PRATT MILLER

TRANSFORMING WHAT'S POSSIBLE.

Modularity in Motion

Accelerating the Future of Defense, Motorsports, and Mobility

Jon Honig, Vice President, Mobility
Steve Hechtman, Manager, Embedded Controls

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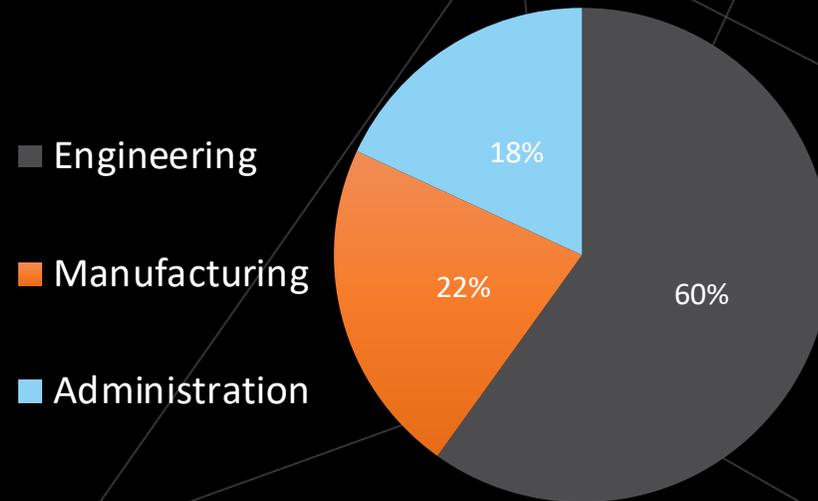## TRANSFORMING WHAT'S POSSIBLE.

EST. 1989

TEAM MEMBERS ~370

ANNUAL REVENUE $120M

WHOLLY OWNED SUBSIDIARY OF OSHKOSH CORP.

EMPLOYEE DISTRIBUTION

- Engineering — 60%
- Manufacturing — 22%
- Administration — 18%

LOCATIONS

NEW HUDSON, MI

Home of Pratt Miller's corporate headquarters and four satellite buildings spanning approx. 205K sq. ft of state-of-the-art engineering and manufacturing space.

HUNTERSVILLE, NC

Home of Pratt Miller's Driver in the Loop (DiL) Simulator.

TOP WORK PLACES 2012 — Detroit Free Press
TOP WORK PLACES 2013 — Detroit Free Press
TOP WORK PLACES 2014 — Detroit Free Press
TOP WORK PLACES 2018 — Detroit Free Press
TOP WORK PLACES 2024 — Detroit Free Press
TOP WORK PLACES 2023 — Detroit Free Press
TOP WORK PLACES 2022 — Detroit Free Press
TOP WORK PLACES 2020 — Detroit Free Press
TOP WORK PLACES 2019 — Detroit Free Press

A portfolio of leading brands

FRONTLINE COMMUNICATIONS

IMT

JERR-DAN

JLG

MAXIMETAL

McNeilus

OSHKOSH AeroTech

OSHKOSH AIRPORT PRODUCTS

OSHKOSH DEFENSE

OSHKOSH S-Series

Pierce

PRATT MILLER

OSHKOSH

MARKETS

PRODUCT DEVELOPMENT LIFECYCLE

PRATT & MILLER

RESEARCH AND INNOVATION

- Concept Creation
- First Principles Analysis
- Experimental Design and Analysis
- Principle and Applied Research
- Technology Discovery and Exploration
- Proof of Concept and Feasibility Studies
- Trade Studies
- Connected Systems Roadmapping

ENGINEERING AND DESIGN

- System Simulation
- Electronics & Controls Engineering
- Design Engineering
- Aerodynamics
- Tire Engineering
- Human Machine Interface (HMI)
- Connected Systems Design

PROTOTYPE BUILD

- Full Vehicle Build
- Machining
- Fabrication
- Composites
- Assembly
- Electronic Systems
- Hydraulic Systems
- Additive Manufacturing
- Connected Systems Build

TEST AND DEVELOPMENT

- Full vehicle objective and subjective testing
- Vehicle instrumentation and data analysis
- Vehicle and system model correlation
- System and component functional testing
- Custom test specifications and test equipment development
- DiL/ SiL/ HiL Testing
- DVP creation & support
- Connected Systems Testing

LOW RATE PRODUCTION

- Low Volume Manufacturing
- Life Cycle Product Management
- Manufacturing Engineering
- Production Validation
- Supply Chain Management
- Production Quality

Pratt Miller and New Eagle

- Customers since 2010
- ECU and Component vendor used across all three business areas
- ECUs in race cars, hybrid, electric, autonomous, robotic, combat, and hydrogen vehicles
- 2025: Technical Partnership Established

- Raptor enables portability and code re-use between markets, scalability from race track to production

PRATT MILLER
MOTORSPORTS

RAPTOR USE CASE: TRACTION & LAUNCH CONTROL

- **Corvette & Cadillac - Traction Control System**

- **Cadillac Racing Team – Traction & Launch Control System**

  - Programmed using embedded model-based development

  - Coordinated bi-directional clutch and engine torque control

  - Resulted in **>90% of race positions gained**

  - Zero stalls in 6 seasons

  - Led series to implement rolling starts

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MOTORSPORTS
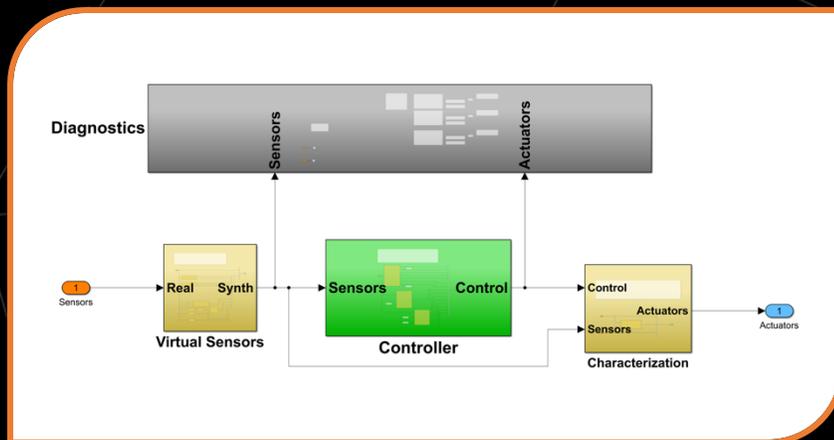
## RAPTOR USE CASE: TRACTION & LAUNCH CONTROL

"Week in and week out there are a lot of things that you can count on, one is that the sun will come up and the other is that we will get a good start"

-Johnny O'Connell, Driver, ATS-VR

RAPTOR USE CASE: PERFORMANCE TORQUE VECTORING SxS

- **Custom series hybrid-electric powertrain**

- **4-wheel in-hub electric motors**

- **Vehicle Controller (RCM112)**

  - High-speed & low-speed torque vectoring

  - EV supervisory controls

  - Body and power control

- **Genset Controller (GCM70)**

  - **4th generation controller/generator**

![Pratt Miller Defense logo]
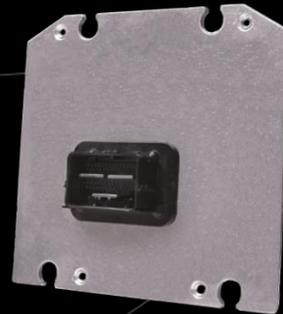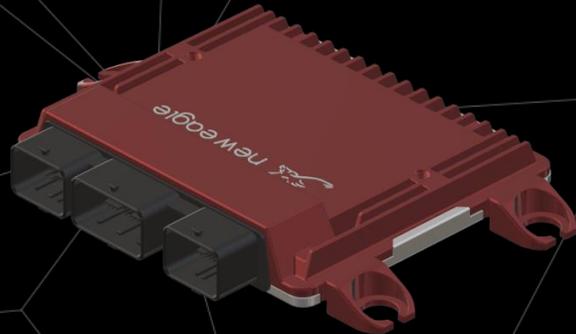
RAPTOR USE CASE: DARPA GXV-METS

- **Pratt Miller Designed & Built Platform Demonstrator**

- **Radically Enhanced Mobility - Survivability through agility**
  - Traverse 95% of terrain

- **Vehicle Controller**
  - Orientation controls
  - Four-wheel steer-by-wire

- **4x Corner Controllers**
  - Controls of active hydraulic suspension – *6 feet of travel*

Code Modularity – Co-Simulation to Vehicle

- Control-algorithms developed using Simulink co-simulation with high-fidelity multibody dynamics simulation
- Model-Based Design enables portability between simulation and vehicle
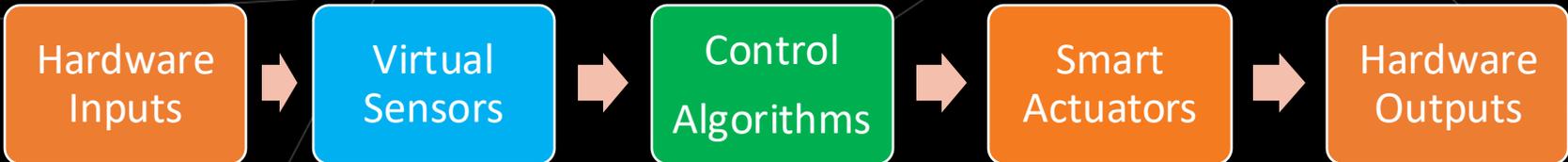- All controls development and tuning performed by 3 Pratt Miller engineers

MODULARITY IN MOTION
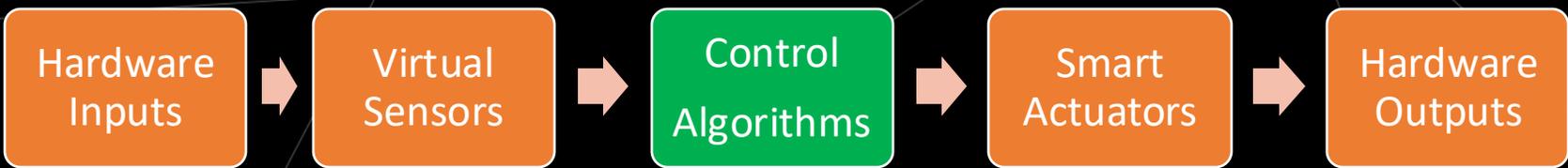## TRACKLESS MOVING TARGETS – VEHICLE AND INFANTRY

Infantry Target		Vehicle Target
1,350 lbs	**Weight w/ Armor**	10,500 lbs
Four Wheel (Inboard)	**Drive Motors**	Front & Rear
Four Wheel (Explicit & Skid)	**Steering**	Four Wheel (Explicit)
>12 mph	**Top Speed**	>30 mph
48V & 24V	**Electrical**	350V & 24V

Hardware Inputs → Virtual Sensors → Control Algorithms → Smart Actuators → Hardware Outputs

Heavy Library Reuse – Shared Lateral and Longitudinal Controller

MODULARITY IN MOTION

AUTONOMOUS HYBRID PASSENGER VEHICLE
- AND -
AUTONOMOUS HYBRID TRACKED MIILITARY VEHICLE

Hardware Inputs	→	Virtual Sensors	→	Control Algorithms	→	Smart Actuators	→	Hardware Outputs

Shared Longitudinal Control Algorithms

FUTURE USE CASE: AUTONOMY

- Gap in rugged, cost-effective high performance computing solutions

  - MIL-Spec systems can be prohibitively expensive

  - Consumer-grade hardware doesn't meet environmental standards

- Raptor High Performance Compute platforms deliver GPU capabilities in a rugged, flexible form factor

- Raptor toolchain accelerates time to market
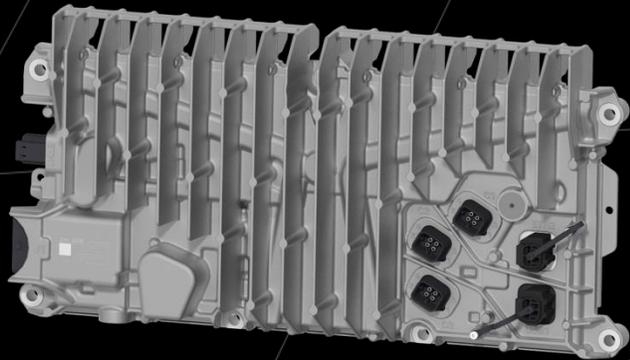
Final Lap - Takeaways

- Raptor ECUs support diverse applications

- Enables rapid deployment with small teams

- Reusable Raptor & Simulink libraries

- Proven, production-ready toolchain allows easy scalability

- Rugged high-performance computing with a growing hardware selection

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