



## Submission to the Research and Development Review Expert Panel

from

The Canadian Association of Defence and Security Industries (CADSI)

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### **Abstract**

The Canadian defence and security industries contribute over 90,000 direct jobs, \$10 billion in output and \$5 billion to \$7.5 billion in exports to the Canadian economy each year. Despite its already substantial investments in R&D, there exists significant untapped R&D, innovation and economic potential in the industry. Because of the unique nature of the defence and security industries, this potential can only be released by a direct, industry development strategy in which government and industry collaborate in pursuing common technological development objectives to serve Canada's future defence and national security requirements. This is because all developed nations, including Canada, operate a managed defence and security market using the WTO exception to national treatment for defence and security requirements to maximize the economic pay-off to their country from these government expenditures, and to obtain the security benefits of relying on home grown technologies for the defence of their country.

Accordingly the Canadian defence and security industries propose that the government adopt a five point program to fulfill the government's commitment in the Canada First Defence Strategy to use the government's planned \$240 billion investment in defence and its other investments in security over the next 20 years to build global excellence and leverage Canada's industrial competitive advantage:

1. Coordinate the existing, disparate R&D support programs into a synergistic, powerful vehicle to achieve a much more ambitious and targeted defence and security R&D and industry development strategy;
2. Adopt four key improvements to the SRED tax credit program to increase the productivity of the experimental development feature, to permit tax credits to flow earlier in the technology development cycle where they are most needed, and to coordinate more effectively with the IRAP Program;
3. Stimulate increased collaboration between individual companies and university research teams on joint research missions through new or refocused university grant programs, improvements to IP policies, and changes to the IRAP program;
4. Strengthen the ability of the venture capital industry to provide the level of domestic and foreign expert risk financing required in defence and security industries to bridge the "valley of death" between R&D discoveries and successful market penetration, especially for SMEs; and,
5. Transform the current approach to Industrial and Regional Benefits policy into a powerful engine for funding the development and commercialization of new defence and security technologies and industrial capabilities through a new arms-length commercialization agency.

The defence and security industries are also pleased to provide, in Annex A, specific answers to the 15 questions posed by the R&D Review Expert Panel in its discussion paper.

## **1. Introduction:**

The Canadian defence and security industries appreciate the opportunity to share with the Research and Development Review Expert Panel their views on how research and development and innovation can most productively be stimulated in Canada. Your work is exceedingly important since in our view there exists important untapped R&D and innovation potential in the Canadian economy, and in particular within the already R&D intensive defence and security industries.

Our comments to you start by providing some relevant background on Canada's defence and security industries. We then explore a set of synergistic initiatives that could unlock the substantial untapped R&D, innovation and economic potential of our defence and security industries without placing undue stress on the government's fiscal position. We include in Annex A comments on the questions that the Panel has posed on current federal policies and programs to promote private sector R&D and innovation.

## **2. Canadian Defence and Security Industries:**

The Canadian defence and security industries are composed of over 800 high technology companies that provide over 90,000 direct jobs and 270,000 indirect jobs across the country, and contribute over \$10 billion to the Canadian economy each year, including between \$5 billion and \$7.5 billion in exports.

Defence and security is high tech. Defence and security companies are high investors in R&D and create high tech centers of excellence and clusters that catalyze innovation, and provide good jobs for highly qualified graduates from Canadian universities. It is connected to international networks that bring knowledge to Canada that is exploited in open innovation collaborations and international partnerships. It supports many research initiatives that are underway in our universities and benefits from university research discoveries.

The defence and security industries are a major exporter and as a result are a significant generator of wealth. Between 50% and 75% of defence and security industrial production is exported. This is not only good for job creation in Canada, but also for the prosperity of the many communities in which defence and security companies are located. Most defence and security companies are 'dual use' with internal synergies between their defence/security and civil commercial activities, markets, partners. The industry is broad, touching air, land and marine platforms, remote surveillance, command and control systems, and physical and cyber security.

Defence and security is a fundamental and unique federal government responsibility – the defence and security industries are a primary pillar of the national capacity to deliver on that responsibility. No nation can maintain a strong and independent defence posture without having sufficient industrial capacity to deliver the critical and strategic capabilities that cannot be purchased in the world markets because of other nations' security and trade policies and restrictions. No nation can afford to fail in matters of national defence or of national security.

The defence and security industries build equipment that provides the very best capability for the Canadian Forces and Canadian security personnel (especially first responders). The industry has stayed at the forefront of the global defence and security market (witness the significant level of sales and exports) and needs to not only stay there but extend its leadership position if it is going to remain a primary pillar of national defence and security capability. Being at the forefront of the market is a primary condition for ensuring that the Canadian industry will be successful.

## **3. Stimulating Increased R&D, Innovation, Economic, Employment and Export Growth in the Defence and Security Industries**

When the government announced its Canada First Defence Strategy (CFDS) it clearly set out as one thrust the objective of increasing the contribution of the Canadian defence, aerospace and security industry to Canada's evolving defence and security requirements. The government saw the commitment to a schedule of defence expenditures over the next 20 years as an opportunity for Canadian companies to build global excellence and leverage Canada's industrial competitive advantage. The government committed to a new and renewed relationship with the defence industry and research and development organizations across the country to help tap this new potential. The government needs to be similarly committed to achieving global excellence and leverage in the security industry through its security expenditures.

There are three unique strategic reasons why the circumstances of the defence and security industries require the government to collaborate in developing and pursuing a direct industry development strategy:

- First, the \$240 billion the government plans to spend on defence and the additional funding for security, over the next 20 years, provides a major economic development opportunity for Canada that cannot be ignored, especially since the government will be the purchaser of these goods and services. The government, and Canadians, care about how this taxpayer money is spent to benefit Canada;
- Second, significant technical and security benefits can be derived from sourcing Canadian defence and security requirements from Canadian companies, rather than simply purchasing Canada's requirements from foreign companies. More specifically, it is not appropriate for the defence of Canada to rest unduly on foreign companies, particularly given the control that foreign governments exert on their defence and security industries to respond to their own national defence and security requirements; and,
- Third, World Trade law provides an exception to the national treatment of foreign companies for products and services that fall under the defence and national security of a country (in large measure because of the second point above). All developed countries use this exception to favour their own defence and security industries in procurement so that they can develop domestic capacity to serve their national defence and security requirements, and so that their economy and citizens benefit from the substantial investments made in defence and security. Also, this 'managed' nature of world defence and security markets makes it imperative for a government to consciously develop their own domestic industry in order for that industry to have success in penetrating world defence and security markets.

These three unique factors call for a direct industry development strategy. Indirect supports, as through tax incentives like SRED, are not sufficient to meet the government's and the country's requirements. That is why the defence and security procurement policy of the Government of Canada explicitly recognizes the need to favour sourcing from Canadian industry, and in those cases where the prime contractor has to be a foreign company, to require that significant technological, economic and regional benefits flow to Canada through the IRB policy.

### **3.1 Defence and Security Industry Strategy**

The defence and security industries make substantial contributions to R&D, innovation and economic growth for Canada. However, they also possess the untapped potential to significantly expand these contributions over the coming decades if, like many of our NATO allies, Canada adopts an integrated, forward-looking defence and security industries strategy to maximize the economic and security benefits for Canadians from the government's investments in defence and security.

Now is the time for Canada to adopt an integrated, forward-looking defence and security industry strategy that can propel Canada to world leadership across a range of capability areas where the Canadian defence and security industry has already demonstrated its excellence. This strategy coupled with secure defence and security spending levels and a series of expenditure-neutral policy and program shifts in the government's approach to stimulating research and development will transform the defence and security industries into a key engine for innovation, economic growth, exports and the expansion of high quality employment in Canada. The government has had significant success with the industrial strategy in one area of defence and security - aerospace - and it is now time to expand this success by developing a broader defence and security industrial strategy.

A Defence and Security Industry Advisory Board composed of senior experts from the defence and security industries, academe, and government, reporting at the Ministerial level, could provide ongoing advice to the Ministers of Industry, Public Works and Government Services Canada, Finance and Defence on the effectiveness of the defence and security industries strategy and required modifications to objectives and program operations to increase benefits for Canadians.

The defence and security industries strategy will be based on the following framework principles:

- Secure the long term, predictable funding for Canada's defence and security needs;
- Pre-position Canadian industry for success in support of Canadian and international defence and security projects;
- Articulate priority defence and security capabilities for development into world class excellence;

- Align and target federal support policies and programs to support this strategy in a whole of government approach; and,
- Align procurement strategies with the defence and security industry strategy.

Five key policy and program changes are required to the government's current approach for stimulating R&D and innovation in order to tap the potential of a defence and security industries strategy:

1. Coordinate the existing, disparate R&D support programs into a synergistic, powerful vehicle to achieve a much more ambitious and targeted defence and security R&D and industry development strategy;
2. Adopt four key improvements to the SRED tax credit program to increase the productivity of the experimental development feature, to permit tax credits to flow earlier in the technology development cycle where they are most needed, and to coordinate more effectively with the IRAP Program;
3. Stimulate increased collaboration between individual companies and university research teams on joint research missions through new or refocused university grant programs and changes to the IRAP program;
4. Strengthen the ability of the venture capital industry to provide the level of domestic and foreign expert risk financing required to bridge the "valley of death" between R&D discoveries and successful market penetration, especially for SMEs; and,
5. Transform the current approach to Industrial and Regional Benefits policy into a powerful engine for funding the development and commercialization of new defence and security technologies and industrial capabilities through a new arms-length commercialization agency.

### **3.2 Coordinate Existing R&D Programs**

The current government approach to development of Canada's defence and security industries consists of several policies and programs managed by different government departments and agencies that operate separately in a largely uncoordinated manner (SADI and SRED support for private sector R&D, NRC research, DRDC research, IRB, EDC, CCC, Trade Commissioners and Defence Attaches, and government procurement). Major procurements proceed on a largely ad hoc basis with insufficient pre-positioning and development of strategic Canadian industry capabilities to maximize Canada's economic and security interests.

Under the proposed defence and security industries strategy government and industry will articulate and nurture a limited number of jointly agreed upon critical defence and security industries capabilities through joint, targeted strategies involving private investments and government support through the coordinated application of these same programs - SADI, SRED, NRC, DRDC, IRB, EDC, CCC, Trade Commissioners and Defence Attaches, and procurement policies. At the same time the effectiveness of individual programs in stimulating R&D investments can be improved, for example, by updating the IRAP Program and by having SADI repayment criteria focus more closely on revenues derived from the R&D investments. The collective buy-in to a set of national defence and security capability development priorities will drive private investments and the priorities within the set of coordinated government programs. Procurement strategies will meet military requirements in alignment with the strategy.

### **3.3 Improvements to SRED**

The SRED program provides important incentives to the defence and security industries to undertake research and development in the complex and risky environment of managed defence and security markets both in Canada and around the world. There are four specific improvements to SRED that would be effective in helping meet the full R&D and innovation potential of the defence and security industries:

- The definition of "experimental development" could be broadened to encompass all business activities aimed at maturing a product and reducing market risk. These could include: analysis, experiments, technology demonstrators, process improvements, and in certain cases, certification and acceptance activities;
- Tax credits at the R&D stage are sometimes insufficient to drive innovation forward. Since the real obstacle to commercialization rests at the end of the R&D stage, at the onset of marketing, the government could extend the current tax credit system so that it applies until a certain amount of sales have been achieved;
- The Government of Quebec has implemented a fully refundable tax credit that operates with respect to a percentage of wages. This best practice has been successful in generating an increased impact on investment in R&D in Quebec and could be implemented at the federal level to increase the effectiveness of SRED; and,

- The IRAP Program should be harmonized with SRED to provide a more effective stimulus to R&D investment. IRAP funding should not be deducted from a company's SRED tax credits as is the practice.

### **3.4 Stimulate Increased Company-University Researcher Collaboration**

The federal government has established several programs to stimulate business-university collaboration in research and development, notably the tri-council Networks of Centers of Excellence Program (the industry-led and commercialization NCEs in particular) and the industry programs at the Natural Sciences and Engineering Research Council (NSERC) such as the Industrial R&D Fellowships, Collaborative R&D Grants, College and Community Innovation Program, and Ideas to Innovation. These programs provide federal grants to university researchers and students who are collaborating with industry.

Most of the support for industry-university researcher collaboration is focused on large networks involving many companies and many researchers. While significant progress can be achieved in such networks to develop industry-wide innovations, important impacts on business R&D and innovation also occur when a single company and a single team of university researchers decide to pursue a joint strategic research mission tied to a particular technical problem or opportunity for the company. There exist important examples of both large and small companies that have succeeded in creating such collaborations that in effect extend the R&D capability of the company and open up new vistas for technology development that can be 'firsts' not only for the company, but also for that industry sector. These beneficial impacts occur in part because it is just one company collaborating with the university researchers under a mutually agreeable IP agreement.

Unfortunately there do not exist enough of these examples as shown by Canada's business-university R&D collaboration statistics compared to other OECD nations. The government could either modify the mandates of some of these existing industry-oriented programs to allow expenditures supporting individual company collaborations with university researchers, some of the existing NSERC programs noted above could be expanded, or a new program could be designed to support individual company R&D collaborations.

A second opportunity would be to twin the R&D funding to a company in the IRAP Program with funding from such a university R&D grant program. The IRAP funding would be partially directed to finding a suitable university research team with whom to collaborate.

The intellectual property policies of universities and government S&T departments can be a constraint to effective R&D collaborations between industry and the public sector. Universities sometimes retain IP in order to combine different research discoveries into a bigger package that has the potential to generate bigger licensing revenues for the university. This can get in the way of transferring individual IP to willing private companies. Also the exceptions that government departments make to the policy of transferring all IP to private companies are too broad and too often applied. More needs to be done to get public IP transferred to the private sector where it can generate tangible innovation.

### **3.5 Invigorate Canada's Relatively Young Venture Capital Industry**

One of the key constraints impeding innovation in Canada, and in the defence and security industries in particular, is the lack of adequate seed and venture capital funding for new R&D discoveries - this despite the existence of significant pools of capital with Canadian institutional investors like insurance companies and pension plans, and even larger international pools of capital. The Canadian defence and securities industries are good at developing new technologies and product opportunities, but financial markets are often unable to provide fledgling SME companies with adequate financing to bridge the "valley of death" between the demonstration of a new discovery and successful market penetration. Over 85 per cent of the companies in the defence and security industries are SMEs. It is often the case that "starved" new technology SMEs sell out to US investors and move their operations south of the border.

The government can take two actions to stimulate the Canadian seed and venture capital financial sectors. The first would be to provide new tax incentives to investors to increase their participation in seed and venture capital financing. The flow-through-share initiative applied to oil and gas exploration is one example of a tax initiative that could be applied with significant economic benefit to the defence and security industries. The second would be to use the government's commercial offices in the US (particularly in Los Angeles and Boston)

to help recruit savvy US venture capital managers to come to Canada where the institutional capital and tax policies would be in place to make significant gains in venture financing.

### **3.6 Transform Industrial and Regional Benefits Policy to Support a New Arms-Length Agency to Commercialize New Defence and Security Technologies**

The World Trade Organization exception to national treatment for foreign firms in the case of defence and national security procurements, and Canada's Industrial and Regional Benefits (IRB) Policy provide the opportunity for Canada to direct procurement of defence and security procurements to Canadian firms, and in cases where foreign manufactured products are procured, to require the original equipment manufacturer to provide industrial and regional benefits to Canada (usually equivalent over time to the capital cost of the equipment) and to ensure that SMEs have the opportunity to participate sufficiently in these benefits.

In practice the IRB Policy is applied on a case-by-case basis for each individual major procurement project. In conjunction with a defence and security industrial strategy that identifies target opportunity areas for Canadian technology development, there is a significant potential to use the IRB Policy on a more strategic basis as one of the key means to achieve these technology development opportunities over an extended period of time. At any one time there exists an as yet unspecified portion of the IRB benefits to which foreign manufacturer are committed, in part because it is often a difficult task to identify sufficient corporate linkages for generating the promised level of IRBs.

The government could offer foreign equipment manufacturers a new mechanism for meeting their IRB requirements – they could be invited (or required) to provide assistance in the form of a financial contribution to a new arms-length mechanism to support the development, demonstration, market readiness and certification requirements for a new priority technology identified in the defence and security industries strategy. In order to make this option attractive to original equipment manufacturers the government could consider giving five for one credits to outstanding IRB commitments for investments in this arms-length commercialization initiative. At the present time the unspecified portion of outstanding IRB commitments is in the billions of dollars. A ten percent commitment from this outstanding commitment could potentially provide up to \$400 million in financial support for such technology development, commercialization and certification initiatives. We understand that the government may be planning to amend the IRB policy to permit IRBs to be used for direct investment in R&D. This is a progressive development that needs to be combined with a defence and security industries development strategy as described in this submission.

There already exists a model for such an arms-length agency – Sustainable Development Technology Canada (SDTC) – that provides funding support to firms to help them bring research discoveries into the marketplace. The SDTC has had some notable successes in helping environmental technology firms bridge the “valley of death” between R&D and successful market penetration. In the case of the defence and security industries a similar Defence and Security Technology Canada (DSTC) could potentially have even greater success in accelerating the contribution of these crucial industries to Canada's economic growth, security and sovereignty.

The proposed defence and security industries strategy coupled with the above six initiatives will prepare Canada to excel in the dangerous but potentially lucrative waters of an international military market being reshaped by geo-political forces and technology. The proposed strategy will generate the following strategic economic and security benefits for Canada:

- Increased private sector innovation and economic, employment and export growth driven by the emergence of world class excellence in key defence and security capabilities where Canada is already demonstrating international competence;
- Enhanced military security and sovereignty through the development of additional domestic sources of supply for key, mission-sensitive technologies;
- The ability to optimize the economic return on investment in defence and security spending by pursuing common priorities in key capability areas through private sector R&D investments; government priorities in industry support programs and procurement strategies; academic and public sector research; and the development of private sector manufacturing, production and service capabilities, capacities and readiness; and,
- The ability to monitor, assess, refine and report on progress through an ongoing industry/academe/government Board of experts.

## Annex A

### Feedback from the Canadian Defence and Security Industries on Questions Posed in the Expert Panel Consultation Paper

In the body of this submission we have focused on the types of government policy and program changes within the remit of the R&D Expert Panel that would have a particular impact on stimulating increased R&D and innovation in Canada's defence and security industries. In this Annex we offer the views of our industry members on the fifteen questions that the Panel has posed in its discussion paper "Review of Federal Support to Research and Development" and adopt a somewhat broader perspective.

**1. In addition to the R&D activity defined by the OECD, should government be funding other business activities related to the commercialization of R&D? If so, what and why?**

Yes, government needs to do more to address the problem of helping R&D discoveries to bridge the dangerous ground between discovery and development and the successful penetration of markets. Too often attractive discoveries in Canada fail to make it to successful commercialization and end up as the flagship for successful companies in the US.

There are several things that government can do for this:

- Increase coordination between the disparate R&D and commercialization policies and programs by bringing a common strategic technology development focus to investments in certain strategic industry sectors (like the defence and security industries);
- Strengthen the venture capital financial sector as discussed in Section 3 above;
- Stimulate innovation and R&D through public procurement of innovative products that, in addition to stimulating private sector R&D, can increase productivity in the government. The government focus on value for money and lowest cost in procurement is robbing the government of significant opportunities for productivity improvement and cost reduction over the medium to long term;
- Implement the Defence and Security Technology Canada (DSTC) initiative (which is largely or totally expenditure neutral) and potentially, similar initiatives in a limited number of other key industry sectors offering significant incremental innovation potential; and,
- Increase the effectiveness of SRED by making the changes described in Section 3 above.

**2. Does Figure 2, the model of business innovation presented above, capture the key structural factors and inputs to innovation? If not, what is missing?**

The model's focus on process improvements does not necessarily capture all of the key drivers and enablers of the innovation process. Business innovation is primarily driven by commercial survival and the sustainment or growth of a company's operations. Resources are therefore at the centre of the business innovation process. Emphasis should also be put on the invention and production of commercially viable products rather than just increased productivity through process improvements and the adoption of general-purpose technologies. A strategic and sustainable positioning of a firm's product portfolio is a key output from a systematic system of innovation.

The model also fails to capture the influencing role government can play in becoming a reference customer for a particular innovation. "Public Spending" might therefore be a better label than "Public Policies". Most successful exports in the defence and security industries in particular arise from the development of a system for Canada that can then be marketed to Allies with similar objectives.

**3. Regarding capital, is there an adequate supply of risk capital for Canadian firms at each stage of their growth (start-up, small, medium, large)? If not, why not? Where returns on investments are low, what are the reasons and potential solutions?**

Risk capital is particularly important in the defence and security industries given the long lead times associated with the development of new technologies and the products that go along with them. There is a deep sense of frustration in parts of the industry at the inadequate supply of venture capital (VC) in Canada. The creation of a healthy and stable VC community – if necessary enabled by government regulation/intervention – seems to be

the only viable option in the short-term and long-term to remedy this situation. SMEs in particular seem to prefer a functioning VC capital market (rather than government funding) to secure R&D funding and to drive innovation and growth.

The financial sector is seen to be too risk-averse and too conservative. It is therefore perceived to be one of the main obstacles to innovation and the commercialization of innovative products. Moreover, venture capitalists (e.g. bankers or union representatives) do not always instill trust amongst business representatives as they are sometimes perceived to be lacking crucial personal experience in the business sector.

Yet, having the state take on the role as a main venture capitalist, does not necessarily lead to more satisfactory outcomes. Government-sponsored R&D programs are frequently seen to be too bureaucratic, causing delays and sometimes even adding costs.

For established firms in the IT sector and in knowledge-based industries, there is sometimes enough VC available. However, with the government as the client, VC is frequently not used effectively due to uncertainty regarding the client's needs, timelines, and specifications around the procurement process. The set of policy initiatives contained in Section 3 above coupled with action to strengthen the VC market through tax incentives and the recruitment of US investment managers would go a long way towards dealing with this problem.

**4. Regarding ideas and knowledge, do you believe it is important for Canadian firms to perform their own R&D and, if so, what do you believe are the key factors that have been limiting business R&D activity in Canada?**

Yes, Canadian firms should absolutely perform their own R&D, especially since foreign owned companies tend to conduct their research offshore.

Exposing Canadian companies to global market forces rather than protecting them from global competition might be the best incentive to further innovation.

In defence-and-security-related R&D in particular, the main limiting factor is uncertainty around government endorsed projects, architectures, and standards for procurement as well as rated solicitation requirements that encourage company investment in innovation.

A key factor that has been limiting business R&D in Canada is the lack of financial incentives for high "technology readiness level" demonstrators. Most research dollars have been directed at conceptual and pre-competitive research in universities. As a result, many worthwhile new ideas have been developed in academic circles to the level of concept validation and remain there. Businesses, the only ones who can develop these ideas further to the level of technology demonstration required for investment in a product have only been able to address a small number of them. In the USA, many such technology demonstrators are developed under the umbrella of defence technology procurement. In Europe, governments and the European community have recognized this need and set programs to assist Original Equipment Manufacturers and their suppliers to carry out technology demonstrators. The situation in Canada is compounded by the fact that the IP of many of the new concepts have remained in the hands of university professors and their fresh spinoffs, many unable to bring them effectively to the market.

**5. Regarding networks, collaborations and linkages, what are the main impediments to successful business-university or business-college partnerships? Does the postsecondary education system have the right capacity, approaches, and policies for effective partnerships with business?**

Problems have been experienced with bureaucracy and the fact that businesses and universities do not follow the same rationale (e.g. counting in terms/semesters vs. following the financial year/quarterly reports, focus on publications vs. quarterly reports to measure success, focus on owning IP for universities vs. control of enabling technologies for businesses).

There are also concerns that very few such collaborative projects fit within the industrial partner's key strategic objectives; at best they become "targets of opportunity". Businesses prefer to partner with academia when they can be in the driver's seat.



IP policies have reduced the effectiveness of university/industry collaboration. Generally, it is understood that, even when carried out with seed money from business and with the in-kind participation of business researchers, the IP remains with the University professor. Business, at most, gets a license to use and exceptionally protection against the researcher selling to its competitors. This policy makes for a one-way collaboration in which innovative ideas can only come from the university professor and students. Combine this with statistics that show that the most significant product innovations have come from industry labs and not university labs. A more effective collaboration should therefore be a true two-way collaboration, where some of the creative ideas come from the staff of the business that supports the university research. To achieve this requires at the minimum a joint IP agreement, conducive to free two-way intellectual exchanges. Even better would be if the IP could be assigned to the supporting business that has the task to bring products to the markets. The university researchers would still have their names as inventors or co-inventors on the IP papers.

The country needs more single company collaborations with university researchers. This is where very specific innovation accomplishments reside. Companies seldom reveal technologies required to boost their individual company comparative advantage in group industry settings. There are examples of such single company – university research group collaboration, but we need many more.

With regard to the defence and security industries in particular, it has been suggested to create a business model that involves the public sector from early on and throughout an R&D project. The Government, rather than merely creating policies around procurement requirements, could engage industry and academia from the beginning in a cooperative, staged developmental approach (policy leading to requirements leading to architecture/standards leading to competitive tender, etc). This would require some government spending to achieve early risk reduction well in advance of equipment procurement. The Government should set clear objectives and timelines but invite industry-wide participation. This is preferred to the early selection of a “customer friend” that keeps early stage development in house longer than necessary.

**6. Regarding the creation of demand for business innovation, what role, if any, do you believe that government should play in being a “first customer” for R&D investments in Canada?**

This is critical for the credibility in the international market place, especially in the defence and security domain where governments (rather than the private sector) determine research trends and specific R&D requirements. There is a perception that the Canadian government is not performing well in this area. Other governments favour their domestic industries and would not buy Canadian unless the Canadian government has already invested in Canadian products and systems.

A positive example is the DND TCCCS/Iris program that led directly to technology development (first secure integrated voice/data network for tactical military deployment) resulting in significant sales and spin-offs related to the Bowman program in the UK. The project involved a spirit of innovation and pioneering that is lacking in much of today’s project mandates looking for off-the-shelf and low risk solutions, requiring non-recurring investment to take place in the absence of detailed knowledge about the ultimate customers objectives.

The defence and security industries in particular needs clear direction from the government before entering and fully developing a risky and costly R&D project. This can be problematic at times when requirements are formulated by the government with limited participation by industry: companies are not always fully able to achieve perfect understanding of the government’s intentions with regards to a specific technology. Thus, the company perceives a risk, which will stall R&D at low levels of technical maturity.

One suggestion to remedy the situation, especially for public developmental projects in the defence and security sector, is to require an innovation plan (which will be a rated requirement) from each company bidding in a public tendering process. This process could help identify capital or maintenance projects where a higher level of tolerance for new development risk is expected. Factors in the innovation plan could include identification of new IP that will be developed with benefit to Canada or technology and system readiness levels, including opportunities of increasing them.

**7. Regarding talent, is Canada producing sufficient numbers of graduates with the right skills to drive business innovation and productivity growth? If not, what changes are needed? Where demand for advanced skills is low, what are the reasons and what changes, if any, are needed?**

In principle, Canada does produce sufficient numbers of graduates with the right skills. However, if there are no adequate jobs for graduates because of low R&D rates, they will leave the country. So it is a demand question, not a supply question.

If collaboration between universities and industry became more efficient and effective (see question 5) chances for the maintenance of an optimal balance would increase. Several initiatives to help achieve this include: expand NSERC programs to encourage company-university exchanges by facilitating more training through internships, the integration of professor research programs into companies and joint research projects; and establish shared training programs that are recognized by all partners for “in company” training.

Also, the defence and security industries are largely major project-based where R&D and innovation are concentrated in the first stages of a multi-year project. This means that in order to retain highly qualified technical staff a company needs to have an ongoing R&D program or they will risk losing key staff in the latter stages of a major project. An ongoing R&D program is more achievable, especially for SMEs, when a medium term government-industry development strategy exists that reduces the market risk associated with the development of new technologies for a market with a single purchaser.

As students graduate from universities and technical institutions and enter the workforce full-time, companies bear the cost of providing these new graduates with the necessary practical training to be productive during their first year of employment. In order to offset the cost of this training and support and to recognize the extent to which companies provide this necessary continued education, the government could consider a subsidy up to a maximum of 1/3 of a new graduate’s wages during his/her first year of employment.

Another favourable practice for the attraction and retention of highly qualified talent from abroad is the Quebec Government policy of waiving income taxes for such immigrants for the first five years of their employment.

**8. Can you describe whether and how your firm employs students currently enrolled in community colleges, polytechnics and universities, and what government measures could make it easier to work with students during their academic programs and to recruit them after their graduation?**

Employing university coop students, for instance in customer and internally funded projects, is an effective way for firms to get to know the students and vice versa. This scheme is working well.

It would be easier, though, to work with students and to recruit them later if government security clearance processes were faster.

Many CADSI member companies participate in internship programs, and some in university course work and sponsoring Masters/ PhD students through collaborative research projects.

The most successful relationships have occurred when students have been given a very specific problem to solve within a very limited time period (~3months) during which time they may be interning at company that allows them to be working side-by-side with employees that are active on the project. This provides the student with an environment more suitable for more fluid information exchange and closed feedback loops in addition to access to SMEs, practical knowledge, commercialization constraints, and readily available integrated test equipment. NSERC has several programs that support these kinds of student research assignments in industry.

**9. With which federal programs supporting business or commercially oriented R&D in Canada do you have direct experience and knowledge? In your view:**

- a. Which of these programs are working, and why?
- b. Which programs are not working, and why not?

Generally speaking, there is a perception that the range of programs is not structured or coordinated effectively and, hence, that there are overlaps and contradictions between different programs.

The programs that work are those that assist industry in acquiring and deploying competitive technologies in a timely and cost-effective manner. It is immaterial whether they involve grants or loans: the key factors are timeliness and efficiency. Using those yard-sticks, most existing programs miss the mark.

CADSI industry members currently access a number of federal support programs, especially the Strategic Aerospace and Defence Initiative (SADI), Scientific Research and Development Program (SRED), government

procurement, the International Science and Technology Partnerships (ISTP), and the DRDC Applied Research and Technology Demonstration Programs.

The Federal programs accessed by CADSI member companies are both critical and successful and have been proven to provide a means of support for remaining competitive in the global defence market in addition to providing a necessary means of maintaining and increasing the technology competence within Canada.

- 10. If you have direct experience and knowledge of the SR&ED tax credit, what are your views in relation to the following:**
- a. Does the current structure of the SR&ED tax credit encourage incremental investment in R&D? Does it free up capital to invest in other aspects of innovation activities in the firm? Does this vary by size, ownership, sector or nationality of firm?**
  - b. What are the strengths and weaknesses of the refundable portion of the SR&ED tax credit for Canadian-controlled private corporations and to what extent does it encourage the growth and commercial success of SMEs?**
  - c. Bearing in mind the improvements being made by the Canada Revenue Agency, are there additional opportunities for change to simplify the administration of the SR&ED tax credit and facilitate the applications process?**

SRED encourages sound strategic technology investment practices within industry.

It could be explored whether SRED is used to maximum advantage, e.g. whether it should be applied more selectively to promote certain sectors or to reward certain practices.

SRED tax credits could be changed to a cash refund against proven eligible expenses (as is now being done in Quebec) rather than a credit against taxes owing.

The qualifying R&D activity must continue to emphasize and could broaden the definition of “experimental development”. Qualifying activities should encompass all business activities aimed at maturing a product and reducing commercial risk. These would include (in addition to basic research) analysis, experiments, technology demonstrators, process improvements, IP protection expenses, and in certain cases certification and acceptance activities. The latter is particularly important for highly government regulated areas such as IT security and military performance standards because a product’s commercial success in the market is dependent on eliminating risk around certification in the development phase.

Tax credits at the R&D stage are helpful but sometimes insufficient. Given that the real obstacle on the way to commercialization is at the end of the R&D stage, i.e. when a product starts to be marketed, the government could extend the current tax credit system so it applies until a certain amount of sales has been achieved.

The administrative burden of SR&ED seems reasonable given the benefit companies derive from it and the complexity in assessing qualified activities although the burden is more severe for SMEs. Recent changes in the T661 form have facilitated the application process from the perspective of the amount of input required in an application. The form, its guide and the audit practice however, have shown marked changes in the level of importance placed upon compliance by the CRA at the expense of fostering an environment for an incentive program that encourages and nurtures innovation as a primary means to achieve competitiveness in the global marketplace. In addition, a harmonization with the Quebec program, particularly with respect to making the return fully refundable would continue to facilitate and enhance the SRED program.

- 11. How could the Government of Canada lighten the administration requirements of its programs on recipients and improve outreach to business?**

Programs should be pruned and simplified. Risk management is essential but “insurance policies” should not be part of terms and conditions. The pace of programs should be faster as well: “Waiting 12 months for a government partner is inconsistent with the pace of business.”

The Industrial Research Assistance Program (IRAP) in particular needs to be simplified to reduce the administrative burden, especially as far as forms and report requirements are concerned.

For the defence and security industries specifically the government could establish a private sector managed

defence and security commercialization institute (see the proposal for a Defence and Security Technology Canada institute in Section 3 above). This would help ensure market-driven decisions as well as a focus on commercialization, continuous improvement of the product, and facilitating technical insert into long term systems. The benefit to companies would be to have funding for ongoing development of its products available (including for export); the benefit for the government department involved would be to have access to continuously improved products and systems; and the advantage for the government would be stronger companies positioned to meet domestic requirements but able to succeed internationally. Funding could come from the uncommitted portion of current IRB commitments, and ongoing additional funding could come from the investment of defence and security related loan repayments and IP royalties into the fund rather than sending them to the Consolidated Revenue Fund.

**12. How could the Government of Canada be more innovative and responsive to meet new needs or opportunities, and try alternative service delivery-approaches in its programs?**

See question 11 and Section 3 in the body of this submission.

**13. Are there any gaps in the Government of Canada's support to business and commercially-oriented R&D? Do firms performing R&D in other countries have an advantage over Canadian firms because of access to programs that are not available in Canada? What would be the principal features of new programming to fill these gaps?**

As discussed in the answer to Question 1 the key gap relates to helping stimulate successful progression of new technology development from the R&D stage to successful market penetration. Most existing technology push initiatives do not last long enough to solve this problem and the venture capital industry is not yet strong enough to take up early stage financing to the degree required. Several of the proposed initiatives in Section 3 above will address this problem and some are applicable to industries in addition to the defence and security industries.

A particular kind of gap is the lack of coordination between government R&D and innovation policies and programs and the lack of strategic technological directions developed by industry in collaboration with government.

Canada should not necessarily seek to copy other countries' programs but provide an environment characterized by agility, responsiveness, and efficiency – which is currently not the case. As a comparably small country Canada should be well placed to improve and harness the relationship between Government and industry thereby making it easier to respond to changing global markets, in advance of more powerful competitors. This requires a far greater level of trust and cooperation between Government and industry than is currently the case.

The Canadian government should a) deliver existing programs in a timely manner; b) prune and streamline existing programs; and c) ensure that Canadian federal procurements form the launch base for new technological products and services and provide an international marketing flagship.

The UK seems to have programs that are better at fostering partnerships between academia, industry and government sponsors in addressing market needs. Government research and development programs need to embrace industry participation and be careful not to “down-select” too early. The work products from early stage, cooperative innovation must translate into the blueprints for acquisition otherwise it will remain stuck in the academic/government research world that makes commercialization very difficult.

**14. What lessons and best practices can be taken from provincial business and commercially oriented R&D programs, and how should the two orders of government align their programming?**

One innovative practice which is to be praised is that in Quebec, new hires of highly qualified people from abroad do not pay provincial income tax for five years.

Quebec also has a fully refundable tax credit operating with respect a percentage of wages. This best practice should be implemented at the federal level in order to increase the effectiveness of the SRED program.

**15. Is there a difference between R&D and innovation? If yes, how are they different? Should government focus on R&D or Innovation? What should the balance be?**

The government should focus on both R&D and innovation. Innovation is largely viewed as a change in the thought process for doing something, and/or the useful application of new inventions or discoveries, as well as the development of a new type of product. R&D is part of the innovation process, but is not limited to technology, including thinking, products, processes, marketing, management and organizational design. Innovation is not realized until there is a product or service delivered in the marketplace. The consequence of these realities is that government could consider supporting changes made in relation to business development, processes, or service-oriented delivery in addition to the development of new technologies and new products.