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# Can Lean Maintenance Help Save the Airlines?

*The drive to eliminate waste improves both costs and quality*

*By John Seeliger, Ketan Awalegaonkar, and Bert Hunter*

Maintenance, repair, and overhaul is a huge cost for airlines, and hard-pressed carriers are looking to raise the productivity of this function. As carriers outsource more business to shops in Asia and Latin America, “lean” techniques offer a promising alternative.

As the spate of recent bankruptcy filings testify, airline profits continue to be squeezed by the emergence of low-cost carriers, high fuel prices, labor costs, and other factors. The aviation industry needs to find new ways to cut costs. Airline managers thus are turning their attention to maintenance, repair, and overhaul (MRO), which after fuel and labor is the next major cost category, representing up to 15% of an airline’s cost structure.

Carriers can reduce MRO costs through more efficient maintenance processes, upgraded information technology, and a redesigned maintenance organization. A promising alternative to traditional MRO methods is to institute “lean” manufacturing techniques and tools.

Increasingly, Asian and Latin American MRO providers will be competing with North American and European shops operated by airlines, original equipment manufacturers (OEMs), and independent providers. The challenge for all concerned will be to reduce costs while maintaining or even improving quality and reliability. Given the importance of fleet safety, it’s imperative to balance cost leadership and value-capture from the maintenance function with quality and reliability.

## The Rise of Outsourcing

Aviation MRO consists of line maintenance,

component maintenance, engine maintenance, and airframe maintenance. OEMs such as GE Engine Services, Honeywell, and Pratt & Whitney share close to 80% of the \$38 billion market with airlines’ in-house operations. The rest of the market is divided between airline-owned, third-party providers and independent providers. The independents are coming on strong as they outsource lower-skilled, labor-intensive work and offer lower cost structures, sharper focus, and greater flexibility than the airlines can provide.

Asian and Latin American MRO providers in particular represent a formidable threat to North American and European shops. Between 2004 and 2014, Latin America is projected to increase MRO revenue by 88% and Asia by 61%, while North America is expected to see only 5% growth. The superior cost position of Latin American and Asian shops will prove attractive to airline customers (Exhibit 1).

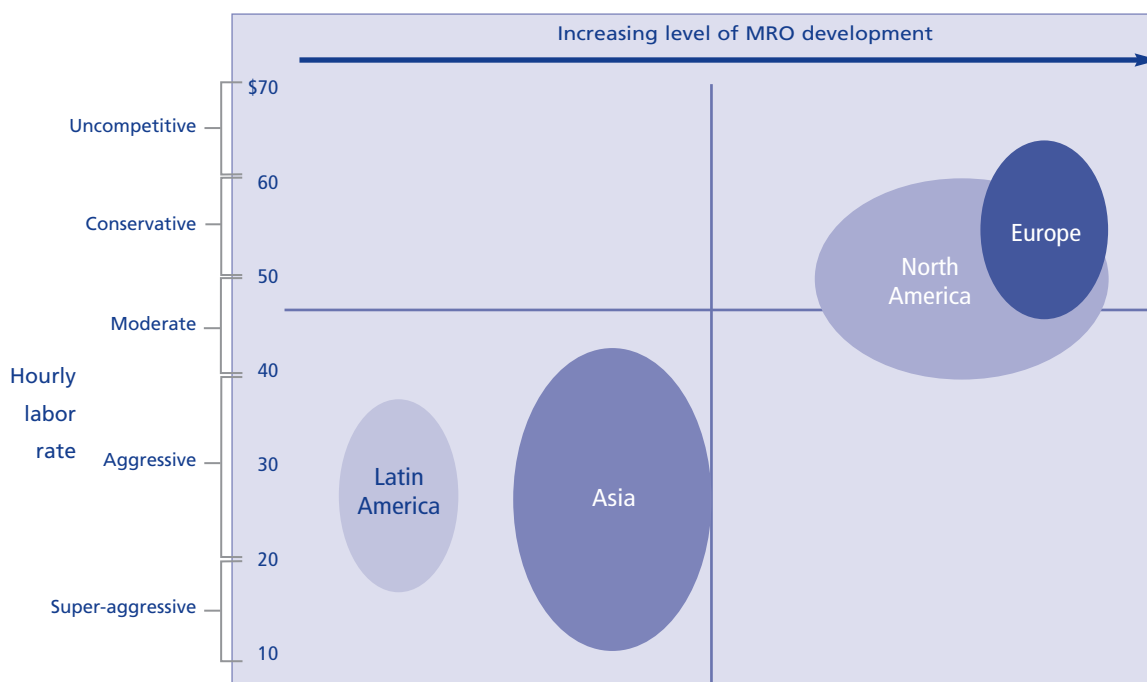
The rise of ultra-low-cost providers will dramatically change the competitive landscape (Exhibit 2). Initially, the impact will be felt in the airframe and component markets. As the experience and skills of these overseas competitors increase, it will affect both high-technology products and next-generation platforms.

How can North American and European providers respond to this challenge? While many have already achieved significant cost

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Exhibit 1 Emergence of ultra-low-cost MRO providers



Source: Mercer analysis

structure improvements through across-the-board cost cuts targeting employees and suppliers, these reductions will not suffice. Such efforts, while effective in the short term, often lead to poor employee morale, which affects productivity. To compete successfully with the new low-cost providers, domestic providers will need to raise the performance bar yet again with shorter turnaround times, higher quality, and lower total costs. The lean model provides a proven set of practices to enable this transformation.

### What is Lean?

Lean is a business philosophy pioneered by Toyota after World War II. It harnesses a set of standard tools and techniques to design, organize, and manage operations, support functions, suppliers, and customers. Compared with the traditional system of mass production, the lean model meets or exceeds customer requirements while using less labor, space, capital, and time to make a wider variety of products.

Lean techniques cut costs by eliminating waste—those items and process steps the

customer doesn't value. These reductions paradoxically increase quality as production problems become more visible and root causes more easily identified and remedied in simplified work processes.

The lean approach increases throughput dramatically by focusing on single-piece continuous flow—individual pieces rather than bulk quantities. The flow of work enters the repair cycle only when required and is matched with labor capacity. This takes place not throughout an entire hangar or office but rather in smaller, contained areas capable of servicing a variety of parts with the same apparatus. Lean providers use a flexible structure of cellular product-family work teams.

Since flow is initiated based on the pull of actual customer demand, you can essentially eliminate overproduction. The lean approach also reduces inventory levels and increases turns through the combination of just-in-time (JIT) and kanban-controlled production. As a result, lean significantly reduces working capital requirements.

Lean manages fixed assets more efficiently through the application of Total Productive

## Exhibit 2 Current competitive position of MRO providers

	Competitive position		
	Weak		Strong
Line maintenance	➤ Airline	➤ Independent MROs	➤ Ground handlers
Components	➤ Airline	➤ Stand-alone	➤ Independent MROs
Engine maintenance	➤ Airline	➤ Independent MROs	➤ OEM
Airframe maintenance	➤ OEM	➤ Airline	➤ Independent MROs

Source: Mercer analysis

Maintenance and revamped accounting systems that seek to measure value in the eyes of the customer. A by-product is more available floor space that becomes free additional capacity to support a more aggressive sales effort.

To achieve the ambitious goal of continuous improvement and to create flow and pull, there are four key elements to consider: production system design, organizational system design, training, and culture (Exhibit 3):

- *Lean production system design.* The design should support a customer-driven business model that encompasses production planning and control, process management, quality, scheduling,

material management, and production.

- *Organizational system design.* Organizational systems and structure must be adapted to reinforce, stabilize, and institutionalize the new way of doing business through the alignment of functions such as HR, Finance, and IT, and the encouragement of desired behaviors through performance measurement and compensation.
- *Lean training.* While it is essential for the first six to 12 months of a transformation that 75% of the effort comes from the top, it is equally important that 75% of the lean effort come up from the bottom after the first year. This is only possible through appropriate training.

## Exhibit 3 The key elements of the lean approach

Lean production system design	Organizational system design	Lean training	Lean culture
<ul style="list-style-type: none"> <li>• Enterprise value stream                             <ul style="list-style-type: none"> <li>– Physical/production</li> <li>– Supply chain and materials</li> <li>– Administrative and support</li> <li>– Information flow</li> </ul> </li> <li>• Lean operations                             <ul style="list-style-type: none"> <li>– JIT systems (continuous flow, pull, leveled production, etc...)</li> <li>– Facilities layout</li> <li>– Cellular manufacturing</li> <li>– Kanban system design</li> </ul> </li> <li>• Improved work methods                             <ul style="list-style-type: none"> <li>– Error proofing</li> <li>– 5S &amp; visual controls</li> <li>– Total Productive Maintenance</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Organization design and processes</li> <li>• HR policies</li> <li>• Performance management and goal setting</li> <li>• Compensation philosophy</li> <li>• Information technology</li> <li>• Lean accounting and measurement</li> </ul>	<ul style="list-style-type: none"> <li>• Modular and progressive                             <ul style="list-style-type: none"> <li>– Lean 101</li> <li>– Value stream mapping</li> <li>– Kaizen and Kaikaku: Methods for waste reduction</li> <li>– QCDS management</li> <li>– Error proofing</li> <li>– Production Preparation Process</li> <li>– Set-up reduction</li> </ul> </li> <li>• “Train the trainer” program                             <ul style="list-style-type: none"> <li>– Determine certification levels</li> <li>– Establish organic capability</li> </ul> </li> <li>• Active training plans for each employee</li> </ul>	<ul style="list-style-type: none"> <li>• Clear leadership commitment</li> <li>• Total employee involvement as a condition of employment</li> <li>• “Bottom-up” vs. “top-down” approach to problem solving</li> <li>• Relentless communications at all levels</li> </ul>

## Exhibit 4 Key steps in a successful lean approach



- **Lean culture.** Lean culture focuses on sustaining change through leadership, empowerment, and communication.

Most lean transformations that fall short of their objectives typically fail to take a comprehensive approach to each of these four dimensions.

### How Lean Can Help

Compared with traditional manufacturing, MRO provides unique challenges. It is more complex in work scope and variability of demand. Lean addresses the variability inherent in job shops with mixed modeling, a tool that offers great flexibility. MRO job shops can be analyzed to identify product family patterns; reorganized into these natural groups; redesigned in a cellular fashion to increase flexibility and adaptability; and managed with kanban to achieve flow and pull.

Another technique to manage the variability and variation of an MRO environment is the integration of lean with Six Sigma techniques. This approach supports continuous improvement through the use of the DMAIC (Define, Measure, Analyze, Improve, and Control) model and related

tools such as process analysis and standardization.

The critical first step in the lean model is to review the maintenance process flow with the mechanics, who are most closely involved with the process, in order to identify and eliminate those activities that do not contribute directly to the end product.

Lean implementation works best with a holistic approach that addresses all critical elements from strategy to the shop floor (Exhibit 4). Some of these steps, such as objective-setting, need to be performed annually to ensure constant recalibration. Others are iterative processes that drive waste out of the system and deliver continuous improvement. Still others nurture and sustain the lean culture. Faithful adherence to this cycle leads the way to lean excellence.

### Anticipated Results

Lean manufacturing represents an opportunity to protect future revenues through true competitiveness. Our experience suggests that with the lean model, MRO shops can achieve some extraordinary performance improvements. Over a three-to-five-year period, it is not uncommon to realize:

- Inventory reductions of up to 75%
- Labor productivity increases of up to 20%
- On-time delivery improvement to 99+%
- Reduction of defects by 20% annually, with zero defects possible
- Total lead time reductions of up to 75%
- Floor space reductions of up to 50%
- Set-up time reductions of up to 75%
- Capacity increases of up to 20%

Things often get worse before they get better. Lean will uncover problems long hidden amid the waste. The benefits, however, clearly justify the journey.

Moreover, this level of performance improvement will be essential to the medium- and long-term viability of MRO providers. With a good strategy and support, substantial benefits can be achieved in as few as six months with exponential benefits thereafter. And given the growth forecast for MRO demand over the next decade, companies that start now will be better positioned to secure a competitive advantage.❖