Exclusive event for the DAIR Innovation Network

DESIGN THINKING

FULL-DAY WORKSHOP

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Hosted At:

Siemens Canada

DESIGN THINKING WORKSHOP

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BACKGROUND

NGen's Cluster Accelerator Funding has been instrumental in advancing the DAIR Innovation Network. Designed to tackle the aerospace sector's most pressing challenges, the Innovation Network fosters a collaborative ecosystem that accelerates innovation by extending an organization's capabilities beyond their own four walls. By mitigating the frictions that often delay applied research and commercialization, DAIR continues to drive engagement within its physical hub and across the broader Canadian aerospace community.

Through a series of design thinking workshops and dedicated working groups initiated in 2025, DAIR has worked to significantly bridge the gap between industry and academia. This foundational effort has cultivated a shared understanding of the aerospace value chain, setting the stage for deeper collaboration. Notably, the past year has seen a strategic evolution in focus; as Canada increases its defence commitments, DAIR has successfully expanded its scope from aerospace to a comprehensive Aerospace & Defence mandate.

DESIGN THINKING – A BRIEFING

THE SUCCESS OF ANY SUSTAINABLE INNOVATION IS RARELY THE RESULT OF A SINGLE BREAKTHROUGH. RATHER, IT DEPENDS ON THE CAREFUL ORCHESTRATION OF THREE CRITICAL LENSES:

1. **Desirability (User Focus):** The solution must meet a genuine need for the end-user or customer. Here we need to validate that either a viable market exists or one that can be strategically developed.

2. **Viability (Business Focus):** The solution must be economically sustainable and align with long-term organizational goals and brand identity. This lens addresses the risk of financial insolvency by ensuring as best as possible that the project can be developed, delivered, and scaled profitably within an acceptable timeline.

3. **Feasibility (Technical Focus):** The solution must be technically achievable. This considers whether the organization possesses, or can acquire, the necessary expertise, skill, production capacity, and technical capabilities to build and scale the solution within the required time-to-market.

By evaluating a project through these distinct perspectives, organizations can effectively mitigate the inherent risks (be they human, technical, or financial) that often derail ambitious ideas. Balancing what users truly need, what technology can realistically deliver, and what the business model can support helps to ensure that an innovation is not only inventive but also resilient and scalable in a competitive market.

Design Thinking methodology serves as a powerful mechanism for achieving equilibrium across these three lenses – desirability, viability, and feasibility. As a non-linear, iterative approach to problem-solving, it streamlines the transition from ideation to commercialization by allowing teams to continuously refine solutions based on real-world testing and feedback. By synthesizing intuitive exploration with analytical rigor, design thinking functions as a versatile framework that can seamlessly integrate into or enhance existing organizational and strategic models.

Leveraging the Design Thinking methodology also provides organizations with a structured yet flexible framework to navigate the complexities of modern innovation. While traditional linear processes often prioritize internal constraints, Design Thinking shifts the focus toward human-centric outcomes and iterative problem-solving. This approach is particularly critical in industries where traditional decision making methodologies are no longer enough to address the speed of technological change or the ambiguity of market demands.

STRUCTURE OF THE WORKSHOP

Participants were organized into multidisciplinary teams comprised of academic, industry, and partner members from DAIR's Innovation Network. Each group was tasked with a sequence of four activities designed to facilitate the development toward an end-solution to the day's pre-selected question. To ensure spontaneity and authentic collaboration, the specific instructions for each task were withheld until the immediate start of the activity.

The four activities were structured to build upon one another, with strict time constraints employed to maintain focus and ensure the workshop's conclusion within a single day. Following the completion of each activity, teams presented their findings to the broader group, facilitating a plenary session where all participants were invited to pose questions and provide constructive feedback.

The workshop employed the Scan, Focus, Act methodology. This cyclical and iterative approach enabled participants to navigate complexity and make more effective choices and decisions throughout the event. Although fundamental in its design, the method is highly effective, encouraging participants to diverge in ideas and thoughts before converging on actionable and implementable solutions.

To begin, we address the challenge of the day by asking the question:

"How might DAIR expand the shared sandbox where industry and academia in the aerospace and defence sector co-develop solutions?"

With fewer than four hours, the balance of the day was dedicated to a high-velocity 'sprint' toward developing a viable answer.

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PHASE 1 – SCAN

The Scan Phase of the workshop ensures everyone has the information needed to engage in more productive idea-sharing. Its goal is to gather insights, identify opportunities, and understand the broader environment by actively observing internal and external factors that influence decision-making. This phase provides a clear picture of the current situation, namely the challenges, opportunities, and possible paths forward.

ACTIVITY #1 – THE GOOD, THE BAD, THE WOW

The opening phase of the workshop focused on establishing a collaborative foundation through a structured icebreaker activity. This activity served a critical role in transitioning the group from simple individual introductions to a more collective mindset. While participants had already introduced themselves to the larger room, this exercise was specifically designed to encourage reflection on personal experiences and foster comfort in sharing insights with their immediate team members, a dynamic intended to support and enhance subsequent activities.

During the activity, each participant was tasked with identifying three distinct types of collaborative experiences from their past: one positive, one negative, and one "WOW" experience, with “WOW” defined as an extreme success or failure. Although participants were permitted to share examples of internal cross-team or cross-departmental projects, they were encouraged to share examples from external collaborations. Following these small-group discussions, each team nominated a spokesperson to synthesize these stories and share with the rest of the room, effectively bridging individual history with the workshop’s broader goals.

Highlights from Activity #1:

The collaborative reflection session revealed a broad spectrum of experiences, ranging from highly synergistic partnerships to those hindered by systemic friction. Participants identified successful external collaborations as those rooted in strategic alignment, where compatible organizational cultures and mutual respect allowed for results that likely could not have been achieved independently. These "good" experiences often centered on innovative problem-solving and the merging of diverse industry capabilities, which allowed teams to share specialized resources and meet aggressive deadlines more efficiently.

Conversely, "bad" experiences were frequently characterized by communication breakdowns, vague roles, and a lack of consistent information sharing. These pitfalls often led to duplicated efforts, cultural clashes over decision-making processes, or a "too many cooks" scenario where excessive cross-team involvement without clear boundaries slowed project momentum.

The most impactful takeaway from the session was a "WOW" experience involving a catastrophic structural failure of an aircraft frame, illustrating the high stakes of precision in collaborative engineering. This example detailed how exceeding design tolerance by as little as 1% resulted in an aircraft effectively falling apart. While it made for an after-the-fact humorous story, and was of course unmatched in the “WOW” category, this example served as a reminder that a failure in precision between design and manufacturing partners can lead to significant project delays.

ACTIVITY #2 – TO COLLABORATE, OR WHY NOT COLLABORATE?

The workshop session focused on the drivers and barriers of collaborating beyond an organization's "four walls." Participants were tasked with identifying ten reasons for pursuing external partnerships and ten challenges that often stand in the way of forming external partnerships. To guide the brainstorming, it was suggested that groups could frame their discussions around five core business capabilities: People, Process, Technology, Data, and the End Product.

During the first half of the activity, groups explored why an organization would look outward, noting that external collaboration allows for a diversity of talent and specialized expertise that might not exist internally. From a process and data standpoint, participants found that sharing resources can streamline workflows and provide deeper insights for better decision-making. Leveraging a partner's technology was also cited as a way to accelerate innovation, ultimately leading to a more robust and competitive end product.

The second half of the session shifted to the challenges of these external relationships. Teams identified that people-related hurdles, such as cultural friction and a lack of trust, often create significant impediments. Process and data complications, including misaligned goals and security risks when sharing information, were also highlighted as major deterrents. Furthermore, technical incompatibilities and conflicting visions for the end product can lead to duplicated efforts or a diluted final output. The activity concluded with each group nominating a spokesperson to share their top findings with the wider room.

Highlights from Activity #2:

Collaborating with external partners offers significant strategic advantages by pooling resources and expertise to drive mutual growth. At its core, these partnerships facilitate shared costs, resources, and risks, allowing companies to pursue ambitious projects that might be too taxing to handle alone. This synergy often leads to greater innovation and the generation of superior ideas, as "fresh eyes" and the sharing of technology know-how challenge internal status quo. Furthermore, such alliances support robust workforce development and provide a platform for exchanging industry best practices.

Beyond internal improvements, these relationships significantly expand a company's reach and influence. By leveraging an enlarged network built on shared trust, businesses can rapidly increase their geo-political footprint and gain critical access to new markets. Ultimately, these collaborations transform individual organizational limits into a collective strength, fostering an environment where innovation and market expansion can occur more efficiently and effectively.

Strategic partnerships and joint ventures often face significant operational and structural hurdles that can jeopardize their success. On a strategic level, aligning the vision and objectives of two distinct entities is frequently stifled by conflicting timelines and a lack of common goals, while the presence of too many decision-makers can stall progress and create administrative gridlock. Protecting assets also poses a major risk; sharing intellectual property makes it difficult to quantify value creation and risks creating a future competitor, not to mention the inherent risk of facilitating the poaching of key staff.

Operationally, collaboration is often hampered by logistical and interpersonal barriers, including differences in corporate culture and organization, disparate time zones or hours of availability that reduce efficiency, and communication gaps that wouldn't exist in an internal environment. Furthermore, deep-seated internal biases and working in distributed teams can prevent everyone from meshing effectively. These challenges are compounded by external pressures such as political risk, trust issues, complex legal implications, and significant concerns regarding systems security when integrating infrastructures.

The **Focus Phase** distills insights from the initial Scan Phase to pinpoint the most critical information. By narrowing their scope, teams can identify high-priority issues and strategic opportunities. This process establishes a clear set of actionable priorities, ensuring resource allocation is optimized and the approach to problem-solving remains targeted and efficient.

ACTIVITY #3 – PROJECTS, RESEARCH... RESEARCH, PROJECTS

Each group developed five collaborative project or applied research ideas tailored to the Canadian aerospace and defence sector. In order to keep projects on the more realistic side and less on the complete moon-shot side, it was asked that projects should be completed within a timeframe of three months to five years.

Participants began by identifying the end customer for each idea and then evaluated them through the lens of innovation: desirability to the customer, viability for generating value to the organization, and technical feasibility. Every idea was ranked from 1 (most) to 5 (least) across these three categories which would determine a ranked overall achievability rating.

An illustrated example:

Idea	Desirability	Viability	Feasibility	Overall
Idea #1	1	3	5	3
Idea #2	5	1	2	2
Idea #3	4	4	4	5
Idea #4	**2**	**2**	**1**	**1**
Idea #5	3	5	3	4

Finally, the groups shared their ranked proposals with the larger collective for broader discussion.

Highlights from Activity #3:

Future collaboration projects focused heavily on advancing autonomous systems and advanced materials to meet evolving defence and commercial needs. In the realm of unmanned technology, initiatives include developing micro drone swarms, loyal wingmen for manned-unmanned teaming, and specialized Arctic drones capable of operating in extreme climates. These are supported by intelligence-driven breakthroughs like AI-driven flight paths and even smart bullets, alongside the need for pre-travel pre-conditioned aerial drones. The infrastructure for these systems is further enhanced by the development of dual-use high-strength materials and the electrification of hydraulics, both of which prioritize performance and reliability across multiple sectors.

A second major pillar centers on industrial modernization and workforce development. This includes creating an aerospace workforce readiness framework and pioneering the application of rare earth elements to secure critical supply chains. Innovation in manufacturing is pushed forward through AI-driven design of experiments (DOE) for additive manufacturing and the certification of new composite materials. To ensure long-term sustainability and efficiency, projects also target smart MRO (Maintenance, Repair, and Overhaul) and the integration of collaborative flexible robots, alongside the certification of key product differentiators that give partners a competitive edge in global markets.

The **Act Phase** translates the insights from the Focus Phase into a roadmap forward. The objective is to implement targeted solutions and strategies based on the priorities established in previous activities. This results in tangible improvements and generates a feedback loop that informs and refines future scanning and strategic cycles.

ACTIVITY #4 – FIRST, LAST AND EVERYTHING ELSE

During the final workshop session, teams synthesized their collective insights to develop project ideas where DAIR could play a vital role in the early stages to enhance overall project success. The groups focused on their first ranked concepts from the 3rd Activity, refining them so as to leverage DAIR's resources that could accelerate the transition from conceptual to commercial validation. To help focus their collective efforts, the teams were asked to use any five specific challenges from the ten previously identified in Activity #2 and propose how DAIR's infrastructure could smooth out any part(s) of the process.

To develop these solutions a bit more, teams developed a mini-process for DAIR to help move project ideas forward faster. Finally, teams presented their ideas to the larger group for feedback and refinement. This being the final activity, groups were effectively asked to share their finished idea with the larger group.

Highlights from Activity #4:

Project #1: Loyal Wingman

A "loyal wingman" is a high-performance, autonomous unmanned combat aerial vehicle (UCAV) designed to fly alongside and support human-piloted fighter jets in combat.

The Loyal Wingman project highlights significant concerns regarding the alignment between collaborative partners, which often becomes stifled as projects progress. A primary challenge is the eventual lack of common objective alignment, where the disparate goals of individual organizations begin to diverge. This fragmentation hinders the project's overall momentum and can lead to a breakdown in effective cooperation, a recurring issue within the complex ecosystem of modern defence initiatives.

DAIR could serve as a critical middle ground to address these systemic gaps by facilitating the initial establishment of both organizational and objective alignment. By acting as an impartial 3rd party, DAIR could build essential trust between industry, academia, and government, a cohesive bond that is currently identified as a major missing component in the Defence sector. Beyond initial setup, DAIR could play a vital role in "keeping the parties honest," ensuring long-term adherence to the agreed-upon strategic objectives.

Furthermore, DAIR could develop and provide the necessary structure to navigate and resolve complex legal challenges and complications. Many of these issues are symptoms of misalignment; by maintaining consistent objective focus, many potential legal hurdles can be avoided entirely. This framework also offers a robust mechanism for the sharing of Intellectual Property (IP), allowing collaborative opportunities to be put together through DAIR with the legal and ethical safeguards required by all participating stakeholders.

Project #2: AI driven DOE (design of experiments) in additive manufacturing

The primary objective of this project is to pioneer advanced materials tailored for the aerospace and defence sectors, focusing specifically on the evolution of composites and additive manufacturing. By exploring the intersection of new material science and sophisticated machine technologies, the initiative aims to navigate the inherent complexities of modern production while unlocking new functional capabilities.

To manage the vastness of technical data, the project will scale the institutional knowledge base by digitizing the expertise currently managed manually by Frank Defalco at NGen. This new system will serve as a centralized intelligence hub, allowing members to query the platform to identify task owners, project history, and key technical contacts. A central component of this project is the development of a comprehensive connectivity platform to map the industry landscape. This platform will track "who is doing what" across the sector, identifying specific expertise, machine availability, and technological specializations. By cataloging these resources, DAIR and NGen both can facilitate better collaboration and ensure that the right partners are matched with the right technical challenges. Ultimately, this project would bridge the gap between material innovation and industrial application. By integrating high-tech data systems with a clear map of industry stakeholders, the initiative will provide the physical and technical infrastructure needed to transition new aerospace materials from the lab to the flight line.

Project #3: Pre-condition / Pre-travel drones

Pre-conditioning and pre-travel preparation for aerial drones are essential processes to ensure the aircraft is airworthy, legally compliant, and safe for transport. While pre-travel involves the logistical and physical preparation for moving the drone (especially by air), pre-conditioning (often referred to as pre-flight conditioning or inspection) is the systematic check performed immediately before a mission to verify the drone's systems and environment.

DAIR could act as a strategic mediator for aerial drone pre-conditioning and travel projects, bridging the gap between diverse industry partners. By facilitating clear communication, DAIR ensures that all stakeholders—from tech developers to end-users—stay aligned throughout the development lifecycle. This role is particularly critical as collaborative ventures grow in complexity; DAIR is positioned to step in as a dedicated Program Manager, coordinating the intricate pieces of the project to ensure seamless integration and execution. To support the high-stakes nature of aerospace and defence, DAIR could offer a secure facility that serves as a safe space for sensitive testing and collaboration.

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This environment is backed by robust confidentiality protocols and professional legal support, including access to IP lawyers. These resources would help navigate the friction of intellectual property rights, allowing partners to share expertise without compromising their proprietary assets. Beyond infrastructure, DAIR could help address the "know-how" gap by connecting teams with specialized technical expertise and potential collaborators. If a project lacks a specific skill set, the network identifies the right talent to make the integration work. This technical support is paired with significant financial backing, including an estimated minimum of $10M in funding through DAIR, with the potential for the broader network to help secure additional capital to scale the initiative.

Project #4: Dual-use, High-Strength Materials

This project focuses on the joint development of dual-use, high-strength materials, specifically targeting the creation of foreground Intellectual Property to foster seamless collaboration between partners. By establishing a shared IP framework, the initiative allows multiple organizations to contribute their unique expertise to a unified goal, ensuring that the resulting innovations are accessible and beneficial to all involved parties.

However, many companies face significant hurdles when attempting to develop these materials independently. A primary challenge is the lack of internal capacity and bandwidth, as the specialized skills required for high-strength material science are often in short supply. Furthermore, the need for speed in modern innovation cycles puts immense pressure on teams to execute quickly, which is difficult to achieve without dedicated, outside support.

To mitigate these risks, DAIR could act as a strategic partner by identifying and filling critical resource gaps. DAIR's support prevents a drain on a company's existing resources by providing the necessary infrastructure and expertise to handle technical hurdles. This allows participating teams to remain focused on high-level innovation while ensuring the project moves forward at a competitive pace.

WHAT'S NEXT

Looking ahead, a cornerstone of DAIR's long-term strategy is the development of the MOTH building, which is slated for construction during the 2026/2027 period. This facility is designed to serve as part of a premier physical Innovation Hub, providing a dedicated space for academic instruction, collaborative problem-solving and technological advancement. Additional facilities within the DAIR Hub location will expand the opportunity for collaboration and innovation. By establishing this infrastructure, DAIR is not only investing in a physical landmark but also creating a permanent ecosystem where industry leaders, researchers, and partners can converge to accelerate high-impact projects.

In the immediate term, DAIR remains committed to their highly successful initiatives, including the Green Fund, Supplier Development Initiative programs, and ongoing R&D and workforce training activities. However, the insights gathered from today's workshop mark a pivotal shift in their trajectory, offering a wealth of new perspectives on what future programming could entail. These fresh inputs will be integrated into the strategic roadmap, ensuring that any upcoming initiatives are directly responsive to the evolving needs and opportunities identified by DAIR stakeholders.

Thanks to the NGen Cluster Accelerator Funding, DAIR has been able to grow the Innovation Network in both scale and opportunities available to the members. Since January of 2025, the Innovation Network has welcomed 23 new organizations (industry and academic) and held 2 dedicated thought leadership events, the Design Thinking Workshops, to ensure DAIR understands the collective needs of all players in the aerospace ecosystem. The DAIR Team are in discussions with multiple interested organizations about the Innovation Network and are focused on building the membership in a meaningful way to continue supporting collaborative and innovative opportunities for all.

Lastly, a huge thank you to Siemens Canada for their support both for the physical location to host the Design Thinking Workshop, and to their team for the tour of their Oakville facility and the opportunity to learn more about their SMART Manufacturing technologies. It was insightful and provided those in attendance the chance to understand how these technologies could be a benefit to their own work/facilities.

Thank you to the day's participants...

DAIR would like to thank all the individuals and organizations who came to the Design Thinking Workshop for their passion and willingness to openly share their knowledge and experience during the discussions. Your commitment to the process contributed to solution roadmaps that can be explored and actioned to further enable collaboration within the aerospace ecosystem.

ATTENDEES INCLUDED: