



Reducing vehicle costs
through the use of technology

Rapidly evolving interconnect
standards boost next-generation
embedded systems



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By Matt Bowers, President, and COO, Lone Star Analysis

Keeping vehicles operating has always been a challenge, as any fleet operator of size can tell you. Tire and brake challenges, electrical problems, engine complications, and a myriad of other issues serve to degrade the availability of critical revenue-producing or mission-achieving assets.

In commercial work, according to Ryder Systems, heavy trucks experience at least one emergency breakdown annually. The best case is these events' high mitigation costs, the worst includes serious safety issues. A survey of nine heavy truck fleets, also conducted by

Ryder Systems, found typical days out of service (DOS) for a single tractor was 3.19 days per month. This reduction in operating availability is extraordinarily costly.

How costly? Very, according to Element Fleet Management, a publicly traded fleet management solutions company based out of Toronto, Canada. Downtime costs a fleet an average of \$448 - \$760 per day, per vehicle. Couple the cost per day with Ryder's DOS and downtime costs a heavy truck fleet operator \$1,429 - \$2,424 per month, per vehicle. Multiply it times 1,000 to represent a large fleet and

those numbers get very high.

Ground-Based Vehicles

The term "ground-based vehicle" encompasses a wide range of machines. These various fleets can be segmented out by the market, with the top ten being heavy trucking, courier and delivery, food and beverage, oil, gas and mining, construction, waste and recycling, utilities, first responders, public transportation, and military. There are many similarities between the various segments based on the types of vehicles they operate, whether it's light trucks, heavy trucks, buses,





dump trucks, or ambulances. They all have tires, brakes, electrical systems, and engines of some type, which means they all face similar failure and maintenance issues.

Where the similarity starts to diverge is in the individual elements being served in the unique market segments. For instance, think about a first responder vehicle like an ambulance. Not only does it have all the usual automotive systems, but it also typically has a generator to power the emergency medical equipment. Another example is a light military tactical vehicle, like the HUMVEE or Joint Light Tactical Vehicle (JLTV). While the automotive systems are straight forward, where they operate and the availability of maintenance resources can be very challenging.

Regardless of the market segment, all have a similar desire, to keep assets operating to deliver an outcome at optimal cost. To do this, a fleet operator needs to do the right maintenance, at the right time, in the right place, with the right parts and people. A daunting challenge to say the least, and not practically possible without excellent maintenance analytics available.

Maintenance Methods

This leads to the types of maintenance approaches being used to support a fleet and

its impact on asset availability and maintenance cost. Practically, there are two broad categories of maintenance: Reactive and Preventative. Reactive maintenance focuses on responding to events that have occurred. Something broke or went wrong and now we need to fix it. Preventative maintenance, which includes various approaches, focuses on periodically evaluating and maintaining the vehicle before something breaking or going wrong.

Preventative maintenance approaches are generally much better at both keeping assets operational and reducing cost. As an example, the U.S. Department of Energy revealed time-based, cycle-based, and risk-based approaches to maintenance reduced cost by 12-18% over-reactive approaches. They also found predictive approaches, another subset of preventative maintenance, drive even more value. Predictive programs deliver an additional 8-12% improvement from time, cycle, and risk-based approaches. They typically deliver:

- 25-30% reduction in overall maintenance costs from reactive approaches
- 70-75% elimination in breakdowns
- 35-45% reduction in downtime
- 20-25% increase in asset productivity

Given the results, why doesn't everyone

use a predictive maintenance approach? The short answer is cost and data availability. To implement a predictive approach requires acquiring, managing, and analyzing data related to vehicles. These systems can be difficult to find for various types of vehicles if they are available at all. On top of sourcing, implementing this type of system can be costly, especially across large fleets of vehicles.

An excellent example of the challenges can be seen with the U.S. Army's land-based vehicles. Data accessibility and availability are widely variable by vehicle type. An M1 Abrams tank, a Stryker armored fighting vehicle and a HUMVEE have wildly different systems and extremely limited data availability. As a result, predictive maintenance at the asset level is difficult, if not impossible, without significant alterations. This drives the U.S. Army to focus on time-based, cycle-based, and risk-based maintenance schemes.

While the basic preventative maintenance approaches are reasonable, as described above, a predictive approach would be hugely beneficial to U.S. Army fleet readiness and would help drive costs down in assets with typically very long useful lives. Preventative approaches can also be beneficial from a readiness perspective in-theater, driven by an awareness of parts and maintenance needs

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in advance. This advanced awareness ensures the best availability in sometimes difficult-to-reach environments.

Moving into 2021, we should expect vehicle maintenance to continue a shift to more data-driven maintenance approaches. Commercial markets are beginning to use a more compressive set of telemetry data, not just location awareness, to monitor assets. This data will drive more advanced predictive and prescriptive maintenance analytical solutions.

Finding the Right Solution

While there may be multiple options when it comes to choosing a more advanced solution, it's important to understand what the necessary features are for creating an efficient maintenance program.

A good fleet maintenance advisory solution should utilize both predictive and prescriptive analytics to maximize vehicle uptime and minimize maintenance costs. This kind of solution works by predicting degradation and failure and prescribing specific actions to help drive tailored maintenance support on an asset-by-asset basis.

The right solution is also data-driven, using telemetry data from companies specializing

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in data intelligence and fleet management, like CalAmp, Geotab, and Verizon Connect. Data can then be used to create more than 50,000 simulations to represent how each vehicle system is operating and determine all of the possible changes and outcomes from a diagnostic perspective. A good program also incorporates a variety of artificial intelligence (AI) techniques to predict how the state of vehicle systems will change over time. The ideal process is quick and easy. Once it's determined a vehicle system is degrading or failing or will begin to degrade or fail in the future, actions to mitigate the issue should be prescribed immediately before it can become a larger problem.

By creating a vehicle early warning signal, an efficient program enables fleet managers to extract all of the predictive values described by the U.S. Department of Energy. The key added value, above the predictive analytics, is the prescriptive aspect of a system. The prescriptions help customers identify the right people, parts, and tools necessary to support the maintenance requirements, reducing follow-up inspection time, and tightening the logistics chain for parts, adding even more value. One example of this type

of solution, Lone Star Analysis' MaxUp Fleet for Vehicles, is currently in field trials with municipal first responder vehicles and heavy truck customers and is expected to launch more broadly in the first quarter of 2021.

2020 has been a difficult year for many industries and companies. 2021 promises to be a significant improvement on our way back to more normal business. This year has shown us working smarter and driving efficiency is a key business differentiator, and vehicle maintenance is not excluded from this. We are just starting to see the possibilities of advanced analytics on our vehicle fleets, and those embracing the opportunity to improve now will reap the benefits for many years to come.

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