RESISTANCE TO DIGITAL TECH IMPEDING GROWTH OF AIRCRAFT MRO

Abstract

Industries across sectors are evaluating how new technologies like cloud, data analytics, blockchain, machine learning, automation, Internet-of-Things, etc., can boost efficiency, performance and revenue. However, the maintenance, repair and overhaul (MRO) business, the after-sales support segment of the aviation industry, seems to be resistant to digitalization. Investments are limited and with low levels of successful solution adoption in this space. This paper explores some of the concerns within the MRO segment that may be hindering the adoption of digital. It also lists out solutions based on the latest technologies that can deliver quick benefits and return on investment (ROI) for airline operators as well as MRO businesses.

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Introduction

Aircraft manufacturing is constantly evolving as new aircraft replace older ones, often with more complex and advanced features.

Amid the ongoing disruption from new technologies, it is pertinent to remember that building new business models relies on companies or individuals with forward-thinking mindsets. Aviation is a fertile playground for digital technology. However, the maintenance, repair and overhaul (MRO) segment appears to be reluctant to go digital. A recent study predicts that the market size of MRO will increase considerably owing to the expected addition of around 20,000 aircraft to the global fleet. The spend on MRO is estimated to rise from around US $82 billion in 2019 to US $116 by 2029. Thus, the industry needs to optimize its functioning in order to address this expansion.

There are many opportunities to use machine learning and artificial intelligence for predictive, preventive and prescriptive maintenance. However, only a few organizations in the industry are actually adopting these technologies. Similarly, remote inspections using drones and external cleaning using robots are use-cases that have been developed but are seldom implemented. While additive manufacturing (AM) has a better adoption rate, especially after the initiative by Lufthansa to collaborate with Oerlikon, it has not been utilized to its full potential within the MRO domain.

Objectives of MRO

The key requirement from MRO is to ensure maximum airworthiness of an aircraft. Since the aviation industry is governed by regulatory bodies like Directorate General of Civil Aviation (DGCA), Federal Aviation Administration (FAA), European Union Aviation Safety Agency (EASA), etc., maintaining proper compliance and adhering to safety standards are top priorities. Thus, it is not just the organization that must follow the norms. Even the certifying personnel are responsible for the correct documentation, safety, compliance, and ensuring airworthiness of the aircraft they declare as serviceable.

Challenges to digital adoption

Here are some of the factors that might contribute towards the resistance of adoption of automation within the MRO market:

Complex solutions

MRO has been a late adopter of new technologies. Many believe that automation may complicate the life of a maintenance engineer. Systems that are not user friendly are a major concern and often the primary reason for low adoption levels. As a result, using such systems is considered an additional job on top of the core task of aircraft maintenance. Fearful of losing their jobs to automation, engineers are resistant to the adoption of such systems.

Liability in the balance sheet

Since adoption levels are low, the return on investment (ROI) is negative. As a result, CFOs are forced to write off investments that have limited tangible benefits. Actions like this impede technology adoption since it is perceived as a cost burden rather than an investment. According to the CFO of a prominent MRO, only the top management recognize that digital technologies can help achieve the business objectives of MRO. Thus, any organizational change introduced by top management should be done keeping in mind the lowest level of employees in the value chain. These employees must be taught how to adopt these new technologies to enhance their workability. The primary focus should be easy and quick acceptance by end users. In MRO, this can be possible only when the user acceptance training (UAT) is designed around a maintenance engineer's activities.

Ownership of data

This industry experiences repeated conflicts over data ownership whether it is about repairs or aircraft related. For example, data conflicts often arise when consolidating the parts history certificates for an aircraft. The certificates for a specified tail number rarely match the physical parts actually fitted on the aircraft. According to unofficial industry estimates, a 90% data match is a good outcome.

Building employee trust in digital

MRO businesses must adopt new technologies to keep pace with other industries or risk losing out to other innovators. Organizations have started digitizing their manuals, task cards, etc., in order to lay the foundation over which digital solutions can be implemented.

One key question is the validity of concerns like engineers losing their jobs due to automation. In reality, digital solutions

act as tools to enhance performance. As aircraft become more complex, several aids are needed to help maintenance personnel ensure that these are airworthy and delivered on time. When data-rich digital solutions are leveraged along with decades of firsthand work experience, it will lead to incremental improvements in overall quality.

Machine learning coupled with data analytics solutions can inform engineers when to replace faulty parts using fault codes. This will help avoid aircraft on-ground (AOG) instances. A blockchain solution can make the repair history of an aircraft part tamper-proof. This will ensure that the right part goes into the aircraft, thereby eliminating counterfeiting. Such solutions will reduce downtime and improve reliability, maintenance planning, and most importantly, airworthiness.

Regulatory bodies can collaborate to establish an agency that defines the principles of technology adoption. This agency can invite MROs to test the effectiveness of a given technology and develop guidelines for its usage. Additionally, an initiative involving OEMs to test new concepts can be used on a trial basis and standardized following successful pilots.

Many MRO proofs-of-concept leveraging digital technologies have been shelved due to the lack of standardization and formalization. This industry must wake up to the reality that adoption of new technologies is vital and that effective solutions to existing concerns are available. Moreover, most of the main reasons hindering adoption are, in reality, trivial. Regulatory bodies have an important role to play by:

1. Encouraging change and ensuring that the industry does not shy away from the much needed transformation

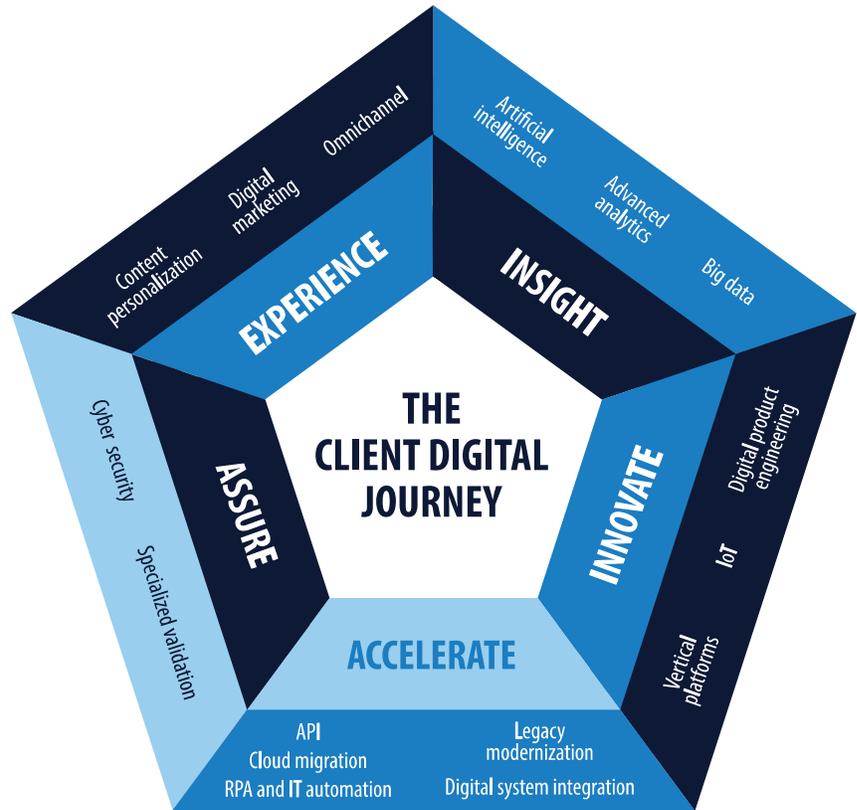2. Maintaining employee trust so that they are empowered to enhance workability

The Infosys approach to transforming MRO

Aviation companies – OEMs as well as MROs – are realizing that technology plays a vital role in building sustainable business models for the future. Nevertheless, CXOs prefer implementations that offer the best results in the shortest duration at the best price with a faster return on investment.

The 'Be the navigator' initiative by Infosys focuses on finding new ways to derive value from customer data through insights. The right insights can accelerate business decisions and processes, thereby delivering an enhanced experience.

The 'Zero aircraft on ground' initiative is inspired by the zero downtime expectations of aircraft operators. It uses various digital solutions across six segments (shown in Fig 1) to ensure no unplanned AOG. It is based on the latest technologies that analyze operations data and provide business insights.
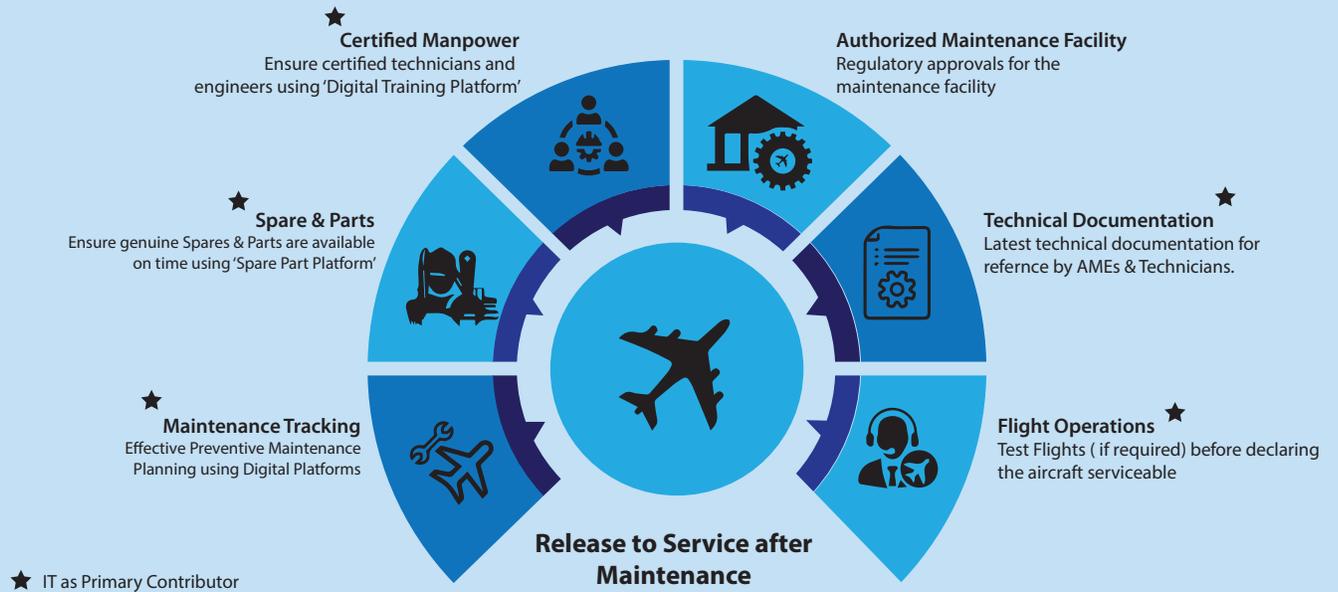

Infosys' Digital Pentagon Pillars

"Zero AOG" Concept - The Industry Benchmark

Certified Manpower
Ensure certified technicians and engineers using 'Digital Training Platform'

Authorized Maintenance Facility
Regulatory approvals for the maintenance facility

Spare & Parts
Ensure genuine Spares & Parts are available on time using 'Spare Part Platform'

Technical Documentation
Latest technical documentation for refernce by AMEs & Technicians.

Maintenance Tracking
Effective Preventive Maintenance Planning using Digital Platforms

Flight Operations
Test Flights (if required) before declaring the aircraft serviceable

Release to Service after Maintenance

★ IT as Primary Contributor

The Digital Approach to Business Enablement-
Answers the potential industry challenges due to the rapid upcoming growth of Aviation in the next decade

Fig 1: Conceptual framework of a zero AOG solution

The recommended digital solutions, technologies used and expected business benefits are explained in Table 1.

Segment name	Technologies used	Business benefits
Maintenance tracking	Data analytics, machine learning and cloud	• Replaces reactive, hard-time based maintenance with predictive maintenance • Historical fleet data is used to predict maintenance schedules
Spare parts	Blockchain, data analytics, machine learning, and cloud	Ensures availability of cost-effective spare parts at the right time and place
Certified manpower	Machine learning, augmented/virtual reality, artificial intelligence, and holography	• Personalized training programs catering to different employee skills and talent • Ensures certified and skilled manpower is always available for maintenance tasks
Authorized maintenance facility	Cloud and Internet-of-Things	• Personalized training programs catering to different employee skills and talent • Ensures certified and skilled manpower is always available for maintenance tasks
Technical documentation	Cloud, data analytics and visualization	• Eliminates errors like referring to the wrong job card when performing maintenance • Ensures accessibility to the correct version of the technical document during maintenance
Flight operations	Cloud	Aircraft health management solutions can deliver benefits like: 1. Active monitoring of flight data transmitted through aircraft messaging systems 2. Proactive and effective maintenance planning 3. Providing maintenance engineers with recommendations for quick resolution based on historical data Flight operations solutions can enable effective operations control and management to ensure that flying crew is available during test flights. This requirement, though optional, is vital because aircraft acceptance from the pilot is mandatory for considering an aircraft as serviceable.

Table 1: Applicable technologies and expected benefits

Infosys differentiators

Infosys is well-positioned to develop and deliver innovative solutions such as those mentioned in Table 1. These can assist MROs in adopting digital for better business outcomes.

Over the years, Infosys has gained deep domain knowledge in building best-in-class digital solutions suited to various industries. Before implementation, we assess the requirements of business stakeholders and use this understanding to drive user adoption. This empowers organizations to set up processes quickly and realize benefits from the new system almost immediately

Conclusion

Every enterprise must innovate if they want to survive in today's highly competitive marketplace. The MRO market has been a late adopter of digital innovation primarily because the end users – engineers – are fearful of being replaced by automation and resistant to the change. Some of the other challenges include conflicts in data ownership and low perceived value from technology investments. Infosys proposes a range of digital solutions that can help the MRO market improve activities like maintenance tracking, spare parts inventory, flight operations, and technical documentation to name a few. These solutions leverage a variety of technologies and are customized according to stakeholder requirements. When paired with human expertise, they promise to improve engineering efficacy, flight airworthiness, safety, and reliability.

References

1. https://www.oliverwyman.com/our-expertise/insights/2019/jan/global-fleet-mro-market-forecast-commentary-2019-2029. html#:~:text=With%20the%20expansion%20of%20business,from%20%20%2481.9%20billion%20in%202019.

About the Author

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Amitav is responsible for growing the Aviation Consulting footprints at Infosys. He brings with himself valuable experience across Defence, Commercial and General Aviation.

He is a firm believer in improving the life of every member of the aviation fraternity. He has been a key contributor in building various solutions across the complete value chain.

Currently, he conceptualizes new digital solutions for the industry that can address business challenges.

He completed his B.E. in Mechanical Engineering from VTU and holds a PGDM in International Business from IIFT, Delhi. His interests include painting and teaching.

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