Next Generation Military Vehicle (NGMV)
(Bringing New Technology to Conventional Military Vehicles)

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Provide an overview of the NRC’s Next Generation Military Vehicle (NGMV) initiative and seek feedback from potential enablers, contributors and partners.
Goal of the NGMV Initiative

Deliver both a virtual and a physical demonstrator that highlights new technology concepts to meet the demands of the future battlefield.

NRC currently has one AVGP Cougar and one AVGP Husky. Investigating the possibility of acquiring 1-2 Coyotes when they are declared surplus.
Agenda

• Introduction to NRC
• Background
• Scope
• Legacy challenges and problems
• Technology Considerations
• Benefits and Challenges
• Potential Partners
• Implementation Strategy
About NRC

- Government of Canada’s Premier Research and Technology Organization (RTO)
- Celebrating 100 years of service in 2016
- $895M annual R&D investment
- 3,550 employees
- Serve thousands of industrial and government clients annually
NRC Corporate

- NRC is a Departmental Corporation of the Government of Canada, reporting to Parliament through the Ministers of Innovation, Science and Economic Development (Navdeep Bains); Science (Kirsty Duncan); and Small Business & Tourism (Bardish Chagger).

- NRC is governed by a council of appointees drawn from its client community
NRC Mandate

Our mandate
• Stimulate wealth creation for Canada through innovation.

Our mission
• Accelerate the growth of small and medium-sized enterprises by providing them with a comprehensive suite of innovation services and funding.

Our vision
• Be the most impactful program of its kind in the world, where Canadian firms go first to transform their ideas into commercial success.
The Canadian Army’s strategy, as articulated in its latest policy document *Advancing with Purpose* (September 2014), clearly states it will continue to operate as a medium-weight force across the full spectrum of operations from “peacetime military engagement” to high intensity conflict.

This implies the continued use of armoured platforms and systems to “seize and hold ground.”
Currently the CAF relies on a fleet of approximately 850 wheeled and 300 tracked armoured vehicles configured for various military functions such as APC, Reconnaissance, CP, ambulance, etc

• Bison Vehicle Fleet (~200) [LAV 2.5]
  – Entered service in 1990
  – Based on MOWAG Piranha design from 1972

• LAV III Fleet (~650)
  – Entered service in 1999
  – Based on MOWAG Piranha IIIH designs originating from 1972
  – 550 currently being upgraded to LAV 6.0 (to be in service until at least 2035)

• M113 Tracked Fleet (~300 remain until 2020, 850 declared surplus)
  – First fielded in 1960s by US Army
Why Now?

• Development of the next-generation fighting vehicle seems to have peaked in the early to mid 2000’s
• At that time, several large US OEM’s exhibited prototype vehicles
• Active efforts in vehicle development was slowed/halted as a result of the wars in Iraq and Afghanistan, but things seem to be ramping up again
• Consequently, the timing is perfect to lay the initial groundwork for the development of the Next Generation Military Vehicle
The scope of the NGMV demonstrator is to:

• Implement evolutionary technologies developed for ground vehicles into a military platform in order to:
  – demonstrate viability; and
  – measure impact compared to conventional methods.

• Develop synergy between the various integrated technologies to leverage the benefits of each.

• Ultimately to deliver to industry the most promising concepts to be further commercialized
Conventional military vehicle propulsion and power distribution technologies are:

- Design limited by the role or task of the platform
- Lack flexibility to integrate new systems (modularity)
- Lack of an obstacle detection system for autonomous vehicle navigation
- Inefficient on-board power utilization
- Poor extreme temperature performance
- High noise and thermal signature of propulsion system
Conventional military vehicle propulsion and power distribution technologies are:

- Vehicles are nearing (or at) their gross maximum weight
- Useable internal space is at a premium
- Ever increasing in-service costs
- Ever increasing need for electric energy to run onboard (and dismounted) systems
NRC Organizational Structure

DIVISIONS

Emerging Technologies
- Information and Communications Technologies
- Measurement Science and Standards
- National Science Infrastructure
- Security and Disruptive Technologies

Engineering
- Aerospace
- Automotive and Surface Transportation
- Construction
- Energy, Mining and Environment
- Ocean, Coastal and River Engineering

Life Sciences
- Aquatic and Crop Resource Development
- Human Health Therapeutics
- Medical Devices

Industrial Research Assistance Program
- Pacific Region
- West Region
- Ontario Region
- Quebec Region
- Atlantic & Nunavut
- National Office

Common Services to support portfolios and IRAP
Security Materials Technologies

Developing, validating and deploying cost-effective protection systems for personal protection equipment and armoured vehicles.

Key technology areas:

• Technology platform development
• Engineered materials products
• Personal protective equipment (PPE) products
• Vehicle armour products
We work with automotive and surface transportation manufacturers and suppliers to strengthen research and technology development, product innovation and manufacturing process capabilities from concept to commercialization.

Helping develop even the most complex engineering solutions with:

• unique infrastructure and expertise
• state of the art testing and experimentation services
• advanced manufacturing processes
• novel materials and design concepts
Leading expertise

Our experts help optimize your solutions to enhance fuel efficiency, manufacturing and safety for transportation industry with

- Targeted component and prototype development
- Materials manufacturing and processes
- Fuel efficiency, battery and fuel cells
- Aerodynamic performance
- Power management
- Vehicle intelligence
- Dynamic and structural computer modelling and analysis
- Environmental simulation and analysis
- Climatic challenges, safety, and environmental impact
Key research areas

We collaborate with companies across the surface and transportation sector at all stages of product development, focusing on novel solutions in:

- Lightweighting of Ground Transportation Vehicles
- Vehicle Propulsion Technologies
- Advanced Manufacturing and Design Systems
- Industrial Biomaterials
- Fleets and large, heavy duty vehicles optimization
- Rail vehicle and track optimization
Unique facilities

Single-location access to an exceptionally wide variety of facilities to test vehicles and components

- Aluminium technology centre
- Laser processing and surface modification centre
- Six wind tunnels, including a 9m x 9m x 23 m one
- Polymer, composite and biomaterial processing
- Powder metallurgy and spray coatings processing
- Fuel cell development and testing
- Heavy vehicle testing including climatic and tilt testing
Vehicle Propulsion Technologies

Develop and validate technologies to improve the efficiency of the internal combustion engines
Deliver advanced propulsion technologies through vehicle hybridization and electrification

Leverage expertise that spans automotive, energy storage, chemistry and chemical engineering, energy and environment, manufacturing and materials

Accelerating development of innovative propulsion technologies and alternative fuels for future energy efficient vehicles
Advanced Manufacturing and Design Systems

Develop innovative technologies to improve product design, reduce the costs and time required to design, develop and manufacture automotive parts.

- Advanced manufacturing
- Design-to-manufacture software

Significantly reducing automotive design and manufacturing costs to increase Canadian manufacturers ability to compete globally
Technology Thrusts (1/2)

Technology streams to be investigated:

• Mechanically decouple the power source from propulsion
• Electrification of the propulsion system
• Automated and intelligent propulsion system able to adapt to load and terrain in real-time
• Low noise and thermal signature power sources and storage systems
• Intelligent electrical power management systems able to adapt to changes in the mission and/or role
Technology Thrusts (2/2)

Technology streams to be investigated:

• Advanced materials for light weighting to enhance mobility and survivability (such as light-weight armour and disk brakes)
• Intra-vehicular networking (Vetronics) of all onboard systems
• Collaborative inter-vehicle mobility intelligence (“swarm”) capability
• Real-time terrain awareness for intelligent mobility control
Proposed Implementation Strategy/Timeline

• Identify core team to develop solution architecture
• Generate work plan and budget
• Perform technology analysis and simulations
• Identify & prioritize technology streams and architectures
• Design & Build most promising architectures
• Conduct systems integration on platform
• Conduct static and mobility tests
• Establish partners to deploy production versions of components
Potential Partners

• Vehicle OEMs and aftermarket manufacturers
• System integrators
• Battery and alternate vehicle power generation companies
• Material and armour producers
• Suspension and tire companies
Why NRC?

NRC is uniquely positioned with centres of excellence in:

- Vehicle mobility design and modelling
- Fundamental battery research
- Advanced composite materials
- Vehicle propulsive technology expertise
- High power electrical design capabilities
- Complete testing and integration facilities
- Unique position between OEM’s and DND (fundamental knowledge of both the needs of the CAF and industry)
NRC Solutions Centre

• A physical collaboration centre for established companies
  • Not an incubator!
• Access point to NRC research, design & development experts & services
• Confidential work spaces for individual firms or multi-party work
• NRC-supplied project management to teams, as required

➢ Design and construction phases approved and in process
Solutions Centre Concept
Your R&D solutions provider

We work with companies, associations and government to

• Solve client specific and industry-wide technology problems
• Bridge the gap between early-stage R&D and technology market readiness to decrease investment risk
• Develop, adapt and transfer technology reducing time to market
• Create complex multidisciplinary technical solutions that address emerging industry needs

Our world renowned experts and one of a kind facilities combine to give you unique technology solutions and shorter time to market
What do we do?

• Conduct **collaborative and strategic R&D** projects to answer complex, emerging technology questions

• Provide **testing and advisory services** to solve near-term problems

• Develop and license **technology** to reduce time to market

• Facilitate access to **big science infrastructure** to validate and improve performance of even the most novel solutions
Next steps

• Confidentiality agreement requirements
• Potential projects deep dive
• Research needs
• Testing needs
• Licencing opportunities
• Intellectual property options
• Scope of work statement
Thank you
For more information on how we can help you please contact
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