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Keep Flying

Why a human-centered Aviation Maintenance approach is essential to Aviation Sustainability

The Three Pillars of Maintenance Sustainability

January 2023

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The Three Pillars of Maintenance Sustainability

CONTENT

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Why a human-centered Aviation Maintenance approach is essential to Aviation Sustainability

CH. 1 EMPOWERED PEOPLE

The first pillar of Maintenance Sustainability

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A SUSTAINABILITY PLATFORM

We believe sustainable aviation maintenance relies on three pillars.

With more effective oversight, planning, and communications, aviation can ensure the three pillars of sustainable aviation maintenance are powerful enough to fuel optimal flight operations now and well into the future. The three chapters of our White Paper explore the three pillars of sustainability.

In this first chapter, we review the first of these pillars: EMPOWERED PEOPLE.

FLY NET ZERO 2050

"Fly Net Zero is the commitment of airlines to achieve net zero carbon by 2050.

— IATA

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1. EMPOWERED PEOPLE

In this first chapter of our White Paper on sustainability, we delve into factors in human resources currently impacting aviation maintenance and, more broadly, aviation operations. We consider how a platform might resolve systemic issues, enhancing the positive impact of aviation's Interaction Field with gains in sustainability.

2. EFFICIENT PROCESSES

The next chapter will explore how optimized maintenance processes can reduce waste and downtime, supporting aviation sustainability.

3. EFFECTIVE LIFE CYCLE MANAGEMENT

In the third chapter of this sustainability series, we will explore the life cycle management of aviation through the lens of the people who ensure and account for the extension of that life cycle. We will also look at the documentation required for accountability—an essential element to ensure that the sustainability actions taken in aviation are credible and provable.

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CH. 1 EMPOWERED PEOPLE - the first pillar of Maintenance Sustainability

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FOREWORD

By Marco Cesarino
Head of Beacon

I am pleased to share the first of three chapters of our Maintenance Sustainability White Paper, focused on the people who will help aviation meet its Net Zero 2050 target. Throughout our journey building Beacon, we've seen many opportunities for the aviation industry to ensure long-term sustainability by sharing knowledge, co-creating, and collaborating.

The social transformation currently underway will change the nature of work. Digital natives drive decisions. Their expectations of the workplace and communication channels differ from previous generations. Millennials and GEN-Z want information at their fingertips. They want to collaborate and exchange insights. And they expect to have agency. They need a voice within the organization.

AVIATION 2041

41,170 New Aircraft Deliveries

3.8% Traffic Growth

2.1 Million personnel needed

602,000 New pilots

610,000 New MTX

899,000 New cabin crew

— BOEING GMF

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In an open knowledge platform, exchanging knowledge leaves a record for the organization and the industry to learn from, simplifying the onboarding process for staff, training new hires, and upskilling existing personnel. A horizontal platform democratizes communication, ensuring all aviation stakeholders have a voice as they work.

We expect the new aircraft and fuel technologies that will help aviation meet its Net Zero 2050 commitment will require the workforce to develop new skills quickly. The Future of Air mobility is already close to a reality that will require seamless integration in the airspace. It's easy to see that new service dynamics are no longer a wishlist item for aviation. They've become a must-have.

Aviation's knowledge base—regulations, safety standards, best practices, common fixes, recurring issues, virtually everything aviation needs for a sustainable future—has long been trapped in silos. Silos are unsustainable. They create blind spots in the organization, which generate wasted efforts and lost knowledge as the workforce changes. Yet, the silo mindset is pervasive and inefficient, resulting in lost opportunities.

We spoke directly with those who keep aircraft flying—maintenance technicians, controllers, and maintenance providers. We listened to their stories and noted the pain points they frequently encountered. Some key themes developed, like time—fighting against the clock—especially when an aircraft is out of service. There were many issues with missed communications, complicated logistics, paperwork, and challenges measuring success.

We paid attention to their emotions. Some of our early research showed that mechanics often feel undervalued, despite playing a critical role in aviation and possessing specialized skills in high demand. They lack a way to have their voice heard and their contributions acknowledged. A human-centric platform can offer that.

Our design principles acknowledge the community's existing expertise. We aim to empower them to work together more collaboratively to shape a sustainable future for the industry. That can be achieved by augmenting the power of people to find sustainable solutions.

We respect and admire the people who have dedicated their lives to keeping the aviation industry flying. We've designed the platform to encourage more people to join them.

Marco Cesarino
Head of Beacon

EMPOWERED MTX

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THE FIRST PILLAR OF AVIATION MAINTENANCE SUSTAINABILITY

Aviation has announced bold plans for sustainable aviation that will revolutionize the future of flight. While we look forward to advancements like hydrogen-powered aircraft, we believe sustainability goes beyond materials and fuels.

Above all things, sustainability is about people.

ONLY 20%

"Of the current in service fleet is the latest generation fuel efficient aircraft.

Replacement of older generation aircraft is one of the most straightforward ways to decarbonize the sector."

— AIRBUS GMF

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Our society demands that we reduce carbon emissions because we want to ensure that the environment of the future can sustain us.

How people use material resources and whether they become more effective at using, reusing, and recycling resources will decide our fate.

That is why maintenance is an essential part of sustainability.

There is a lot of study on the effective use of materials and new technologies to mitigate carbon impact to sustain life. But the aviation industry could gain from delving deeper into the human factors and systems that will keep aviation sustainable in both an ecological and economic sense.

As Jennifer Desharnais, Manager Sustainability for Airports Council International (ACI) World, wrote in her insightful article A Sustainability Strategy: Why it Matters published in ACI Insights.

“Businesses, including airports, are connected to countries, governments, communities—and the daily decisions they take go beyond financial outcomes. They play an active role in society and have commensurate responsibilities. Yet, sustainability and business performance are complementary, not competing. Indeed, airports can benefit from energy and operational efficiencies, investing in smart technologies and buildings, and attracting and retaining the best talent.

“One of the challenges with sustainability is that it is an evolving concept and not everyone has the same understanding of its meaning. It’s not easy to grasp what it implies to have a sustainable strategy in place, and to be entirely committed to achieving the balance between the environmental, social, and economic pillars.”

Through improved efficiencies in the sphere of aviation activities, our industry can contribute to long-term systemic sustainability that benefits the people who rely on aviation—and that’s virtually everyone, even if they’ve never boarded an aircraft.

BEACON BY THE NUMBERS

110K+ CASES

2.8K+ AIRCRAFT

1.5K+ USERS

190+ AIRPORTS

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1/3 *of Global Trade Value relies on Air Cargo*

57,529 *Cargo Tonnes shipped by air in 2021*

— IATA WATS 2021

That's food, medicine, vaccines, microchips, baby formula, emergency supplies, fresh flowers, cattle, precious metals, gems, cold hard cash, manufacturing parts and virtually anything the world needs in a hurry.

Modern life would not be what it is if we hadn't figured out how to fly. Aviation deserves credit for many of the simple comforts and freedoms we take for granted in our world today. By making aviation activities systemically sustainable, we believe aviation can have a broader and more meaningful positive impact on our world.

We support the environmental targets that ensure the decarbonization of the aviation industry and want to empower the people who will ensure we meet these targets. Sustainability is about people.

1.8 Billion *people traveled by air in 2021*

— IATA WATS 2021

To visit friends and family. To do business. To explore our world. To make up for everything they missed during the global lockdown.

Between 2019 and 2040, IATA forecasts passenger numbers will increase at an average annual rate of **3.3%**, reaching **7.8 billion** passenger journeys per year by 2040.

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THE ENGINE OF SUSTAINABLE MAINTENANCE AND BEYOND

One way to look at the connections airlines make is as a series of interlocking, interdependent circles of influence—they are all the ways in which aviation companies affect each other and the world around them. The inner circle includes operators, regulators, the supply chain, supporting aviation infrastructure, their management, operations, engineering, maintenance, customer service, and other staff.

IN THE US

16,405,000 Flights/Year

45,000 AVG daily flights

5,400 Aircraft in the sky at peak operational times

– FAA

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The outer circle includes all elements of society which depend on aviation. That is a broad swathe of modern society and the global economy, ultimately impacting every individual and every industry. By exploring those circles of influence, we can better understand that aviation's sustainability improves the sustainability of our modern society.

If you think of these circles of influence as an engine, what fuels it is the radiating impact of an empowered aviation workforce.

Erich Joachimsthaler, Ph.D., CEO & Founder of Vivaldi Consultancy, has captured the concept of these eccentric and concentric circles of influence in his book The Interaction Field: The Revolutionary New Way to Create Shared Value for Businesses, Customers, and Society.

Joachimsthaller regards Interaction Fields as a value-added dynamic. Rather than focusing on competition and disruption, Joachimsthaler suggests there is more value to be gained from collaboration, participation, and engagement with players in your Interaction Field.

"Companies who embrace this model generate, facilitate, and benefit from data exchanges among multiple people and groups–from customers and stakeholders, but also from those you wouldn't expect to be in the mix, like suppliers, software developers, regulators, and even competitors. And everyone in the field works together to solve big, industry-wide, or complex and unpredictable societal problems," Joachimsthaler says.

*"IN 2020...CIVIL AVIATION CONTRIBUTED 2.3 PERCENT OF U.S. GDP, $0.9 TRILLION IN TOTAL ECONOMIC ACTIVITY, AND SUPPORTED ALMOST **5 MILLION JOBS***."*

— FAA , The Economic Impact of U.S. Civil Aviation: 2020

*a 50 percent decrease when compared to 2019, due to the pandemic.

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> “The aviation industry supports 87.7 million jobs around the world, either directly within the industry, or supported through the industry’s supply chain, employees’ spending and in the aviation-enabled tourism sector.”
>
> — ATAG

As aviation aspires to a more sustainable future, a platform that fosters such an Interaction Field might ensure greater awareness of opportunities to conserve and more efficient use of resources—intellectual, material, and human.

When speaking with us on this topic, Joachimsthaler pointed to three key factors which create an Interaction Field.

“The first one is the value of information. If the value of information is very high, then the input value of information makes things more efficient,” he said. “It makes things more transparent. The second one is how you externalize modularity. That is, can you outsource some activities to others? Because if you try to do everything yourself, you can’t scale it. It’s a really important criterion because you don’t get the volume or the quality of interactions—and you’re not solving a big problem—unless you can externalize activities. The third is whether you can experiment. Is it too risky to experiment?”

Aviation is safety-first and risk-averse, with good reason. But we have flight simulators so pilots can perform iterations, tests, and trials in digital spaces, tracking their performance and building their skills. The records kept by these simulators also ensure an open exchange of knowledge, records, and information. This approach dampens the risk of experimentation for aviation companies and delivers better and safer results.

What if achieving these same aims was possible through the digital tools and platforms that empower aviation design, engineering, operations and maintenance?

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We now see some areas in design and manufacturing for aviation embrace the concept of digital simulation and digital knowledge exchange. Digital training tools are implemented for certain aviation functions. But too few consider the benefits of digital tools for aviation maintenance.

We aim to examine that dynamic and the gaps in maintenance coverage more closely, considering the factors of change that will ensure aviation sustainability, and then focus it all back where we firmly believe it belongs—empowering the people who keep us flying.

We suggest that aviation tap into new technologies and turn on the engine of sustainability available through the powerful network effect of a switched-on Interaction Field to power sustainable aviation maintenance.

Aviation ensures knowledge exchange and knowledge retention by finding new ways to manage the connection and communication dynamics in operations. The industry could empower people to be more efficient with greater job satisfaction. We like to think of people as the engine of sustainable aviation. Because aviation touches all aspects of modern life, the radiating impact of an empowered aviation workforce could have a very positive effect on our world.

Full Visibility

. Greater control over MTX cases
. Consolidates fragmented communication in secure channel
. Keeps team focus on troubleshooting

Seamless Management

. Quick access to event history
. Simplifies support for MCC/LM
. Actionable data insights on AC and component performance

Enchanced Knowledge

. Real-time visibility macro/micro level
. Enchanced data analytics streamline decision making
. Boost team productivity

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THE SUSTAINABILITY OF PEOPLE

As Desharnais suggests, aviation sustainability is far more than reducing carbon emissions. There are connection gaps in our current operating model of aviation. Aviation has an opportunity to reinvent the model, ensuring smoother, more efficient operations, more effective communication and collaboration, and a generational connection that could excite and encourage more young people to become part of this truly amazing industry.

THE WORLD CHANGES, AIR TRANSPORT MUST ADAPT

"[I]t is the environment that has the most focus among industry stakeholders. The 2050 target is set and there is a clear roadmap to reach emissions and sustainability goals in the medium and long terms. Technology, Air Traffic Control, SAF availability, economic contributions – all of these are mapped yet not all are resolved."

— Embraer, Market Outlook 2022

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EMPOWER MTX TEAMS

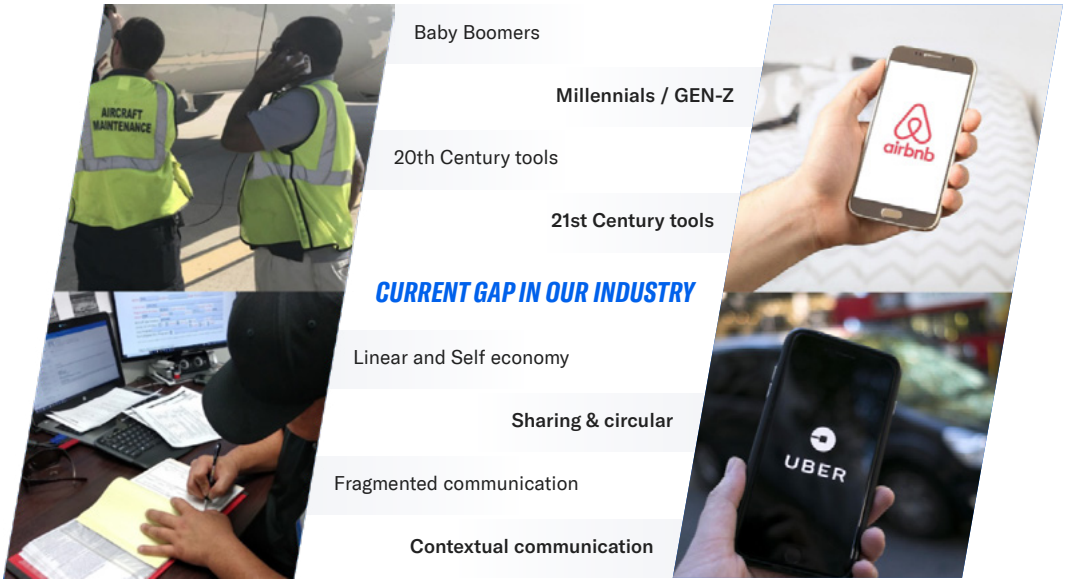
Beacon equips Operators, MROs, and Technicians with the tools to increase capacity and aircraft availability while optimizing operating costs.

Reduce OOS *Time by* **20%**

Increase *Productivity by* **10%**

Reduce Overall *Delays by* **5%**

We also know that there is a great deal of interest in aviation jobs. Our findings from Answer the Public—an insightful internet search analysis tool—show that most of the queries related to aviation maintenance are about the available job opportunities. What if aviation could capture those interested in jobs—who remain on the sidelines—by offering a more accessible workplace for digital natives to navigate?



EMPOWERED MTX

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THE DAWN OF A NEW WORKFORCE DYNAMIC

The Covid pandemic accelerated the trend toward new workplace dynamics, which began long before the pandemic and magnified the skilled workforce shortage aviation already predicted years ago.

"The time required to recruit, train, complete security/background checks, and perform other necessary processes before staff are 'job-ready' is presenting a challenge for the industry in 2022. In some cases, employment delays may act as a constraint on an airline's ability to meet passenger demand," IATA stated in a recent industry briefing. "In countries where the economic recovery from the pandemic has been swift and the unemployment rate is low, tight labor markets and skill shortages are likely to contribute to upward pressure on wages. The industry's wage bill is expected to reach $173 billion in 2022, up 7.9% on 2021, and disproportionate to the 4.3% increase in total jobs."

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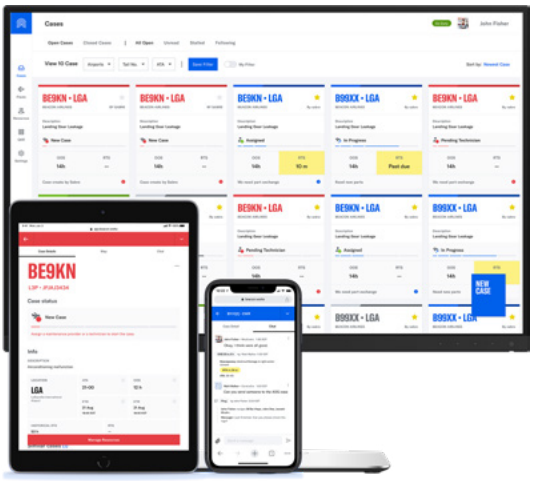
Current projections suggest aviation will need 2.1 million new skilled workers by 2041, including 601,000 maintenance personnel, to sustain operations. Those skilled workers will need to absorb the collective knowledge of the existing workforce, learn industry best practices, and gain skills to handle the new generation of aircraft technologies, which will help aviation meet its Net Zero 2050 commitment. While there is interest in aviation careers, the hurdles of training and certification may discourage some candidates from joining the workforce. Related industries that require similar skill sets may attract others by offering higher wages or more attractive benefits.

We are at a pivotal point in history where people with unique skills have more agency to be selective about their careers. While compensation is a factor, it is not the only driver. People need to feel that the organization acknowledges their role and their value.

As our in-house futurist and Strategic Design Advisor, Scott Paterson, observes:

LEAD THE CHANGE



"People expect to have agency within the organization and their expectation is based on actual evidence. They've seen it is possible to have agency, despite maybe being told for years that it is not. They've created organizations, tools, platforms, social media networks, based on this evidence. So it is more substantial than a want or even a need. They know it is possible, and therefore expect it. They also suspect that anyone not offering them a voice in the organization is doing so for a potentially questionable reason."

"A number of organizations have realized that in order to be competitive, retention of top talent is something we need to invest in significantly, and that means the whole person. Having the right people and the right culture is a factor of sustainability—in the sense that it is essential to continue growing and sustaining the business."

While we've seen companies in the aviation industry create positive workplaces that recognize and empower their people, the missing link is often whether all members of the organization have the right tools available to work at their best. To attract, develop and retain a skilled workforce, aviation, like other industries, must empower people, offering the right collaborative tools and greater flexibility. The workplace must evolve to foster collaboration and knowledge exchange, so the workday has fewer friction points, skills transfer more readily between experienced staff and new staff, and trainees gain the skills they need to advance more quickly.

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THE CYCLE OF SUSTAINABLE KNOWLEDGE EXCHANGE

The basic principle of sustainability entails thinking in an ecosystem. To ensure we are sustainable, we must make choices and decisions that consider the broader impact of our actions beyond our immediate sphere.

Aviation does not exist in a vacuum—the laws of physics prevent it. Aviation is a multi-faceted industry that impacts and facilitates a vast range of industries and human endeavors. Manufacturing, food supply chains, medicine, technology, education, sport, leisure, exploration, understanding, reunion, and congress are all better today than they have been in history because people can fly.

Efficiencies in aviation result in value-added gains for all the facets of the ecosystem (and economy) which rely on this essential form of modern transport.

LIFE OF THE WORKFORCE

Knowledge and best practices are reinforced through more effective collaboration and communication. Empowered employees can focus on the work that needs doing with confidence. Apprenticeships become more meaningful as cross-generational specialist knowledge becomes easier to record, access and apply. Career advancement opportunities open up as skilled staff are recognized and rewarded for their performance.

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We think of this dynamic in aviation terms—as an engine of sustainability—and this engine is the very heart of our platform.

When individuals can network together more effectively, their collective efforts are more than optimized. They multiply exponentially.

Social media platforms describe this concept as “going viral.” Some information sparks with the right combination of users and spreads like wildfire.

We prefer not to think of the effect of productivity networks in terms of infection because they accomplish the opposite. They don’t weaken the whole. They strengthen it.

It is far more akin to brain function, with animated neurons building associations and learning. When an idea seen on the platform sparks for another member of the platform, what happens next is a valuable augmentation of capabilities and knowledge.

All members of the platform network—that is, share—the same awareness of circumstances. Those with unique insights can contribute seamlessly to solving issues, leaving an augmented record for the group to reference in the future and enhancing collective knowledge.

“As we dove into the development of our human-centered maintenance platform for aviation, we also saw many solutions that only fixed basic symptoms, or band-aided solutions, or temporary fixes that became permanent because there wasn’t enough time or priority to do better,” Paterson adds. “But when you engage people the way we have, and using our design methods, you identify the right problem, which goes a long way towards designing the right solution.”

With optimized maintenance processes, organizations conserve energy and resources, becoming more economically, environmentally and socially sustainable.

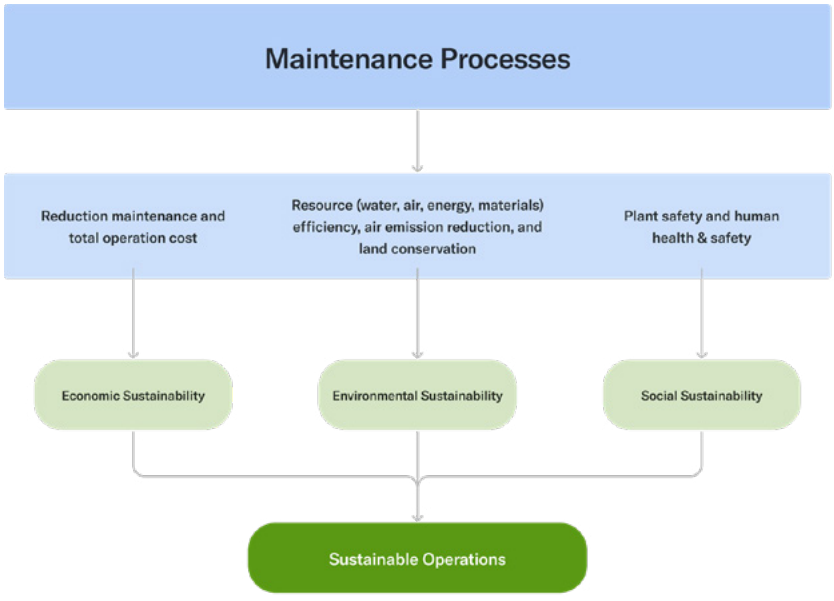

FIGURE 1. THE CONTRIBUTION OF MAINTENANCE PROCESS IN SM

SOURCE: THE CONTRIBUTION OF MAINTENANCE PROCESSES IN SUSTAINABLE MANUFACTURING. MAINTENANCE 4.0 TECHNOLOGIES FOR SUSTAINABLE MANUFACTURING - AN OVERVIEW, MAŁGORZATA JASIULEWICZ - KACZMAREK, ARKADIUSZ GOLA

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HUMAN-CENTERED TECHNOLOGY IS THE IDEAL FRAMEWORK FOR MAINTENANCE SUSTAINABILITY.

Humans perform maintenance tasks, and humans benefit from them. The technology and systems used to manage, oversee, plan, and carry out aircraft maintenance should be built with humans in mind. It must be intuitive, easily understood, and allow for human interactions that enhance collective understanding and knowledge.

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The exchange of knowledge and information empowers sustainable progress.

When one person knows a fact, the organization is vulnerable.

When two people know a fact, the organization is not significantly more resilient to events and outside factors.

The organization only becomes resilient, resourceful, and sustainable when the collective can readily access the knowledge and understanding of two or more people; and when they can further enhance knowledge by sharing additional information and insights.

That is the power of a digital platform and the network it creates. It is the framework for the Interaction Field in aviation.

While group training (an essential aviation requirement) can enhance knowledge, many people genuinely learn by doing. What we do repeatedly builds habits and knowledge.

Aviation maintenance technicians are resourceful, often finding ways to solve common issues and creating unique tools to handle tough jobs. That innovative thinking can also be rewarded through the platform, ensuring that knowledge spreads in the organization.

Having a platform that engages people as they work, and captures collective knowledge, is essential to the long-term sustainability not only of aviation maintenance but to aviation itself.

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A NEW ERA OF AIRCRAFT MAINTENANCE

We at Beacon are fully committed to delivering an engine of sustainability and bringing the aviation ecosystem together into one platform.

A great deal of aviation activity still follows a pipeline model of information exchange, adhering to a workforce hierarchy that does not reflect the needs of the organization or its people. It is a leaky pipe, which doesn't maximize the organization's energy use or intellectual resources. Manual processes, multiple layers of paperwork, and a reliance on inefficient communication channels all result in a loss of knowledge along the way and a vague understanding of events in real time. An older generation has a veritable ocean of specialized knowledge, which is difficult to transfer without the right tools.

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Platforms, digital systems, devices, and networks give the highly skilled people of aviation the tools they need to exchange knowledge and stay up-to-date on the critical priorities that keep you flying. They also maintain an accurate record of activities, which becomes a helpful record for operations and sustainability reporting. As the adage goes, you can't improve what you don't track. Aviation has set up systems for accountability that keep us flying safe, but many of these still rely on written documentation, which is harder to share efficiently across the operation.

If we know anything about the people of aviation, it is that they are highly resourceful and intelligent. They can make miracles happen when they lack a tool for a particular job, find a solution on their own, or check with colleagues. By providing a platform for the exchange of that knowledge, resourcefulness, and creativity, aviation creates a circular economy of know-how.

As we've found, many people in aviation, across generations, are already seeking digital networks and platforms for knowledge exchange on their own, beyond connections made on social media platforms. The popular Reddit thread on aviation maintenance shows that there is a desire and a need to reach out to others who may have specialized knowledge and can relate to the unique workplace conditions. Imagine if all these existing employees had a better way to share specialized tools and fixes for vexing problems, one dedicated to aviation entirely and from which all aviation could benefit.

We see maintenance empowered by a dynamic of perpetual, sustainable growth for the industry we love—the industry that delivers the world.

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Why a human-centered Aviation Maintenance approach is essential to Aviation Sustainability

Ch. 2. EFFICIENT PROCESSES

The second pillar of Maintenance Sustainability

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Efficient Processes

A SUSTAINABILITY PLATFORM

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In this chapter, we review the second of these pillars: EFFICIENT PROCESSES.

FLY NET ZERO 2050

"The costs of decarbonizing aviation are in the trillions of dollars, and the timeline to transition a global industry is long,"

— IATA Director General Willie Walsh.

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1. EMPOWERED PEOPLE

In the first chapter of our White Paper on sustainability, we delved into factors in human resources currently impacting aviation maintenance and, more broadly, aviation operations and considered how a platform could resolve systemic issues.

2. EFFICIENT PROCESSES

In this chapter of our White Paper, we explore how aviation could optimize maintenance processes to reduce waste and downtime, supporting aviation sustainability.

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Why a human-centered Aviation Maintenance approach is essential to Aviation Sustainability

CH. 2. EFFICIENT PROCESSES - the second pillar of Maintenance Sustainability

CONTENT

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Efficient Processes

FOREWORD

By Marco Cesarino
Head of Beacon

One of our design principles is “cut through the complexity.” We wanted to simplify the transfer of information and how tasks are prioritized, in aviation maintenance, championing clarity and using technology to enhance human potential.

THE VALUE OF A MINUTE SAVED

Each airline saving a minute is also reducing the waste of vital resources during “downtime” for themselves and their interaction fields, ensuring the sustainability of aviation and those who rely on it.

In 2021, U.S. passenger airlines’ average cost of aircraft block (taxi plus airborne) time was **$80.52** per minute.

— A4A

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Our people-first focus made us think differently about disruption in the sense that startups like ourselves often use the word. In a startup environment, disruption is too often about blowing things up, tearing things down, and taking everything in a new direction. But we have opposed that sense of disruption from the start. We respect the knowledgeable and caring people of the aviation community and want to work with them to transform the aviation industry, working within its safety-first framework, so that it is both future-ready and sustainable. We knew any changes Beacon might introduce to the status quo had to be creative, value-added, and inclusive.

This endeavor supports sustainability by advancing the collective progress of the aviation ecosystem, including individuals and partner organizations, to the industry at large. Through the Interaction Field of the aviation ecosystem, which we examined in the first chapter of this White Paper, sustainability gains radiate to all the industries which rely on aviation.

From day one, we've dedicated ourselves to fostering connections and designing for mindfulness and intentionality. We wanted this platform to embrace the pride and joy of empowering flight. We all know aviation is a stressful environment, with every minute of aircraft downtime creating a costly ripple effect throughout the aviation ecosystem.

By increasing transparency and streamlining work, we hope to maximize the pride of a job done effectively and efficiently, reducing that stress and gaining acknowledgement for the skilled person who makes it happen. We want to increase the joy of watching an aircraft leave the hangar and the tarmac on time, taking off into the skies again, and help people focus on the part of the job that matters most. We aim to boost the satisfaction of a career in a field that is always a blend of science and magic. We want people to feel encouraged, to love their careers in aviation, and keep flying.

Marco Cesarino
Head of Beacon

EFFICIENT MTX

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Efficient Processes

THE STATUS QUO

Aviation Maintenance is a critical factor in an airline's on-time performance, which not only affects the airline's reputation but also impacts the airline's economic, social, and ecological sustainability.

In the first chapter of this White Paper, we mentioned the Interaction Field of aviation. Think of this Interaction Field as the power of collaborative interactions between organizations with a common interest, extending outward to all the parties who rely on those organizations. In aviation terms, airlines, MROs, and suppliers have interaction fields that extend to airports, passengers, industries that ship cargo on planes, and all the towns and cities which rely on aviation to deliver tourists and goods.

DELAYS CAN COST OVER $10K PER HOUR

"In assessing the potential impact of (un)availability, operators asserted that aircraft dispatch delays can cost **$10K** (or more) per hour with flight cancellations imposing a financial penalty of **$100K** (and above) per instance,"

— IATA MTCG

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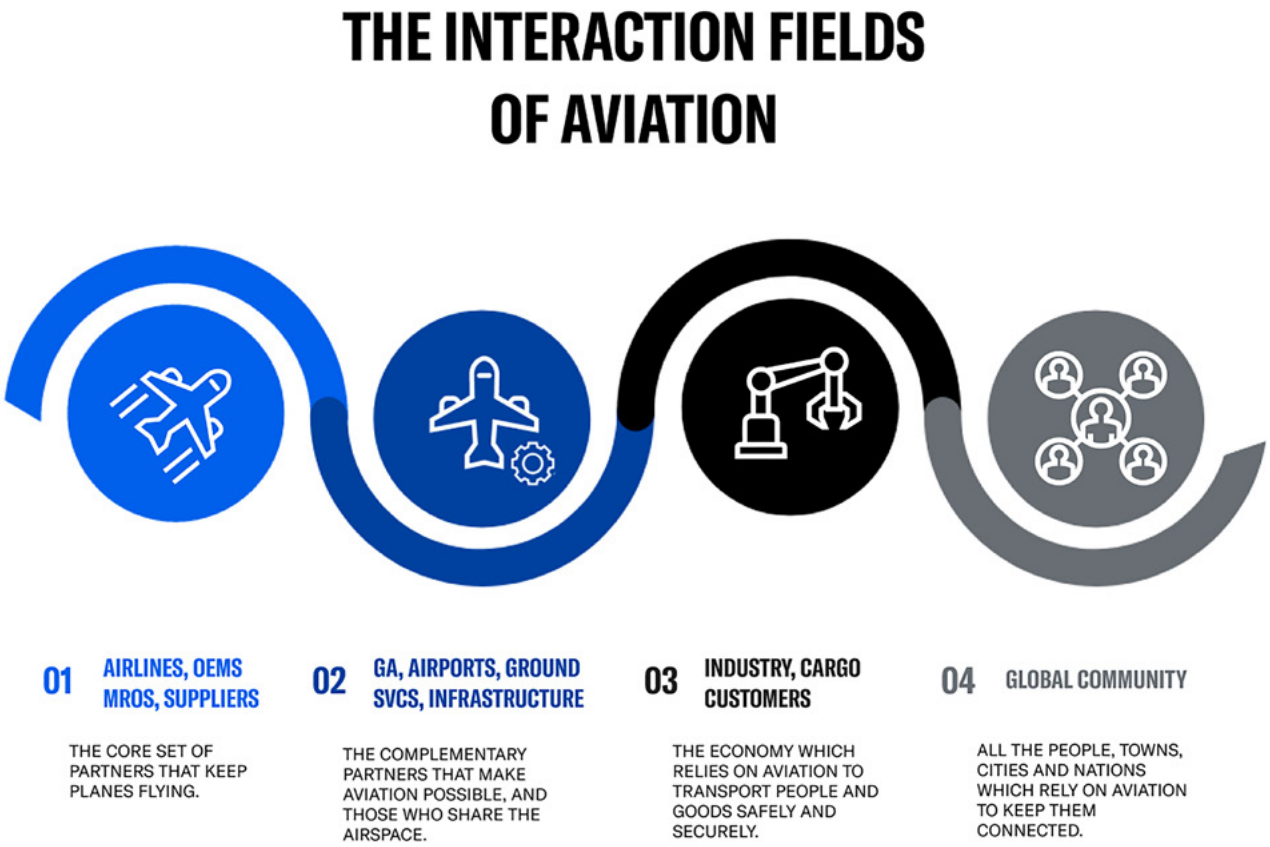
Aviation impacts all industries and parts of consumers' lives in one way or another, even if they never fly.

Aviation maintenance will need the tools and methods to facilitate a coordinated and rapid response for failure modes reported in flight.



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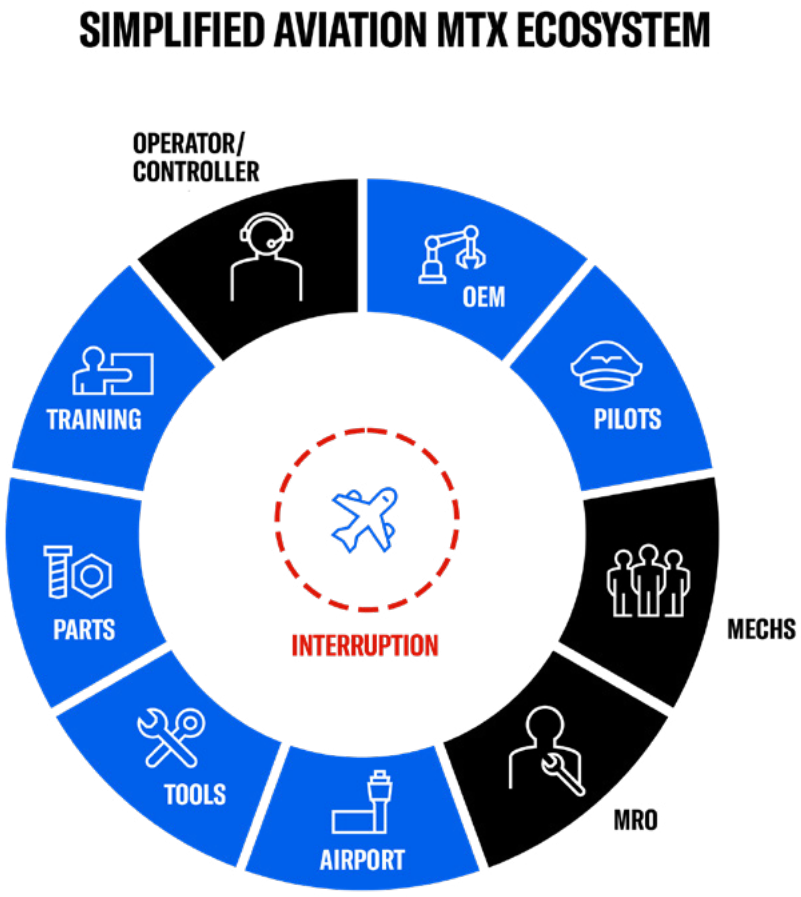
The current tools available to many working in this time- sensitive industry—phone calls, paper documents, faxes, emails—are just not up to managing the complex logistics of day-to-day operations.



Whatever gains we make through more efficient aircraft maintenance processes, better collaboration, and better knowledge exchange in aviation benefit both the aviation industry and those who depend on aviation.

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Efficient Processes

THE IMPACT OF FLIGHT DELAYS ON SUSTAINABILITY

In sustainability, small actions have significant results. Delays of any kind cost airlines and their customers, passengers, and shippers, wasted time, and lost productivity.

$47 PER HOUR

"Flight delays have cost air travelers billions of dollars at an estimated **$47** per hour for the average value of a passenger's time."

— Airlines4America

Beacon

When an airline's maintenance department operates more efficiently, it doesn't just make that airline more sustainable. Their efficiency also means fewer air traffic disruptions at their airports, which help other operators at that airport be more sustainable.

And it's not just airlines. Flights taking off and landing on time make ground workers more efficient and simplify baggage processing. Taxis and other drivers spend less time waiting for passengers in vehicles, emitting CO2. The shippers who rely on aviation also benefit. Perishable goods are preserved, ensuring less waste, and supply chains run smoother, ensuring greater productivity.

Every minute an airline gains in its operations, the aviation ecosystem gains, and so do the customers that rely on the ecosystem.

Every minute saved in getting planes back up in the skies can be hours saved in the cumulative Interaction Fields of aviation. That time is a sustainability factor because we expend fuel, consume energy, and waste resources without accomplishing the mission.

Airlines for America reports that in 2021, U.S. passenger airlines' average cost of aircraft block (taxi plus airborne) time was $80.52 per minute.

That cost includes fuel use, which impacts environmental sustainability. It also includes the costs of staff on standby, not just maintenance but also crew. The value of the aircraft asset is also factored in. When planes aren't flying, they're not generating revenue, which impacts the economic sustainability of the airline.

Delays also waste valuable capacity beyond the airline's assets—extra gates, ground vehicles waiting, and ground personnel on standby.

And that negative impact on sustainability radiates out to those who rely on aviation as factories wait for critical components, short life cycle shipments like fresh fish and flowers risk going to waste, and other businesses waiting for deliveries work less efficiently.

It's not only money. It's the wasted resources that money represents. Each airline saving a minute is saving millions in the cumulative for all those who rely on aviation while reducing the waste of vital resources. The more airlines that save a minute, the better use of resources airlines make, and the better use of resources their industry partners and customers make.

> *"FAA/NEXTOR CALCULATED THE ANNUAL COSTS OF DELAYS TO AIRLINES AND PASSENGERS IN DIRECT EXPENSES, LOST DEMAND, AND INDIRECT COSTS TO BE* ***$28 BILLION*** *IN 2018."*
>
> —Airlines4America

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Efficient Processes

A SINGLE SOURCE OF TRUTH

For aviation companies, being confident of the status of any activity, transaction, or event is critical for the continuity of operations and safety. Having the right information with the right context—immediately and throughout—is critical to reducing the time spent on the ground. But today, many of these processes are still manual, relying on paper checklists and documents and imperfect methods of communication, such as faxes, telephone calls, or email. These methods become a knowledge sieve, allowing critical information to fall through the cracks. Misunderstandings or lack of awareness on the status of a part or what work must be performed on an aircraft can cause costly delays.

EVERY MINUTE COUNTS

70% of OOS Events Span between **60-90 minutes.**

Most of this time is spent on coordination, not focused on the fix.

Beacon

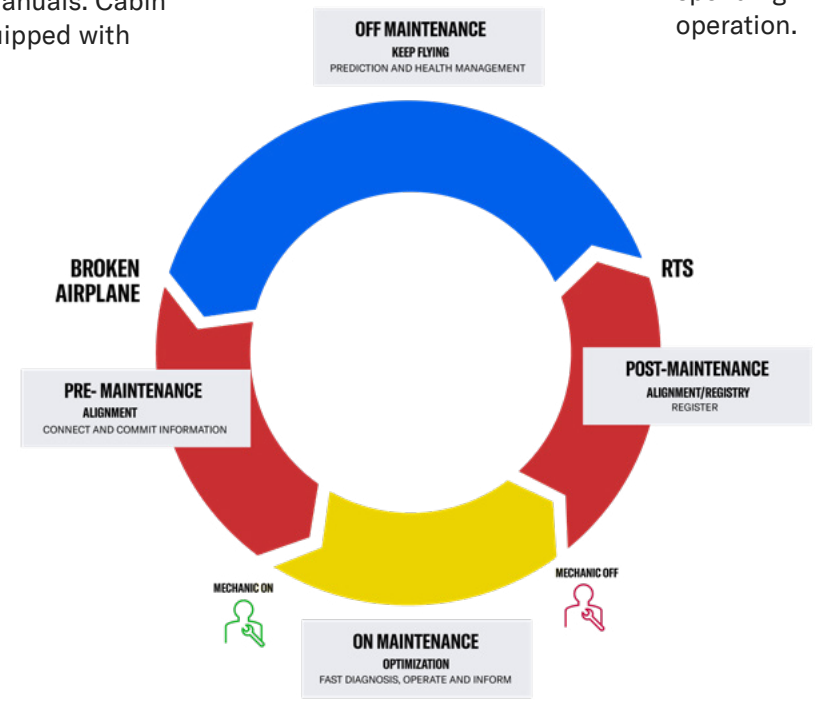
For regulatory reasons, aviation still relies on paper documentation, including maintenance manuals and checklists. While there is a rationale for this hard-copy recordkeeping, the process around maintenance, and the method of communication and collaboration could be digitized. In fact, we see trends toward that already with the introduction of aircraft health monitoring systems, which will require an adequate interface to alert maintenance crew of problems in-flight.

We can also consider the adoption of digital tools to facilitate other critical functions. Flight crew now have digital flight bags, saving volumes of pages in hard-copy manuals. Cabin crew are equipped with PEDs to perform their cabin services duties. These digital tools not only make work easier on crew, they also open up new opportunities for communications and enhanced, personalized service for passengers. Maintenance should not be left behind.

As an industry, aviation must embrace digital solutions that offer a single reliable source of truth to guide decision-making. As we move forward to a sustainable future, we need to empower human resources and make the best use of our limited time by acting on accurate information. Flight safety must always remain the top priority, which is why digital tools must be compliance-ready, compatible with existing systems, easy to adopt, and accessible to all. Digital tools should enhance current processes by addressing the communication gaps that lead to misunderstandings, missing parts, and ultimately aircraft delays.

The Beacon platform reduces the time required for pre- and post-maintenance alignment, with contextualized information available immediately helping to cut wasted time and resources in the process.

Optimized processes, through more efficient communication exchange, also shorten the time required for the fix, resulting in the aircraft spending more time in operation.



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Efficient Processes

HOW PLATFORMS POWER TRANSFORMATION

The aviation industry has acknowledged that new technologies will be required to meet Net Zero 2050, which includes new technology aircraft such as hydrogen-powered and electric airplanes, but it should not be limited to those new aircraft technologies, just as sustainability is not limited to carbon reduction alone.

New technologies that streamline operations have an important role in aviation sustainability. That includes innovations like ‘smart aircraft’ and ‘smart cabins’, which we’ll delve into more deeply in the next chapter of this series. It also includes tools like digital twinning of the fleet to plan more efficient operations and digital tools that boost collaboration, communication, and understanding.

AVIATION VS. OPEN COMPUTE

Data centers have a significant environmental footprint, contributing approximately **2%** of global greenhouse gas emissions.

IATA reported that all of aviation contributed around **2%** of global greenhouse gas emissions in 2019.

Data centers turn to platforms to make their maintenance and operations more efficient.

Will aviation do the same?

New technologies that streamline operations have an important role in aviation sustainability. That includes innovations like 'smart aircraft' and 'smart cabins', which we'll delve into more deeply in the next chapter of this series. It also includes tools like digital twinning of the fleet to plan more efficient operations and digital tools that boost collaboration, communication, and understanding.

Platforms fit in this category, and many industries have already implemented them to improve their performance.

We spoke to Simone Cicero, CEO of Boundaryless and the inventor of Platform Design Toolkit to discuss the power of platforms to transform an industry by encouraging collaboration at an ecosystemic level.

"When you have a product, whenever you can organize the market of services on top of the product, it's a smart move. It's another direction where you can expand your business leadership in the digital space, in digitalized markets," Cicero said. "It's what we call extensions. So you can think of not just intermediating the services that happen on top of a piece of hardware, for example, like a plane, but you can think of building ways for third parties to contribute to your product."

Cicero shared one example of this collaboration dynamic with the project Open Compute , which has completely transformed the way we build data centers. Data centers have a significant environmental footprint, contributing approximately 2% of global greenhouse gas emissions. (For comparison purposes, IATA reports that aviation contributed approximately 2% of global greenhouse emissions in 2019.) Like aviation, data centers are also heavily reliant on people for their operations.

"Open Compute created an ecosystem that intermediates more than $2 billion by creating this shared specification process where everybody agrees on open designs. These enable much smaller players to essentially design and manufacture parts locally. So you may have a separate design deployed across the world, but when the data center is in Tunisia, you have a Tunisian firm providing services and not depending on the US subsidiary to send people abroad."

If this sounds familiar in an aviation context, it is because that structure already exists in our maintenance ecosystem. OEMs have local authorized distribution and maintenance centers. A large network of independent small manufacturers, repair stations, and testing labs support the day-to-day servicing of aircraft. The missing link between the Open Compute Data Center approach and the aviation approach is that most of the interactions between these parties in aviation happen in a linear and disconnected fashion. There is no open exchange where all affected parties are aware of the same status of a part, repair, or test result.

In today's world, data centers are critical to global productivity and global sustainability. Though arguably they are not as critical as aviation. After all, data centers also rely on aviation for their supply of component parts. Aviation should at least be on-par with data centers by adopting new ways of exchanging critical knowledge.

Cicero describes the standards established by the cutting-edge technologies that are becoming essential to our global productivity as "integrity strategies." They focus on ensuring governance through a single source of truth.

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"What we are seeing coming up, for example, from the Web3 ecosystem, creating shared governance processes, and potentially decentralizing decision-making are fostering new types of organizations," Cicero says. "The platform becomes an enabler of commercial changes and then it all plays out in the ecosystems which need to be optimized to become unique. We are seeing this in the car industry as well as in many other spaces. There is a kind of convergence in creating these open standards, and the tendency will be that we agree on the standards, we agree on shared governance processes, and shared specification processes. If we succeed with this convergence, and in the ontologies we use, the language we use for organizing markets, it will be much better for everyone. The energy can then be put into creating custom solutions. The interesting thing is many companies, at the moment, especially big companies, are pondering organizational models that make this happen inside their own context."

This is where aviation has a huge advantage over emerging technologies and new business models. The shared standards are already globally defined, the ontology and terminology are known, the governance processes are clear, and the infrastructure is already in place to ensure aviation retains its record as a safe and reliable mode of transport. By deploying a platform to exchange information with those standards, rules, and regulations already in place, aviation has the potential to improve the efficiency of its processes by many multiples to keep aircraft flying.

Some examples of what Cicero describes, applied to the aviation ecosystem, might include integrating approved repair stations that handle component parts into the platform for better tracking of components that are out for repair and overhaul. This would make it easier for maintenance technicians and controllers to know with confidence whether a critical component will be available to install as needed or whether it has been determined to be BER (beyond economic repair) and must be replaced. Another possibility is to add suppliers and service providers to the platform during major maintenance events—such as during C-checks or cabin refurbishment programs—to help boost the information flow. Partners can answer questions on LOPAS (location of passenger accommodations), and report/address problems with any components delivered. The possibilities to extend the platform of aviation maintenance to key partners and suppliers are virtually limitless.

"It's a matter of understanding that you have a product [in this case the aircraft] relying on these products that are, to some degree, human-powered services and marketplaces," Cicero says. "Everything that fits into the product can be added to the platform as an extension."

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Efficient Processes

STREAMLINING BEST PRACTICES FOR SUSTAINABILITY

The aviation industry senses a need for open collaboration from the ground up. In our previous chapter, we mentioned the popular aviation maintenance Reddit community where technicians exchange knowledge.

Industry working groups also see that need.

JET AGE, MEET DIGITAL AGE

The jet age positioned aviation at the heart of innovation.

Platforms can power aviation's next great era of sustainability.

Beacon

"A link needs to be created between the repair organization and the line or base maintenance organization that shares the experience. On one hand, the troubleshooting will be improved, and problems will be solved in a more effective way. On the other hand, unnecessary repair or overhaul events will be avoided. The more data the airline has, the more sophisticated the decisions will be, so it makes sense to share experiences with other airlines in order to improve data quality. If component maintenance is outsourced to a service provider, it is important to have a feedback loop with the line or base maintenance provider and to cover these improvements in contract negotiations or tenders," say the authors of a study prepared by IATA's Maintenance Cost Technical Group (MCTG), an airline volunteer group that gathers and analyzes maintenance costs, delves into the complexities of maintenance operations, and suggests best practices.

As MCTG suggests, there are weak links in the chain of maintenance which could damage the whole as traffic increases and new aircraft are introduced to the fleet. The "feedback loop" they reference ideally describes the collaborative interactions facilitated by a platform.

The need is there, and it is clear. All that is required now, is to take the first step forward by cutting through the complexities in today's maintenance practices which result in lost momentum and misspent resources.

JET AGE

The Time-Suck of Missing Information

The Risks os Lack of Documentation

The Search for Missing Parts

The Hazards of Miscommunication

A Siloed Knowledge-Base

Tricks of the Trade vs Best Practices

Staff Shortage

DIGITAL AGE

Digitizing Connection
Beacon is responsive and adaptive and empowers professionals and organizations to connect and collaborate effortlessly

Future Ready (Dynamic Architecture)
Beacon is future-ready, leaning forward, poised for action, enabling and transforming the industry daily flights.

The Ecosystem
Value-added Interaction Fields powered by the network effect of an effective platform.

Empowering
Beacon empowers teams to Focus on the Fix.

EFFICIENT MTX

Beacon

The jet age positioned aviation at the heart of innovation. Platforms can power aviation's next great era of sustainability. It is that need that drives us every day to optimize the Beacon platform and to ensure we remain human-centered in our approach.

We are poised and ready to enable the sustainable age of aviation, one that holds true to its core values of safety and engineering know-how, while adjusting our vectors to get more people up to speed, speaking the same language, reading from the same manual, and doing their best to keep aircraft flying for generations to come.

We love planes and we're pretty sure our great-grandkids will too.

A NEW ERA OF SMARTER COLLABORATION FOR FASTER RETURN TO SERVICE

"I now can assign cases to my team from a distance."- **Supervisor**

"Coordination has never been that easy." - **Crew Chief**

"I only pick the phone when it is absolutely necessary. Beacon gives me great visibility and extra bandwidth." **- Controller**

"I can now focus on the best part of the work, the fix." **- Technician**

Beacon empowers the users to see more and more clearly.

It provides insights to make better decisions.

Beacon enables them to be more efficient by communicating better and collaborating smarter.

With Beacon, users can focus on the best part of their job—keeping planes flying

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Keep Flying

Why a human-centered Aviation Maintenance approach is essential to Aviation Sustainability

CH. 3 EFFECTIVE LIFE CYCLE MANAGEMENT

The third pillar of Maintenance Sustainability

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Effective Life Cycle Management

A SUSTAINABILITY PLATFORM

We believe sustainable aviation maintenance relies on three pillars.

With more effective oversight, planning, and communications, aviation can ensure that the three pillars of sustainable aviation maintenance are powerful enough to fuel optimal flight operations now and well into the future. The three chapters of our White Paper explore the three pillars of sustainability.

In this third chapter, we review the third of these pillars: EFFECTIVE LIFE CYCLE MANAGEMENT.

FLY NET ZERO 2050

"SAFs (sustainable aviation fuels) account for the largest share of CO2 reduction potential, varying between **59% and 64%** across scenarios. **Improvements in aircraft technical and operational efficiency contribute an additional one-third of CO2 mitigation.** Zero-emission planes powered by hydrogen account for up to **5%** of emission reductions in 2050."

—ICCT (The International Council on Clean Transportation)

Beacon

1. EMPOWERED PEOPLE

In the first chapter of our White Paper on sustainability, we delved into factors in human resources currently impacting aviation maintenance and, more broadly, aviation operations and considered how a platform could resolve systemic issues.

2. EFFICIENT PROCESSES

In this chapter of our White Paper, we explored how aviation could optimize maintenance processes to reduce waste and downtime, supporting aviation sustainability.

3. EFFECTIVE LIFE CYCLE MANAGEMENT

In the third chapter of this sustainability series, we will explore the life cycle management of aviation through the lens of the people who ensure and account for the extension of that life cycle. We will also look at the documentation required for accountability—an essential element to ensure that the sustainability actions taken in aviation are credible and provable.

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Why a human-centered Aviation Maintenance approach is essential to Aviation Sustainability

CH. 3 EFFICIENT LIFE CYCLE MANAGEMENT - the third pillar of Maintenance Sustainability

CONTENT

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Effective Life Cycle Management

FOREWORD

By Marco Cesarino
Head of Beacon

We designed Beacon to “make the invisible visible.” We focus our platform’s “disruption” energy on breaking down silos and connecting people who can share resources.

We know a lot of organizations, primarily commercial or larger operators, have a lot of data and know-how stored in their digital and people systems. They lack an interface to reveal what matters most: the repeat maintenance events of aircraft in need of special attention, the aircraft’s history, and the overall health of the fleet.

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Parts suppliers can offer valuable solutions and tools, but only a few know about them. Flight services, catering, ground services, and maintenance may have untapped knowledge to help airplanes take off sooner, avoiding service disruptions. They only need to talk to each other, share knowledge, and collaborate in a fluid—not fragmented—way. This dialogue and knowledge exchange becomes increasingly valuable to the aviation industry as previously siloed bits of information are connected and made relevant in context.

Knowing what you know is an important step toward organizational progress. As Knowledge Management professional, Ekta Sachania writes for KMI:

“Knowledge that can be quantified and documented is explicit knowledge. It is tangible and can be conveyed through processes, documentation, books, videos, etc. However, this just forms only a fraction of any organization’s knowledge while the rest of the knowledge bound to people’s experiences, intuition, insights, expertise, and personal conclusions is the tacit knowledge.

Recognizing the importance of this tacit knowledge and capturing it in a methodical way to make it explicit is a challenge for most organizations.”

This is the challenge we set about to facilitate. Transitioning from tacit knowledge to explicit knowledge is at the heart of making the invisible visible. Once tacit knowledge becomes explicit, you can augment it and easily disseminate it throughout the organization, fostering more meaningful collaboration in which everyone feels valued and recognized for their knowledge.

Breaking down silos requires transparency and accountability across all communications, data sharing, and decision-making channels. In this sense, it becomes a sustainability endeavor, up-cycling knowledge, optimizing the use of human and data resources, and allowing people to collaborate more efficiently and effectively.

When we make the invisible visible, we help our customers focus-in on issues that lead to chronic flight disruptions and quickly help identify spare capacity to improve operations, not by working harder but by working smarter.

By advancing the progress and the potential of each mechanic and the organization that mechanic works for, with healthy aircraft operating optimally, we can transform aviation and make it ecologically and economically sustainable.

Marco Cesarino
Head of Beacon

EFFECTIVE MTX

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Effective Life Cycle Management

MAINTENANCE ACCOUNTABILITY

There is no sustainability without accountability. For aviation to demonstrate a credible sustainability strategy, it must account for more than just a reduction in carbon emissions. Tracking the parts and materials used and their context will also be essential.

Sustainable aircraft maintenance, regardless of the aircraft type, will require an efficient exchange of information to avoid loss and waste while accounting for the origins and use of parts throughout the life cycle. Aviation is well ahead of other industries in this sense since parts marking and tracking is already a well-established regulatory requirement. We have the processes in place to govern the practice.

FLY NET ZERO 2050

"Hovering consistently well above a **99%** benchmark of aircraft technical availability implies a careful steering of the aircraft maintenance with a sharp focus on preserving the capabilities and performance of the asset close to its 'as new condition'. Hence, the needed enabler for a **24/7** visibility on, awareness of, and action to maintaining the required level of aircraft health."

— IATA MCTG

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A platform model designed to support the life cycle of the fleet enhances the best practices of tracking and traceability for part checks, overhauls, repairs, and changes. Knowing the context of when maintenance technicians replaced a part or sent it out for repairs, how often, and under what circumstances is just as crucial to fleet life cycle management as keeping regulatory records. Analytics and search functionality refine accountability by allowing a more comprehensive view of maintenance events and making the context of these events visible. Finding commonalities in maintenance events enhances sustainability by highlighting recurring failure modes that might require process changes or re-engineering.

Operators can shift from airplane-centric to operations-centric planning and fleet management, in which the total operational capacity is optimized by digitizing the flow of aircraft through their life cycle. When the invisible becomes visible, unscheduled MTX events are minimized and their duration is shortened.

With awareness of the context, operators can quickly share insights into their extended networks, reducing recurrent failures and increasing operational utility for the operator's fleet and the global fleet.

One of the challenges of information flow throughout the operational life cycle is the need to preserve data in order to retain asset value. The full documentation of work performed on aircraft and aircraft components, and the traceability of parts added or removed from service, are required by regulators around the world. Without that information, assets must be scrapped, resulting in material and financial losses. Some aircraft components, even something as seemingly innocuous as an aircraft seat cushion, require special handling at the end of their service life, which means the information flow and record-access must be continuous for the asset, from cradle to grave.

Safety requirements make aircraft inherently expensive to operate and maintain. Some components which might still have a useful service life cannot be repurposed or recycled merely because they lack the documentation to support that critical documentation to support their re-introduction to service. Digitization of the maintenance process can help ensure that documentation is available when it's needed.

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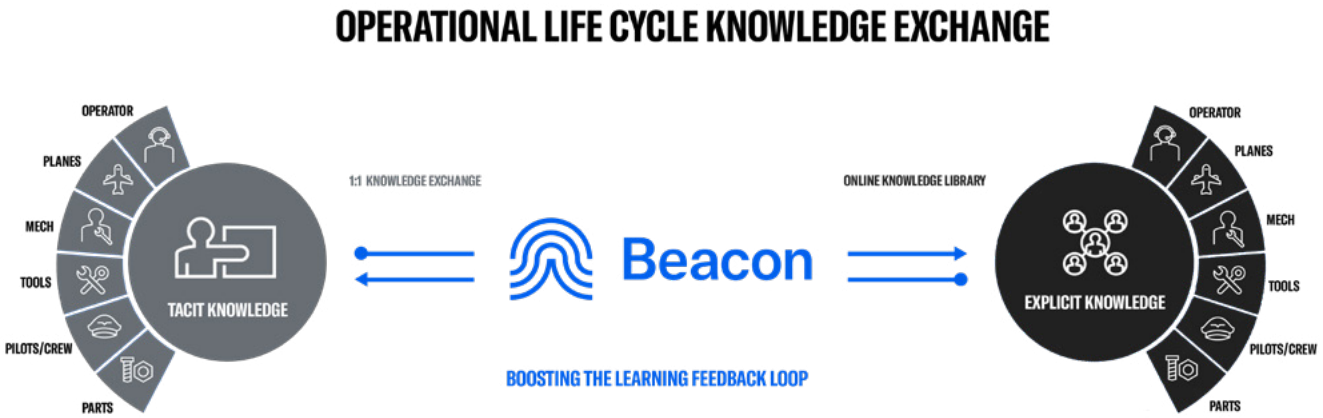
Another way to look at it is that the preservation and more efficient exchange of information and asset records inherently adds value to the asset and retains utility. By adding stakeholders (suppliers and service providers) to the platform, operators have an opportunity to improve the financial and ecological sustainability of the organization by reducing process and material waste.



Through platform collaboration, sustainability gains magnify beyond the asset owner to the entire aviation supply chain, while ensuring that AHM (Aircraft Health Management) data helps improve product design, reducing AOG supply pressures, and supporting an after-market life for retired equipment.

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Effective Life Cycle Management

A DYNAMIC APPROACH TO MAINTENANCE

New Aircraft Life Cycles Require New Tools. Aircraft maintenance will always require specialized knowledge to ensure safety. A platform more readily distributes that knowledge.

As we covered in second chapter of our White Paper series on sustainability, the status quo of aviation maintenance is unsustainable, and it is not up to the challenge of traffic growth predicted over the next two decades.

It also falls short of what sustainable fleet management requires.

FLY NET ZERO 2050

"In 2020, the world fleet consisted of a total of **30,771** aircraft. This includes western built aircraft in commercial operations (Passenger, Cargo, Combi), with narrowbody, widebody and regional jets and turboprops (ATR42/72 and Q300/400 only). Thirty-one percent (**31%**) of the fleet was parked or stored compared to **10%** on average in the past decade."

— IATA MCTG— IATA

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As commercial aviation recovers from the impact of the COVID shutdown, maintenance operations face significant challenges. The fleet mix has shifted with the retirement of larger aircraft and next-generation narrowbody aircraft deployed on longer routes. Maintenance teams must restore grounded aircraft to flight-ready conditions as capacity demands increase.

The fleet shift will challenge the current processes in place for maintenance coordination.

A return to service of a large fleet of grounded aircraft will increase the maintenance teams' workload. They will need more effective collaboration tools to get the job done.

New aircraft technologies using alternative propulsion systems will require the rapid training of maintenance staff, requiring new methods of knowledge exchange.

A fleet of "smart aircraft," generating oceans of aircraft health data on their components, will require a new approach to fleet maintenance planning.

As "smart aircraft" take to the skies, controllers and technicians must interpret and act on aircraft health reporting, exchange information, and ensure that predictive maintenance delivers the expected efficiency returns. The IATA MCTG has detailed the requirements in its report on the shift from "passive" Aircraft Health Monitoring to "active" Aircraft Health Management (AHM).

AHM could revolutionize aircraft life cycle management, but it requires active knowledge exchange among the people who keep aircraft flying to streamline workflows matching the speed of aircraft data flow.

"The AHM (Aircraft Health Management) means using aircraft and fleet generated data to promptly identify the individual aircraft's needs for maintenance work and trigger an effective and efficient maintenance action," authors of the IATA MCTG AHM report write. "This is an end-to-end comprehensive process, which encompasses aircraft systems, data transfer and electronic processing, data analysis, and subsequent informed decision on improved, re-defined, or alternative methods to maintenance tasks. Such a process includes both 'on-board' and 'off-board' sequences, and its results are highly relevant to planning and executing the aircraft scheduled maintenance program or the ad-hoc required maintenance action. It is a dynamic action-oriented approach and a consequential evolution of the already acknowledged albeit more 'passive witnessing' field of Aircraft Health Monitoring."

A platform fosters this "dynamic action-oriented approach" with an efficient exchange of information on an aircraft requiring maintenance. The platform provides a single point of truth for all the complexities that arise in the maintenance process. The network ensures that actions required based on critical AHM data are captured and shared effectively.

There are no efficiency gains from managing a fleet of "smart aircraft" via fax machine correspondence, phone, or e-mail. New tools are required to ensure the timely exchange of notifications from 'on-board systems' to the 'off-board' human team who will manage issues revealed by that data.

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Effective Life Cycle Management

AIRCRAFT MAINTENANCE EXTENSIONS

Aviation developed advanced reservation and GDS systems to manage the complexities of airline bookings and flight schedules. These have benefited all travel sectors through API integrations with multiple other solutions. Beacon works with carriers to capture data from GDSs in aid of maintenance planning.

FLY NET ZERO 2050

"At the 77th IATA Annual General Meeting in Boston, USA, on 4 October 2021, a resolution was passed by IATA member airlines committing them to achieving net-zero carbon emissions from their operations by 2050. This pledge brings air transport in line with the objectives of the Paris agreement to limit global warming to 1.5°C.

— IATA

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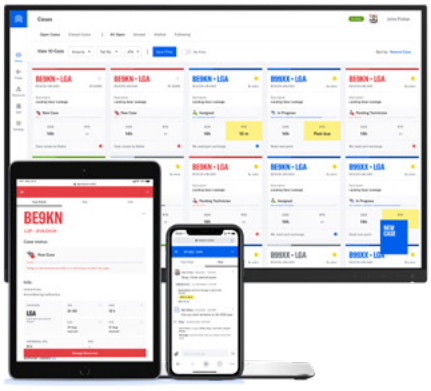
As discussed in the second chapter of our White Paper, Simone Cicero, inventor of the Platform Design Toolkit refers to these growing and robust platform connections and collaborations between parties with a common interest as 'extensions.' The benefit of these extensions is substantial. They do not require a re-design of proprietary information systems. They are designed solely to enhance collaboration and co-exist as complementary tools for the organization to optimize its processes.

Managing the life cycle of current and future aircraft, transmitting data from multiple systems and various hardware—from engines to seat-back IFE and galley equipment—will require such extensions, delivered by a fleet-agnostic platform, to ensure the effectiveness of AHM. As every stakeholder has access to the right information, at the right time, coordination of a response to complex AHM data is simplified.

More effective AHM will be critical to ensure a sustainable future for aviation.



COLLABORATE SMARTER

Beacon is an agnostic platform designed for the aviation industry that fosters collaboration at scale and enables all people involved in resolving unscheduled maintenance to find, coordinate and synchronize the people and resources they need to solve problems more quickly.

Request a Demo

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Effective Life Cycle Management

THE NETWORK EFFECT: AN ENGINE FOR A SUSTAINABLE FUTURE

Platforms are more than tools. They can be a power-source for enterprise, and are particularly helpful in developing better economies of scale and optimal use of resources. As the authors of *Platform Revolution: How Networked Markets Are Transforming the Economy and How to Make Them Work for You* write, their power is defined as the *"Network Effect."*

FLY NET ZERO 2050

"To succeed, it will require the coordinated efforts of the entire industry (airlines, airports, air navigation service providers, manufacturers) and significant government support."

— IATA

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"Network effects refers to the impact that the number of users of a platform has on the value created for each user. Positive network effects refers to the ability of a large, well-managed platform community to produce significant value for each user of the platform."[1]

Their effectiveness is virtue of optimal use of modern connectivity and the open exchange of resources and knowledge that platforms foster. Platforms are the cure for leaky pipeline models that waste energy and resources through inefficiencies.

"In the world of platforms, the Internet no longer acts merely as a distribution channel (a pipeline). It also acts as a creation infrastructure and a coordination mechanism. Platforms are leveraging this new capability to create entirely new business models. In addition, the physical and the digital are rapidly converging, enabling the Internet to connect and coordinate objects in the real world—for example, through smartphone apps that allow you to control your home appliances at long distance. Simultaneously, organizational boundaries are being redefined as platform companies leverage external ecosystems to create value in new ways. In this new stage of disruption, platforms enjoy two significant economic advantages over pipelines. One of these advantages is superior marginal economics of production and distribution."

"A platform's ability to scale rapidly is further enhanced by network effects. When positive network effects kick in, higher production leads to higher consumption, and vice versa."

"A virtuous feedback loop is set in motion, fueling the growth of the platform at minimal cost. Leveraging network effects, platforms are able to build open electronic ecosystems embracing hundreds, thousands, or millions of remote participants. Such ecosystems can be larger than most pipeline-based organizations and can have access to more resources than a traditional pipeline company can command. As a result, the value created in such an ecosystem can be much larger than the value created in a comparable traditional organization. Therefore, firms that continue to compete on the basis of resources that are owned internally are increasingly finding it difficult to compete with platforms."[2]

"Leveraging network effects, platforms are able to build open electronic ecosystems embracing hundreds, thousands, or millions of remote participants. Such ecosystems can be larger than most pipeline-based organizations and can have access to more resources than a traditional pipeline company can command. As a result, the value created in such an ecosystem can be much larger than the value created in a comparable traditional organization. Therefore, firms that continue to compete on the basis of resources that are owned internally are increasingly finding it difficult to compete with platforms."[3]

As aviation moves toward intelligent assets—smart aircraft—creating a framework for open collaboration and communication between stakeholders of the fleet and its equipment will be essential. The economies of scale in maintenance, repairs, spare parts distribution, and labor allocation—all made possible by platform collaboration—will make aviation more sustainable economically and environmentally.

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[1] Parker, Geoffrey G.; Van Alstyne, Marshall W.; Choudary, Sangeet Paul. Platform Revolution: How Networked Markets Are Transforming the Economy and How to Make Them Work for You (p. 17). W. W. Norton & Company.

[2] Parker, Geoffrey G.; Van Alstyne, Marshall W.; Choudary, Sangeet Paul. Platform Revolution: How Networked Markets Are Transforming the Economy and How to Make Them Work for You (pp. 64-65). W. W. Norton & Company.

[3] Parker, Geoffrey G.; Van Alstyne, Marshall W.; Choudary, Sangeet Paul. Platform Revolution: How Networked Markets Are Transforming the Economy and How to Make Them Work for You (p. 65). W. W. Norton & Company.

Additional Refererence: Pipelines, Platforms, and the New Rules of Strategy : https://hbr.org/2016/04/pipelines-platforms-and-the-new-rules-of-strategy

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Effective Life Cycle Management

BEACON SHINES A LIGHT ON SUSTAINABLE AIRCRAFT MAINTENANCE THROUGHOUT THE LIFE CYCLE OF THE FLEET

Beacon exists to keep airplanes flying by dramatically cutting the single biggest pain points in the industry: costs related to delays, cancellations, and reduced availability time.

We believe in an agnostic and collaborative approach to streamline operations, starting with the end-to-end unscheduled maintenance process.

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EMBRAER·X

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LIFE OF AN ISSUE

Life Cycle management is essential to the sustainability of an enterprise. In an industry as complex as aviation—relying on thousands of parts to operate a fleet of aircraft—there are additional complications and burdensome requirements for documentation. Reducing those complications by streamlining communications with automatic accountability—record keeping and traceability of every issue for every aircraft—can make aviation maintenance sustainable.

A platform system follows the flow of aircraft maintenance of the issue from first creating a maintenance event alert to its resolution, maintaining a record of communications, facilitating collaboration between departments, ensuring accountability for tasks, and simplifying workflow with notifications and status updates from people with the right expertise for the job. Along the line, everyone shares knowledge. There are no silos, lost connections, or organizational blind spots.

LIFE OF THE FLEET AND ORGANIZATION

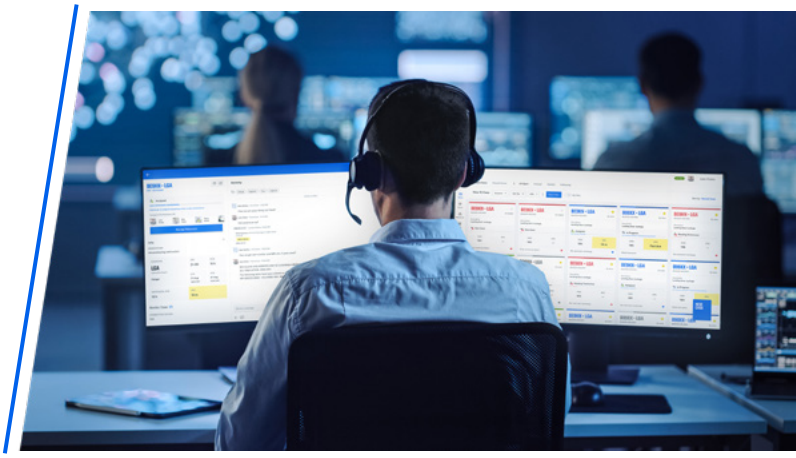
The fleet record produced through the platform grants visibility into all cases.

Users can sort by status, priority, and urgency with past and real-time analytics to make better decisions.

An eagle-eyed perspective on the status of all aircraft in maintenance, enhances fleet management, helping to identify recurring issues and promoting faster return to service. Less down time results in revenue optimization and reputation management. As passengers keep flying, with fewer service disruptions, they spread positive sentiment about the airline brand.

LIFE OF AN AIRFRAME

The cumulative digital record of each issue becomes a reliable, easy-to-reference aircraft history. This digital record complements maintenance documentation and logbook records with a more valuable and actionable real-time view of the fix for previous issues. This knowledge enhances the information available in standard manuals.



Beacon

Keep Flying

Empowered People

A SUSTAINABLE FUTURE OF AVIATION MAINTENANCE

In this White Paper series, we have reviewed the three pillars of maintenance sustainability: Empowered People, Efficient Processes, and Effective Life Cycle Management.

To attract tomorrow's workforce and transfer the knowledge of the current workforce, we need digital tools that are accessible and intuitive. As more digital-natives enter the workforce, a maintenance platform designed around eliminating unnecessary frictions in the process will also keep a record of maintenance events to shorten the learning curve.

Beacon

Every efficiency gain at an airline radiates through aviation's Interaction Fields making the global economy more sustainable, as passengers, industries and communities benefit.

To meet Net Zero 2050, the aviation fleet will go through a dramatic change, with a mix of next-generation "smart" aircraft and new technology aircraft using new propulsion systems. Between today and tomorrow, aviation maintenance processes will need to get up to speed to ensure more effective life cycle management.

We believe that aviation can become sustainable by 2050, reducing its carbon footprint, improving its products and processes to keep aircraft flying.

THE SKY HAS NO LIMIT.

EFFECTIVE MTX

Beacon

Keep Flying

ABOUT US

Beacon

What Lifts Us?

GROWTH MINDSET

We embrace a growth mindset no matter how hard the challenge is ahead and inspire partners by approaching unprecedented ideas with creativity, humanity and grit.

CO-CREATION

Our superpower lies in the depth of our diversity and our desire to understand and constantly learn from alternative perspectives.

PEOPLE-FIRST

We always put people first and are passionate about enhancing people's lives - from our partners to our network of Beacon community members.

ALWAYS ON

We're responsive and adaptive. We listen deeply to the community and are unafraid to change course to accelerate our mission.

Beacon is a trailblazer with the tenacity to open new opportunities to allow its users to benefit from a new way of aviation maintenance. We bring together nonconformists, audacious adventurers, and those who dare to change the status quo and contribute to building a sustainable future for the aviation industry. Beacon leads the ecosystem with optimism, simplicity and expertise into a new era of collaboration and smarter ways of creating value.

BEACON

Beacon challenges current MTX systems and brings 21st-century solutions to improve maintenance services. Beacon applies a human-centric and ecosystemic approach to the use of technology to industry challenges. Beacon is a fleet-agnostic platform that works alongside existing in-house systems to facilitate the interaction among stakeholders in aviation maintenance while ingesting data to bring actionable insights which enable optimal aircraft operations. Beacon cuts through complexity and provides a simple-to-use solution to maintenance event tracking. We are designing a new era of maintenance with faster return-to-service, better communication, and smarter collaboration so you can keep flying.

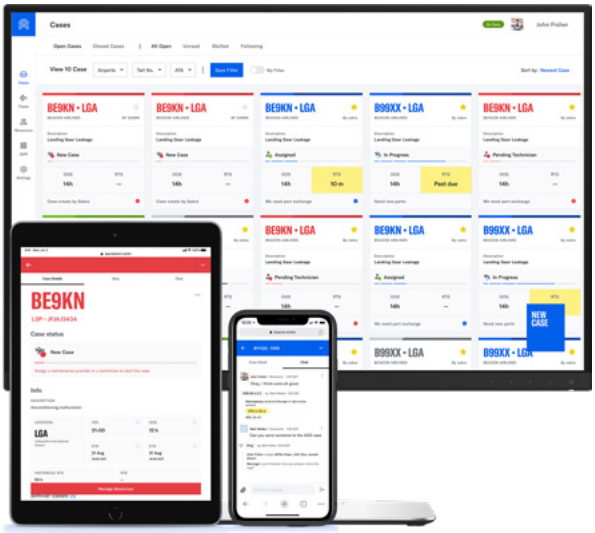
EMBRAER-X

Embraer-X is a venture builder and Embraer's innovation agent that transforms ideas into innovative businesses, transcending the aviation market and igniting the Innovation Ecosystem. We are crafting the path to make a positive impact in the world by developing solutions that inspire our partners to spread true grit to make changes people crave, based on our three pillars: Sustainable by Design, Integrated Mobility and Airborne Info-Systems. Learn more at embraerx.embraer.com

Beacon

LEAD THE CHANGE

We want to hear your thoughts! Share your views on the future of aviation maintenance sustainability with Beacon by following us on LinkedIn.



SCHEDULE A DEMO OF THE BEACON PLATFORM

Request a Demo