



Innovation,  
Science and  
Economic  
Development

Innovation,  
sciences et  
développement  
économique

Industrial  
Technologies  
Office

Office des  
technologies  
industrielles

## Technology Demonstration Program



# Supporting innovation in aerospace, defence, space and security





**Innovation, Science and Economic Development (ISED) Canada's mission is to foster a growing, competitive, knowledge-based Canadian economy to:**

- improve conditions for investment;
- ***improve Canada's innovation performance***
- increase Canada's share of global trade; and,
- build an efficient and competitive marketplace.

**ISED's mandate is to help make Canadian industry more productive and competitive in the global economy, thus improving the economic and social well-being of Canadians.**

- 17 agencies and organizations make up the ISED Portfolio including:
  - managing Canada's airwaves;
  - overseeing its bankruptcy, incorporation, intellectual property and measurement systems;
  - providing financing and industry research tools to help businesses develop, import and export;
  - encouraging scientific research; and,
  - protecting and promoting the interests of Canadian consumers.



## **Build Canada as a global centre for innovation**

*Canada is working on an inclusive plan to foster a confident nation of innovators—one that is globally competitive in promoting research, translating ideas into new products and services, accelerating business growth and propelling entrepreneurs from the start-up phase to international success.*

- **Innovation Leaders have been identified to lead round-table discussions that will take place across the country. These leaders represent the private sector, universities and colleges, the not-for-profit sector, social entrepreneurs and businesses owned and operated by Indigenous people.**

# Innovation Agenda



The six areas for action reflect the Government's focus on people, technology and partnerships.

1. ***Entrepreneurial and Creative Society:*** To foster a culture of innovation and entrepreneurship, build skills to embrace global changes, leverage Canada's diversity and attract top global talent.
2. ***Global Science Excellence:*** To support world-class research excellence from fundamental to applied science.
3. ***World-Leading Clusters and Partnerships:*** To build super clusters for business innovation and global reach, from idea generation to value creation.
4. ***Grow Companies and Accelerate Clean Growth:*** To develop start-ups and scale innovative, high-impact small, medium and large firms, growing the next generation of job-creating global companies.
5. ***Compete in a Digital World:*** To harness the digital economy across sectors to encourage digital adoption and strengthen competitiveness.
6. ***Ease of Doing Business:*** To enhance and align agile marketplace regulations and standards, and enable market access so Canadian businesses can thrive globally.



## ITO is a Special Operating Agency of ISED

- advances leading edge research and development (R&D) by Canadian industries
- manages two active programs: the Technology Demonstration Program (TDP) and the Strategic Aerospace and Defence Initiative (SADI).
- accelerates innovation by Canadian industries through support for R&D that results in social and economic benefits for Canadians.
- is a first-class organization recognized for excellence in program delivery.

# Canada's Aerospace presence



- **Canada is a global leader in the Aerospace sector which, in 2014:**
  - employed more than 180,000 highly skilled workers across the country and contributed \$29B to the economy.
- **The Canadian aerospace industry is an innovation leader with:**
  - More than 20% of the industry's activity dedicated to R&D
  - The industry investing \$1.8 billion each year into R&D
  - R&D investments increased by 60% in the last ten years (2004-2014)
- **When compared with other OECD countries, Canada's aerospace industry ranked:**
  - 5<sup>th</sup> in terms of GDP (2011)
  - 1<sup>st</sup> in civil aircraft production (2014)
  - 3<sup>rd</sup> in civil engine production (2014)
- **One of Canada's largest exporters, the industry exports nearly 80% of its products to highly diversified markets**
  - 62% of total product exports to the US, 23% to Europe, 8% to Asia and 7% to Africa, the Middle East, and Central and South America

# Canada's Defence presence



- **Canadian defence and security industrial is an essential and driving force in Canada's economy which, in 2014, employed more than 63,000 highly skilled workers across the country and contributed \$6.7B to the economy.**
- **The Canadian defence and security industry dedicated over \$250 million to R&D in 2011**

# Canada's R&D presence



- According to OECD data, in 2013, Canada's ratio of R&D spending as a percentage of GDP was 1.69, down from 1.79 in 2012.
- Among G7 countries, Canada ranked fifth in 2013, and its ratio of gross domestic expenditures on research and development to GDP was lower than in the United States (2.73). Israel had the highest ratio at 4.21, followed by South Korea at 4.15 and Japan at 3.47.
- In order to enhance the competitive standing of Canada's aerospace and defence sector, it is necessary to continue creating conditions in which innovation is encouraged and accelerated.

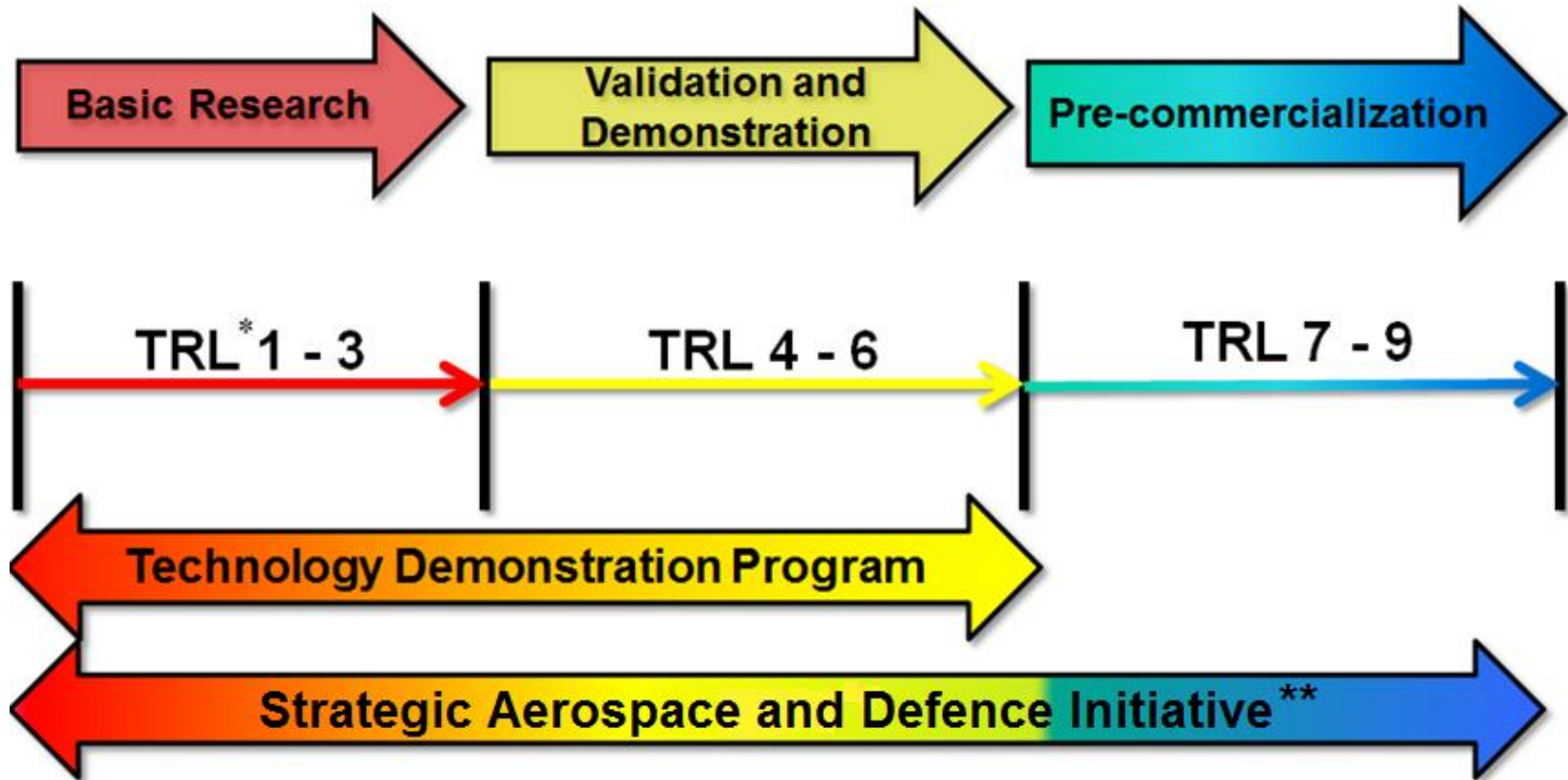


# Policy Imperative



- **The 2012 Aerospace Review, an arms-length review mandated by the Government of Canada, to produce concrete, fiscally-neutral recommendations on how federal policies and programs can help maximize the competitiveness of Canada's aerospace and space sectors, highlighted a gap in existing federal programs, which provided no support in the high-cost, high-risk area of technology demonstration.**
- **In response to this Review, the Technology Demonstration Program (TDP) was created and launched in 2013**
- **Program Funding: \$110M over four years (2014-2018) and \$55M annually thereafter**

# TDP Supports Early and Mid-Stage R&D



\* The National Aeronautics and Space Administration's Technology Readiness Level (TRL) scale is an accepted method of estimating technology maturity

\*\* The Strategic Aerospace and Defence Initiative, a repayable contribution program also administered by Innovation, Science and Economic Development Canada



# Program Objectives



**According to the Aerospace Review, collaborative approaches to R&D, as a rule, yield better results for both participants and the economy. This is particularly true for an industry like aerospace, in which R&D is a costly, long-term undertaking.**

## **TDP responds to this by:**

- Ensuring a concentration of technology development in strategic areas
- Being the basis for next-generation manufacturing and technical capabilities and services
- Generating benefits to Canada



*Non-repayable* contributions in support of one or more *large-scale* technology demonstration (prototype or proof of concept) projects per year

Collaboration among companies, academic and research institutions to facilitate the integration of many technologies



Early stage, high risk R&D that is not close to commercialization

## Benefits

Foster the growth of a competitive, knowledge-based Canadian Economy

Advance science and technology, knowledge and innovation

Encourage and further leverage private sector R&D investments

Lead to spill-over economic benefits to other corporations in the aerospace, space, defence and security (A&D) sectors

Lead to spill over economic benefits to other sectors of the Canadian economy



# Program Model



- **Led, normally, by an OEM or a Tier 1 supplier incorporated in Canada and carrying out business in Canada to result in:**
  - Bringing together the necessary collaborators to make significant innovation breakthroughs in areas that will make or keep them competitive;
  - Partnering with SMEs to promote the development of the supply chain; and,
  - Collaborating with post-secondary and research institutions to promote knowledge transfer and spill over benefits.
- **Comprises large-scale technology demonstration activities conducted in Canada, to the prototype stage**
- **Brings together a number of collaborating partners, including at least one Canadian small or medium-sized enterprise (SME) and one accredited Canadian post-secondary or research institution**

# Program Considerations



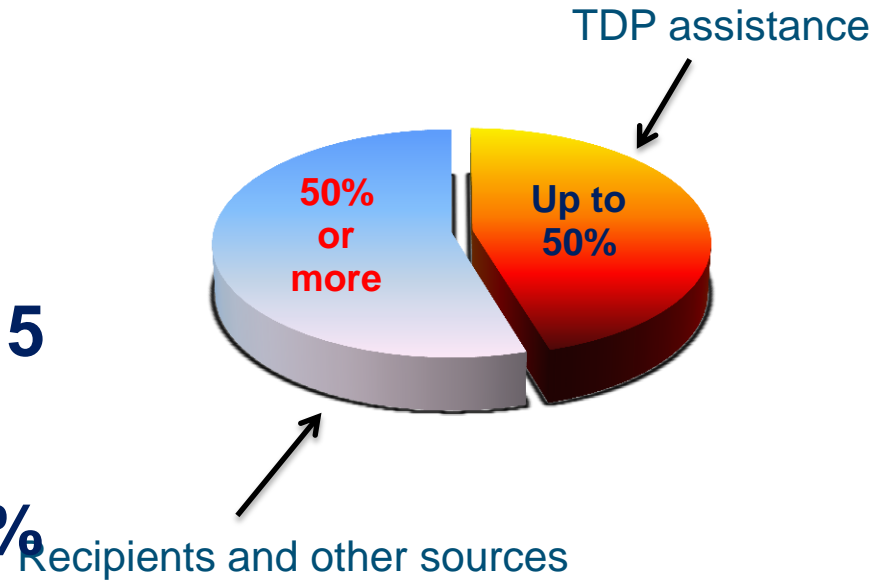
- **A&D sector relatively more R&D-intensive than other Canadian industries and is collaborative in nature.**
- **However, technology demonstration is known as the valley of death (*stage at which innovations are often abandoned due to lack of capital to test them*).**
  - This is a structural deficiency affecting the performance of the Canadian aerospace industry, and an area where TDP plays a role in unlocking innovations to the benefit of the sector and the economy as a whole.
- **TDP supports large-scale technology demonstration projects in the A&D sectors that include activities up to the testing of representative models or prototype systems in a relevant environment.**
- **Further technological development and investment is generally required to tailor, adapt, test and validate results for specific product/service applications before commercialization.**



# Funding Model / Profile



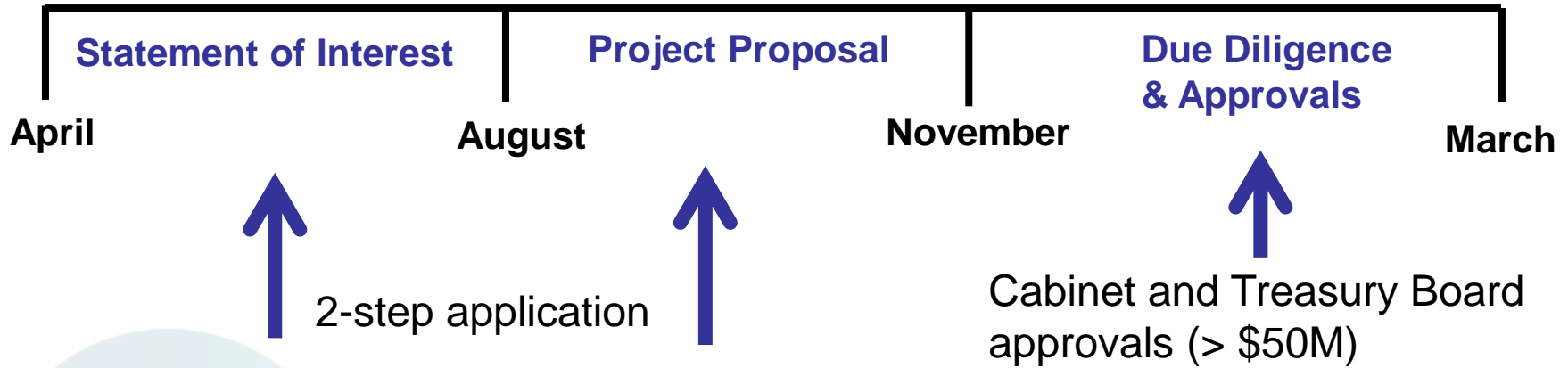
- Annual call to approve 1 or more large scale R&D projects per year, with a total annual budget of \$54M
- Target project duration is 5 years
- Projects are funded at 50% of eligible costs to a maximum of \$54M



# Application and Approval Process



← 12-18 month approval process →



**Note:** The selection of projects is at the Minister's discretion.



# Program Evaluation Criteria



- **Statements of Interest and Project Proposals are evaluated on the following criteria:**
  - Economic Benefits to Canada
  - Broader Benefits to Canada
  - Collaboration
  - Innovation
  - Management and Technological Capability
  - Financial Capability
  - Post-Project Commitment
  
- **Statements of Interest are assessed by a committee of government officials from various departments with particular emphasis on the anticipated economic benefits to Canada**
  
- **Project Proposals undergo a thorough due diligence involving site visits, meetings and consultations with internal and external experts**

# Results To Date



Round	Call for Statements of Interest (SOI)	SOI Submission Deadline	SOI Results Notification	Proposal Submission Deadline	Announcement of Approved Project
Round 1	September 2013	December 2013	January 2014	April 2014	May 2016
Round 2	April 2014	June 2014	September 2014	December 2014	Summer 2016*

## ➤ Round 1

- 8 Statements of Interest received
- 3 invited to submit full proposals
- 1 proposal was approved and announced on May 5, 2016

## ➤ Round 2

- 9 Statements of Interest received
- 5 invited to submit full proposals
- One proposal was approved and is to be announced

## ➤ Round 3

- To be launched shortly.

\* Dates to be confirmed



# Observations



- **An average of 5 – 6 large scale projects over \$100M per Round**
- **Incremental and disruptive technology proposals**
- **Large number of collaboration partners (9 to 21), including SMEs and academia**
- **Approximately 50% allocation of TDP funding from lead OEM to collaborators**
- **National representation with regional concentration**
- **Appealing to multinationals**



- **Both TDP Applicants who were selected for approval indicated that the legal and financial exposure from entering into funding agreements with the various collaborators was too onerous and that all of the risk resided with the Applicant**
- The Terms and Conditions of the program were amended in June to introduce a multi-recipient model, where all members of the project sign the contribution agreement. This would allow for better risk-sharing and for direct contractual relationships between the Crown and all of those receiving the funding.



- **The program limited support to those activities being conducted in Canada and did not reflect the international nature of the A&D industry and the global market it operates in.**
  - The amended Terms and Conditions now include a provision that limited funding from the program may support R&D outside of Canada when necessary for the project's success and/or when the R&D cannot otherwise be undertaken in Canada.
- **In an increasingly infrastructure-intensive industry, the program did not anticipate possible government support for these activities as part of a longer technology demonstration project.**
  - Eligible Recipients may now request support for R&D infrastructure, such as shared facilities (e.g. specialized laboratory with advanced research equipment or testing facility).



- **Should the model be broadened to include other sectors?**
- **What is the appropriate project size?**
- **Is there an opportunity to align with other similar international programs?**
- **How do we best structure the program to maximize on supply chain integration?**



Canada 





- **The Aerospace Review also recommended that the government co-fund a Canada-wide initiative to facilitate communication and collaboration among aerospace companies, researchers, and academics.**
  
- **Based on the CRIAQ approach to collaborative research, the Consortium for Aerospace Research and Innovation in Canada (CARIC) was created and launched on April 17, 2014**
  - Primary objective is to enhance the global competitiveness of the Canadian aerospace sector by partially funding collaborative research and technology development (R&TD) projects at the low to mid TRLs (1-6).
  
  - Program Funding: \$30 million over five years (\$6 million annually) starting in 2014/2015.
  
  - Average Contribution to March 2015: \$320,000



# CARIC Collaborative Projects



	<b>Low TRL (1-3) Understanding Technology</b> 	<b>Mid TRL (4-6) Maturing Technology</b> 
<b>Partnership</b>	2 industrial partners + 2 academic partners (minimum)	
<b>Stacking Limit</b>	75%	
<b>CARIC Funding</b>	max. 10% of eligible project expenditures	max. 50% of eligible project expenditures
<b>Project Lead</b>	Universities or colleges	Industries

# CARIC Research Themes



<b>Acoustics, noise control, environment, security, icing</b>	<b>Composites</b>	<b>Modeling, simulation, multidisciplinary optimization</b>
<b>Air operation and human factors - organizational innovation</b>	<b>Diagnostics, prognostics, surveillance of components</b>	<b>Product and system development, productivity</b>
<b>Autonomous systems</b>	<b>Interior design</b>	<b>Supply chain optimization and LEAN</b>
<b>Avionics and control</b>	<b>Manufacturing and assembly processes, quality assurance</b>	