Innovation, Science and Economic Development Canada
Industrial Technologies Office

Innovation, Sciences et Développement économique Canada
Office des technologies industrielles

Strategic Aerospace and Defence Initiative

Program Highlights 2014-15

Canada

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Contents

1. Introduction

Canada's aerospace and defence (A&D) industries, consisting of firms specializing in aerospace, defence, space and security technologies, are recognized around the world for producing leading edge products and services. Domestically, the industries are important economic drivers in all regions of the country and collectively, are a significant player in the development of Canada's knowledge-based economy.

Canada's aerospace sector (2014):

- *700 companies*
- *180,000 jobs*
- *$29B to the GDP*

Canada's aerospace manufacturing ranked fifth among OECD countries in terms of GDP (2011).[1] With some 700 companies of all sizes located across Canada, the aerospace sector contributed more than $29B to the economy in GDP, generated $27.7B in direct revenues and supported more than 180,000 jobs, with 76,000 as direct employment in 2014.

In terms of the share of direct GDP, about 73 percent of the Canadian aerospace industry's activity is dedicated to manufacturing while Maintenance, Repair and Overhaul (MRO) service related activities makes up the rest. Both manufacturing and MRO sectors are expanding rapidly and have grown to 29 percent and 37 percent respectively over the last 10 years (2004-2014). Canada's MRO sector generates more than $7.1 billion in annual revenues and employs nearly 29,000 highly skilled workers.[2]

Global Leader

#1 in civil flight simulation

#3 in civil engine production

#3 in civil aircraft production

The Canadian aerospace industry is national. Central Canada accounts for most of the manufacturing industry. Western Canada plays a dominant role in the MRO sector and Atlantic Canada has been the fastest growing region in MRO over the past five years.

Canada is a global leader in key niche segments. It leads the world in civil flight simulation and ranks third in civil engine production. It is second in business and regional aircraft production, and third in overall civil aircraft production. Moreover, Canada's civil aircraft production growth is forecasted to outpace the global market

[1]Industry data are taken from *The State of the Canadian Aerospace Industry: 2015 Report*, Industry Canada and the Aerospace Industries Association of Canada (AIAC), June 2015 http://aiac.ca/wp-content/uploads/2015/11/The-State-of-the-Canadian-Aerospace-Industry-2015-Report.pdf

[2]*Canada's aerospace sector*, Invest in Canada series, Department of Foreign Affairs and Trade Development Canada, Winter 2014

for the 2014-2021 period (22 percent for Canada versus 11 percent for the global civil aircraft production).[3]

Nearly 80 percent of Canada's aerospace products and technology are exported to highly diversified markets: 62 percent to the USA, 23 percent to Europe, 8 percent to Asia and 7 percent to Africa, the Middle East, and Central and South America. While traditional partners such as the USA and Europe continue to dominate current exporting trends, Canadian companies are increasingly diversifying their global presence with the emergence of new markets in the Asian, African and Latin American regions.[4]

Canada's aerospace industry is also strongly connected to the international supply chain. Over 60 percent of its exports are supply chain oriented, and those exports are becoming increasingly diversified both in terms of destination and product category. While the USA is the key aerospace supply chain export market for Canada, exports to the Asia Pacific region account for close to 20 percent of the overall growth in the value of exports in the last 10 years.[5]

R&D performance:

- *$1.8 billion invested in R&D in 2014*
- *5 times the R&D intensity of Canada's total manufacturing average*

Canada's aerospace manufacturing sector boasts 5 times the research and development (R&D) intensity of Canada's total manufacturing average. Nearly 20 percent of aerospace manufacturing activity is dedicated to R&D, representing a $1.8B investment in 2014. A vibrant R&D culture allows Canada to compete in new markets and industries, and helps Canadian businesses offer new or improved products, processes and services.

The 2013 report by the Canadian Council of Academies, *The State of Industrial R&D in Canada*, identified aerospace products and parts manufacturing as one of Canada's industrial R&D strengths.[6] Canadian companies have to continue to invest aggressively in R&D to remain competitive and on the leading edge of new innovations to foster the growth needed to remain competitive over the long term. 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).

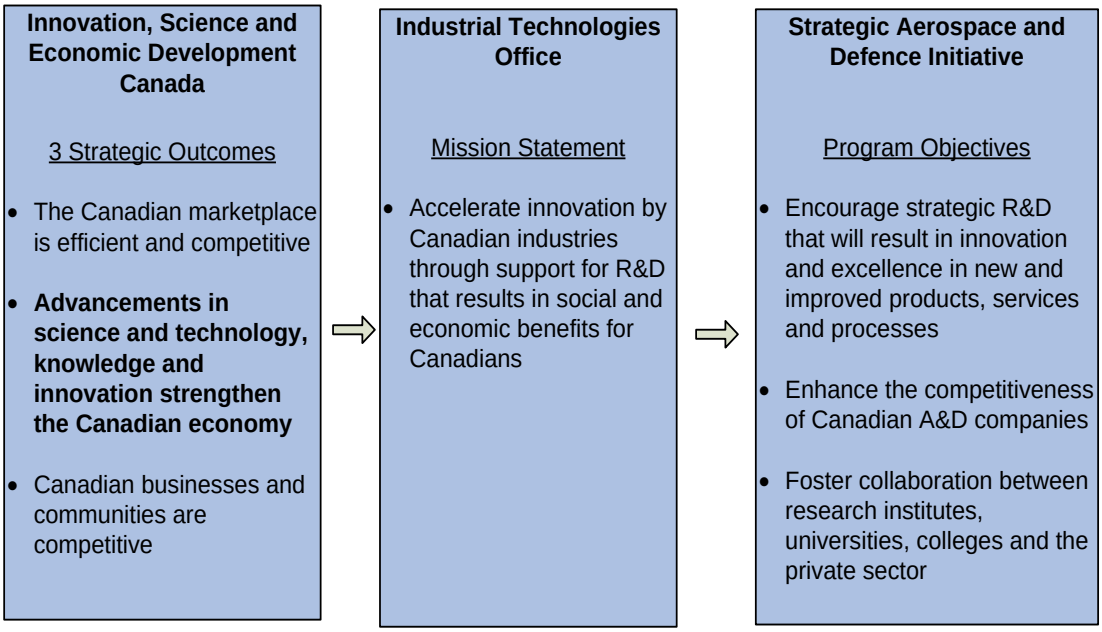
As part of the federal government's commitment to research and innovation, the Strategic Aerospace and Defence Initiative (SADI) was launched on April 2, 2007. SADI provides financial support to advance strategic industrial research and pre-competitive development R&D projects in the A&D industries.

3 *The State of the Canadian Aerospace Industry: 2015 Report*
4 *Leadership in Aerospace*, Ready for takeoff, Globe and Mail, November 2014
5 Global Trade Atlas (based on Statistics Canada), 2014
6 *The State of Industrial R&D in Canada*, Canadian Council of Academies, 2013, pg. 118

SADI is delivered by the Industrial Technologies Office (ITO), a Special Operating Agency of Innovation, Science and Economic Development Canada.[7]

This report highlights developments in 2014-15.

2. Innovation, Science and Economic Development Canada's Strategic Outcomes and SADI



Innovation, Science and Economic Development Canada's strategic outcomes determine how its programs and resources are aligned and contribute to its mandate. Under the strategic outcome: *advancements in science and technology, knowledge, and innovation strengthen the Canadian economy*, the Department delivers programs that invest in science and technology to generate knowledge and equip Canadians with the skills and training they need to compete and prosper in the global knowledge-based economy. These investments help ensure that discoveries and breakthroughs happen in Canada and Canadians realize the social and economic benefits that result.

SADI directly supports the Department's strategic outcome; *advancements in science and technology, knowledge, and innovation strengthen the Canadian economy*. It contributes to Canada's innovation performance by supporting and stimulating scientific research, development and innovation in Canada, leverages public funds and other investments, encourages strategic partnerships and collaboration among companies and research institutions and provides financial

[7] Previously known as Industry Canada, the Department's name was changed to Innovation, Science and Economic Development Canada in November 2015.

assistance to encourage firms to take strategic R&D risks. These commitments are key components of the Department's mission, which is to foster a growing, competitive, knowledge-based Canadian economy.

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

At the same time, by nurturing private sector R&D at home, SADI helps Canadian companies of all sizes remain competitive in the global economy.

3. SADI Overview

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

SADI's three objectives

(1) encourage strategic R&D that will result in innovation and excellence in new or improved products, services, and/or processes;

(2) enhance the competitiveness of Canadian A&D companies; and

(3) foster collaboration between research institutes, universities, colleges and the private sector.

Eligibility Criteria

- Applicants are for-profit corporations incorporated under Canadian law.
- Projects comprise R&D that takes place in Canada.
- At least one percent of total eligible project costs are allocated to collaboration with post-secondary institutions in Canada.
- Projects comprise industrial research or pre-competitive development.
- Projects include strategic R&D activities that support the development of next-generation A&D products, services and/or processes, build on Canadian strengths in A&D technology development, enable Canadian companies to participate in major

platforms and supply chains, and/or assist the A&D industries in achieving Canada's international obligations.

- SADI funding is essential to the location, scope and/or timing of the proposed project.

Project Approval Process

Submission of the Application: SADI applications are accepted throughout the year using an on-line application form. ITO staff provide guidance to potential applicants. 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 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 economic and social benefits that it expects 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 Innovation, Science and Economic Development. Funding requests for more than $10 million require Treasury Board approval. Funding requests for more than $20 million require Cabinet and 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 covering up to 40 percent of total eligible project costs. Repayments are unconditional or based on the recipient's gross business revenue, begin two years after the completion of the R&D, and are typically repaid 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 Joint Strike Fighter (JSF) program. SADI supports up to 40 percent of eligible project costs. The nominal amount (100 percent) of the contribution is payable over 15 years for DDSA and over 20 years for JSF projects.

Monitoring Process

Site visits, progress reports, annual financial statements and annual benefit reports allow ITO to monitor the progress of each project, with the degree of frequency varying, depending on the project's risk rating and size.

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), which ended in 2006. The budget for 2014-15 was $191 million.

As of March 31, 2015, a total of $1.53 billion in authorized assistance had been approved under SADI, of which $863 million[8] had been disbursed against eligible claims.

ITO's operating expenses for the management of SADI and TPC were $5.4 million in 2014-15. Operating expenses cover salaries, audits, site visits, outreach and other administrative program costs.

Program Resources by Fiscal Year 2014-15 ($000)

Fiscal Year	ITO Operating Expenses *	SADI Annual Contribution Disbursements **	TPC Annual Contribution Disbursements **
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
2013-14	5,554	182,045	1,230
2014-15	5,410	147,860	971

* Represents total operating costs for the management of SADI, the (TPC) Program and other programs.
** As presented in the Annual Public Accounts of Canada. The amounts reported in the Annual Public Accounts of Canada include actual disbursements made in each fiscal year.

5. SADI Project Portfolio

As of March 31, 2015 the SADI portfolio was comprised of 37 projects (with 29 recipients) and a combined authorized assistance of $1.53 billion. The authorized assistance ranged from $276,000 to $300 million per project. Active SADI projects are either in the R&D phase or in the repayment phase. The R&D phase generally takes place over a 5 year period. Funds are typically repayable over 15 years and begin one to two years after the end of the R&D phase. In 2014-15, 49 percent of the SADI projects were in the R&D phase and 38 percent were in the repayment phase.

[8]The amount of $863 million corresponds to the total amount disbursed under SADI at the end of fiscal year 2014-15.

SADI Project Portfolio				
Status	**# of Projects**	**Authorized Assistance ($)**	**Disbursements ($)**	**Repayments ($)**
Research and Development Phase	18	811,661,318	166,929,240	N/A (projects are in R&D Phase)
Repayment Phase*	14	668,608,464	665,683,454	8,628,057
Inactive **	5	51,348,191	30,026,060	10,384,677
Total	37	1,531,617,973***	862,638,754	19,012,734

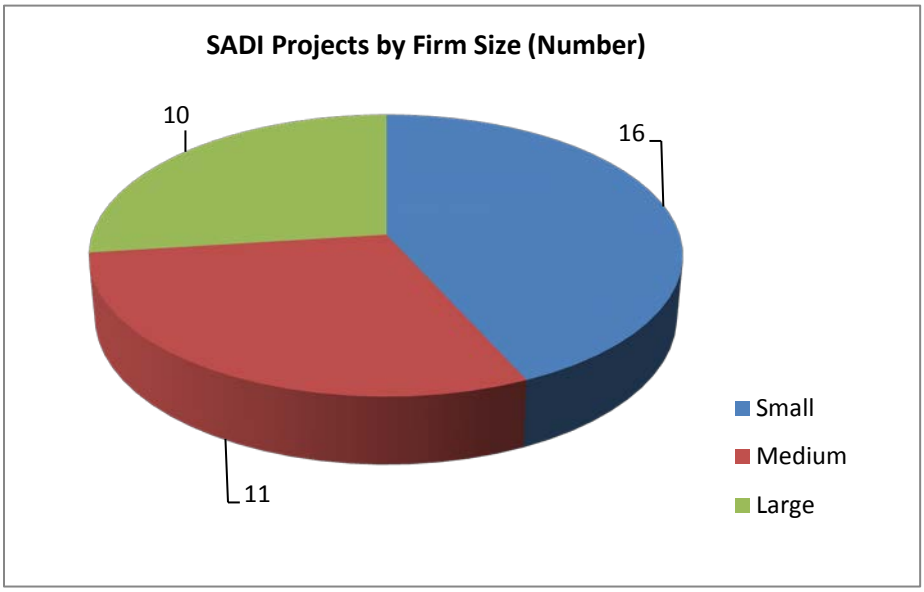
* The first year SADI projects entered the repayment phase was in 2011-12 and repayments are forecasted to increase significantly in future years as more projects enter this phase.
**Includes projects that have been terminated and for which both the company and the Department have agreed to terminate the contribution agreement, due to different circumstances, including a change in the control of the company, cessation of operations, bankruptcy or receivership.
***As at December 31, 2015, this amount stood at $1.32 billion. On December 30, 2015, the Government of Canada and Pratt and Whitney Canada (P&WC) entered into a series of amendment agreements, including amendments to its 2 SADI projects, resulting in the financial settlement of P&WC's repayment obligations. As part of this amendment, the authorized assistance for one of P&WC's SADI projects was reduced from $300 million to $87.9 million.

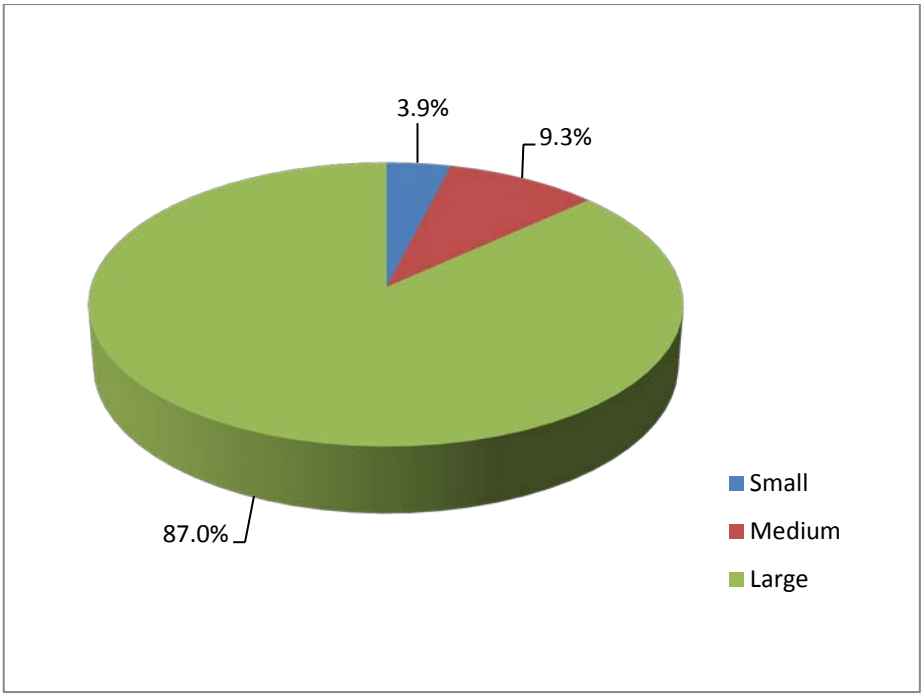
SADI provides contributions to companies of all sizes

SADI is accessible to Canadian incorporated companies of all sizes, located in Canada, that perform R&D in the country.

Of the 37 SADI projects:

- **small** companies with less than 100 employees account for **16 projects and 3.9 percent** of the authorized assistance;
- **medium-sized companies** with 100-500 employees account for **11 projects and 9.3 percent** of the authorized assistance; and
- **large** companies with more than 500 employees account for **10 projects and 87 percent** of the authorized assistance.





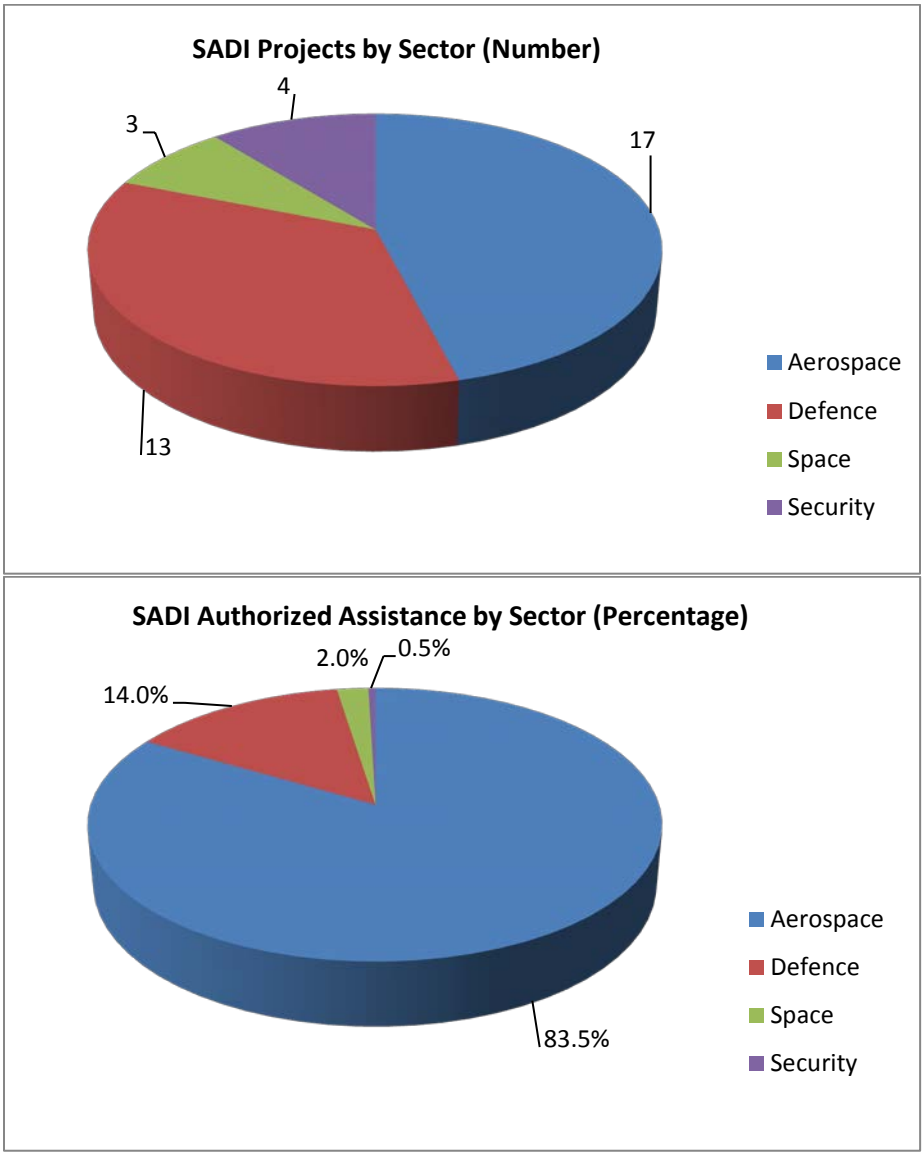
SADI supports the aerospace, space, defence, and security sectors

SADI is available to the A&D sector, which includes companies specializing in aerospace, defence, space and security technologies.

Of the 37 SADI projects:

- 17 projects supported the **aerospace** sector accounting for **83.5 percent** of the authorized assistance;

- 13 projects supported the **defence** sector accounting for **14 percent** of the authorized assistance;
- 3 projects supported the **space** sector accounting for **2 percent** of the authorized assistance; and
- 4 projects supported the **security** sector accounting for less than **0.5 percent** of the authorized assistance.



SADI PORTFOLIO

Company		Project Description	Authorized Assistance *	Phase
2007-08				
1	Diamond D-Jet Corporation	Single-engine, five-passenger jet aircraft	$19,600,000	Inactive
2008-09				
2	Integran Technologies Inc.	Nanotechnology enabled tooling	$4,596,000	Repayment
3	Magellan Aerospace Limited	Structural components for the F-35	$43,391,600	R&D
4	Héroux Devtek Inc.	Advanced landing gear technology	$26,964,430	Repayment
5	Norsat International Inc.	Microwave, wireless & portable satellite technologies	$5,975,200	Repayment
6	CMC Electronics Inc.	Integrated cockpit & communications system	$52,287,784	Repayment
7	EMS Technologies Canada Ltd.	Next generation mobile satellite communications	$8,718,634	Repayment
8	SkyWave Mobile	Fleet management, shipping security	$3,127,200	Inactive
9	CAE Inc.	Enhanced simulation technology	$250,000,000	Repayment
10	Sputtek Inc.	Advanced protective coating technologies	$360,285	Inactive
2009-10				
11	AXYS Technologies Inc.	Unifying data from monitoring & surveillance sources	$1,836,900	Repayment
12	PCI Geomatics	Earth observation information extraction	$7,665,000	R&D
13	BelAir Networks Inc.	Radio technology with advanced security	$9,690,706	Inactive
14	Kongsberg Mesotech Ltd.	Acoustic instrumentation for underwater security	$4,968,000	R&D
15	Integran Technologies Inc.	Cadmium replacement coatings	$276,284	Repayment
16	Integran Technologies Inc.	Hard chrome alternative	$807,399	Repayment
2010-11				
17	2154331 Canada Inc.	Flight simulation	$18,570,000	Inactive
18	D-TA Systems Inc.	Advanced sensor processing	$1,790,140	Repayment
19	ASCO Aerospace Canada Ltd.	Structural components for the F-35	$7,688,288	R&D
20	Pratt & Whitney Canada Corp.	Gas turbine engine applications	$300,000,000	Repayment
21	Thales Canada Inc.	Fly-By-Wire flight control system	$12,988,800	Repayment
22	FLYHT Aerospace Solutions Ltd.	Automated flight information reporting system	$1,967,507	Repayment
23	Ultra Electronics TCS Inc.	Tactical high capacity radio	$32,447,400	R&D
2011-12				
24	Integran Technologies Inc.	Nanostructured alloys as an alternative to copper beryllium	$399,386	Repayment
2012-13				
25	Engineering Services Inc. (ESI)	Intelligent security robot	$778,800	R&D
26	GasTOPS Ltd.	Oil systems diagnostics	$1,275,700	R&D
27	NGRAIN	3D tools	$9,500,000	R&D
28	Héroux Devtek Inc.	Advanced landing gear technology	$48,957,693	R&D
29	Norsat International Inc.	Improvements to satellite terminals, microwave components & radio frequency antennas	$13,270,265	R&D
2013-14				
30	AXYS Technologies Inc.	Port waterside application & data	$2,000,000	R&D
31	Dominis Engineering Ltd.	Naval propulsion impellers & high skew monoblock	$544,500	R&D
32	Ultra Electronics Maritime Systems Inc.	Advanced underwater sensing systems	$8,231,222	R&D
33	CAE Inc.	Project Innovate	$250,000,000	R&D
34	Avcorp Industries Inc.	Advanced metal-bond manufacturing capability	$4,431,208	R&D
2014-15				
35	KDM Analytics Inc.	Automation of the identification of cybersecurity flaws	$1,500,042	R&D
36	Pratt & Whitney Canada Corp.	Advanced aerospace engine technologies and processes	$87,851,852	R&D
37	L3-Wescam	Surveillance and targeting systems	$75,011,600	R&D

* 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 is managed with integrity, transparency, and accountability in a manner that is sensitive to risks and designed and delivered to address government priorities in achieving results for Canadians. SADI's governance framework includes a Performance Measurement Strategy (PM Strategy) to provide the Department with a plan to continuously monitor and assess program results, collect information to make informed decisions, take appropriate, timely action and support evaluations of the program. SADI's PM Strategy identifies performance indicators for each of the program's three objectives: innovation, competitiveness and collaboration. Information on these three objectives is collected annually from project recipients through the Annual Project Benefits Reports (APBRs).

This section reports on the overall progress of recipients in meeting program objectives, based on the 2014-15 reporting portfolio.[9] Approximately half of the funded SADI projects are in the R&D phase and are making good progress in achieving the activities outlined in their Statement of Work, as defined within each contribution agreement and summarized under Annex A (Project description).

Innovation

As at March 31, 2015, 30 projects out of the SADI reporting portfolio have resulted in the development of new or improved products, services, processes and/or other technologies, with the following breakdown:

91% of the SADI reporting portfolio is innovating

- 7 projects by large companies (representing $734.6 million in authorized assistance);
- 10 projects by medium-sized companies (representing $103.7 million in authorized assistance); and
- 13 projects by small companies (representing $44.8 million in authorized assistance).

This result demonstrates that the majority of companies have been successful to date in significantly advancing their research and development work, irrespective of their company size.

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.

Strategies for protecting the technological developments enabled by SADI projects differ from company to company. Formal intellectual property protection, such as patenting, was used by about a third of funding recipients while most companies relied on trade secrecy to protect the outcomes of their SADI research projects. Formal intellectual property protection is an indicator of innovation, however, the absence of formal intellectual property protection does not denote an absence of innovation. The reasons for the type of intellectual property protection used by

[9] As of March 31, 2015, the SADI portfolio consisted of 37 projects, with 4 new projects approved in 2014-15. The reporting portfolio represents the cumulative results of **33 projects** that have reported on benefits achieved as of March 31, 2015 and excludes the 4 new projects as they have not completed a full reporting cycle.

companies to protect their inventions are based on their individual business strategy and vary considerably.

As of March 31, 2015, $863 million of approved funding has been disbursed against eligible claims, leveraging over $1.6 billion from other sources to accelerate innovation in Canada, or $1.87 per SADI dollar disbursed (against a program target of $1.82).

61% of the SADI reporting portfolio is commercializing products, services, processes or other technologies. More than half of these projects have completed the R&D phase.

Competitiveness

As of March 31, 2015, 20 projects out of the SADI reporting portfolio have resulted in the successful commercialization of new and improved products, services, processes and/or other technologies:

- 5 projects by large companies (representing $642.2 million in authorized assistance);
- 8 projects by medium-sized companies (representing $94.2 million in authorized assistance); and
- 7 projects by small companies (representing $31.3 million in authorized assistance).

Details of the project results are described in Annex A. Companies are progressing well in their early days of exploring new market opportunities. They are beginning to generate economic and broader benefits for Canada.

An important indicator of competitiveness is the ability of a Canadian subsidiary of a multinational corporation to maintain or establish a research and development or production mandate[10] in Canada. When this occurs it demonstrates that the research and development work related to the SADI project has in part enabled the subsidiary to maintain or improve its leadership in its area of expertise.

Seven SADI recipient companies are subsidiaries of multinational corporations. SADI funding contributed to these seven recipients being able to maintain their current R&D or production mandate in Canada. Further, 29 percent of these subsidiaries reported being able to establish a new research and development mandate and 14 percent were able to establish a production mandate. In most cases, if a subsidiary obtained the research and development mandate, it also obtained the production mandate for the resulting product, service, process or technology.

Most recipient companies also reported other outcomes, as a result of their SADI project(s), that had a positive impact on their ability to compete. Companies reported an average of five positive competitiveness outcomes per project. The top five reported outcomes were: the ability to invest in training and skills development (79 percent); the ability to penetrate new markets or sectors (70 percent); the ability to invest in machinery and equipment and information and

[10]A mandate is a business, or an element of a business, in which the subsidiary participates and for which it has responsibilities beyond its national market.

communications technologies (55 percent); an increase in the number of customers (49 percent); and, an increase in the number of suppliers (49 percent).

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. The target over the R&D phase of each project is to have all recipients engage in meaningful collaboration. By March 31, 2015, 30 projects out of the SADI reporting portfolio had engaged in collaborations with various universities, colleges and affiliated research institutes:

91% of the SADI reporting portfolio has enabled collaboration between the private sector, research institutions and universities

- 7 projects by large companies (representing $735.6 million in authorized assistance);
- 10 projects by medium-sized companies (representing $118.9 million in authorized assistance); and
- 13 projects by small companies (representing $46.3 million in authorized assistance).

Additionally, 24 percent of these projects financially supported research chairs and 33 percent supported research laboratories.

Academic collaboration also often occurs in the form of student internships and recruitment, thus helping to prepare and train the R&D workforce of tomorrow. Companies reported the following results:

- 79 percent of project recipients reported hiring students temporarily as part of their SADI projects (for the duration, or part of the duration, of the project).
- 49 percent of project recipients reported hiring students on a permanent basis as employees of the company.

A higher proportion of small companies, as compared to medium-sized and large companies, hired students on a permanent basis as employees of their company.

To date, 10 projects that have completed the R&D phase have reported continuing with the collaborative relationships established during the SADI project. This demonstrates that the partnerships have a sustainable quality and that companies are steadfast in their commitment to engage the research community and others beyond the SADI project.

Environmental and Societal Benefits to Canada

SADI also contributes to the achievement of broader environmental and social benefits for Canadians.

SADI is a formal implementation strategy within the Government of Canada's *2013-2016 Federal Sustainable Development Strategy*.[11] Although the environment and sustainable development are not explicit objectives of SADI, a long term outcome of the program is to contribute to broader environmental benefits for Canadians. Projects supported under SADI often lead to new energy efficiencies and positive environmental benefits as new A&D technologies are developed.

As of March 31, 2015, the SADI reporting portfolio identified the following environmental benefits:

- 13 projects attained a reduction in material usage (39 percent);
- 11 projects achieved energy efficiency (33 percent);
- 15 projects reached production efficiency (46 percent); and
- 6 projects managed to conserve natural resources (18 percent).

SADI project recipients also reported broader social benefits with improved technologies ensuring better safety and security (for example: enhanced emergency communications capabilities and mobile robots for public security):

- 11 projects contributed to better safety (33 percent);
- 8 projects contributed to improving national security (24 percent).

[11] To consult the 2013‑2016 Federal Sustainable Development Strategy, please see: http://www.ic.gc.ca/eic/site/sd-dd.nsf/eng/sd00615.html#sec6

7. New SADI Agreements

KDM Analytics Inc.

The government approved a repayable contribution of $1.5 million in December 2014 to KDM Analytics, a leading cyber-security assurance company based in Ottawa. The company specializes in cyber security solutions and the protection of computer infrastructures. KDM Analytics' solutions are designed to address the complexity of cyber threats by analyzing attack options, including multi-stage attacks, assessing vulnerabilities and facilitating security mitigation tactics. The funding will enable the company to provide innovative protection to critical cyber infrastructures and resources.

The full press release can be found at: http://www.kdmanalytics.com/kdma/news.html

Pratt and Whitney Canada Corp

In December 2014, the government approved a repayable contribution of $300 million to Pratt & Whitney Canada[12]. This contribution aims to support the production of the next-generation of airplane engines that will power lighter and greener airplanes. More than 65 Canadian suppliers will contribute to this work.

The full press release can be found at: http://news.gc.ca/web/article-en.do?mthd=tp&crtr.page=1&nid=912759&crtr.tp1D=1&_ga=1.43260518.217355265.1418051250

L-3 WESCAM

In March 2015, the government approved a repayable contribution of $75 million to L3-WESCAM, Canada's largest manufacturing defence company for advanced airborne imaging and sensors. This contribution will support the company's R&D of new high-tech air, land and sea surveillance cameras and sensors that are essential to Canada's defence, security, and search and rescue operations.

The full press release can be found at: http://news.gc.ca/web/article-en.do?mthd=tp&crtr.page=2&nid=953809&crtr.tp1D=1&_ga=1.266290442.468080467.1420463316

[12] On December 30, 2015, the Government of Canada and Pratt and Whitney Canada (P&WC) entered into a series of amendment agreements, including amendments to its 2 SADI projects, resulting in the financial settlement of P&WC's repayment obligations. As part of this amendment, the authorized assistance for one of P&WC's SADI projects was reduced from $300 million to $87.9 million.

8. Service Standards

ITO is committed to continual improvement in its service delivery standards. These standards are established in order to provide predictable and timely services to clients. ITO staff work with clients to ensure that information requirements and processes are well understood so that these objectives can be met.

ITO Service Standards

Service Standard	2010-11	2011-12	2012-13	2013-14	2014-15
Application Assistance Response Time – Respond within one business day to requests for assistance with a project application Target: 100%	100%	100%	100%	89%	89%*
Claims Processing Time – Process completed claims and release payments within 45 calendar days. Target: 90%	93%	100%	89%	100%	97% of completed claims were released for payment within 45 days
Application Processing Time – 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: 90%	1 out of 3 projects was approved within 6 months	1 out of 1 project was approved within 6 months	1 out of 3 projects was approved within 6 months	3 out of 4 projects were approved within 6 months	100% - 1 out of 1 project under $10 million was approved within 6 months
Application Processing Time **Small Enterprises (SEs)** - Complete the proposal review and provide a funding decision within 4 months of receiving a completed application for applications requesting less than $2 million. Target: 90%	n/a	n/a			100% - One of one project submitted was approved within 4 months
Amendment Processing Time - Process an amendment and provide an approved amended agreement within 6 months. Target: 90%	n/a	n/a	90%	43%	100% of amendments were processed within 6 months

* Due to operational constraints, this target could not be reached. Measures are in place to meet the target set in 2015-16.

**Applications requesting more than $10M are subject to Cabinet and/or Treasury Board approval and require more time to process, and are therefore excluded from the calculation.

We aim to respond to all requests for information from the public within one business day. This applies to requests received via phone or email (contact information is available on ITO's website). In 2014-15, we achieved this target 89 percent of the time.

Our target is to process claims within 45 days, 90 percent of the time. In 2014-15, 92 claims were submitted and 97 percent of them were processed within the 45 day period.

We have established a rigorous due diligence process to ensure an appropriate review of applications. We strive to complete the processing of applications under $10 million within the 6 month service standard. As for small enterprises with projects under $2 million, the service standard is to process an application within 4 months. Out of the four projects approved in 2014-15, 2 were under $10 million, of which one was approved within 6 months and the other, within 4 months.

In 2014-15, ITO processed 100 percent of all amendments to existing contribution agreements within the 6 month service standard.

ITO, in consultation with industry stakeholders, will continue to refine its service standards as required. An upcoming internal audit of the program will contribute to the enhancement of these standards.

Service standards results are published on ITO's website at
http://ito.ic.gc.ca/eic/site/ito-oti.nsf/eng/00734.html

9. Conclusion

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

Although many SADI projects are currently in the research and development phase, significant progress is already being made toward achieving benefits to Canada.

Business priorities for 2015-16 include continued efforts to increase SADI program awareness and investments, and a continued commitment to service excellence. We are also looking forward to strengthening and establishing collaborations with other partners, whether at the provincial/territorial level, or with the private sector. A stronger partnership will enable us to do more outreach and create opportunities for increased financial leverage, as well as tapping into operational capacities of other organizations that have needed expertise, influence, or resources.

ANNEX A

The majority of SADI projects are in the research and development (R&D) phase. Economic and social benefits are expected from the research and subsequent 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 R&D for at least one year (i.e. projects contracted before 2014-15) and those that were still performing R&D in 2014-15. As well, it includes projects that entered the repayment phase, or became inactive in 2014-15.

Projects contracted in 2014-15 are listed in Section 7 – New SADI Projects.

PROJECTS IN THE RESEARCH AND DEVELOPMENT PHASE

ASCO AEROSPACE CANADA LTD. (ASCO Canada)

Location: Delta, British Columbia
Authorized SADI Assistance: $7,688,288
Contribution Agreement: October 25, 2010

Innovation: The objective of the project is to test and verify new manufacturing processes for machining titanium which can be incorporated on the Lockheed F-35 Joint Strike Fighter (JSF) bulkhead production parts. Continuing studies are required to monitor elements such as tool life to ensure that the processes are not only technically effective, but also cost effective. As part of the SADI project, ASCO Canada purchased a Macbormill machine (a high-speed milling machine) which is now operational and enhances ASCO Canada's capabilities to produce aircraft more efficiently. As a result of its new capabilities, ASCO Canada was asked, on behalf of the JSF program, to provide additional quotations in early 2014 for both machining and assembly work. In 2015 Asco was awarded additional JSF work.

Collaboration: Since the beginning of the project, ASCO Canada has maintained a co-op partnership with the University of British Columbia and has recruited five post-graduate students into its operations. In May 2011, ASCO Canada started a joint R&D project with the National Research Council (NRC) to study deep pocket/slotting titanium machining with very small diameter tools. The research project was completed by year end and involved three NRC engineers and three ASCO Canada engineers.

Economic and Other Benefits: This project has allowed ASCO Canada to retain twenty highly-skilled and experienced technical staff, all of whom are expected to be retained. This project will enable ASCO Canada to compete for additional JSF work and in the future adapt the processes developed to other aerospace markets. The processes developed under this project have allowed ASCO Canada to participate in the JSF spar processes (process to develop the main structure of the JSF aircraft wing). The company is also looking for other applications for the processes and technical expertise being developed. Processes developed under this project will

enable ASCO Canada to maintain a competitive edge over the global competition. During the project, ASCO Canada implemented additional waste reclamation and recycling programs, dramatically reducing industrial waste and minimizing its ecological footprint by 20 percent.

AVCORP INDUSTRIES INC.

Location: Delta, British Columbia
Authorized SADI Assistance: $4,431,208
Contribution Agreement: April 21, 2014
Innovation: Avcorp has commenced development of new and enhanced processes, procedures, plans and equipment for advanced Metal Bonding capabilities. This will allow Avcorp to manufacture, assemble and test, larger and more geometrically complex, lighter but stronger, higher performance but lower cost aerostructures.

The subsequently developed new capabilities include process improvements in primer and topcoat application (durability), clean room tool usage (efficient flow), and 5-axis router machine trimming (increased capacity). The primary focus of these developments has been to reduce cycle times, while maintaining process repeatability and improving product quality.

Tasks still in development include researching material alternatives for metal bond tooling (cost savings), new adhesives (faster cure times and stronger bonds), along with new core materials (shape flexibility and weight savings). Additionally, investigations into the metal processing, adhesive priming, and ultrasonic inspection practices are under way that will lead to accuracy improvements, time savings, and the use of more environmentally-friendly materials.

All of these design, process, material, chemical, and fabrication or inspection equipment/system improvements will continue to be achieved through a continuous, iterative, Lean Six Sigma DMAIC (Define >> Measure >> Analyze >> Improve >> Control) process. This means that the overall Metal Bond Process Advancements and Enhancements will continue throughout most activities in this Project.

Collaboration: The Green Belt Training Phase of Six Sigma Collaboration with the British Columbia Institute of Technology (BCIT) has been completed with Black Belt Training and Certification on-going.

Additional planned collaboration over the next several months of the project includes 3 Co-op Students who will support the Structural Engineering and Design for Manufacturing & Assembly (DFMA) and the 5-Axis CNC Programming.

Economic and Other Benefits: The implementation of the new processes, procedures, and equipment, under the Advanced Metal Bond Manufacturing Capability Development Project, have enabled Avcorp to extend its knowledge base, improve cost effectiveness, enhance product range and to become more competitive on a global scale.

For example, the Tunnel Cover program is currently generating Sales and Profits; the Ruddevator has been approved by the USAF as the new product of choice via its Configuration Control Board (CCB) process and New Orders are anticipated in the near future.

The R&D undertaken as a result of this SADI Project has led directly to Avcorp's ability to compete and win new business and to increase or at least maintain the skilled jobs, and the Canadian Supply base that supports each of these programs.

AXYS TECHNOLOGIES INC

Location: Sidney, British Columbia
Authorized SADI Assistance: $2,000,000
Contribution Agreement: July 24, 2013

Innovation: The objective of the project is to create a secure application and data hosting service that will provide real-time data management services for the port and habour security industry, including surveillance, monitoring, detection, and alerting of undesired port activity. The ultimate objective is to increase the level of domain awareness in Canada's ports.

Collaboration: AXYS has collaborated with the University of Victoria, as well as Camosun College. In addition, AXYS continues to engage computer science and engineering co-op students in its R&D activities. AXYS has also been working with the Port of Prince Rupert which is expected to be an early product adopter and flagship account.

Economic and Other Benefits: Once the innovation currently being developed is complete, this technology is expected to provide an application and data hosting platform to help defence and security organizations, port operators and other stakeholders.

CAE INC.

Location: Saint-Laurent, Quebec
Authorized SADI Assistance: $250,000,000
Contribution Agreement: February 27, 2014

Innovation: Project Innovate is CAE's extensive five and half-year research project under which CAE is developing its next-generation of simulation platforms for its civil aviation and defence markets. The dynamic and continuously changing traditional simulation and training marketplace forces CAE to accelerate its pace of innovation as it seeks to maintain and grow its market share. CAE is developing interactive training tools and technologies that it can integrate into any of its legacy, current, or future simulators, in order to provide a differentiator against other simulation companies. CAE will create a state-of-the-art modular system which will be more efficient and much easier to deploy and maintain. The new system will also enhance CAE's user experience greatly. In addition, CAE is developing technologies and training solutions geared towards joint and networked operations in order to be a training systems integrator in air, sea and land domains. The application of these new technologies will also find its way into CAE's Defence and Security technologies to create an interoperable virtual world to help train defence forces and run complex mission scenarios.

CAE is focusing on equipping all its simulators with latest multi-processor capabilities, which will allow it to update the simulation software with greater ease while helping to keep its simulators current with changing aircraft technologies. In order to improve the learning experience for the end user, CAE is also developing latest user-interfaces and life-like 3D graphics, multi-touch screens, voice recognition, web connectivity for remote training, and the ability to interact with tablets.

Collaboration: CAE uses a collaborative model of technological development that benefits universities and research facilities. It is committed to fostering long-standing relationships with many Canadian academic institutions and national research laboratories for the purpose of ensuring the success of the project. The company is collaborating with several Canadian universities such as Concordia University, Ecole Polytechnique a Montreal, McGill University, and the University of Toronto among others. CAE is also working closely with the Consortium for Research and Innovation for Aerospace in Quebec (CRIAQ), the National Research Council of Canada (NRC) and the National Optics Institute (INO). With approximately 250 co-op students employed by CAE every year, universities are benefitting from knowledge spill-over while developing and training Canada's future aerospace workforce.

Economic and Other Benefits: The technologies developed in the project will be applicable to other Canadian industries. The simulation-based decision-making technologies not only serve the needs of the military, but can also be used within paramilitary and medical domains. As a Training Systems Integrator and Tier 1 supplier, CAE expects to strengthen its Canadian supply chain, training partners and its collaboration with the academic world in the R&D sector.

DOMINIS ENGINEERING LTD.

Location: Ottawa, Ontario

Authorized SADI Assistance: $544,500
Contribution Agreement: January 7, 2014

Innovation: The objective of this project is to improve manufacturing processes for large diameter (up to 2 m) water jet impellers and high skew monoblock propellers. The project will enable the company to increase productivity by developing and implementing an innovative approach in 5-axis machining of large rotating propulsion components to their final form in one set-up. Impellers manufactured with this innovative approach are expected to be of superior accuracy and quality than those produced by traditional processes such as manual grinding. Development and implementation of these new processes could virtually eliminate manual grinding and hand finishing of impellers.

Collaboration: As part of this project Dominis plans to engage engineering co-op students from Carleton University.

Economic and Other Benefits: Dominis Engineering is the only manufacturing company in Canada capable of meeting and exceeding stringent requirements for water jet impellers used in the Littoral Combat Ship (LCS) Program (USA). So far the company has supplied water jet impellers for seven LCS vessels. This project will further strengthen the company's technology base and improve its competitiveness.

ENGINEERING SERVICES INC. (ESI)

Location: Toronto, Ontario
Authorized SADI Assistance: $778,800
Contribution Agreement: December 6, 2012

Innovation: The objective of this project is to develop a mobile robot for patrolling, under remote control, private and public buildings, private premises for commercial and residential use, and open space and areas used by the public officially, commercially or privately. The robot will operate with limited human supervision, and will be integrated within networks of public or private security systems. The proposed technology will reduce the human resource cost and increase the quality of services. As a result of the SADI funding, ESI will develop a proof-of-principle demonstration prototype. The project has been completed and a patent application is in progress of preparation.

Collaboration: ESI has involved four engineering students in this project (three from the University of Toronto and one from McMaster University) who worked on various aspects of engineering design. The students have been active members of the engineering design team and the work provided the students with exposure to the engineering profession and an opportunity to apply classroom theory to real design problems.

Economic and Other Benefits: Once testing on actual premises is completed, the resulting product prototype will expand the use of robotics for applications to the security industry sector and among supply chain partners. The project will demonstrate the capability to introduce automation (including some human hands-on interaction) in order to broaden and improve services and mitigate human resource shortfalls. The project is allowing ESI to enhance its skills in the development of mobile robots for security as well as increase its competitiveness in being able to showcase a product in a new business domain.

GASTOPS LTD.

Location: Ottawa, Ontario
Authorized SADI Assistance: $1,275,700
Contribution Agreement: September 28, 2012

Innovation: The project involves R&D in the area of Laser Induced Breakdown Spectroscopy with the objective of developing the capability to measure the concentration of metallic contaminants in jet engine oil. The project's goal is to develop a prototype portable instrument

that will enable aircraft maintenance personnel to measure contaminants on the ground beside an aircraft rather than in a lab or in another location. The instrument would provide air maintenance personnel with an immediate engine health assessment.

Collaboration: For the duration of the project, GasTOPS will engage Queen's and Carleton university co-op students. The co-op students will provide investigative and engineering R&D support to develop the Laser Induced Breakdown Spectroscopy capabilities. GasTOPS considers Canadian university co-op students an important source of innovative ideas and approaches to help generate next-generation technologies.

Economic and Social Benefits: GasTOPS is one of the few small and medium-sized enterprises qualified and able to provide supplier-designed articles in the Joint Strike Fighter (JSF) program. This project will enhance the company's capability in this regard and will generate additional opportunities across the aerospace market.

HÉROUX-DEVTEK INC.

Location: Longueuil, Quebec
Authorized SADI Assistance: $48,957,693
Contribution Agreement: February 21, 2013

Innovation: The Héroux-Devtek Inc. (HDI) project will integrate new technologies into landing gear design and allow HDI to become a Tier 1 supplier of complete systems. Tier 1 suppliers are responsible for delivering complete systems to original equipment manufacturers. A growing requirement for aerospace industry clients is the use of new materials and processes to make finished products and manufacturing processes more environmentally sustainable. Building on its solid past experience as a supplier of machined parts and its previous R&D programs, HDI intends to carry out this project by grouping the technologies to be developed into four categories.

All of the activities complement each other and will ensure that HDI's primary objective is achieved. They will also be aimed at eliminating or reducing environmentally harmful processes, reducing greenhouse gas emissions, reducing the environmental footprint and improving the life cycle of landing gear, during design, manufacture, operation, maintenance and overhaul. On the project completion date, HDI will be able to offer a "ready-to-use" unit to the company assembling the aircraft. HDI therefore proposes acquiring knowledge on how to integrate the various landing gear systems, from the landing gear lever in the cockpit to the tire.

This is why HDI is developing sub-systems of new technology, such as the landing gear integrity monitoring system, weight-on-wheels detection, advanced shock absorption, and electrical operation of the landing gear, as well as integrating the various landing gear systems, including the various electronic boxes such as the brake control, steering control, emergency control and landing gear control systems.

Collaboration: The project will bring significant technological benefits to the academic and research communities. During this project, HDI intends to collaborate with various universities and technical colleges such as McGill, École de Technologie Superieure (ETS), École Polytechnique, Laval and Concordia, at a cost of $1.5 million. HDI is working in partnership

with several other Canadian companies as part of the Consortium for Research and Innovation in Aerospace in Quebec (CRIAQ), Mitacs-Accélération, etc. These collaborative projects provide major support that promotes knowledge sharing, training and selecting technical labour before they enter the job market.

To date, through its collaborative partnerships, HDI has rapidly developed important expertise in a number of areas, such as the use of new composite parts, and the numerical modelling of manufacturing processes including the aero-acoustic process for landing gears. An important achievement has been the characterization of the mechanical system's dynamic behavior, which has served as the basis for the development of a load prediction algorithm on the landing gear.

As part of this project, HDI has hired 18 interns to date, one of whom obtained a permanent position with HDI.

Economic and Other Benefits: This project will enable HDI to provide clients with new materials and processes intended to make finished products and manufacturing processes more environmentally sustainable.

It is certain that the planned projects, such as the project "Integration of new technologies into the design of landing gear – Phase II" will greatly enhance HDI's competitiveness and competition in the market. HDI's market shares have increased considerably in recent years, which is why it is focusing on new technology that will enable it to increase its value proposition. HDI is currently ranked third in the world among landing gear suppliers. HDI's objective is to keep up with the competition and offer a viable alternative in the market.

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 utilized for various other industries (fisheries, oil and gas, engineering) with favorable results. KML's sonar designs use advanced telemetry and data processing in order to obtain the most detailed images as fast as possible.

Collaboration: KML has employed co-op students (temporary) as well as Post-Doctoral students (long term) from Simon Fraser University and provided funding for a PhD student at the University of Victoria for the development of imaging technology. KML is also looking into supporting a chair position within the University of Victoria for marine engineering and sciences. KML is assessing the potential to engage a Post-Doctoral fellow at the University of British Columbia for using sonar and acoustics for material characterization and possibly classification. KML continues to place importance on its university collaboration for work related and unrelated to the SADI project.

Economic and Social Benefits: To date, KML has commercialized one model of its M3 sonar which has a wide range of abilities and operable depths. Its unique imaging technology has been protected with patents. 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 been released to production for use by police and first responders for evidence recovery and security applications. The product's versatility has also been taken advantage of within the fisheries market for stock assessment and monitoring through the use of fish tags.

[13]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 R&D of new processes for composite manufacturing and complex assemblies that incorporate both composite and metallic components. This project is related to the multinational 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 have to align within one-half thousandth of an inch, which is 1/6th the thickness of a piece of paper. The first units produced by Magellan were sent to the United Kingdom for final assembly and met specifications. In December 2012, Magellan delivered the first F-35A Horizontal Tail Assembly from the Winnipeg facility. The first flight of Magellan's first assembly took place in February 2014. 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 and is found nowhere else in Canada. Development collaboration is also being done with the University of Manitoba and the Composite Innovation Centre, in Winnipeg, Manitoba.

Economic and Other Benefits: Magellan is advancing its manufacturing capabilities with leading-edge equipment in state-of-the-art facilities, and continues to develop technologies that provide an opportunity for many years of work. These precision machining, composite work, and inspection technologies provide employment in highly-skilled manufacturing jobs and

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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. Many design, engineering and affordability changes continue to happen as the F-35 JSF proceeds with flight testing. Magellan expects this phase of the program to last a few more years, and continues to seek better ways of producing the various products being manufactured. Low-rate production of Magellan built units are currently undergoing in-flight testing, with full-rate production of the JSF program expected in 2019. A total of 18 ship sets of Horizontal Tails have been completed to date, with the program annual delivery rates set to increase in the coming years.

NGRAIN (CANADA) CORPORATION

Location: Vancouver, British Columbia
Authorized SADI Assistance: $9,500,000
Contribution Agreement: October 30, 2012

Innovation: The objective of this project is to develop the 3D tools and application framework necessary to drive the next-generation of aircraft by developing interactive 3D simulation software that will assist in technical training and operational support, and provide the most true-to-life virtual hands-on experience to users. The new software will be used to guide workers through operational procedures, and will reduce equipment maintenance time. The interface and user experience will be improved with increased functionality, realism, and wherever possible, take advantage of other platforms' capabilities.

Progress to date has included new augmented reality products, virtual reality upgrades, visual analytics demonstrations and laser scan technology. Across North America NGRAIN is used on dozens of Canadian Forces (CF) and US Department of Defense (DoD) platforms. Specific to the SADI project, NGRAIN software is now used operationally on the F-35 Joint Strike Fighter and the F-22 Raptor by the United States Air Force (USAF).

Collaboration: NGRAIN collaborates with a variety of Canadian education and private sector companies in pursuit of the objectives envisioned for this project. This includes working with the University of Toronto, University of Alberta, Algonquin College, University of British Columbia and the British Columbia Institute of Technology (BCIT). To date, NGRAIN has worked with the University of Toronto, BCIT and Algonquin College on laser scanning, 3D rendering and mobile deployment of simulations. The company has also completed a manufacturing floor visualization project with the Visual Analytics Research & Development Consortium (VARDEC) for Boeing, along with Canadian small business partner Convergent Technology.

Economic and Other Benefits: The SADI program has aided NGRAIN in advancing its technology more rapidly than otherwise would have been possible. In addition to funding specific lines of advanced research, it has facilitated collaboration with other Canadian educational and business enterprises that would not have otherwise occurred. With SADI

support, NGRAIN has been able to invest in new hardware including 3D printers, holographic display's (zSpace) and wearable devices (Epson Movario, Meta), which have put NGRAIN at the forefront of rapidly expanding Industrial Internet of Things, including virtual reality, augmented reality and visual analytics.

The software developed through this project is expected to provide growth opportunities for the Canadian high-tech industry and will enable companies to increase their level of technology development and create new knowledge-based jobs across diverse industry segments. Many of the 3D modelling and training technologies developed could be adapted to other industries (e.g. automotive production, agriculture, civil aviation, nuclear power, oil and gas, and healthcare), allowing users to increase productivity, reduce costs and become more competitive.

NORSAT INTERNATIONAL INC.

Location: Richmond, British Columbia
Authorized SADI Assistance: $13,270,265
Contribution Agreement: March 28, 2013

Innovation: The objective of this project is to increase Norsat's capabilities in the production of satellite terminals, components and wireless components to maintain its leadership position within the A&D industry. The project is enabling Norsat to expand its line of microwave components and improve existing product performance. In particular, Norsat has developed and refined the industry leading ATOM line of Ku band transmitter products for use in satellite user ground stations, airborne platforms and mobile platforms. Norsat initiated the development of Ka band transmitter products following some of the design concepts of the Ku band ATOM. These products, also marketed as ATOM, are new designs and will result in the smallest products of their kind on the market. Norsat has also initiated a new Low Noise Block Downconverter (LNB) development to replace some of the current ageing LNB products.

The project has enabled Norsat to develop a low-cost antenna system capable of operation across X, Ku and Ka bands. Norsat has completed the integration of the Ku band ATOM transmitter products into the satellite antenna system line of products thus increasing the Canadian content in these products and making them more cost effective. Additionally Norsat was able to develop motorized solutions for its larger antenna systems.

The project has allowed the company to design and build a simplified flat panel antenna prototype which will address the challenges of tracking a satellite from a moving vehicle. This is a challenging technology and will require several iterations of design and prototype development. The project has also enabled Norsat to develop the Sentinel RMC, a platform ideal for any application requiring remote real-time data monitoring and control, allowing Norsat to enter into the M2M (machine to machine) oil and gas industry for the first time.

As part of this project, the Outdoor Transmission Kit (OTK) was created to support Norsat's line of portable office products. These products provide access to accessories and services such as internet connectivity, phones, printers and more. The OTK provides remote transmission

capability that can withstand harsh environmental conditions, making them ideal for first responders globally.

The SADI project has also enabled Norsat to develop innovative new filters and antennas within the wireless communications market. In particular, a large effort was spent on the R&D of ceramic resonator filters which allows for smaller filters that are important at low frequencies where typical filters are quite large. This product development has created a new level of space efficiency in multi-channel combining requirements and can be used for public safety systems globally. Temperature compensation still remains a challenge however, and additional research is required. In addition to developing new filters, the SADI project has enabled Norsat to develop new wideband antennas for the land mobile radio market.

Collaboration: Norsat has collaborated with Simon Fraser University (SFU) to develop antenna components including the flat panel antenna prototype. Norsat used the Sierra Wireless Laboratory at SFU to characterize the Norsat 1m reflector and feed for Asiasat certification. The flat panel prototype was also characterized at SFU. Norsat collaborated with Kratos Systems and Solutions Inc. on the ATOM Radio Frequency product line which kick-started the development of products for the microwave product line.

Economic and Other Benefits: Some additional benefits of the project include enabling Norsat to expand its microwave product line and create the environment needed for the further development of these products. SADI has supported Norsat in the update of its test and measurement equipment including new Vector Network Analyzer, Signal Generators and Signal Analyzers. The project has enabled Norsat to expand its Canadian supply chain in support of its new ATOM Radio Frequency products. The Canadian Vendors include printed circuit board manufacturers, machine shops and cable assembly shops.

The SADI project is helping to position Norsat to be successful in the wireless communications market by being the first to market with innovative new products. It will also enable Norsat to retain and increase its workforce.

PCI GEOMATICS INC.

Location: Richmond Hill, Ontario
Authorized SADI Assistance: $7,665,000
Contribution Agreement: August 12, 2009

Innovation: The objectives of this project have been twofold. First, PCI has been researching and developing 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. Secondly, an investigation and experimentation into the development and demonstration of software that can automatically extract information from earth observation data obtained from satellites and other aerial vehicles. The resulting data are essential for decision-making in many fields, including environmental monitoring, agriculture, security and intelligence, A&D, and wide-area surveillance. This software converts data into decision-supporting information at faster speeds and with less

operator interaction. Through this SADI project, PCI has enhanced its capabilities in this field and continues to work on researching and developing new technologies for the marketplace.

Collaboration: PCI has most recently engaged in collaboration with Queen's University on a project researching feature extraction from Very High Resolution remote sensing imagery. It is anticipated that this research will lead to commercial applications in the future. Previously, PCI has also collaborated 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 related to this project include: an exploration with the University of Toronto in the area of neural net computation applications in high resolution earth observation imagery and a collaboration with the University of New Brunswick in the area of optical and radar image processing.

Economic and Social Benefits: SADI funding has aided PCI in enhancing its technologies, most notably the Geomatica and GeoImaging Accelerator products, and allowed 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 a wide range of 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 advanced the capabilities of extracting valuable information from geospatial imagery, providing quality, accurate, and timely information to PCI software users. Quality geospatial information can be available much more quickly, and at lower cost, than previously possible.

ULTRA ELECTRONICS MARITIME SYSTEMS INC.

Location: Dartmouth, Nova Scotia
Authorized SADI Assistance: $8,231,222
Contribution Agreement: August 30, 2013

Innovation: The objective of this project is to develop next-generation sonar technologies. Ultra Electronics Maritime Systems Inc. (UEMS) will build smaller, lighter versions of existing sonar systems with improved capabilities and performance. The resulting products will introduce next-generation underwater sensing, data transport, and active sonar transduction technologies that will differentiate UEMS in the emerging low-frequency active sonar marketplace.

Thus far, the company has developed and successfully prototyped one of the two proposed smaller diameter low-frequency sonar systems that uses transducer technologies. The second is still under development. Smaller amplifiers suitable for the new smaller low-frequency transducer technologies have been designed and prototyped. The transmitter equipment has also been designed and is currently being developed. Multiple new vector sensor designs have been prototyped, and design refinements are underway. Patent applications are also being developed. Micro-electromechanical systems (MEMS) vector sensor work with Simon Fraser University (SFU) had its first prototype developed.

The low-frequency high-power underwater system provides broad frequency coverage and has been used extensively for advanced research in underwater surveillance and anti-submarine technology.

Collaboration: The project has several post-secondary education collaborations, the largest being the collaboration with SFU for a new MEMS based accelerometer. This endeavour was made possible through a Natural Sciences and Engineering Research Council of Canada (NSERC) CollaborativeR&D grant between the Department of National Defence, Defence Research and Development Canada, NSERC, and UEMS. The total value of the collaboration is greater than $1M. Over its duration, this activity will support one research engineer, two post-doctorate fellows, two PhD students, two Masters of Science students, and three Bachelor of Science students (hired as research assistants). This is a key element in developing smaller vector sensors for underwater operation.

The next largest collaboration is the UEMS sponsorship of an NSERC Senior Industrial Research Chair at Dalhousie University in underwater digital communications. This activity has been on-going for 18 months and currently supports eight undergraduate students, four Masters students, one doctoral student, and two post-doctoral fellows.

Other collaborative R&D activities were conducted with Dalhousie University on innovative options for modern towed bodies for sonar, and with the University of Calgary for novel methods of testing towed arrays in instrumented water tunnels and tow tanks, which supported one post-doctoral fellow. An NSERC Applied R&D activity was conducted with the Nova Scotia Community College to define the effort required to regenerate an out-of-date low-frequency vector sensor calibration capability; this has supported five college students for a short period. Other potential collaborations with Dalhousie, Memorial, and UNB are being explored.

Economic and Other Benefits: The SADI assistance has allowed UEMS to significantly increase its R&D staff capacity with the following permanent staff: two recent PhD graduates in Physics, six recent Bachelor of Engineering graduates in Electrical Engineering, one senior Bachelor of Engineering in Mechanical Engineering, one recent Bachelor of Engineering graduate in Mechanical Engineering, one recent Masters of Engineering graduate in Mechanical Engineering, one senior Computer Aided Design (CAD) developer, one senior systems engineer, one senior project manager, and two mechanical technologists. The SADI assistance has been a significant factor in UEMS's ability to attract and retain this new intellectual capital. Furthermore, it is also expected that developments from this project will lead to lower acquisition and ownership costs for customers, and will increase the number of ships capable of supporting sonar products, thereby enhancing national defence capabilities.

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 radio platform that fully exploits Software Defined Radio concept and a multiband/multichannel architecture that integrates several communication technologies into one system. In October 2013, Ultra was awarded a contract from the US Army Warfighter Information Network-Tactical (WIN-T) to evaluate this Canadian technology which promises unequalled levels of mission flexibility. The evaluation of the early production multiband/multichannel ORION radio was successfully completed in May 2014, confirming the Canadian technology to be revolutionary and reliable under demanding operational conditions.

Innovation work is continuing with the development of new mobile, ground, overwater and mesh waveforms, further increasing operational flexibility. Parallel work is ongoing to reach a more aggressive SWaP (Size, Weight and Power) objective for which we are incorporating new filters and RF power amplification technologies. In February 2015, Ultra-TCS won a Public Works and Government Services Canada (PWGSC) Built in Canada Innovation Program (BCIP) contract to leverage their overwater and SWaP technologies in a new product aimed at market segments that are new to Ultra TCS. This resulted in successful trials with the Royal Canadian Navy DNR-3 in March 2015 demonstrating the ORION's unique Maritime abilities. In December 2014, an ORION-based Mission Adaptive Tactical Radio innovation was also selected as a BCIP project for tactical vehicle applications under the sponsorship of DND DLR-5. Long term innovation work includes the development of a unique "Launch & Forget" aerial range extension node concept.

Collaboration: Ultra Electronics is supporting an Natural Sciences and Engineering Research Council of Canada (NSERC) Industrial Research Chair in high performance wireless emergency tactical communications technology at the École de Technologie Superieure (ETS). The Chair currently employs 1 Post-Doc fellow, 2 Professional Engineers, 10 PhD candidates, and 4 M. Eng. candidates. This Chair has allowed many students to develop highly specialized expertise in wireless technology and to benefit from valuable internships in the industry. A strong relationship between researchers and industry practitioners makes this relationship a wellspring of innovation, as recognized in 2008 by a NSERC Synergy prize. Since 2012, the company has been contributing in kind and funding in a 3 year NSERC project conducted jointly with AeroETS involving the use of autonomous mini-UAV platforms as on-demand aerial repeaters.

Additional University partnerships are being considered for jointly developing advanced network synchronization and signal processing techniques for the ORION program. Ultra TCS continues to have discussions with a Canadian developer of advanced 3G/4G technology for incorporation into the ORION product platform and has added new Canadian collaborators including CMRSummit Technologies, Varitron Technologies, and Apollo Microwaves.

Economic and Social Benefits: In 2014, 40 radio frequency units derived from Ultra-TCS' High Capacity Radio SDR platform were purchased by the Department of National Defence (DND) adding to 20 previously sold enabling the Canadian Forces to own a unique, 34Mbps, tri-band transmission system that can operate from 225MHz to 5000MHz. Ultra-TCS is also bidding the High Capacity Radio for a major tactical radio-relay procurement opportunity in India. This position has allowed the Company to also introduce the lower priced ORION radio to the Indian

market. In 2015, Ultra-TCS signed a contract to deliver ORION radios to DND DLCSPM to address a number of operational issues.

The development and production of the ORION radio enables Ultra Electronics to continue to maintain a base of Canadian suppliers to support design activities. More than 10 software and firmware design contractors contributed to this project with a significant level of the hardware design subcontracted to Canadian companies. Ultra-TCS foresees that the success of the multiband/multichannel radio will be beneficial to the Canadian economy by contributing positively to Canada's trade balance as the Company exports the majority of their production. This project will maintain high technology jobs in Canada and provide leading edge technology to our military and public safety forces.

PROJECTS THAT ENTERED THE REPAYMENT PHASE IN 2014-15

AXYS TECHNOLOGIES INC.

Location: Sidney, British Columbia
Authorized SADI Assistance: $1,836,900
Contribution Agreement: August 5, 2009
Project completion: March 31, 2014

Innovation: The objective of this project was to research and develop a system to integrate and manage data from various maritime monitoring and surveillance sources to provide comprehensive real-time information. This provides a unified view of the maritime domain and enhances port and waterside security. The innovative aspect of this project involved developing the system's ability to receive information from various sources, integrate the data and present it to users and decision-makers in real time. As of March 31, 2015, this project is considered complete with several installations around the world including Canada, Saudi Arabia, New Zealand and Ecuador.

Collaboration: AXYS has collaborated with the University of Victoria, Camosun College and Memorial University of Newfoundland. In addition, the company continues to engage engineering co-op students in its R&D activities. AXYS has also been working with the Port of Prince Rupert to enhance its waterside monitoring and surveillance program and is collaborating with JASCO Research and Ocean Sonics in the area of marine underwater acoustic surveillance. And, since project completion, AXYS has engaged with the Canadian Hydrographic Service with regard to data sharing services.

Economic and Other Benefits: With SADI support, AXYS has been able to develop a highly innovative product 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. AXYS has also seen its sales and workforce grow. Its technology has allowed for better maritime domain decision-making and for the provision of better information to stakeholders and improved microclimate data delivery.

CAE INC.

Location: Saint-Laurent, Quebec
Authorized SADI Assistance: $250,000,000
Contribution Agreement: March 30, 2009
Project completion: March 31, 2014

Innovation: The objective of this project was to improve CAE's existing modelling and simulation technologies to develop simulators for a wider range of aircraft. This project has resulted in further development of CAE's core modeling and simulation technologies and the introduction of several innovative products and services across a broad spectrum of A&D applications. These innovations have allowed for a number of new trademarks to be registered and patent applications to be filed and granted.

Innovations developed include: a new Full Flight and Mission Helicopter for single and dual-pilot seating introduced as the CAE 3000 Series platform; a next-generation Dynamic Synthetic Environment™ which allows changes in the synthetic environment, such as weapons, weather or the latest intelligence from the real world, to be reflected dynamically; the Augmented Visionics System, which provides pilots with a synthetic virtual representation of the environment around them; the next-generation of Magnetic Anomaly Detection – Extended Role which can be mounted on lighter platforms such as on Unmanned Arial Vehicles; the development of an Unmanned Arial System (UAS) Mission Trainer which combines an open architecture with commercial off-the-shelf hardware and simulation software to provide a comprehensive, platform-agnostic training system (meaning it runs equally well across more than one platform) for UAS pilots, sensor operators, and mission commanders; and the development of Augmented Engineering Environment that allows building and integrating simulation models to be delivered to Original Equipment Manufacturer (OEM) at a very early stage in the development timeline of a prototype aircraft than before, as well as the development and qualification of the world’s first A350 full flight simulator.

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. CAE 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 and the Institut national d'optique.

Economic and Other Benefits: CAE has introduced new aircraft simulation platforms including the 3000 Series full-flight simulator technology and CAE's Visual System Tropos-6000. In addition, technology developed under this project has allowed CAE to collaborate with Bombardier Aerospace for its CSeries platform, Global 7000 and Global 8000 aircraft programs, the Aviation Industry Corporation of China (AVIC) for the new AVIC Medium-Sized Transport

aircraft, the Mitsubishi Aircraft Corporation for the Mitsubishi Regional Jet, and AgustaWestland for the AW189 full-flight simulator.

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

This project has also strengthened CAE's Canadian supply chain through partnerships with Canadian industrial partners and suppliers.

CAE's simulation product platforms have contributed to a better environment through the use of new composite materials to reduce material footprints, and electric motion and vibration systems. In addition, wide-body aircraft pilot training allows savings of between 7,500 and 14,000 litres of fuel and 6.6 metric tons of CO2 for every hour of training. Noise and other negative impacts are also mitigated.

D-TA SYSTEMS INC.
PRATT & WHITNEY CANADA CORP. (P&WC)

Location: Longueuil, Quebec
Authorized SADI Assistance: $300,000,000
Contribution Agreement: December 10, 2010
Project completion: August 31, 2014

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 and intelligent engine controls and advanced manufacturing technologies. The company is 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 jets. 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, providing significant annual contributions to universities and research institutions. They have been recognized by the Science Technology and Innovation Council, an independent advisory body, as a leader in strategic collaboration. On a yearly basis, P&WC conducts over 200 collaborative projects with 20 universities across Canada, engaging well over 400 students through different programs.

P&WC participates in seven Natural Sciences and Engineering Research Council of Canada (NSERC) industrial research chairs established at universities in British Columbia, Nova Scotia, Ontario, and Quebec and five consortia and research networks, such as the 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 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 Other 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 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 to the environment. In its next-generation regional turboprop, these new technologies are resulting in significantly 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 associations 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
Project completion: December 31, 2013

Innovation: The objective of the project was 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. The project supported the development of three new technologies related to the Bi-directional 429 bus, Flight Control Computer and Back-up Flight Control Computer. It resulted in the development and commercialization of three new products, a Flight Control Computer version V2, a Flight Control Computer version V3 and a Back-up Flight Control Unit.

Collaboration: Thales was involved in several collaborative projects with the Consortium de Recherche et Innovation en Aérospatiale au Québec (CRIAQ), l'École Polytechnique de Montréal, l'université McGill, École de Technologie Supérieure for total research contributions

that exceeded $690,000. Through these research projects an exchange of knowledge was enabled between the universities' researchers and Thales in the development of new prototypes. Thales was and is still striving at aligning research to the needs of industry. Finally, Thales provided a minimum of five student internships during each semester. Through this project, Thales was able to provide first-hand experience to many engineering students and actively promoted a career in Aerospace.

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

PROJECTS THAT BECAME INACTIVE IN 2014-15

No SADI projects became inactive in 2014-15.