demonstrates the vitality of federal science and technology,"[22] highlighted the work of various government bodies. CAESAR is mentioned in the context of Defence R&D Canada, under "Enhanced Collaboration with Partners":

> "The special relationships that exist between Canada and the U.S. have seen the successful development, commercialization and exploitation of many technologies and systems. The unique position that Canada enjoys in defence science creates favourable conditions for Canadian industry to access defence programs in the United States.
>
> Examples...include:....
>
> • Coalition Aerial Surveillance and Reconnaissance [CAESAR] ...which integrates different forms of surveillance information and processes to provide an improved coalition operational picture to the war fighter and ensure interoperability among allied nations."[23]

CAESAR is Dead, Long Live MAJIIC!

In recognition of CAESAR's great success in building weapon/sensor/user interoperability among the world's leading warfighters, the U.S. Air Force's Materiel Command gave its International Award for Armaments Cooperation to the project in June 2003.[24]

War planners, military scientists, technicians and warfighters from the participating nations, all proclaimed CAESAR to be a fantastic success. One commentator noted that "On completion, the programme was called the 'hidden jewel of NATO.'"[25]

Although the CAESAR project ended in March 2005, it was immediately reborn as an even bigger NATO-led project. The new and improved incarnation was also dubbed with a clever acronym to match the symbolic power of CAESAR. It's now called MAJIIC, or Multi-sensor Aerospace-Ground Joint ISR Interoperability Coalition.

While CAESAR integrated two emerging aerospace-based ground-surveillance/reconnaissance technologies, (SAR and GMTI), its successor has the more ambitious task of fusing data from these and other sources, including:

- Electro-Optical sensors
- Infrared sensors
- Motion Video sensors
- processed Electronic Support Measure data.[26]

MAJIIC was also expanded beyond the seven original CAESAR nations by adding two new state participants: Spain and the Netherlands.[27] Other countries may also join MAJIIC, including Australia, Belgium, Turkey[28] and Sweden.[29] And, at a MAJIIC "Bidders Conference" other potential participants were named, including: South Korea, Japan and Singapore.[30]

Who's Waving the MAJIIC Wand?

There is no doubt that the state with the strongest grip on the MAJIIC wand is the U.S. Afterall, the world's rogue superpower spends as much on the military as the rest of the world combined.[31]

While other MAJIIC members give one or two types of sensor hardware, the U.S. supplies more than two dozen, including six types of Uninhabited Aerial Vehicles (UAVs), seven kinds of aircraft with ISR sensors and ten ground-based "exploitation workstations" to process sensor data. Here's a veritable alphabet soup of ISR-related assets provided to MAJIIC by the U.S.:

> "**USAF:** DCGS-AF [Distributed Common Ground System-Air Force], DGS-X [Distributed Ground System-Experimental], JSTARS [aircraft], U2 [aircraft], Predator [UAV], Global Hawk [UAV], MC2A [E10A Multi-sensor Command and Control Aircraft], NCCT [Net-Centric Collaborative Targeting].
> **U.S. Army:** DCGS-A[rmy], TES [Tactical Exploitation System], JSWS [Joint STARS workstation]/ CGS [Common Ground System], ARL-M [Army Reconnaissance Low- Multi-function aircraft], ACS [Aerial Common Sensor UAV], T[Tactical] UAV.
> **U.S. Navy:** DCGS-N[avy], AIP [Anti-surface warfare Improvement Program for P-3 Orion aircraft], P-3 [aircraft], MMA [Multi-Mission Maritime Aircraft], BAMS [Broad Area Maritime Surveillance] UAV, GHMD [Global Hawk Maritime Demonstration - UAV], TES-N [Tactical Exploitation System-Navy], TCS [Tactical Control System].
> **U.S. Marine Corps:** MAGIS [Marine Air Ground Intelligence System]."[32]

MAJIIC originated to solve data-collection and management problems encountered during the U.S.-led bombing of Iraq in 2003.[33,34,35]

The U.S. military stands to benefit more from MAJIIC because it will likely be during U.S.-led wars that the MAJIIC toolkit will be put to use. One of many military-produced articles praising MAJIIC's contribution to the work of U.S. warfighters, was written for the American Forces Press Service. Its author begins by saying:

> "U.S. forces operating in Iraq, Afghanistan and elsewhere may soon be able to use 'MAJIIC' to locate an enemy position on the battlefield and share intelligence information and imagery with coalition allies."[36]

That day may be coming soon. MAJIIC has already held at least one training exercise during which live data from a U.S. Predator UAV flying over Iraq was fed into the MAJIIC system.[37]

To gauge the degree to which the U.S. controls MAJIIC, one can also peruse the cornucopia of U.S. "unified combatant command units" that have their fingers in the MAJIIC pie: "JFCOM [Joint Forces Command], CENTCOM [Central Command], EUCOM [European Command], PACOM [Pacific Command], STRATCOM [Strategic Command], SOCOM [Special Operations Command]."[38]

MAJIIC is subsumed under the U.S. Department of Defense as a five-year Advanced Concept Technology Demonstration project. It was requested by Admiral Edmund Giambastiani[39] who heads the U.S. Joint Forces Command. It has integrated MAJIIC into a much more broadly-defined war plan called the ISR Troika Project. This three-pronged effort is designed to give frontline soldiers access to the widest possible array of sensor data.[40]

Besides RADARSAT, Canada is now giving MAJIIC the use of a Tactical Unmanned Aerial Vehicle (TUAC) for "target acquisition and surveillance." The Sperwer has been Canada's TUAC of choice in the Afghan war since Oct. 2003.

Canada Ups its Ante

The Canadian government is now giving more to MAJIIC, than it gave to its predecessor, CAESAR. Here are some examples of Canada's enhanced collaboration in this new NATO-led effort:

Money:

Canada's officially-recorded spending on CAESAR (2001-2005) was a mere $4 million.[41] (Not to mention giving access to the $1.145 billion RADARSAT system.) However, Canada's projected spending on MAJIIC (2006 onwards) is ten times more, i.e., $40 million.[42]

RADARSAT:

When RADARSAT-2 is launched later this year, Canada will begin providing MAJIIC with data from the world's most advanced commercial satellite. RADARSAT's earth images, and more importantly its GMTI data, will be used in MAJIIC preparations for war, including Theater Missile Defense roles.

Tactical UAV:

According to John Kane, the MAJIIC Joint Technical Manager, for the U.S. Joint Forces Command, Canada has added a whole new sensor platform to MAJIIC's sensor toolkit, a "Tactical UAV."[43]

However, the type of Tactical Uninhabited Aerial Vehicle (TUAV) that Canada has turned over to MAJIIC has not been publicly disclosed. It may be the CU-161 Sperwer drone which has been Canada's TUAV of choice in the Afghan war since October 2003. That's when Canada's Sperwer detachment began supplying Intelligence, Surveillance, Target Acquisition and Reconnaissance data for use in that war.[44]

The Quebec-based Oerlikon-Contraves corporation, is the prime contractor for the Sperwer.[45] This Canadian-built "Little Hawk" has been exported to the militaries of Denmark, France, Greece, Sweden and The Netherlands.[46] The Sperwer has an electro-optical sensor in a ball-shaped turret under its nose. Its flight path, and the movement of its video camera, are controlled by soldiers in a mobile Ground Control Station.[46]

Alberta War Game, June 2006:

According to an NC3A report "Experimentation Activities with Aerospace Ground Surveillance," Canada will likely host a MAJIIC war game. This "live flying exercise with all MAJIIC nations in June 2006 [will] probably [be] held in Alberta, Canada."[47] Although this event is not named, there is little doubt it is "Maple Flag." For almost 40 years, this annual 'Top Gun' weapons-firing competition has been held at Alberta's Cold Lake Air Force Base. This year, between May 14 (Mothers' Day) and June 23, it will host more than 5,000 NATO and allied warfighters. Troops and warplanes will converge on Alberta to take advantage of "the vast, unrestricted airspace and more than 640 targets of the Cold Lake Air Weapons Range."[48]

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Clean Hunter 2001: RADARSAT in a TMD War Game

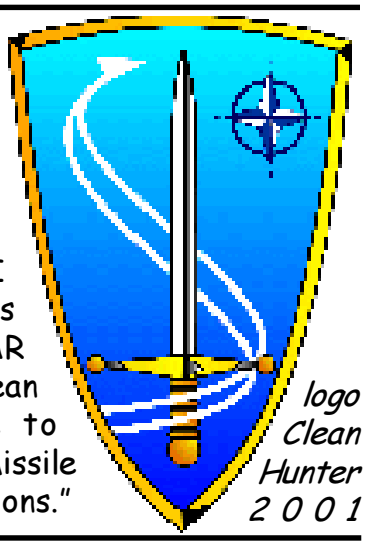
Clean Hunter is the name of a huge, annual, multinational, military exercise that has provided the armed forces of NATO member states, including Canada, with an opportunity to practise "Theater Missile Defense" (TMD) operations. It is said to be the "largest live-fly exercise in Europe"[1] and "the largest and best exercise of its type in the world."[2]

Clean Hunter was formerly called Central Enterprise. It was described by Dr. J.David Martin, the U.S. Ballistic Missile Defense Organisation's Deputy Head of Strategic Relations, as:


Dr. J.D. Martin

"encompassing air and theatre missile defence. A key objective was to make the Theater Air Missile Defense mission a part of normal operations in central Europe."[3]

Since June of 2001, Canada has helped NATO warfighters to prepare for the day when RADARSAT-2 will be ready for use to protect battle-deployed troops and weapons. This unique Canadian space-based SAR/GMTI sensor is the only satellite that has been groomed through the CAESAR project—and war games like Clean Hunter 2001—to contribute to NATO's goal of making Theater Missile Defense "a part of normal operations."



Central Enterprise 1998 provided "support for Theatre Missile Defence Conventional Counter-Force (CCF) capability" and also "validated the ability of GMTI [Ground Moving Target Indicator] sensors to support the TMD CCF role."[4] (See pp. 16-17) It was, in fact, one of the key "exercises that led up to the initiation of the CAESAR project."[5] (See pp.19-23.)

After CAESAR was created, it used Clean Hunter as an opportunity to pursue NATO's desire to increase the "interoperability" of its warfighters, their operational procedures and the use of SAR/GMTI technologies in TMD operations. Canada's collaboration in this effort was of historic significance.

Dr. Chuck Perkins, the U.S. Act-

TMD: Coming to a Theatre of War Near You?

Theater Missile Defense (TMD) has a starring role in Ballistic Missile Defense (BMD). In fact, TMD is the performance of "missile defense" weapons in their *most important role*. TMD will soon be used in wars, to destroy missiles that threaten allied troops and weapons systems that have been deployed far from home.

TMD is not only a part of BMD, it is at the forefront of this whole weapons program. In very real terms, TMD is the "top priority" of the U.S. warplanners that are preparing to use BMD. (See Gen. Horner's statement, p.25.)

In the U.S., TMD is overseen by the Missile Defense Agency, just as previously it was part of the BMD Organization and before that, the Strategic Defense Initiative Organization.

To many, "missile defense" is seen as an impossible futuristic, sci-fi "shield" to protect entire "homeland" populations. So called National Missile Defense (NMD) is supposed to defend Americans from missile attacks launched by terrorists or "rogue states," like Iran, Syria and North Korea.

This preposterously unattainable vision of defending America from missile attack was first popularised by President Ronald "Star Wars" Reagan, although the enemy of the day—dubbed the "Evil Empire"—was then the USSR. Reagan, and many since, focused people's attention on the space-based weapons that were, and still are, only one small part of the NMD dream.

The idea that "missile defense" weapons are for defending civilian populations, is really just a clever pretext; a shield-like ploy protecting the project's real but covert, offensive function. NMD is a big lie used by warplanners to garner much-needed and widespread support for the most expensive weapons creation program in world history. Can you think of a better way to get public approval for an offensive arms program than to say that the weapons are needed for homeland defense?

So, if creating a protective shield for the American people, or their friends and allies in Canada, is just a fanciful scam designed to deceive, what is this project really all about? Is it all just a cynical ploy to create a cash cow to pour hundreds of billions of dollars into weapons-producing industries? Although it *has* functioned very well at that economic task, it also has a more sinister underlying use for warfighters.

To understand the role of this weapons program, one must examine the cutting edge of "missile defense" known as TMD. Its weapons and sensor systems have been tested in simulations, military exercises and real wars.

Yes, TMD *is* coming to a theatre of war, but it will not likely be anywhere near you, unless you are in the Middle East or Central Asia, close to the strategic oil reserves that the U.S. and NATO nations call their own.

TMD is *the* "missile defense" system to watch, not only because it will literally *defend missiles*, but because when used in those faraway wars of the near future, it will be seen on home-entertainment systems near you, during the nightly wash of TV news.

ing Deputy Under-Secretary of Defense for Advanced Systems and Concepts, noted that Canadian technology played a key role in Clean Hunter 2001. He explained that the use of RADARSAT in that war game represented the

> "first use of [a] Space-Based MTI [Moving Target Indicator] sensor (Canada) in a NATO exercise."[6]

He also said Clean Hunter 2001 was the

> "first use of coalition interoperability CONOPS [Operational Concepts] for GMTI and SAR [Synthetic Aperture Radar] assets and Ground Station[s] in a tactical TMD exercise."[7]

More detailed evidence regarding the use of RADARSAT in this "missile defense" testing/training exercise can be found in a technical paper by David Taylor of the NATO Consultation, Command and Control Agency (NC3A). In a table called "Distribution of CAESAR AGS [Airborne Ground Surveillance] simulations and exploitation workstations for Clean Hunter 2001," we learn that only four countries (Canada, France, the UK and U.S.) had SAR/GMTI sensors to contribute. The table lists Canada's RADARSAT-2 as a "Spaced Based Radar GMTI."[8]

Taylor's paper describes how computer-simulated target data was used during Clean Hunter 2001 to prepare CAESAR participants for future "missile defense" operations. He says

> "it was necessary to simulate the TMD portion [of Clean Hunter 2001] because there were no live assets scheduled. The simulated CAESAR assets fulfilled this function during the exercise."[9]

He explains that CAESAR's TMD portion of Clean Hunter 2001 used simulated signals from seven different advanced sensor assets, including RADARSAT-2. All of these cutting-edge Intelligence, Surveillance, Reconnaissance devices cited by Taylor use SAR and GMTI technology:

> "The full complement of [the] Coalition Aerial Surveillance and Reconnaissance (CAESAR) project was present at Clean Hunter 2001, including sensor simulations representing ASTOR (UK), CRESO (IT [Italy]), Global Hawk (U.S.), HORIZON (FR [France]), Joint STARS (U.S.), *RADARSAT II (CA* [Canada]*),* and U2 (U.S.)." (Emphasis added).[10]

Taylor goes on to say that these "various CAESAR sensor simulations were used to generate target detections for use by the exploitation workstations in support of a Joint Theatre Missile Defence Cell, which was responsible for producing targets for allocated ground attack assets."[11]

So, although Canada's RADARSAT-2 will not be launched until December 2006, NATO warfighters have been readying themselves for its eventual use in TMD missions since as early as June 2001, when this war game took place.

Through the CAESAR project and specifically through military exercises like Clean Hunter 2001, the armed forces of a select group of NATO countries have practised for the day when data from Canada's RADARSAT-2 would be available to them for use in TMD operations during real battles. Canada's special role in planning for this "missile defense" warfare of the future has included providing a unique space-based technology, and preparing our armed forces—and those of our closest allies—to use that technology. The technology in question, RADARSAT-2, will be the most advanced commerical satellite ever built and the "the world's first space based radar with GMTI capabilities."[12]

Canada's RADARSAT-2 was *the one and only* satellite being groomed for TMD use during the Clean Hunter 2001. In fact, during the whole CAESAR project, RADARSAT-1 and -2 were the only space-based sensors being integrated into NATO's war plans. Canada's RADARSAT is, therefore, a unique and vital contribution to NATO's general warfighting ambitions, and more particularly, to its goal of making TMD "a part of normal operations."

However, when New Democratic Party and Bloc Québécois MPs have pointedly questioned Canadian government and corporate representatives about the potential role of RADARSAT-2 in future "missile defense" operations, the response has always been immediate, emphatic and dismissive: There is, they say, no possible role for RADARSAT in "missile defense"!

Such responses are predicated on the mistaken belief that because RADARSAT-2 cannot track missiles in flight, it will have no part whatsoever in "missile defense."

However, a major lesson to be learned from studying the CAESAR project is that RADARSAT-2 *does,* in fact, have a role in "missile defense."

"I am pleased that Congress and the Department of Defense *Bottom-up Review** have prioritized our development and fielding of BMD [Ballistic Missile Defense] systems. ***We all agree Theater Missile Defense is the top priority."***

General Charles A. Horner, USAF
- commander-in-chief, NORAD Command
- commander, Air Force Space Command
- commander-in-chief, U.S. Space Command

Source: Statement to the Senate Armed Services Committee, as amended by the Joint Staff, Office of the Secretary of Defense and the National Security Council, April 20, 1994. <www.fas.org/spp/starwars/congress/1994_h/s940420h.htm>

*** The Bottom-Up Review:** The U.S. Department of Defense laid out a three-fold missile-defense program. It gave top priority to Theater Missile Defense (TMD). Three projects constituted the core of TMD:
(1) improvements to the Army's Patriot missile system,
(2) modification of the Navy's AEGIS system to make it capable of intercepting theater ballistic missiles, and
(3) a new Army missile defense system called Theater High Altitude Area Defense.
Source: "Ballistic Missile Defense: A Brief History," by the Historian's Office, Missile Defense Agency. <www.mda.mil/mdalink/html/briefhis.html>

RADARSAT-2's role is *not* to detect missiles in flight but rather to track and target vehicular ground movements that are characteristic of ballistic-missile launch preparations. (See pp.14-18.)

RADARSAT-2 is highly-coveted for use in "missile defense" operations because of its state-of-the-art GMTI technology. For years, CAE-SAR's TMD exercises demonstrated that warfighters from NATO states can work together using diverse sensors, including RADARSAT-2, to detect the telltale movements of missile-launch vehicles, called Transporter-Erector-Launchers (TEL):

> "TEL batteries have to follow an intricate sequence of movements (transload site, hide, fire, hide, reload, fire, hide, transload/overnight). Supply units must move at prescribed times to specific sites and headquarter units relocate as part of operational security. Key objectives of the [Clean Hunter 2001] exercises were the location and attack of TBM [Theater Ballistic Missile] infrastructure targets: Transload, Forward Operating Locations, Forward Operating Bases and Headquarter sites. The simulation of these facilities was represented with stationary vehicles that could be imaged with the various SAR sensors."[13]

In other words, the idea is to process the data from RADARSAT-2 to determine where missiles might *possibly* be launched from. NATO's plan is to use SAR/GMTI data from Canada's RADARSAT-2 to help locate potential missile-launch sites. This target data will then be relayed to weapons systems, like air-, sea- or ground-based ballistic missiles operated by the U.S. or allied military forces. Those weapons would then use the data from sensor systems like Canada's RADARSAT-2, in pre-emptive first-strike attacks to destroy what might possibly be the enemy's missile-launch sites. As Taylor explains, the

> "objective of the TMD segment of Clean Hunter [2001] was to provide a realistic Tactical Ballistic Missile (TBM) threat. The Exercise mission was to protect NATO forces from TBM attack through CCF [Conventional Counter-Force] operations...to ensure that threat TBM infrastructure and support systems could be *destroyed prior to TBM launch*."[14] (Emphasis added.)

FIRST STRIKE!

Government and corporate representatives vehemently dismiss the possibility that RADARSAT-2 could be used in future "missile defense" operations. However, CAESAR's TMD exercises during Clean Hunter 2001 prepared NATO warfighters to use RADARSAT-2 data to target *possible* enemy missile-launch sites for destruction in preemptive, first strike attacks.

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RADARSAT-1 and Strong Resolve 2002

The following reports refer to the use of RADARSAT-1 surveillance data during the Strong Resolve (SR) 2002 war game:

"ISR assets provided to SR 2002 included... the Canadian RADARSAT."[1]

"MTI and SAR data from actual HORIZON, RADARSAT-1 and Joint STARS platforms were successfully shared by the entire CAESAR suite of exploitation workstations.[2]

"Systems participating in Strong Resolve [2002] included...RADARSAT satellite (full operational systems)."[3]

"Extensive U.S. and coalition technical and operational preparation led to this exercise 'deployment' providing live fly E-8 Joint STARS, French HORIZON and Canadian RADARSAT-1 surveillance data to NATO coalition forces."[4]

"CAESAR supported multiple echelons of command on both sides of the conflict, providing near-real time data from the French HORIZON system, the U.S. Joint STARS system and the Canadian RADARSAT-1 space sensor.[5]

During the...Strong Resolve exercise..., the French SAIM image intelligence system merged multi-source MTI and SAR data from RADARSAT-1 (Canada), JSTAR (U.S.) and Horizon (France).[6]

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