

## THE LEGALITY OF THE MILITARY USES OF OUTER SPACE BY THE CANADIAN FORCES

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### 1. ABSTRACT

Canada is one nation amongst other active countries to promote peace on this planet and in outer space for several years in various United Nations forums such as the Committee for Disarmament and the Committee for the Peaceful Use of Outer Space. The diplomats of the Canadian External Affairs Department produce a lot of excellent working papers and continue to lobby for a better international security amongst nations. Furthermore, the track record of Canadian Forces in all the blue berets missions is also well known because of the professionalism of all its volunteer forces. However, Canada does not have the status of a neutral country; on the contrary, Canada is participating in some military alliances like the North Atlantic Treaty Organization (NATO) and still agree with the nuclear policy of NATO. Canadian officers are involved in some limited military space activities and also participate in NORAD (North American Aerospace Defence Command) activities jointly with the United States Air Force. This integrated "command" is only a few blocks away from the unified "U.S. Space Command" in Colorado Springs on Petersen Air Force Base.

The Department of National Defence of Canada did publish an unclassified version of its military space policy in 1987. Since that date, few attempts to recommend a new "white paper" on Canadian Defence Policy, including its military space activities, were made but these were unsuccessful

However, it is clear that some generals at the National Defence Headquarters want a proper budget for all their space activities when it could be beneficial for their operations on land, sea and in air but at the right price. My purpose is to examine with scrutiny that official space doctrine in relation to the rules of international law. In other words, all those military activities related to outer space by Canada are within or not of the the complex system of laws in force in outer space or down under on this planet.

Finally, after that legal analysis of some passive defence systems on earth and in outer space, I will make some suggestions to improve the international legal regime regarding some military activities in outer space. I do believe that we could improve the "corpus lex spatialis" with better legal mechanisms dealing with disarmament and arms control on both earth and in outer space for a better international security amongst nations. This legal essay will also address the several problems related to some active defence systems like weapons and A.S.A.T. (anti-satellite) in case of a space warfare. The aim is rather to provide some legal guidelines to officers in their planning to contribute an international minimum order with the help of the high technology and some space assets available to their forces on land, sea, in airspace and also in outer space.

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## 2. INTRODUCTION

In the last Second World War, Canada was amongst the Allied Forces that did contribute to the scientific research and was one of the providers of uranium which is used to build some atomic weapons. For many years, the Canadian Armed Forces were also nuclear capable and participated directly with NATO Allies to promote nuclear deterrence, in cooperation with the United States Armed Forces in Europe and Canada. In the beginning of the history of space activities in Canada, it was the Department of National Defence which was the leader and which allocated the budget for the first series of Canadian satellites in the beginning of the Sixties. As you are aware, "Alouette" was our first satellite launched by the United States in 1962. We were then the third nation in the world in orbit around the planet. Later on, the Liberal Government of Pierre Elliot Trudeau decided that the Canadian Armed Forces should no longer be directly involved in the delivery of nuclear weapons systems and accordingly restricted the Armed Forces only to conventional weapons. However, Canada, one of the founding nations member of the North Atlantic Treaty Organization, remained an ally supportive of the nuclear defence systems of the Alliance as one of its main deterrence pillars. Today Canada still collaborates closely with NATO, for example, in the testing of the cruise missile technology and also the the aerospace defence of the North American Continent in the joint military command of NORAD responsible for some space missions (space monitoring, surveillance, early warnings, attack assessments). Canada must cooperate with its Allies to maintain a common vital defence system with the greatest mutual benefit at an affordable cost to our economy. Canadian Forces still believes in its collective security interest in the NATO Alliance within the scope of the Charter of the United Nations, including the right of self-defence (Article 51),.

Before retiring, Mr. Trudeau, our former Liberal Prime Minister, suggested a peace initiative by banning all weapons in outer space in the beginning of the Eighties. Soon after, the new Conservative Government, under the leadership of Mr. Brian Mulroney, officially declared that the Strategic Defense initiative (SDI) was prudent. SDI did not contravene either the 1967 Outer Space Treaty (multilateral) or the 1972 Anti-Ballistic Missile Treaty (bilateral). While several of our allies did participate

as "a government-to-government" effort in total support of SDI, Canada only gave a limited support with its corporations and institutions. They were nevertheless free to pursue opportunities of interest to them in the SDI programme, including some space weapons research but without the proper support from our government. It was a sad political decision for our aerospace industries and researchers.

## 3. A CANADIAN LEGAL VIEW

Since 1982, the Department of External Affairs of Canada is very active in the United Nations Conference for Disarmament to promote the prevention of an arms race in outer space at the condition that proper verification and controls are available for both space-to-space and space-to-ground monitoring so as to guarantee compliance with the eventual arms control measures in relation to outer space, like the PAXSAT studies for example. Canada is also dynamic at the Committee for the Peaceful Uses of Outer Space within the United Nations. In July 1987, the Department of National Defence adopted an unclassified space policy for the Canadian Armed Forces which definitely needs some space technology to operate properly with efficiency. As an example, in the last conflict with Iraq the commercial communication satellites of Canada were used extensively by the Canadian Armed Forces to reach their units in the Persian Gulf area, thus confirming the dual role of some space assets. The other space areas of Canadian military interests are surveillance, navigation, search and rescue, meteorology, oceanography, cartography and manned space activities. Furthermore, that official policy stipulates the following on the subject of research and development of space-based weapons:

"Research (and possible development) of ballistic missile defence (BMD) and related systems are areas of vital interest to Canada and DND must be capable of monitoring events closely and advising the government. DND will concentrate its activities on the broad areas outlined in paragraph 6. In cases where development of Canadian technology could have a direct and exclusive application to the development and deployment of space-based weapons or other areas limited by government direction, further specific policy guidance will be necessary."<sup>2</sup>

You should also note that the Act respecting National Defence in Canada gives the authority to encourage defence research and in fact Part III of said legislation is entitled "Defence Research Board"<sup>3</sup>, where military, scientific and academic personnel are working together in new defence technology in collaboration with our interested aerospace defence industries. This research and development is essential to the Canadian Armed Forces in order for them to operate with all the new high technology for a better performance of our troops in their missions, including our role in aerospace defence within NORAD and as United Nations peace keepers.

Last April, the Honourable Marcel Masse, the Canadian Minister of National Defence issued the latest "Canadian Defence Policy" in our changing world. He stated that:

"Today, the number of certainties is far outweighed by the number of uncertainties.....Our aim is to deter the use of force or coercion against Canada and Canadian interest and to be able to respond adequately, should deterrence fail."<sup>4</sup>

He also confirmed that Canada does not have any other alternative to collective defence. The Canadian Armed Forces are responsible for the surveillance and control of our sovereignty of Canadian interests including our aerospace zone and also including our airspace over the high Arctic.<sup>5</sup>

"In this context, space-based surveillance, navigation and communication systems are becoming increasingly important, particularly as their accessibility to military and civilian users grows in the years ahead. We must be prepared to make the best use of these technologies in meeting our security requirements, while upholding Canada's long-standing commitment to the peaceful development of space."<sup>6</sup>

All those priorities for the Canadian Armed Forces could not be achieved without the utilization of some military satellites. Of course, Canada will respect the international public law including the "lex corpus spatialis" in force for the benefit of a better peace.

In the new policy it is stipulated at least officially

some space missions for the Canadian Air Forces:

"In designing the air forces of the future, we have sought to:

- ...
- maintain aerospace surveillance and defence forces in Canada;
- ...
- improve the capability for arms control verification"
- ... 7

The capital budget devoted to the air forces will be spent partly on:

- ...
- The North American Air Defence Modernization Programme;
- ...
- Space-based surveillance systems;"<sup>8</sup>

to satisfy some of the needs of the Canadian Armed Forces.<sup>9</sup>

It is now obvious that the Canadian Government has made it quite clear and official that some military operations should be done with proper space assets. Canada and the United States will continue to cooperate closely in the aerospace defence of the North American Continent within the NATO structure. The renewal for five years of the NORAD Agreement is a concrete example of joint aerospace defence venture between "best friends". For more than 50 years Canada and the United States collaborate in their defence relations via the Permanent Joint Board on Defence since 18th August, 1940.<sup>10</sup> Canada could not join the neutral country group but may be a good allied state even in space to some extent in some limited defence system.

Therefore, most of the Canadian space military activities described hereinabove were mainly force multiplier and did involve only very limited scientific research and/or testing of aerospace weapons. Certainly no deployment of any space-based weapons was carried out from Canada being conventional or exotic weapons systems at least to the best of my knowledge of the unclassified information available.

#### 4. AN INTERNATIONAL LEGAL VIEW

These military activities in outer space are, in

my view, in conformity with the international law in force. All those space activities could be non-aggressive and, furthermore, may contribute to a better stability for a certain minimum order on this planet. The space technology gives an excellent support to the modern armed forces. The advantage of having access to this new high technology is essential and also vital for any combined combat operations on land (i.e. Persian Gulf) on sea (i.e. Falklands), in the air and also in outer space, according to some military lawyers and strategists.

"Military activities in space are fundamental to our national security. Space is the high ground, and effective control of it in any future conflict could be decisive. The unique characteristics of space have made practical the development of a multitude of systems to support and enhance military operations. These include systems for navigation, weather forecasting, communications mapping and geodesic measurements, nuclear nuclear explosion detection and monitoring, ballistic missile early warning, photo reconnaissance and surveillance including arms control treaty monitoring. These systems are crucial to the employment of our military forces and provide a significant increase in the effectiveness of the force. They have been characterized as force multipliers, thus permitting the accomplishment of national goals, and objectives with fewer, although more efficient, forces."<sup>11</sup>

We have to remember that the international jurists have not yet reached a consensus on the boundary between airspace and outer space, so it may be premature to limit some types of weapons in certain areas of space. Some jurists believe that the rapid evolution of new technologies which will be available in the next millenium is still unknown. Why should we, today, limit our defence systems of tomorrow when technology is progressing in space defence systems.

An excellent legal article by our learned colleague, Professor Harry Almond of Georgetown University, entitled "Space without Weapons"<sup>12</sup> describes well the needs for some space weapons. In order to maintain a minimum international public order on this planet, we need an aerospace force. The same applies to outer space if we want to be able

to enforce international law. We should seek to achieve a global security order and be ready to maintain the free navigation of spaceship like on the high seas. Any threats being aliens, unidentified flying objects, space pirates, natural meteorites or asteroids, space mines, incontrollable satellites, any firing by accident of an intercontinental ballistic missile or any weapons could be stopped. We should be able to destroy even an unmanned nuclear satellite about to crash in an inhabited space platform or on a village, and we may also be able to re-orbit some space threats if necessary in case of crisis or imminent danger for the benefit of mankind.<sup>13</sup> Professor Almond quoted his colleague Michael Reisman of Yale Law School to reaffirm that law includes the right to exercise some authorized coercion in which sometimes we must use a certain degree of force to keep some international public order.<sup>14</sup> We do agree with their views.<sup>15</sup>

At the same McGill Symposium on "Space without Weapons - L'Espace sans armes" in 1989, Commodore W. Fenrick of the Office of Judge Advocate General, a specialist in international public law of the Canadian Armed Forces, seems to agree with the views of Professor Almond in his address on "Space without Weapons: The Current Legal Situation". He stated the following:

"Subject to constraints on use of force contained in the UN Charter, conventional weapons which are not ABM systems may be deployed in earth orbit. Conventional weapons may not be installed on the moon or on other celestial bodies but they may be stationed elsewhere in outer space. Anti-satellite weapons which are not ABM systems may be deployed at sea, on land, and in the air, even if they are weapons of mass destruction. ASAT weapons deployed in space must, however, be conventional weapons.

A suggestion that no new legal instruments are necessary to prevent the further militarization of space and that all that is needed is increased emphasis on verification and compliance would be overly optimistic."<sup>16</sup>

My former teacher of space law, Dr. Carl Q. Christol, at the 21 Colloquium of Space Law, confirmed that space law does not prohibit certain

types of anti-satellite and or of interceptions with certain conventional weapons.<sup>17</sup> This legal position is also rightly shared by a jurist from Israel who, like us, defends the theory of the right of self-defence in outer space.<sup>18</sup> At least some experts in space law did affirm the legality of space militarization and also the deployment of certain types of space weapons (F.O.B.S., kinetic killer satellite, even some types of exotic space-based or ground-based weapons). A limited weaponization of outer space could be done within the limits of international law.

##### 5. THE LEGAL VIEWS OF SOME CANADIAN DIPLOMATS

Canadian diplomats working in their delegation in 1986, at the session of the United Nations Committee for Disarmament, did file an official working paper entitled "Terminology relevant to Arms Control and Outer Space" which dealt with "weaponization" of outer space in those words:

"To the best knowledge of the international community, weapons have not yet been placed in orbit on a permanent or semi-permanent basis although it is generally assumed that anti-satellite (ASAT) weapons have been inserted into full or partial orbit for testing purposes on more than one occasion in the past. Apparently, the trajectories of intercontinental ballistic missile (ICBM) systems have not been interpreted to involve the weaponization of space. The important distinction between weapons placed in space, weapons which only transit space on the way to their targets and weapons based elsewhere which are used to attack targets in space, often is blurred in discussions."<sup>19</sup>

It is clear that we are facing major legal problems in trying to limit the scope of action of the military strategists interested in protecting their respective space assets. It could be argued that those satellites, shuttles and on space platforms, even with conventional and/or exotic weapons, may contribute in a certain way to the stability of an international order by their potential dissuasive power. As we have already determined, most civilian space assets could also be used for military missions. Even some former eastern bloc jurists identify the space shuttle as a potential ASAT and/or an aggressive vehicle. Maybe

it is a bit naive, but we personally believe that, in order to maintain a minimum state of order in outer space, we might at least need certain types of space weapons to enforce international law, not only on this planet but also in space for the benefit of all mankind and our collective security. We always have to remember the sad history of several States which did not, even in spirit, respect their legal obligations especially towards international law including space powers, thus breaching their commitment.<sup>20</sup>

Many multilateral and bilateral agreements are reflected in the "corpus lex spatialis". The jewel of the crown of space law is the Charter of Outer Space of 1967 and its well-known article IV which addressed more specifically some military activities. It is clear in said Charter that it is not all types of space weapons that are prohibited. Some ASAT weapons systems being space-based or ground-based, can be lawfully deployed in outer space or on earth but not on celestial bodies. Said article IV did not stipulate that outer space must be used "exclusively for peaceful purposes". Certain ASAT weapons could easily qualify as not being weapons of mass destruction. Some conventional weapons and also laser and particle beams weapons could be lawfully used in outer space irrelevant if they are ground or space-based.<sup>21</sup> The "Magna Carta" of space does without doubt permit some military activities and limit only some mass destruction weapons systems. We also share the legal point of view that whatever is not specifically prohibited "verbis expressis" in international public law is therefore permissible and accordingly lawful, even for some space defence purposes.

As we know, the legal principles contained in the Charter of the United Nations are also part of the "lex corpus spatialis". In its article 1, one of its purposes is "to maintain international peace and security" and to that end to take "effective collective measures for the prevention and removal of threats to the peace, and for the suppression of acts of aggression or other breaches of the peace ...". What would happen if a nation used some prohibited weapons or did not act in conformity with the international law in outer space? Could that lead to a breach of the peace in outer space? If a state imposed some restrictions on the free navigation in outer space or declared itself to be sovereign of the moon and all its assets, could we defend international law? I think that in such situation, we should use

some space weapons to enforce the principles of justice according to international law when all diplomatic negotiations have failed. Sometimes the use of arms can be stabilizing when the purpose is to restore international order. If a state does not behave on the high seas and limits the free navigation or even attacks a foreign ship, then under these circumstances, the country under attack or its allies can react by using all the necessary weapons systems to defend said assets according to the principle of self-defence within the scope of the laws of war and international law. This analogy to the regime of the law of the sea could be extended to outer space. One of our most senior diplomats, Mr. de Montigny Marchand, while he was the Canadian Ambassador in Geneva to the United Nations said:

(Free translation from French)

"I would go as far as to sustain that at the Conference on Disarmament, in one period where I did have the honour to represent Canada. A wider acknowledgement was gained to the effect that the interdiction of ASAT will not permit automatically to reach the aims that were fixed at the beginning, (i.e. banning all space weapons)."<sup>22</sup>

Another Canadian diplomat, Mr. Robert Rochon, a senior lawyer of the Department of External Affairs of Canada, also confirmed that some military activities are consistent with international law. He also stated that "a considerable measure of prohibition and protection already extend to outer space".<sup>23</sup> We do agree with his point of view. Maybe we just need at this stage to refine the legal text of some space agreements by a few amendments in the form of protocols to increase their clarity and scope. However, if we go for any additional agreements, these must be more precise and define in greater detail their obligations with adequate (in situ) verification of compliance in space and on earth with proper hefty sanctions in case of any breach. The strategists are already quite limited in their space defence plan.

One of my fellow Canadians, the Director of the Arms Control and Disarmament Division of External Affairs, Colonel Cleminson, was right about his beliefs that ASAT in orbit (space-based) "would likely be located in the same volumes of space as their potential targets",<sup>24</sup> mainly in low earth orbit. These low orbits are available for space-to-space verification

mission and could also be reached by some space weapons, if necessary. We should preferably have a few allies within NATO who would be contactable within minutes in case space weapons systems were required to defend any allied assets in danger in outer space. NATO should not have a shield for threats from earth only, our "collective defence" commitments should also apply to space threats. We could avoid a second crash of an uncontrollable nuclear space vehicle on our territory, unlike Cosmos 954 if some space weapons were available on quick notice.

## 6. A NEW OPTION FOR CANADIAN MILITARY SPACE DOCTRINE

Our best ally, the United States, did inscribe in their official "National Space Policy" of 1989 that their national security in space includes "enhancing operations of United States and Allied Forces".<sup>25</sup> Let's face it, we live in a dangerous world of arms proliferation. Several States now have access not only to missile technology but also to arms of mass destruction. Canada could help several NATO allies, like France, United Kingdom, Spain, Italy and the United States in their military space programmes including research and the manufacture of some components of aerospace weapons.

Canada has no military strategic interest to be amongst the club of space weapons countries, but to complete our NATO pro-nuclear policy, we could also assist our military partners in a collective approach to a total dissuasion with proper strength on both earth and in outer space. Canada's defence space policy could be more coherent with our global security approach if we change our attitude to weaponization of outer space by accepting at least to cooperate with some passive defence systems of satellites.<sup>26</sup> The important point is that no single space nation has access to space weapons. Furthermore, because of the new reality from several new space powers, the United States should think of offering, through NATO, some military space technology at more competitive prices. In fact, Canada should begin to increase all its military space programmes with its traditional military allies and make a special effort with its European allies for a better diversification. Canada should also take the opportunity to reduce its costs in defence spending by joining its Allies in some military space programmes and at the same time access new military space markets in Europe and not only with the United

States. Some competition could reduce the cost of sharing military space assets.

The military space strategy of tomorrow could be based preferably on total non-nuclear space systems,<sup>27</sup> (including the propulsion system and not only the weapons as such). In our view, some future space-based systems including certain types of conventional weapons could be more of a deterrent nature than the present nuclear weapons umbrella. Canada could work for a common peace in deterring aggression with passive space systems, including a combination of defensive space weapons and verification/arms control satellites in orbit and their respective earth stations links. Canada, in its military space policy, should seek to be an excellent ally to our friendly space powers more interested than us in some force application and in a limited space control.<sup>28</sup> Canada could contribute more in the space force enhancement and space support system, as an excellent sub-contractor for the Allies. The Canadian Forces must have a clear doctrine to integrate some military space operations (in conjunction sometimes with Allies) and also consolidate all its military space systems requirements when possible on a Canadian civil satellite in order to save costs to our taxpayers, otherwise share a space platform with an ally.

We already fly common crew on NATO Awacs, so why not establish a NATO combat space wing in a new NATO space command to be more efficient in a recession time. We think that we should delete from our last priorities the topic "Military Man in Space" and replace it with arms control and verification. On the other hand, the new defence space policy should add a new priority - "the research and technology development in conjunction with our Allies", including space weapons systems but not their direct deployment. However, a Canadian aerospace industry should be able to build some parts and any components of NATO space-based or ground-based weapons systems. We still participate right now in the cruise missile technology which could carry nuclear arms, so why not also be in space weapons business with conventional ammunition?

We should remember that our national defence space doctrine should not be dictated by our arms control policy.<sup>29</sup> The defence space policy should only support verification measures provided that the priority is always being given to the supreme interest of the national security objectives and also in

considering common space defence requirements within our vital collective military alliance and not in isolation from our partners in space. I would like to stress the political reality in Canada: several peace groups are very active in lobbying against defence spending and more so if the words "space weapons" are mentioned. Only a few of our politicians are really knowledgeable on the subject of space defence issues and the lobbying on the Parliament hill is "exclusively peaceful" between advocates of a stronger defence within NATO and the Canadians who want to pull out of NATO completely and disarm our Forces to a strict minimum for only a domestic role.

On the other hand, Canada now has at least its own Space Agency after waiting several years for that legislation.<sup>30</sup> We could understand that the Space Agency is civilian by the nature of its mandate, but it is sad that it does not have amongst its personnel a permanent senior position for a military space advisor like they have at the CNES (Centre National d'Etudes Spatiales) and remain dedicated to the peaceful use of outer space.

The future defence space policy should recognize the critical importance of the military uses of space to our security and also of our Allies. Canada will have a definitive advantage if our Forces could cooperate in certain defence space support and also in most enhancing military operations (multiplier effect) with space systems including defence-based passive weapons (e.g sensor, radar, etc....) with our Allies. The benefit of a close collaboration in this high technology domain will not only help our military sector but also the civilian one. Canada could play a role in combat support and also a certain role in combat space operation such as surveillance, space monitoring, early warning, attack assessment, radars, sensors, and other related passive defence space-based and ground-based systems within an integrated Allied command and control.

Even today only few maritime States have a major war fleet with aircraft carriers to guarantee the freedom of navigation of the high seas; so why can't we also have some space nations with their respective military space assets deployed in outer space to maintain at least a minimum order around the earth. The timing is good, NATO is seeking some new important role and while the Western European Union (strictly European) is not strong enough in the military use of outer space without its North

American Allies at least in the near future. Canada has already been the partner of several space-minded States, United States, Japan, the former U.S.S.R., United Kingdom, France, Sweden and various other European countries via ESA projects. We could suggest some multilateral space defence system as a new NATO project to our allies.

#### 7. NEW OUTER SPACE THREATS ARE THERE

It seems that more than nineteen (19) Third World\* countries currently have ballistic missiles in their arsenals and thus the number of the club of space powers has started to increase. Some of them also were or still are in the process of gaining access to mass destruction weapons technology.<sup>31</sup> That is why we strongly believe that it is very important for Canada to support at least the global protection against limited strike plan (GPAL) and to accept this time the new invitation of our "best friend".<sup>32</sup> This new system of weapons and why not also some other SDI projects could use some non-threatening technology. It could be a good limited layer of insurance protection over our head at a reasonable cost with some spin-off benefit for our aerospace defence industry.

In 1985, we already lost many dozens of millions in SDI contracts, at least ten (10) times compared to Germany and sixteen (16) times compared to the United Kingdom. Both European governments did fully endorse the SDI research programme while we only did not stop our space industries and universities to bid without any government support and accordingly only won 8 millions of SDI contracts according to some of our reading. Let us hope that this time around, our government will endorse "GPAL" with a clear and loud message of support from government to government. Furthermore this new plan already has the seal of the doves of the U.S. Congress to build that new weapon system with space-based sensors. We should always keep in mind the residual and/or dual capacity of many space assets that would also be harmful in time of crisis to our collective security.

GPAL could be a sound and worthwhile allied space defence programme for us; it will assist us in facing the new strategic reality of the 1990s with the incontrollable proliferation of missiles and arms of mass destruction in a new multi-polar world order.

Canada must change its defence space doctrine and cooperate closely with its Allies to maintain a better minimum international order in outer space. Under a NATO space command, preferably with an inventory of certain types of space weapons to impose the respect of international law, if necessary against various potential space threats to the peace-minded inhabitants on this planet. Canada, with this new defence space doctrine will remain faithful to our external policy promoting peaceful uses (non-aggressive) developments of outer space. This new policy does not promote space offensive weapons but only passive defence systems for legitimate self-defence for outer space within NATO structure. Canada's

\* Afghanistan, Argentina, Brazil, Egypt, India, Iran, Iraq, Israel, Kuwait, Libya, North Korea, North Yemen, Pakistan, Saudi Arabia, South Africa, Syria, South Korea, South Yemen, Taiwan.

Source: See note 31 at page 16



official position is not changed, outer space is not exclusively for civilian space missions. We also accept the dual role (military/civilian) of some space assets and even dedicated military space platforms. Furthermore, certain types of space weapons, (being ground-based and/or space-based), could also qualify<sup>33</sup> according to the "lex corpus spatialis" as being permissible in law. In fact, these high tech defence weapons systems could also be helpful in case of need by the United Nations Security Council for a peace mission on this planet and/or in outer space.

Canada must participate at least even in a limited way to some capability in space combat operations, preferably within NATO Alliance (multilateral). At any rate, the Canadian Forces should as a bare minimum assist (even in bilateral agreement like NORAD) our military partners to improve their collective space control and the application of proper force through the medium and in the medium if necessary. In other words, the Canadian Forces should have some space capability for ready combat operation in outer space as members of NATO crew of a space wing engaged in passive space defence and also in a limited participation in certain space weapons systems. Otherwise our forces would not have the proper training and equipment to participate with efficiency in a new complex international security order with our Allies and would accordingly only play a police role in domestic conflict in case of limited emergency, like a national guard. If the Canadian Armed Forces have only a limited access to the new space systems, they would not be able to maintain their professionalism and could expose their lives to risks that could be reduced with proper high technology equipment in a total defence systems concept.

We believe that we could compete for the ground-based segment and also the space-based segment of those space defence systems. We should be participating in the complex structure of space-based passive defence systems. The new space defence doctrine must not restrict the military space opportunities for our aerospace industries. Our small professional armed force have been tasked military missions that required some space technology in order to assume our share of collective security system as a small but efficient partner both on earth and in outer space. The continual proliferation of ballistic missile is an alarming sign that more States on the road of developing their own launch capabilities and

accordingly some potential relative threats to allied space assets (including anti-satellite weapons).<sup>34</sup> The United States have a definite interest to rely partly on its space-faring allies in order to have a multilateral control capability more in line with the new international reality being a multi-polar political world.<sup>35</sup>

"Thus, it is largely the responsibility of the U.S. to ensure that the allies have an interest in supporting American space control efforts."<sup>36</sup>

## 8. A CANADIAN EAGLE BI-HEADED POLICY

The Department of National Defence of Canada is well aware and realizes clearly that an insufficient involvement in military space activities could restrict its available options for the Canadian Armed Forces. Those technical constraints could also possibly have a negative impact on our domestic security and our collective defence interest for a safer planet.<sup>37</sup> Our Forces have no choice, they must be space capable. We should have more "Memorandum of Understanding" with our allies to improve our defence space-based assets (like the one with U.S. in 1987 on space-based synthetic aperture radar for the surveillance of a NATO zone of strategic importance) for our collective alliance<sup>38</sup> and also some ground-based systems.

On the other hand in the Department of External Affairs, our diplomats are still working hard at the Conference on Disarmament. In the report of the Ad Hoc Committee on Prevention of an Arms Race in Outer Space at the 582 Plenary Meeting held in February 1991, we could read again that some Western States do not want to complicate further the already complex status of the "Corpus Lex Spatialis".<sup>39</sup> Canada has already identified 29 different modes of harming a satellite and is still working on a detailed verification strategy for each mode to build up some confidence measures. Furthermore, the relatively new concept of "keep-out zones" in outer space seems unworkable so far to Canadian researchers.<sup>40</sup>

We want to mention that our Ally, France, is one of the future major space military power to watch closely. The French armed forces will rely more and more on space systems for their defence and could possibly become a good space military partner in the

near future in some joint venture.<sup>41</sup>

In the United States, it is the "Missile Defence Act of 1991"<sup>42</sup> which gave the legal authority for their missile defence goals. In Canada, no new piece of legislation is necessary. The National Defence Act and the Canadian Space Agency Act are sufficient to engage our energy and forces in space defence systems including space-based sensors capable of cueing ground-based anti-ballistic missile interceptors and also able to give initial target vectors for the defence weapons of our allies. It is true that the United States "Brilliant Pebbles" program could be an excellent space-based interceptor providing a limited global defence to all allies against some space threats, i.e. unauthorized launches or accidental probable collision, and/or limited ballistic missile attacks. Canada could cooperate closely to the development of certain space-based defence programs of our allies including research, development and support activities of some space weapons systems projects like certain interceptors and associated space-based and/or ground-based sensors. The members of the Canadian Senate in 1985 in their report on National Defence entitled "Canada's Territorial Air Defence" already insisted in their chapter VI on the importance of space defence "beyond the year 2000" for Canada.<sup>43</sup> We did wait too long, our Forces should be more space capable and collaborate in "GPAL" as soon as possible and in other space defence systems.

One suggestion to our Minister of Defence could be the creation of an "ad hoc" outer space committee composed of civilians and military whose objective would be to draft a new combined Canadian Space Policy for both civilian and military sectors under his chairmanship and also perhaps to have his own civilian legal counsel (not a member of the Office of the General Judge Advocate) for some impartial expertise in international public law like at the Pentagon in his "Cabinet" to avoid potential conflict of interest.

## 9. CONCLUSION

Do you really believe that a multilateral treaty may still prevent an ASAT and/or space weapons breakout with the available national means of technical measures of verification?<sup>44</sup> Our answer is simply "NO". We must confess that we do not have such a level of faith in arms control compliance

without a proper police stick to enforce international law if required. The space-based systems are a must in the employment of force in this contemporary age on earth and/or in outer space.<sup>45</sup>

We have to remember the sad and recent history of cheating of their legal obligations by some States regarding some weapons of mass destruction. If a country could violate too easily an arms control agreement in impunity, it could have severe defence consequences. We must insist on high standards for any measures of verification. We have no place for uncertainties because of the risk involved.<sup>46</sup> Canada should insist on strict arms control and disarmament measures near the "foolproof" warranty. We should be on the road to improve our collective space defence systems. Our allies should reach some common denominator in space defence systems. However, the United States must be ready to share the space control and agree on a collective military strategy for space operations with its allies. Otherwise, their isolationist position could be counter-productive and sow the seeds to create a new military arm without big brother "SAM" in Europe, under the Western European Union. We should also realize that any space strategy has a direct impact on other objectives like some economic and technological considerations and most states want their proper slice in the space pie, not only the left-overs.<sup>47</sup>

All Canadians involved in any defence space operations or in any research and development of military space systems need to understand the inter-relationship between the principles of our national space policy, arms control, international law and our defence policy of 1992.

"As space control programs proliferate (both in numbers of space weapons and in terms of survivability enhancements), an accurate understanding of the military and legal environment will prove absolutely essential in

review its official policy of banning all weapons in outer space. This policy was excellent in the past, but the new geo-political reality needs a change in our orientation to face the space threats of today and tomorrow. Some of our diplomats could understand the necessity of new military space policy for our country in order to maintain peace on earth and in outer space to deter any potential aggression in both milieux. One of our junior officers was on target when he chose the following title to his 1992 research memoir at the College Militaire Royal de Saint-Jean in our space science program: "Canadian Government Policy Choices with regard to Space-based Weapons: A Decision Must Be Made".<sup>49</sup> The decision should be in favour of a major change of policy promoting some space weapons systems for our new defence role.

Ideally, the best solution for all of us is the prohibition of weapons not only in space but also on earth like if we were all good angels. The reality is quite different, we are only human beings, and sometimes engaged in arms conflict because of our lack of respect of international laws. We should remind ourselves that any disarmament and/or arms control measures in outer space could affect some defence systems down under on this planet. We believe that we could also benefit from the presence of some military space defence systems in order to reduce the proliferation of certain types of weapons on earth and in outer space. In the meantime, it may be better to have a minimum of space weapons to be able to maintain a limited international order for all nations and pray for a better world for all faith in the future.

Canada could continue to promote the peaceful use and development of space even when its allies are protecting our collective security on earth and our space assets in outer space. Lastly the term "peaceful purposes" of the Canadian Space Agency Act may well be interpreted to include certain non-aggressive military uses or some development and testing of space-based weapons systems. Let us hope that this time our security interest will finally prevail over the arms control lobby,<sup>50</sup> so that we will be able to guarantee at least some minimum international order in outer space with our space military allies like on this planet. However, our best allies should not have the exclusivity of the control of outer space, it must be shared among allies. We do not believe that a total ASAT ban prohibiting all dedicated ASATS

could be beneficial for our collective security. We could need at least a certain limited number of space weapons available in time of crisis for a case of common self-defence or to avoid a greater danger in order to save some lives in outer space as well as on this planet. Preferably, the said space weapons should not have any nuclear power sources at least those in low earth orbit. At any rate a completely total ban on ASAT is impossible because of the residual or dual capabilities of some space assets whether we like it or not. We need a new orbit slot for certain space weapon defensive systems.<sup>51</sup>

Canada's resources with respect to budget and human power in space must not be diluted. On the contrary, it should be consolidated to the maximum with domestic interests first, and only thereafter with our traditional Allies. The Canadian aerospace industries need to be competitive in a global world, so they could be able to sub-contract on both civilian and military space assets projects. Canada may continue to adhere to its space legal obligations while its Allies could deploy, if they so wish, some type of space-based weapons for an effective collective security system. Our country could also be the spearhead to improve the "corpus lex spatialis" by amending some of the space agreements for a better understanding. The Canadian Forces may with some Allies begin to suggest the creation of a NATO space command where the Europeans could have a major role to play and not only the United States, our best military partner.

NOTES

operations, arms control verification and humanitarian assistance."

1 The Charter of the United Nations (1945), In no. 67 United Kingdom Treaty Series, Cand. 7015, 1946

7 Idem at page 27

2 Department of National Defence Space Policy, Area of Interest No. 7, Page 3, Ottawa, Ontario, Canada, 1987

8 Idem at page 28

3 National Defence Act Revised Statutes of Canada 1985, Volume VI, Chapter N-5, Sections 47 and 55-60

9 Idem at page 19  
The only dedicated paragraph with the heading "Space" reads as follows:

"Space is an important component of the international security environment. The spread of weapons of mass destruction and ballistic missile technologies to a growing number of countries around the world is of primary concern. As a result, the United States and Russia will examine the possibility of cooperating on the development of ballistic missile defences.

4 Canadian Defence Policy - 1992 By the Department of National Defence, Ottawa, Ontario, Canada April 1992 at page 1

Canada will need to address these and other space-related security issues as they evolve. Over the longer term, we will have to acquire an appropriate capability in space-based surveillance systems. We can assume that, eventually, space-based systems will be capable of monitoring our territory, our airspace, our ocean approaches and other areas under our jurisdiction. The Canadian Forces will benefit from improved surveillance, communications and navigation provided by these systems. For National Defence, the most cost-effective way of deploying such systems and maintaining control over Canada's sovereign airspace may be to address this problem in cooperation with other agencies. Whatever option Canada chooses, it must find ways of keeping abreast of new technologies and ensuring that its own national requirements can be met to the greatest degree possible. It is clear, however, that space-based systems are extremely expensive and that Canada's final decision may well rest on resolving the issues of affordability and priority."

5 Idem at page 5

6 Idem at page 11  
Minister of Defence then concluded in those words:

"The future will involve opportunities for enhanced cooperation on security issues, as well as a great deal of uncertainty and instability. As we move forward in this emerging environment, the Canadian Forces will remain an important instrument of Canadian foreign policy. The defence of Canada's sovereignty, our continued participation in collective security arrangements, and our aspiration to help resolve regional conflict, all call for the maintenance of flexible, capable armed forces. These forces will have to adapt to new domestic realities and new geostrategic conditions on the basis of the following priorities:

- defence, sovereignty and civil responsibilities in Canada;

- collective defence arrangements through NATO, including our continental defence partnership with the United States;

- international peace and security through stability and peacekeeping

10 External Affairs and International Trade Canada  
Annual Report 1990-1991, pages 29 and 46

11 Reed and Norris

Military Uses of the Space Shuttle  
13 Akron Law Review, (1980), p. 665 to 666

Colloquium on the Law of Outer Space in 1978  
Ed Mortimer, D. Schwartz, page 192

12 Harry H. Almond, Jr.  
Space Without Weapons  
In the proceedings of the McGill Symposium of the Centre for Research of Air and Space Law  
1989, p. 109 to 136

b) Outer Space: Battleground for the Future  
La Conference canadienne sur l'Armement nucleaire et le droit  
Ottawa, Ontario, 1987

13 Idem at page 116

14 Idem at page 126

15 Idem at pages 129 and 130

"It is probable that neither the offensive doctrine of mutually assured destruction, nor the doctrine of defense, will alone provide for strategic stability. Yet, there may be a suitable blending of the two, particularly if evidence is forthcoming that a SDI, possessing an efficiency and economy sufficient to make it practical, is in fact designed to serve as a defensive and not an attack mechanism. Thus, the traditional presence of both the sword and the shield may produce counsels of caution against the improvident use of excessive force in the transactions of nations.

The formulation of the treaties might be chosen as a strategy, jointly agreed upon among space powers, preserving their freedom to continue military activities in space. Article IV of the 1967 Outer Space Treaty prohibits the deployment and orbiting of nuclear and other mass destruction weapons (i.e., the chemical, biological and radiation weapons, in addition to the nuclear weapons. But it does not prohibit all other weapons, and it does not prohibit the delivery or other systems needed to transport such weapons to make them effective. Hence the military strategies remain largely unaffected: weapons that are not in the mass destruction category are so destructive in themselves that the prohibited weapons are not needed to establish an effective military strategy.

c) Space Law, Past, Present and Future  
Section A, The Militarization of Space  
Kluwer Law, 1991, page 3

and also

d) Louis Haeck (major)  
The legality of military uses of outer space by the Canadian Forces, McGill University Doctoral thesis 11989, 600p.

The military strategies are not inhibited by undertakings to renounce force under all circumstances in outer space. There are no undertakings to renounce self-defense, or reprisals. Although the Charter [Article 2(4)] prohibits aggression, it does not do away with the forcible right of self-defence.

18 Bruce A. Hurwitz  
The Legality of Space Militarization  
North Holland, 1986

16 Idem, see note 12 supra, at page 150

19 Canada Working Paper, United Nations  
CD/716/CS/WP15  
15 July, 1986

17 Carl Q. Christol

a) Article four of 1967 Principles Treaty: Its Meaning and Prospects for its Clarification  
in  
Proceedings of the Twenty-First

20 Dana J. Johnson  
The Impact of International Law and Treaty Obligations on United States Military Activities in Space

- High Technology Journal, 1987, p. 80
- Note to the reader: Excellent Appendices are at the end of that brilliant legal article namely:
- Appendix A: Prohibited and/or Constrained Activities in Space
- Appendix B: Treaties directly affecting Space Operations
- Appendix C: Treaties potentially Impacting Space Operations
- Appendix D:
- Table 1 - The Impact of International Law upon Space Support Functions
- Table 2 - The Impact of International Law upon Force Enhancement Functions
- Table 3 - The Impact of International Law upon Space Control Functions
- Table 4 - The Impact of International Law upon Force Application Functions
- 21 Canada Working Paper, United Nations On the Survey of International Law relevant to Arms Control and Outer Space CD 1618/CD/05/WD.6 23-07-85, p. 12
- 22 De Montigny Marchand Arms Control in Outer Space: Another Area where the Incremental Approach is the Right One. in Proceedings of the McGill Symposium, of 1989 of the Centre for Research of Air and Space Law, L'espace sans armes McGill, CR DAS, 1989, p. 181
- 23 Rochon, Robert Treaty (res) and Verification Presentation on Arms Control and Outer Space. in "Proceedings of the McGill Symposium of 1985 of the Centre for Research of Air and Space Law" "Des Traités pourraient-ils éviter la course aux armements dans l'espace extra-atmosphérique" McGill, CR DAS, 1985, pages 129 and 135
- 24 Lt. Col. F.R. Cleminson The Feasibility of Space-based Remote Sensing in the Verification of a Treaty to prevent an Arms Race for Outer Space Idem, page 16
- 25 The White House November, 1989
- 26 Colin S. Gray American Military Space Policy University Press of America, 1982 Note: Please read pages 102 and 103, the list of questions on military space policy is a must.
- 27 Simon P. Worden, Bruce P. Jackson Space, Power and Strategy The Natural Interest, Fall 1988, p. 51
- 28 United States Air Force Space Policy Office of the Secretary 2 December, 1988, p. 3 and James W. Canan Space Comes Into Its Own Air Force Magazine, March 1989, p. 23
- 29 Henry F. Cooper Anti-satellite Systems and Arms Control: Lessons from the Past in Strategic Review, Spring 1989, p. 45
- 30 An Act to establish the Canadian Space Agency and to provide for other matters in relation to space C-16, Second Session, 34 Parliament, 38 Elizabeth II 1989, (passed on 15-12-89)
- Note: In its sections 4 and 5, it is not prohibited that the Agency shall have a role in some military space programmes on condition that they are promoting the peaceful use of outer space, (i.e. non-aggressive, space defence is not offensive).
- 31 Dana J. Johnson Trends in Space Control Capabilities and ballistic Missile Threats: Implication for ASAT Arms Control

Rand Report, March 1990

32 Tim Harper  
Will Canada welcome Son of Star Wars?  
Toronto Star, March 15, 1992, P. B-1  
and  
John Hay  
Canada should snub invitation to join the  
Strategic Defence Initiative  
The Gazette, March 18, 1992, p. B-7

33 J.W. Schomisch  
SDI Critical Technologies  
Pasha Publication Inc. 1991, p. 107  
"6.3.1 Anti-Satellite Weapons  
"... But to make sure that the ASAT space-  
based interceptor does not run afoul of the  
1972 Anti-Ballistic Missile Treaty, it will have  
a visual rather than infrared seeker." ... (p.  
107)

Said weapons is designed to comply with the  
Treaty and will not use direct hit-to-kill to  
avoid space debris.

The main difference with this technology is  
that it required a lot simpler data processing  
compared to ABM mission. The launch  
signature will be also different. That ASAT  
system will not have an ABM capability  
because of its design and its capability."

"Four ASAT missions have been developed  
by U.S. Space

Command. They are:

- providing deterrence by putting  
hostile-nation space capabilities at  
risk and responding in kind to an  
ASAT attack without escalating the  
conflict;
- degrading the other side's war  
fighting capabilities by denying over-  
the-horizon targeting of U.S. Forces,  
reducing support to land forces and  
denying space operations;
- denying electronic intelligence  
gathering through communications  
interception and visible and infrared  
imaging; and
- protecting U.S. space-based  
command, control, communications  
and intelligence assets.

A program concern, especially since the  
program is using technology developed in the

SDI program, is to make sure ASAT  
development does not violate the 1972 Anti-  
ballistic Missile (ABM) Treaty. Jellett said  
the ASAT system could be developed so it  
has a different launch signature from an  
ABM interceptor, which can be verified by  
launch detection sensors."

34 See note 31 supra at page 1  
and  
Keith B. Payne

Missile Defense in the 21st Century:  
Protection against Limited Threats including  
Lessons from the Gulf War  
Western Press, 1991

and  
Arnold Kanter  
Whither SDI? Strategic Defense in the Next  
Administration  
A Rand Note - 2806 - RC  
September 1988

35 See note 31 supra, at page 3  
"Should members of the Western Alliance  
perceive it is in their national interests to  
seek control of space, there may occur a  
congruence of interest with the U.S., leading  
to areas of mutual benefit, which in turn will  
strengthen the Western Alliance less  
stressfully than current nuclear and  
conventional forces".

36 See note 31 supra, at page 17.

37 See note 2 supra, page 3.

38 Thomas Duffy  
USAF Systems Command, Canadians Begin  
Talks on Space-based Radar Program  
in  
Inside the Pentagon, November 18, 1988,  
page 2

and

Ron Lowman  
Canada, U.S. Work to Home Space-based  
Radar Objectives  
in  
Defence News, November 20, 1989, page 21

and

David Hughes  
Team of Canadian, U.S. Firms Begin  
Detailed Design Work on Radarsat  
in  
Aviation Week and Space Technology  
February 12, 1990. pages 111 to 115

and

Thomas Duffy  
Canadian Space-based Radar Program Passes  
Major Milestone  
in  
Electronic Combat Report  
November 24, 1989, page 1

- 39 Canada, External Affairs  
Prevention of an Arms Race in Outer Space  
Conference on Disarmament  
(Final records and working papers of 1991)  
Ottawa, Ontario, Canada, February 1992,  
CD/1105  
24 August 1991, Sections 34, 35, 42 and  
extract of 60

Section 34:

"One delegation of the Western Group believed that the existing legal regime for arms control in outer space was equitable, balanced and extensive. The current regime placed some legal restraints on virtually every type of weapon in outer space and recurring predictions of an impending arms race in outer space had not been borne out. Therefore the allegations of its insufficiency were overstated. A legal regime, in and of itself, was not sufficient to prevent an arms race in outer space because one needed compliance with that regime, its enforcement and participation in that regime.

Section 35;

One delegation of the same Group, while recognizing that the existing legal regime was insufficient to prohibit some potentially threatening activities and was partially based on bilateral agreements subject to different interpretations or withdrawal, affirmed that the prohibition to deploy any weapon in space would be neither realistic nor efficient: it could indeed limit some stabilizing activities and at the same time would not

take account of the other threats to space activities.

Section 42:

In connection with the reiteration of some proposals for a comprehensive ASAT ban, one delegation of the Western Group stated that it did not believe that verification schemes proposed to date were adequate for this purpose. A key problem was verifying compliance with such an agreement. Another problem concerned the legal issue of how ASAT weapons should be defined and categorized. The delegation reiterated that the existing legal regime placed a wide variety of legal restraints on the nature, deployment and uses of ASATs. It stated that conventionally-armed ASAT weapons that lacked an ABM capability and that were not armed with nuclear weapons were currently not limited by any arms control agreement.

Extract of Section 60:

".... It was recognized once more that the legal regime applicable to outer space by itself did not guarantee the prevention of an arms race in outer space. There was again recognition of the significant role that the legal regime applicable to outer space played in the prevention of an arms race in that environment and of the need to consolidate and reinforce that regime and enhance its effectiveness and of the importance of strict compliance with existing agreements, both bilateral and multilateral."

- 40 Peter C. Hughes  
Satellites Harming Other Satellites  
by  
Arms Control Verification Occasional Papers  
No. 7  
External Affairs, Ottawa, Ontario, Canada,  
July 1991
- 41 Serge Grouard  
Strategies europeennes et espace militaire  
in  
Dossier no. 30 de la fondation pour les  
etudes de defense nationale  
Paris, France, 1989



- et
- Collectif
- Special Espace  
in Defense, no. 57, juin 1991  
Paris, France
- N.B. The section IV is only on Space and Defence with 8 articles. At page 96, General Jean Gurnet and Mr. Didier Compard in their article on "The Anti-Ballistic Defences" mention the collaboration with the Italian forces to develop a system of tactical anti-ballistic missiles from their ASTER programme
- et
- Marisol Touraine  
La France face aux armes anti-satellites  
in  
Defense Nationale, March 1987 at pages 61  
and 73
- et
- Vice Admiral Jean Chabaud  
Espace et Defense  
in  
Defense Nationale, August 1988 at pages 37  
and 55
- Free translation from french:  
"... but we should also be ready to build ASAT (and also some counter measures) if necessary. I am personally convinced that will be the case before the end of this century." (page 55)
- 42 10 USC 2431  
or  
Public Law 102-190-December 5, 1991  
105 STAT 1321, Part C -  
Missile Defence Program, Section 231
- and
- Dean Wilkening, Kenneth Watman,  
Michael Kennedy, Richard Darilek  
Strategic Defences and Crisis Stability
- Rand Paper, April 1989
- 43 Report of the Special Committee of the Senate on National Defence, Ottawa, January 1985, page 57
- "... It therefore recommends that an early inquiry be conducted into Canada's present and future military requirements in space with a view to establishing a national military space programme."
- and also
- Louis Haeck (major)  
A Military View of the Laws of Warfare in "Dominio Siderum" in McGill Annales de droit aerien et spatial, volume XVI, 1991, at p. 307 and 336
- 44 Murray R. MacDonald  
Anti-satellite  
A suggested Canadian policy  
(unpublished) military memoirs, see page 24\_
- 45 Conduct of the Persian Gulf Conflict  
An Interim Report to Congress, Department of Defence  
(Public Law 102-25), Washington  
July 1991, pages 6-9 on Space-based Systems
- 46 William J. Durch  
Anti-satellite Weapons, Arms Control Options and the Military Use of Space  
Contract AC 3PC 103  
United States Arms Control and Disarmament Agency  
Harvard University, July 1984, page 53
- 47 Robert H. Chisholm (Major)  
Our Space Welfare: Military Strategy for Space Operations  
Research Report No. Au-ARI-84-3, Air Power Research Institute  
June 1984, Chapters 4 and 6
- 48 Steven R. Petersen (Major)  
Space Control and the Role of Anti-Satellite Weapons  
Research Report No. AU-ARI-90-7  
Airpower Research Institute  
May 1991, page 83

- 49 Patrick Cormier (Second Lieutenant)  
Unpublished term paper  
1992, 65 pages
- 50 Mr. Lyle Dean MacWilliam, NDP member  
House of Common Debates  
6 October 1990, p. 4418-4419
- and
- The Guide to Canadian Policies on Arms  
Control, Disarmament, Defence and Conflict  
Resolution  
by the Institut Canadien pour la paix et la  
securite internationale, 1990, p. 100
- 51 De Quetteville, (Major-General)  
The DGFDF Space Development Briefing to  
Aerospace Industries Association of Canada  
on 14th April, 1992 (bilingual)  
National Defence Headquarters, Ottawa,  
Ontario, 1992