

MRO SURVEY 2015

# TURNING THE TIDE

A WAVE OF NEW AVIATION TECHNOLOGY WILL SOON  
HIT THE MRO INDUSTRY

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# A CREST FORMS IN AVIATION TECHNOLOGY

These advances could cut 15 to 20 percent of MRO spending from the aftermarket.

A wave of technological change is about to break on the aviation aftermarket, powerful enough to erode core elements of today's industry.

By 2020, most companies in the aviation maintenance, repair, and overhaul sector will use new technology in a way that fundamentally changes how the industry works. According to Oliver Wyman's 2015 MRO Survey, the use of big data in the aviation industry will become pervasive, with the rise of aircraft health monitoring and predictive maintenance systems. The way MROs touch the aircraft will change with wearable and other new repair technologies and additive manufacturing (3-D printing). And most aviation companies will have to manage overhauls of the aging IT backbones that have been inhibiting efficient working environments.

We anticipate these advances could cut 15 to 20 percent of MRO spending from the aftermarket, and spawn new business models and revenue streams. In total, this would amount to a redistribution of \$10 billion to \$15 billion of value among current industry players and entice new competitors to enter.

To ride the wave, MROs must prepare now. As new technology hits the market, MRO providers risk losing profitable work and the opportunity to define the commercial frameworks for deploying technology. MROs and operators must actively choose technologies to develop and exploit. Those that fail will end up as innovation takers, ceding further aftermarket control and profits to competitors.

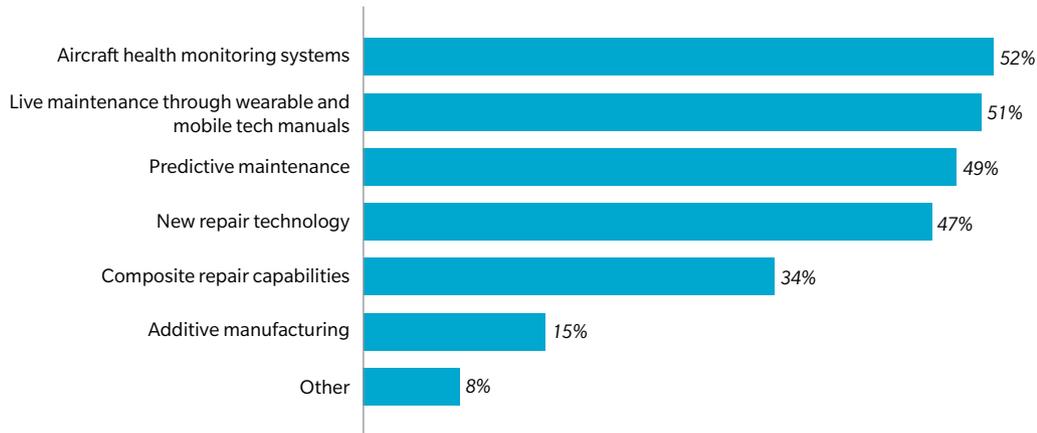
MROs will first have to overcome their own reluctance to innovate. The 2015 survey uncovered a number of issues that hamper acceptance of new technology. Seventy-six percent of respondents said their organizations have clear visions and growth strategies in new business areas, and most said they employ a strategic planning method to visualize areas of opportunity and identify the most promising prospects. However, respondents gave their companies failing grades on the ability to translate identified opportunities into plans and get sign-off from top management (53 percent), and on pilot projects and fast-to-market roll-out programs (58 percent).

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### Exhibit 1: Investments in technology

#### Has your organization approved investment for developing any of these technologies now or during the next five years?

Percent of responses for types of technology (multiple selections possible per category)



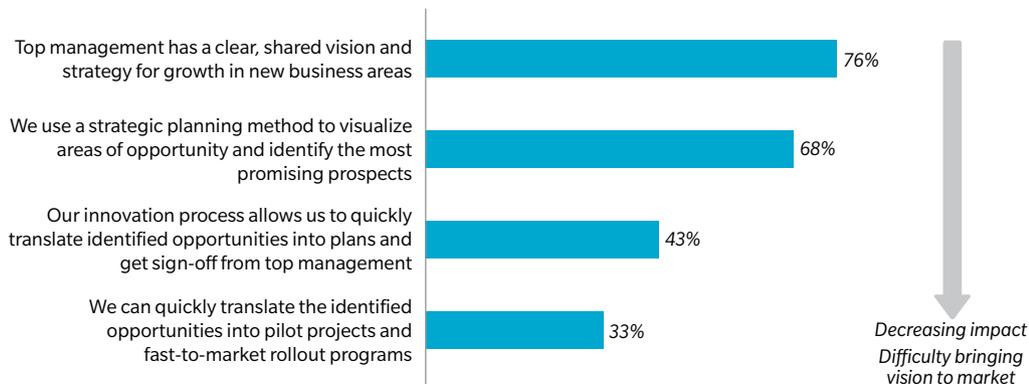
Source: Oliver Wyman 2015 MRO Survey

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### Exhibit 2: MRO innovation

#### Does your organization foster innovation?

Positive responses (multiple selections possible)



Source: Oliver Wyman 2015 MRO Survey

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# BUOYED BY INNOVATION

Given the new aircraft, technology, and services, the capabilities that MROs need to win business in 2020 and beyond will differ from those needed in 2015.

Innovation has always propelled the MRO industry, with advances including lean processes, computer-based training, non-destructive testing, human factors analysis, RFID tagging, and intermittent fault detection. However, the change generated by these innovations within the last 20 years has been incremental. These technologies helped companies improve their supply chains, cut costs, and differentiate their products.

But this next wave of innovative breakthroughs is distinctive. Instead of incremental cost cuts, the new advancements could disrupt existing aftermarkets and present new business models.

Disruptive aftermarket technology comes at a time of great innovation in the entire aviation industry. Airlines are poised for a once-in-a-generation shift in technology with the introduction of two completely new narrow-body aircraft, two new engines, four new super-regional aircraft, and growth in composite fuselage fleets, all supported by new components manufacturing techniques and systems with operational awareness.

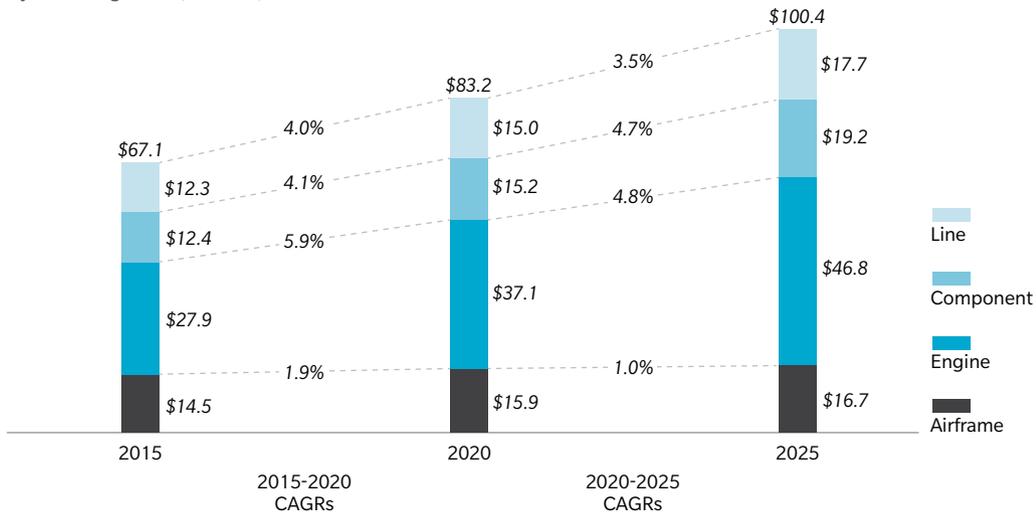
Given the new aircraft, technology, and services, the capabilities that MROs need to win business in 2020 and beyond will differ from those needed in 2015. The CAVOK Global Fleet and MRO Market Forecast puts MRO spending in 2020 at \$83.2 billion, and rising to \$100.4 billion in 2025. To qualify for this work, MROs must transform their product and service offerings substantially and select partners to help build capabilities. Recognizing this sea change ahead, the majority of MRO respondents said they “must be leading innovators in the marketplace in order to compete.” However, a similar majority see themselves moving at the same speed or falling behind their peers in adopting new processes, technology, services, and products.

MROs should grab this opportunity to control their own destiny at a time when manufacturers have gained control of a sizable share of the maintenance market on new-generation aircraft. Early business models will frame what is being sold and how. Skilled first-movers will have the opportunity to define the structure and features of new offers to the market.

Airlines should consider their approach to new technologies and their data dependencies before tethering themselves to specific commercial models and systemic reliance on third parties.

Exhibit 3: MRO spending to rise

**Global MRO Market Forecast**  
by MRO segment (US\$ BN)

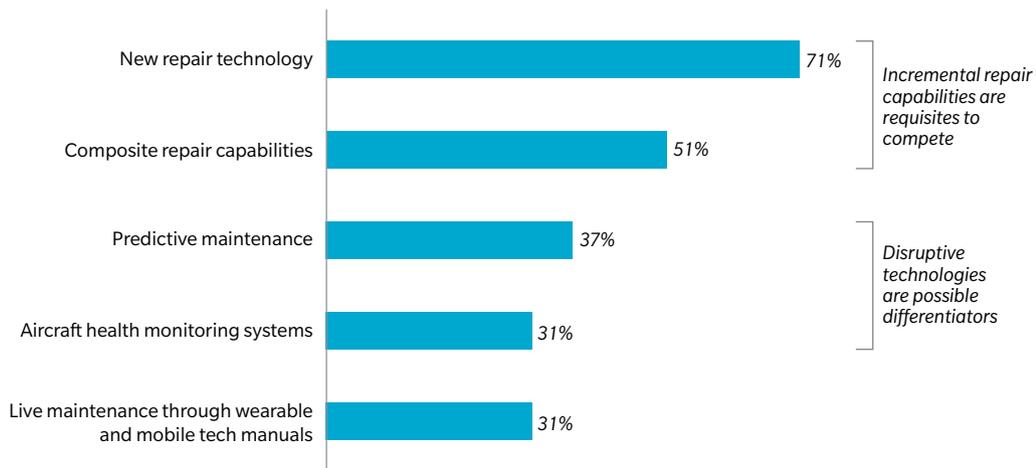


Source: CAVOK Global Fleet and MRO Market Forecast

Exhibit 4: Airline expectations of MRO technology

**When procuring MRO services, do you look for a third-party provider that offers any of the following technology or innovations?**

Percent of airline responses for types of technology (multiple selections possible per category)



Source: Oliver Wyman 2015 MRO Survey

# DIVING DEEP INTO DATA

Carriers flying large fleets of similar aircraft could gain a significant competitive advantage by keeping much of their fleet data proprietary.

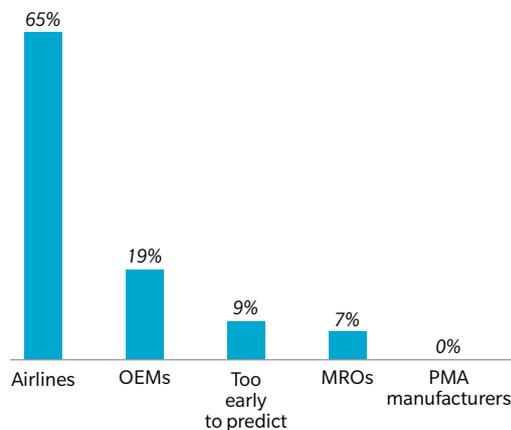
Most MRO respondents to the 2015 survey said they are investing in new technologies that use data to make better decisions. The collection, storage, aggregation, and analysis of data will be key factors in aircraft health monitoring and predictive maintenance. This new wave of innovation differs from prior waves because it presents more opportunities for non-MRO firms to extend their reach into the industry and compete for services.

Big data also poses a fundamental question that could shift the existing industry:

Who owns the data? OEMs moved early to structure offers that ingrained the practice of customers sharing data with manufacturers. This shaped the perception of data analysis as the domain of the OEMs, and it placed them in a potential conflict, as carriers entrust their parts removal analysis to the same organizations that sell those replacement parts.

## Exhibit 5: Beneficiaries of technology

**Who is best positioned within the industry to benefit from predictive maintenance?**  
Percentage of responses by industry cohort



Source: Oliver Wyman 2015 MRO Survey

This situation points to a potential role in the aftermarket value chain for an intermediary as a fair arbiter of data, one that can be trusted by both OEMs and carriers. There are early signs that this role could emerge, leaning not on the industry's traditional strength in the science of performance but instead on the relatively nascent science of prediction. However, the market has yet to settle on whether established MROs or newcomers, such as IT consultants or software providers, should perform this function.

When asked to finish the sentence "I cannot let my competitors beat me to market with ..." survey respondents picked a clear winner: predictive maintenance. By using predictive maintenance, operators rely on data to limit part failure and reduce total part costs by replacing components before they cause breakdowns. The approach cuts labor costs by reducing unscheduled repairs, out-of-service events, and costs for employee time-on-tools.

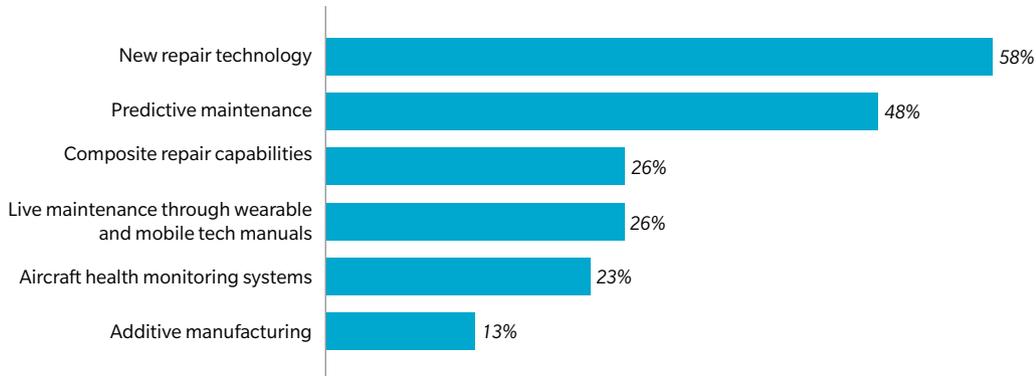
This has the hallmarks of a technology that should, for a change, funnel savings to operators. To secure these savings for themselves, airlines will need to take the lead. How a carrier structures its predictive maintenance business, and the extent of savings captured by the airline, could change the way investors value the company.

These savings would cut into MRO revenues. For all its benefits, predictive maintenance also holds the ability to separate decision-making from time-on-tools, limiting the value that MROs add. An MRO that takes strides to establish

## Exhibit 6: MRO technology priorities

**Complete the following sentence: "I cannot let my competitors beat me to market with ..."**

Percent of positive MRO responses for types of technology (multiple selections possible per category)



Source: Oliver Wyman 2015 MRO Survey

## FUEL PRICES EBB

### Lower fuel prices could reward the MRO industry.

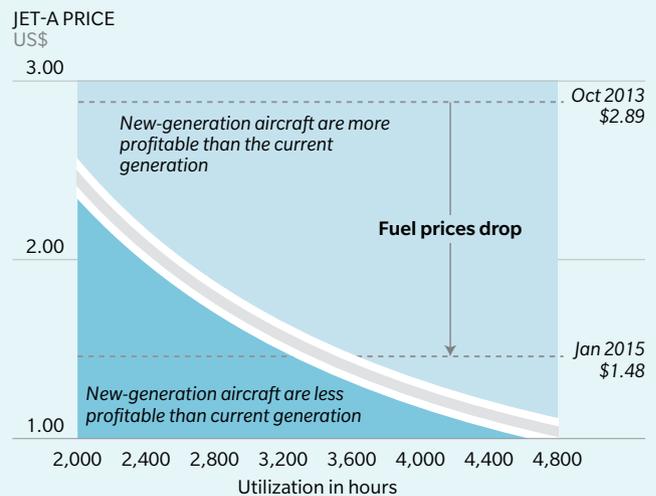
As Oliver Wyman's recent article, "[As Oil Prices Fall, New Aircraft Lose Competitive Edge](#)" says, declining fuel prices could tilt the relative operating cost advantage in favor of older aircraft versus upcoming new-generation fleets. Low fuel costs more than offset the higher maintenance costs of older planes. This could delay retirements of older aircraft and keep a larger population of aging aircraft in service longer.

In the MRO Survey, 74 percent of airline respondents reported they will consider new fleet plans if fuel prices remain low. This could include adding capacity, delaying retirements, or delaying new orders.

For airlines, the risk of adding too much capacity is acute. North American airlines have recently achieved their best margins in a decade and seem to have finally lifted themselves out of a boom-and-bust cycle. Industry yield has grown steadily since 2002. A flood of capacity could unravel those gains.

For the MRO industry, added capacity would be a boon. If oil remains around \$50 a barrel, 59 percent of survey respondents anticipate increases in overall MRO activity.

### Aircraft generational profitability curve: Where is your fleet's inflection point?



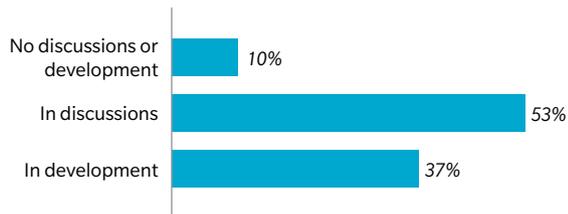
Source: Oliver Wyman analysis

## Exhibit 7: Talking predictive maintenance

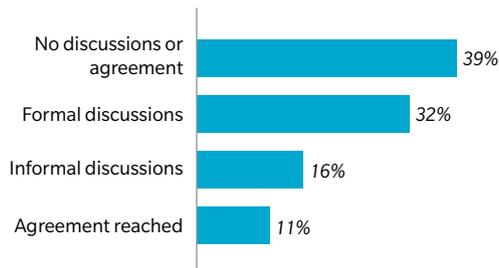
### To what degree has your organization discussed predictive maintenance and the use of big data analytics?

(Multiple selections possible per category)

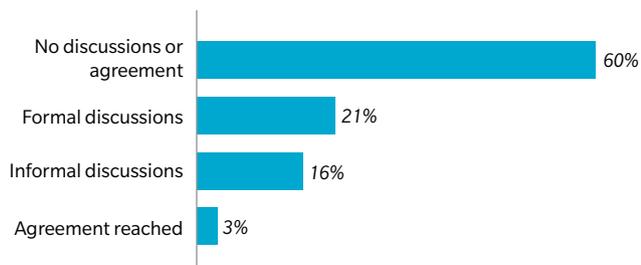
#### INTERNALLY



#### WITH OEMs



#### WITH MROs



Source: Oliver Wyman 2015 MRO Survey

predictive maintenance capabilities and partnerships could replace this revenue with new offers.

Aircraft health monitoring systems align and aggregate data from aircraft to give operators insight on operating performance constraints. Such health monitoring systems promise to improve aircraft reliability and lower operating and maintenance costs.

Having performance data about a particular aircraft prior to planned downtime allows the operator to customize the check specifically to that tail number, with the promise of dramatically changing the type of maintenance performed during heavy checks.

Carriers flying large fleets of similar aircraft could gain a significant competitive advantage by keeping much of their fleet data proprietary. Provided these carriers can adequately analyze the outputs, they could learn how to operate their fleets better than competitors.

Clearly there are positive externalities from the current practice of feeding data back to manufacturers, which use it to inform other carriers and improve their own products and services. However, operators fervently protect their customer data. How long will airlines treat operational data differently?

Still, the big data panacea hovers just tantalizingly out of reach. More constraints need to fall to truly harness the potential power of health monitoring. Regulators need to update rules to allow for dynamic planning and check scheduling. Data pipes connecting in-flight aircraft to servers on the ground need to be bigger and cheaper to enable speedy flow. Most important, analytical techniques need to improve to get the right decision every time and prevent false positive indications. Collecting data is one thing. Having meaningful, reliable information is quite another.

# DISRUPTERS ROLL IN

The sea of disrupters does not begin and end with data, and focus here may be diverting attention from other technologies that are quickly rolling in.

Additive manufacturing was a surprise non-contender in the 2015 MRO Survey, as respondents said the technology is not a prime candidate for implementation in the next five years. Fewer than one in five respondents reported their firms had moved beyond internal discussions on additive manufacturing. A full 40 percent of respondents haven't broached the subject at all.

The ability to instantly manufacture parts could enormously reconfigure supply chains, change requirements for spares, upend the market for parts manufacturer approval, and alter the relationship

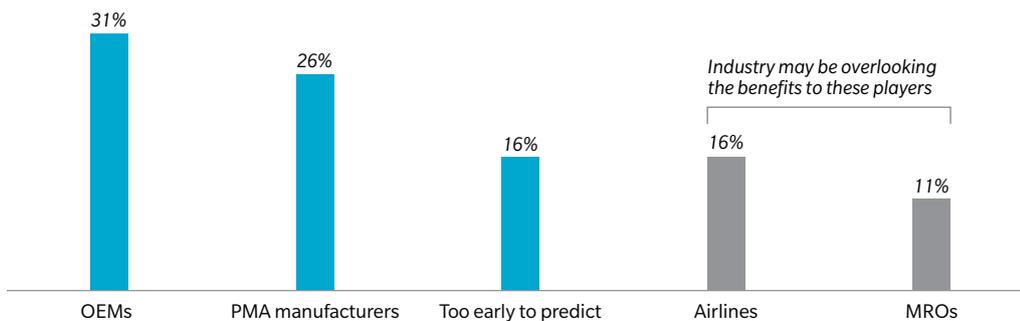
between OEMs and customers. High cost and a lack of acceptance among aviation customers are impeding additive manufacturing, but those issues could resolve more quickly than anyone anticipates.

While survey respondents predicted OEMs and PMA holders would be most likely to benefit from the introduction of additive manufacturing, we see significant upside for operators and MROs. Additive manufacturing could reduce OEM and PMA manufacturers' roles to that of design and engineering specialist on some types of parts, similar to the licensing model employed by software firms like Microsoft and Adobe. While printing full-fledged engines may be futuristic, the ability to confidently manufacture consumables and

Additive manufacturing was a surprise non-contender in the 2015 MRO Survey.

## Exhibit 8: Wide open field for additive manufacturing

**Who is best positioned within the industry to benefit from additive manufacturing (3-D printing)?**  
Percentage of responses by industry cohort



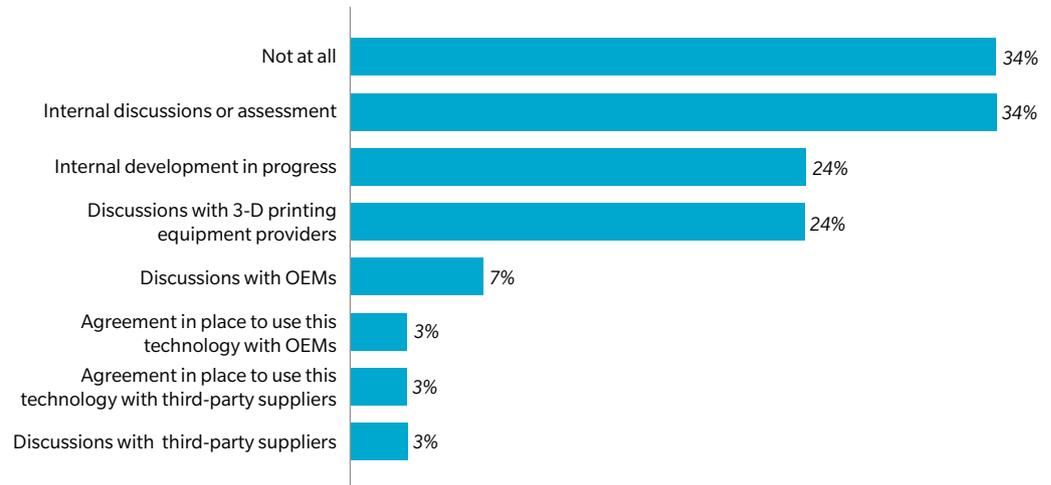
Source: Oliver Wyman 2015 MRO Survey

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### Exhibit 9: Few MROs move on additive manufacturing

#### To what degree has your organization discussed additive manufacturing (3-D printing) in the context of aircraft maintenance?

Percent of MRO responses by type of activity (multiple selections possible per category)



Source: Oliver Wyman 2015 MRO Survey

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expendables on site may be here sooner than survey respondents expect.

One much discussed technology that hasn't disrupted the industry is composites. Boeing's new 787 and Airbus' A350 bring a slew of technologies to market, including composites and titanium and advanced aluminium alloys used throughout the fuselages. With hundreds of the new wide-bodies in use, and hundreds more in production, there is a growing base of customers that will need aftermarket

support for the full range of their newly acquired technologies.

Rather than becoming the harbingers of a new archetype, the A350 and 787 stand a greater chance of harboring multiple technologies that will be discontinued. OEMs have used pieces of the new technology for other models, but many core features are not being replicated. MRO leaders will need to think carefully about whether an investment in servicing these aircraft will be profitable.

# MROs STANDING ON THE SHORE

Survey responses point to a hesitance within the aftermarket to develop new offerings. Despite management strategies for growth, 73 percent of MRO Survey respondents said they attribute 10 percent or less of forecasted 2015 revenues to products and services stemming from internal MRO-related research and development conducted within the last five years.

Respondents said budget and capital availability are the leading inhibitors of innovative change. Organizational resistance is a further roadblock, and the lack of an innovative culture was also cited.

These issues are not unique to the MRO industry. Oliver Wyman's Organization Transformation practice has seen this play out in multiple markets around the world. Given the magnitude of disruptive

change imposed by the race to innovate, MROs should reconsider the ability of their current organization to smoothly transform. This goes beyond natural organizational resistance to doing things that are unknown or writing a new set of objectives to capture new business. Embracing new directions could require MROs and operators to reshape organization structures, processes, talent profiles, partnerships, and corporate culture.

MROs and operators alike must ask themselves if they are better than their competitors at developing fast, customized approaches that closely resemble customer needs. This may require an evolution of competencies. Employees and managers who are used to repetitive and predictable models must design new, customized services. The organization must open itself to calculated risks.

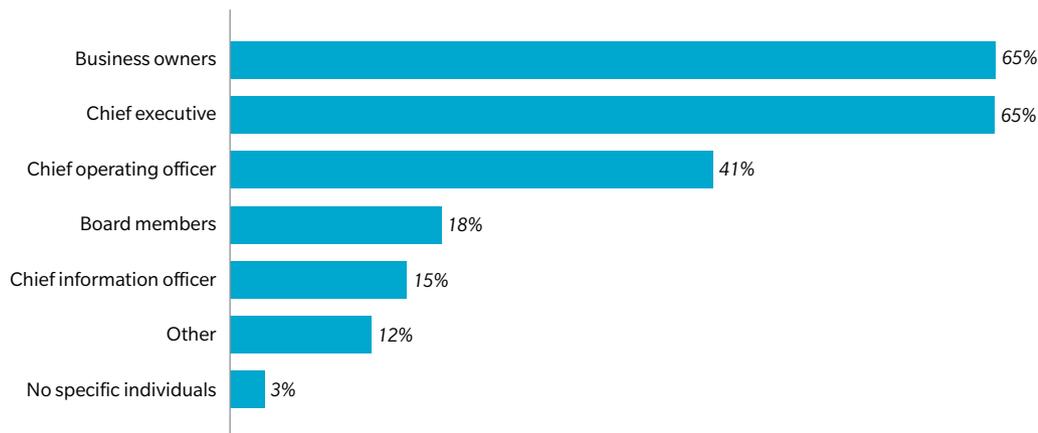
73%

Portion of respondents who said they attribute 10 percent or less of forecasted 2015 revenue to MRO-related R&D within the last five years.

## Exhibit 10: Champions of innovation

### Who champions innovation at your organization?

Percent of MRO responses for job function (multiple selections possible per category)



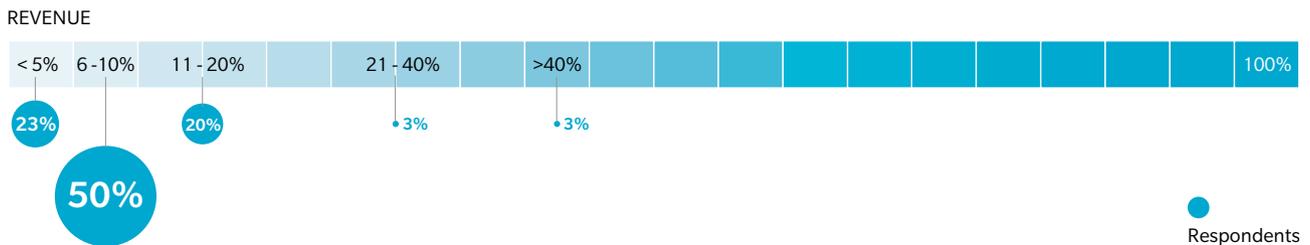
Source: Oliver Wyman 2015 MRO Survey

MROs will need time, resources, and most of all capital to become innovators. And they must do so at a time when many

need significant IT upgrades, which could crowd out investment for other technology platforms.

### Exhibit 11: Majority of MROs do not innovate through internal R&D

**What percentage of your forecasted 2015 revenue would you attribute to products and services stemming from internal, MRO-related research and development conducted within the last five years?**



Source: Oliver Wyman 2015 MRO Survey

## NEW SWELL OF TECHNOLOGY UPGRADES

**Aviation companies across the MRO industry are planning to upgrade their information technology infrastructure in the next three years.**

Survey respondents said that a large portion of their IT systems have been in place for more than 12 years, with some tracing their roots to the time of the Nixon administration. Among airlines, more than 75 percent said their engineering, maintenance programs, maintenance planning, reliability management, and records systems were installed prior to 2002. And more than half of all respondents reported upgrades planned soon for engineering, maintenance programs, reliability management, records, or supply chain systems, and in many cases multiple systems.

Given the antiquated nature of so many systems, the potential for increased efficiency through better functionality and greater flexibility looms large. So, too, do the risks associated with upgrading critical systems with this scale and reach. A strong majority

of respondents reported relying primarily on in-house customized systems and avoiding commercial off-the-shelf (COTS) software, especially for complex, purpose-driven MRO systems.

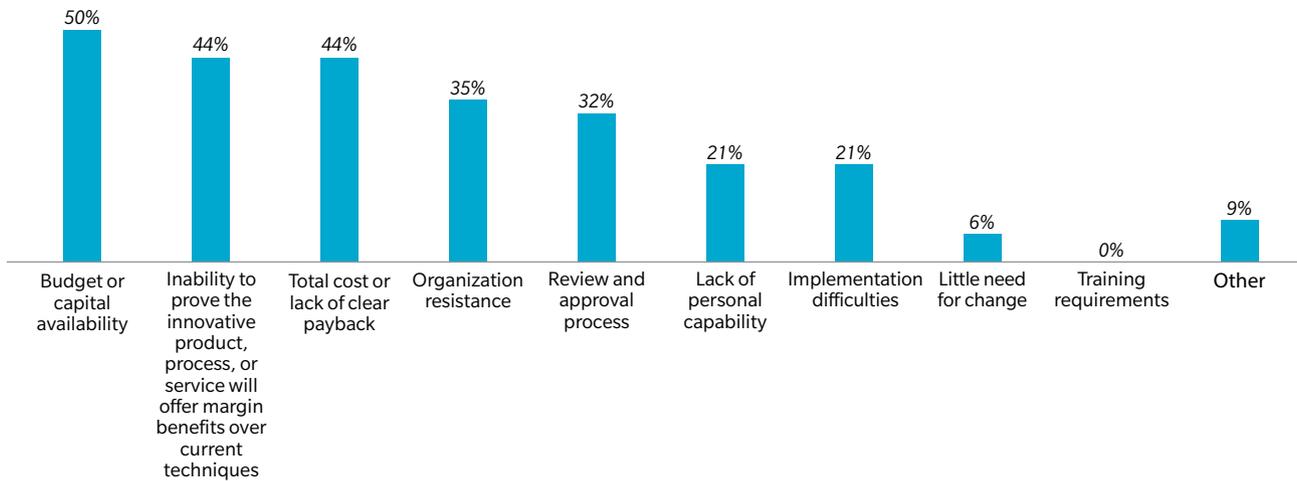
Given the potential upside, respondents recognize the need to upgrade and thus mitigate substantial risks. But half of them said sticker shock over development costs and a lack of budget kept them from installing more robust IT systems.

System upgrades are nothing new for the MRO industry, and experience has taught our respondents the key issues to address in IT implementations and migrations. The biggest three are: Lack of resources to properly execute data cleansing and migration (54 percent), lack of business resources to support requirements and specifications (49 percent), and cost and budget overruns (47 percent). Among airlines these same three factors were even more prevalent.

## Exhibit 12: Inhibitors of MRO innovation

### The primary inhibitors of innovation at my organization are:

Percent of MRO responses per inhibitor (multiple selections possible per category)

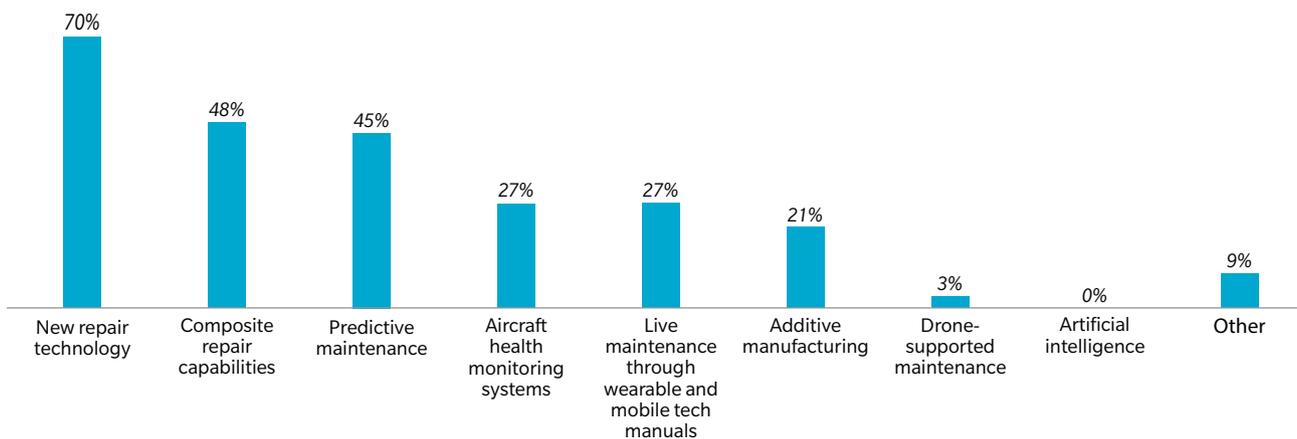


Source: Oliver Wyman 2015 MRO Survey

## Exhibit 13: Minority of MROs venturing beyond linear evolution of repair capabilities

### Has your organization approved investment for developing any of the following technologies now or during the next five years?

Percent of positive MRO responses for types of technology (multiple selections possible per category)



Source: Oliver Wyman 2015 MRO Survey

# INNOVATION TIDE IS IN

Within MROs, there is a need for clarity, purposeful analysis, and selection.

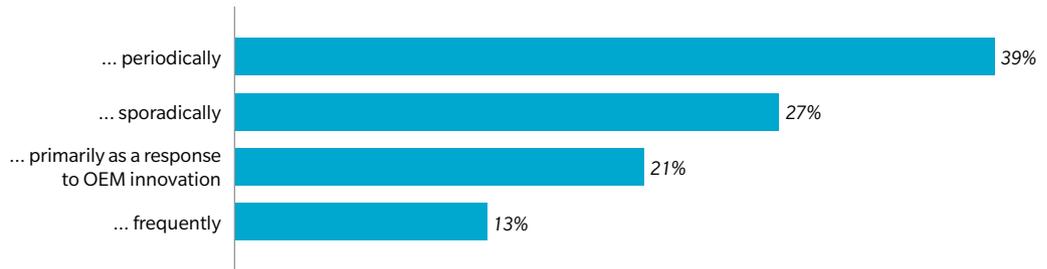
Most survey respondents view innovation as something that comes in waves, with 66 percent saying innovation is “periodic” or even “sporadic” for the industry. Twenty-one percent viewed MRO innovation as primarily a response to OEM innovation. Only one in four respondents saw “creative and inventive solutions developed by MROs” as a primary driver of MRO innovation.

Research and development is critical for a manufacturer’s product life cycle. But historically, MROs just adapted the technology passed on from airlines and OEMs, such as composite technology and reconfigurable avionics. On occasion,

MROs adopted technology from associated industries, like lean processes or human factors analysis. With this innovation feeder system in place, MROs have not needed to develop significant R&D activities of their own.

For a business managed through incremental innovations, this is a rational approach. However, disruptive change will challenge management to think beyond standard practices and commit time and resources to successfully pick and choose technologies and develop beneficial business models. Within MROs, there is a need for clarity, purposeful analysis, and selection. The time for placing bets is now.

Exhibit 14: MRO industry experiences innovation in waves



Source: Oliver Wyman 2015 MRO Survey

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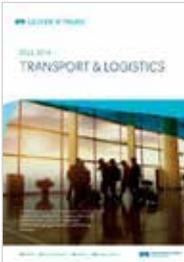
The decline in jet fuel prices could stymie the airline industry's march toward a new generation of narrow-body aircraft.



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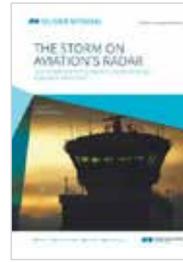
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This report was published by TeamSAI prior to its acquisition by Oliver Wyman and integration into the CAVOK business.



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Oliver Wyman's MRO Survey is an industry standard for information about changing trends in the maintenance, repair, and overhaul sector. Going into its second decade, the survey queries leaders across the MRO industry, including top executives from airline operations, procurement, and engineering departments, captive and independent maintenance providers, OEM aftermarket divisions, and financing and leasing professionals.

More than 100 people responded to the 2015 survey, and 79 percent hold positions of director or higher. Around 71 percent work for companies based in North America, 19 percent for companies in Western Europe, 4 percent in Asia, and 6 percent in Latin America, the Middle East, and Eastern Europe. Airline employees made up 46 percent of the respondents, 36 percent of respondents work for MROs, and 6 percent for OEMs.

If you would like to participate in next year's survey, please contact Birgit Andersen at [birgit.andersen@oliverwyman.com](mailto:birgit.andersen@oliverwyman.com).

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