Gain insights from your data; take action to increase efficiency

Advanced analytics reshape MRO in aviation and other sectors
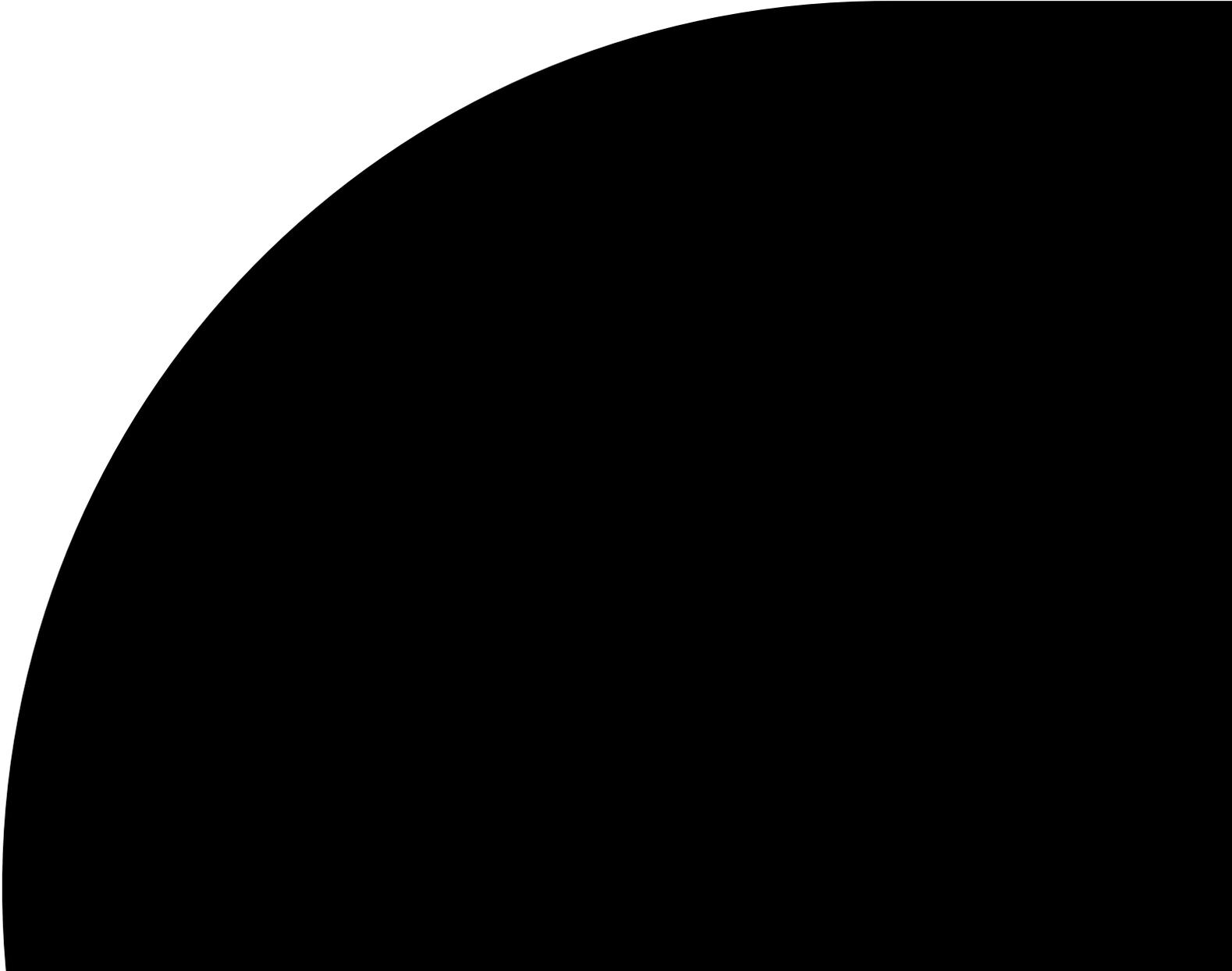
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Airlines, military operators, and aerospace & defense (A&D) organizations are focusing more on their management/ maintenance, repair, and overhaul (MRO) or operations and technology to reduce costs while improving efficiencies.

Historically, MRO has been a low priority area for IT investments, but a confluence of factors brings the sector into sharp review.

These factors include:

- Aging technology and equipment that are more challenging to support

- Legacy solutions that are unable to leverage data generated by newer aircraft and systems

- The need to improve efficiencies from capital investments and reduce operational expenses

To compete, MRO organizations must capture, store, and manage data generated from on-board sensors, operational systems, staff, operations, and partners across globalized supply chains.

Yet, collecting and warehousing data is not enough. Companies must transform their information into insights and actions—Actionable Analytics. Without actions, insights can't translate into measurable business value. Using analytical insights to change operations is often the hardest part of the challenge.

In this paper, DXC Technology examines the realities and challenges of a data-driven aviation sector. We explore how MRO organizations can leverage analytics and data management to reduce costs, and accelerate turnaround time, driver safety, reliability, and profits.

The changing MRO realities

The global commercial aviation sector is growing, but it continues to struggle with costs, profitability, changing customer expectations, and regulatory burdens.

Experts project the world airliner fleet to grow from approximately 23,000 today to 44,500 by 2033.[1] New aircraft types will have longer planned maintenance intervals, while the existing fleet will stay in service for up to 20 to 25 years, with many aircraft seeing longer use if they are converted to freighters. Even with longer maintenance intervals on newer aircraft, the pressure for greater dispatch reliability, increased annual availability, and lower maintenance costs will continue.

The MRO segment growth projections—along with ongoing needs to control costs, maintain flight schedules, and enhance safety—present opportunities and challenges. Today's MRO industry is dealing with fleet turnover, market consolidation, new aircraft technology, and changing business economics.

Aircraft must undergo rigorous maintenance programs, but each hour a plane is out of service for maintenance is another hour it's unavailable as a revenue-generating asset. While successive generations of aircraft are engineered to require maintenance less frequently, manufacturer and airline maintenance programs remain conservative. Optimizing maintenance programs based on in-service data is possible, but it must be approved by regulators—typically these efforts by carriers have been one-off rather than systematic.

Changing economics forces airlines to reduce costs. Thus, many have responded by outsourcing additional MRO activities. Aircraft and engine manufacturers have taken advantage of this opportunity by offering maintenance services, while also growing their other aftermarket offerings. The increasing competition among OEMs, independent MROs, and in-house MRO providers forces everyone to compete on cost, efficiency, and value-added services. These efforts can greatly benefit from data analytics.

A key challenge: MRO data

Dramatic technology-driven changes are coming to the aviation aftermarket, both commercial and defense. Advances in Big Data, predictive maintenance, aircraft health monitoring, and additive manufacturing will fundamentally change how MRO organizations operate.

Data volumes are growing exponentially—for instance, a 777 downloads about 1MB of data per flight, compared to approximately 28MB from a 787.[2] Even that quantity of downloaded data is a small fraction of the roughly 40TB of data actually generated by a 787 each flight, most of which is not used—deleted at the gate. Airlines, manufacturers, and MRO organizations currently struggle to store, manage, use, and understand the flood of information. When the data is stored and managed, it is typically stored in data warehouses that are difficult to access or query by business users, making it impossible to analyze to create value.

Airlines and MROs don't use the diverse data available, including unstructured data, to optimize MRO operations. Crew experience, as well as network structure, has an impact on aircraft operations and therefore, maintenance needs. But these data are typically in silo systems, so maintenance planners and reliability engineers rarely look beyond aircraft cycles, flight hours, or component failure rates. Some companies have dashboards that give real-time views of current work status in their MRO operations, but these can't draw actionable insights from the onrushing flow of information.

Increasing volumes of sensor data are flowing from aircraft, but many organizations struggle with the speed of analytics, along with storage needs. Others don't recognize potential value in sensor-generated data, as demonstrated by low subscription rates for higher frequency reporting on some existing communications networks such as ACARS.[3]

[2] "Putting the 'e' in Boeing", MRO Management magazine, March 2014

[3] See example **http://www. bloomberg.com/news/ articles/2014-03-12/malaysian- air-said-toopt-out-of-boeing- plan-to-share-jets-datat**

Many data-related issues challenge the MRO segment, with few organizations having invested in MRO-oriented technologies. Airlines typically place a higher priority on IT investment for passenger service, while A&D companies are more likely to invest in enterprise resource planning (ERP) solutions.

When data is analyzed, the insights generated are seldom used to improve planning and execution. Many times the actual data used for analysis exists in rudimentary Excel spreadsheets on personal workstations. When data is stuck in desktop programs, it can't be used in sophisticated data analysis—the kind of analysis that makes a measurable impact. To create value, analytic insights must drive activities within supply chain systems, hangar execution systems, and labor management. For example, advanced analytics can change what parts are ordered or where resources are assigned. In many cases, getting the value from analytics requires a change in the maintenance program.

A change in an airline's maintenance program must be approved by airworthiness authorities, as maintenance programs are strictly regulated. It also implies changes in contract structures since a reduction in non-routine maintenance on a heavy check would reduce revenue for an MRO under current typical contracts structures. The real challenge—for stakeholders across the MRO spectrum—is to create value for the airlines by driving down costs, increasing uptime, and supporting safer and more efficient flight operations.

The good news is that MRO executives now recognize challenges and opportunities in datadriven environments.

In its 2015 MRO Survey, Oliver Wyman discussed emerging issues with executives from airlines, independent maintenance providers, OEM aftermarket firms, and others. Their key findings included:[4]

• MRO organizations recognize that the collection, storage, aggregation, and analysis of data will be key factors in aircraft health monitoring and predictive maintenance.

• Data-oriented predictive maintenance was cited as a critical tool MRO organizations can use to limit part failure and reduce total cost of parts.

• Performance data about a particular aircraft allows operators to customize heavy-check maintenance for that specific tail number.

• Respondents view the ownership and management of proprietary aircraft and process data as key in the emerging information-oriented environment.

The solution: Actionable Analytics

To realize maximum performance and efficiencies, MRO organizations serving airlines or other transportation sectors must do more than capture and manage data. MROs must deploy data analysis tools to enable real-time analytics and build predictive models. This gives you real insights into key processes and variables, while anticipating and planning for events.

New data analytics tools give regular business users better insights. But, to get the greatest value and most useful insights from available data, you need highly qualified staff who know how to use Big Data. For most organizations, this means recruiting new, skilled employees or engaging a partner that has the talent you need. With experienced experts, you gain capabilities that let you use the best tools for analysis of large data sets, such as R. Other tools such as Tableau and Spotfire enable a much greater degree of flexibility and self-service to existing staff than traditional business intelligence (BI) tools.

Embedding analytics into the daily operations of a carrier, MRO, or OEM aftermarket organization may require deployment of additional capabilities, such as high-performance computing, wireless and mobile communications, cloud architectures, and more. Fundamentally, integration between the analytics and the execution systems are required. DXC describes this approach as Actionable Analytics. For

[4] Oliver Wyman: "Aviation, Aerospace & Defense: Turning the Tide, A Wave of New Aviation Technology will soon hit the MRO Industry," MRO Survey 2015.

MROs, it's all about effectively using the data, and available data is expanding exponentially. A Big Data platform is an essential component to your maintenance planning system.

Benefits of analytics-driven MRO

Strategic benefits of data-oriented MRO are readily apparent. Better information lets MRO organizations improve their overall efficiency of operations through optimized staffing, planning, inventory management, sourcing, and repair activities. Data analytics can significantly reduce unplanned line maintenance by enhancing failure prediction, accelerating problem rootcause identification and resolution, accelerating incident response, and optimizing inventory management and allocation.

Data-driven analytics can be used to optimize base maintenance, allowing task-card-level prediction of nonroutine work. Robust analytics can drive streamlined material staging, more efficient labor planning, and more effective equipment check programs. When data and analytics streamline engine and component service, carriers can reduce AOG times, minimizing the revenue impact of flight delays, and therefore maximizing uptime for crucial revenueproducing assets.

It's useful to examine precisely how analytics and data management are applied across various aspects of the MRO environment.

A streamlined repair loop

A fast, efficient repair loop is one of the best ways to drive MRO success, and parts management is vital to the process. Advanced analytics and data management could potentially drive recommended spare parts list management and rotable pool optimization.

Rotable demand patterns can be affected by fleet hours, aircraft operation and landing cycles, geographic positioning, maintenance staff expertise, and fundamental part reliability. But Big Data, predictive analytics, and proactive maintenance offer the potential to take analysis to a new level. For example, understanding how the "as used" environment impacts reliability beyond what cycles and flight hours indicate.

The supply pattern for rotables can be affected by maintenance programs, efficiency of parts moving through repair loops, and regulatory compliance processes at receiving and distribution warehouses. Analytics can optimize inventory locations and reduce inefficiencies leading to increased inventory that lead to over investment in inventory, while also reducing operator risk and downtime.

MRO organizations must effectively manage repairable, expendable, and consumable parts and components that are on aircraft, in the shop waiting for repair, or elsewhere in the repair loop.

Analytics can benefit maintainers and operators with predictive models that produce value and drive changes throughout the operation, including:

- Quantities of parts ordered and order frequency

- Location of stocked parts—many organizations have inventory infrastructure where parts flow one direction, making it impossible to respond to changes in fleet deployment or aircraft type

- Decisions for pre-emptively replacing a component on an aircraft

- Decisions about ordering parts and anticipating needs

- Inventory staging at specific locations where needs are expected

- Information needs at point-of-use by A&P mechanics and other frontline labor for maximum productivity

These examples require analytics integration into the smallest details of operational business processes and systems. Analytics integration is inclusive, ranging from the ERP systems, to the maintenance planning and execution systems, to workforce management systems, as well as dashboards and reporting tools used by frontline supervisors and senior management.

In some cases, the best value for MRO companies and their customers will come from using insights that drive changes to the mandatory aircraft maintenance program itself. Maintenance programs have to be approved by the Federal Aviation Administration (FAA) or other airworthiness authorities for each airline and aircraft type. A change in this protocol is a significant undertaking but the benefits are worthwhile.

The analytic methods also apply to nonroutine repairs and line maintenance. This work is often done on a cost-plus contractual basis. Service contracts must evolve to compel actions derived from analytics, which reduce nonroutine work. These analytics can support faster diagnostics and improved line maintenance.

Partnership considerations

Airlines recognize the value of collaborating with partners—those with proven expertise in analytics and data management, including experience in aviation, travel and transport, among other sectors.

Companies need partners that understand how to generate value and overcome challenges by deeply embedding Big Data analytics, while connecting it to daily operations and enterprise systems.

DXC is that partner. We offer scalable analytics and computer platforms, mobility solutions, software applications, imaging and sensor solutions, and proven experience in mission-critical systems integration. DXC delivers MRO solutions and support for carriers, OEM organizations, and independent providers.

In particular, DXC is experienced in linking the "new world" of Big Data analytics to the "old world" of enterprise systems With DXC, clients innovate faster, realizing significantly more value from their analytics investments.

Aviation and beyond

The principles and requirements of Actionable Analytics apply to maintenance and repair operations across the transportation sector. Other sectors can benefit—any industry where expensive assets are maintained--from mining to electric power generation—can also benefit from MRO analytics.

Mining operations

In an open-pit mining operation, remote production locations present unique MRO challenges. Operators face hazardous working conditions, a challenging labor model, and unplanned breakdowns and repair.

One large mining company sought to leverage advanced data management to improve maintenance and production efficiencies. It also wanted to better integrate machine telematics, equipment GPS tracking, and transactional operational data to achieve goals. The mining firm needed to reduce equipment downtime with predictive maintenance using sophisticated analytics. Additionally, it needed a way to increase efficiency during shift changes, while improving equipment operator safety.

DXC responded by deploying systems that enabled near real-time data collection and analysis. Data was made accessible via secure connectivity from anywhere in the world. Statistical simulations provided actionable insights into MRO at mining sites. As a result, the company gained earlier warnings of part failures. These insights let it make preventive repairs during scheduled maintenance. Crew and equipment were put on more efficient schedules. Hazardous choke points were eliminated, and drivers were trained for safer operating procedures.

In this MRO application, Actionable Analytics helped deliver greater safety with improved operating efficiency.

OTR equipment

Executives at a large U.S. transportation leasing company saw MRO analytics as the logical approach to improve efficiencies, reduce costs, and enhance customer satisfaction.

DXC developed a framework for more advanced data analytics, while assessing the company's maintenance and labor processes. The solution used pattern recognition to identify the most probable and costly components for breakdowns. Driver behaviors contributing to wear and tear were identified, along with repair performance characteristics at various locations across different component repair jobs.

The result was a three-part approach that addressed repair histories, driver behavior, and repair efficiencies. Predictive analytics were used to design a more efficient, productive environment for this over-the-road (OTR) leasing company.

Actions from analytics

Data-oriented systems are driving profound changes in MRO—for aviation and across the broader transportation industry. This shift demands close integration of powerful analytics with resource and maintenance planning systems, workforce management, and reporting systems.

Forward-looking MRO executives understand the strategic value gained from Actionable Analytics. As discussed in this paper, MRO organizations of all kinds must harness modern analytics and data management technologies to reduce costs and downtime. These actions add up to increased performance, safety, and fleet reliability—ultimately improving the bottom line.

Learn more at
[www.dxc.technology/analytics]

About DXC
DXC Technology (NYSE: DXC) is the world's leading independent, end-to-end IT services company, helping clients harness the power of innovation to thrive on change. Created by the merger of CSC and the Enterprise Services business of Hewlett Packard Enterprise, DXC Technology serves nearly 6,000 private and public sector clients across 70 countries. The company's technology independence, global talent and extensive partner alliance combine to deliver powerful next-generation IT services and solutions. DXC Technology is recognized among the best corporate citizens globally. For more information, visit www.dxc.technology.

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