

Aerospace Innovation White Paper

Innovation Agenda Submission

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Aerospace Industries
Association of Canada

L'Association des industries
aérospatiales du Canada

EXECUTIVE SUMMARY

By any metric, Canadian aerospace is a prime example of how innovation drives the development of national and regional economies and communities. Not only is it an important contributor to the Canadian economy, but it is also a world leader in many respects. The Canadian aerospace sector attracts talent and investment from around the world. Industry leading companies choose Canada as the place in which to design and manufacture new products and from which to sell them to the world. The Canadian aerospace sector leads the world in productivity and leads the country in business investment in R&D. It has made significant contributions to Canadian prosperity, technologies, and scientific excellence for decades.

The government's Innovation Agenda represents an opportunity for the aerospace sector to lead the way in moving Canada's economy towards a model of growth based on globally innovative products and services which support high value jobs that have a positive and long-lasting effect on the middle-class. Companies in the aerospace sector understand that the future of the industry, and the wider economy, depends on developing green and clean solutions to today's challenges. There is also a clear understanding that finding ways for small Canadian companies to scale up, to form networks and clusters, and to become part of global value chains is critical to the sector's continued success.

With these outcomes in mind, AIAC has developed ten recommendations that outline ways in which the aerospace sector can create new opportunities for Canada. These recommendations span a range of possible government departments and programs. They cover both direct and indirect measures, as well as sector-specific and broad-based initiatives. Their focus is on making a stronger Canadian innovation ecosystem which would support globally a competitive industry that continues to grow and thrive. Our intention in this submission is to provide a range of practical and accessible options to support the implementation of the Innovation Agenda. We believe that, taken together, these recommendations form a coherent program that would help the aerospace sector remain at the forefront of the global innovation economy. These recommendations are the results of a process coupling exhaustive consultation with the industry and a significant analysis of the government's policy framework.

One of AIAC's core values is to foster collaboration between stakeholders. We are eager to work with the government to continue expanding aerospace best practices and strengthening the innovation ecosystem.

LIST OF RECOMMENDATIONS

1. Harness aerospace strengths to the inclusive and clean growth agenda
2. Enhance the Strategic Aerospace and Defence Initiative (SADI) and the Technology Demonstration Program (TDP)
3. Reinforce the national collaborative research network
4. Create a Canadian Innovation and Research Program
5. Leverage government procurements to stimulate innovation in Canada
6. Create Grand Challenges Aero initiatives
7. Strengthen national laboratories and their access to industry as well as key aerospace research, testing and certification infrastructure support
8. Introduce improvements to SR&ED to incentivize business innovation
9. Support the creation of the Downsview Aerospace and Innovation Research (DAIR) hub
10. Ensure proper resource allocation to Transport Canada's Civil Aviation Directorate

NOTA BENE

The Canadian aerospace industry also includes a number of world-leading space manufacturing and services companies. However, the dynamics of the space industry and its market are significantly different than the civil and defence aviation sectors. For this reason, **AIAC's recommendations on how best to support the space sector are contained in a separate white paper.** The main thrust of this white paper is that the space sector is a critical cross roads and that urgent action is required to both define the government's long term vision for the sector and to provide for an immediate funding boost to stabilize the sector and retain key Canadian capabilities in the interim while a plan is under development.

AIAC RECOMMENDATIONS: ALIGNMENT WITH GOVERNMENT'S SIX AREAS OF ACTION

GOVERNMENT INNOVATION AGENDA AREAS OF ACTION AND WORKING QUESTIONS

AIAC RECOMMENDATIONS AND RATIONALE

1. Promoting an entrepreneurial and creative society

- How can Canada become the best country in attracting and developing talent?
- How do we work together to equip youth with the right skills for the future economy?
- What more can be done to cement Canada's place as a leader in social entrepreneurship?

Recommendation 1, 3, 5, 6 and 9

To encourage youth and talent to become more innovative, the aerospace sector could create employment and business opportunities through 1) the development of consortium and flagship programs and by 2) further leveraging procurement. Creating research and training hubs and assessing future skills gaps will also be key.

2. Supporting global science excellence

- How can colleges play a larger role in the innovation ecosystem?
- How can we increase demand for science, technology, engineering and math graduates?
- How do we make best use of our science and research strengths?

Recommendation 1, 3, 6, 7, 9 and 10

Canada's scientific capability is world-class. The innovation paradox can be solved by increasingly integrating research interest and assets in order to support our response to the industry's challenges, at all TRL levels and for businesses of all sizes. Canada's brightest academics could support developing responses to industry challenges.

3. Building world-leading clusters and partnerships

- What is the right model for made-in-Canada innovation clusters led by businesses?
- What are the barriers to Canadian participation in global supply chains?
- How can businesses, institutions and governments attract talent and investment?

All recommendations would support clusters and partnerships development.

Collaboration, enabled through Grand Challenges, research networks, as well as the leveraging and alignment of stakeholders, tools and assets is key to building strong clusters. Government needs to develop risk-sharing mechanisms and provide a stable investment environment.

AIAC RECOMMENDATIONS: ALIGNMENT WITH GOVERNMENT'S SIX AREAS OF ACTION (cont'd)

GOVERNMENT INNOVATION AGENDA AREAS OF ACTION AND WORKING QUESTIONS

AIAC RECOMMENDATIONS AND RATIONALE

4. Growing companies and accelerating clean growth

- How can Canada support the scale-up of innovative companies?
- Which market-based approaches encourage adoption of clean technologies?
- What more can be done to increase business enterprise R&D (BERD) spending?

Recommendation 1, 2, 3, 4, 5, 6, 8 and 9

Through access to capital, risk-sharing initiatives, environmental targets and support for scaling-up small businesses, the aerospace sector can contribute to produce global contenders, contribute to the greening of aviation and aerospace technologies, and encourage further R&D projects at all TRL levels.

5. Competing in a digital world

- What do we need from our digital infrastructure? How fast can we transition?
- What are innovative ways to develop stronger digital skills among Canadians?

Recommendation 1, 2, 6, 7 and 9

Through the right incentives and support, the aerospace sector can contribute to the growth of digital skills and the digitization of business and supply-chain and thus be more competitive over the long term.

6. Improving ease of doing business

- How can regulations be designed to promote innovation across key sectors?
- What new approaches could be explored to improve government services to businesses?

Recommendation 1, 2, 3, 7 and 10

Ensuring that key government departments are properly resourced and that processes are streamlined is key to unlocking innovation potential within the industry.

AN INNOVATION POLICY FOR A SUSTAINABLE AEROSPACE INDUSTRY

Canada's aerospace sector is the fifth-largest in the world. For decades, we have punched well above our weight in the global market, leading in key market segments, overall productivity indicators, and the strategic importance of the sector to national manufacturing averages. We have built world-class capability and capacity when it comes to high-value, innovative aerospace products and services. We are home to world-leading OEMs and we have fostered a highly innovative supplier base that is integrated into growing markets all over the globe.

Canadian aerospace is an important domestic economic driver, contributing over \$28B in GDP to the national economy each year and supporting the employment of over 211,000 Canadians. The industry is highly innovative, investing over \$1.9 billion into R&D annually. It is well-integrated into global markets and supply chains, exporting 80% of its products to a diverse array of international destinations.

Aerospace innovation involves high levels of risk, requiring extensive collaboration between industry and researchers and costly investments that can span years. Organizations such as the Consortium for Aerospace Research and Innovation in Canada (CARIC) and programs such as the Strategic Aerospace and Defense Initiative (SADI) and the Technology Demonstration Program (TDP) support the collaboration of researchers and engineers, thus increasing the industry's competitiveness, bolstering supply chain development, and better supporting knowledge transfer from academic institutions into industrial applications.

However, external forces such as increased competitive pressures and current technology and industrial trends are challenging the ability of the aerospace sector to keep its competitive edge and market share and to contribute meaningfully to the government's agenda. This context commands new, updated or streamlined innovation policy tools, both broad-based and specific, to ensure the aerospace sector can enable Canada's middle-class to reap the benefits of tomorrow's economic opportunities.

Our analysis indicates that through targeted investments, enhanced alignment and streamlined processes, the future contribution of aerospace to Canada's prosperity can be expanded, while including more skilled and creative young Canadians from diverse backgrounds. This submission describes how the aerospace sector can further contribute to Canada's objectives with respect to innovation, the environment, investments, Business Expenditures in R&D (BERD) and exports while minimizing budget impact and ensuring additional revenue to the government over the medium to long term.

This white paper submitted to the Innovation Agenda, entitled "A New Innovation Policy for a Sustainable Aerospace Industry," contains four sections. The first section provides a renewed vision for the aerospace sector informed by the government priorities and as such, sets targets and defines metrics to measure success. The second part summarizes AIAC's analysis on the current innovation policy framework and how it relates to the state of the aerospace industry sector today. The third part highlights key elements for consideration in developing an innovation policy that will foster the clean growth of the aerospace industry. The first three sections support the recommendations, which are detailed in the fourth and last section.

1) THE OUTCOME

AIAC recommends the development of an innovation policy to foster the growth and success of a sustainable aerospace industry that would support the government's objectives with respect to clean and inclusive growth. This section presents a vision for what the aerospace sector could look like in 2025 and provides a set of metrics against which progress and success could be measured. This section also outlines what are the strategic objectives that both the industry and the government should strive for in the implementation of this vision.

1.1) The Canadian aerospace industry in 2025

The AIAC is proposing a long-term vision for sustainable aerospace – that is, an industry which promotes clean and inclusive growth. In 2025, the Canadian aerospace sector will be:

- a world leader in **green aviation**;
- growing by **keeping its market share** and still ranked 5th in the world;
- an **innovation and export manufacturing champion**, contributing even more than its relative size to inclusive Canadian growth;
- competing in a digital world and creating value from disruptive digital learning and training technologies which are transforming industries and in particular aerospace;
- growing through a workforce that is:
 - » increasingly **diverse**;
 - » **highly skilled** and **trained**; and
 - » **abundant**;
- animated by **strong clusters, networks and collaboration**;
- supported by **world-class research, testing and certification infrastructure**;
- contributing to responding to **key national and global challenges**;
- a **government partner** in developing and promoting science, innovation and economic development best practices; and
- a **driving force** in the development of a high tech and clean tech economy.

In 2025, aerospace will be relying on a strong scientific, technological and entrepreneurial culture with a dense network of highly competitive SMEs, from coast to coast. Aerospace innovation will be fostered by close collaboration between all stakeholders, including businesses, universities and colleges, research and technology organisations, governments and their agencies. Aerospace competitiveness will be linked to its ability to contribute to the greening of aviation. Aerospace will also contribute to the strengthening of Canada's brand, representing one of the most attractive high technology sectors for young to engage in, with strong professional STEM prospects for an increasingly diverse workforce.

1.2) Metrics – measures and indicators of success

The ultimate outcomes for a sustainable aerospace innovation policy can be captured through the following quantitative metrics: 1) contribution to GDP; 2) job creation; and 3) exports.

Targets for 2025 are as follows:

- **Aerospace contributes more than \$37B to GDP**
- **Aerospace generates more than 255,000 jobs to the Canadian economy**
- **Aerospace manufacturing exports represent more than \$28B**

These metrics can be met only if the industry is sufficiently competitive and sustainable to keep its market share in the fast growing global industry.

In addition to the annual AIAC-ISED State of the Aerospace Industry Report, which will allow us to track annual variations between 2016 and 2025, transformation in the industry's overall structure will act as a leading indicator to measure the degree to which the innovation policy is producing the expected effects. For instance, ISED highlighted in a recent study¹ that the bulk of the growth between 2004 and 2013 in the aerospace sector is observed in firms counting between 200 and 500 employees. Another study² also demonstrated that medium-size firms are more inclined to take on risk, invest in R&D and develop partnerships with external stakeholders with a view to taking on larger and more challenging mandates in order to respond to the supply-chain consolidation. This growth is a leading indicator of the sector's ability to invest in innovation as more and more smaller firms (below 100) and medium firms are scaling up. Over the longer term, the industry should see growth within larger firms as well as increased growth in the number of larger firms in Canada. In summary, the numeric variation of small, medium and large firms, as well as their respective growth, should enable the government to assess whether its targets can be met over the longer term.

Between 2016 and 2025, a number of leading indicators can be identified to measure the policy effects of support for partnerships across firms, academia and government labs in multiple sectors. For example:

- Number of members (by type) in the national collaborative research network;
- Number of research project done in partnerships, across the TRL scale;
- Number and size (in dollars) of research projects involvement per member;
- Number of students, undergraduate and graduate, participating in a industry-led research projects;
- Number of interregional and international research projects; and,
- Number of participants in national and regional forums;

1 Industry Canada, January 2015. Aerospace Supply Chain Analysis – Draft for discussion. Government of Canada.

2 ISED, September 2016. Innovation Practices in Canadian Aerospace Manufacturing – Draft for Discussion. Government of Canada.

Moreover, there are qualitative metrics for which the policy success could be measured against:

- Aerospace contributions to Canada’s achievement of the goals set by the Vancouver Declaration with respect to GHG emissions;
- Canadian contribution to the reaching and setting of new international environmental standards and regulation in green aviation with respect to emission, noise and sustainable practices; and
- Development of an environmental assessment tool to allow for a standardized approach to measure environmental impact in aerospace.

1.3) Strategic objectives –The five imperatives

Based on thorough consultation with industry stakeholders and extensive dialogue with multiple government departments and agencies, AIAC identified key diagnostic elements, out of which flow a set of strategic objectives to support the fulfillment of the long-term vision for the aerospace sector. This set of strategic objectives should be pursued or supported generally or specifically in all aerospace policy or programs.

- 1.3.1 **Diagnostic:** Aerospace-related programs and policies are scattered throughout multiple departments, agencies and departmental branches, leading to suboptimal alignment and coordination. The industry is also experiencing difficulty in identifying which programs could support them in their endeavors.
- » **Objective:** To recognize aerospace as a strategic contributor to innovation and thus, to enable better alignment and coordination of government-led or supported organization in terms of funding, priority areas, and innovation-related activity.
- 1.3.2 **Diagnostic:** Compared to larger firms, aerospace SMEs are, relative to their size, about half as R&D intensive. Given the lack of external funding support, SMEs are also struggling to scale-up their production, R&D and integration capacities to access global supply chains.
- » **Objective:** To better support the scaling-up of aerospace SMEs and consortia through R&D programming, procurement levers and enhanced access to capital.
- 1.3.3 **Diagnostic:** Canada’s relatively small aerospace market is a limiting factor for R&D and capital investment. Its geography is also conducive to greater redundancy in terms of scientific capability and hinders optimal flows of people and goods from coast to coast.
- » **Objective:** To increase access to aerospace research expertise and assets; to promote collaboration and allow for cross-sector innovation; and to ensure that aerospace research stakeholders have a common understanding in terms of priorities. To prove aerospace innovations by early adopters in Canada which allow showcasing these innovations developed in Canada.

1.3.4 **Diagnostic:** While industry stakeholders were able to reach a consensus on a SWOT analysis (see annex 1) relatively easily, the sector lacks an integrated vision that could enable a long-term planning exercise to foster growth around national goals of strategic importance, beyond aerospace, which would drive public investment.

- » **Objective:** To strive for an innovation ecosystem which is broad, properly funded, interconnected and a model of best practices for the manufacturing sector as a whole. The ecosystem also supports the development of emerging technologies.

1.3.5 **Diagnostic:** While significant progress has been made through the Emerson and Jenkins reports, the aerospace industry's ability to invest, grow and innovate further lack integrated policies to provide stability for a long-term vision and leverage tools in a coherent and cohesive manner over the innovation life-cycle and the various stages of business growth.

- » **Objective:** The development of an innovation policy which covers civil aerospace, space, defence, and emerging technologies, and gives full consideration to the development of other broad-based programs supporting innovation.

2) THE INNOVATION POLICY FRAMEWORK AND THE AEROSPACE SECTOR TODAY

In order to develop an informed and effective innovation policy framework for the aerospace sector, it is advisable to provide the industrial lay of the land in terms of global performance and to identify the key levers of its competitiveness. With this background, we can capture and build on the Canadian aerospace know-how, examine the change drivers that are set to impact its future development, and provide an analysis of current challenges and opportunities.

2.1) The industry status today: The lay of the land³

Canada is an established world leader in the aerospace sector, ranking first in the world in flight simulators and pilot training; second in small engine (helicopter and turboprop), business aircraft and regional aircraft production; and third in overall civil aircraft and engine production. Canadian aerospace also leads the world in overall productivity and its strategic importance to its national manufacturing sector.

In Canada, the aerospace industry is out-performing all the other manufacturing sectors with respect to R&D, export intensity, and trade diversity. Against all other manufacturing and high-tech sectors in Canada, studies by Global Affairs Canada in 2014 and 2015⁴ revealed that aerospace is the only sector – outside of natural resources oriented sectors – that has a comparative advantage in Europe as well as in Asia, where our exports are primarily

³ This section provides further analysis complementary to ISED, 2016. State of Canada's Aerospace Industry – 2016 Report. Government of Canada and AIAC.

⁴ DFATD, August 2015. Canada's Export Competitiveness in the European Union. Office of the Chief Economist Foreign Affairs, Trade and Development Canada, and: DFATD, November 2014. Canada's Export Competitiveness in Asia-Pacific, Office of the Chief Economist Foreign Affairs, Trade and Development Canada.

growing. Through its contributions to Canada's success in open and diverse trade, aerospace is set to play a key role in translating prosperity to the middle-class. The favorable exchange rate, coupled with productivity performance, can only support this advantage further.

Over the next 20 years, global passenger traffic growth is expected to exceed world GDP growth by 1.9 percent (in absolute terms); increasing demand will require nearly 40,000 new aircraft valued at \$5.9 trillion (USD) over the same period. Our nation is already reaping the economic and innovative benefits of a strong aerospace industry. Given the global context, Canada has an opportunity to leverage the strength of our industry to attract even more of the innovation-driven, highly-skilled activity that this increased demand will create.

The manufacturing sector is a key economic driver for Canada. In 2014, Canadian manufacturing generated record sales of \$620 billion and exported goods valued at \$318 billion. The third largest source of employment in Canada, manufacturing directly employs 1.7 million Canadians and pays an estimated \$93 billion in wages and salaries each year.⁵ Advanced manufacturing, with its focus on innovation and investment in next-generation products and operations, offers another opportunity for Canadian manufacturers to increase their competitiveness and performance against less-agile competitors.

Aerospace directly contributes to the growth and success of the Canadian manufacturing sector. For instance, productivity and innovation, which have plagued much of Canada's manufacturing sector, are well supported by Canadian aerospace:

- R&D intensity and productivity growth are 5 times and 2.5 times higher than the Canadian manufacturing average, respectively;
- Aerospace workers also:
 - » earn 29% more than the average manufacturing employee;
 - » are more skilled (nearly 47% higher than the average); and
 - » contribute more to the GDP per-employee (62% more value-added);
- Making up only 5% of Canada's overall manufacturing activity, aerospace accounts for nearly 30% of all R&D investments across the manufacturing sector;
- Canadian aerospace manufacturers collaborated significantly more with government, academia and industry compared to total manufacturing; and,
- Overall, aerospace manufacturing firms reported a higher use of business practices related to innovation than the manufacturing average.

The aerospace industry is well-positioned to lead the growth of a more innovative, agile, future-oriented manufacturing sector. Not only is Canadian aerospace industry more productive, more innovative, and more highly-skilled than the manufacturing average, it also has an important advantage when it comes to attracting innovation-related investment from outside our borders. The State of Canada's Aerospace Industry Report revealed that in 2015 Canadian operations of foreign-owned firms contributed to over 40% of the industry's R&D investments and 39%

⁵ Source: Canadian Manufacturers and Exporters (CME).

of exports. This proves that, in contrast with the tendency of most global manufacturers to establish Canadian operations solely for the purpose of distributing their goods to the Canadian market, global aerospace leaders come to Canada to do business with the world, conducting high-value innovation activity in Canada and then exporting the results of those activities back into the global market. In this favorable context, the strategy put forward should focus on the ingredients needed to support further inclusive growth.

2.2) Levers of competitiveness

Innovation is a multi-faceted process. In aerospace, given that it is a fiercely competitive but highly rewarding global industry where safety, performance, and cost are paramount, innovation is a necessity. Firms must be able to master multiple practices to succeed.

For instance, firms need the ability to:

- Plan investment effectively;
- Be cost efficient by controlling operating and R&D costs and steering clear of products and capabilities that compete on a man-hour basis;
- Access global supply chain;
- Attract global mandate.

Firms also need to access market opportunities, such as:

- Global commercial and civil markets;
- International and domestic defence markets;
- The shaping of new market segments in both manufacturing and services.

Overall, the industry success is highly dependent on three capabilities. The first relates to technology, as businesses need to be equipped with cutting-edge equipment exploited by a well-trained workforce. Secondly, they need to master all of the processes that support the development, provision and support of a technology-based industrial product or service. Thirdly, they need the capacity to economically manufacture the product at the desired production rates or scale up and deliver a service to the desired business levels and locations.

The Canadian aerospace industry's track record and global competitiveness demonstrate that the industry has a mature innovation culture, proven innovation processes and practices, including in management. As a result, the aerospace industry is able to identify innovation-related targets and apply its innovation ability to other high-tech, clean tech and manufacturing sectors, thus generating prosperity for the middle-class in every region.

However, consolidation in European, American and other emerging markets has resulted in large players dominating and shaping the market and industrial landscape, leading to an uneven playing field for the Canadian industry. In this globally competitive sector, there is a real threat that Canada's position will be marginalized. Our response to these challenges must be based on increased collaboration and partnerships by reinforcing existing clusters and networks, supporting consortiums and joint-ventures, and ensuring that all available tools are optimized to fully support Canadian competitiveness.

2.3) Change drivers

As competitive pressures evolve, technologies change rapidly, demographics shift, and industrial dynamics are reshaped. While the aerospace sector's past successes clearly indicate the prosperity the industry brings to Canadians, these drivers of change require the industry to adapt and to be strategic.

It is a fact that global economic and population growth translate into urbanisation, which in turn generates increasing growth in air travel and the establishment of new routes. Beyond this market force, which is expected to grow between 5 and 6 percent per year over the next two decades, there are four other change drivers that are expected to play a central role in the development of the industry.

The first change driver relates to the digitization of manufacturing. This trend includes profound changes in the way that manufactured products are designed, made, assembled, shipped and repaired. It allows for a complete integration of all activities and information over the life-cycle of the products and creates the needs for new services to manage or optimized processes. Industry 4.0 is one of the concepts which capture the most attention.

Advanced manufacturing technologies such as additive printing or new materials predate this concept and are already affecting the industry's investment planning and ability to compete. The internet of things, big data, and cyber security are all emerging domains which will have a profound impact on businesses and will further transform manufacturing. In essence, this change calls for an acceleration of measures encouraging Industry 4.0 transition; the harnessing of software and hardware expertise to develop cyber security systems; and, support for an increasing use of modeling, visual analytics and big data.

The second change driver relates to the environmental imperative and the need to improve the industry's sustainable development practices. Innovation in the aerospace sector is closely related to environment considerations as there are economic advantages to developing products and services which use less material and fuels and produce less noise. Over the past several years, new international and domestic standards, regulations and targets have been created in order to ensure that civil aviation adequately contributes to national and global environmental objectives. Quiet airframes and engines, sustainable materials and processes, weight reduction, clean technologies, and improved efficiencies in air traffic management are already critical areas of development.

The third change driver refers to the ongoing consolidation of global supply chains. This is not a new phenomenon as it has been central to businesses strategies for the past decade. However, it is still a change driver that affects business opportunities, collaboration, management, logistics and the ability to compete globally. The impact of this driver will only deepen as the digitization of manufacturing and the environmental imperative further push consolidation and integration, all while OEMs are gradually moving their focus from platform design to delivery. Ultimately, this translates into increasing pressure to drive costs down, generating an ongoing need for process innovation and organizational innovation. As a result, it is still relevant to prioritize supply chain development and integration initiatives.

The expansion of markets and technologies related to space and autonomous and adaptive aircraft constitutes the fourth change driver. Technology development for microsatellites and UAVs has been particularly rapid, opening up new fields of application and expanding into new private and public markets. By determining Canada's needs and working to adapt rules and regulations, the government has the potential to tremendously impact the development of further expertise that could capture global markets.

2.4) Challenges and opportunities

The last five years have contained several milestones for the Canadian aerospace industry. Following the review and implementation of the Emerson and Jenkins reports, important steps have been taken by both industry and government to create an environment which supports Canadian aerospace innovation, manufacturing, and business development both domestically and around the world. Of note:

- The creation of a large-scale Technology Demonstration Program;
- The creation of a national collaborative research network, the Consortium for Aerospace Research and Innovation in Canada (CARIC);
- The recapitalization of SADI at close to \$1 billion and the modification of its Terms and Conditions to make the program more accessible to small businesses; and
- The introduction of Industrial Technological Benefits (ITBs) and Value Propositions (VPs) to the defence procurement process.

Yet even as we have made important gains, the global aerospace industry continues to evolve and present new challenges and opportunities to Canadian firms. Supply chains are consolidating, requiring suppliers to take on more risk, volume and cost in order to compete. New markets are opening, introducing not only dramatic growth opportunities but also new government-backed industrial players seeking to develop domestic aerospace capabilities.

Inside civil aviation, product life-cycles are shifting away from the design phase and towards delivery, and important new environmental regulations are making process innovation and the accelerated transition to green aviation more critical than ever. Throughout the aerospace industry, companies of all sizes are being challenged to make strategic investments and business decisions today that will determine their success for many years to come. Within the defence industry, forecasts for global defence spending are mixed, while changing procurement processes and increased focus on aftermarket activities are altering the way contracts are negotiated. Procurement budgets are tightening for many Western countries, and nations are looking for ways to extend the lifespan of their existing fleets and procure new equipment in a more cost-effective way than ever before. In the space industry, new innovations and business models are impacting the satellite sector, and a consensus is emerging among the international space community about where space exploration will go next and exciting commercial ventures are under development. Here at home, a plan for our future in space is urgently needed.

In order to update its aerospace environmental scan, AIAC developed a SWOT analysis which is annexed to this document. Through this SWOT analysis, we have identified specific policy elements which must be addressed.

On the one hand, a high level and integrated view of threats and weaknesses can be summarized in a few critical points:

- Relatively low government risk-sharing in the development of large scale demonstration projects, as well as low risk-sharing for the later stages of those projects, does not respond to the high-risk and high-cost nature of the later stages of aerospace innovation development;

- There is relatively low integration of advanced manufacturing and digital capabilities in SMEs, as well as a lack of overall government support to acquire advanced manufacturing tools and capacity;
- Similarly, there is a lack of training support, in particular for the continuous learning of more experienced technicians, to excel in a digital environment;
- Numerous SMEs have relatively small R&D budget and capability. SMEs and integrators are not well supported to grow their competitiveness through process innovation support;
- Canada's international reputation and capability in certification is eroding rapidly, which may translate into a bottleneck to innovation and a loss of a critical competitive advantage;
- Despite the industry's favourable reputation as a trusted supplier for the international civil and defence markets, Canada is sometimes at a disadvantage for non-competitive reasons;
- In order to complete and strengthen the innovation toolkit, it is necessary to increase industry access to scientific and advanced manufacturing equipment and expertise, explore how to support the creation of open, living and shared laboratories (both for skills development and prototyping objectives), and further support the development of certification, validation and environmental testing infrastructures.

On the other hand, a view of the aerospace strengths and opportunities indicates that:

- The aerospace sector has the opportunity to take a world leading role through innovation to honour Canada's international commitment to fight climate change;
- The industry is well equipped to work with the government in developing growth opportunities related to emerging technologies in segments such as unmanned systems and space;
- Setting up national priorities through grand challenges with direct funding provided to late-stage innovation projects would attract and develop the brightest minds, leverage scientific excellence, and maximize past and future public investments in research infrastructure;
- Enhancing existing programs through changes to their terms and conditions would boost demand from industry and thus maximize their economic impact;
- The government's procurement powers, especially with respect to the defence sector, can be further leveraged to support the scaling-up of SMEs;
- Canada's aerospace sector is second to none in terms of its ability to develop partnerships between industry, government and academia. This is a key pillar of the innovation economy and could be further harnessed to support clean and inclusive growth.

3) A NEW INNOVATION POLICY FOR A SUSTAINABLE AEROSPACE INDUSTRY

Innovation in aerospace is much more than the ability to develop a new platform or product. This narrow view considerably limits the extent to which the government can drive innovation through aerospace. We must define our terms, therefore, in such a way that policy lenses can be adjusted to foster the economic, social and environmental progress through aerospace. To articulate the key elements of a new innovation policy, it is also critical to identify the current policy gaps and, conversely, to examine what are the international best practices.

3.1) Defining aerospace and innovation

The Canadian aerospace sector is multi-faceted. From a product perspective, the Canadian aerospace sector has key industrial capabilities in all of the market segments and their respective sub-segments, including aircraft, rotorcraft, UAV, satellites, simulation and training. From a service perspective, Canada is a world leader in in-service support (ISS), maintenance, repair and overhaul (MRO) as well as testing, certification and technical publications. From a technology perspective, aerospace drives advancement in multiple fields such as IT-related innovation such as big data analytics, quantum computing, new materials, optics and photonics, advanced manufacturing, telecommunications, and electronics. The intersections between products, services and technology are central to innovation and thus should be taken into consideration when defining priorities and project funding eligibility.

The Conference Board defines innovation as “the generation of ideas and their transformation into economic value through the development of new or improved products, services and processes.” Innovation should be understood broadly. It encompasses not only the development of products and services, but also process, organizational and market innovation. To foster competitiveness, programs addressing innovation should give proper consideration to business activities, tools and capacities associated with improving processes and relationships with external stakeholders. The industry also recognizes that the government has a lead role to play in defining new markets through regulations, standards and certification which will spur innovation efforts.

3.2) Identifying the gaps

There are three angles from which to examine policy gaps in aerospace innovation. The first and most common one is technological, through the concept of technology readiness levels (TRLs). From this view, three gaps exist today: 1) low TRL funding, and industry–academia collaboration; 2) insufficient resources dedicated to technology demonstration projects; and 3) a lack of policy instruments to bring demonstration projects to market and to leverage public sector procurement. As a technology is maturing and is about to be brought to market, firms will assess the manufacturing readiness level (MRL), which is critical to ensure industrialization. This concept is key to capturing all investments needed to produce and to sustain that technology, and to address issues relating to supply-chain, tools, equipment and skills. This underlines the need to address policy-making from the process and organizational innovation perspective as well.

Taking a market segment view, in aerospace there is widening gap between the unmanned systems market development and the setting-up of adequate regulations. This gap can be filled by increasing industry and government collaboration. With respect to ISS and MRO, there are gaps in terms of investments incentive from R&D or

procurement programs to further leveraging Canadian expertise. In the space sector, microsattellites are rapidly emerging. This will lead to new business models and opportunities; however, the government's needs with regard to this segment – and its resulting impact on the Canadian market – have yet to be assessed and defined.

The third angle from which we may examine policy gaps relates to various business types and sizes. For start-ups, which have a high profile in public discourse in innovation but are the exception rather than the norm in aerospace, the gap relates to financing, and demand-based policy. For SMEs, policy could provide better support to product and process innovation, incentivize consortium-building, and develop and encourage mentoring and supply-chain development. For integrators, innovation policy is essential in order to fully leverage their domestic capability so that they can grow internationally and ensure more effective foreign direct investment campaign to attract new players. For OEMs, the policy gap is a strategic one, as providing a stable, comprehensive and compelling value proposition to ensure Canada is the best place to invest and to innovate is critical.

3.3) International Best Practices

In Annex 2, AIAC developed a template to enable a descriptive analysis of international strategies meant to foster innovation and to provide key policy orientations in national aerospace industry growth. The sample focuses on countries with which Canada has the most similarities, i.e. the United Kingdom, Germany and France. We added an EU example as it demonstrates the value of long term vision in coordinating priorities in a complex federal perspective. In summary, here are some of the best practices that Canada should follow to keep up with our closest national competitors:

- Government provision of **significant R&D funding and risk-sharing in large-scale projects**;
- Private and public sectors collaboration and **common understanding of R&D strategic priorities**;
- Greater focus on **skills development**;
- **Leveraging defence procurement** in support of national industrial capabilities;
- **Interdisciplinary and broad approach to aerospace**, including adjacent sectors such as ICT, embedded systems, energy, materials, transportation, and the environment;
- **Prioritization** and significant government **funding** for research infrastructure and testing facilities accessible to the industry;
- **Greening of aviation** pursued as a strategic objective.

This comparison highlights the ways in which strategic policy development and engagement can augment the capacity of our innovation ecosystem. These best practices would support the Canadian industry's efforts to close the gap with the US, where a fragmented ecosystem is characterized by abundant resources (human and financial – both private and public), tools (federal and private labs) and means (university defence contracts, NASA funding, SBIR, Air Force Research Labs) of ensuring that ideas lead to commercialization and that technological solutions can be found across sectors. Therefore, AIAC's advice is to reinforce Canada's strengths in an integrated fashion to support further innovation.

AIAC RECOMMENDATIONS

INNOVATION, SCIENCE AND ECONOMIC DEVELOPMENT

Recommendation 1 – Harness aerospace strengths to the inclusive and clean growth agenda

We recommend that ISED formally continues to exploit the strengths of the aerospace sector by further leveraging and aligning existing policy levers in its portfolio. The **allocation of \$10M over 5 years** would support the development of a national industrial strategy, analytical capability and business intelligence to help set investment priorities, and tactically support business endeavors.

Context:

This transversal approach is based on the fact that the aerospace sector, compared to other manufacturing and high-tech sectors in Canada, is uniquely positioned to deliver increased value to Canada's science, innovation and economic development and its spill over effects in other sectors and regions. As the sector also helps to ensure Canada's sovereignty, it has the capacity to support nation building as it does in other advanced nations.

The aerospace sector is tied to the development of emerging technologies, the defence and space industries, and advanced manufacturing. It also accounts for numerous high-impact and scaling-up firms. As such, the innovation policy would benefit greatly from a strategy that would integrate various policy dimensions and ensure all stakeholders are working towards a shared set of measurable outcomes. The strategy should track investments in the aerospace sector, provide business intelligence about future market and S&T drivers, and enable comparison of resources invested and associated policy instruments for priority areas with other aerospace nations. This strategy should provide recommendations on portfolio policy objectives and alignment with respect to the implementation of the innovation policy recommendation for aerospace.

Also, given that innovation is fueled by talent, we recommend that the government work with the provinces to ensure that skills development, internship and training meet industry needs, both in terms of quantity and curriculum.

This strategy would also provide policy recommendations for various portfolios, including:

- National Research Council (NRC): how to improve industry access to federally-funded laboratories, IP management, ease of doing business;
- NSERC: identify the optimal level of resources needed for the aerospace research priority area and for key programs such as CRD, Engage, Discover and CFREF;
- Regional Development Agencies: how RDAs can contribute strategically to business industrial capabilities, innovation, digital transformation, and the development of supply chains;
- How to ensure the Industrial and Technology Benefits Policy and Key Industry Capabilities are fully leveraging the long-term competitiveness of the aerospace sector;

- How ISED can best invest resources and deliver on priority international activities led by Global Affairs;
- Further research on the definition of the aerospace's cluster, associated technology centres of excellence, scientific and technology drivers of competitiveness, and networks with a view to identify critical areas of actions.

Recommendation 2 – Enhance the Strategic Aerospace and Defence Initiative (SADI) and the Technology Demonstration Program (TDP)

To reflect the need for government to demonstrate willingness to support risk-sharing, the current objective of current administrative view of ensuring that SADI's overall portfolio provides a return of 100% should be examined so as to provide more flexibility. Assuming current funding levels are maintained (approximately \$200M per year), we recommend introducing changes in the terms and conditions of the program with an **overall budget impact of up to \$40M per year**. However, fiscal impact would become positive over the longer term as proposed changes would provide an incentive for business to invest more, which in return would translate into growth and revenue for government.

Terms and conditions

- SADI should become a partially refundable program based on achieving R&D performance metrics such as time to market, employment, business growth, and global supply chains integration. Refunds could be up to 20% in lieu of payment or included as a SR&ED tax cash refund on eligible investment. Refunds should be tied to R&D re-investments made in Canada.

Eligibility

- Projects led by business consortium should be eligible to apply;
- Sharing ratio of eligible expenses should be allowed up to 50% of total cost of the project;
- Equipment, tools, activities and infrastructure should be encouraged to account for eligible expenses to support process innovation and competitiveness;
- To be eligible, the business risk profile should be considered based on past performance with customers or projects in addition to financial metrics.

Continuous improvement and linkages with other programs

- SADI and TDP should be streamlined to accelerate significantly decision-making and to greatly reduce reporting requirements. As well, oversight on the work breakdown structure should be significantly reduced in order to focus on enhanced flexibility to achieve outcomes;
- The TDP program would continue to cover projects from TRL 4 to 6 with the inclusion design systems, test rig and software as eligible expenses. SADI would allow for innovation projects ranging from lower TRLs through to commercialization from TRL 1 to 9, with a view that lower TRL projects could additionally be facilitated by the national research aerospace network (recommendation 3);

- A bridge option between TDP and SADI would be optional for firms willing to take on long-term technology development investment cycle;
- A bridge between BCIP and SADI should be explored;
- Establish a government-industry working group to design and implement a continuous improvement framework for SADI and TDP.

Context:

SADI is the backbone of aerospace programming in support of commercialization of innovation. However, given the current low-interest environment and risk avoidance approach in its delivery, it is currently undersubscribed. The proposed change reflects the unique characteristics of aerospace R&D i.e. high TRL R&D is very high capital intensive and involves increasing risk over time upon the completion of the project development cycle because innovation cannot enter market and translate into economic value until its development is fully demonstrated and approved against stringent standards and certification requirements. It would allow for greater consideration of the important role that process innovation plays to the future competitiveness of the industry, especially as it relates to increasing Canada's participation in global value chains.

The administrative burden and the nature of their terms and conditions, compared to private loans, hinders the ability of these programs to positively incentivize existing businesses to invest more in R&D and to attract new global players in Canada. SADI and TDP processes and reporting should be streamlined to reduce fiscal impact of new measures. As a result, SADI would draw in more applications and thus maximize its impact on innovation metrics through an enhanced risk-sharing model. Upon business approval, the Department could use the information it collected on aerospace high-impact firms to initiate fast-track decision-making.

Recommendation 3 – Reinforce CARIC as the national collaboration aerospace research network

We recommend reinforcing CARIC based on its success and in an effort to continue building on the work and result generated by the Green Aviation R&D Network (GARDN), which is set to phase out in 2019. **We recommend the allocation of \$280M over 7 years** with total leveraging impact from the industry and other programs of \$560M. For the allocation of \$40M per year, **\$30M would come from the Clusters and Networks initiative announced in Budget 2016** and **\$10M from the RDAs'** existing contribution to the clean tech agenda.

- Blue Sky (TRL 1) – Introduction of a new sub-program funding to promote and develop ideas to exploit Canada's world-class scientific research. \$3M per year. (\$6M in leveraging impact (LI)).
- Low TRL and mid TRL (2-6) – \$8M per year (LI of \$14M)
- Small Technology Development Program – Introduction of new sub-program to incentivize SMEs to maximize innovation through partnership. \$15M per year (LI of \$30M)
- Priority Green Technology – Aerospace research projects (TRL 3-6) that would support Canada's goal with respect to the Vancouver Declaration. \$8M per year (LI of \$16M)
- Aero Connect – \$500K per year (or could be covered by Recommendation 1)

- Strategic studies – To identify technology and market priorities in conjunction with international environmental regulations and Canadian regional capabilities. \$500K per year (ibid)
- Operations – \$5M per year
- Establish an engagement process to incentivize OEM to maximize the national network for defence procurement value proposition, and their following commitments with respect to Industrial and Technology Benefits. To that effect, develop a template and an engagement process to allow OEMs to propose multiple potential projects on one transaction sheet in order to develop a more meaningful and long-term approach to their innovation investment in Canada.

Context:

From an industry and academia perspective, there is a consensus on the relevance and added-value of collaborative aerospace research, both from CARIC and GARDN. Given that GARDN is phasing out and led to great benefits to the industry – for example, it led to the first civilian jet powered by 100% bio-fuel and supported the development of more than 60 green technologies – it would be advisable from all stakeholders’ perspective to continue its work and to accelerate the momentum to remain competitive.

Collaborative aerospace research is experiencing significant uptake while resources are limiting the network ability to seize opportunities. As the national research network membership is expected to grow and to draw in more international participation of significant value, it should be resourced to respond to the upcoming demand. The national research network also sees tremendous opportunities to kick-start green aviation projects, which would provide the aerospace a competitive edge over the long term while facing increasingly stringent environmental international regulations. A small technology demonstration program would be created as well to provide an inclusive R&D mechanism for SMEs to fill a gap from the perspective of TRL funding. The creation of a Blue Sky sub-program would significantly harness further Canada’s global research strengths in every region with the industry long-term view on technology development, for both smaller and larger businesses. All these changes justify a significantly enhanced resources allocation and would be welcomed by all aerospace stakeholders, since it would create a vibrant network where collaboration would be key to clusters’ growth.

Reinforcing CARIC would provide this opportunity by affirming strongly a new objective linked to the greening of the aviation. The reinforced CARIC would have a clear incentive to integrate environmental considerations at the early-stage of the innovation process. Its terms and conditions would be more flexible and thus enhancing its ability to leverage research potential both across Canada and internationally. Finally, it would enable increasing projects with other research networks of different adjacent networks.

The objectives of the network would focus on:

- delivering research innovation;
- greening aerospace and aviation, especially with respect to noise, emission and sustainability;
- strengthening the network to create synergy across regions; and,
- training qualified and highly qualified personnel.

The national aerospace network would represent an effort to:

- pursue the development of the Canadian aerospace collaborative research between regions and internationally;
- reduce the fragmentation in innovation program; and,
- integrate further the innovation and the clean tech agenda, including through the development of environmental assessment tools.

RDAs would be required to partially fund the network. RDAs' participation would be instrumental in order to connect key aerospace stakeholders, support regional activities and forums, and liaise with other national, regional and international stakeholders. In particular, the RDAs would be proactive to support the framing of green aviation research projects, to develop further a more effective and coordinated regional innovation ecosystem and accelerate the transition to a low-carbon economy based on provincial specificities.

PUBLIC SERVICES AND PROCUREMENT CANADA

Recommendation 4 – Create a Canadian Innovation and Research program

Building on the success on the overall success of BCIP, we recommend the further development of demand-based policy by creating a Canadian program based on the successful model of the US Small Business Innovation and Research (SBIR) initiative (see Annex 2). To provide significant incentive for innovation and to ensure long-term outcomes, we estimate that the government, including provincial governments, **should allocate up to 200M\$ with the objective of budget neutrality, i.e. without tapping into SADI/TDP or SR&ED allocation**, through recalibration of departmental procurement and R&D budget. We would support the implementation of a SME set-aside. Larger Canadian as well as foreign-owned Canadian registered businesses with the objective to increase their Canadian investment in R&D and that could guarantee to keep the intellectual property in Canada would be eligible.

Context:

With respect to aerospace, we recommend working closely with the CSA and DND portfolios to ensure their technological needs and budgets are fully leveraged to the benefit of eligible businesses.

We would support a phased program where funding could be allocated to feasibility studies, technology development, commercialization (as per BCIP); and procurement. In order to unlock innovation potential from the aerospace sector, this new program would cover technological capabilities, process and product innovation. To maximize its outcomes, the program would develop an optional mentorship component where larger companies could work with suppliers to integrate their innovation into a larger technological solution that the government procures. In such cases, the larger company could be approved as the official testing house rather than a government agent. It is proposed that PSPC should partner with the national aerospace network to support the delivery

of the program for aerospace-related technology project.

Recommendation 5 – Leverage Government procurements to stimulate innovation in Canada

Increase the use of government procurements, especially minor capital programs, to fund Non-Recurring Engineering investments needed to bring new “made in Canada” products, services and capabilities to market, emphasizing “best value” over “technically compliant lowest cost” selection criteria. This could be accomplished within existing procurement funds.

Context:

Minor capital programs (less than \$20M) do not require any Canadian content or ITB contributions under the current Defence Procurement Strategy. Often, procuring agencies are only interested in off the shelf solutions that offer the lowest development risk at the cheapest price. This approach does not stimulate innovation nor promote new Canadian business opportunities at home or abroad. An alternative approach would be to leverage these procurements to provide an initial channel to market new products or services created in Canada under the recommended investment channels by encouraging procurement agencies and departments to accept low risk developmental programs where practical.

WHOLE OF GOVERNMENT INITIATIVES

Recommendation 6 – Creation of a Grand Challenges Aero initiative

AIAC recommends the allocation of \$200M over 5 years to the creation of strategic innovation initiatives. For each initiative, the aerospace industry would combine its efforts with other sectors and academia in order to develop advanced solutions based on existing technological expertise. Multiple government departments would support the initiatives through funding, policy, technical assistance, research infrastructure and networks. The Grand Challenges Aero initiative benefits would span beyond the manufacturing and high-tech sectors.

Context:

Based on needs expressed by both the market and the Government of Canada, the Grand Challenges Aero initiative would set industry-driven projects across sectors to trigger new innovations with a view to fostering exports. It would combine the government pull effect on innovation and the technology push from the industry to develop new solutions and applications in order to provide an impetus for the most innovative firms to scale up. A grand initiative would also attract talent from abroad, nurture the brightest in Canada and provide an opportunity to support work integrated learning programs. AIAC supports the government in setting big-horizon goals and creating broad-based partnerships to fund ambitious R&D projects that solve complex, large-scale problems and spark commercial opportunities associated with advanced manufacturing and clean growth. Universities’ efforts would be funded on a competitive process based on their ability to leverage expertise, infrastructure, contribute to skills

development, and manage IP. Industry teams would contribute funding and in-kind expertise. The reinforced national aerospace research would be mandated to facilitate these initiatives.

We recommend a small set of large undertakings, as for example:

- **New digital technologies (\$15M per year)**
 - » Digitization of industrial production – with the automotive sector
 - ◆ To develop a common virtual transportation platform model, to enable digitalization of manufacturing, and support the development of supply chain
 - ◆ Government support from National Research Council and RDAs
 - » Intersection of aerospace with medical, gaming, and education sectors – with academia and IT sector
 - ◆ Future Learning Systems and Instructor Capabilities
 - ◆ Future Training Using Connected services
 - ◆ Intelligent Cloud Capable simulation and Monitoring systems
- **Green Power – with the energy sector (\$10M per year)**
 - » To develop green energy systems to be deployed in remote areas or as an alternate source of power
 - » Support from NRCan, ECCC and RDAs
- **Environmental monitoring – combining expertise in aerospace, space and ICT sectors (\$10M per year)**
 - » Leveraging aerospace and space-based assets to an integrated network-based system of awareness, surveillance, communications, navigation, and mapping
 - » Support from DND CSA, ECCC, INAC, NRCan
- **De-icing – with the optics, advanced materials and robotics sectors (\$5M per year)**
 - » To develop more efficient and environmentally friendly systems of a) de-icing in civil and military airports and b) icing prevention for rotor and fixed wings aircraft and UAVs
 - » Support from DND and Infrastructure Canada.

Recommendation 7– Strengthen national laboratories and their access to industry as well as key aerospace research, testing and certification infrastructure support

- Restore NRC funding entirely out of the Science budget in order to move from a cost-recovery to a marginal cost model. The NRC would contribute to the new Canadian SBIR-like program by channeling its procurement budget to a new strategic fund to support the development of innovation in Canada.

- Explore with Infrastructure Canada, the Canadian Space Agency, Global Affairs Canada and the Canadian Foundation for Innovation novel ways to support businesses willing to invest into key strategy research and testing facilities and equipment.
- Ensure DND Aerospace Engineering and Testing Establishment support access to its infrastructure and equipment in the same manner that the NRC, as previously recommended above.
- Explore effective ways to increase access to industry to world-class research infrastructure funded by CFI to ensure both scientific and innovation goals can be pursued.
- Explore with provinces and other stakeholders how to support the creation of open, living and shared laboratories (both for skills development and prototyping objectives), and how to support further the development of certification, validation and environmental testing infrastructure.

Context:

In Canada, there are numerous world-class facilities and equipment which are not fully leveraged to support innovation by industries from various sectors. DND, the CSA, universities and colleges, and the NRC have neither clear objectives nor a proactive and pragmatic approach to ensure publicly funded assets can translate into inclusive growth. The Government should recognize that these assets play a critical part in bridging scientific expertise with business know-how in order to solve market-based problems in a way that would translate into commercial opportunities.

Recommendation 8 – Introduce improvements to SR&ED to incentivize business innovation

We recommend introducing improvements to SR&ED to incentivize business innovation.

- Restore funding to previous levels.
- Explore how the SR&ED program could cover and favour process innovation by delinking its conception of innovation to technological advancement. SR&ED should cover change made in relation to business processes, service-oriented delivery and support the commercialization of these advancements.
- Explore with the CRA the possibility to harmonize its program with the Quebec program, where tax credits are fully refundable.
- Streamline SR&ED claims, ensure fairness and common-sense, and improve timelines.

Context:

Canada's innovation system is supported predominantly by indirect funding, which is a striking difference from most advanced nations. SR&ED plays a critical role in this system. Extensive consultation with the aerospace community highlighted the impact of this tax measure to business of all sizes, both newer and mature ones. Here are some of the key points that came out of our consultation following the unfolding of the Innovation Agenda in June 2016:

- *“SR&ED has been and remains a critical driver in our decision to create and retain innovation-related research and develop talent in Canada. Any reductions would seriously compromise any R&D efforts we would otherwise make in Canada. We have already witness lower investment, modernization and potential competitiveness due the cancellation of the CAPEX portion of SR&ED”*
- *“The SR&ED program was and remain a key driver in our decision to create and keep a large number of innovation-related R&D jobs in Canada. This R&D activity did not have to happen in Canada, we specifically chose to keep it here. The program was instrumental to create and growing world-leading commercially successful advancement in aeronautical, mechanical and materials-science engineering. Tens-of-millions-of-dollars in Canada engineering and manufacturing jobs having been created by us. Additionally, the resulting intellectual property remains Canadian-owned. Further reductions of SR&ED incentives would have a significant impact on our decision to conduct R&D in Canada.”*
- *“The SR&ED credit was a major enabler to reinvestment in the growth of our Engineering Group. We could afford a larger and growing Engineering team with lower non recurring engineering costs, resulting in a faster innovation cycle while maintaining product cost on a par with our international competitors. Without SR&ED, the company growth would have been stunted. We would not have been in a position to innovate and get new and compelling products to the market place as quickly as SR&ED allowed us to. Additionally, US companies were attracted by our companies for design and build contracts partly due to our lower development costs.”*

All in all, every business consulted was adamant about the key role SR&ED played in their decision-making process to engage in R&D. Increasing innovation-related activities generates HQP jobs, Canadian intellectual property, revenues and support international competitive and Canada’s trade balance.

Recommendation 9 – Support the creation of the Downsview Aerospace and Innovation Research (DAIR) hub

AIAC recommends that the government fulfills the recommendation of the 2012 Emerson Report supporting the of the Downsview Aerospace Innovation and Research (DAIR) initiative.

AIAC also recommends the Government to work with regional stakeholders in the West and in the Atlantic, i.e. regional presence of Federal departments and agencies, associations, provinces and industry, to continue fostering the development of the aerospace industry with a view to creating new opportunities to grow partnerships and to enabling future strategic investments in the creation of regional clusters. This collaborative approach should apply as well to the Montreal metropolitan area – a global leading aerospace cluster – to seize opportunities to reinforce both the industry, and its partnership with academia.

Context:

The Toronto metropolitan area, and Ontario in general, presents several assets and a great diversity of stakeholders that could benefit from increased collaboration. Through its reinforcement regionally, DAIR would support the industry’s growth and ability to support innovation. It would also allow for stronger linkages with other clusters and assets across the country.

DAIR, located on Canada Lands Company (a federal commercial Crown Corporation) property, is a partnership consisting of four leading academic institutions – Centennial College; the University of Toronto Institute for Aerospace Studies; Lassonde School of Engineering at York University; and Ryerson University – and eight companies at the leading edge of Canada’s aerospace industry—Bombardier; FlightSafety International; UTC Aerospace Systems; Safran Landing Systems; Pratt and Whitney Canada; SPP Canada; MacDonald Dettwiler and Associates Canada; and Canadensys Aerospace Corporation.

The objective of DAIR is to establish an aerospace hub, consisting of educational institutions and large and medium sized firms that together will bolster and enhance innovation and address the projected skills shortage by attracting more students to aerospace and increasing their readiness to contribute to the sector upon graduation. DAIR will increase collaboration and enhance R&D and business opportunities. Ultimately DAIR will improve the global competitiveness of Canada’s aerospace sector as a whole.

Toward this overarching objective, the goals of the Hub include the following:

- Co-locate national aerospace R&D infrastructure and expertise, both academic and industrial, in order to facilitate and increase collaborative research and development projects with a view to provide student and graduates with work integrated learning experience;
- Enable the development of research facilities shared between multiple academic institutions and companies;
- Provide a focal point for provincial and national aerospace education, training, conference, workshops and outreach to the general public, particularly K-12 students;
- Attract foreign investment in Canada, through both location of foreign companies and increased R&D investment from Canadian subsidiaries of foreign-owned firms;
- Provide a location for facilities related to R&D program, including in green aviation, incubation space for start-ups.

The initial components of the proposed Downsview Park Aerospace hub include the following:

- **An Aerospace Innovation Centre, which will house research offices, shared research facilities, conference facilities and incubation space;**
- **The University of Toronto Institute for Aerospace Studies Campus; and,**
- **The Centennial College Aerospace Campus.**

Further to these elements, it is expected that additional entities, both local and international, will become part of the Hub over time.

The creation of an Aerospace Hub can provide a viable and sustainable solution to the projected shortage of skilled labour and will increase the competitive advantage in the aerospace industry for both Ontario and Canada. According to the Business Case written by KPMG in January of 2014, the creation of the Aerospace Hub at Downsview Park would have the potential to facilitate the development of up to 14,400 jobs and provide direct, indirect, and induced benefits of up to \$2.3 billion over the next 20 years.

TRANSPORT CANADA

Recommendation 10 - Ensure proper resource allocation to Transport Canada Civil Aviation (TCCA) Directorate

Based on the best information available to AIAC, we recommend that the budget of TCCA be increased by **at least \$30 million over 5 years**. This budget increase should be used to support:

- The hiring of much needed, highly specialized Certification and Standards staff;
- An increased focus on effectively negotiating international airworthiness and maintenance bilateral agreements; and,
- The updating and modernization of TCCA's regulatory framework.

As well, the AIAC recommends that Transport Canada and aerospace stakeholders collaborate more efficiently on climate change issues. Specifically, Transport Canada representatives on various international or foreign forum and initiatives (such as the International Civil Aviation Organization (ICAO), the Continuous Lower Energy Emissions, and Noise (CLEEN) program and the Aviation Sustainability Center (ASCENT) could provide valuable guidance to Canadian aerospace industry on innovation priorities. This collaboration could occur under Canada's Action Plan to Reduce Greenhouse Gas Emissions from Aviation and other similar government initiatives.

Context:

An adequately funded and competently staffed Transport Canada Civil Aviation (TCCA) Branch is critical for the continued ability of Canada's civil aviation sector to develop, manufacture and export its products and services worldwide. TCCA's certification or approval is the final and essential step in the innovation value stream for Canadian civil aviation products and services.

TCCA is recognized as a premiere civil aviation regulatory authority. Alongside the FAA and EASA, the regulatory agencies for the United States and the European Union respectively, certification and regulatory approvals from Transport Canada are globally recognized as being the gold standard for civil aviation products and services. TCCA's reputation gives Canada's civil aviation manufacturing industry an important competitive advantage since it facilitates Canadian trade and export opportunities around the world, opening doors for Canadian products and services into new markets and making it easier for Canadian manufacturers and service providers to do business in foreign jurisdictions. Because of its global reputation, TCCA certification, approval and oversight are key enablers for civil exports.

However, TCCA's ability to continue its levels of service is at risk, and its international reputation as a competent certifying authority is rapidly being lost. This situation is due to the current funding levels at TCCA and persistent, inadequate funding levels for the Certification and Standards departments at TCCA. AIAC is concerned that TCCA's current funding levels will discourage new foreign investment in the sector and could, in the medium to longer term, lead to disinvestment by foreign entities in the Canadian aerospace sector.

Recognizing the importance of aerospace manufacturing to the Canadian economy and its growth potential, federal agencies, provincial agencies and municipalities have invested significantly in the sector. Support for the

sector has been both direct (for example the SADI program) and indirect (for example SR&ED tax credits). However, these government investments are suboptimal unless TCCA's Certification and Standards departments are properly funded and competently staffed.

Since approximately 80% of the sector's innovative products and services are exported, airworthiness and maintenance agreements with foreign regulatory authorities are key facilitators for this trade. Persistent, inadequate funding of the Standards department is severely hampering Transport Canada's ability to improve existing or negotiate new bilateral agreements and to update its regulatory framework to respond to technological changes and international regulatory developments. For example, the International Civil Aviation Organization (ICAO; a specialized UN agency) has adopted Safety Management System (SMS) requirements for design and manufacturing organizations; ICAO member states are expected to enact regulations reflecting the ICAO requirements. Regulatory authorities in the US and Europe are currently developing regulatory policies for SMS; however, due to budget constraints TCCA is lagging on this matter.

Design standards for civil aviation aircraft are developed through international working groups comprised of the lead regulatory authorities (FAA, EASA, TCCA, ANAC-Brazil) and manufacturers; budget constraints are now preventing TCCA from participating in these working groups.

The Certification and Standards departments at TCCA employ highly specialized engineers and other technical staff. AIAC has been advised that many staff will retire soon, leaving significant skills gaps and thereby impacting TCCA's ability to competently certify/approve Canadian civil aviation products and services. Increased funding is urgently required to permit the training and hiring of key technical staff in the Certification and Standards departments.