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Lumics White Paper #13

Reducing turnaround times in heavy maintenance by focusing on the critical path

By observing the critical path of several C checks from different perspectives, Lumics helped a client uncover a ca. 40 % potential reduction in turnaround time (TAT). Using a bottom-up approach, employees from all levels and five different business units were integrated, enabling improvement potential not only for one location but for all business units.

By Mark Heinecke-Wolter, Christian Schüberl and Victor Kociok

Reducing TAT to improve A/C availability in an expanding market

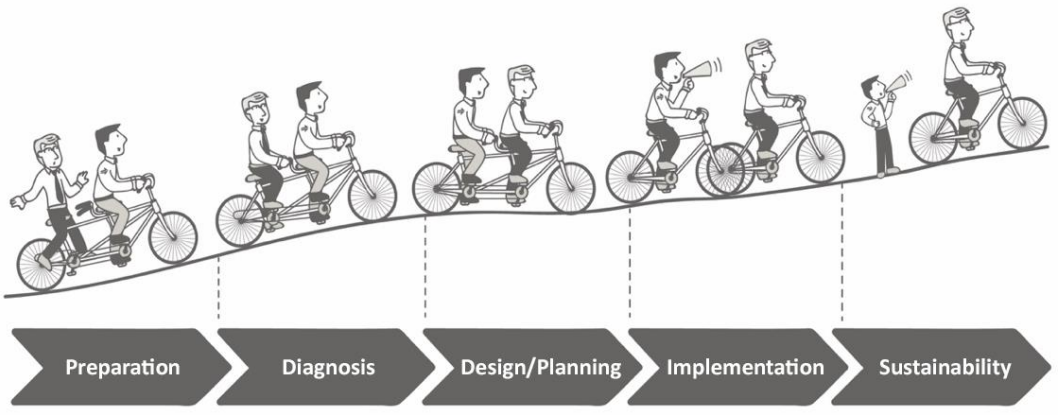
Passenger and cargo volume demand is constantly on the rise. In-service fleets are forecast to grow annually 3.6% on average – from 27,500 aircraft in 2019 to 39,175 aircraft by 2029. The market for supporting maintenance, repair, and overhaul (MRO) is directly connected to this growth, with an expected concurrent increase in spending of 3.5% on average each year, increasing from 82 billion USD in 2019 to 116 billion USD by 2029.[1]

To stay competitive in this expanding market, aircraft operators are always on the lookout for reliable and cost-efficient heavy maintenance providers. Aircraft generate revenue when flying, so their availability is one of the main drivers of increased profitability. This requires the aircraft to be available on time after each C check without exceeding the contracted TAT and projected costs.

However, MRO providers are often faced with a tight layover schedule, individual customer contracts, as well as capacity shortages when findings emerge and non-routine work. Furthermore, they must ensure immediate availability of unplanned materials as well as remuneration by the customer for additional effort. Low-cost carriers are putting additional cost pressure on MRO providers. In this highly competitive environment, our client is striving to ensure the contracted TAT for a customer airline while seeking opportunities for overall improvement suitable and scalable to other business units.

Lumics' proven transformation phase approach

To create sustainable transformation, Lumics' approach is designed to integrate the client in all phases. In this project, for example, more than 25 experts from different international business units were part of the observation team during the diagnosis phase. This experienced team brought together key departments, including the Head of Production, Senior Lean Manager, Engineers, Bay Managers, and the Central Planners. By incorporating a bottom-up approach with a holistic outlook, better exchange of knowledge was ensured. The client drew on Lumics' expertise and started to tackle the top findings directly after the diagnosis phase through the definition of levers.



Lumics Transformation approach

[1] Oliver Wyman, Global Fleet & MRO Market Forecast Commentary 2019–2029, 2019

Agile methods and initial training ensured maximum progress

Agile methods facilitated progress aligned to all levels and rapid adaptation of findings to the client's needs. To begin, an on-site kickoff set objectives and established tasks and priorities. To ensure improved results and create a common understanding, all team members were first trained in the necessary skill set for using lean management methods, like shift observation and multi moment sampling.

Daily team check ins benefited from Kanban boards that communicated the day's goals, organized parallel observations, planned workshops, and addressed possible challenges. At the end of every day each team member presented their top learnings, observations were digitalized, and an outlook for next day was provided in a team check out.

Alignment of project goal and definition of observed C checks during preparation phase

The project goal was aligned between all of the client's relevant stakeholders and Lumics at the outset. To take into account weekend work in the analysis, the observed C check layovers were defined and experts from participating business units were assigned to different departments to capture a holistic view, including various perspectives. Timelines and milestones ensured a shared approach for accomplishing the project's objectives.

Diagnostic phase with different lean management methods and five focus areas along the critical path

Before concentrating on the critical path in detail, more than 45 hypotheses were collected and prioritized in a joint workshop. In addition, dedicated interviews were conducted to incorporate expertise and experience from all business units.

To narrow the focus and select appropriate diagnostic methods, each layover's critical path was identified. Primarily lean management methods were conducted, enabling a shop floor view from various perspectives. A detailed review of past layovers' protocols combined with data analyses of relevant departments complemented these analyses and paved the way for testing the proposed hypotheses as well as uncovering potential for TAT reduction.

In a final phase, the relevant levers identified were elaborated in a workshop with the managers of local business units, concentrating on five focus areas: core processes, planning and steering, infrastructure and tooling, material supply, and work packages.

By clustering the findings from these focus areas with their differing impact on TAT, the possibility of a ca. 40% TAT reduction was derived based on recommended potential levers.

Focus area 1: Core processes

Efficient processes paired with the continuous improvements brought about by Lean MRO are major drivers of a shorter TAT and at the same time fewer required mechanics per aircraft. With the support of business unit experts, 287 hours of shift observation at the involved departments was made possible, ensuring that all core processes, like removal and installation of cabin parts as well as dock-in and dock-out, were covered multiple times.

These shift observations were summarized and evaluated via three classification categories: “valuable work,” “not valuable but necessary work,” and “waste.” For these core processes, “waste” – in terms of waiting and unnecessary motion caused by, for example, insufficient preparation – was uncovered. By matching and comparing these core process results with observations of all shifts and processes during layovers, it was shown that “valuable work” for the majority of core processes was above average. Nevertheless, over all observed layovers, mechanics spent more than one hour on average per shift waiting and walking, leaving room for improvement.

Focus area 2: Planning & steering

An effective, overarching planning and steering of complete layovers is essential for a balanced operation overall, especially when findings incur changes that affect the critical path. Analyses concentrated on processes for handling and matching capacity with workload and the available infrastructure.

In general, a significant amount of waiting during single shifts indicated inadequate capacity steering to ensure the right number of people with the required qualifications at the right time for the actual workload. Often, a lack of cross-qualification resulted in waiting or motion to get support for specific tasks and infrastructure. Additionally, idle times were not always transparent to supervisors nor were they always used for supporting team members.

Team leaders and mechanics were interviewed to evaluate the degree of maturity in terms of criticality and execution period of planned essential inspections for C checks. It was found that late inspections with high criticality reduced time to react on critical findings. Only half of the inspections with high criticality are usually conducted on the first day during a small C check. High criticality was defined as more than a 30% chance for critical findings that could possibly result in a delay.

Focus area 3: Infrastructure & tooling

Infrastructure and tooling are typically high-value assets that can directly delay layover TATs when not available in the required quantity and quality. Improvements in availability and increased supply efficiency are possible levers for reducing TAT, among others. To gain an overall picture, various analyses were aimed at this focus area.

Shift observations of two docking situations revealed an increased share of “valuable work”: partial or full docking of the aircraft accounted for a 12% difference.

These findings were supplemented by visualizations of walking distances during one shift and analyses of these long distances caused by inappropriate docking and layout. Additionally, 5S standards were not consequently followed, resulting in an overall loss of efficiency and more work interruptions.

Additional time was lost every day by mechanics waiting in long queues during peak times because ca. 70% of inspections with high and medium criticality require tooling from the tool crib. Furthermore, some critical tools were not available in sufficient quantity, or a lack of transparency meant that mechanics had to wait until tools were returned by others with no information about when the tools would become available.

Focus area 4: Material supply

Material shortages can directly delay TATs when the required amount is not delivered on time. Costs also increase when necessary materials are requested on an AOG basis. This in turn impacts various interfaces, like the suppliers and the customer airline as a supplier for a specific airline material.

Data analyses revealed that two of the work centers with the largest share of AOG material were central to the layover critical path, and that only 25% of the AOG material ordered by one work center was delivered on time during a one-year period, jeopardizing the planned TAT.

By analyzing the data connected to customer supplied material, it was shown that delayed layover due to customer supplied material shortages resulted in an average TAT extension of more than one day. Some of the material shortages were due to additional or changing customer requests which interfere with the planning and steering process.

Focus area 5: Work packages

The work packages included in or excluded from C checks vary between airline operators depending on the individual maintenance program. Supervising MRO staff should have knowledge of the work packages included in a fixed price which are part of the contract between the operator and MRO provider.

Analyses revealed that not all employees were aware of the included and excluded tasks. This resulted in repeated stop, walk, and ask situations leading to reduced efficiency or creating additional work that was not always sold to the customer. Furthermore, data from past layovers showed high volatility in the workload for the same type of C checks requiring an adjustment in the initially planned man hours. This result was also found during shift observations where work package changes were requested by the customer during layover or customer walks.

Customized recommendations for design phase relevant to all business units, local MRO organization, and customer airline

After final evaluation of the results, the findings were classified into three categories. This enabled identification of potential areas of improvement at different levels and locations: location relevant, customer relevant, and business unit relevant.

A potential lever workshop was conducted as the first step in the design phase. Together with the client's local management team, the top three levers for each of the five areas of analysis were jointly defined. General findings relevant to business units were reviewed based on scalability to other business units.

Design/planning, implementation, and sustainability phases in Lumics' transformation approach

Depending on the client's needs, Lumics supports the phases following diagnosis to achieve sustainable implementation of defined measures.

During the design and planning phase, cutting-edge, customized concepts are collaboratively designed. These concepts are supported in the best possible way via training programs in additional lean management methods, tools, and mind-sets for all maintenance and engineering staff including the leadership team. A jointly developed change story usually is used as one communication channel for the forthcoming changes, as well as serving as a visualization of the organization's vision. At the end, realistic implementation plans are established.

To prepare for a smooth implementation phase, employees from different levels are trained as change agents. During the implementation phase, Lumics supports a successful implementation and is a sparring partner for the client if challenges arise. Engagement is further strengthened through targeted feedback and coaching.

During each phase, the client's capability to design and implement continuous improvement is developed. For a sustainable continuation of the project and ongoing implementation of measures, Lumics offers support during the sustainability phase as needed.

Planned results

This detailed analysis, together with experts from different business units, has laid the foundation for reaching the goal of reducing TAT over the next few years through implementation of the defined levers in the five areas. One reason for this project's success was the commitment at all levels to active collaboration during the diagnosis phase as well as during the identification of levers. The initiative and engagement demonstrated by all participants along with the sharing of best practices has paved the way for future improvements, including transfer to other business units.

> "The collaboration with the LUMICS team as well as with experts from our various business units allowed us to get a holistic view on our heavy maintenance concept and to share best practices for potential improvements. With the definition of levers we were able to tackle some of the top findings resulting in an increased effectivity and efficiency."
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> Senior Lean Manager

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