What We Heard Report

IDEaS Space and Rocketry Ideation Session

Presented by Consortium for Research and Innovation in Aerospace in Québec (CRIAQ)

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Lumi Global
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CRIAQ

IDEaS IDEeS
INNOVATION FOR DEFENCE EXCELLENCE AND SECURITY
INNOVATION POUR LA DÉFENSE, L'EXCELLENCE ET LA SÉCURITÉ

Executive Summary

On March 31, 2026, the Consortium for Research and Innovation in Aerospace in Québec (CRIAQ) hosted the Space and Rocketry Ideation Session at Lumi Global in Montréal, Québec. The event convened invited stakeholders from Canada's space and rocketry ecosystem, including small and medium-sized enterprises (SMEs), larger aerospace firms, academia, research organizations, and government representatives.

The purpose of the ideation session was to gather targeted input to inform the next phase of the Innovation for Defence Excellence and Security (IDEaS) program of the Department of National Defence (DND) Launch the North Challenge, with a specific focus on Stream 2: Medium Lift Capability—a long-term innovation stream aimed at developing a 4,000-kg-class launch capability over a 10-year horizon.

Participants discussed strategic, technical, policy, and ecosystem factors required to build a sustainable, industry-led launch capability that enhances Canada's sovereign access to space, strengthens the national industrial base, and positions Canada as a credible long-term launch partner to allies. This report synthesizes the key themes, insights, opportunities, and considerations raised during the session.

Résumé exécutif

Le 31 mars 2026, le Consortium de recherche et d'innovation en aérospatiale au Québec (CRIAQ) a tenu la séance d'idéation sur l'espace et les lanceurs dans le cadre du programme IDEaS chez Lumi Global à Montréal, Québec. L'événement a réuni des intervenants invités de l'écosystème spatial et des lanceurs au Canada, notamment des petites et moyennes entreprises (PME), de grandes entreprises aérospatiales, des représentants du milieu universitaire, des organisations de recherche et des représentants gouvernementaux.

L'objectif de la séance d'idéation était de recueillir des contributions ciblées afin d'éclairer la prochaine phase du programme Innovation pour la défense, l'excellence et la sécurité (IDEaS) du ministère de la Défense nationale (MDN), dans le cadre du défi « Lancer depuis le Nord », en mettant particulièrement l'accent sur le volet 2 : capacité de levage moyenne — un axe d'innovation à long terme visant à développer une capacité de lancement de classe 4 000 kg sur un horizon de 10 ans.

Les participants ont discuté des facteurs stratégiques, techniques, politiques et écosystémiques nécessaires à la mise en place d'une capacité de lancement durable, dirigée par l'industrie, qui renforcerait l'accès souverain du Canada à l'espace, consoliderait la base industrielle nationale et positionnerait le Canada comme un partenaire de lancement crédible à long terme auprès de ses alliés. Le présent rapport synthétise les principaux thèmes, observations, possibilités et considérations soulevés lors de la séance.

What We Heard Report

Background

As reliance on space-based assets for defence, security, and economic activity continues to grow, Canada faces increasing pressure to ensure reliable, sovereign access to space. While near-term launch options are critical, participants emphasized that medium-lift capabilities represent the backbone of a mature national launch ecosystem, enabling a wider range of defence, civil, and commercial missions.

Stream 2 of the Launch the North Challenge is designed as a longer-horizon, industry-led innovation effort, recognizing that medium-lift systems require substantial coordination across supply chains, sustained investment, advanced infrastructure, and long-term policy alignment. IDEaS is using this ideation process to better understand how government can act as an enabler—reducing risk, aligning incentives, and fostering innovation networks capable of delivering capability at scale over a decade.

Engagement Approach

The ideation session combined expert framing presentations with facilitated discussions focused on long-term capability development. Discussions were structured to move from **strategic vision** to **practical enablers**, encouraging participants to think beyond individual technologies toward system-level and ecosystem-level solutions.

Discussion areas included:

- Canada’s desired end-state for medium-lift launch capability
- Technology and infrastructure priorities over a 10-year horizon
- Innovation network and partnership models
- Policy, regulatory, and procurement considerations
- Conditions for long-term sustainability and commercial viability

Participants engaged in guided table discussions followed by plenary report-backs, allowing common themes and divergent perspectives to emerge.

Key Themes We Heard

1. Long-Term Vision and Strategic Clarity

Participants stressed the importance of a clear, stable national vision for medium-lift launch capability. Given the scale and duration of investment required, industry needs confidence that government priorities will remain consistent over multiple budget and political cycles.

A recurring message was that Stream 2 should articulate a credible end-state—including target performance, mission classes, and sovereignty objectives—while allowing flexibility in how industry achieves that outcome.

2. Medium-Lift Capability Requires Ecosystem-Level Thinking

Unlike smaller launch systems, medium-lift capability was viewed as a system-of-systems challenge. Participants noted that propulsion, structures, avionics, range safety, ground systems, launch infrastructure, and supply chains must evolve in parallel.

As a result, participants emphasized the need for industry-led innovation networks, rather than isolated project funding, to coordinate development across multiple firms and institutions.

3. Sustained Investment and Funding Continuity

The 10-year horizon underscored concerns about funding continuity. Participants cautioned that fragmented or stop-start funding models would undermine progress and discourage private investment.

There was strong support for:

- Multi-year programmatic funding
- Clear phase-gates with predictable follow-on opportunities
- Mechanisms that allow companies to plan capital investments and workforce growth with confidence

Government's role as an anchor customer and risk-sharing partner was repeatedly identified as critical.

4. Infrastructure and Test Capacity as Strategic Assets

Participants identified domestic test and launch infrastructure as one of the most significant enablers for medium-lift capability. Access to propulsion test facilities, integration sites, and launch ranges was seen not only as a technical requirement, but as a strategic determinant of sovereignty.

Participants encouraged:

- Better utilization and coordination of existing federal, provincial, academic, and private assets
- Early planning for scalable infrastructure suitable for medium-lift class vehicles
- Policies that enable shared access while protecting safety, security, and intellectual property

5. Regulatory Predictability Over Regulatory Speed

For long-horizon development, participants emphasized that predictability and clarity in regulatory processes are as important as speed. Medium-lift systems require early engagement with regulators to ensure that design, operations, and infrastructure investments align with future licensing requirements.

Participants proposed:

- Earlier and more structured engagement between industry and regulators
- Clear guidance on how current regulatory frameworks may evolve to accommodate medium-lift launches
- Exploration of graduated or adaptive regulatory models appropriate for long-term capability development

6. Sovereignty as Control, Not Just Geography

Participants reinforced that sovereignty should be understood as decision-making authority and freedom of action, not solely the ability to launch from Canadian soil. Key dimensions included Canadian ownership, control of critical technologies, data rights, and assured access in times of crisis.

There was broad agreement that Stream 2 should explicitly support Canadian industrial leadership while remaining compatible with allied collaboration.

7. Talent, Supply Chains, and Industrial Readiness

Developing a medium-lift capability over a decade requires sustained attention to talent pipelines and supply-chain depth. Participants noted risks related to workforce attrition, competition from foreign programs, and single-point suppliers.

Long-term success depends on:

- Stable demand signals
- Integration of academia and training institutions into innovation networks
- Opportunities for SMEs to scale within Canada rather than exit prematurely

8. Managing Risk Over a 10-Year Horizon

Participants highlighted that traditional risk-averse funding and evaluation models are poorly suited to long-term, high-impact innovation. Medium-lift systems will inevitably face technical setbacks and iterative redesign.

Participants encouraged IDEaS to:

- Normalize learning through incremental testing and failure
- Use evaluation criteria that value technical credibility and systems integration capability

Balance innovation with disciplined engineering and reliability

Key Insights

- **Consistency builds confidence:** Stable objectives and funding matter more than rapid pivots.
- **Networks outperform silos:** Medium-lift capability requires coordinated innovation across many actors.
- **Infrastructure is strategic:** Test and launch assets are foundational, not ancillary.
- **Government sets the conditions:** Industry can lead, but government must align policy, regulation, and procurement.
- **Talent follows opportunity:** Long-term missions are essential to retaining Canadian expertise.

Opportunities Identified

- Define a clear Stream 2 end-state and roadmap aligned with a 10-year horizon
- Establish industry-led innovation networks supported by IDEaS
- Design multi-year funding pathways that de-risk private investment
- Map and coordinate national launch and test infrastructure
- Engage regulators early to improve long-term predictability
- Use anchor-customer models to support commercial viability
- Strengthen talent and supply-chain resilience through sustained demand

Next Steps

Insights from the ideation session will inform how IDEaS will design and implement Stream 2 of the Launch the North Challenge, including funding mechanisms, partnership models, and policy engagement. Participants broadly agreed that achieving a medium-lift launch capability is a long-term national endeavour requiring coordination, patience, and sustained commitment.

IDEaS will need to continue to engage stakeholders as Stream 2 evolves, ensuring that Canada’s approach to medium-lift launch development is ambitious, realistic, and grounded in the strengths of the national innovation ecosystem.

About IDEaS

Innovation for Defence Excellence and Security (IDEaS) is the Department of National Defence (DND) and the Canadian Armed Forces (CAF) access to innovation program. It transforms defence and security challenges being faced by DND/CAF into innovative solutions to improve Canada's defence capabilities.

IDEaS continuously taps into Canada's extraordinary talent and ingenuity with various calls for proposals every year. With its five funding elements, IDEaS supports the development of innovative solutions by helping push technology forward from early R&D to a demonstrable level that can increase defence capabilities.

IDEaS is for all Canadian innovators, from defence primes to academia, small- and medium-sized enterprises to not-for-profits, municipal/provincial/territorial entities to individuals. Details of the program, and well as information on funding opportunities and program specific news are available on the IDEaS website.

About CRIAQ

The Consortium for Research and Innovation in Aerospace in Québec (CRIAQ)

Created in 2002, the Consortium for Research and Innovation in Aerospace in Québec (CRIAQ) is a unique model for collaborative aerospace research, bringing together companies of all sizes, universities and research centers. Its mission is to increase the competitiveness of the aerospace industry by stimulating technological innovation and corporate commitment through collaborative R&D. CRIAQ also aims to develop a new generation of innovators to reinforce Quebec's technological leadership in cutting-edge aerospace applications: digital aviation, advanced air mobility and sustainable aerospace.

www.criaq.aero

Annex A – Propulsion & Engine Systems

Purpose of this Annex

This annex synthesizes findings from Propulsion & Engine Systems Breakout session during the IDEaS Space and Rocketry Ideation Session (31 March 2026). It provides a focused summary of what was discussed, the current state of Canadian propulsion capability at medium-lift scale, what is working well and where gaps remain, and how these insights should inform the design of Round 2 of the IDEaS Launch the North: Accelerating Canada's Sovereign Access to Space Challenge.

1. What Was Discussed

Participants consistently framed propulsion scaling as a systems problem rather than a discrete engine design problem. Early instincts captured in the Mentimeter emphasized *testing infrastructure* as the dominant breakpoint were propulsion transitions from engineering to system integration. Additional high-frequency themes included thermal management, propellant selection and handling, boundary-layer effects, multiple-engine architectures, and the involvement of many organizations across the value chain.

As discussion progressed, the table shifted from individual technical phenomena toward binding constraints that emerge only at medium-lift scale, including:

- The inability to validate engines at representative thrust, duty cycle, and thermal loads without domestic test infrastructure.
- Propellant handling, storage, and certification challenges that scale faster than combustion or performance gains.
- The cascading impact of propulsion constraints on vehicle mass fraction, reliability, cadence, and cost.
- The distinction between physics-limited problems (requiring fundamental research) and integration-limited problems (requiring coordinated systems engineering and infrastructure investment).

2. Current Status

The discussion indicated that Canada possesses pockets of propulsion expertise, including small-scale engine development, advanced materials research, and niche

propulsion technologies. However, at medium-lift scale, participants identified a gap between component-level capability and system-level readiness.

Key status observations included:

- No domestically accessible propulsion test infrastructure capable of supporting sustained, representative medium-lift engine testing.
- Fragmented propellant production, handling, and qualification capacity, particularly when viewed through a sovereignty lens.
- Limited ability to integrate turbomachinery, valves, cooling systems, and controls into a fully validated propulsion system within Canada.
- Dependence on foreign facilities or suppliers for critical steps in the development and validation cycle, introducing schedule, cost, and sovereignty risks.

3. What Is Going Well

Participants highlighted several positive signals:

- Strong conceptual understanding within the Canadian community that propulsion challenges at medium-lift scale are system-level and cannot be solved through isolated R&D projects.
- Growing recognition that propulsion test and integration infrastructure is a strategic national asset, not simply a support function.
- Alignment between industry, academia, and government on the need to distinguish between physics breakthroughs and integration investments when designing funding programs.
- Willingness among participants to engage in industry-led, networked development models rather than single-proponent solutions.

4. What Is Not Going Well

The session also surfaced persistent and unresolved challenges:

- Testing infrastructure is pacing progress more than combustion performance or engine design knowledge.
- Propellant handling, storage, and regulatory compliance were repeatedly described as *intractable at scale* under current conditions.

- Systems integration risks are often underestimated or treated as downstream issues rather than first-order constraints.
- Existing funding models are perceived as insufficient for sustained, multi-year propulsion system maturation, particularly where infrastructure and certification are involved.
- Regulatory and qualification pathways for medium-lift propulsion systems remain unclear and insufficiently integrated into early design decisions.

5. What Is Next

Participants emphasized that future progress depends on intentional design of the innovation environment, not simply increased technical ambition. Near-term priorities identified include:

- Early and explicit definition of medium-lift propulsion constraints that IDEaS expects proponents to address.
- Coordinated planning for domestic propulsion test capability, potentially shared across government, industry, and academia.
- Integration of regulatory and certification considerations into early-stage propulsion development.
- Long-horizon funding pathways that allow iterative testing, learning, and system maturation without penalizing failure.

6. Implications for Round 2 of the IDEaS Launch the North Challenge

Insights from the Propulsion & Engine Systems table suggest that Round 2 should not frame propulsion as a standalone technology area, but rather as a system-enabling capability tightly coupled to infrastructure, regulation, and integration capacity.

In practical terms, Round 2 could:

- Frame challenge statements around system-level propulsion barriers, such as testability, integration, and qualification at medium-lift scale.
- Encourage proposals that demonstrate credible access to, or plans for, representative propulsion testing rather than paper performance alone.
- Distinguish between physics-limited and integration-limited challenges when defining evaluation criteria and milestones.

- Support consortia or networked approaches that link engine developers, infrastructure providers, and systems integrators.
- Use propulsion constraints as a lens to assess overall vehicle credibility, cadence potential, and sovereign control.

Taken together, these measures would align Round 2 with what participants consistently emphasized: that propulsion scaling fails first at the system boundary, not at the engine drawing board.

Annex B – Structures, Materials & Mass Fraction

Purpose of this Annex

This annex captures and synthesizes the outcomes of Structures, Materials & Mass Fraction from the IDEaS Space and Rocketry Ideation Session (31 March 2026). It summarizes what participants identified as the binding structural constraints unique to medium-lift launch vehicles, assesses the current state of Canadian capability, highlights what is working and what is not, and outlines how these insights should directly inform the design of Round 2 of the IDEaS Launch the North Challenge.

1. What Was Discussed

Discussions consistently emphasized that structural mass fraction degradation is not driven by a single component, but by the compound interaction of load cases, manufacturability limits, and qualification realities that only become binding at medium-lift scale.

Initial instincts captured in the feedback from Mentimeter pointed to *propulsion-adjacent systems, upper stages, frames, mechanical interfaces,* and *materials* as where mass penalties emerge. As discussion deepened, participants converged on several system-level realities:

- Structural assumptions that hold at light-lift scale fail under medium-lift vibration, buckling, and aero-elastic coupling regimes.
- Mass penalties often arise not from poor design choices, but from the need to preserve margins under combined thermal, acoustic, dynamic, and cryogenic stresses.
- The lack of domestic test, inspection, and certification infrastructure forces conservative design margins that erode mass fraction.
- Manufacturing repeatability, defect tolerance, and inspection confidence were repeatedly noted as hidden drivers of structural mass growth, independent of material sophistication.

The table repeatedly returned to the distinction between what can be designed in theory and what can be built, inspected, transported, and qualified at scale in Canada.

2. Current Status

Participants characterized Canada's current position as structurally capable at small scale but system-limited at medium-lift scale.

Key observations included:

- Strong academic and research expertise in materials science and structural analysis.
- Limited domestic capability for large-scale composite structures, cryogenic tanks, large-diameter metallic structures, and high-temperature structural materials.
- Absence of full-scale structural test and qualification infrastructure, particularly for vibration, combined-load, and cryogenic cycling environments.
- Reliance on foreign or adjacent-market suppliers for critical materials and processes, many of which are not optimized for launch-vehicle production volumes or schedules.
- Constraints on transportation and handling of large structural components that directly affect feasible design envelopes.

Overall, participants viewed the gap as less about novel materials invention and more about scale-appropriate production and qualification capacity.

3. What Is Going Well

Several positive signals emerged:

- Clear and early recognition that mass fraction is a system outcome, not a material choice.
- Strong shared understanding that combined-stress environments, not single-axis performance, define medium-lift structural constraints.
- Alignment across industry, academia, and government that domestic test, inspection, and certification capability is as critical as design capability.
- Growing realism about the limits of adjacent-market supply chains and the need for launch-specific prioritization.
- Willingness to challenge the assumption that newer or more exotic materials automatically produce better system outcomes.

4. What Is Not Going Well

Persistent challenges were equally clear:

- Structural test and qualification infrastructure is widely viewed as the single most binding constraint.
- High-temperature materials expertise and processing capacity are fragmented and insufficiently integrated into launch-vehicle needs.
- Manufacturing constraints—defect rates, inspection confidence, low production volumes—force conservative designs that erase theoretical mass advantages.
- Certification pathways for novel manufacturing approaches (e.g., large-scale additive or composite structures) remain unclear.
- Structural design, manufacturing, inspection, and certification are often treated as separable problems when, at medium-lift scale, they are inseparable.

5. What Is Next

Participants identified several priorities for future progress:

- Early articulation of which structural constraints IDEaS expects proponents to confront directly, rather than assume away.
- Recognition that structural testing and qualification are pacing items, not downstream tasks.
- Better alignment between program timelines and the realities of material and structural maturation.
- Explicit separation of design ambition from production and qualification credibility in evaluating proposals.

6. Implications for Round 2 of the IDEaS Launch the North Challenge

Insights from the Structures, Materials & Mass Fraction table suggest that Round 2 must frame structural performance as an integrated capability challenge, not a materials R&D problem.

In practice, Round 2 could:

- Frame challenge statements around structural credibility at medium-lift scale, including vibration, buckling, transport, and combined-load qualification.

- Encourage proposals that demonstrate realistic approaches to manufacture, inspect, test, and certify large structures in Canada, not just optimized designs.
- Treat access to structural test and qualification infrastructure as a first-order evaluation criterion.
- Avoid over-rewarding novelty in materials at the expense of repeatability, inspection confidence, and timeline realism.
- Use structural mass fraction as a proxy for system integration maturity, not as an isolated performance metric.

Collectively, the table's findings reinforce a central message: at medium-lift scale, structural mass fraction erodes fastest where design intent collides with manufacturing, inspection, and qualification reality.

Annex C – Avionics, Guidance, Navigation, Control (GNC) & Autonomy

Purpose of this Annex

This annex summarizes the outcomes of discussions related to Avionics, Guidance, Navigation, Control (GNC), and Autonomy during the IDEaS Space and Rocketry Ideation Session held on 31 March 2026. It captures what participants identified as the principal technical and programmatic considerations affecting avionics and autonomy at medium-lift scale, assesses the current state of Canadian capability as perceived by participants, and outlines implications for the design of Round 2 of the IDEaS Launch the North: Accelerating Canada's Sovereign Access to Space Challenge.

1. What Was Discussed

Participants generally characterized avionics, GNC, and autonomy as non-binding technical constraints relative to propulsion and structures when scaling from light-lift to medium-lift launch vehicles. The prevailing view during the session was that most core avionics and GNC technologies are mature, well understood, and incrementally scalable.

Key discussion themes included:

- Reliance on ITAR-controlled inertial measurement units (IMUs) and GNSS (e.g., GPS) was not viewed by participants as a significant near-term constraint.
- The principal technical challenge identified was guidance, navigation, and control during descent and recovery, particularly for reusable boosters.
- Automation of the interface between the GNC system and the Flight Termination System (FTS) was highlighted as a potential means of reducing operational risk.
- Participants generally assumed that flight computers and controllers could be scaled proportionally in size, weight, power, and control authority as vehicle size increases.

The discussion, however, relied on several implicit assumptions, including operation in benign environments with stable GNSS availability and minimal external interference.

2. Current Status

Participants characterized the current status of avionics and GNC capability as adequate for progression to medium-lift, provided that external assumptions remain valid.

Key status observations included:

- Avionics hardware and embedded computing were viewed as sufficiently mature and readily available, including through international supply chains.
- No immediate technical barriers were identified in scaling flight controllers or control algorithms from light-lift to medium-lift applications.
- Integrated system testing was acknowledged as the ultimate measure of progress, but sub-component testing remains the dominant activity today.
- Regulatory responsiveness (e.g., Transport Canada and provincial authorities) was identified as a pacing factor for flight testing but not specific to avionics alone.

Overall, avionics and GNC were viewed as enabler technologies that rarely drive schedule or cost unless external conditions change.

3. What Is Going Well

Participants highlighted several positive aspects:

- Broad confidence in the technical maturity of GNC algorithms and avionics architectures.
- General acceptance that avionics scaling does not pose the same nonlinear challenges seen in propulsion or structures.
- Recognition that automation—particularly in safety-critical interfaces—can reduce operational complexity and risk if implemented thoughtfully.
- Conservative, incremental development approaches were viewed as appropriate and aligned with investor and regulatory expectations.

This risk-averse posture was seen as reinforcing system reliability, even if it limits rapid innovation.

4. What Is Not Going Well

Despite general confidence, several weaknesses emerged:

- No industry-based GNC subject-matter experts were present in the discussion, limiting the depth of challenge to prevailing assumptions.
- The discussion assumed:
    - No GNSS degradation or denial.
    - No electronically contested operational environment.
    - Sufficient structural rigidity to mitigate aeroelastic effects and propellant sloshing.
- These assumptions were largely unexamined and may not hold under more realistic operational or sovereign-defence scenarios.
- Failure was broadly viewed as detrimental rather than instructive, reinforcing conservative design choices and limiting experimentation.
- The absence of mechanisms or incentives for IP sharing within the Canadian industrial base was identified as a systemic risk to long-term capability development.

5. What Is Next

Participants emphasized that future credibility will depend less on algorithmic novelty and more on demonstrated, repeatable, integrated testing.

Key forward-looking considerations included:

- Integrated system testing as the primary indicator of meaningful progress.
- Realistic program phasing that acknowledges long development timelines; a three-year path to launch was viewed as unrealistic, while a ten-year horizon was considered more credible.
- Greater attention to regulatory pacing and test-range availability as determinants of avionics and autonomy maturation.
- Alignment between autonomy ambitions and realistic vehicle, structural, and operational constraints.

6. Implications for Round 2 of the IDEaS Launch the North Challenge

Insights from the Avionics, GNC & Autonomy discussions suggest that Round 2 should neither over-prioritize nor ignore this domain.

In practical terms, Round 2 could:

- Treat avionics and GNC as system-enabling capabilities, evaluated primarily through integration realism rather than standalone technical sophistication.
- Require proponents to clearly articulate and justify operational assumptions, particularly regarding GNSS availability, electronic environment, and structural coupling.
- Encourage credible approaches to booster recovery, automated safety interfaces, and integrated system testing, rather than incremental avionics upgrades alone.
- Use avionics maturity as a stress test for overall program realism, including timelines, regulatory interaction, and test cadence.
- Avoid assuming that avionics simplicity equates to low risk, particularly as autonomy increases and vehicles transition toward reuse.
- Taken together, the table's findings suggest that avionics and autonomy will not be the first system to fail—but unexamined assumptions around operating environments and integration could create latent risk as launch systems mature.

Annex D – Scaling-Up Challenges: Corporate Maturity, Manufacturing, Test & Qualification

Purpose of this Annex

This annex synthesizes insights from Scaling-Up Challenges & Considerations, focusing on corporate maturity, manufacturing readiness, and test & qualification as system-level constraints in developing a Canadian medium-lift launch capability. It summarizes what participants identified as the dominant non-technical pacing items, assesses current sector readiness, and outlines implications for the design of Round 2 of the IDEaS Launch the North Challenge.

1. What Was Discussed

Participants consistently framed scaling-up as primarily an organizational and industrial maturity problem, not a technology deficit. Mentimeter inputs converged on themes of capital, workforce and experienced talent, supply chain readiness, manufacturing at scale, and test and qualification capacity as the most limiting factors for medium-lift development.

Key discussion threads included:

- Corporate maturity: The ability to plan, integrate, and deliver large, multi-year, multi-supplier programs was viewed as uneven across the sector.
- Manufacturing reality vs. design intent: Participants emphasized that producing quality at scale—repeatably and with confidence—was poorly understood by early-stage companies and often underestimated by investors.
- Test & qualification as a pacing item: High-thrust test stands, test ranges, inspection, and qualification capacity were repeatedly cited as constraints that money alone cannot solve.
- Time and phasing: Scaling requires long horizons; several participants explicitly challenged the viability of short timelines absent intermediate value creation.

Across discussions, the table returned to the idea that scaling-up exposes gaps between startup logic and sovereign capability development.

2. Current Status

Participants described the current Canadian ecosystem as entrepreneurial but immature relative to the demands of medium-lift launch development.

Key status observations included:

- Capital and financing are available for early R&D, but patient capital for manufacturing infrastructure, test assets, and long qualification cycles is limited.
- The supply chain lacks sufficient experience in high-complexity, low-volume space manufacturing, increasing cost and risk as scale grows.
- Manufacturing infrastructure (e.g., large CNC, additive manufacturing equipment) is expensive and often low-utilization during R&D phases, making it unattractive to private investors.
- Test & qualification infrastructure, including high-thrust stands and ranges, remains fragmented, constrained, or externally dependent.
- Regulatory engagement capacity exists, but speed, sequencing, and clarity were seen as limiting when combined with startup timelines.

3. What Is Going Well

Participants identified several strengths:

- Clear, shared recognition that scaling is not an extension of R&D, but a distinct phase requiring different skills, capital structures, and governance.
- Growing acknowledgement that manufacturing quality and repeatability, not peak performance, determines credibility.
- Recognition of IDEaS' role in providing initial demand signals to help reach early capability thresholds.
- Willingness across stakeholders to discuss uncomfortable topics, including corporate maturity, ownership structures, and long-term intent.

4. What Is Not Going Well

Persistent challenges were consistently emphasized:

- Organizational maturity gaps—including program management, systems integration, and supplier coordination—were seen as sector-wide vulnerabilities.

- Difficulty attracting and retaining experienced talent due to competition, long timelines, and uncertainty.
- Manufacturing at scale is insufficiently understood by entrepreneurs and insufficiently valued by venture capital.
- Testing and qualification are under-resourced and under-planned relative to their impact on schedules and credibility.
- Investor hesitation driven by unclear market demand, long timelines, and limited intermediate revenue opportunities.
- Fragmented policy, regulatory, and funding processes that collectively slow progress, even when individual elements function adequately.

5. What Is Next

Participants emphasized that credibility in scaling will depend on intentional program and ecosystem design, not incremental fixes.

Key forward-looking considerations included:

- Early differentiation between R&D readiness and scale readiness in program expectations.
- Program structures that recognize the cost and time required to build manufacturing, test, and qualification capacity.
- Clear articulation of end-state market demand, including the role of government as an anchor customer.
- Phased approaches that allow value creation and learning during long development timelines, rather than binary success/failure outcomes.

6. Implications for Round 2 of the IDEaS Launch the North Challenge

The Scaling-Up table's insights suggest that Round 2 must explicitly account for non-technical readiness if medium-lift ambitions are to be credible.

In practical terms, Round 2 could:

- Evaluate proponents on organizational and manufacturing maturity, not just technical promise.
- Recognize test and qualification access as a first-order system constraint and evaluation factor.

- Encourage realistic phasing that bridges R&D and scale-up rather than assuming seamless transition.
- Distinguish between companies pursuing short-term exits and those structured for long-term sovereign capability development.
- Use consistent government demand signals to reduce market uncertainty and attract talent, suppliers, and patient capital.

Collectively, the findings reinforce a central message: Canada’s medium-lift challenge is paced less by rocket physics than by the ability of organizations, supply chains, and institutions to mature together.

Annex E – Cross-Cutting System Constraints: Infrastructure, Integration & Program Realism

Purpose of this Annex

This annex consolidates cross-cutting constraints identified throughout the IDEaS Space and Rocketry Ideation Session that do not sit cleanly within a single technical domain but consistently emerged as system-level limiting factors. It focuses on constraints related to infrastructure, systems integration, program realism, and ecosystem readiness, drawing on Breakout 2 discussions as well as participant notes submitted following the session.

1. What Was Discussed

Across multiple breakout tables and plenary discussions, participants repeatedly emphasized that the most binding constraints to achieving a Canadian medium-lift launch capability are not isolated technical problems, but interdependent system and program constraints.

Recurring themes included:

- Testing infrastructure as a foundational constraint, particularly for large-scale propulsion, structural, and integrated system testing.
- The reality that “it is always a systems problem” reflects the difficulty of integrating propulsion, structures, avionics, operations, and safety into a coherent, qualified launch system.
- The nonlinear way in which infrastructure, logistics, and scale interact, particularly for medium-lift vehicles.
- The importance of accepting that launch failure is likely and should be accommodated within program design rather than treated as an exception.

Participants consistently framed these issues as determinants of feasibility, not secondary implementation details.

2. Current Status

The current Canadian context was characterized as technically capable, but system-constrained.

Key observations included:

- No domestic test location currently exists that can support the safety distances, acoustic loads, propellant quantities, and operational tempo required for medium-lift engines and vehicles.
- Industrial participants expressed strong interest in government-enabled shared test infrastructure, noting that similar needs exist across defence programs.
- Northern and remote locations were identified as potential options, but participants flagged logistics, accessibility, and engagement with Indigenous communities as critical considerations.
- Supply chains, transportation networks, and launch-site support infrastructure were recognized as potential single-point failures if not addressed early.
- Program-level assumptions often underestimate timelines, costs, and workforce maturity required to reach high TRL levels.

3. What Is Going Well

Participants identified several areas of alignment:

- Strong consensus that testing infrastructure is a national, cross-program asset, not an individual project expense.
- Shared understanding that integration risk grows faster than subsystem complexity as vehicles scale.
- Realism about timelines: multiple participants noted that advancing engines or launch systems to TRL 8 is a decade-scale effort, not a short-term project.
- Broad awareness that scale drives secondary effects—pad wear, refurbishment cycles, logistics strain—that must be planned for explicitly.
- Willingness to discuss uncomfortable but necessary topics such as workforce immaturity, cost magnitude, and investor risk tolerance.

4. What Is Not Going Well

Equally consistent concerns emerged:

- Over-optimistic timelines and cost assumptions remain common in early-stage proposals.
- Fragmented infrastructure planning risks creating bottlenecks that cannot be solved late in development.
- Workforce capacity—engineers, technicians, inspectors—is insufficiently mature and not being developed at the pace required.

- Heavy reliance on foreign suppliers, ITAR-controlled materials (e.g., RP-1), and non-Canadian testing facilities undermines sovereignty objectives.
- The absence of clear exclusions and sequencing risks funding activity that is technically interesting but programmatically stagnant.

5. What Is Next

Participants emphasized that progress depends on intentional program architecture, not incremental technical advances alone.

Forward-looking considerations included:

- Treating test infrastructure, launch sites, and logistics as first-order program elements.
- Designing programs that explicitly assume failures, redesigns, and learning cycles.
- Aligning workforce development, regulatory engagement, and capital planning with realistic timelines.
- Ensuring that funded work contributes to a coherent, integrated system pathway rather than isolated technical demonstrations.
- Using constraints and exclusions to drive focus, realism, and credibility, rather than limiting innovation.

6. Implications for Round 2 of the IDEaS Launch the North Challenge

Insights from this cross-cutting discussion suggest that Round 2 success will be determined as much by infrastructure and program design as by technical ambition.

In practical terms, Round 2 could:

- Explicitly recognize testing and integration infrastructure as pacing items and evaluation criteria.
- Require proponents to articulate credible logistics, launch site, and supply-chain assumptions.
- Normalize long timelines and staged progress rather than compressing development unrealistically.
- Reinforce that sovereign access to space is a system-of-systems challenge, not a sequence of disconnected projects.

- Use constraints and exclusions to protect the integrity and credibility of the medium-lift objective.

Participants consistently emphasized that ignoring these system-level constraints will result in stalled or symbolic progress, regardless of technical merit.

Annex F – Ecosystem Roles, Authority & Integration (System Integrators, Industry, Academia, Government)

Purpose of this Annex

This annex consolidates insights from Ecosystem Roles, Authority & Integration, with additional synthesis from participant notes submitted following the session. It focuses on how roles, decision authority, and integration responsibility must be structured to enable a credible Canadian medium-lift launch capability, and where misalignment currently risks slowing or undermining progress.

1. What Was Discussed

Participants repeatedly emphasized that medium-lift rocketry is fundamentally an integration problem, not a shortage of ideas or isolated technical capability. The discussion focused on who must own what, which decisions cannot be delegated, and where Canada's ecosystem currently lacks coherence.

Key themes included:

- The central role of a system integrator with clear authority over requirements, trade-offs, schedules, and verification.
- Persistent confusion across the ecosystem about who is accountable versus who is contributing.
- The tendency for technology development to be pushed by available funding, rather than pulled by a clearly articulated system demand.
- Structural fragmentation between industry, academia, and government, driven by misaligned incentives and timelines.

Participants stressed that collaboration without authority does not scale.

2. What the System Integrator Must Never Delegate

There was strong consensus that certain functions must remain centralized under a single integration authority in a medium-lift program:

- Ownership of system-level requirements and internal specifications
- Accountability for safety-of-flight and certification decisions
- Overall verification and validation strategy
- Risk identification and prioritization (with only non-critical paths delegated)

- Final arbitration of technical and programmatic trade-offs

Participants noted that while centers of expertise may exist outside Canada, integration authority cannot be outsourced without undermining sovereignty objectives.

3. Where Industry, SMEs, and Academia Add Value

The discussion clearly differentiated where each actor provides the most value when properly integrated.

Industry

- Best positioned to demonstrate, industrialize, and integrate technologies.
- Requires clear milestones and expectations that culminate in demonstrated outcomes, not perpetual development.
- Responds strongly to demand signals; “industry follows the money” unless anchored by credible system needs.

SMEs

- Viewed as potentially faster and more agile in solving focused technical problems.
- Provide value when scoped to bounded subsystems or enabling technologies, rather than being asked to integrate end-to-end solutions.

Academia

- Adds leverage through HQP training, exploratory research, and long-horizon problem-solving.
- Must be engaged selectively, as incentives to publish influence what problems are appropriate.
- IP considerations matter; models such as CRIAQ’s academic-IP/industry-license framework were cited as workable examples.

Participants cautioned against assuming that all roles are interchangeable or that inclusion automatically equates to impact.

4. Current Ecosystem Constraints

Participants identified several systemic weaknesses:

- Limited shared understanding of how to build a rocket as a system, particularly among organizations new to rocketry.
- Difficulty mapping who is doing what in Canada, as ecosystem information is fragmented or unavailable.

- Gaps in identifying Canadian suppliers for critical materials and processes.
- Tension between sovereignty goals and the participation of non-Canadian firms establishing Canadian presences.
- Lack of clarity around downstream phases, including operations and maintenance (O&M) responsibilities.

These issues were described as structural rather than technical.

5. What Is Going Well

Participants did identify areas of progress:

- Strong appreciation for demonstration-driven programs, such as industry demonstration models that require teams to show tangible outcomes.
- Recognition that IDEaS plays a valuable role in forcing convergence around demonstrations and TRL advancement.
- Increasing realism about the time required—often a decade—to move from early capability to sustained manufacturing and operations.
- Willingness across participants to discuss difficult issues related to authority, incentives, and failure.

6. What Is Not Going Well

Recurring concerns included:

- Diffuse authority leading to stalled decision-making.
- Over-emphasis on early R&D without sufficient pressure to converge on integrated systems.
- Weak demand signals that make it difficult for industry to invest confidently.
- IP and export-control considerations creating friction if not addressed early.
- Risk that collaboration becomes an objective in itself, rather than a means to execution.

Participants emphasized that ecosystem goodwill does not replace accountability.

7. Implications for Round 2 of the IDEaS Launch the North Challenge

Insights from the Ecosystem Roles, Authority & Integration discussions suggest that Round 2 must be deliberate in how it structures collaboration and authority.

In practical terms, Round 2 could:

- Require a clearly identified system integrator with non-delegable responsibilities.
- Evaluate proposals on ecosystem architecture and governance realism, not just technical merit.
- Use incentives to reward demonstration, continuity, and escalation, rather than dispersed participation.
- Define explicit boundaries for academic and SME roles to protect integration efficiency.
- Align IP and international collaboration frameworks with sovereign capability objectives.

Participants consistently emphasized that medium-lift success depends on disciplined integration, not maximal participation.

Annex G – Time Scale, Program Phasing & Realism: Failure, Reusability, and Regulatory Pacing

Purpose of this Annex

This annex builds on findings from Time, Scale & Program Phasing Realism, incorporating additional perspectives captured in participant follow-up notes. It focuses on how reusability assumptions, regulatory engagement, and acceptable failure modes materially affect realistic timelines and program phasing for a Canadian medium-lift launch capability. The intent is to clarify where optimism must be constrained by structural realities and where IDEaS program design can enable credible learning within bounded risk.

1. What Was Discussed

Participants emphasized that time scale realism is inseparable from design choices, particularly decisions around reusability, regulatory engagement, and where failure is allowed to occur.

Key discussion themes included:

- Reusability as an economic necessity at medium-lift scale, increasing launch cadence and long-term viability—but at the cost of additional systems, mass, and complexity, especially in guidance, navigation, and control (GNC)
- Recognition that larger vehicles introduce non-linear physical effects (e.g., propellant sloshing, higher vibration environments) that lengthen development and test cycles compared to small-lift rockets.
- Broad consensus that ground infrastructure and regulatory engagement timelines are frequently omitted or underestimated in early program planning.
- Clear differentiation between:
    - *Engineering questions* (“Can we build it?”), and
    - *Regulatory questions* (“Can we certify or qualify it?”),
      with participants noting that these timelines do not always align.

2. Current Status

Participants described a persistent mismatch between program ambition and institutional pacing realities.

Key status observations included:

- Regulatory processes, particularly through Transport Canada, were cited as capacity-constrained, with timelines that can significantly affect development schedules for SMEs and startups.
- Regulatory engagement is often initiated too late, when design changes are costly and timelines are less flexible.
- Flight termination systems (FTS) were identified as an example where qualification, rather than formal certification, defines progress—but still imposes real schedule constraints.
- Infrastructure availability—especially propellant-agnostic test facilities located away from populated areas—was seen as a gating factor independent of funding.

3. What Is Going Well

Participants identified several areas of convergence:

- Strong alignment that failure must be expected and categorized, not treated uniformly.
- Clear support for a distinction between:
    - Failures that are only discoverable through flight (acceptable and instructive), and
    - Failures that should have been caught during ground testing (less acceptable).
- Recognition that design-phase regulatory engagement materially improves downstream schedule predictability.
- Agreement that clear, concrete, and achievable objectives are essential to maintaining momentum and credibility within time-bounded programs.

4. What Is Not Going Well

Participants highlighted several recurring risks to realism:

- Reusability is often treated as a future enhancement, when in practice it must be designed in from the outset—extending early timelines.
- Regulatory timelines are still frequently treated as adjustable variables, rather than fixed external constraints.

- Manufacturing-scale realities (e.g., higher vibration loads, defect tolerance, material trade-offs) are underestimated and surface late, leading to schedule resets.
- Program designs sometimes fail to specify what failure modes are acceptable, creating confusion during evaluation and public communication.

5. What Is Next

Participants emphasized that credible timelines depend on front-loading realism, not managing it later.

Forward-looking considerations included:

- Defining acceptable failure modes in advance and aligning them with explicit test stages.
- Initiating regulatory engagement during the design phase, not as a pre-launch formality.
- Sequencing infrastructure development in parallel with vehicle development, rather than assuming availability.
- Explicitly accounting for the mass, integration, and testing impacts of reusability when setting milestones.
- Making IDEaS requirements for the next phase specific and test-based, rather than aspirational.

6. Implications for Round 2 of the IDEaS Launch the North Challenge

Insights from this discussion reinforce that Round 2 timelines must be anchored in what can be learned safely and credibly within the program window, not what could be achieved under ideal conditions.

In practical terms, Round 2 could:

- Require proponents to explicitly state which failures are acceptable and why.
- Treat regulatory timelines and infrastructure availability as first-order constraints in proposal evaluation.
- Ensure reusability assumptions are reflected in early phase scope, mass budgets, and test plans.

- Align funding milestones with demonstrated learning and risk reduction, rather than single events.
- Communicate openly that extended timelines are not a weakness, but a marker of serious system development.

Participants consistently emphasized that realism—especially about failure, regulation, and scale—is what separates credible progress from symbolic advancement.

Annex H – Sustainability, Government Coordination & Non-Technical Risks

Purpose of this Annex

This annex summarizes findings from Sustainability, Government Coordination & Non-Technical Risks, which focused on identifying the non-technical conditions that could undermine Stream 2 of the IDEaS *Launch the North* Challenge, even if technical R&D objectives are achieved. The discussion examined sustainability of effort, government coordination, policy and funding coherence, workforce development, regulatory capacity, and broader public-interest risks that shape long-term viability of a sovereign medium-lift launch capability.

1. What Was Discussed

Participants consistently emphasized that technical success is insufficient on its own. The table focused on risks that operate quietly and cumulatively—often becoming visible only after significant investments have been made.

Opening Mentimeter responses pointed to:

- Funding continuity and consistency
- Inconsistent policy signals
- Misalignment with payload customer needs
- Government demand uncertainty
- Risk aversion and intolerance to failure
- Public acceptability and social licence
- Regulatory capacity constraints

As discussion progressed, the emphasis shifted from listing risks to identifying assumptions that should not be embedded in program design, particularly assumptions that may not materialize and could destabilize Stream 2 if left unexamined.

2. Current Status

Participants described the current environment as one where non-technical risks are real but unevenly acknowledged.

Key observations included:

- Policy and funding frameworks were viewed as inconsistent across time and departments, creating uncertainty for long-term industrial investment.
- Government demand signals were seen as necessary but currently insufficiently explicit to anchor private capital and workforce decisions.
- Regulatory processes—while essential—were identified as capacity-constrained, potentially becoming pacing items as activity scales.
- Workforce development was identified as a multi-year endeavour (3–5 years), with retraining estimates of six months viewed by some participants as optimistic given aerospace safety and certification requirements.
- Environmental, safety, and community considerations related to launch sites were recognized as complex, multi-stakeholder challenges, not box-checking exercises.

Overall, participants characterized sustainability risks as systemic and interdependent, rather than isolated issues.

3. What Is Going Well

Participants identified several positive signals:

- Strong alignment that non-technical risks must be explicitly surfaced and managed, rather than assumed away.
- Shared understanding that long-term commitments—policy, funding, and demand—are critical enablers of competitiveness.
- Recognition that government can reduce industry risk through predictable regulatory pathways and coordinated action, even where market demand remains uncertain.
- Openness to exploring mechanisms such as allied participation or shared use, provided sovereignty, safety, and geographic realities are respected.
- Broad agreement that sustainability requires deliberate coordination across departments, rather than siloed program execution.

4. What Is Not Going Well

The discussion highlighted several persistent vulnerabilities:

- Over-reliance on assumptions such as:
    - Sufficient commercial demand materializing quickly
    - Rapid company scale-up
    - A readily available talent base
    - Uniform understanding of what “sovereign” means
- Risk that short-term funding cycles and demand signals undermine long-horizon capability development.
- Limited clarity on how government intends to incentivize private investment while sharing risk appropriately.
- Underestimation of public perception, environmental review, and community acceptance as schedule- and scope-defining factors.
- Concern that intolerance to failure—political, public, or institutional—could suppress learning and slow progress.

Participants repeatedly warned that non-technical risks accumulate silently until they become program-limiting.

5. What Is Next

Participants emphasized that sustainability depends on intentional program design choices made early.

Forward-looking considerations included:

- Clearly stating which assumptions IDEaS will not rely on in Stream 2 design.
- Distinguishing risks that can be resolved through program structure from those that must be explicitly acknowledged and managed.
- Coordinating policy, funding, regulatory engagement, and workforce planning to reduce friction and uncertainty.
- Establishing predictable demand and commitment signals that extend beyond single program cycles.
- Integrating sustainability considerations—economic, regulatory, environmental, and social—into evaluation criteria, not as afterthoughts.

6. Implications for Round 2 of the IDEaS Launch the North Challenge

Insights from the Sustainability, Government Coordination & Non-Technical Risks table suggest that Round 2 credibility will depend as much on coherence and coordination as on technical ambition.

In practical terms, Round 2 could:

- Avoid embedding assumptions about market maturity, talent availability, or rapid commercial demand.
- Explicitly acknowledge sustainability risks in CFP design, rather than treating them as externalities.
- Reinforce coordination across government to provide consistent policy and demand signals.
- Treat regulatory capacity, community engagement, and public acceptability as first-order program considerations.
- Communicate clearly that long-term capability development requires patience, tolerance for failure, and institutional consistency.

Participants consistently emphasized that without alignment across funding, policy, regulation, and demand, technical success alone will not produce a sustainable sovereign launch capability.