

MRO SURVEY 2014

SIGNS OF NEW LIFE

NEW PARTNERSHIPS, FRESH HIRING, 3-D PRINTING



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EXECUTIVE SUMMARY

Original equipment manufacturers won the market for high-value, aftermarket aviation services, leaving independent maintenance, repair, and overhaul providers scouting for paths to evolve and grow.

Despite the newfound prominence of OEMs in their traditional markets, engine and component MROs are preparing to fortify their remaining footholds through strategic partnering and by accelerating development of unique services. Airframe MROs, meanwhile, seek to capitalize on shifts caused by rising labor costs in emerging economies, long a favored maintenance destination for US and Western European fleets.

In our annual survey of airlines, MROs, and OEMs, we confirmed the disparity in engine and component maintenance for new, modern fleets. MROs have all but ceded this territory to manufacturers, and independent maintenance providers are now redefining their search for growth within this new paradigm. Many, for example, appear to have either completed or abandoned pursuits of OEM licenses during the past year. They are turning to new forms of collaboration with OEMs and lessors, while considering mergers and acquisitions to consolidate high-value capabilities, increase efficiency, and broaden reach. MROs continue to deploy serviceable material, inventory reduction, and other strategies designed to help customers cut costs.

A shrinking gap in labor rates, combined with sustained sentiment in favor of repatriating base maintenance, has slowed the multi-year pattern of sending aircraft

overseas from developed markets. In the US, mounting investment in domestic hangar capacity may in fact herald a long-term reversal of this trend, suggesting fervent future demand for technical labor. Hiring is gaining momentum, and our survey doesn't support conventional wisdom that the supply of skilled labor in the US has weakened. Still, MROs face the challenge of not only hiring to handle this growth, but also to replace a graying workforce.

Looking further out, survey respondents are divided on how one headline-grabbing technology, additive manufacturing, or 3-D printing, will affect the aviation maintenance market. Our respondents expect expendable parts will be the most likely use for 3-D printing in the short term. However, they have lower expectations for the likelihood of proprietary materials being manufactured this way. That suggests industry participants expect OEMs to protect their technology from adaptive manufacturing by others.

As always, by responding to the needs of operators to continually combat rising costs, creative and proactive MROs can solidify their grasp on airline customers. Airlines are anxious to maintain choice in the aftermarket, despite the events of the recent past. By developing value-added services in niches left unprotected by smaller manufacturers, employing cost-reduction options ignored by larger OEMs, and partnering smartly to alleviate operators' new pain points, independent providers can continue to fill a critical role in the ever-evolving MRO landscape.

85%
of survey
respondents said
M&A activity or
speculation is
steady or rising.

OPERATOR ENVIRONMENT

OEMs Dominate as Airlines Continue to Seek Alternatives

The theme of emerging OEM dominance in the maintenance aftermarket has been established in previous versions of this survey and elsewhere. Clouded by this multi-year narrative, however, is the still-strong desire of operators to preserve material and service alternatives for maintenance of their fleets. For airlines seeking to compete and place engine and component maintenance on next-generation aircraft, OEMs have largely emerged as the only choice. Engine and large systems manufacturers have designed and deployed effective strategies to restrict alternative material and repair development by third party MROs.

Based on our survey, there is limited expectation among airlines that the current state of maintenance placement will change in the near future. When asked where they expect to place maintenance of new aircraft engines, 69 percent of operator respondents say the OEM. MROs fare better on component maintenance, with 63 percent of airline respondents selecting them as likely service providers. However, OEMs also appear as likely providers of component services on 44 percent of responses, suggesting this category is destined to be served by a mix of MROs and OEMs for most operators. Momentum here appears to be very much with the OEMs (Exhibit 1).

Airline responses to our survey, however, show that operators intend to sustain maintenance cost reduction efforts throughout the aircraft life cycle, suggesting operators will continue to seek OEM alternatives where still possible. And many of the ways airlines expect to manage costs

are particularly aligned to the traditional advantages of MROs. When asked about reducing costs of engine and component maintenance (two high-investment, material-intensive categories that are most impacted by OEM dominance), airline respondents highlight strategies MROs are best positioned to address: reducing inventory levels (38 percent), developing serviceable material programs (31 percent) and developing alternative repairs to reduce part replacement costs (31 percent). In each of these, OEMs are fundamentally motivated to oppose these options, as each reduces demand for new parts, which carry robust margins for manufacturers. If MROs continue to hone and expand these capabilities, perhaps in deeper partnership with airlines to gain access to necessary operational and technical data, they may yet successfully stem OEM momentum and defend their remaining market.

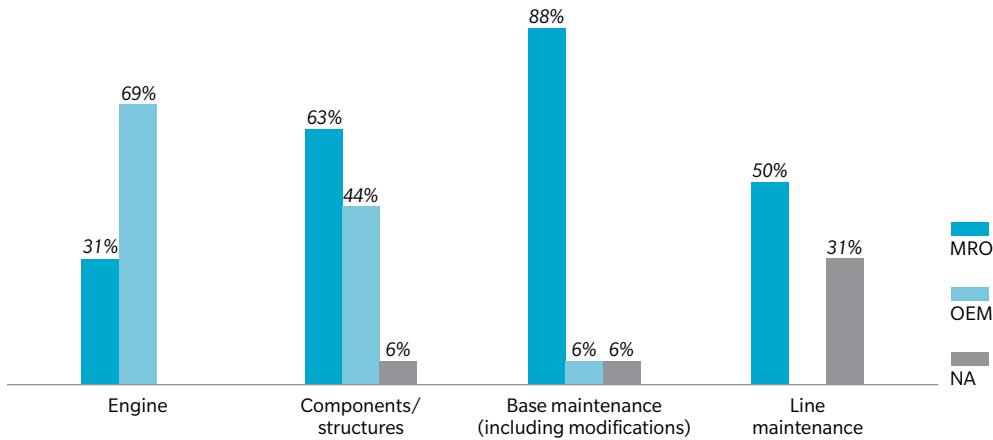
69%
of operator
respondents
expect to place
maintenance
of new engines
with OEMs.

EXHIBIT 1: DESTINATION OF FUTURE MAINTENANCE

Who do you expect to predominantly hire for new aircraft maintenance in the future?

Percent of airline responses for types of vendor, by platform (multiple selections possible per category)

POSITIVE RESPONSES

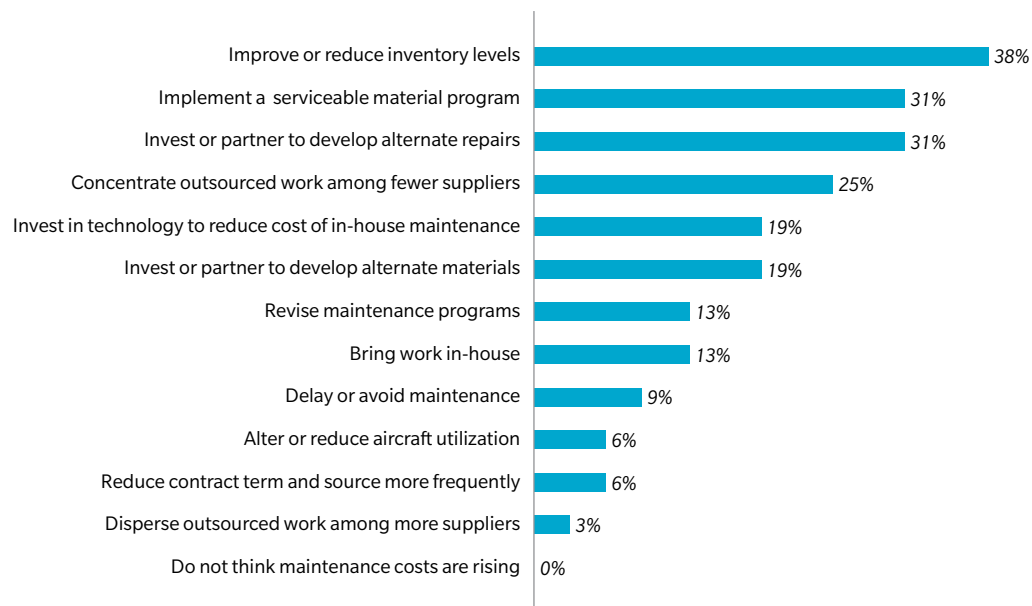


Source: Oliver Wyman 2014 MRO Survey

EXHIBIT 2: COST REDUCTION STRATEGIES, COMPONENT/ENGINE COMBINED

What strategies have you considered or adopted to combat rising outsourced engine or component maintenance costs?

Percent of responses by strategy



Source: Oliver Wyman 2014 MRO Survey

PARTNERING STRATEGIES

OEM PARTNERSHIPS WITH MROS STAGNATE

The 2014 survey suggests that MROs have reached a critical point in seeking fruitful forms of cooperation with OEMs. MROs are moving beyond simple licensing agreements, which we discovered in last year's survey represent the majority of current partnerships. While 76 percent of MRO respondents say they have partnered with an OEM in the last three years (up from 71 percent last year), just 56 percent describe that partnership as a license agreement (down from 82 percent last year). This decline might suggest OEMs are now finalizing development of their licensed repair networks, and MROs need to look beyond these arrangements for new sources of revenue.

Progress in shaping deeper relationships, however, appears to be slowing or even

stopping. The proportion of MROs reporting a successful joint venture or intellectual property development agreement with an OEM during the past three years is virtually the same this year (27 percent) as last (31 percent). This stagnation could mean that MROs have simply given up on proposing more advanced concepts to OEMs, having failed to establish mutually beneficial frameworks during the past several years.

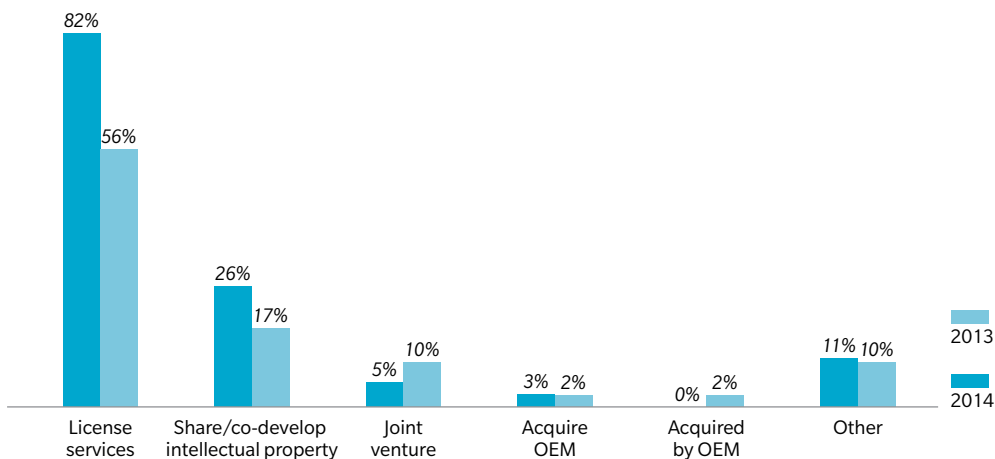
A look at failed collaborations reinforces the notion that new partnership opportunities between MROs and OEMs are drying up. Failed collaboration in all forms declined from 2013 to 2014, most likely indicating diminishing engagement between the parties. Failed license agreements were reported by 64 percent of MRO respondents in 2013, declining to 46 percent this year. Last year, 47 percent of MROs reported

56%
of MRO respondents said they signed license agreements with OEMs during the last three years, down from 82% last year.

EXHIBIT 3: FORM OF COLLABORATION BETWEEN MROS AND OEMS 2013-14

Indicate the nature of the partnership consummated.

Percent by response of MROs that have partnered in last three years



Source: Oliver Wyman 2013 and 2014 MRO Surveys

discussing, but failing to finalize, a joint venture in the last three years. This year: 32 percent. Similarly, in 2013, more than half of MROs indicated trying and failing to reach intellectual property development agreements in the last three years, with that proportion falling to 17 percent this year.

Now that this form of partnering appears to have reached its peak, many MROs that failed to secure significant licensing or other arrangements with OEMs may be looking for new partnering alternatives. Without the steady influx of licensed work from OEM partners, generating new sources of revenue is imperative for MROs.

LESSORS WANT PARTNERSHIPS, BUT FORM IS UNCLEAR

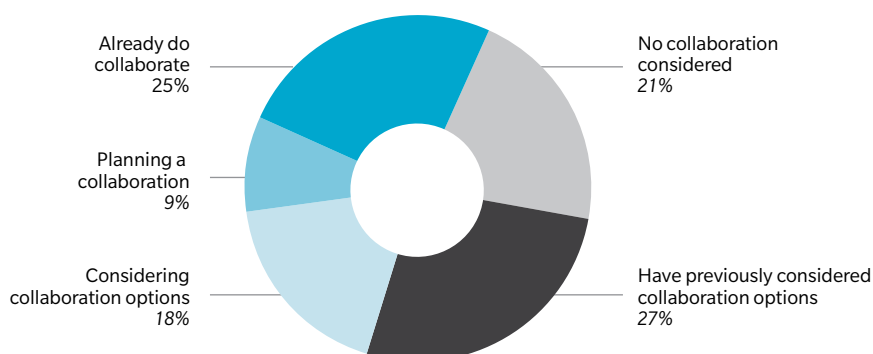
In last year's survey we suggested MROs partner more actively with aircraft lessors to develop joint aircraft-plus-service value propositions for airline customers at the point of aircraft selection. We consider this a

critical juncture in the maintenance selection process. As OEMs have overwhelmingly limited the aftermarket alternatives on new aircraft types, airlines now exploit new equipment selection as their primary source of leverage (i.e., pitting manufacturer against manufacturer). This chain reaction has, by and large, frozen MROs out of competition for services on new aircraft. By partnering with lessors, MROs offering comprehensive labor, technical, program, and logistics services may be better able to penetrate these transactions and gain a foothold in the massive market for new aircraft maintenance, rather than ceding further ground to OEMs.

According to our survey, MROs are in various stages of partnership with lessors, with no clear trend to suggest a breakthrough business design is imminent. Nearly 80 percent of MRO respondents have at least considered partnering, with 33 percent having already partnered in some form, or with firm plans to do so.

EXHIBIT 4: LEVEL OF COLLABORATION BETWEEN MROS AND LESSORS

How would you describe your collaboration with lessors to develop maintenance services for airlines?
Percent by response of MRO respondents



Source: Oliver Wyman 2014 MRO Survey

The form of potential future partnerships between these two constituents, if any, is unclear. The most common form of current or contemplated collaboration, per our MRO respondents, is maintenance of aircraft at or approaching lease return (61 percent). That's a simple customer-provider relationship that does not allow MROs the broader, earlier access to operators needed to regain ground in the market. Less than half of respondents indicate considering lessor partnerships delivering maintenance to active fleets (45 percent). Even fewer say they've pondered bundling value-added niche services that might differentiate MROs from OEM counterparts, and lessors from direct competitors. Just 24 percent report discussing serviceable material

support to active fleets through lessor channels, and less than 20 percent indicate discussing provision of program or technical management services that lessor customers, particularly smaller operators, often value.

Although a progressive form of collaboration between these entities remains to be established, 67 percent of MRO respondents expect an increasing level of partnership with lessors during the next five years. This ratio is consistent with findings in a separate survey of lessors that Oliver Wyman conducted in 2013, which found 60 percent of lessor respondents expected increased collaboration with MROs during the same period. This is a theme to watch as MROs search for new avenues to stability and growth.

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lessors during the
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SERVICEABLE MATERIAL STRATEGIES

MROs Might See Opportunity to Expand this Strategy

We found a vast majority of airlines have adopted an active serviceable materials strategy since OEM emergence, with 84 percent of airline respondents classifying their approach to serviceable material as "active" or "comprehensive" (compared with 71 percent last year). A majority of airline respondents report their use of this material has grown during the last three years, though our findings (57 percent this year and 66 percent in 2013) suggest this strategy may be reaching a saturation point.

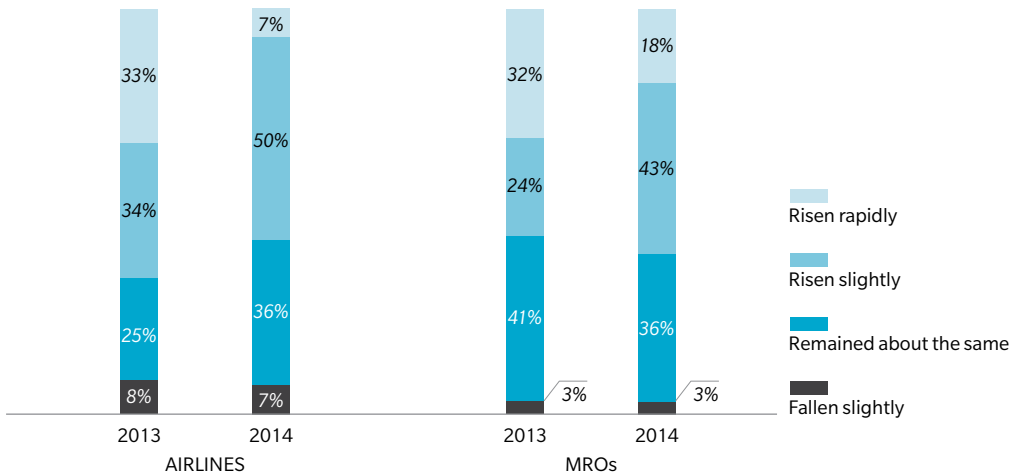
MROs have responded effectively to this growth in demand, with 79 percent of our MRO respondents reporting an "active" or "comprehensive" program and 60 percent reporting a rise in usage during the past three years, both figures tightly aligned with airline findings. The ability of MROs

to identify, source, and harvest serviceable material provides an edge against OEM counterparts seeking to serve mature aircraft. Few OEM respondents (25 percent in 2014 and 10 percent in 2013) characterize their own serviceable materials strategy as "active" or "comprehensive." This is, of course, consistent with an OEM's natural incentive to sell high-margin new material and it is unlikely, in our estimation, that OEMs will soon develop competitive programs. Anecdotal evidence suggests some OEMs, however, are active in constraining serviceable material supply through aggressive open market buying.

A myriad factors are driving demand for this material. Prime among these is increasing availability of feedstock for teardown, buoyed by retirements of popular modern aircraft

EXHIBIT 5: USE OF SERVICEABLE MATERIALS, AIRLINE AND MRO

How has your use of serviceable parts changed during the last three years?
Percent of respondents



Source: Oliver Wyman 2013 and 2014 MRO Surveys

types and increasing cost-effectiveness of part harvesting processes. This factor is cited by 41 percent of respondents as a growth driver. Persistently high cost of new material, particularly in engine applications, is another common factor, also cited by 41 percent of respondents. Additional tailwinds include: availability of surplus parts (34 percent), which is driven by global supply chain efficiencies and component reliability improvements, and the increasing acceptance among operators (29 percent), who are historically deterred by documentation and quality concerns that are being more effectively addressed as the industry's capability improves.

MROs might have a greater opportunity to expand serviceable material programs. According to our results, maintenance providers overstate the importance of certain obstacles to the broader acceptance of this strategy. Specifically, while half (51 percent) of MRO and OEM respondents select lease return conditions as a hindrance to

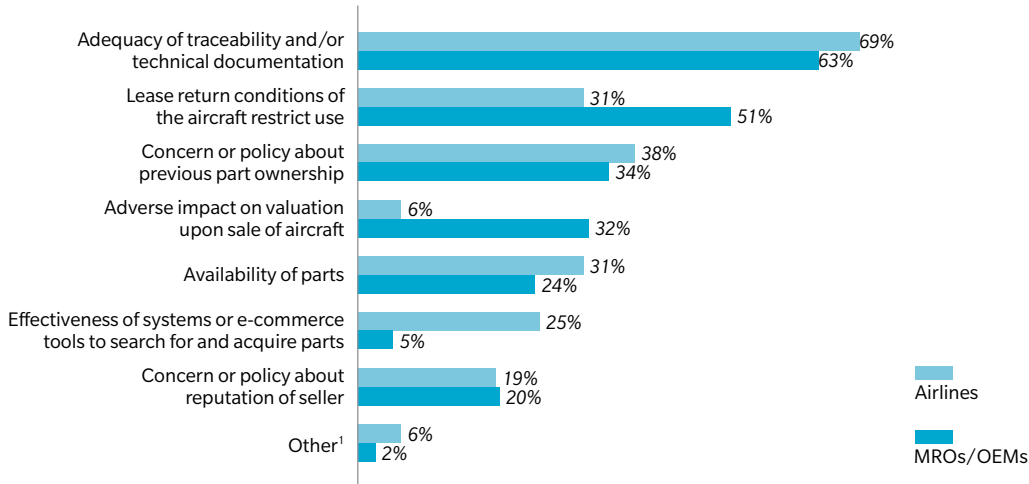
broader adoption, only 31 percent of airline respondents suggest likewise. In separate research we conducted on this subject, industry veterans echo this sentiment, suggesting that, though lessors strictly monitor power plant content, they are far more lenient with other systems. This belief is consistent with our finding that few operators consider serviceable materials to be a significant drag on aircraft values. Whereas 32 percent of MRO and OEM respondents cite this as a hindrance to serviceable material adoption, only 6 percent of airlines agree. Naturally, as airlines increasingly accept serviceable material as operators, it stands to reason they will equally accept it as future aircraft buyers.

60%
of MRO
respondents
reported a
rise in usage
of serviceable
material
during the last
three years.

EXHIBIT 6: SERVICEABLE MATERIALS STRATEGY HEADWINDS, AIRLINE AND MRO/OEM

What do you think prevents your customers from using serviceable material more significantly?

Percent of respondents citing each factor



Source: Oliver Wyman 2013 and 2014 MRO Surveys

¹ For airline respondents includes "part reliability," for MRO/OEM includes "total care customers."

NORTH AMERICAN AIRFRAME OPPORTUNITY

Hiring Expands as Airlines Prefer Maintenance Work at Home

While engine and component MROs face staunch OEM competition and must innovate to prosper, airframe providers face no such challenge. At least in the US, they are seeing the market turn in their favor. This year, we confirmed a surprising predisposition among domestic operators to place airframe work stateside, even with a mild to moderate price disadvantage against foreign repair stations. In this year's survey, 60 percent of airline respondents say they are willing to absorb up to a 5 percent cost deficit relative to overseas alternatives to select a domestic provider, and 20 percent indicate willingness to accept up to a 15 percent deficit. Based on calculations in last year's edition of this survey, we think this

trend could result in the creation of 5,000 new airframe maintenance jobs in the US, both technical and administrative.

The US media often point to a broad decline in supply of skilled tradespeople, and the issue will surely become an agenda item in many midterm elections in 2014. Interestingly, our survey does not strongly support this hypothesis, at least in the short-to-midterm. The current hiring outlook for MROs appears to be mixed at worst. In North America, respondents are equally divided in their assessment of the ease of filling open technical positions, with 33 percent of MROs finding multiple candidates with minimal recruiting, 34 percent finding an adequate

32%
of North American
MROs are hiring.

supply of candidates with intense recruiting, and 33 percent reporting a shortage of candidates with intense recruiting. Western European respondents, despite less workforce expansion, actually report a more challenging hiring environment, with 46 percent of respondents indicating an “adequate” supply of candidates and 39 percent finding “few” candidates, even with intense recruiting efforts.

Recent investments in domestic capacity by AAR Corp., AMR Corp., and Aviation Technical Services suggest the repatriation trend is accelerating, and there are early clues that a labor squeeze may develop if the rate of onshoring continues to climb. MROs appear to be reacting to this trend already. When asked to characterize their outlooks for hiring skilled technical labor, 32 percent of North American respondents indicate they are hiring to expand this workforce. This contrasts to just 18 percent in Western

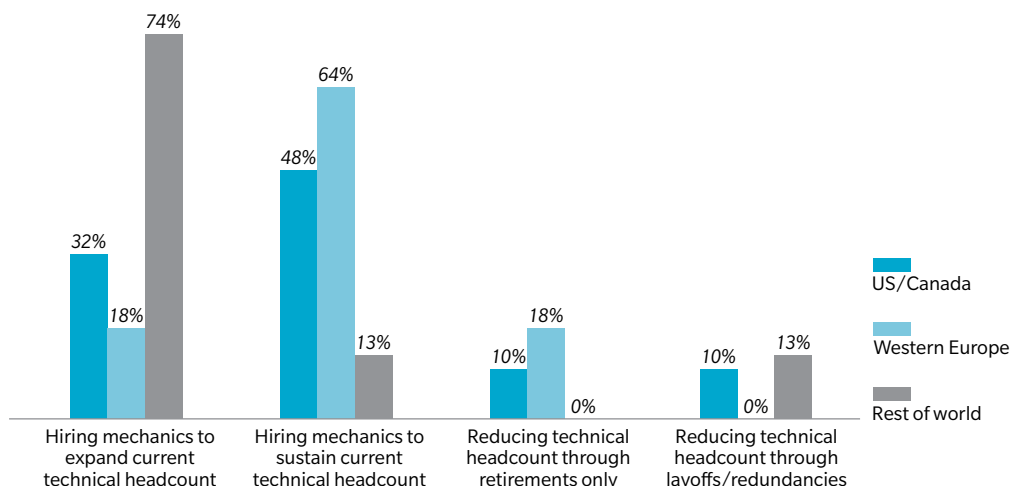
Europe. Another 48 percent of domestic respondents indicate they are maintaining the size of their technical workforces, with just 20 percent reducing headcount through attrition or layoffs. This divide is a significant departure from a decade ago, when many airframe maintenance facilities were being shuttered and workforces slashed.

Even with a mixed hiring picture, the bubbling repatriation trend may create an imminent squeeze on stateside labor supply. Among North American respondents, 37 percent report their technical workforce averages 46 to 55 years of age. This contrasts with 19 percent in Western Europe and 13 percent in other global regions. As this cohort ages into retirement, maintenance facilities in the US will require an infusion of qualified mechanics to meet the steadily growing demand for onshore technical services.

EXHIBIT 7: HIRING OUTLOOK FOR TECHNICIANS, BY GEOGRAPHY

How would you describe your company’s immediate hiring outlook for qualified technicians?

Percent of respondents by geography

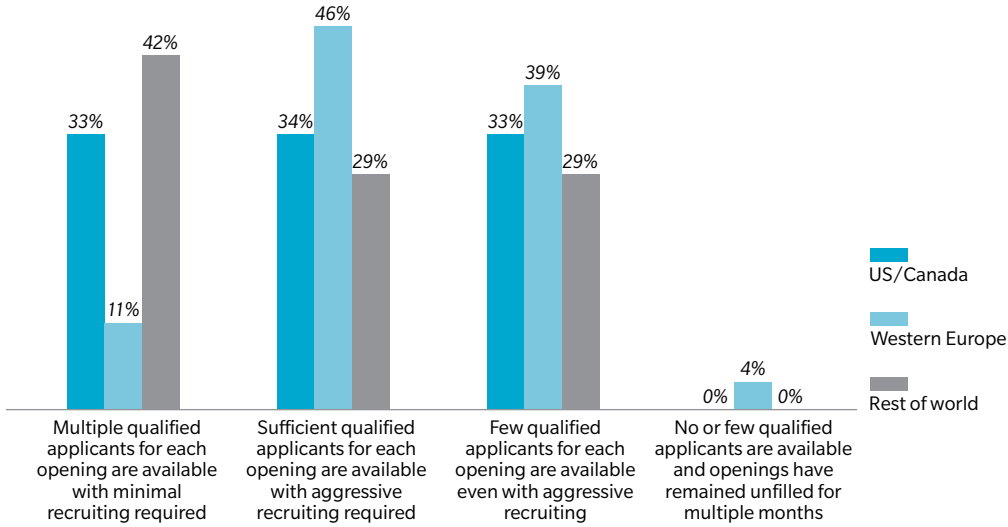


Source: Oliver Wyman 2014 MRO Survey

EXHIBIT 8: LABOR SUPPLY OUTLOOK FOR TECHNICIANS, BY GEOGRAPHY

Which option best describes the availability of candidates to fill technical workforce openings?

Percent of respondents by geography

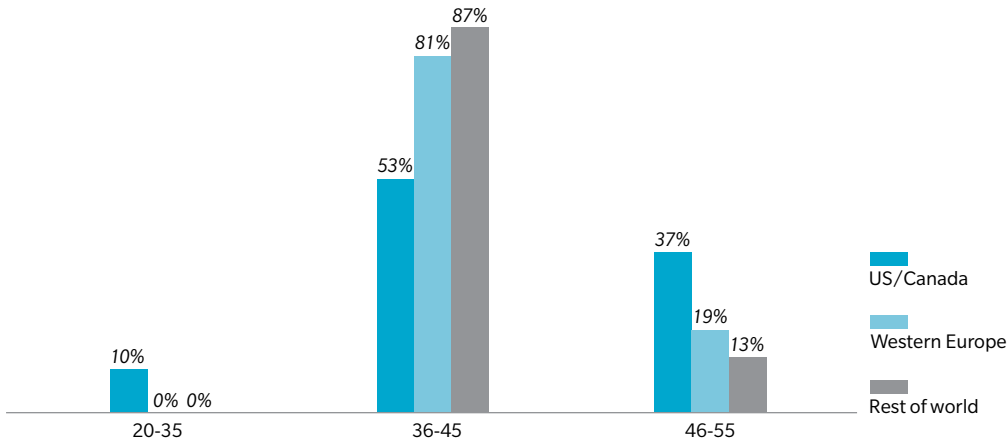


Source: Oliver Wyman 2014 MRO Survey

EXHIBIT 9: AGE OF TECHNICAL WORKFORCE, BY GEOGRAPHY

What is the average age of your technical workforce?

Percent of respondents by geography



Source: Oliver Wyman 2014 MRO Survey

MERGERS AND ACQUISITIONS

Quietly Heating Up?

With the post-2008 crisis receding and airline financial performance stabilizing, the aviation sector appears to be emerging as a more attractive play for some investors. While financial investors are intrigued by the industry's macro growth story (long-term global fleet growth and renewal fueled by emerging markets and new technology), strategic players are seeking safer ground in a shifting landscape.

MRO and OEM respondents report that merger and acquisition activity in the maintenance aftermarket is beginning to heat up, with 39 percent responding that the level of activity and speculation has increased during the past three years, while just 5 percent indicate a decline. Our respondents also report significant activity within their respective organizations during this period – just 32 percent of

THREAT OR OPPORTUNITY? 3-D PRINTING ON THE HORIZON

Though additive manufacturing, or 3-D printing, in industrial applications has attracted media attention the past several months, survey respondents are not yet clear on most aspects of the technology. Respondents loosely agree that expendable parts will be the most likely purpose for 3-D printing within five years, though proprietary expendables rated notably lower compared with generic and customer-branded categories. This suggests that some respondents may expect OEMs to suppress the use of this technology by airlines or independent MRO providers. Engine material applications appear to be far less feasible in the eyes of our respondents, with just 19 percent saying non-proprietary parts could be generated through 3-D printing, and a scant 12 percent saying proprietary parts could be produced in the short-term.

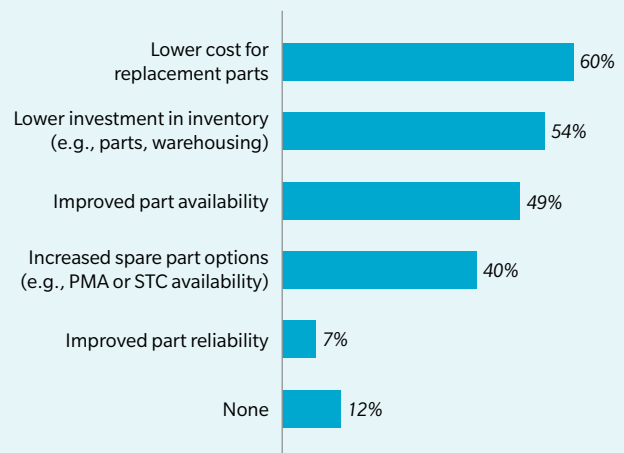
No consensus arose from our respondents in terms of when the technology might become a practical element of the maintenance supply chain, in what applications it might be effectively deployed, or who might benefit from its eventual approval and adoption.

However, respondents agree on a set of likely benefits that 3-D printing might bring to operators, specifically: lower cost of replacement parts (60 percent), lower required inventory investment (54 percent), and

improved part availability (49 percent). And, according to our respondents, there's no consensus on who will benefit. Based on all responses, 37 percent expect parts manufacturer approval houses to benefit from 3-D printing, followed by OEMs (25 percent), airlines (21 percent), and MROs (5 percent).

EXHIBIT 10: EXPECTED BENEFITS TO AIRLINES, COMBINED

What benefits might the successful deployment of 3-D printing technology bring to airlines?
Percent of respondents



Source: Oliver Wyman 2014 MRO Survey

MRO and OEM respondents noted that their organization had not completed or contemplated some form of M&A activity during the past three years.

Interest in the segment appears to be emanating from all corners, with MROs themselves among the most active constituents. When asked to list entities observed as active in maintenance market transaction activity or speculation, 49 percent of MRO and OEM respondents cite MRO strategic buyers. Private equity investors with concentrated aviation holdings followed closely (41 percent), trailed by private equity investors with diversified holdings (29 percent) and OEMs (27 percent). The prominence of MROs in this speculation may suggest some strategic maneuvering among providers seeking to capitalize on the opportunities discussed

above or girding themselves for continued competition from OEMs.

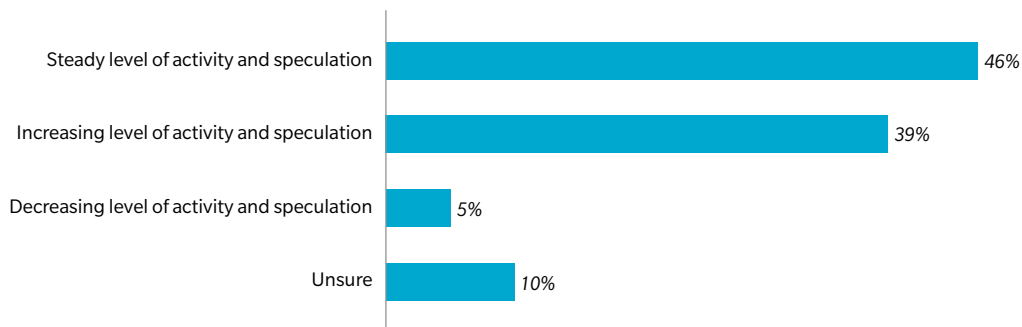
Though traditional civil aviation OEMs have been relatively quiet in the past two years, potentially having already executed intended investments and partnerships, some nontraditional OEMs have begun to enter the picture. Two recent deals, Lockheed Martin's acquisition of Aveos' engine MRO assets and Textron's purchase of Jet Aviation's European MRO assets, suggest these players are beginning to diversify into the civil space, attracted by solid fundamentals. MROs may soon find new, deep-pocketed suitors attracted to their industry expertise and access to end customers who can compete with the dominant OEMs. This is a trend worth watching in the coming months.

49%
of respondents
cited MROs as
strategic buyers.

EXHIBIT 11: DIRECTION OF M&A ACTIVITY, COMBINED

How would you characterize the current merger and acquisition climate in the airline MRO industry compared with three years ago?

Percent of respondents



Source: Oliver Wyman 2014 MRO Survey

EXHIBIT 12: M&A ACTIVITY PARTICIPANTS, COMBINED

What types of firms appear to be active in the market at this time?
Percent of respondents



Source: Oliver Wyman 2014 MRO Survey

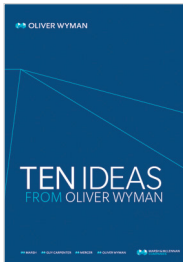
CONCLUSION

As OEMs have successfully dominated the aftermarket industry for new aircraft, MROs have – for now – found ways to sustain themselves, chiefly by serving older aircraft, developing value-adding capabilities, and expanding service offerings through partnering and acquisition activity. The worldwide fleet is shifting increasingly

toward newer aircraft on which OEMs have secured an outsized proportion of aftermarket spend. MROs must continue to hunt aggressively for competitive edges before manufacturers beat them to opportunities to serve carriers in innovative ways.

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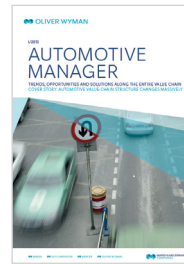
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ABOUT THE SURVEY

Going on its second decade, the annual MRO survey produced by Oliver Wyman is an industry standard for information about changing trends in the MRO sector. 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.

This year, more than 80 percent of respondents hold positions of director or higher. Roughly half of the respondents work for entities in North America, while 34 percent are in Europe, 7 percent in Asia and 2 percent in the Middle East and Latin America. Interestingly, this year, the airline population was particularly balanced across self-reported carrier types, with traditional network and low-cost representing one quarter of respondents, blended network, regional, and cargo carriers at almost 20 percent each, and regional-only carriers representing 13 percent of respondents.

If you are interested in participating in next year's survey please contact Birgit Andersen at birgit.andersen@oliverwyman.com.

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