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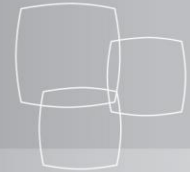
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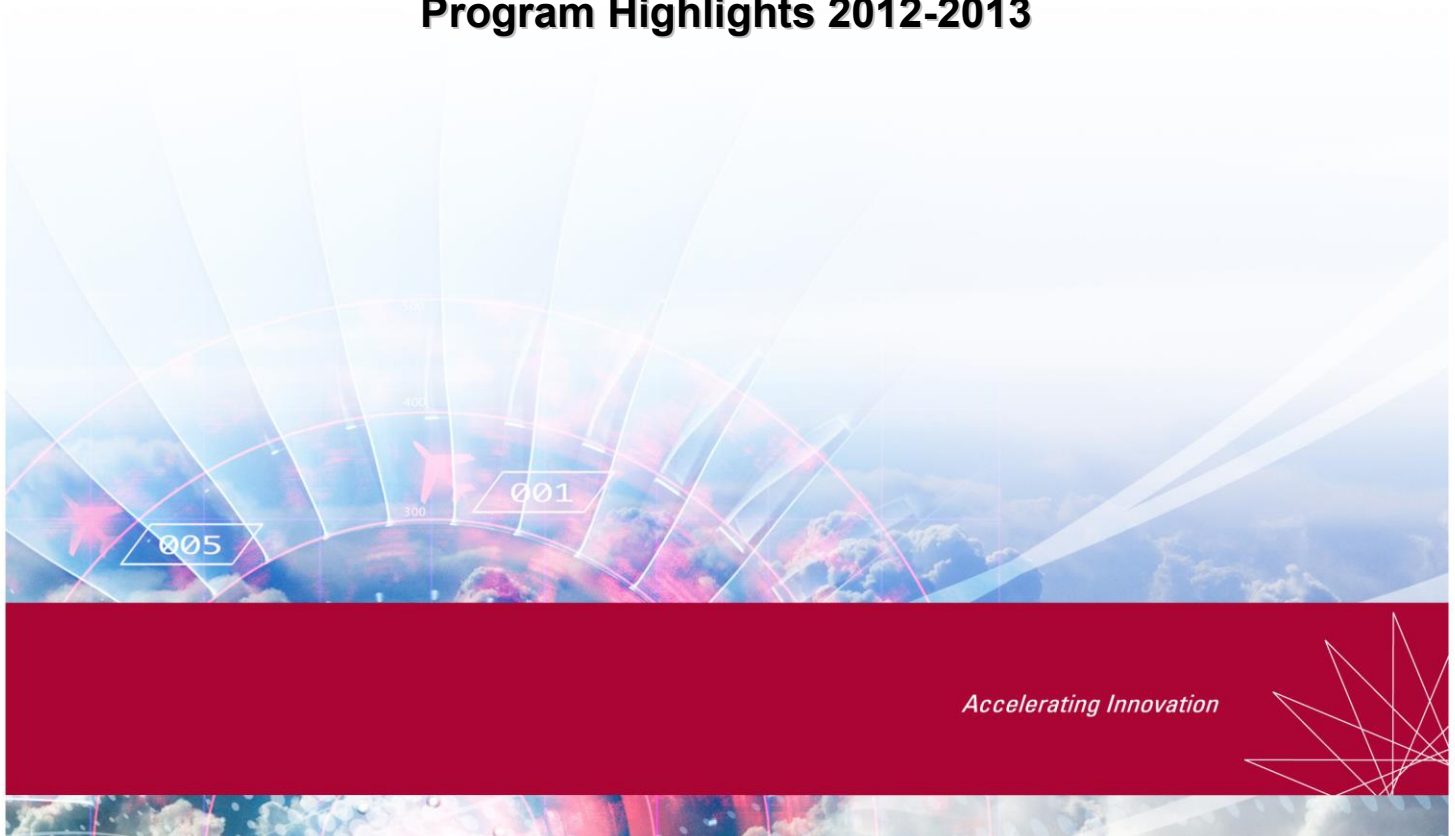
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SADI / *Strategic Aerospace and Defence Initiative*

Program Highlights 2012-2013





Industry Canada

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Industrial Technologies Office

Program Highlights 2012–2013

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1. Introduction

Canada's aerospace, defence, space and security (aerospace and defence) industries are major contributors to our nation's economy and important global players. Canada's aerospace manufacturing sector is ranked 5th among OECD countries in terms of revenues and GDP, with \$22.8 billion in direct revenue and more than 700 companies across the country.^[1] This industry supported more than 170,000 direct, indirect and induced jobs in the Canadian economy in 2012, including approximately 73,000 direct jobs.^[2] The defence industry is comprised of 700 firms, employed approximately 26,000 Canadians, and generated \$9.4 billion in sales in 2011.^[3]

In the global marketplace, research and development (R&D) is a key driver of economic growth, and innovative companies are more likely than others to be part of that growth. R&D allows Canada to compete in new markets and industries, and helps Canadian businesses offer their customers new or improved products, processes and services. With annual investments of more than \$1.7 billion each year, the aerospace sector is among Canada's largest contributors to Canadian R&D activities.^[4]

R&D benefits individual Canadians too, through economic development, employment opportunities, and the potential environmental and safety benefits of new or improved technologies (for example: better fuel efficiency, reduced emissions, and enhanced emergency communications capabilities).

A recent 2013 report by the Canadian Council of Academies, *The State of Industrial R&D in Canada*, identifies aerospace products and parts manufacturing as one of Canada's industrial R&D strengths.^[5] Canadian companies must continue to invest aggressively in R&D to stay on the leading edge and be competitive.

The Strategic Aerospace and Defence Initiative (SADI) accelerates innovation by Canadian aerospace and defence companies to produce economic, technological and social benefits for Canadians. The program provides repayable contributions in support of strategic industrial and pre-competitive R&D. SADI was launched in 2007 and is delivered by the Industrial Technologies Office (ITO) of Industry Canada.

This report highlights developments in 2012–2013.

^[1] 2013 Report: The State of the Canadian Aerospace Industry, Aerospace Industries Association of Canada (AIAC)

^[2] Ibid

^[3] Canadian Commercial Aerospace, Defence, Commercial and Civil Marine and Industrial Security Sector Survey 2011, Statistics Canada and Industry Canada, 2013

^[4] Aerospace Review, Beyond the Horizon: Canada's Interests and Future in Aerospace, November 2012

^[5] The State of Industrial R&D in Canada, Canadian Council of Academies, pg 118

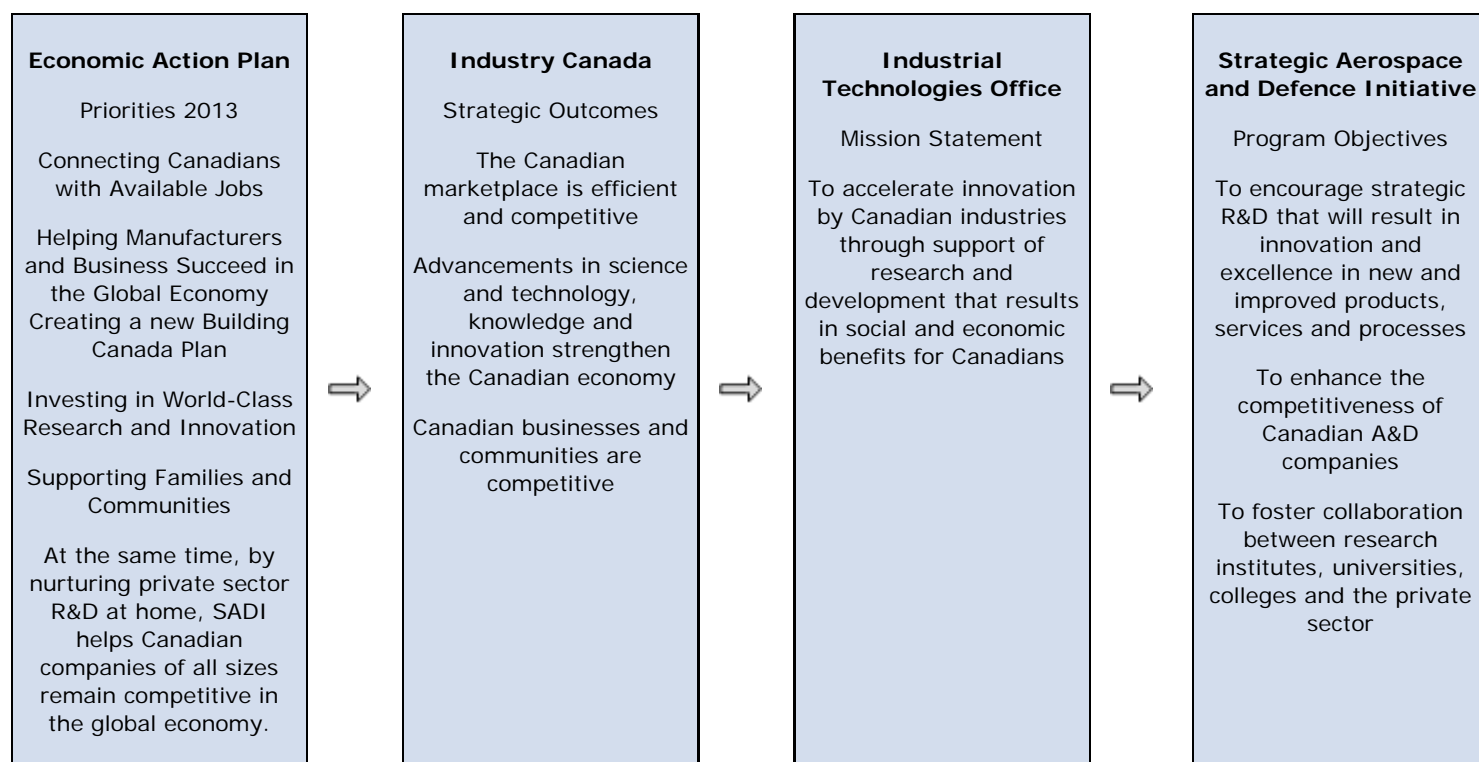
2. Supporting the Government of Canada's Science and Technology Strategy

In May 2007, the Government of Canada released its Science and Technology (S&T) strategy entitled: *Mobilizing Science and Technology to Canada's Advantage*.

The Strategy focused on creating a business environment that encourages private sector innovation while ensuring that public funds are invested wisely. It recognized the important role that the private sector and others play in the Canadian economy, and committed to investing in R&D. Since 2006, the government has provided \$9 billion in new funding for science and technology and the growth of innovative firms.

SADI is an important part of the S&T Strategy. With a focus on Canada's aerospace and defence industries, the program directly supports the federal government's commitments to R&D, leveraging other investment and encouraging strategic partnerships and collaboration among companies and research institutions. These commitments are key components of Industry Canada's Business Plan 2012–13, which sees science and technology, knowledge, and innovation as effective drivers of a strong Canadian economy.

By making repayable contributions in strategic industrial and pre-competitive R&D projects, SADI helps create a supportive environment in which Canadian companies can develop advanced technologies, products and processes. These efforts benefit not only the company conducting the R&D, but also other companies throughout the aerospace and defence supply chain and the Canadian economy as a whole through technology transfer and other spill-over benefits.



3. SADI Overview

SADI provides repayable contributions to support strategic R&D among Canadian based aerospace and defence industries. By sharing in the risks and rewards of R&D, SADI supports innovation by Canadian aerospace and defence companies. The program also encourages private sector investment in R&D by increasing the amount of capital available for eligible projects.

The three key objectives of SADI contributions

1. encourage strategic R&D that will result in innovation and excellence in new or improved products, services, and processes;
2. enhance the competitiveness of Canadian aerospace and defence companies; and
3. foster collaboration between research institutes, universities, colleges and the private sector.

Eligibility Criteria

- The company must be incorporated under Canadian law, conduct R&D with aerospace and defence applications and contribute to a highly skilled and knowledge-based workforce.
- The project must comprise industrial research or pre-competitive development.
- The project must include strategic R&D activities that support the development of next generation aerospace and defence-related products or services, build on Canadian strengths in aerospace and defence technology development, enable Canadian companies to participate in major platforms and supply chains, or assist the aerospace and defence industries in achieving Canada's international obligations.
- The applicant must demonstrate that SADI funding is required to meet the location, scope and/or timing of the proposed project.
- The project must comprise R&D that takes place in Canada.
- The project must involve collaboration with post-secondary education institutions in Canada.

Project Approval Process

Submission of the Proposal: SADI proposals are accepted throughout the year using an on-line application form. There are no submission deadlines, nor contribution minimum/maximum amounts. Once the on-line application form is complete, it becomes the applicant's project proposal.

Eligibility and Completeness Screening: ITO screens each proposal to ensure that the project meets the six eligibility requirements and that the proposal contains adequate information upon which to start a due diligence review.

Due Diligence Review: ITO evaluates the company's capability to achieve the social and economic benefits that it claims will result from the R&D activities, through an assessment of financial resources, management expertise, the business plan, technical feasibility, etc.

Project Approval: Final project approval rests with the Minister of Industry. Funding requests for more than \$10 million require Treasury Board approval. Funding requests for more than \$20 million require the Cabinet and the Treasury Board approvals. Once a project receives approval, a contribution agreement is signed by the recipient and the Crown outlining the legally binding obligations and responsibilities of both parties and the conditions under which payments will be made.

Repayment Terms

The SADI program provides repayable contributions, as opposed to loans, generally covering 40 percent of the total eligible project costs. Repayments are unconditional or based on the recipient's gross business revenue, and begin two years after the completion of the R&D over a 15-year period. The maximum amount repayable is based on risk as calculated by ITO during the due diligence review.

SADI also supports projects under the Defence Development Sharing Agreement (DDSA) with the United States Department of Defense and the multi-national Joint Strike Fighter (JSF) program. SADI typically contributes 40 percent of eligible project costs and the repayment is 100 percent of the contribution, payable over 15 years for DDSA and over 20 years for JSF projects.

Monitoring Process

Annual site visits, monthly or quarterly progress reports, annual financial statements and annual benefit reports allow ITO to monitor the progress of the company in meeting the objectives of the project, with greater oversight in cases of large and high risk projects.

4. Financial Framework

SADI's program funding comes from appropriations made available through the estimates process, and an authority to access repayments collected from SADI and the program that preceded it, Technology Partnerships Canada (TPC). In addition, in 2009, \$200 million over four years (2010–11 to 2013–14) was announced for SADI.

Economic Action Plan 2013 announced stable funding of almost \$1 billion for SADI over the next five years. The budget for 2013–2014 is \$238 million.

As of March 31, 2013, SADI approved \$890 million in authorized assistance of which \$568 million has been disbursed against eligible claims.

SADI annual disbursements continue to grow while operational costs decline as the program reaches steady state. ITO's operating expense was \$5.6 million in 2012–13 for the management of SADI and TPC. Operating expenses cover salaries, audits, site visits, employee training, outreach and other administrative program requirements.

Program Resources by Fiscal Year (\$000)			
Fiscal Year	ITO Operating Expenses ¹	SADI Annual Contribution Disbursements ²	TPC Annual Contribution Disbursements ²
2007–08	12,660	10,500	256,553
2008–09	12,635	35,783	198,813
2009–10	12,369	62,035	130,916
2010–11	10,596	114,558	46,726
2011–12	7,784	163,675	25,194
2012–13	5,591	199,095	17,210

¹ Represents total operating costs for the management of SADI and TPC.

² As presented in the Annual Public Accounts of Canada. The sum of the amount reported in the Annual Public Accounts of Canada (\$585 million) includes actual disbursements and estimates for disbursements to be made in 2013–14 related to expenses incurred in 2012–13. The amount of \$568 million corresponds to actual amount disbursed at the end of fiscal year 2012–13.

5. SADI Project Portfolio

As of March 31, 2013 the SADI portfolio comprised 29 projects (with 24 recipients) with a combined authorized assistance of \$890 million. The authorized assistance ranged from \$276,000 to \$300 million per project. Most projects are still performing R&D and have yet to enter the repayment phase.

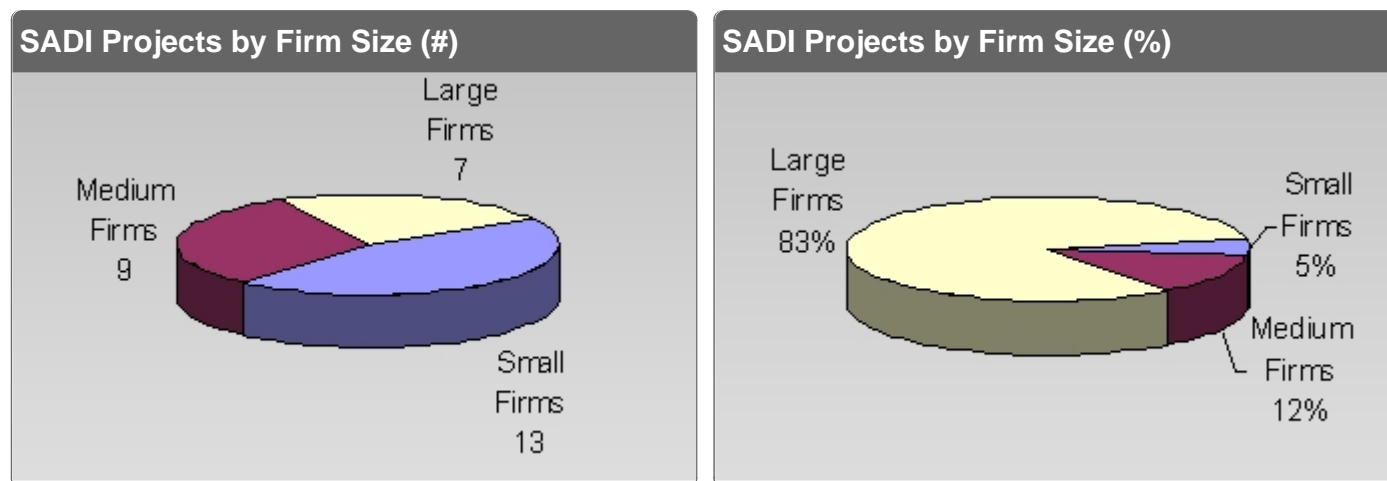
SADI Project Portfolio				
Status	# of Projects	Authorized Assistance (\$)	Disbursements (\$)	Repayments (\$)
R&D Phase	18	764,730,001	465,166,941	Not due until 2014
Repayment Phase ³	7	76,948,409	76,076,788	1,413,342
Inactive ⁴	4	48,220,991	26,898,859	6,162,957

³ Repayments begin one to two years after the completion of the R&D according to the terms of the contribution agreement. SADI projects have only recently entered this phase, therefore repayments are anticipated to increase significantly in subsequent years.

⁴ Includes projects unable to be completed and for which both the company and the department have agreed to terminate the contribution agreement, due for example, to a change in the control of the company, cessation of operations, bankruptcy or receivership. One project is excluded from this list because it was cancelled after being announced before any funds were disbursed.

SADI provides contributions to companies of all sizes

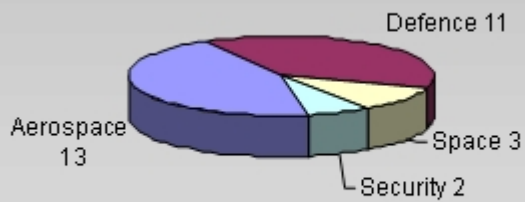
Of the 29 SADI projects, small companies with less than 100 employees accounted for 13 projects and five percent of the authorized assistance; medium-sized companies with 100–500 employees accounted for nine projects and 12 percent of the authorized assistance; and large companies with more than 500 employees accounted for seven projects and 83 percent of the authorized assistance.



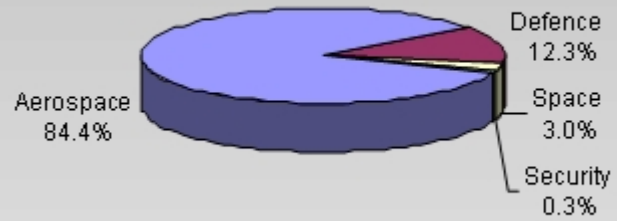
SADI supports the aerospace, space, defence, and security sectors

Of the 29 SADI projects, 13 projects supported the aerospace sector accounting for 84 percent of the authorized assistance; 11 projects supported the defence sector accounting for 12 percent of the authorized assistance; three projects supported the space sector accounting for three percent of the authorized assistance; and two projects supported the security sector accounting for less than one percent of the authorized assistance.

SADI Projects by Sectors (#)



SADI Authorized Assistance by Sectors (%)



SADI supports Canada's international objectives

Of the 29 SADI projects, five are developing new technologies for the Joint Strike Fighter (JSF) and three are developing technologies for the government of the United States under the Defence Development Sharing Agreement (DDSA). This is a testament to the strength of Canadian companies in their respective niches.

- The five JSF projects account for 17 percent of SADI's portfolio and seven percent of authorized assistance.
- The three DDSA projects account for 10 percent of SADI's portfolio and 0.2 percent of authorized assistance.

SADI Portfolio 2007-2013

Company		Project Description	Authorized Assistance ⁵
2007–2008			
1	Diamond D-Jet Corporation	Single-engine, five-passenger jet aircraft	\$19,600,000
2008–2009			
2	Integran Technologies Inc.	Nanotechnology enabled tooling	\$4,596,000
3	Magellan Aerospace Limited	Structural components for the F-35	\$43,391,600
4	Héroux Devtek Inc.	Advanced landing gear technology	\$26,964,430
5	Norsat International Inc.	Microwave, wireless and portable satellite technologies	\$5,975,200
6	CMC Electronics Inc.	Integrated cockpit and communications system	\$52,287,784
7	EMS Technologies Canada Ltd.	Next generation mobile satellite communications	\$8,718,634
8	SkyWave Mobile Communications Inc.	Fleet management, shipping security	\$3,127,200
9	CAE Inc.	Enhanced simulation technology	\$250,000,000
10	Sputtek Inc.	Advanced protective coating technologies	\$360,285
2009–2010			
11	AXYS Technologies Inc.	Unifying data from monitoring and surveillance sources	\$1,836,900
12	PCI Geomatics	Earth observation information extraction	\$7,665,000
13	BelAir Networks Inc.	Radio technology with advanced security	\$9,690,706
14	Kongsberg Mesotech Ltd.	Acoustic instrumentation for underwater security	\$4,968,000
15	Integran Technologies Inc.	Cadmium replacement coatings	\$276,284
16	Integran Technologies Inc.	Hard chrome alternative	\$807,399
2010–2011			
17	2154331 Canada Inc.	Flight simulation	\$18,570,000
18	D-TA Systems Inc.	Advanced sensor processing	\$1,790,140
19	ASCO Aerospace Canada Ltd.	Structural components for the F-35	\$7,688,288
20	Pratt & Whitney Canada Corporation	Gas turbine engine applications	\$300,000,000
21	Thales Canada Inc.	Fly-By-Wire flight control system	\$12,988,800
22	FLYHT Aerospace Solutions Ltd.	Automated flight information reporting system	\$1,967,507
23	Ultra Electronics Canada Inc.	Tactical high capacity radio	\$32,447,400
2011–2012			
24	Integran Technologies Inc.	Nanostructured alloys as an alternative to copper beryllium	\$399,386
2012–2013			
25	Engineering Services Inc. (ESI)	Intelligent security robot	\$778,800
26	GasTOPS Ltd.	Oil systems diagnostics	\$1,275,000
27	NGRAIN	3D tools	\$9,500,000
28	Héroux Devtek Inc.	Advanced landing gear technology	\$48,957,693
29	Norsat International Inc.	Improvements to satellite terminals, microwave components and radio frequency antennas	\$13,270,265

⁵ Authorized Assistance represents the maximum amount contracted at the time of the initial contribution agreement. Actual amounts disbursed may be lower than the maximum allowed.

6. SADI Results

SADI's [Performance Management Strategy](#) identifies performance indicators for each of the program's three objectives: innovation, competitiveness and collaboration. This section reports on the overall progress of recipients in meeting program objectives. For descriptions at a project level, please see [Annex A](#).

As of March 31, 2013 the SADI portfolio comprised 29 projects with 24 recipients.

Innovation

By March 31, 2013, 24 out of 29 projects resulted in the development of new or improved products, services or processes. In some cases, the entire project was not completed, but an element of it was completed and efforts had begun to commercialize or put into use the new technology. Most projects are in the R&D phase and are making good progress in achieving the activities outlined in their Statement of Work, as contained in the contribution agreement and described in Annex A. The overall program target is to see 90 percent of R&D projects successfully completed over the life of the program.

From program inception to March 31, 2013, \$568 million of approved funding has been disbursed against eligible claims, leveraging over \$1.1 billion from other sources to accelerate innovation in Canada. Over this period, the program has leveraged \$1.97 per SADI dollar disbursed.

Competitiveness

By March 31, 2013, 17 out of 29 projects resulted in the successful commercialization of new and improved products, services, processes and technologies.

As described in Annex A, companies are progressing well in their early days of exploring new market opportunities. They are beginning to generate economic benefits to recipients and broader economic and social benefits, including increased production efficiency, reduced consumption of fossil fuels and reduced waste. The overall program target is to see 82 percent of R&D projects result in successful commercialization over the life of the program.

Collaboration

When companies undertake collaborative R&D with universities and colleges, the benefits extend beyond the goals of the specific project, resulting in a stronger alignment of research interests, training of the next generation of researchers and engineers, acceleration of innovation, improved access to research infrastructure, and increased student employment. By March 31, 2013, 26 projects resulted in collaborations with various universities, colleges and affiliated research institutes. The target over the R&D phase of each project is to have all recipients engage in meaningful collaboration.

7. 2012–2013 Highlights

New Agreements

GasTOPS Ltd.

The government announced a \$1.275 million repayable contribution to GasTOPS Ltd on November 1, 2012. This Ottawa-based company is developing a method to measure metallic contaminants in jet engine oil to be used on the Joint Strike Fighter program. The project will enable aircraft personnel to measure contaminants more quickly than before and do this measurement on-site rather than in a lab or another location.

The full press release can be found at <http://news.gc.ca/web/article-eng.do?nid=704409>.

NGRAIN (Canada) Corporation

The government announced a \$9.5 million repayable contribution to NGRAIN (Canada) Corporation on June 26, 2012. This funding will support the Vancouver-based company's research and development in advanced 3D technologies that provide training and performance support on complex equipment to aerospace and defence personnel. This new software will be used to guide workers through repair jobs, even in the field, and will help reduce equipment maintenance time. The technology developed could be adapted for use in other fields, such as automotive production, civil aviation, nuclear power, oil and gas, and medicine.

The full press release can be found at <http://news.gc.ca/web/article-eng.do?nid=753149>

Engineering Services Inc.

The government announced a repayable contribution of \$778,800 on February 10, 2013 to Engineering Services Inc. (ESI). The Toronto-based company will perform research and development to create a next-generation mobile robotics platform capable of carrying out such tasks as reconnaissance in law enforcement, defence and other security sectors. This project is expected to expand the use of robotics and automation in other Canadian companies and among supply chain partners and will increase reliability in security-related work.

The full press release can be found at: <http://news.gc.ca/web/article-eng.do?nid=719599>

Héroux Devtek Inc.

The government announced a repayable contribution of \$48.9 million to Quebec based Héroux-Devtek Inc on March 28, 2013. The contribution will support a research and development project to reduce the company's environmental impact and develop new technologies. This contribution will help Héroux-Devtek develop a completely integrated aerospace landing gear system for both commercial and military aerospace markets. Research on the project will lead to new technologies that reduce or eliminate a number of environmentally harmful processes thus reducing greenhouse gas emissions and improving Héroux-Devtek's overall environmental footprint.

The full press release can be found at: <http://news.gc.ca/web/article-eng.do?nid=729019>

Norsat International Inc.

The government announced a repayable contribution of \$13.3 million to British Columbia based Norsat International Inc on March 28, 2013. Norsat is a major provider of broadband communications products for data transmission in remote and austere environments. The contribution will support a research and development project aimed at improving the company's existing line of satellite terminals, microwave components and radio frequency antennas and develop next generation satellite terminals and microwave components. This repayable contribution will allow Norsat to broaden its research capacity and maintain its leadership position in the industry while fostering collaboration with university researchers.

The full press release can be found at: <http://news.gc.ca/web/article-eng.do?nid=729229>.

Service Standards

ITO is committed to continual improvement with aggressive service standards. We consistently respond in a timely manner to incoming requests to assist applicants in understanding the program and submitting an application.

Our target is to process claims within 45 days, 90 percent of the time. In 2012–2013, we substantially met this target by processing 137 of 154 claims (89 percent) under the 45 day period. Of these claims 72 percent were processed in under 30 days.

While we strive to complete the processing of applications for under \$10 million within six months, we do not compromise our due diligence and take the extra time when it is required to ensure appropriate oversight. Out of the five agreements approved in 2012–2013, three were under \$10 million. Of these, one was approved under six months. The others required more time to complete the appropriate oversight.

In 2012–2013, ITO processed 90 percent of all amendments to existing contribution agreements within six months.

Table 4: ITO Service Standards

Service Standard	2010–2011	2011–2012	2012–2013
Application Assistance Response Time <ul style="list-style-type: none"> Respond within one business day to requests for assistance with a project application Target: 100%	100%	100%	100%
Claims Processing Time <ul style="list-style-type: none"> Process completed claims and release the payment within 45 calendar days. Target: 90%	93%	100%	89%
Application Processing Time <ul style="list-style-type: none"> Complete the proposal review and provide a funding decision within 6 months of receiving a completed application for applications requesting less than \$10 million. Target: 100%	1 out of 3 projects was approved in 6 months	1 out of 1 project approved in 6 months	1 out of 3 projects was approved in 6 months
Amendment Processing Time <ul style="list-style-type: none"> Process an amendment and provide an approved amended agreement within 6 months. Target: 90%	n/a	n/a	90%

[Service standards results](#) are published annually on ITO's website.

Recipient Audits

In 2012–2013, ITO performed a total of 13 SADI and TPC project audits: three cost audits, seven revenue audits and three lobbyist audits. Projects were selected for audit based on risk and materiality. The projects audited are part of a multi-year audit plan which identifies audits planned for the period ending 2016-17. Recipients were found to be in compliance with the conditions of the contribution agreements and where audit issues were found all were resolved satisfactorily.

SADI Evaluation

In 2011-2012, the department conducted an [evaluation](#) of SADI to assess the program's relevance and performance. The evaluation concluded that SADI addresses a demonstrable need for R&D support to the aerospace and defence sector, is aligned with the priorities of the department, and is consistent with the overall federal responsibility to increase competitiveness. The evaluation recommended that the program further streamline the application process; improve client uptake, particularly among small and medium sized enterprises; and further enhance collaboration.

ITO developed a new application form, which it continues to improve to make information requirements more transparent and reduce the application processing time for potential recipients. Further effort has been made to process applications efficiently without compromising the required due diligence. ITO also embarked on a renewed outreach effort to raise awareness of the program, particularly among small and medium sized enterprises. In addition, collaboration commitments are now systematically included in contribution agreements as contractual requirements.

Auditor General Report

In 2012, the Auditor General completed a [review](#) of Industry Canada's aerospace programs which included SADI. The Auditor General concluded that Industry Canada is managing its aerospace programs in a sound manner, detailed due diligence is completed before signing contribution agreements, new projects meet eligibility criteria, claims are carefully reviewed before issuing payments, appropriate steps are taken to obtain repayments, and sufficient information is collected to determine progress against objectives.

The Auditor General's report also made recommendations in areas where the department can improve. In response to these recommendations, ITO revised its claims standard to apply it to a broader base of claims, is publishing more information on program results and accomplishments on its website, notably through annual Program Highlights reports, and implemented the other administrative improvements as proposed.

The ITO website has been overhauled to provide easy reference to program descriptions and application forms. Companies are now more able to quickly determine whether ITO programs are relevant to them, understand the assessment and approval process, and download application forms.

Aerospace Review: Beyond the Horizon: Canada's Interests and Future in Aerospace

In 2011, the government launched a review of the aerospace and space sector. On November 29, 2012, David Emerson, head of the review, publicly released his reports, *Beyond the Horizon: Canada's Interests and Future in Aerospace* and *Reaching Higher: Canada's Interests and Future in Space*. These reports made recommendations to government to improve the long-term competitiveness of the sector.

Reflecting extensive consultation with industry, the report concluded that SADI is an essential tool in the government's tool box for helping companies finance R&D in Canada at levels they would not otherwise be able to justify given other demands on their resources. In the case of multinational companies, the report noted that SADI encourages R&D to be performed in Canada when it might otherwise be undertaken elsewhere.

The report recommended that the government maintain SADI funding at current levels and that modifications be made to improve the effectiveness of the program.

In response to the review, Economic Action Plan 2013 announced stable funding of almost \$1 billion for SADI over the next five years and that a review of the SADI program would be undertaken to improve its effectiveness.

To enhance the incentive for the private sector to invest in R&D and reduce administrative burden, the program now supports 40 percent of eligible costs and supports indirect costs at a rate of 75 percent of direct labour. In addition, the program ensures that Canada captures the benefits of longer term production related activity and supports the international exploitation of intellectual property to enhance the competitiveness of Canadian-based companies. Repayments have also been delayed by one additional year to better align with the period of revenue generation potentially strengthening repayments of government contributions. A shorter four-month service standard for processing new applications for firms with under 100 employees seeking less than \$2 million will

better respond to the needs of small businesses.

The aerospace review also recommended the creation of a program to support, on a non-repayable basis, large-scale aerospace technology demonstration projects conducted by groups of collaborators.

Technology Demonstration Program (TDP)

Economic Action Plan 2013 announced the government's intention to create the [Technology Demonstration Program](#) with funding of \$110 million over four years (2014-2018), and \$55 million thereafter. On September 4, 2013, the Minister of Industry launched the TDP fulfilling a key recommendation of the Aerospace Review.

In keeping with the Emerson report recommendation, the program will support large-scale technology demonstration projects conducted by groups of collaborators. It will leverage other investment of sufficient scale to accelerate innovation in the aerospace, defence, space and security sectors. Projects funded through this program are expected to be the basis for the next-generation of manufacturing and services in Canada and bring long-term benefits to Canada.

Demonstration activities involve moving new technologies out of the laboratory in order to test them to ensure that they fulfill their intended use in a safe and efficient manner. This is a critical phase in the pre-commercial development of technologies for new aerospace and defence products. Companies often find it difficult to finance this step in the technology development process, limiting the speed and scale with which innovation is advanced.

The program will align the research agendas of industry and academics, giving students relevant study/work experience and accelerating the diffusion of knowledge. The program will also accelerate technology development and save costs because project members will have the opportunity to prove their technologies simultaneously and share resources. Canadian industry leaders and their supply chain will be better positioned to compete against companies receiving similar assistance in other countries to form powerful R&D supply chains.

8. Conclusion

SADI is fulfilling its key objectives: encouraging innovation through R&D excellence, enhancing the competitiveness of Canadian companies, and fostering collaboration between the private sector, research institutions and universities.

Although most SADI projects are currently in the R&D phase, significant progress is already being made toward achieving benefits to Canada.

Business priorities for 2013–14 include the implementation of both the changes to the SADI program and the new Technology Demonstration Program (TDP).

Annex A

The majority of projects in the SADI portfolio are in the research and development (R&D) phase. Economic and social benefits are expected from the research and then commercialization of the innovation over the 20-year life cycle of an average project.

This annex provides an update on the status of projects that have been undertaking their R&D for at least one year (i.e. projects contracted before 2012–2013), as well as projects that entered the repayment phase, and those that became inactive in 2012–2013.

Projects the Research and Development Phase (2007/08 – 2011/12)

ASCO Aerospace Canada Ltd.

Location: Delta, British Columbia

Authorized SADI Assistance: \$7,688,288

Contribution Agreement: October 25, 2010

Innovation: ASCO Canada's R&D is focused on developing new techniques and approaches to titanium and aluminium milling, putting in place strict internal quality assurance procedures, and developing an advanced computerized machining process.

Collaboration: ASCO Canada has maintained a coop partnership with the University of British Columbia and has recruited post graduated students into its operations.

Economic and Social Benefits: In under a decade ASCO Canada has transformed itself from a small machine-shop working on one-off machining contracts into a highly sophisticated machining firm compliant with stringent industry standards. It has been awarded large volume, contracts for complex structural aerospace components including for the F-35 Joint Strike Fighter, where ASCO Canada will machine the titanium bulkhead (frame) of the plane, the single largest structural component. ASCO Canada has implemented additional waste reclamation and recycling programs, dramatically reducing industrial waste and minimizing its ecological footprint. Recently, Asco was awarded additional commercial projects which will capitalize on the technology developed under this project. The company growth continues with 2013 revenues expected to exceed the previous year by over 20 percent.

Axys Technologies Inc.

Location: Sidney, British Columbia

Authorized SADI Assistance: \$1,836,900

Contribution Agreement: August 5, 2009

Innovation: The objective of this project is to research and develop a system to combine data from various maritime monitoring and surveillance sources to provide comprehensive real-time information to enhance maritime domain awareness. The innovative aspect of this project involves the system's ability to receive information from various sources, integrate the data and present it to users and decision makers in real time. The goal of this project will be to integrate and manage data from sensors and systems to provide a unified view of maritime domain and enhance port and waterside security. This project is currently in the research and test phase with approximately 90 percent completed to date.

Collaboration: AXYS has been collaborating with the University of Victoria, Camosun College and Memorial University of Newfoundland. AXYS has also been working with the Port of Prince Rupert to enhance its waterside monitoring and surveillance program. As well, AXYS continues to engage engineering co-op students in its research and development activities and is collaborating with JASCO Research and Ocean Sonics in the area of marine underwater acoustic surveillance.

Economic and Social Benefits: Once the innovation currently being developed is complete, this technology is expected to help defence and security organizations, port operators and other stakeholders improve maritime surveillance and security and respond promptly to security incidents such as undesired vessel movements, discharge of pollutants at sea, oil spills and severe weather threats.

CAE Inc.

Location: Saint-Laurent, Quebec

Authorized SADI Assistance: \$250,000,000

Contribution Agreement: March 30, 2009

Innovation: Development of several innovative products is underway which has allowed for a number of new trademarks to be registered and patent applications filed and granted. Products which are in late development phase include: the 3000Series full-flight simulator (FFS) platform, the Augmented Visionics System, and the next generation of Magnetic Anomaly Detection. CAE has completed a technology demonstrator for its Unmanned Aerial System Mission Trainer.

Collaboration: CAE uses a collaborative model of technological development that benefits universities and research facilities. The company has made contributions in excess of \$7 million for collaborative projects with universities and research institutes including: a McGill University Research Chair; Carleton University's Centre for Advanced Studies in Visualization and Simulation; and CAE's Augmented Engineering Environment Software/Development Laboratory at École Polytechnique de Montréal. It has also launched collaborations with Ottawa and McMaster Universities, the Consortium for Research and Innovation in Aerospace in Quebec, the National Research Council of Canada, the Institut national d'optique and other educational institutions.

In addition to encouraging its own technical employees to continue studies in advanced degrees through educational assistance benefits, CAE employs approximately 170 co-op students per year through the SADI program, helping to develop the talent pipeline of the aerospace industry.

Economic and Social Benefits: The company has introduced new aircraft platforms incorporating Project Falcon technologies. Project Falcon has also enabled CAE to maintain and broaden training services. CAE is strengthening its Canadian supply chain through partnerships with Canadian industry and broadening Canada's international footprint through global sales of over 18 follow-on devices.

Modeling and simulation applications have been leveraged into the defence and security applications, notably PRESAGIS products which were featured at the 2010 Vancouver Olympics. CAE is expanding professional services offerings, applying modeling and simulation to achieve safety, security and efficiency/ productivity benefits for entire Nations, such as Brunei. Falcon know-how in complex algorithmic modeling and evidence-based training has also been applied in healthcare and mining markets.

CAE's simulation product platforms have been made more environmentally positive through the use of new composite materials to reduce material footprints, and electric motion and vibration systems. Under Project Falcon, CAE is contributing to a better environment: for wide-body aircraft pilot training, between 7500 and 14000 litres of fuel are saved for every hour of training that is converted from aircraft to simulator and 6.6 metric tons of CO2 are saved per hour of live training converted to simulation. Noise and other negative impacts are also mitigated. CAE demonstrates its commitment to market leadership by bringing innovation to its products, services and processes. CAE has more than 8,000 employees at more than 100 sites and training locations in approximately 30 countries. Over 3,900 of these employees are in Canada and over 1,450 of them are directly dedicated to R&D activities.

D-TA Systems Inc.

Location: Ottawa, Ontario

Authorized SADI Assistance: \$1,790,140

Contribution Agreement: August 25, 2010

Innovation: This project involves research and development of products that convert high frequency analog signals into intermediate frequency analog signals (Activity 1), develop software/firmware for recording and processing the digital data (Activity 2), and convert intermediate frequency analog signals to digital data for computers (Activity 3). The objective is to change how large-scale defence systems such as radar, radio, and sonar are built. The end results of the R&D will be configured solutions to enable large-scale systems to be built without the need for additional hardware components. To date, Activity 1 has been successfully completed resulting in cutting-edge technology products which have been delivered to defence customers in the USA; Activity 2 is approximately 70 percent complete and expected to be fully completed before the end of 2013. Significant progress has been made on Activity 3. Improvements in recording data at a higher rate is expected to surpass current industry norms.

Collaboration: D-TA founded Carleton University's Dipak and Tara Roy Sensor Processing Laboratory which was opened in November 2011. This laboratory supports graduate research and facilitates advanced research in sensor processing to develop concepts, algorithms and system architectures for a variety of applications, including: radio, radar, sonar, wireless, medical imaging and instruments, and other areas of interest to communication, defence and aerospace sectors. Four students have benefited from D-TA guidance and supervision and access to company facilities. One of these students has been recruited as a full-time employee of the company. In addition, D-TA has executed a commercial contract with the support of a Carleton University engineering faculty member. Further, D-TA brought a number of organizations together including Carleton, Memorial and Royal Military College, Defence Research and Development Canada (DRDC) to explore collaboration opportunities.

Economic and Social Benefits: The R&D project has increased D-TA's capabilities and enhanced its competitiveness. D-TA has been able to significantly increase its number of international clients, including 35 blue-chip customers in eight countries. A number of new high paying jobs were created in 2013.

Héroux-Devtek Inc.

Location: Longueuil, Quebec

Authorized SADI Assistance: \$26,964,430

Contribution Agreement: September 2, 2008

Innovation : The project to incorporate new technologies into landing gear design consists of developing and integrating new technologies such as advanced design and modeling capability; developing landing monitoring and diagnostic tools; and developing lighter landing gear that is more resistant to corrosion. As a result of the advancement of the HD SADI-funded project, seven new products have been developed, 15 technologies have been optimized and five processes have been established. SADI assistance has resulted in the following projects currently undergoing qualification: front and main landing gear and tail skid shock absorber for the Sikorsky CH-53K helicopter; front and main landing gear for the Embraer Legacy 450/500 business jets; and front and main landing gear for the Learjet 85 business jet; as well as the Bombardier/Learjet emergency release system. In addition, 15 other new technologies have been developed, commercialized and/or placed in service.

Collaboration : Since 2007, HD has hired 35 student interns from Laval University, the École Polytechnique, ÉTS, Dawson College and Collège Bois-de-Boulogne. In the medium term, the company is aware of the need to develop a collaborative relationship with certain educational institutions.

Economic and social benefits: As a result of the SADI project, three major sales have been concluded with three different major clients: front, main and tail skid landing gear for the Sikorsky CH-53K helicopter; front and main landing gear for the Embraer Legacy 450/500 business jets; front and main landing gear for the Learjet 85 business jet, as well as the Bombardier/Learjet emergency release system. This project, which involves optimizing the landing gear design to reduce its weight, will generate environmental benefits over the long term. In addition, the creation of full-time positions and the hiring of students will generate long-term economic benefits.

Integran Technologies Inc.

Location: Mississauga, Ontario

Authorized SADI Assistance: \$807,399

Contribution Agreement: March 24, 2010

Innovation: Integran has developed a proprietary and patented electrodeposition nanophase cobalt phosphorous product called Nanovate CoP as a replacement for Electrolytic Hard Chrome (EHC) in steel components used in aerospace applications. This product is an environmentally compliant alternative to EHC that exhibits significant performance enhancements, including superior sliding wear, lubricity, corrosion protection and fatigue resistance while showing efficiencies over EHC. The greater efficiencies of this newly developed process include lower power consumption and higher deposition rates resulting in a much smaller carbon footprint. This new product can be employed on, and adheres to, all standard (low carbon) steels, high strength steels and aluminum alloys and may equally be used in military and private sector products. Demonstration and validation components installed on the US DoD aircraft and are currently being evaluated for performance against strict military specifications. The plating specification and activation procedures, as well as data acquisition with the US DoD, remains ongoing.

Collaboration: Integran collaborates with a number of Master and PhD students from the Materials Engineering Department of the University of Toronto to leverage their knowledge, expertise and equipment. Students are given the opportunity of working in a real world leading edge environment in which to apply their skills and to learn new ones from actual hands-on applications.

Economic and Social Benefits: Integran licensed its Nanovate CoP process to a Montreal-based aerospace company as an alternative to hard chromium electroplating in gas turbine power plant applications for aerospace use. Qualification and approval of the technology for use at the US DoD will guide supplier OEM requirements. Through industry collaboration and participation at technical conferences, presenting papers and publishing articles, Integran has engaged in interactions with all major aerospace landing gear and airframe companies. Integran is currently conducting prototyping programs which should lead to licensing opportunities. This new technology replaces existing hard chromium plating processes known to cause adverse health effects (ranging from skin ulcerations to lung cancer) and reduces greenhouse gas emissions and water pollution. Integran has also extended license exclusivity by five years to a major US manufacturer of hard chrome steel bars and tubes for the fluid power (hydraulic) industry.

Integran Technologies Inc.

Location: Mississauga, Ontario

Authorized SADI Assistance: \$399,386

Contribution Agreement: March 15, 2012

Innovation: The objective of this project is to undertake research and development of a nano-structured alloy material that offers superior performance while meeting the highest environmental standards as an alternative to toxic copper-beryllium for aerospace and defence products. The nano-structured alloy development continues to progress and is being targeted for parallel applications requiring high strength, high corrosion protection, good electrical conductivity and high thermal stability, as well as a number of other properties possessed by copper-beryllium.

Integran has engaged with major users of copper-beryllium (e.g. aerospace and defence companies) and will be conducting prototyping programs which is expected to lead to licensing and manufacturing opportunities. This new nano-structured material solution has been shown to be promising both scientifically and commercially and Integran believes it possesses a unique position as product prices are expected to become more attractive within the aerospace industry.

Collaboration: Integran is involving two engineering students from the University of Toronto in this project. The students are taking one year to work in the company as part of their program.

Economic and Social Benefits: Once the R&D is completed, Integran expects to expand its product line and customer base, providing next-generation metal alloys that are more robust and free from toxic copper-beryllium alloys. In addition, qualification and approval of the technology (e.g. for use at the US DoD) will guide supplier OEM requirements.

The nano-structured material being developed is expected to offer a number of additional benefits, such as increased production efficiency, reduction in material usage, and penetration of new markets where the nano-structured alternative offers higher strength and lower friction than CuBe, providing new business opportunities. The combination of these benefits is expected to broaden the customer base to include those customers which cannot afford copper-beryllium and its associated toxicity and/or require performance improvements over copper-beryllium only offered by the nano-structured materials being developed as part of this project.

Kongsberg Mesotech Ltd.

Location: Port Coquitlam, British Columbia

Authorized SADI Assistance: \$4,968,000

Contribution Agreement: February 23, 2010

Innovation: Kongsberg Mesotech Ltd. (KML) is developing its next generation of sonar for the purposes of monitoring and classifying threats to ports and high-value marine assets. These high resolution images will also be used for mine detection, avoidance and counter measure. The sonar being developed has proven itself in trials and has been deployed to various other industries (fisheries, oil and gas, engineering) with favourable results. KML's sonar units use advanced telemetry and data compression in order to obtain the most detailed images as fast as possible. The unique imaging technology of the M3 sonar has been protected with patents.

Collaboration: KML has employed coop students (temporary) as well as Post Docs (long term) from SFU and provides funding for a PhD student at the University of Victoria for the development of imaging technology. KML continues to look to engage a Post Doctoral fellow at the University of British Columbia for using sonar and acoustics for material characterization and possibly classification.

Economic and Social Benefits: To date, KML's has commercialized one model of its M3 sonar which has a wide range of abilities and operable depths. A dual axis single beam sonar system to acquire profile points for 3D point cloud rendering and modeling has been released to production with use in port security and clearance as well as commercial engineering applications. A 1MHz 1171 single beam sonar system for high resolution imaging has also been released to production for use by police and first responders for evidence recovery and security applications.

Magellan Aerospace Limited

Location: Winnipeg, Manitoba

Authorized SADI Assistance: \$43,391,600

Contribution Agreement: September 1, 2008

Innovation: The objective of the project is to undertake the research and development of new processes for composite manufacturing and complex assemblies that incorporate both composite and metallic components. This project is related to the multi-national Joint Strike Fighter (JSF) program. The complexity and precision, essential to produce the parts that go into an F-35 JSF, requires specific technologies. For example, the aircraft design demands exactness such that on the multiple pieces that are assembled for the horizontal tail assembly, almost

1,400 holes each, have to align within one-half thousandth of an inch, which is 1/6th the thickness of a piece of paper. Magellan has successfully completed the first units. The technology required to complete this engineering feat, and do it repeatedly and efficiently, continues to improve with new equipment, software updates and new processes, all supported by SADI.

Collaboration: Working with Red River College, Magellan opened the Centre for Non-Destructive Inspection Technologies, which is located on the College's Industrial Campus at Magellan Aerospace. This state-of-the-art centre allows students and professors to learn and experience laser technology that inspects carbon fibre parts up to 85 percent faster, on the only installation of its kind outside of the US. Red River College worked with Magellan in developing JSF assembly and composite training classes for current employees. Magellan also sits on an advisory board which outlines the Red River College composite courses. Work is also being done with the University of Manitoba and the Composite Innovation Centre.

Economic and Social Benefits: Magellan is advancing its manufacturing capabilities with leading edge equipment in state-of-the-art facilities at divisions within Canada, and continues to develop technologies that provide the opportunity for many years of work. These precision machining, composite work, and inspection technologies provide employment in highly skilled manufacturing jobs and world-class learning opportunities for students and faculty. With the international participation associated with the JSF program, Magellan is gaining global recognition for its accomplishments in applying advanced technology in a production environment. Components that have been produced at Magellan are flying as part of the flight testing fleet. As this phase of the program continues over the next few years, Magellan will continue to make affordability, design, and engineering improvements. Full rate production of the JSF program is now expected in the latter part of this decade.

PCI Geomatics Inc.

Location: Richmond Hill, Ontario

Authorized SADI Assistance: \$7,665,000

Contribution Agreement: August 12, 2009

Innovation: The objective of this project is to research and develop a high-speed computing framework and software suite that will make it possible to process large amounts of raw satellite image data faster and more cost-effectively, with an emphasis on increasing the automation of image processing. The resulting data are essential for decision making in many fields, including environmental monitoring, agriculture, security and intelligence, aerospace and defence, and wide-area surveillance. This project has developed and demonstrated software that can automatically extract information from earth observation data obtained from satellites and other aerial vehicles.

Collaboration: PCI has recently entered into a collaboration with Queen's University on a project researching feature extraction from Very High Resolution remote sensing imagery. Previously, PCI completed a collaboration with the University of Ottawa under the SME4SME program in the exploration of visual attention models in the context of satellite imaging. Other investigations and engagements undertaken by PCI within the term of this SADI project include: an investigation into the area of neural net computation applications in high resolution earth observation imagery with the University of Toronto, and a collaboration with the University of New Brunswick in the area of optical and radar image processing. PCI continues to seek out opportunities to collaborate with post secondary institutions.

Economic and Social Benefits: SADI funding has aided PCI in enhancing technologies, most notably Geomatica and GeoImaging Accelerator, allowing them to enter the marketplace at a faster rate. SADI assistance has enabled PCI to apply more resources to technology development, improve the quality of its product releases and expand its range of offerings to new technologies. Technology development undertaken with the assistance of SADI funding has resulted in software products that are capable of processing and managing large volumes of geospatial data quickly and accurately. This software converts data into decision support information at faster speeds and with less operator interaction and can be used to create custom applications. Recent improvements to the software products have increased the efficiency of many data processing workflows, resulting in savings of time, energy and computing resources to PCI software users. Information can be processed much more quickly, and at lower cost, than previously possible.

Pratt & Whitney Canada Corp. (P&WC)

Location: Longueuil, Quebec

Authorized SADI Assistance: \$300,000,000

Contribution Agreement: December 10, 2010

Innovation: P&WC is developing aircraft engines that are lighter, more powerful, and offer better fuel consumption and improved durability, enabled by technologies related to lighter materials, high temperature coatings, next generation combustors, novel compressor architectures, intelligent engine controls and advanced manufacturing technologies. The company is leading the way in developing cleaner, quieter engines which, in many cases, will exceed the noise and emission standards in the industry. The technologies developed in this project are being demonstrated in next generation platforms, such as regional turboprop and large business jet. The quality of the innovation is reflected in over 60 patents granted per year.

Collaboration: The company has established and maintained collaborative relationships with a large number of universities, research institutions and industrial partners in Canada, with a total investment of approximately \$10 million per year. It has been recognized by the Science Technology and Innovation Council as a leader in strategic collaboration. On a yearly basis, P&WC conducts over 200 collaborative projects with 17 universities across Canada, engaging well over 400 students through different programs. P&WC participates in seven NSERC industrial research chairs established at universities in British Columbia, Nova Scotia, Ontario, and Quebec and five consortia and research networks, such as Consortium for Research and Innovation in Aerospace in Quebec (CRIAQ), which enhance university expertise and develop Canadian supply chains. In addition, P&WC has established ten university Centres of Expertise and has been instrumental in the creation of the Undergraduate Aerospace Institutes at six universities in Ontario and Quebec. All collaborative initiatives contribute to advancing university expertise, expanding the capability of the supply chain, and developing the next generation of aerospace professionals in Canada.

Economic and Social Benefits: Since the start of the project, the technologies developed have led to the certification of a new PT6A turboprop engine, which builds upon the PT6A legacy. The PT6A-140 offers more power to extend its capabilities for missions with higher altitudes and demonstrates a 5 percent improvement in specific fuel consumption, through the incorporation of advanced aerodynamics, a more efficient compressor, and the latest generation of hot section materials. Other innovations have reduced emissions, increased maintenance intervals and further enhanced ease of operation with the introduction of digital electronic control to small gas turbine engines. These new technologies are delivering additional benefits such as reduction of noise and elimination of materials of concern. In its next generation regional turboprop, these new technologies are resulting in 20 percent lower fuel consumption. Through the use of fewer raw materials, increased automation and more efficient manufacturing processes, the company is lowering its use of energy and reducing its production of pollutants. In addition, the project provides development opportunities for the company's already highly skilled workforce and its research and industrial partners. Since the beginning of this project, over 1400 engineering employees have increased their technical skills through formal training. P&WC employees are actively participating in over 130 technical committees and aerospace association to shape the future of the aerospace industry.

Thales Canada Inc.

Location: Saint-Laurent, Quebec

Authorized SADI Assistance: \$12,988,800

Contribution Agreement: December 23, 2010

Innovation: The objective of the project is to research and develop a full Fly-By-Wire (FBW) flight control system that is lighter and more reliable than the mechanical linkages of the hydro-mechanical flight control systems. To date, this project has resulted in the development of three new technologies related to the Bi-directional 429 field bus, Flight Control Computer and Back-up Flight Control Computer. In addition, the project has resulted in the development of two new products with the Flight Control Computer and a Back-up Flight Control Unit V2 and a further evolution to version V3. Version V3, still in the prototyping phase, will allow introduction of side stick controller inceptors and allow Thales to increase the level of understanding of this technology.

Collaboration: Thales is involved in several collaborative projects with the "Consortium de recherche et

d'innovation en aérospatiale au Québec", École Polytechnique de Montréal, McGill and École de Technologie Supérieure for total research contributions approaching \$690,000. Through these research projects there is an exchange of knowledge between the universities' researchers and Thales in the development of new prototypes. Thales is also hiring 10 students on a full time basis. In addition to aligning research to the needs of the industry, this provides the students invaluable work experience and on the job training.

Economic and Social Benefits: Thales's two new products, the Flight Control Computer and Backup Flight Control Unit are both available in V2 version and ready for integration into commercial, FBW aircraft. Their modularity and adaptability allows them to meet the needs of a wide range of regional and business FBW aircraft in terms of aircraft size, structure and performance requirements.

Ultra Electronics TCS Inc.

Location: Montréal, Quebec,

Authorized SADI Assistance: \$32,447,400

Contribution Agreement: March 22, 2011

Innovation: Ultra Electronics is developing a new generation of tactical radio systems, comprising wireless and mobile communication devices for military and government security applications. The company is on track with respect to developing a family of high capacity radios with unique features for different markets. New technologies under development include a platform that fully exploits the Software Defined Radio concept; a multiband/multichannel radio that integrates several communication technologies into one system. At the CANSEC tradeshow in May 2013, the company announced the launch of the ORION radio, their 4th generation of High-Capacity Radios with multiband, point-to-point and point-to-multipoint radio capabilities that thickens the terrestrial transport layer to help boost military mission commands and Intelligence, Surveillance & Reconnaissance applications performance, simultaneously reducing the burden on beyond line-of-site systems. The radio combines high-bandwidth throughput, performance and operational flexibility within a small form factor. Configuration of the ORION is carried out using applications on an Android handset, which communicates securely with the ORION via the access channel.

Collaboration: Ultra Electronics is contributing \$250,000 per year to support a NSERC Industrial Research Chair in high performance wireless emergency tactical communications technology at the École de Technologie Supérieure. The Chair currently employs 2 institutional researchers, 2 Post-Doc fellows, 4 Professional Engineers, 12 PhD candidates, and 8 Masters Engineering candidates. This has allowed many students to develop highly specialized expertise in wireless technology and to benefit from valuable internships in the industry.

Economic and Social Benefits: The Company has released and sold a version of the high capacity radio that addresses a new military frequency to the United Arab Emirates. This year, 20 new frequency units have been purchased by the Department of National Defence. It has completed the R&D on another radio and is now bidding to win major contracts in India. One other radio and the adaptive antenna are mature enough to start business development efforts. More than 10 software and firmware design contractors contributed to this project with much hardware design subcontracted to Canadian companies. The development and production of the new generation of the Orion radio enables the company to maintain a large base of Canadian suppliers to support design activities.

Projects that Entered the Repayments Phase in 2012/13

EMS Technologies Canada Ltd.

Location: Ottawa, Ontario

Disbursed Assistance: \$7,846,771

Contribution agreement: March 3, 2009

Innovation: SADI supported a project at EMS Technologies Canada Ltd. (EMS) to research and develop next-generation mobile satellite communications technology. The investment enabled EMS to develop new technologies for its satellite communications products. EMS successfully developed a family of satellite communications transceivers that are industry leading connectivity solutions serving the commercial and defence aviation markets. The technology developed improved satellite communication services, with a reduction in the size and weight of transceivers and functionality aligned with customer requirements. This new technology is currently being adopted by a number of major commercial aircraft manufacturers.

Collaboration: EMS launched a co-op student recruitment program that hired students from Waterloo University, Carleton University and Ottawa University to work on the SADI project. Approximately 22 co-op students were hired during the last year of the project, a substantial increase from previous years. EMS also contributes to the Canadian contract manufacturing sector through technology transfer with its suppliers.

Economic and Social Benefits: Several products developed under the SADI project have been commercialized and shipped to hundreds of customers, including a next generation Quad Helix High Gain antenna, a low cost transceiver for small aircraft and a number of customer specific transceivers for major commercial aircraft OEMs. The project improved both cabin and cockpit satellite communication. In addition, with a reduction in product size and weight, it is also helping to reduce the overall fuel requirements and thus the carbon footprint of the aircraft deploying EMS Technologies Canada satellite communications equipment.

Esterline CMC Electronics Inc. (CMCe)

Location: Saint-Laurent, Quebec

Disbursed Assistance: \$52,287,784

Contribution Agreement: January 13, 2009

Innovation: The objective of the project was to develop cost-effective cockpit technologies for next-generation business jets, helicopters and transport aircraft. The company developed a complete cockpit system with open architecture which will make the components of the cockpit easily customizable and adaptable to changing technologies and varied aircraft platforms. Through many of the technical innovations developed through this project, the company achieved the majority of its original goal to develop a fully integrated generic navigational and communications cockpit system.

Collaboration: CMCe established collaborative relationships with several Canadian universities, colleges and public research institutes, including: the École Polytechnique de Montréal, Carleton University in Ottawa, and the École de Technologie Supérieure (ETS) in Montreal to study model-driven engineering for automatic code generation. The company collaborated with 13 engineering trainees at Sherbrooke University and studied the integration and management of interfaces in cockpits and simulators with Concordia University in Montreal, École Polytechnique de Montréal, McGill University and the École de Technologie Supérieure (ETS). CMCe established a "SmartDeck" cockpit Integration laboratory at the École Nationale d'Aérotechnique (ÉNA) in St-Hubert, Québec and studied Infra Red (IR) technology with the Institut National d'Optique (INO) in Quebec City and the Centre OPTECH of the CEGEP André-Laurendeau in Montreal.

Economic and Social Benefits: The ultimate objective of this project was to establish CMCe as Canada's first cockpit designer/manufacturer. The company is now in position to showcase its prototypes in many renowned international aerospace trade shows. Its commercialization efforts have already attracted several business opportunities for both complete cockpit systems and individual system components. The commercialization of the CMCe *SmartDeck*® integrated glass cockpit for General Aviation (GA) PART 23 class aircrafts, led to the selection of CMC on two new platforms, the CO50 business aircraft from Cobalt Aircraft Industry of Saguenay, Canada and

the EV-55 Outback aircraft from Evektor Aerotechnik of the Czech Republic. The company is now focused on adapting on other aircraft platforms the numerous generic technologies developed.

Many of the cockpit technologies developed within this program reduce fuel consumption of aircraft. The Vertical Navigation features of the Flight Management Systems allow optimization of flight profile to minimize fuel burn. The Enhanced Vision Systems allow landing in poor weather conditions and thus avoid costly diversions. The Global Positioning Systems support precision approach and curved approaches, also reducing fuel burn. Navigation technologies providing more accurate measurement of position and flight intent also provide an increased level of safety.

FLYHT Aerospace Solutions Ltd.
(formerly AeroMechanical Services Ltd.)

Location: Calgary, Alberta

Disbursed Assistance: \$1,967,507

Contribution Agreement: February 22, 2011

Innovation: This project involved the development of next-generation data communication systems for commercial and military aircraft. Flyht has successfully developed technologies to support an on-board, remotely programmable avionics system capable of using text, voice and data transmission to communicate to and from an airplane. Flyht developed two systems, the AFIRS 228B and AFIRS 228S, which can relay data from the black box and other diagnostic components to the ground in real time.

Collaboration: The Company hired an engineering student and a MBA student from the University of Calgary to support the project. Flyht also collaborated with many organizations, such as Au-Zone Technologies, Semiconductor Arts, and DBRF (all in Calgary), Peter Matthews (British Columbia), CDI (USA) and L3(USA). Flyht's aim with these collaborations has been to create a knowledge base in Alberta specifically in the area of aerospace communications.

Economic and Social Benefits: The improvements to the AFIRS 228 system enhance the system's ability to communicate in real-time with computer servers on the ground when triggered by a fault reading indicating an unusual occurrence. This data streaming capability can be used to increase safety by preventing accidents. As well, it is anticipated that using the 228 on fleet or aircraft will reduce fuel requirements which will impact fuel consumption and the use of non-renewable resources.

INTEGRAN TECHNOLOGIES INC.

Location: Mississauga, Ontario

Disbursed Assistance: \$4,596,000

Contribution Agreement: August 27, 2008

Innovation: The objective of this project was to undertake research and development of nanotechnology-based coatings for aircraft tools related to the Joint Strike Fighter program. Integran successfully developed a process for plating carbon graphite substrates with its Nanovate (TM) coating to create tools (moulds) used in the construction of aircraft and aircraft components. The innovation combines the hardness, durability and damage tolerance of the metallic coating with the lightweight, low thermal mass and low cost of carbon fibre composite mould tools to deliver a durable and cost-effective solution. The project resulted in one patent and four patent applications.

Collaboration: As a direct result of this project, Integran involved 8 engineering students, offering them an opportunity to work at the company for one year as part of their program. Integran hired two full time engineering graduates to continue its involvement with this work. The project enabled the company to maintain an ongoing relationship with the University of Toronto. Students benefited by working in a real-world leading-edge environment in which they applied and learned new skills via hands-on experience. The collaboration also enabled new research using the university's equipment and Integran's facilities.

Economic and Social Benefits: Once fully demonstrated and validated, the company expects to be able to commercialize the technology. To date, numerous companies have expressed interest. Once in the marketplace, this technology is expected to reduce the carbon footprint of composite manufacturing due to the decrease in

energy and increased throughput related to Nanovar carbon fibre composite tooling. The technology was launched during a number of top-level visits to major European and US aerospace composite companies last year. As inspection and repair processes for composite aircraft parts mature, and the benefits of lighter and stronger airframes are realized, it is expected that original equipment manufacturers will increase composite use in their products. This would make Integran's innovative tool a more viable and cost effective solution compared to currently available products.

Norsat International Inc.

Location: Richmond, British Columbia and Aurora, Ontario

Disbursed Assistance: \$5,975,200

Contribution Agreement: September 5, 2008

Innovation: Norsat's R&D activities focused on the development of portable satellite ground terminals, microwave components, terrestrial wireless antennas, and power conditioning technologies. Its technologies are improving the reliability of satellite terminals and their ability to withstand extreme environmental conditions.

Satellite Terminals: Norsat made significant design and engineering improvements to Rover, GLOBETrekker and Sigmalink terminals. In particular a new low cost reflector was introduced and a high performance feed developed. A 1.2m terminal was developed and a Ka band Rover and GLOBETrekker developed.

Microwave: Norsat continued to improve its microwave products especially the Low Noise Block Downconverter (LNB) controller used with the Universal LNB. A highly integrated and cost reduced Spectrum Analyzer was completed for use as a standalone product and as part of the satellite terminals. Additional filters were created to improve the performance of the LNBs. **Wireless:** Norsat developed temperature compensation technology that improves the performance of high power filters for high power applications. Norsat also extended the frequency range of the enhanced prediction tool, which works as a calculator for part selection to increase manufacturing efficiency. Finally, Norsat developed more compact filters and space saving antennas that improve service to land mobile radio, which is used in emergency services communications. **Patents:** Norsat was granted two patents in 2012.

Collaboration: Norsat collaborated with Simon Fraser University to characterize Ka and Ku band antennas and for feed development. Norsat also collaborated with TR Labs on the development of a feed system for a flat panel antenna.

Economic and Social Benefits: Norsat has become more competitive in the communications market through research that resulted in performance improvement and cost reduction for existing products and the commercialization of new products. As a result of the SADI project, Norsat developed 31 new products and commercialized 23 of these. As a direct result of SADI, Norsat secured 160 new customers including NATO NCI Agency, the First Nations Emergency Services Society of BC, Finnish Defence Forces, the US Air Force, and now serves 15 militaries worldwide. Norsat maintains the communications network for the First Nations Emergency Services Society which is providing enhanced broadband access to 17 of British Columbia's remotely located First Nations communities which are now able to access emergency services and educational and health resources over the internet. Norsat used many local contractors to complete prototypes including Printed Circuit Board (PCB) manufacturers, PCBA assemblers, machine shops and cable assembly shops. Local contractors mean reduced shipping costs, faster turn around and less waste as problems can be rectified quickly. The new products developed have helped to increase Norsat's market share.

Projects that Became Inactive in 2012–13

DIAMOND D-JET CORPORATION (DDJC)

Location: London, Ontario

Disbursed Assistance: \$17,640,001

Contribution Agreement: January 10, 2008

Project: The intent of this project was to develop an entry level jet aircraft to open private and business jet air travel to a new segment of travellers. The objectives were to significantly lower the acquisition cost, the operating cost and the environmental impact, while maintaining high degrees of safety and comfort. Diamond completed 3 of 6 prototypes, and flew over 650 hours validating the objectives, performance, handling and certifiability of the D-JET. The company assisted in the development (2007–2008) of an Aviation Composite Fabrication Program at Fanshawe College which supported the establishment of the aerospace composite structural repair technician program. Diamond also collaborated with Canadian third party companies on the qualification and certification of materials and production processes for composite aerospace structures. Due to soft market conditions and significant funds required to obtain certification, Diamond suspended work on the D-Jet in February 2013 and undertook a restructuring of the company. The company continues working with stakeholders to pursue additional funding and lines of business.