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The Role Of Rugged Mobile Computing In Overhaul, Service & Maintenance Operations

This paper explores the strategic, operational, and technological issues that are addressed by rugged mobile solutions for maintenance and service managers.

The Role of Rugged Computing in Overhaul, Service & Maintenance Operations

The role of rugged mobility in overhaul, service and maintenance operations has become a major competitive factor as fleet operators – along with automotive, aerospace and other large equipment manufacturers – seek to:

- Improve relationships with customers by accelerating repair operations in order to return products back to productive use; and
- Elevate the productivity of mechanics and other technicians who are increasingly under pressure to do more work with fewer human resources in less time at lower cost.

...Complexity and Demand Outstripping Supply

These imperatives are rising in importance as the equipment themselves (planes, trains, vessels, automobiles, etc.) become more technologically sophisticated and are more dependent on automated diagnostic tools.

Another significant trend that is emerging in the market is the shortage of bays to accommodate a growing number of vehicles needing service. Fleet operators, manufacturers and service providers are dealing with the very real prospect of doing a lot more with much fewer resources. Take the automotive sector as a single industry case in point:

- Researchers at New Jersey-based Lang Marketing Resources found that even though the number of autos and light trucks on the road rose to more than 39 million between 1996 and 2006, the number of service bays available to maintain and repair them has actually declined by 44,000 during that time. The outlook for the near future points to a growing shortage of auto maintenance and repair facilities. There were 166 light vehicles in the U.S. for every service bay in 2000; three years later that number had jumped to almost 180.
- By 2006, the number of vehicles per service bay stood at more than 190 and is projected to grow to about 200 per bay by 2008.

These factors signal an impending service bay crisis – one that will make it far less convenient for consumers and businesses to have vehicles serviced. It is a trend that will certainly have a negative impact on the nation's vehicle repair capacity.

“One solution to the growing crisis is improving service bay productivity. Better mechanic training, enhanced tools and equipment, as well as sophisticated diagnostic techniques and shop management software are

force multipliers, which enable service bays and mechanics to handle more vehicles.” – Jim Lang, Lang Marketing Resources, The Aftermarket Annual 2006/2007 Study

The problem is even more acute in the aerospace industry. A study conducted for the Wharton School at the University of Pennsylvania by Dr. Morris Cohen suggests that executives in charge of service bay operations must take a close look at current practices and re-engineer to iron out inefficient processes.

“Despite growing demand for air travel, many legacy carriers have been forced to cut costs to avoid bankruptcy and compete with the popular discount airlines. This dilemma is especially pronounced in the MRO [maintenance, repair and overhaul] market, where an expansion in global fleet equipment has subsequently upped the requirements for efficient maintenance.” -- Dr. Morris Cohen, Implications for Service Parts Management in the Rapidly Changing Aviation MRO Market,

...Maintenance and Repair Requires New Generation of Mobile Technology

In response to these challenges, the maintenance, overhaul and repair industry has looked to mobile technology as a key to improving operations.

The first big step on the road to tailoring technology for the service bay environment came with the development of hand-held scan tools that used bar codes. They often uploaded this data onto fixed desktop computers that were strategically placed (such as in the customer reception area or in centralized parts of the shop floor). This allowed mechanics to access and enter information about equipment they were working on. The early nod to rugged requirements of the environment consisted of putting a plastic cover over the computer keyboards to keep grease from mechanics hands from disabling data entry operations. However, fixed desktops did not meet the growing need for higher levels of productivity in the service bay.

In recent years, there have been efforts to deploy laptop computers (that were designed for office workers) into service bay environments to improve productivity. This has reduced foot traffic between productive workshop activities in the actual service bay and centralized computers that are shared by all the mechanics in the facility.

...Operating in a Hostile Environment

However, conventional laptop solutions have presented challenges of their own. The service bay environment is not a pristine setting – especially as computers move away from the relatively clean office counters and desktops and into the actual shop floor. There is a growing realization that laptops in this environment must be able to survive being bumped or even dropped, as well as withstand the

grease, particles and other hazards that are part of a service bay's normal operating environment. Reliability and ruggedness are critical requirements.

Tracking and Accounting for Notebook and PC Failure Rates

While PC vendors have reduced the annual failure rates (AFRs) on hardware in recent years, analysts at Gartner estimate that AFRs still range from 15 percent to 20 percent throughout the life of the system. Three years ago, notebook AFRs averaged 20 percent in the first year, climbing to 28 percent in the third year (see Table 1).

Table 1
Average Annualized Failure Rates for Desktop and Notebook PCs (Percent)

	Systems Purchased in 2005-2006	Systems Purchased in 2003-2004
Notebooks		
Year 1	15	20
Year 4	*22	28

* Projected

Source: Gartner Dataquest (June 2006)

Gartner notes that the top sources of notebook failures on systems less than two years old are:

- Motherboards and hard drives (tied for first place, each ranging between 25 percent and 45 percent of total hardware failures)
- Chassis, including latches, hinges, feet and case cracks
- Keyboards, with keycaps falling off or getting discolored, and spilled drinks seeping under the keyboard
- Screens

In response to these major trends, repair and maintenance firms are looking to get more efficiency and capacity out of service bay operations by placing rugged laptops and deploying mobile connectivity into this environment.

“The service bay is abandoning the proprietary devices designed for a single purpose in favor of Windows-based technology that can perform multiple functions in a cost-effective manner.” -- Bill Presler, Senior Manager, Market Development, Service Bay, Panasonic Computer Solutions Company

...Rugged Laptops Introduce Versatility and Economies of Scale

Maintenance and repair technicians – along with fleet management professionals – have consequently become a growing source of demand for rugged and reliable mobile computing solutions that can be integrated with industry-specific back-office software.

They are looking for computers that can not only run advanced engine diagnostics but also offer technicians real-time access to manuals, and schematics. They also want to have visibility into parts inventories from virtually anywhere – from local resources stored on nearby servers, to information stored on databases hundreds or thousands of miles away.

*“The trend is quickly moving towards having access to a PC in every service bay. As applications and automotive reprogramming software move to the Web, technicians need to have access to the Web while at the fender of the vehicle. Rugged notebooks provide a way to connect to vehicles (via wireless and USB connections) while getting information from the Web. Service information is critical to technicians. This is especially true as manufacturers and aftermarket-equipment providers move away from CD and DVD solutions to Web solutions.” -- **Gerry Beronja, Director, Global Marketing, Snap-on Diagnostics***

Moreover, there are considerable economies of scale that can be realized from the flexibility and versatility of rugged laptops and notebooks. The same device can be used for:

- Repair diagnostics;
- Inventory management; and
- Facilities maintenance operations.

Best-in-class rugged computers can use commercial off-the-shelf software and are compatible with important enterprise applications. This allows an organization to equip service bays and maintenance facilities at a lower and consistent fixed price point. This contrasts with the high prices associated with deploying dedicated, customized – and therefore expensive – technologies that have typically characterized shop floor automation in the past.

There are additional benefits for companies that integrate wireless into service bay repair facilities. Wireless networks make it much easier for personnel to have access to back-office systems. This allows appropriate staff to use the same device from anywhere in the shop to access inventory, customer data and other important information.

However, to do this right, a company needs to have a top-down commitment from the corporate level to get it all done.

...Aviation Applications for Rugged Computing

In the commercial aviation sector, aircraft maintenance and repair technicians have traditionally had their hands full checking out planes to make sure they were mechanically ready to fly. Their operations have come under increased

stress with the growing pressure to reduce turnaround times and remove or reduce the incidences of unplanned time on the tarmac. After all:

- Grounded airliners take up costly space in an environment that is designed for planes to come in and get out rapidly; and
- Passengers are increasingly less tolerant and more vocal about maintenance-related delays.

*“Every time a mechanic gets on the plane for a service event, they have traditionally had to go back to the parts department based on what they thought the problem was. And they would get that part and hope it was the right part. If they got back and it fixed the problem, great. And if it didn’t, they’d just have to start from scratch.” -- **Bill Presler, Senior Manager, Market Development Service Bay, Panasonic Computer Solutions Company***

Even the 10 or 15 minutes it takes to get a part and see if it fixes the problem can result in a costly delay. These delays can be particularly problematic if the technician discovers that the necessary parts are not immediately available and the aircraft can’t leave without the appropriate repairs.

Rugged computing can mitigate the impact of these situations. When maintenance technicians bring rugged laptop computers to a flight and plug into the onboard diagnostic systems, they immediately know the status of issues that need to be resolved. They can then correlate problems with the availability of parts and personnel by using wireless networks to access back office systems at airport maintenance facilities. Time and error can thus be reduced.

The faster problems and the prognosis for addressing them can be addressed, the more quickly action can be taken to explore how passengers can be moved to their desired destinations. Having that information available in near “real-time” not only accelerates maintenance and repair functions, it enables the airline to provide a higher level of customer service to its customers.

...Compliance Support

Rugged notebooks are also shaping up to be helpful for heavily regulated industries – like aviation – that must remain federally compliant with maintenance-related record-keeping. Even though it is always possible to manage regulatory compliance issues by filling out and filing paper forms, it has not been the most efficient way to manage the process. Nor is it a good use of highly skilled mechanics’ time. Rugged mobility solutions can automate and speed up the record-keeping process.

...Toyota Reduces Time and Error Rates

In the automotive industry, rugged mobility is playing a key role in how manufacturers support their offerings after the sale. Toyota Motor Corporation, for instance, is using rugged computing platforms in its automotive service bay operations. The process it has implemented to support post sales service and maintenance to customers works like this:

- Customers enter the facility and their vehicles are checked into the service bay.
- The car goes back into the shop where a technician connects the onboard vehicle computer to a rugged notebook computer.
- Systems automatically exchange information about the car's vehicle identification number (VIN) without the need for manual data entry (a common source of error).
- The application on the rugged computer pulls down the fault codes and controller calibration information on the vehicle to determine what problems and updates exist and what needs to be done about them.
- The application polls the car's service campaign history. The Toyota database records all completed service campaigns (recalls) that the car has ever had at a Toyota facility.
- Technicians review information about the vehicle, including relevant recalls that have not been performed and diagnostic trouble codes (DTC) from every on-board system. The application also queues relevant service information for the technician based on DTCs and incomplete recalls. This allows the technician to move immediately to the diagnosis/repair phase without spending time to navigate and search for service information.
- When more current calibrations are available for on-board controllers, the application allows technicians to automatically download the relevant calibration and reprogram the vehicle. The technician essentially does this with the push of a button.

By implementing this process on a rugged mobility platform, Toyota has been able to reduce the:

- Amount of time it takes to diagnose problems and take appropriate repair and remediation actions; and
- Opportunity to make mistakes due to manual data entry errors.

The Toyota system also improves the accuracy of repairs by empowering and encouraging technicians to access the information needed to do the job right the first time, instead of the “shooting from the hip” that can occur because of “flat-rate” compensation systems.

The result: Customers are happier because it gets their car fixed and they are back on the road more quickly.

...Volvo Integrates Rugged Computers with Proprietary Systems

Volvo was an early adopter of mobile computing technology in its service bay environment. The company realized there were unique challenges that had to be overcome in order for the technology deployment to go well – and more importantly, for the underlying mission (greater efficiency in auto maintenance and repair) to be accomplished.

Since regular mobile PCs were not tough enough to survive in the service bay with all its grime and grease, Volvo built a strategy around rugged notebooks to get the job done:

- Rugged notebook computers were loaded with Volvo’s internally developed software, which enabled the company’s technicians to run diagnostics on vehicles as well as handle and record basic recurring maintenance.
- The system of rugged computers and back-office systems run by Volvo made it possible for technicians and managers to check the car’s systems after repairs were completed to ensure that everything was indeed working properly.
- The new system also enabled technicians to upload work orders and check parts inventories without having to leave the service bay. This approach not only saved time, but enabled the company to get more done with fewer technicians, cutting overhead costs while boosting speed and quality of service.

According to Volvo executives, the benefits of this approach not only show up in the form of happier customers; they also beef up the bottom line.

...Harley Davidson Extends Rugged Laptop Solution to Dealers

Harley Davidson, the renowned motorcycle manufacturer, wanted to optimize its distribution and support network by replacing its existing Digital Technician Diagnostic tool, which was being used by its 1,450 dealers worldwide.

Harley Davidson replaced the tool with a rugged notebook solution. The solution has resulted in a significant boost in repair efficiency, as well as increased productivity. The company has leveraged these efficiencies into more business, because customers can be served more quickly and repairs and maintenance can be completed in less time with a higher level of quality.

...Conclusion: Rugged Automation is a New Service Bay Imperative

The overhaul, maintenance and service environment is in the process of adapting to a barrage of new forces. Those forces include:

- Increasing sophistication and computerization of the equipment that must be repaired and maintained;
- Competitive pressure to resolve issues more quickly and return equipment to operational use;
- The need to address a higher volume of repairs with fewer people and facilities;
- Compliance with new regulatory mandates for more stringent record-keeping; and
- A shortage of bays to accommodate a growing number of vehicles and equipment in production.

Few service bay operations that expect to be profitable – or even viable – in the years to come, can afford to have completely separate administrative and maintenance processes. This is especially true as fewer technicians and mechanics work in fewer service bays to address a growing number of technologically more complex equipment.

As a result, we are seeing strong demand for solutions that can integrate the ability to diagnose, track, bill, and record all activities associated with maintenance and repair operations in the automotive, aviation, and other relevant environments.

Rugged mobile computing solutions support maintenance operations in a “computer-hostile” environment while simultaneously integrating key back-office automation functions. In so doing, service bays and manufacturing plants can introduce new operational efficiencies and improve customer service while actually reducing the cost of maintenance and repair activities.

Rugged computing offers an opportunity to move away from dedicated “point-solution” devices and systems currently in the field, and replace them with multi-function general purpose computers that cost less and do more.