



National
Defence

Défense
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CANADIAN
ARMED FORCES

2021-2022 ANNUAL REPORT



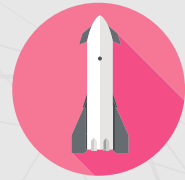
IDEaS
INNOVATION FOR DEFENCE
EXCELLENCE AND SECURITY





IDEaS

**INNOVATION FOR DEFENCE
EXCELLENCE AND SECURITY**



ABOUT INNOVATION FOR DEFENCE EXCELLENCE AND SECURITY (IDEaS):

Since launching in April 2018, IDEaS has been working with Canadian innovators to develop the S&T landscape, and is helping turn innovative thinking into tangible solutions for the Department of National Defence and the Canadian Armed Forces (DND/CAF), as well as Canadians.

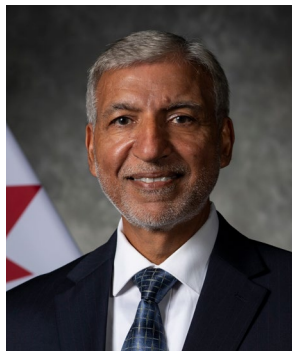
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MESSAGE FROM DR. JASPINDER KOMAL

ASSISTANT DEPUTY MINISTER, DEFENCE RESEARCH AND DEVELOPMENT CANADA



“Innovation will not wait.”

This is the message we have received from the Canadian Armed Forces (CAF) senior leadership at the inaugural IDEaS Marketplace event.

The event highlighted the aspirations and

accomplishments of IDEaS-funded innovators from its first call for proposals.

This is the same message from Department of National Defence (DND) as the Department moves to modernize their infrastructure and equipment to meet current and future threats.

Former Associate Deputy Minister Stefanie Beck spoke of the importance of creating the ability to respond now to meet the challenges and threats of the present and future. It is no longer a future issue we seek to address in the abstract; it is in the here and now that we see the consequences of technology affecting many aspects of our lives.

Innovation is the future of defence. But we must execute in the present to get there. And that’s exactly what IDEaS continues to do. It is going beyond the realm of useful into the world of necessity.

Through IDEaS, DND/CAF know they have a stable partner with an ever-increasing roster of innovators, thinkers, and solutions at their disposal to call on, whatever challenge may arise.

The world, and the future, will not wait.



Now is the time for us to transform how we do our work at National Defence.
With the new technologies coming, we really have no choice.

Stefanie Beck, former Associate Deputy Minister, Department of National Defence
IDEaS Marketplace event, June 2022

MESSAGE FROM PHILIPPE HÉBERT

DIRECTOR GENERAL R&D INNOVATION



I am pleased to present the 2021-2022 IDEaS Annual Report. As the program completes its fourth year, I am amazed at the breadth and depth of both the challenges we confront, and the progress that has been made to solve them.

The program has shifted, grown, and matured over the last four years, as we work to continuously evolve our approach and to meet the ever-changing needs of the DND/CAF.

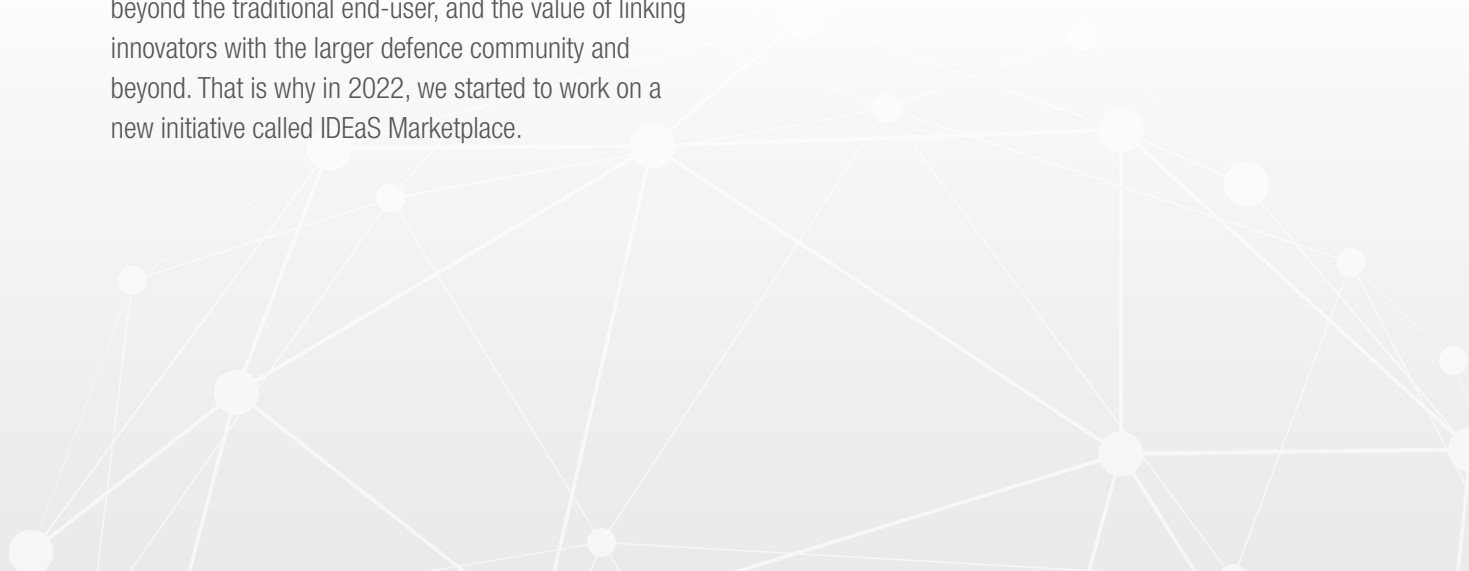
This year, IDEaS awarded its second directed Test Drive contract. It's one of many near-to-market solutions set to emerge from the program to be operationally tested by the Defence Team. This shows that through our innovation continuum, we are unearthing promising solutions to DND/CAF, and this is very exciting and meaningful progress.

We also saw the potential of IDEaS-funded solutions beyond the traditional end-user, and the value of linking innovators with the larger defence community and beyond. That is why in 2022, we started to work on a new initiative called IDEaS Marketplace.

Our goal for Marketplace was to help innovators build connections with other potential stakeholders in the private and public sector, while also providing a window for DND/CAF leadership to see new technologies that may be applicable in different scenarios and operations.

Our allies are facing similar challenges in terms of rapidly advancing technologies that present defence and security risks. We had the opportunity to work alongside our allies in the North Atlantic Treaty Organization (NATO), hosting a NATO Innovation Hub challenge to help address threats in the cognitive domain, as well as share best practices in innovation.

As always, none of this would be happening without the excellence of our team and continued support of our colleagues in Defence Research and Development Canada (DRDC), DND, and the CAF. I would like to take this opportunity to thank DRDC defence scientists, subject matter experts, staff, and challenge originators who enable IDEaS success.



IDEaS CONTINUES ITS EVOLUTION

The 2021-2022 story of IDEaS is one of evolution. The program has matured over the last four years, and new elements and facets of the program have emerged to meet the momentum of our work going forward.

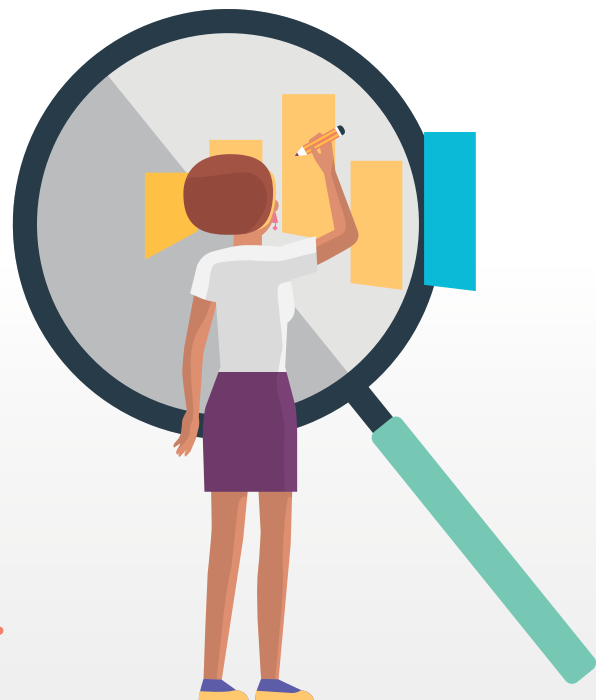
Some of the more advanced technologies that have materialized from the Competitive Projects stream are closer than ever to being product ready.

IDEaS awarded its second Test Drive to the Ecopia Tech Corporation in fall 2021. Originally funded under the *Detection and classification of objects of interest* challenge, the Canadian Forces Intelligence Command (CFINTCOM) will test Ecopia's mapping solution in a real-world environment. The Test Drive will assess the artificial intelligence technology developed to automatically extract land features and objects of interest from geospatial imagery. The objective of the Test Drive is to accelerate the tasking, collection, processing, exploitation, and dissemination cycle, to enhance overall CAF operational planning and decision/action cycles.



Along with this accomplishment, IDEaS called out to industry last year to seek near-market-ready solutions for greening operations. The *Green Heat: Low carbon energy generation for heating existing buildings* Test Drive began with Black & McDonald testing a solution to provide greener heat for DND/CAF facilities. They will convert an existing building's heating system by integrating their hydronic heat distribution system.

IDEaS has made strides in helping government-funded R&D get an added boost. A new program initiative called IDEaS Marketplace helps IDEaS-supported innovators connect directly to potential stakeholders in the private and public sector, while also providing a window for DND/CAF leadership to see new technologies that may be applicable in different scenarios.





Innovation knows no boundaries. That's why we extended our reach internationally, sharing information and best practices with our allies. IDEaS participated in the 2021 NATO Innovation Symposium's discussion panel on lessons learned for building a successful innovation ecosystem. The program also hosted its own lessons learned event in March 2022, discussing defence innovation with allies from around the world.

In November 2021, IDEaS worked with NATO's Innovation Hub to co-host the NATO Innovation Hub Challenge, alongside Canadian Special Operations Forces Command (CANSOFCOM). The pitch-style event focused on cognitive warfare and attracted more than 80 applicants. Being the host country, Canadian content was centre stage, with more than 30 Canadian applications.

Internally, IDEaS further refined and improved its processes to better meet the needs of our clients. We changed the challenge management process to more effectively align with DRDC's operating framework.

To better share our successes and inform on the challenge process, IDEaS launched a departmental [SharePoint](#) site. The goal going forward is to better share knowledge with internal stakeholders and report on progress.

PROGRAM PERFORMANCE

IDEaS continued to advance multiple solutions through its innovation continuum for DND/CAF. The program held its first open call Test Drive, awarded its second directed Test Drive and has funded more than 573 projects to date.

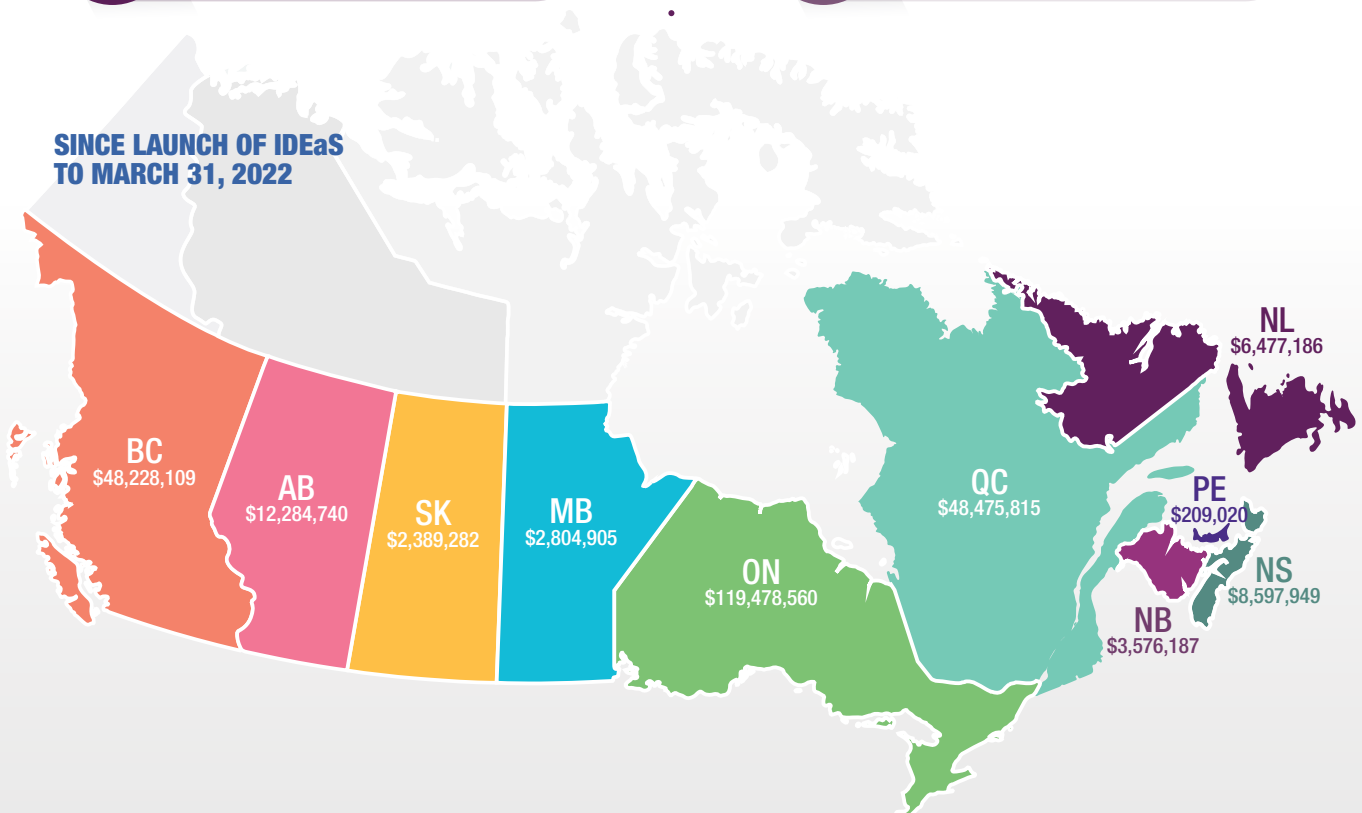
SINCE LAUNCH OF IDEaS TO MARCH 31, 2022



APRIL 1, 2021 TO MARCH 31, 2022



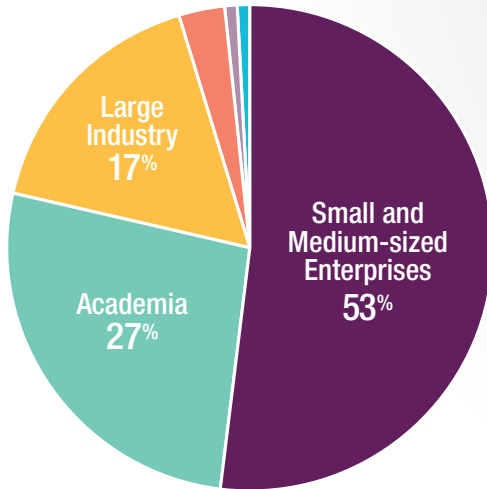
SINCE LAUNCH OF IDEaS TO MARCH 31, 2022



INNOVATOR TYPE BREAKDOWN:

**SINCE LAUNCH OF IDEaS
TO MARCH 31, 2022**

OTHER <1%
INDIVIDUAL <1%
NOT-FOR-PROFIT 3%

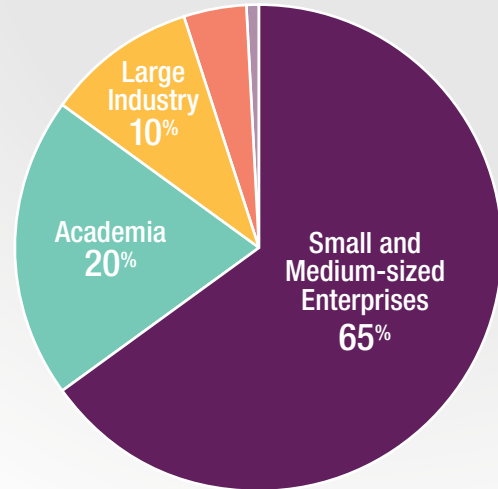


285

UNIQUE RECIPIENTS

APRIL 1, 2021 TO MARCH 31, 2022

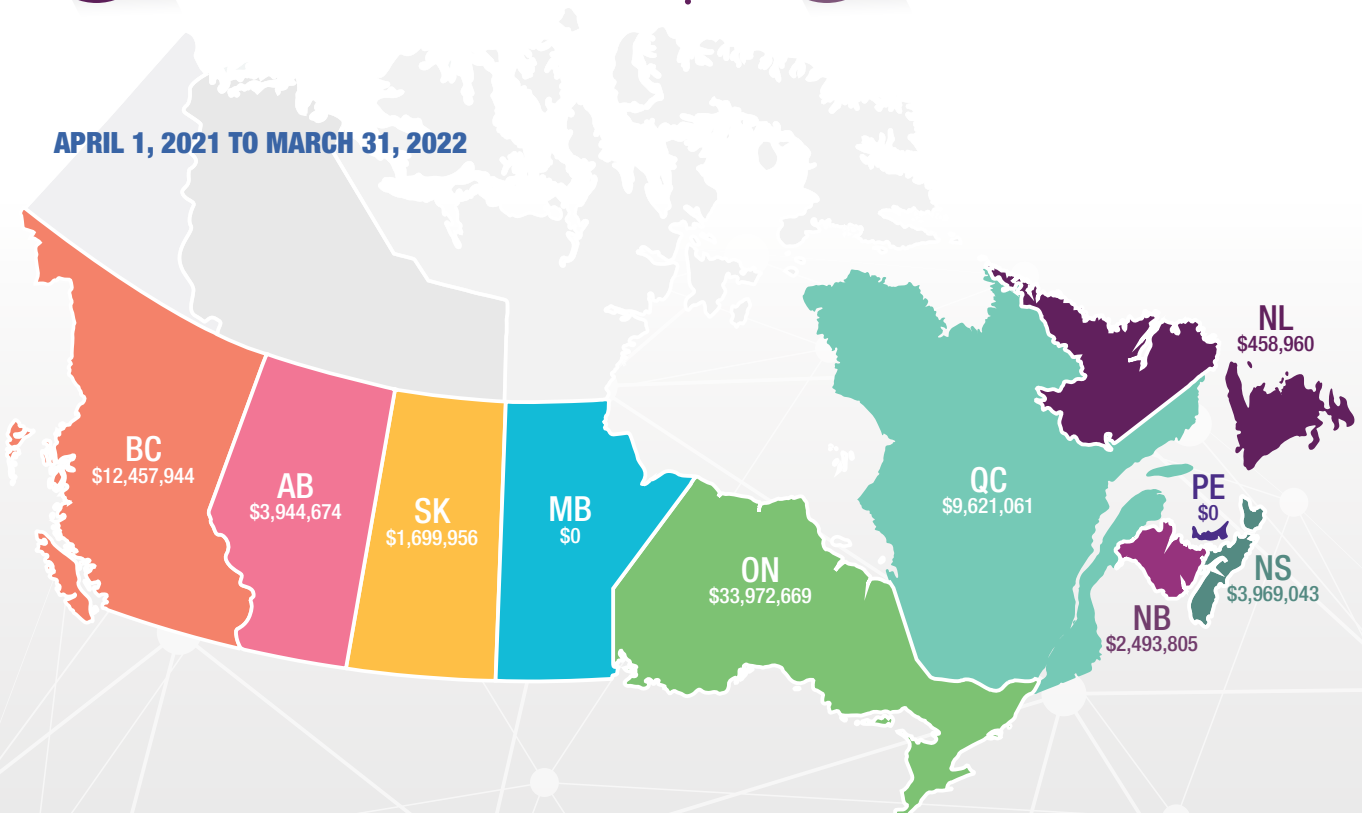
OTHER 0%
INDIVIDUAL <1%
NOT-FOR-PROFIT 4%



96

UNIQUE RECIPIENTS

APRIL 1, 2021 TO MARCH 31, 2022



PROGRAM OF WORK UPDATES

FUNDING MECHANISMS KEEP PACE WITH THE NEEDS OF INNOVATORS

When IDEaS first launched, the structure of the program was designed with a variety of funding mechanisms. Contests, Sandboxes, Test Drives, Competitive Projects, and Innovation Networks all have unique benefits. As projects move along the innovation continuum and projects take different directions, new funding needs began to emerge.

With a structure under Competitive Projects that breeds competition, the first funding given to innovators is a way to get many good ideas in the door. Deemed “1a” funding, the initial \$200,000 is a discovery phase that allows innovators to showcase their solutions and for DND/CAF to assess projects for their potential. Innovators are given six months to push their concepts to new Technology Readiness Levels (TRLs).

The next phase of funding, “1b”, is the mechanism used to further advance technology through the IDEaS continuum where \$1M in funding is given to promising technologies that could meet the needs of DND/CAF. Innovators have a year to push their technology forward.

As projects advanced through the process, it was apparent that while some held promise, additional development funding could advance them to a higher readiness level which could lead to a testing opportunity or help mature the solution towards commercialization. IDEaS can now leverage an additional funding mechanism called “Component 2” to help get projects with operational interest ready for testing by filling the gap between prototype and product. Component 2 will help get more promising solutions to a test-ready state.

WHAT IS COMPONENT 2?

Following two initial funding stages through the Competitive Projects element (1a and 1b), DND/CAF challenge sponsors and stakeholders have the option to further invest in advancing the development of a solution. The goal is to increase the TRL of projects that continue to respond to the intent of the challenge. This investment is facilitated through a directed R&D contract through IDEaS. The longer-term outcome Component 2 funding can be used to move a solution toward a Test Drive opportunity or to solely support further S&T development.

HOW IT WORKS

Once a project moves into Component 2, innovators get direct access to integrator(s) and the L1 stakeholder(s) who will act as the technical authority during the contract period.

Along with regular updates to DND/CAF, innovators may also perform a solution demonstration during the contract period in a real or simulated environment at the innovator’s expense (also known as a “vector check”). IDEaS may accept deliverables offered beyond the standard milestone reports (.e.g., prototypes).

WHAT ARE THE REQUIREMENTS FOR A PROJECT TO MOVE INTO COMPONENT 2?

- Projects which have **successfully advanced** through IDEaS Competitive Projects components to be considered for Component 2.
- Component 2 funding must be requested by the **L1 sponsor(s)/ stakeholder(s)**.
- Only projects at a **TRL of 6 or lower** will be considered for Component 2.
- Innovators will be able to further refine and realign efforts to **effectively address the challenge** as their solution advances.

COMPETITIVE PROJECTS: FIFTH CALL FOR PROPOSALS LAUNCHED



COMPETITIVE PROJECTS LAUNCHED SIX NEW CHALLENGES IN 2021-2022.

Challenge title	Number of proposals submitted	Number of successful proposals
Worth a thousand sources: A fused picture for continental surveillance	22	5
We sea you: Digital tracking and accounting on navy vessels	41	9
Erosion from motion: Reducing wear and tear on rotary blades	33	8
Wireless is where it's at: Secure and seamless wireless network onboard ships	13	3
High bandwidth, low profile: Next generation point-to-point communication solutions for the field	26	9
Less GHGs on the seas: Practical solutions to measure and record energy consumption	27	4

COMPETITIVE PROJECTS FUNDING

\$47M

FUNDED ACROSS
13 CHALLENGES
DURING FY21/22.

82

ACTIVE 1A
PROJECTS

20

ACTIVE 1B
PROJECTS

3

ACTIVE TEST
DRIVES

TEST DRIVES: TWO PATHWAYS TO TEST SOLUTION-READY TECHNOLOGY



THE TEST DRIVES ELEMENT IS THE FINAL STAGE IN THE SOLUTIONS DEVELOPMENT CONTINUUM.

The technologies that are selected for a Test Drive have been developed within the IDEaS continuum, reaching a stage where realistic testing by DND/CAF is considered worthwhile.

However, not all solutions will emerge through the IDEaS continuum; some are available in the market already that may fit the needs of DND/CAF for specific challenges. That's why, in addition to direct Test Drives, the Test Drive element launched its first open call Test Drive for green heating innovations in 2020.

The distinction between an open call Test Drive and a direct Test Drive is simple. With an open call Test Drive, an open call for proposals will be issued for a specific Test Drive challenge to allow multiple proposals to be submitted. The contracts signed by successful applicants will outline the purchase, lease, rent, loan, or other arrangement with the innovator to acquire their

technology in a limited quantity for controlled testing based on a DND/CAF test plan. The contract will also reference any requisite training, repair, maintenance, and other support services.

In some cases, solutions that have successfully concluded their development under another component of the IDEaS program (i.e. Competitive Projects) and reaches the appropriate TRL level may be invited to submit a proposal for evaluation for a direct Test Drive. This approved process allows for successful and innovative solutions to progress through IDEaS, without the challenge being republished and without a repeat of an open call for proposals.

There are no commitments from DND/CAF to enter into full scale procurement of the solution following a Test Drive. However, these projects inform future procurement decisions.



OPEN CALL TEST DRIVE: SEEKING LOW CARBON ENERGY GENERATION FOR HEATING EXISTING BUILDINGS

To help lower carbon emissions across the DND/CAF real property portfolio, DND/CAF launched the *Green Heat: Low carbon energy generation for heating existing buildings* challenge. IDEaS is seeking a large-scale, low carbon energy generation/transfer system for heating existing buildings by integrating with their current hydronic heat distribution systems. The Green Heat Test Drive will help the Government of Canada meet its goal of reducing greenhouse gas (GHG) emissions by at least 90% below 2005 levels by 2050.

A two-stage procurement process was used to narrow down respondents to those with the best chance of success. Several months of collaboration between DRDC test pilot leaders, Assistant Deputy Minister (Infrastructure and Environment) staff, Defence Construction Canada

(DCC) procurement experts, and scientists from Natural Resources Canada culminated in a detailed statement of work and request for advance procurement (RFAP).

Eleven respondents replied to the initial RFAP. The remaining four were then evaluated to select those who would be asked to submit a full technical bid.

Two proponents were chosen to submit a full bid. Of those two, a proposal by Black & MacDonald stood out due to an innovative new combined application of technologies that appeared achievable within the budget test pilot constraints. Black & McDonald were then awarded \$477,000 to create a plan on how to best implement their technology to an existing building at CFB Kingston, with implementation to follow.

THE PROJECT ENTERED THE DESIGN STAGE IN 2022, WHICH IS THE SECOND OF FIVE STAGES:



1

CONCEPT DEVELOPMENT



2

DESIGN



3

CONSTRUCTION



4

OPERATIONAL



5

FINAL REPORTING

DIRECT TEST DRIVE: TEST DRIVING AI AND MACHINE LEARNING TO IMPROVE GEOSPATIAL AWARENESS

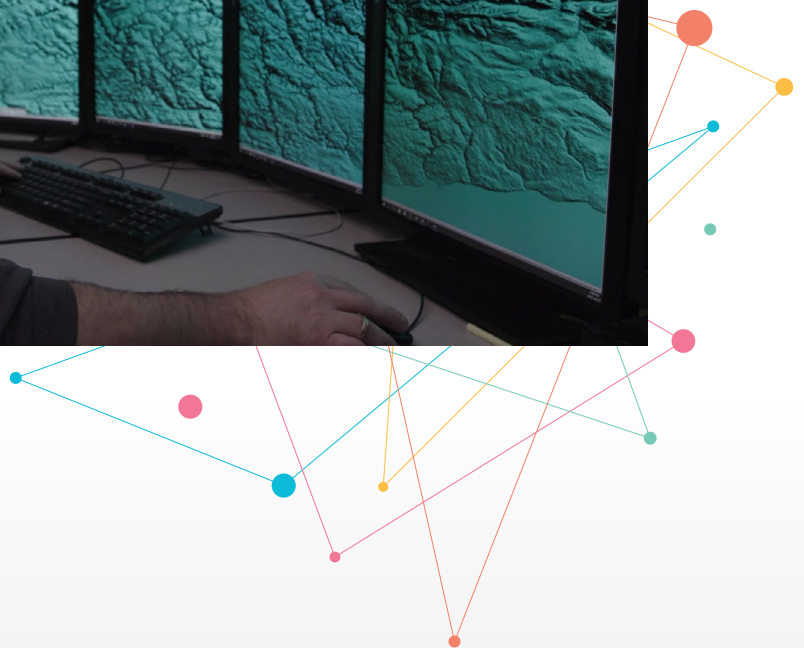
IDEaS provided an additional \$5.8M to Toronto-based company Ecopia to test their mapping solution in a real-world environment. Ecopia was the second project from IDEaS' first call for proposals to advance to a Test Drive. CAF/DND will "Test Drive" their technology to detect, recognize, identify, and track objects of interest using Artificial Intelligence (AI) and machine learning. This ground-breaking technology outputs information from 2D and 3D maps and extracts it 10 times faster, while maintaining a data quality that is fit-for-purpose. Below is a breakdown of how their technology progressed during each stage of funding.

1A FUNDING (\$200K):

During the first stage of funding, Ecopia's proposed solution aimed to create large-scale static maps in near real time. Their solution is based on a combination of a proprietary machine learning algorithm and a distributed expert annotation. The two components evolved in an iterative manner to deliver vector maps by training, prediction, post-editing, and retraining the algorithm. The proposed solution extended the number of features to be detected and classified from 2 features (buildings and roads) to 11 including both natural features (water bodies, swimming pools, bare land, grass, and forests) and physical features (pavement, parking lots, driveways, sport fields). The solution was tested on various terrains, geographies, and imagery types with impressive and accurate results.

1B FUNDING (\$1M):

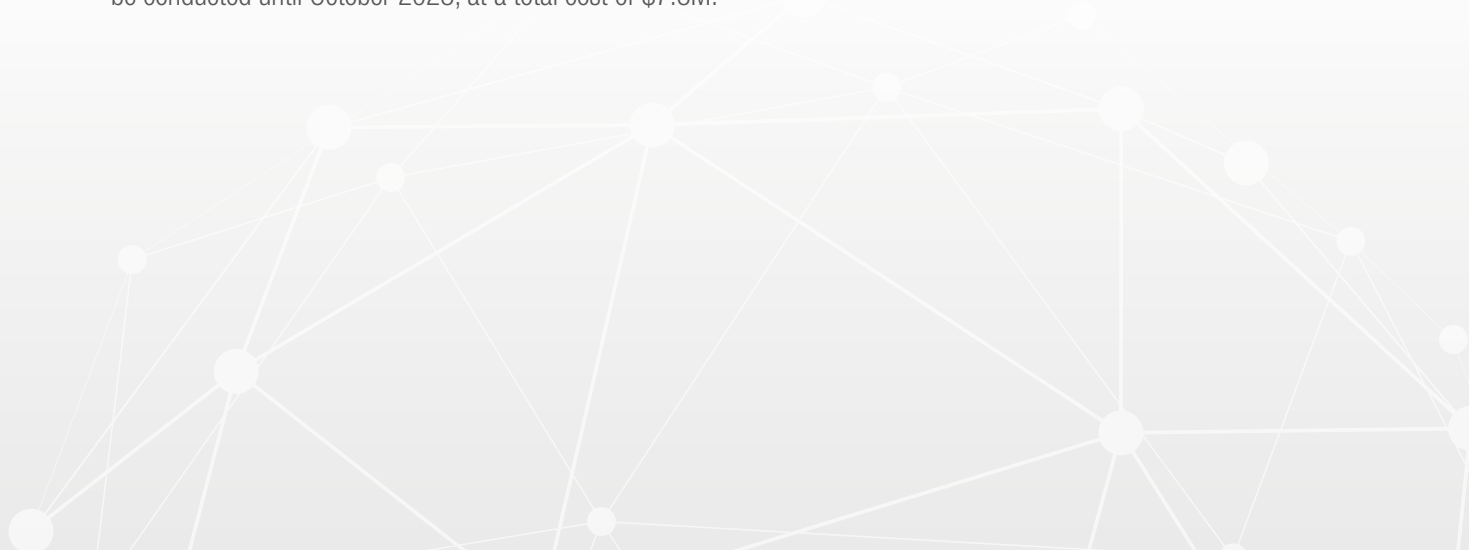
Additional funding was given to develop timely detection and classification of objects and persons of interest. This is a critical functionality to ensure speed, accuracy, confidence, assurance, and precision of impact as part of an operation's decision-action cycle. Ecopia's solution addressed this critical gap by affording DND/CAF with the ability to detect, recognize, and identify persons or objects of interest in a physical environment. During 1b funding, Ecopia worked to finalize and test its solution to detect and identify objects of interest such as airplanes, cars, and trucks in aerial images.





TEST DRIVE:

The final stage of funding will evaluate the suitability and utility of Ecopia's machine learning mapping technology by senior imagery and geospatial analysts. The innovation will be installed at DND/CAF facilities to train AI base models on DND imagery sources and investigate the potential for integration with other systems. The Test Drive will be conducted until October 2023, at a total cost of \$7.8M.



SANDBOXES: CALLS FOR PROMISING TECHNOLOGIES IN CORROSION DETECTION AND UNCREWED AERIAL SYSTEMS



TWO SANDBOXES LAUNCHED CALLS TO HELP EXPLORE SOLUTIONS CURRENTLY IN DEVELOPMENT FOR CHALLENGES FACED BY DND/CAF.

Originally postponed due to COVID-19, the call for applications for the Corrosion Detection In Ships (CDIS) Sandbox re-launched in November 2021. The program received 19 applications and a total of 12 companies were selected and invited to attend CDIS in Halifax, Nova Scotia, from April 25 to May 20, 2022.

On January 27, 2022, IDEaS also launched a call for a new showcase of promising uncrewed aerial systems (UAS). The second such sandbox to focus on UAS threats, *Rise, detect, defeat: Counter uncrewed aerial systems*, to take place from September 12 to October 7, 2022, in Suffield, Alberta.



COVID-19 CHALLENGES: IDEaS FUNDS 15 PROJECTS TO AID IN PANDEMIC RESPONSE



At the onset of the COVID-19 pandemic, the IDEaS program launched four challenges as part of the pan-governmental response to COVID-19. Ranging in topic from moral trauma to sanitization to using big data to track the virus, IDEaS selected 48 projects to receive \$200K in funding. As the threat of the pandemic remains ever present, the IDEaS program continues to support state-of-the-art solutions in the fight against COVID-19 and future pandemic responses. Of these original 48 projects, 12 projects have now received an additional \$1M in funding to pursue their research. There were also three directed contributions to companies with promising technologies:

CUSTOM BIOLOGICS

SARS-CoV-2 Point of Care Test Development - This project is to develop and qualify a rapid point-of-care diagnostic test for the SARS-CoV-2 virus that causes COVID-19.

TOTAL FUNDING:
\$2,776,553

DIAGNOSTICS BIOCHEM

SARS-CoV-2 ELISA kits - Development of immunoassay kits that can measure all three classes of SARS-CoV-2 antibodies simultaneously or individually.

TOTAL FUNDING:
\$1,014,000

ONCOVIR CANADA INC.

Clinical Study of Safety and Immunogenicity of Nasal Poly-ICLC (Hiltonol®) for Prophylaxis of COVID-19 in Healthy Adults - The goal of this project is to advance the clinical development of Poly-ICLC (Hiltonol®), a broad-spectrum antiviral drug candidate, as an innovative solution to strengthen medical preparedness against viral threats.

TOTAL FUNDING: \$2,099,792



INNOVATION NETWORKS



5G RESEARCH UNDERWAY

In November 2021, IDEaS invited Canadian innovators to submit a letter of intent for the development of research clusters (called micro-nets) under the newest Innovation Networks challenge: *Faster, stronger, more secure: Advancing 5G capabilities and concepts for defence and security*. Eight proposals were selected for contribution funding of up to \$1.5M for up to 3 years.

AUTONOMOUS SYSTEMS AND ADVANCED MATERIALS PROGRESS

IDEaS' first two Innovation Networks challenges, *Autonomous systems for defence and security: Trust and barriers to adoption* and *Advanced materials for defence & security: Seeking innovation in detection avoidance and physical protection*, held their first annual Innovation

Symposium in April 2021. Each micro-net updated on progress on the research they are undertaking, sharing knowledge and building their networks. The 2021 Innovation Networks Annual Symposium was a free virtual event. All members of the defence and security community, including stakeholders in defence innovation, were encouraged to attend.

The annual events are a unique opportunity for micro-nets to present their research to the defence community, the academic community, and other like-minded stakeholders. The goal of the events is to encourage collaboration between participants, share knowledge, create relationships, and to promote the development of larger Innovation Networks in these fields.



CONTESTS



CANADA COLLABORATES INTERNATIONALLY IN NATO INNOVATION HUB PITCH EVENT ON COGNITIVE WARFARE

IDEaS and the CANSOFCOM, on behalf of Canada, was given the honour of hosting the fall 2021 NATO Innovation Challenge. The theme of this pitch-style event was “Understanding and protecting the cognitive domain”.

The event was hosted virtually by Canada on behalf of NATO. Innovators presented their solutions to NATO member countries and other interested stakeholders. Cash prizes, as well as international exposure, were awarded to the top three solutions. There was also a special recognition for the top “Made in Canada” solution. Beam Me Up, a Montreal augmented intelligence firm, took home the prize for the top Canadian entry.

POP UP CITY: FINAL ROUND

The Pop up city: Integrating energy, water, and waste management systems for deployed camps Contest continues to push for new technologies to reduce DND/CAF’s global environmental footprint.

The Contest consists of four competitive rounds designed to encourage the development of integrated and scalable energy, water, and waste management systems for relocatable temporary camps. Each previous round brought innovators closer to the goal of a more efficient design, with the final round showcasing the three best solutions. In 2021-2022, innovators continued to build their solutions with IDEaS contributions.

The finale of the Contest will be completed in the summer of 2023.

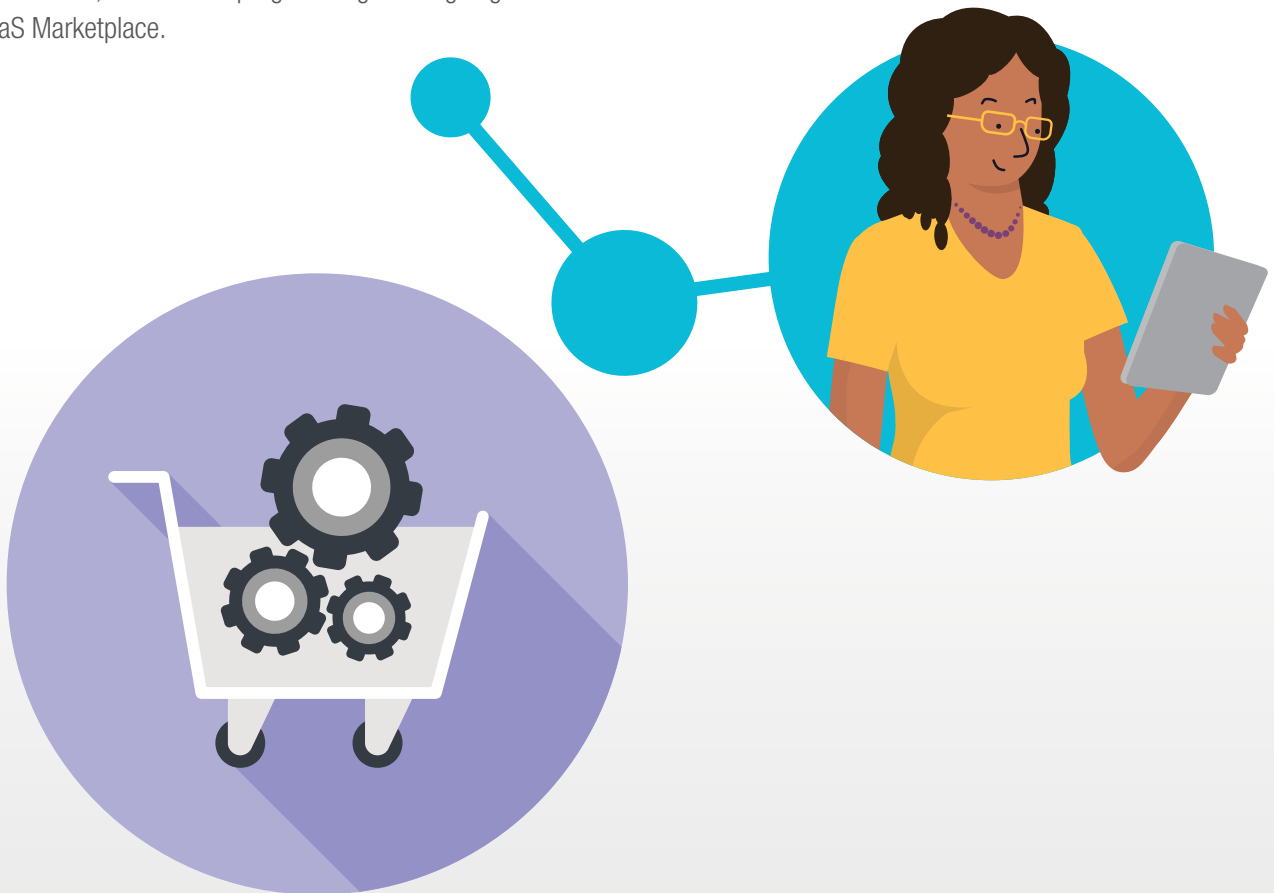


COLLABORATION AND OFF-RAMPING OPPORTUNITIES

MARKETPLACE: A CONVERGENCE OF IDEAS

IDEaS has funded numerous promising technologies in its pursuit of the best possible solutions, with many reaching an advanced state of evolution. The program's success in developing technology provided the opportunity for other government organizations and private sector firms to benefit as innovators reached the end of their IDEaS journey. To offer off-ramping opportunities, promote collaboration, and help connect IDEaS funded projects to end-users, in 2021 the program began designing IDEaS Marketplace.

IDEaS Marketplace is intended to be a place for innovators, DND/CAF personnel, other government innovation funding programs, and large defence primes to meet and learn about new technologies funded through the IDEaS program. This new initiative will help extend IDEaS investments and shape future interactions with innovators and the CAF.



STRATEGIC PARTNERSHIPS

ENGAGING SMALL BUSINESS: PROCUREMENT ASSISTANCE CANADA

IDEaS and Procurement Assistance Canada (PAC) have partnered to encourage the participation of small businesses in federal government procurement. PAC's five regional offices across Canada have in-depth knowledge of the Canadian SME community and experience with supplier and buyer stakeholders. Through Memorandum of Understanding (MOU) agreements, PAC has helped increase stakeholder outreach, holding and attending events and providing information sessions to potential IDEaS innovators.

In 2021-2022, PAC attended or hosted 167 virtual and in-person events. Through these events, PAC connected with more than 3,000 potential innovators on behalf of the program. As events return to in-person attendance, PAC expected their outreach engagements to increase in 2022.

PROTECTING IP: MOU WITH CANADIAN INTELLECTUAL PROPERTY OFFICE

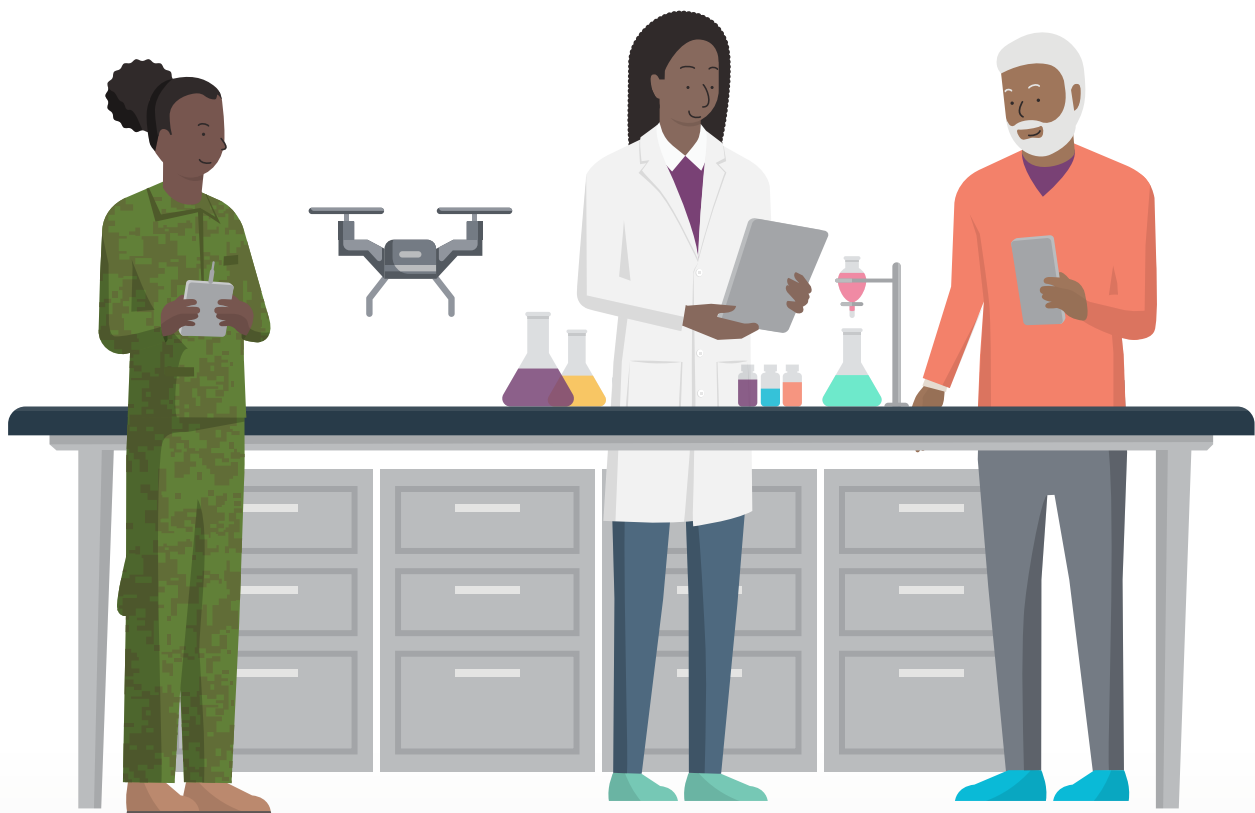
For innovators, generating Intellectual Property (IP) is one of the main benefits of working with the IDEaS program. To increase awareness and use of IP by Canadian innovators, IDEaS and the Canadian Intellectual Property Office (CIPO) signed a Memorandum of Understanding (MOU) to work together to encourage Canadians to develop and protect their IP. The agreement will allow IDEaS and CIPO to collaborate on the development of

digital and virtual content and tools to help identify, protect, and manage IP effectively. It will also strengthen key partnerships between government, industry, and academia to better inform and support SMEs on IP-related issues, and deliver a data-driven and evidence-based approach to ensure higher impact of IP program delivery.



PROGRAM EVALUATION

Like any good innovation, iterative design and re-calibration is required. In accordance with the Treasury Board *Policy on Results*, IDEaS is currently undergoing a formal program evaluation through our Review Services Branch. This review is expected to be completed in fiscal year 2022-2023.



CONCLUSION

Through four years, IDEaS has seen promising advancements in technology, built a strong innovator network, and fostered the collaboration required to push technology even further.

Progress that was initially incremental has leapt up the development path, and new partnerships have emerged to create possibilities that were not even conceived of prior to the program's inception.

At the same time, IDEaS continues to evolve in its design to adapt to new opportunities and circumstances. IDEaS Marketplace offers the opportunity to showcase activities funded through the program, where partners and potential investors will be invited to learn about their technologies.

As more projects from our initial calls complete their funded activities and are evaluated for their potential, the pace of testing of near-to-market technology will increase. As IDEaS enters its fifth year, the program will continue to augment its services, funding, and outreach to bring more technologies and solutions into the DND/CAF landscape.





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