Ground Vehicles: Business Challenges and Key Questions

At PTC, we view industry and government stakeholders in federal aerospace and defense as being in the same boat. The near-term challenges may be different, but longer term, they’re identical: mission success within budget. Since 1985, the most powerful firms in global aerospace and defense have partnered with PTC to establish and maintain a winning advantage. The US government also works closely with PTC on priorities that range from managing acquisition programs and tracking how fleets are configured, to synchronizing maintenance with technology insertion and strategic planning, all within the supply-chain operations reference, or “SCOR,” framework. PTC has the system-wide insight, proven technology, and best practices to help the ground vehicles sector lower risk while connecting the present to the future.

Learn more about key business challenges in ground vehicles:

Additive manufacturing for ground vehicle components

In the additive realm for the ground vehicle business, smart players in industry are cutting product development times by up to 40% and manufacturing times by 80%. On the government side, forward-deployed rapid fabrication labs (R-FABs) focus on keeping readiness rates for tanks and unmanned ground systems at levels just high enough to accomplish the mission. Printing to repair damaged turbines on tanks has been one of hundreds of recent use cases. Back in the depots in CONUS, the DoD will ultimately treat its large-scale metal 3D printers similar to a fleet unto itself, each with its own tail number specific configuration. Whether your competition is another company or an entire nation state, these are transformational breakaway advantages. The stretch goal on the horizon is to additively manufacture electronics and structures fully integrated in one metal print.

- To lower risk and reduce product development and certification times, how can our program managers have full confidence that what they print reflects the finalized design, its proper version, orientation, and inspection history?
- How will capabilities like topology optimization and real-time simulation inside CAD fundamentally change our pivot speed to embrace additive?
- Have I tapped into my supply chain to utilize existing CAPEX in additive versus capitalizing it alone?
- As a defense contractor, how will we change from a spares business into simply monetizing product data that enables the DoD to additively print our spares designs?

Ground vehicle spending

In the FY 2018 US Defense Appropriations Bill, overall defense spending saw the largest YOY increase in the last 15 years. A good portion of R&D spending focuses on ground vehicle
development, and RDT&E was up by $16 billion YOY. Spending on the Army’s Ground Mobility Vehicle (GMV) was increased by $1.8 billion, as was funding for army multi purpose vehicle (AMPV). Additionally, the DoD was authorized $13.2 billion for additive manufacturing in the FY 2018 NDAA for using 3D printers at tactical levels, creating manufacturing innovation institutes, and producing obsolescent parts. Much of the additive spending will be focused on ground vehicles.

- **As the JLTV program matures through LRIP, how is it possible to ensure a single source of truth for product data between government and industry across the lifecycle?**
- **Based on new spending increases, the customer requirements have now changed. Are our vehicle designs bidirectionally reflecting these changes in requirements?**
- **How can our technology platforms enable us to quickly scale up priorities for programs that received unexpected funding increases?**
- **What is the optimal way to quickly develop new vehicle product variants for US allies in NATO?**

### Digital engineering policy

In June 2018, the Office of the US Secretary of Defense issued a policy regarding digital engineering strategy. It will require the use of digital models to inform program decision-making as well as a single authoritative source of truth to sync documents and engineering artifacts to digital models for improved collaboration across government and industry. Product lifecycle management is the centerpiece of this strategy and will have a profound impact on the way ground vehicle systems data is organized and distributed.

- **In the lead up to SSR, PDR, and CDR, could our digital engineering collaboration processes with other services on joint programs be optimized?**
- **Could an MBE approach to product data quicken the process for RCAs after a vehicle failure based on intuitive, model-based views into key component data and processes?**
- **How are we truly enabling MBE for ground vehicle design collaboration across geographically dispersed teams?**
- **Are our vehicle designs bidirectionally reflecting changes in requirements?**

### Innovation in product development

Given the constant requirements of survivability and lethality in ground vehicle development, emerging capabilities in the CAD domain for real time simulation, topology optimization, and FEA integration will aid in the transition to new structures and composites. PLM offers a means to improve development processes across mechanical, structural, and electrical systems as well as environmental testing. The Internet of Things and augmented reality are already ushering in major changes in smart manufacturing and the maintenance of ground vehicles. Each one of these areas can be a fundamental platform for innovation.

- **Are we designing this ground vehicle program for modularity in a cohesive way, across armor, drivetrain, and suspension domains?**
- **Are we taking a holistic view toward survivability versus focusing only on armor?**
- **What is the optimal variation of new composites or other armor materials that will enable maximum occupant safety and mobility?**

### Extended ground vehicle service life

Even though military vehicles are getting lighter and more mobile, today’s designs will have much longer expected service lives than those of just a few years ago. A longer product lifecycle will mean modularity to pivot missions to the evolving threat landscape and lower cost maintenance.

- **Is my team designing this vehicle with modularity in mind to accommodate evolving customer requirements for infantry, command and control, and ISR missions?**
- **For current programs, how we can we manage component upgrades for capabilities like fire control, automation, and power generation?**
- **How can we increase mission readiness by implementing a comprehensive service parts forecasting capability at the program level?**
How can we leverage PLM and CAD technology systems to accelerate our existing plans for knowledge management? Could we use augmented reality technology to lessen training time for maintainers?

Knowledge retention

The US DoD and industrial contractor base is still suffering from the effects of a workforce nearing retirement age. This creates a major knowledge retention continuity issue for ground vehicle systems development and operation in the US and globally.

- Do we have an adequate, trackable repository of vehicle testing data and associated processes such that the knowledge from those tests is transferrable to new employees?
- How can we leverage PLM and CAD technology systems to accelerate our existing plans for knowledge management (KM)? Could we use augmented reality technology to lessen training time for maintainers?
- As we proceed through tech development, how can we track different prototype data for ballistic protection, system performance, reliability, and maintainability?

Innovation versus accountability

With greater funding comes more accountability across the board—both inside government itself and in the industrial contractor base.

- While delivering on contractual requirements, how can we break the mold of the traditional financial model and put investment dollars to work in anticipation of new capabilities the government will need?
- With IoT and augmented reality, how can we smartly build out multiple, simultaneous pilot programs securely, fail the non-performing ones quickly, and scale what is working across multiple OODA loops?
- How can we apply a suspension system designed for Formula 1 racing to a military ground vehicle in order to improve agility on the battlefield? Could this be a win theme?

Government program management

There aren’t many new ground vehicle program starts in the DoD and NATO militaries. Instead, the focus is to keep the programs that are already in flight upgraded and running efficiently. In the FY 2018 US Defense Appropriations Bill, major funding was allotted for upgrades to Abrams tanks, Bradleys, and Stryker, totaling more than $2.2 billion.

- How can we enable platoon leaders to make more decisions about where to place vehicles based on strategy and less on vehicle constraints?
- What is our optimal means of tracking vehicle payload configurations across different upgrade prototypes?

The impulse to innovate is true today in ground vehicles like tanks, MRAPs, personnel carriers, and more.