MINISTRY OF HUMAN RESOURCES

TalentCorp
GROUP OF COMPANIES

Impact Study of Artificial Intelligence, Digital, and Green Economy on the Malaysian Workforce Volume 2

Sector:
Aerospace

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Preface by the Group Chief Executive Officer of TalentCorp

As Malaysia stands on the threshold of a transformative era, we find ourselves driven by the accelerating forces of Artificial Intelligence (AI), Digital, and Green Economy. These global trends are reshaping industries, redefining the future of work, and challenging us to navigate both the opportunities for job creation and the realities of evolving role redundancies.

With a median age of 31, Malaysia leads a youthful ASEAN region where the median age is just 30. This demographic advantage presents a unique opportunity—a vibrant, dynamic workforce ready to harness the opportunities of a Digital and Green Economy. Yet, it also poses challenges. Youth unemployment and underemployment remain persistent issues across ASEAN, with Malaysia facing a youth unemployment rate of 11% and 36.3% of tertiary-educated employees grappling with skill-related underemployment. These figures demand immediate action. Reskilling and upskilling are not just important—they are imperative as the landscape of jobs continues to evolve.

At TalentCorp, we are honoured to serve as a strategic think tank under the Ministry of Human Resources' (KESUMA) mandate. This critical role allows us to leverage our networks and initiatives, providing data-driven insights that strengthen the government's intelligence capacity and support national policy development, advocacy, and long-term strategic planning.

One of our foremost initiatives in this capacity is the **Impact Study of AI, Digital, and Green Economy on the Malaysian Workforce**. This study is designed to offer key guidance to policymakers and industries, equipping them with the knowledge to prepare the workforce for upcoming shifts. It highlights essential reskilling and upskilling programmes to assist Malaysians affected by job displacement, ensuring they transition smoothly into new roles, fostering sustainable growth, and ensuring no one is left behind.

Through insights gleaned from this study, TalentCorp's MyMAHIR Future Skills Talent Council (FSTC)—an industry-led body dedicated to addressing skills needs—will drive efforts to close critical skills gaps. MyMAHIR's collaboration with industry leaders enables us to identify priority competencies and shape training programmes to meet the evolving demands of their sectors. Aligned with the MADANI Economy framework's focus on lifelong learning and guided by best practices from the International Labour Organization (ILO), TalentCorp will continue working closely with key ministries, agencies, and industry players to develop forward-looking curricula that meet the workforce needs of the future.

As Malaysia navigates this new landscape, the findings from this study will serve as an indispensable resource—providing policymakers, industries, and the workforce with the insights and tools required to stay competitive and resilient in an ever-evolving global economy.

On behalf of TalentCorp, I extend our deepest gratitude to our industry partners, colleagues, and experts for their invaluable contributions to this study. Together, we have crafted a comprehensive and impactful report that will serve as a guide for Malaysia's future of work, ensuring that we are prepared for the challenges and opportunities ahead.

Thomas Mathew
Group Chief Executive Officer
Talent Corporation Malaysia Berhad

“As Malaysia navigates this new landscape, the findings from this study will serve as an indispensable resource— providing policymakers, industries, and the workforce with the insights and tools required to stay competitive and resilient in an ever-evolving global economy.”

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Executive Summary

Artificial Intelligence (AI), Digital, and Green Economy are taking the driver's seat in the Aerospace sector, steering innovation while keeping the workforce at the heart of its operations. Our analysis emphasises that these trends will reshape Malaysia's workforce, highlighting its pivotal role, over the next three (3) to five (5) years. It is essential for the Malaysian Aerospace sector to prepare for this transformation to remain a regional leader in the modern age, especially as the global growth of the sector continues to rapidly evolve.

The global Aerospace market has experienced significant expansion in recent years. In 2023, it reached USD308.67 billion (RM1.35 trillion) and is projected to grow to USD369.24 billion (RM1.61 trillion) by the end of 2024, reflecting a robust compound annual growth rate (CAGR) of 19.6%.[1] This post-pandemic growth is driven by heightened demand for air travel, technological advancements, emerging economies, evolving social behaviours, and favourable interest rates.

Malaysia's Aerospace sector mirrors this global expansion. In 2022, it contributed RM1.4 billion to the nation's gross domestic product (GDP). Despite its modest contribution compared to more established sectors, the sector shows high potential, with a CAGR of 17.6%.[2] The expansion is fueled by increasing air traffic, driving demand for maintenance, repair, and overhaul (MRO) services, as well as aero-manufacturing. The Government of Malaysia, through the New Industrial Master Plan 2030 (NIMP2030), recognises Aerospace as a strategic and high-value sector, central to national development and investment priorities.

Malaysia is currently positioned as the second-largest Aerospace sector in Southeast Asia. This prominence is exemplified by Malaysia's strong partnership with Airbus, which has invested heavily in the country and established the largest supplier base here, making Malaysia's Aerospace sector the third-largest market in Asia-Pacific.[3]

Artificial Intelligence (AI): Artificial Intelligence (AI) powered automation in Aerospace is seeing significant advancement in three (3) main areas; predictive maintenance, autonomous system, and quality control.

Digital: Digital is transforming the Aerospace sector, driving efficiency, innovation, and safety. As these advancements progress, they will further enhance the sector's capabilities and create new opportunities, promising to boost its prowess.

Green Economy: Green Economy is transforming the Aerospace sector, driving efforts to reduce environmental impact, enhance sustainability, and adhere to ever-tightening regulations, such as Carbon Border Adjustment Mechanism (CBAM).

1. The Business Research Company, *Aerospace Global Market Report 2024*, 2024
2. Ministry of Investment, *Trade and Industry, New Industry Master Plan 2030: Aerospace Industry*, 2023
3. Malaysian Investment Development Authority (MIDA), *Malaysia's Aerospace Industry*

This impact study on the Aerospace sector, focusing on the MRO and Aerospace Manufacturing sub-sectors, which together contribute 94% to the sector, examines how current trends are shaping the Malaysian labour market. AI, Digital, and Green Economy principles are already being applied across the sector. For instance, AI is leveraged in MRO operations through predictive maintenance, enhancing efficiency, and reducing downtime. Additionally, digital twin technology is being utilised, with virtual replicas of physical assets enabling real-time data collection and analysis for improved accuracy and efficiency in aircraft maintenance. Moreover, waste reduction strategies are at the forefront, with recycling and reusing materials being adopted to minimise the environmental impact of operations.

As the growing influence of AI, Digital, and Green Economy reshapes the Aerospace sector, roles are expected to evolve. For example, a general worker or operator, under MRO and manufacturing, will be impacted by these emerging trends. This role typically involves supporting operations with routine tasks such as cleaning, transporting materials, and assisting with equipment, all while adhering to health and safety regulations. However, advancements in AI, robotics, and digital technologies are automating many of these tasks, reducing the need for human labour as machines take over with greater efficiency, consistency, and cost-effectiveness.

General workers or operators may explore alternative roles that leverage their existing experience and skills in the Aerospace sector or even other sectors. However, to successfully transition into these new roles, they will need to develop relevant skills.

The study has identified **189 roles** that are key for maintaining the sector's standards and operational efficiency. Of these roles, **10 (5%)** are highly impacted by AI and Digital, **162 (89%**) are moderately impacted, and **11 (6%)** are minimally impacted. Additionally, six (6) emerging roles, eight (8) in-demand AI and digital skills, as well as five (5) in-demand green skills have been identified as key drivers of future advancements and innovations within the dynamic Aerospace sector.

Considering the anticipated evolution of Malaysia's workforce over the next three (3) to five (5) years due to the impact of AI, Digital, and Green Economy, eight (8) recommended initiatives have been developed. These initiatives are designed to both adapt to the trends within the Aerospace sector's talent ecosystem and to harness opportunities while addressing challenges posed by these transformative shifts. By aligning with the needs and aspirations of each stakeholder group, these strategies will foster innovation, promote skill development, and ensure the sector's sustainable growth.

The initiatives have been grouped into four (4) categories based on the leading entities: **Government**, **Industry Players**, **Academia**, and **Training Providers**:

GOVERNMENT	**IN1** Provide Funding and Incentives **IN2** Develop Policy and Regulation that are Supportive of Adoption of AI and Digital by the Sector
INDUSTRY PLAYERS	**IN3** Implementation of Continuous Learning and Development Programmes **IN4** Collaborate Between Industry, Government, Academia, and Training Providers
ACADEMIA	**IN5** Develop Industry-Relevant Curriculum **IN6** Promote Micro-Credential Courses
TRAINING PROVIDERS	**IN7** Develop Training Content needed by the Sector **IN8** Offer Diverse Delivery Methods

Chapter 1:

Introduction of the Study

Introduction of the Study

Purpose of the Study

The increasing focus and adoption of AI, Digital, and Green Economy call for a transformative shift in global operating models and workforce, supported by the digitally enabled drive beyond Industrial Revolution 4.0. The study aims to help government, industry players, academia, training providers, and the public to prepare for future workforce demands. The output of this study will contribute to the Malaysia National Skills Registry (MyNSR), a skills taxonomy that will be integrated into the MyMAHIR platform. This platform offers comprehensive insights into industry trends, job roles, required skills, career pathways, and available training programmes across all sectors.

These research and studies cover several sectors, namely Information and Communications Technology (ICT); Food Manufacturing and Services; Pharmaceutical Manufacturing; Medical Devices; Aerospace; Electrical and Electronics; Wholesale and Retail Trade; Energy and Power; Chemical; and Global Business Services.

AI will increasingly impact the nature of work and the broader societal progress

Majority of industry players in Malaysia are conscious about AI and the benefits it brings to organisations. While some have leveraged AI to carry out tasks, many organisations have yet to fully embrace AI as it remains difficult for organisations to justify the expense and effort required to implement AI due to the uncertainty of Return on Investment (ROI). Organisations are also wrestling with how to address AI throughout their operations – not just from a technology perspective but also from the human perspective in terms of roles and skills readiness.

This is also consistent with an inaugural Cisco AI Readiness Index in 2023 where 86% of organisations worldwide are not fully ready to integrate AI into their businesses. Malaysia's AI Readiness tracks that of the Global level, standing at 87% with only 13% considered as "pacesetters".

With the rise of AI, the Malaysian government has launched the National AI Talent Roadmap 2024–2033 to cultivate a skilled workforce to unlock the potential of AI across various sectors. Adding to this momentum, tech giant Microsoft Corp announced a significant investment of RM10.5 billion in Malaysia's cloud and AI infrastructure. Additionally, global tech firms Google and ByteDance will invest RM9.4 billion and approximately RM10 billion to establish data centres and transform Malaysia into a regional AI hub.

Malaysia's digital transformation is key to enhance national competitiveness, empower industries and local enterprises to progress towards high-value added activities

Digital transformation has been a strategic imperative across many organisations for many years. By continuing to embrace digital technologies, Malaysia can significantly elevate the capabilities of its industries and local enterprises. This technological advancement is not just about automating existing processes to enhance productivity, but also about enabling a shift towards higher value activities.

Digital economy is one of Malaysia's key economic pillars, contributing 22.6% to the country's gross domestic product (GDP).[4] This number is set to rise to 25.5% by 2025. To remain relevant and resilient, the Malaysia Digital Economy Blueprint overseen by MyDIGITAL outlines the efforts and initiatives taken to transform Malaysia into a high-income nation that is focused on digitalisation and a regional pioneer in the digital economy.

Malaysia is also making significant strides in Green Economy

When it comes to Green Economy, most organisations in Malaysia today are still driven by compliance to regulations. However, there has been growing awareness and willingness to drive the Environmental, Social and Governance (ESG) agenda at the forefront with concerted efforts from the government, private sector, and public. While progress is being made, ongoing commitment and collaboration across all industries are necessary to ensure a sustainable future for the country.

This is in line with the Twelfth Malaysia Plan (2021–2025) that outlines the nation's aspiration to achieve net-zero greenhouse gas (GHG) emissions as early as 2050. Complementing this, the National Energy Policy (2022–2040) sets the foundation for transforming the energy landscape towards sustainability. In line with these objectives, the Malaysian Government has also developed the National Energy Transition Roadmap (NETR) to accelerate the shift from a traditional fossil fuel-based economy to a high-value Green Economy. Malaysia's efforts are reflected in its leading position in the World Economic Forum Energy Transition Index, ranking 1st in ASEAN and 35th globally.[5]

It is imperative to future-proof Malaysia's workforce for the impact of AI, Digital, and Green Economy

This study aims to provide transformative and strategic inputs to complement the rapid growth of these areas. It will examine how these trends as a whole will reshape Malaysia's workforce in the upcoming three (3) to five (5) years and assess the impact of current and future trends of AI, Digital, and Green Economy; its implications for current and future job roles and skills; the nation's capacity to cater to future workforce demands and needs; and lastly, policy recommendations that the policy makers and agencies, industry players, academia and training providers as a whole can do in spurring the industry forward amidst flexible changes ahead.

This report will provide an overview of the Aerospace sector, including its related sub-segments, the key trends and developments relating to AI, Digital, and Green Economy.

More importantly, it will highlight the roles impacted as well as the skills needed to be future-ready for the Aerospace sector. These findings are based on engagements with industry associations and key players as well as regulators and government agencies.

The report concludes with Recommended Initiatives for four (4) key stakeholder groups, namely: Government, Industry Players, Academia, and Training Providers.

> **"Microsoft's investments in digital infrastructure and skilling will help Malaysian businesses, communities, and developers apply the latest technology to drive inclusive economic growth and innovation across the country."**
>
> ***Satya Nadella, CEO of Microsoft***

4. Vanessa Gomes, *Catalysing Malaysia's Digital Economy*, September 2022, https://mdec.my/esg-mdcap/content-hub/catalysing-malaysia-digital-economy
5. MIDA, *Malaysia ranked first place in S-E Asia in WEF energy transition index*, July 2030, <https://www.mida.gov.my/mida-news/malaysia-ranked-first-place-in-s-e-asia-in-wef-energy-transition-index/>

Chapter 2:

Approach and Methodology

Approach

A six-pronged approach entailed a blend of qualitative and quantitative research techniques that generated insights and met the objectives desired from this study. The study's outcomes reflect what is happening in each industry today and what is expected of each sector in the next three (3) to five (5) years.

Research Techniques

The qualitative and quantitative research techniques were as follows:

Research Methodology

The study focused on three (3) key trends shaping today's workforce: AI, Digital, and Green Economy. Their definition is outlined below:

01 Artificial Intelligence
Development and use of machine learning models capable of performing tasks that would have required human intelligence (deep learning, computer vision, Natural Language Processing (NLP), reinforcement learning, supervised and unsupervised learning).[6]

02 Digital
Activities and transactions driven by the public and various organisations to produce, adapt and innovate digital technologies and services for enhanced productivity and quality of life (big data analytics, cloud, Internet of Things (IoT), and robotic process automation).[7]

03 Green Economy
Employment growth and income driven by investment in low-carbon, resource-efficient, and socially inclusive economic activities, infrastructure, and assets.[8]

To effectively analyse how the key trends impact existing roles, four (4) key parameters have been defined in the assessment process, as stated below:

AI & Digital

1. **Opportunity to automate data-driven or low-creativity activities that are repetitive or rule-based via AI or other technology tools.**

2. **Human intervention is required despite some or most activities being automated or digitalised, as:**
   - Strategic thinking and problem-solving are vital to making decisions
   - Creative thinking is needed to generate new ideas or ways of working
   - Outcomes need to be communicated or socialised and regulated
   - High importance is placed on human emotions or physical involvement in performing the activity
   - Typically performed by a critical role that holds accountability or a role requiring certification

Green Economy

1. **Impact of the environment on jobs that depend on limited natural resources and produce outputs that are polluting or may pollute the environment.**

2. **Opportunity to diversify, requiring new skills to implement the organisation's Environmental, Social, and Governance (ESG) agenda, which includes:**
   - Environment: Areas for improvement in environmental sustainability
   - Social: Diversity, equity, inclusivity, ethics, and community engagement
   - Governance: Risk management, compliance, reporting, and corporate culture

6. World Economic Forum
7. Malaysia Digital Economy Corporation (MDEC)
8. United Nations Environment Programme (UNEP)

Based on the parameters above, the impact assessment of AI, Digital, and Green Economy on roles will result in one of the following outcomes:

HIGH

Roles at risk of convergence or displacement

Need to pivot to adjacent role and reskill

MEDIUM

Roles still relevant

Need to evolve and upskill to deliver beyond what would traditionally be expected

LOW

Roles not severely impacted

Require ongoing self-improvement to stay relevant

The impact assessment results inform individuals and organisations about the levels of risk faced by job roles in the industry. This information can aid in strategising career development and workforce planning, ensuring relevance amidst advancements in the three (3) key trends.

Key Stakeholders Engaged in the Study

Recognising the importance of on-the-ground perspectives, the impact study gathered insights from key stakeholders across the country, including Government, Associations, Industry Players, and Training Providers. The contributions from these four (4) groups enriched and fine-tuned the study's findings.

Stakeholders and their Contributions to the Study

Stakeholder Groups	Government Entities responsible for enforcing industry regulations and ensuring compliance with standard.	Associations Organisations facilitating networking, advocacy, and knowledge exchange among industry players.	Industry Players Companies actively involved in producing and distributing goods or services within the industry.	Training Providers National and state-specific institutions that offer courses to develop skills and knowledge in various fields.
Key Contributions	• Share inputs on industry trends. • Validate high-level impact assessments. • Recommend initiatives.	• Identify selected industry players. • Share inputs on industry trends. • Validate high-level impact assessments. • Recommend initiatives.	• Validate industry trends. • Validate detailed impact assessments. • Identify future roles and skills requirement. • Provide a view of capacity demand and number of highly impacted workforce. • Recommend initiatives.	• Recommend training providers and suitable programmes mapped to skills. • Suggest new training programmes to close existing and future gaps. • Recommend initiatives.

Stakeholders' Selection Criteria

Selecting the right stakeholders ensures the impact study benefits from diverse perspectives and relevant expertise. The four (4) criteria used to identify stakeholders for engagement are:

01
HOLISTIC SECTOR COVERAGE
Comprehensive coverage of industry players across all sub-sectors and the entire value chain

02
STRONG BRAND PRESENCE
Widespread visibility and influence within the sector

03
SIZEABLE EMPLOYMENT COVERAGE
Comprehensive coverage and employee counts across all roles included in the assessment

04
SIGNIFICANT TURNOVER
Ensure a diverse mix of industry players, including large firms with high turnover

The study was conducted from April to September 2024, consulting **26** experts from **18** organisations during a workshop, followed by **eight (8)** separate engagements with industry stakeholders.

Key Facts and Figures of Impact Study Stakeholder Engagements

In-Depth Interviews

Regulators / Government Agencies : 4

Validation Workshops

Associations : 2

Industry Players : 12

Chapter 3:

Sector Overview

The Aerospace sector, both globally and in Malaysia, is advancing with AI, digital technologies, and green economy practices. AI is seeing significant advancements in predictive maintenance, autonomous systems, and quality control. Digital technologies are driving efficiency, innovation, and safety. Green Economy, on the other hand, is pushing efforts to reduce environmental impact, enhance sustainability, and adhere to ever-tightening regulations. Although Aerospace has always kept humans at the heart of its operations, these advancements are creating a skills gap, as new expertise is increasingly in demand, potentially leading to job displacement. However, they also offer opportunities for those who upskill and adapt.

Overview of Global Trends in the Aerospace Sector

Global revenue in the Aerospace sector reached USD829 billion (RM3.64 trillion) in 2023, up from USD745 billion (RM3.26 trillion) in 2022.[9] This robust growth, particularly in air transport for passengers, highlights the sector's resilience as it soars back from the near total standstill during the pandemic. The recovery is fueled by a surge in air travel demand, technological advancements, emerging economies, evolving social behaviours, and favourable interest rates.

Industry-wide revenue passenger-kilometres (RPKs) in 2023 are expected to reach 87.8% of 2019 levels, with projections to double by 2040, expanding at an annual average rate of 3.4%. The number of origin-destination passengers is set to leap from approximately 4 billion in 2019 to just over 8 billion by 2040, reflecting a significant expansion in passenger demand.[10]

A snapshot of the global Aerospace sector

	2023	2022
Revenue	**RM3.64 trillion**	**RM3.26 trillion**

The Aerospace sector operates under stringent regulations, where ensuring compliance with safety standards requires a deep understanding and careful interpretation—tasks that still heavily rely on strong human oversight. Additionally, the sector relies heavily on expert knowledge and skilled technicians, especially in Maintenance, Repair, and Overhaul (MRO) and aerospace manufacturing. While trends such as AI, Digital, and Green Economy can enhance and support various aspects of the sector, they complement the expertise and roles of human professionals.

9. The Business Research Company, *Aerospace Global Market Report 2024*, 2024
10. IATA, *Global Outlook for Air Transport: Highly Resilient, Less Robust*, June 2023

Overview of the Malaysian Trends in the Aerospace Sector

The Aerospace sector in Malaysia has been identified as a strategic sector by the government of Malaysia due to its potential for growth. Recognised as a catalytic high-value industry, it is one of the key focuses for national development and investment. The sector encompasses a wide range of activities, and its sub-sectors include MRO; manufacturing of Aerospace parts and components; systems integration; engineering and design services; as well as training and education.

The origins of the Malaysian Aerospace sector trace back to 1983 with the establishment of Aerospace Industries Malaysia (AIM). The sector began to develop further with the privatisation of the Aircraft Inspection, Repair, and Overhaul Depot (AIROD) in 1985, transitioning from a Royal Malaysia Air Force maintenance facility to a certified MRO service provider for regional air forces. In 1992, SME Aerospace was founded as a key manufacturer of aerospace parts and assemblies under AIM, eventually becoming a significant contributor to Malaysia's expanding Aerospace sector and a respected contract manufacturer on the global arena.[11]

The Malaysian Aerospace sector is presently the **second-largest in Southeast Asia** and is largely driven by jobs in **MRO and Aero-Manufacturing**, which account for 94% of the sector's total revenue.[12] This report will focus on these key sub-sectors, specifically within the civil aircraft domain. The sub-sectors under the Aerospace sector include:

Areas Covered		Areas Not Covered		
MRO	**Aerospace Manufacturing**	**Systems Integration**	**Engineering & Design**	**Education & Training**
• Airframe • Engine & Component • Teardown & Remanufacturing • Line • Modification	• Aero-structure • Avionics • Engines • Airframe Equipment • Cabin Interior	• Monitoring Application • Flight Management Systems • Simulators • Remote Sensing • Unmanned Aerial Vehicle (UAV), Rocket, & Missile Systems	• Engineering & Design	• Higher Learning Institutions • Technical Training Academies • CAAM Part 147 approved training organisations

A snapshot of Malaysia's Aerospace sector[13]

GDP contribution (2022)	**RM1.4 bil**	
Import / Export (2022)	**Import** **RM17.7 bil**	**Export** **RM6.3 bil**
Nature of sector	**Malaysia's Aerospace sector is diverse and fragmented, with SMEs and PLCs operating across various segments.**	
Number of Employees (2022)	**14,244**	

11. The Business Research Company, *Aerospace Global Market Report 2024*, 2024
12. IATA, *Global Outlook for Air Transport: Highly Resilient, Less Robust*, June 2023
13. Ibid

AIRBUS

Malaysia is Airbus' third largest market in the Asia-Pacific region, playing an essential role across commercial, defence, space, and helicopter product lines. Airbus has established a strong presence in the country with a Customer Services engineering centre, a fully-owned maintenance and overhaul facility, and a regional helicopter hub, employing approximately 300 Malaysians, bringing an array of benefits to Malaysia's economy. Malaysia also serves as the largest supplier base for Airbus in Southeast Asia, with local aerospace firms producing key aerostructures and components for Airbus products.[14]

Malaysia's Aerospace sector benefits from several key advantages that drive its growth and global relevance. These include its geographic positioning, continuous investment in infrastructure, and a highly skilled workforce, all contributing to its strength in both MRO and Aerospace Manufacturing. Additionally, the sector is embracing emerging technologies and fostering strong partnerships that support its export capabilities and innovation efforts. Key factors include:

Strategic Location (MRO & Manufacturing)	Malaysia's position within Southeast Asia makes it an ideal hub for Aerospace activities due to its close proximity to major air traffic routes.
Investment and Infrastructure (MRO & Manufacturing)	Significant investments in infrastructure, such as the development of aerospace parks like Subang Aerotech Park with state-of-the-art facilities, and MAHB KLIA Aeropolis, which will be a self-sufficient airport city,[15] aim to catalyse the aviation ecosystem and attract global Aerospace operators.
Skilled Workforce (MRO & Manufacturing)	Internationally certified training programmes, combined with partnerships with global aerospace institutions, ensure a steady supply of qualified professionals within the sector.
Emerging Technologies (MRO & Manufacturing)	A top-down push from global headquarters to adopt new technologies aims to enhance efficiency, reduce costs, and improve overall productivity.
Export Potential (Manufacturing)	Having local companies that are already part of the global supply chain, such as Aerospace Composites Malaysia Sdn Bhd and CTRM Aero Composite Sdn Bhd, strengthens Malaysia's export capabilities. Half of the wing parts for the Boeing B737 are manufactured by Aerospace Composites Malaysia Sdn Bhd in Kedah, and 60% of the wing parts for the Airbus A320 are produced by Composites Technology Research Malaysia (CTRM) in Melaka.[16]
Collaboration and Partnership (MRO & Manufacturing)	The Government of Malaysia, together with European Aeronautic Defence and Space Company (EADS) and Rolls-Royce are spearheading research and development in the Aerospace sector through the Aerospace Malaysia Innovation Centre (AMIC). AMIC serves as a bridge between industry and academia, creating a platform where researchers, particularly from public universities, can collaborate with industry leaders to develop new technologies that meet the evolving needs of the sector.[17]

14. Airbus, *Airbus in Malaysia*, <https://www.airbus.com/en/our-worldwide-presence/airbus-in-asia-pacific/airbus-in-malaysia>
15. KLIA Aeropolis, KLIA Aeropolis: Airport City of the 21st Century
16. Chester Tay, *Cover Story: Overview of five priority sectors, The Edge*, 14 September 2023, <https://theedgemalaysia.com/article/amic-spearhead-innovation-green-aviation>; Malaysian Investment Development Authority, Overview of five priority sectors, 14 September 2023, <https://www.mida.gov.my/mida-news/overview-of-five-priority-sectors/>
17. The Edge, *AMIC to spearhead innovation in green aviation*, 22 November 2011, <https://theedgemalaysia.com/article/amic-spearhead-innovation-green-aviation>

Impacts of AI, Digital, and Green Economy on the Aerospace Sector

A Challenges and Opportunities

Challenges

Cost of Implementation (MRO & Manufacturing):
The adoption of AI and digital technologies requires substantial initial investments in equipment, software, infrastructure, and training. This is especially challenging for small and medium-sized enterprises (SMEs) with limited capital and funding. Increased ESG scrutiny and compliance further complicate the balance between environmental goals and business financial viability. To catalyse research and development towards innovative and lucrative ventures, there is an imperative to bolster financial support and incentives. Such investments are essential, not only from within the industry but also from strategic stakeholders.

Position in the Global MRO Market:
There exists a pressing demand for increased engagement in high-value-added activities, such as component and engine repairs. These sophisticated and lucrative activities transcend standard maintenance operations, necessitating a higher echelon of technical prowess, accredited certifications, and considerable investments in cutting-edge technology and infrastructure.

Workforce Shortages (MRO & Manufacturing):
The sector faces workforce shortages due to factors like the prohibitive cost of training, which deters graduates, and stringent certification requirements that discourage career pursuit in the field. The need for frequent recertification due to technological advancements adds to the challenge. Additionally, the poaching of certified talent by international firms, particularly in Singapore and the Middle East, attracted by the high skill level of local engineers and technicians, further depletes the local pool of qualified professionals.

Data Sharing (MRO & Manufacturing):
The tendency of companies and sector players not to share information with each other can slow down the R&D process and hinder overall sector progress.

Regulatory Challenges (MRO):
Ensuring compliance with ever-changing environmental and data privacy regulations requires ongoing adaptation and investment. Companies must meet quality, safety, and sustainability standards through complex certification and strict monitoring. Malaysian companies, particularly SMEs, struggle with the intricate certification processes of global standards set by international aerospace leaders, often due to a limited understanding of these standards, requirements, and sector demands.

Opportunities

Aerospace as a Standard and Capabilities (MRO & Manufacturing):
The Aerospace sector, renowned for its reliability, consistent performance, and cutting-edge technology, is uniquely positioned to extend its capabilities into sectors that demand durable products and strict adherence to standards. Its robust expertise makes it well-suited to branching into fields such as military, medical, and silicone production, all of which require exceptional health and safety standards as well as long-lasting products. In doing so, the Aerospace sector can leverage its strengths to excel in various high-end value sectors.

Unmanned Aerial Vehicles (UAV) (MRO & Manufacturing):
UAVs enhance inspection speed and precision, safely accessing challenging areas, thus cutting costs and downtime. Their advanced sensors enable predictive maintenance and real-time analysis for better decisions. This aligns with global trends and Malaysia's regulations, creating jobs like drone pilots and technicians, and reducing the carbon footprint compared to conventional methods.

Teardown and Remanufacturing Services (MRO):
There is potential to grow as Southeast Asia's first MRO facility for teardown, recycling, and parts trading. The emergence of these end-of-life services is driven by a growing emphasis on sustainability and the circular economy, the increasing cost of raw materials, and the development of new technologies. These services help reduce waste and lower the environmental impact of the Aerospace sector.

High-Skilled Talents (MRO & Manufacturing):
The sector's growing use of advanced technologies such as additive manufacturing and digital twins is driving the need for specialised skills. Malaysia can respond by tailoring educational programmes to match industry requirements, preparing graduates with the essential expertise. Furthermore, providing ongoing education and upskilling opportunities, including workshops, certifications, and online courses, ensures that existing employees remain abreast of the latest technological developments.

> **Digital Transformation alters job functions; while titles may stay the same, the descriptions evolve. The many complex tasks are beginning to be automated, requiring a different profile of engineer and experiences.**
>
> ***Naguib Md Nor, President, Malaysia Aerospace Industry Association***

Digitalisation (MRO & Manufacturing):
The COVID-19 pandemic has accelerated the adoption of digital technologies in the Aerospace sector, presenting Malaysia with the opportunity to build on this momentum.

- **Technological Integration:** Leveraging advancements in AI, IoT, and big data analytics can drive innovation and competitiveness in Malaysia's Aerospace sector.
- **Enhanced Connectivity:** Improved digital infrastructure can support better communication and collaboration across the industry, leading to more integrated and responsive Aerospace operations.
- **Centralised Data Repository:** Establishing a centralised data repository that connects all stakeholders including industry players in the Aerospace sector can streamline operations, improve efficiency, and enhance decision-making.

Research and Development (MRO & Manufacturing):
Research and development (R&D) in Malaysia's Aerospace sector is specialised, with entities like AMIC and Safran Landing Systems possessing expertise.[18] This opens avenues for local talent to engage in higher-value activities. Increased R&D investments could result in new materials, propulsion systems, and avionics technologies. Collaborations with global aerospace companies and research institutions can also propel innovation.

> **The Aerospace sector is facing significant changes and challenges due to the rapid advancements in AI (Machine Learning), Digital Technologies, and Sustainable Operations**
>
> ***Naguib Md Nor, President, Malaysia Aerospace Industry Association***

B Impacts of AI, Digital, and Green Economy

Artificial Intelligence

Global AI Impact

AI and digital technology have woven themselves into the fabric of the Aerospace sector, driving automation, boosting efficiency, refining decision-making, and unlocking new insights. Their applications are vast and varied, impacting nearly every corner of the sector.

AI-powered automation in Aerospace is seeing advancement in three (3) main areas; predictive maintenance, autonomous system, and quality control.

Predictive Maintenance	AI algorithms analyse data and detect anomalies in aircraft performance data. This helps in reducing unscheduled downtimes and improving aircraft availability.
Autonomous System	AI-powered drones are used to conduct interior and exterior inspections of aircraft, identifying defects and damages more quickly and accurately than manual inspections.
Quality Control	AI-powered vision systems are used for real-time quality control during the manufacturing process, identifying defects.

18. Malaysian Investment Development Authority, *Safran: Advancing Sustainable Aerospace In Malaysia*, <https://www.mida.gov.my/safran-advancing-sustainable-aerospace-in-malaysia/>

Malaysia's AI Impact

AI is widely embraced in the Aerospace sector, yet the workforce remains fundamentally human-centric. The sector selectively adopts AI technology with a primary focus on enhancing safety, quality, and efficiency. AI excels at automating repetitive and computational tasks such as routine inspections, data analysis, visual quality control, and predictive maintenance—areas where consistency, speed, and accuracy are paramount.

However, more importantly in the Aerospace sector, AI cannot replace the essential human judgement, accountability and understanding needed for compliance with regulations and certifications, nor can it ensure the safety and airworthiness of aerospace components during maintenance, repairs, and regulator inspections.

Digital

Global Digital Impact

Digitalisation is transforming the Aerospace sector, driving efficiency, innovation, and safety. As these advancements progress, they will further enhance the sector's capabilities and create new opportunities, promising to boost its prowess. Digital is globally advancing in the following areas; 3D Printing, Internet of Things (IoT), and Digital Twins.

3D Printing	Produces complex aircraft parts with reduced weight and increased strength, leading to cost savings and improved performance.
IoT	Involves the deployment of devices and sensors to collect and transmit real-time data from various aircraft systems. IoT sensors can detect and report anomalies early, allowing for predictive maintenance that reduces unexpected downtime and extends the lifespan of components.
Digital Twins	Creates digital replicas of physical assets involving real-time monitoring and simulation to enhance the design, production, and maintenance of aircraft. These digital twins enable performance and safety optimisation through advanced simulation.

Malaysia's Digital Impact

The COVID-19 pandemic has highlighted the pivotal role of Digital across various sectors. By automating routine tasks, streamlining workflows, and delivering real-time data insights, digital solutions are able to enhance efficiency.

Green Economy

Green Economy Trends

Green Economy is transforming the Aerospace sector, driving efforts to reduce environmental impact, enhance sustainability, and adhere to ever-tightening regulations, such as the Carbon Border Adjustment Mechanism (CBAM). Green Economy is globally advancing in the areas of Regulatory Compliance, Enhanced Regulatory and Policy Frameworks, as well as Economic Incentives.

Regulatory Compliance	Adhering to global environmental regulations and standards to ensure sustainable practices are followed across all aspects of aerospace operations, particularly in MRO and manufacturing. This includes sustainability reporting on environmental performance metrics and initiatives to stakeholders, regulatory bodies, and financiers.
Enhanced Regulatory and Policy Frameworks	Government and international bodies are implementing stricter emission standards and regulations to ensure compliance in aircraft emissions. These regulations focus on improving aircraft and engine energy efficiency to reduce fuel consumption and GHG emissions.
Economic Incentives	The implementation of carbon taxes and subsidies aims to incentivise the Aerospace sector to reduce emissions. This includes offering tax breaks or credits for investments in research and development (R&D), equipment purchases, and job creation within green economy sector.

Malaysia's Green Economy Impact

Embracing greener practices in the Aerospace sector is propelled by several macro trends focused on enhancing sustainability, reducing environmental impact, and ensuring compliance with global regulations.

Malaysia's Aerospace sector, especially its Tier 1 manufacturers, is well-placed to capitalise on Green Economy opportunities, backed by the support from the Ministry of Investment, Trade and Industry (MITI) and Malaysian Investment Development Authority (MIDA).

State of Trends Adoption

Artificial Intelligence

Global

- **Intelligent Maintenance and Engineering Tools:**[19]
  Airbus, in collaboration with IBM, uses advanced analytics and AI to enhance operational efficiency for its clients. Innovations include improved fuel economy through precise data analysis and optimised flight operations, leading to cost savings and a reduced environmental impact. Intelligent maintenance and engineering tools enable predictive maintenance, allowing airlines to anticipate and address issues early, thereby reducing unplanned disruptions, increasing aircraft availability, and ensuring higher safety standards. This shift has moved the workforce focus from routine, manual checks to more strategic roles involving data analysis, system optimisation, and decision-making based on predictive insights.
- **Root Cause Analysis:**[20]
  IBM Watson can analyse large amounts of data and find new, unidentified root causes by uncovering correlations that may not be apparent to humans. In one case, Watson pinpointed the exact correlation between temperature and premature brake wear. This discovery aided in the development of prognostics by aircraft manufacturers, helping airlines prevent delays.

Malaysia

- **Predictive Maintenance:**
  Major airlines in Malaysia have adopted AI-driven predictive maintenance, allowing them to anticipate potential component failures and schedule maintenance proactively. This has resulted in a 53% reduction in maintenance costs and increased aircraft availability. Additionally, this shift has created a demand for a more tech-savvy workforce skilled in data analysis, machine learning, and IoT systems, necessitating upskilling and reskilling programmes.
- **Fault Detection and Diagnosis (FDD):**[21]
  GE Aviation Malaysia has implemented an advanced FDD system at their engine maintenance facility in Subang. The FDD system continuously monitors engine performance data to detect anomalies and diagnose potential faults in real-time. This shift has transitioned the workforce from performing traditional, manual diagnostic tasks to a more analytical and strategic roles, focusing on interpreting data and optimising maintenance schedules.
- **Automated Guided Painters (AGPs):**[22]
  Spirit AeroSystems Malaysia has implemented Automated Guided Painters (AGP) at their Subang facility to enhance the efficiency of painting fairing sections. The integration of AGP has allowed one mobile robot to paint six (6) parts with precision and consistency in a significantly shorter duration compared to manual methods. This automation decreases the need for manual labour, allowing workers to transition from repetitive painting tasks to more complex roles.

19. Airbus, *Airbus opens Skywise to global IT services leaders*, 19 June 2019, <https://www.airbus.com/en/newsroom/press-releases/2019-06-airbus-opens-skywise-to-global-it-services-leaders>
20. Airbus, *Artificial Intelligence for the Aerospace Sector*, 6 December 2016, <ttps://www.airbus.com/en/newsroom/news/2016-12-artificial-intelligence-for-the-aerospace-sector>
21. Skybrary, *Health and Usage Monitoring System (HUMS)*, <https://skybrary.aero/articles/health-and-usage-monitoring-system-hums>; GE Aerospace, *Health awareness rotorcraft*, <https://www.geaerospace.com/systems/avionics/connected-aircraft/rotorcraft>
22. Automation & Robotics, *Automated Guided Vehicle for Painting*, 28 December 2018, < https://www.dfautomation.com/news/next-generation-mobile-painting-robot-2

- **In-line Production Monitoring System:**[23]
  UMW Aerospace has implemented an in-line production monitoring system at their Serendah plant to oversee fan case manufacturing for Rolls-Royce aircraft engines. The system uses machine learning algorithms and real-time data analytics to detect anomalies and predict potential failures, shifting the workforce's focus from manual inspection to data analysis and process optimisation.
- **Automated Tap Testing Technology:**[24]
  Aerospace Malaysia Innovation Centre (AMIC) and Sepang Aircraft Engineering (SAE) have improved Radome inspections by introducing automated tap testing technology, enabling aircraft technicians and inspectors to automate the process and significantly reduce inspection and reporting turnaround times, moving beyond traditional manual and sound-based methods.

Digital

Global

- **Real-time monitoring and enhanced engine performance:**[25]
  Rolls-Royce uses Digital Twin technology to create a virtual copy of its engines, continuously fed with real-time sensor data. This enables engineers to monitor performance, predict maintenance needs, and carry out preventative measures, reducing downtime and improving reliability. Additionally, Digital Twins allow Rolls-Royce to model extreme conditions and gain deeper insights into engine behaviour, surpassing what physical tests can achieve.
- **Leveraging IoT for enhanced efficiency:**[26]
  Raytheon Technologies has incorporated IoT technology into its manufacturing processes to enhance efficiency and control. By using sensors to gather real-time data, the company enables predictive maintenance and operational optimisation. This strategy minimises downtime, improves product quality, boosts output, and reduces costs by allowing immediate production adjustments and more effective resource management.
- **Component Manufacturing:**[27]
  Both Boeing and Airbus use 3D printing to produce complex aircraft components that are lighter and more efficient. Boeing integrates this technology into the production of parts for the 777X and other models, while Airbus uses 3D printing for components of the A350 XWB and A320neo, resulting in reduced aircraft weight and improved fuel efficiency.

23. UMW, *Aerospace*, <https://www.umw.com.my/aerospace>
24. Bernama, *SAE opens country's first smart radome workshop, target 200 repairs in 2019*, 10 June 2019, <https://www.bernama.com/en/news.php/?id=1733871>
25. Barton Goldenberg, *Driving Innovation: Rolls Royce's Success With Digital Twins*, ISM Inc, <https://ismguide.com/rolls-royce-use-of-digital-twin-technology-case-study/>
26. RTX, *Digital transformation: How Raytheon Technologies is finding ways to work smarter and faster*, 14 December 2021, <https://www.rtx.com/news/2021/12/10/digital-transformation-how-raytheon-technologies-is-finding-ways-to-work-smarter-and-faster>
27. Sahil Aswani, *Pioneering the Future: How Boeing and Airbus are Transforming Aircraft Manufacturing with Advanced Technologies*, 2 July 2024, <https://www.linkedin.com/pulse/pioneering-future-how-boeing-airbus-transforming-aircraft-aswani-ojmdf/>

Malaysia

- **Aftermarket Operations:**[28]
  Malaysia Airlines Berhad (MAB) Engineering has significantly enhanced its aftermarket operations through the integration of AMOS, a comprehensive maintenance information system. AMOS delivers real-time airworthiness, operational, and financial control, managing engineering processes end-to-end. This integration has led to improved cost management and maintenance efficiency, allowing MAB to better oversee and streamline its engineering operations.
- **Agile Systems Engineering:**[29]
  Turkish Aerospace Malaysia (TUSAS Malaysia)'s rapid growth is attributed to the adoption of IBM's Engineering Lifecycle Management (ELM) technologies, which boosted productivity and ensured compliance with international standards. It provides a unified environment for requirements management, system design, testing, and workflow tracking, ensuring that teams can collaborate effectively. ELM supports the full lifecycle of product development, from concept to delivery, while maintaining compliance with industry standards. It also helps manage changes and traceability, making it easier to adapt to evolving requirements and regulations.

AI and the Digital Future of Aerospace: Unmanned Aerial Vehicles and Drones

UAVs and Drones have the potential to transform the Aerospace sector within MRO and Manufacturing. A brief description of its opportunities are as below:

MRO

- **Inspection & Monitoring:**
  UAVs equipped with advanced cameras and sensors are utilised for external aircraft inspections and for accessing confined spaces to assess engine components.
- **Safety:**
  Reduce the risk of accidents and casualties by removing the need for human inspectors to operate in elevated or dangerous conditions.
- **Data Collection:**
  Drones enable immediate data and image analysis for proactive maintenance, completing in two (2) hours what might take technicians two (2) days.

Manufacturing

- **Production Line Monitoring:**
  UAVs and drones enhance assembly line oversight and inventory management by ensuring accurate component assembly and tracking stock levels in real-time, which also aids in automated logistics.
- **Quality Control:**
  Inspect the surfaces of parts to check for defects, scratches, and dents.
- **Collaborative Robotics:**
  UAVs can augment automated production systems by working with collaborative robots (cobots) to increase flexibility and capabilities.

28. James Pozzi, *Malaysia Airlines Using Pandemic Lull To Adopt New Technology, Aviation Week*, 9 October 2020, <https://aviationweek.com/mro/aircraft-propulsion/malaysia-airlines-using-pandemic-lull-adopt-new-technology>
29. https://thesun.my/local-news/ibm-malaysia-plays-major-role-in-malaysia-s-aerospace-hub-aspirations-NE12438511

Green Economy

Global

- **Energy-Efficient Practices and 'Cyclean' Engine Wash:**[30]
  Headquartered in Hamburg with global MRO facilities, Lufthansa Technik (LHT) is committed to sustainability by implementing energy-efficient practices, waste reduction, and recycling within its MRO facilities. Additionally, another sustainable solution developed by LHT is its 'Cyclean' system which uses vaporised hot water to clean aircraft engines, reducing fuel consumption by up to 80 metric tons of CO2 per aircraft annually, while also cutting maintenance costs and increasing on-wing time.

Malaysia

- **Development of Energy Efficient Aircraft:**[31]
  New aircraft designs aim to reduce fuel consumption and emissions using improved aerodynamics, lightweight materials, and efficient engines, requiring workforce upskilling to manage advanced technologies and materials. CTRM collaborates with Airbus to produce energy-efficient composite parts for aircraft like the Airbus A320neo, requiring extensive workforce training programmes to ensure employees are adept at working with advanced composite materials.
- **Waste Reduction, Recycling and Reusing Materials:**[32]
  The focus on sustainability in aviation includes designing aircraft and components for recyclability and end-of-life disassembly, necessitating employee training in recycling and waste reduction practices for aerospace materials. Aerospace Composites Malaysia (ACM), a joint venture between Boeing and Hexcel, has implemented processes to recycle composite materials and reduce manufacturing waste.
- **Sustainable Materials:**[33]
  The aviation industry is prioritising the use of eco-friendly materials like bio-composites and recycled alloys in production and maintenance to lessen environmental impact and promote sustainability. This requires employees to learn specialised skills for managing these materials. Safran Landing Systems Malaysia specialises in producing and refurbishing carbon brakes for commercial airplanes. These brakes, used by major industry players like Boeing, Airbus, and ATR, are four (4) times lighter than steel and can significantly reduce CO2 emissions during flights. Currently, they benefit over 500 airlines and 11,500 commercial planes worldwide.

A Sustainable Future in Aerospace

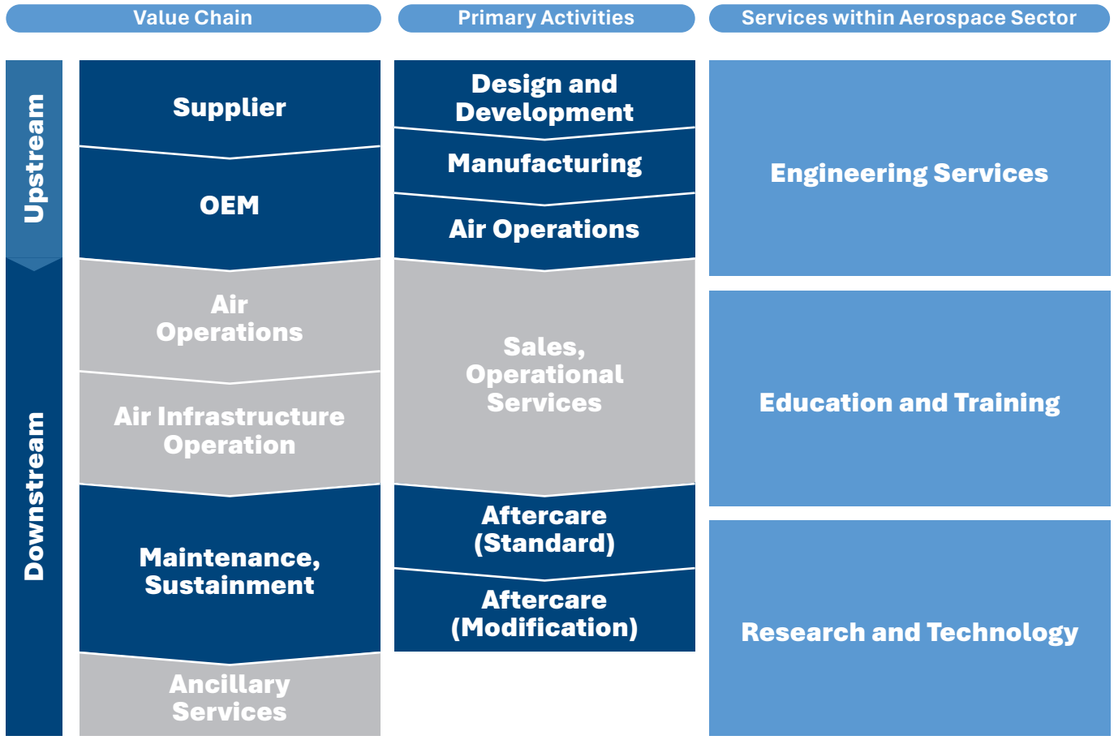
- **Favourable Results from MAB and Firefly:**[34]
  Pilot studies conducted by MAB and Firefly using Neste MY Sustainable Aviation Fuel™ (SAF) have shown promising results, demonstrating the feasibility and benefits of SAF. This paves the way for broader adoption and positions Malaysia as a leader in sustainable aviation in the region.

30. Lufthansa Technik, *Cyclean Engine Wash*, <https://www.lufthansa-technik.com/en/cyclean>
31. Airbus, *Manufacture of parts of Malaysia Airlines' A350 XWB Begins in Malaysia*, 17 November 2016, <https://www.airbus.com/en/newsroom/press-releases/2016-11-manufacture-of-parts-of-malaysia-airlines-a350-xwb-begins-in>
32. Wan Hasrulnizzam Wan Mahmood et al., Green Practice in the Supply Chain: The Case of Malaysian Aero Composite Manufacturing Industry, Advanced Processes and Systems in Manufacturing, 2011
33. Malaysian Investment Development Authority (MIDA), *Safran: Advancing Sustainable Aerospace In Malaysia*, <https://www.mida.gov.my/safran-advancing-sustainable-aerospace-in-malaysia/>
34. Malaysia Airlines, *Malaysia Airlines Flies First Passenger Flight with Neste MY Sustainable Aviation Fuel Supplied by PETRONAS*, 5 June 2022, <https://www.malaysiaairlines.com/my/en/mh-media-centre/news-releases/2022/malaysia-airlines-flies-first-passenger-flight-with-neste-my-sustainable-aviation-fuel-supplied-by-petronas.html>

Chapter 4: Key Findings

Overview of Roles and Skills

Value Chain[35]



35. Ministry of Investment, Trade and Industry, New Industry Master Plan 2030: Aerospace Industry, 2023

Consolidated Job Clusters, Roles, and Skills in Aerospace

4 Job Clusters

- **Aircraft Engine/ Component Maintenance** (37 job roles*)
- **Aircraft Maintenance** (46 job roles*)
- **Fleet Management/ Continuing Airworthiness Management Organisation (CAMO)** (15 job roles*)
- **Manufacturing** (91 job roles*)

189 Job Roles
(*Including Emerging Roles)

21 Skills Clusters

(Categorised into 19 specific skill clusters and two (2) basic skill clusters)

Specific Skills

- **Agile and Continuous Improvement** (2 skills)
- **Automation and Robotics** (2 skills)
- **Business Development and Strategy** (1 skill)
- **Business Operation Management** (4 skills)
- **Customer, Vendor, and Stakeholder Management** (1 skill)
- **Data Development and Implementation** (2 skills)
- **Engineering and Maintenance** (68 skills)
- **General Business Management** (5 skills)
- **Health, Safety, and Environment (HSE)** (8 skills)
- **Manufacturing and Production** (16 skills)
- **People Management and Development** (1 skill)
- **Project and Process Management** (5 skills)
- **Quality Management** (15 skills)
- **Research and Development** (2 skills)
- **Risk Management, Compliance, and Governance** (4 skills)
- **Supply Chain Management** (4 skills)
- **Technical Design and Architecture** (2 skills)
- **Technology Management** (2 skills)
- **Warehouse and Inventory Management** (1 skill)

Basic Skills

- **Innovation and Delivery** (10 skills)
- **Social Intelligence** (6 skills)

161 Skills
Which comprises 145 Specific Skills and 16 Basic Skills

Job Clusters and Roles

As the Aerospace sector evolves under the influence of AI, Digital, and Green Economy, it is essential to understand how these transformations will impact job clusters and roles within the sector. While the sector remains human-centric, some jobs may be displaced or transformed. However, new opportunities will emerge, emphasising the need for adaptive skills and continuous learning. Policymakers and industry leaders will need to focus on training and support to effectively navigate this evolving landscape.

For this impact study, we focus our lens solely on the existing job roles within MRO and Manufacturing, uncovering how they are shaped by ongoing changes.

The study identified four (4) job clusters in the Aerospace sector, namely Aircraft Engine/Component Maintenance; Aircraft Maintenance; Fleet Management; and Manufacturing.

Job Functions	Roles
Aircraft Engine/ Component Maintenance	1. Accountable Manager 2. Aircraft Technician - Engine and Engine Component/ Workshop Planner 3. CAT A Licensed Approved Mechanic 4. Composite Engineer/ Specialist 5. Composite Technician 6. Technical Service Manager 7. Engineering Service Engineer / Technical Service Engineer 8. Senior Engineering Service Engineer / Senior Technical Service Engineer 9. General Manager / Managing Director / Vice President 10. General Worker / Operator 11. Head of Operation 12. Component Workshop Maintenance Technician / Mechanic 13. Workshop Trainee Maintenance Technician / Mechanic 14. Trainee Maintenance Technician 15. Senior Non-Destructive Testing (NDT) Level 3 Engineer 16. NDT Level 3 Engineer 17. Operations Manager 18. Senior Operations Manager / Senior Technical Manager 19. Planning Manager 20. Planning Assistant/ Supervisor 21. Planning Executive 22. Senior Planning Executive 23. Senior Quality Engineer 24. Quality Engineer 25. Quality Manager 26. Repair Engineer / Process Engineer 27. Senior Repair Engineer / Senior Process Engineer 28. Special Process Engineer 29. Store Assistant 30. Senior Technician (Component Repair & Overhaul - Avionics) 31. Technician (Component Repair & Overhaul - Avionics) 32. Senior Technician (Component Repair & Overhaul - Mechanical) 33. Technician (Component Repair & Overhaul - Mechanical) 34. Senior Technician (Engine / Engine Component Repair & Overhaul) 35. Technician (Engine / Engine Component Repair & Overhaul) 36. Welding Technician (Approval Holder) 37. Data Engineer (Emerging Role)
Aircraft Maintenance	1. Aircraft Maintenance Engineer Apprentice 2. Aircraft Technician Systems 3. Aircraft Technician - Structure / Sheet Metal 4. Airworthiness Review Staff 5. CAT A Certifying Technician 6. Conformance Engineer 7. Engineering Manager 8. Engineering Service Manager / Technical Service Manager 9. Engineering Service Engineer / Technical Service Engineer 10. Senior Engineering Service Engineer / Senior Technical Service Engineer 11. Foreman / Operations Manager / Programme Manager 12. Assistant Foreman / Lead Maintenance Engineer / Superintendent 13. General Manager / Managing Director / Vice President (Aircraft Maintenance) 14. General Worker / Operator 15. Licensed Aircraft Engineer - CAT B1 (Mechanical) 16. Licensed Aircraft Engineer - CAT B2 (Avionics) 17. Licensed Aircraft Engineer - CAT C 18. Trainee Aircraft Maintenance Technician 19. Maintenance Control Centre (MCC)/ Maintenance Operation Centre (MOC) Engineer 20. NDT Engineer Level 2 21. NDT Senior Engineer/Foreman 22. NDT Senior Technician Level 1 23. NDT Level 3 Engineer 24. NDT Level 3 Engineer 25. Aircraft Painting Technician 26. Planning Manager 27. Planning Assistant/ Supervisor 28. Planning Executive 29. Senior Planning Executive 30. Programme Director / Senior Operations Manager 31. Quality Manager 32. Quality Assurance Engineer/ Inspector 33. Quality Assistant 34. Senior Quality Engineer 35. Quality Engineer 36. Store Assistant 37. Technical Publication Officer 38. Technical Record 39. Senior Technician (Avionics) 40. Technician (Avionics) 41. Senior Technician (Mechanical) 42. Technician (Mechanical) 43. Technician with Company Authorisation 44. Senior Workshop Engineer 45. Workshop Engineer 46. Drone Pilot (Emerging Role)
Fleet Management/ CAMO	1. General Manager / Managing Director / Vice President (Fleet Management) 2. Maintenance Management Engineer 3. Maintenance Controller / Technical Operations Representative 4. Operations Manager 5. Planning Manager 6. Programme Director 7. Planning Assistant/ Supervisor 8. Planning Executive 9. Senior Planning Executive 10. Senior Quality Engineer 11. Quality Engineer 12. Quality Manager 13. Technical Service Manager 14. Senior Technical Service Engineer (Fleet Management) 15. Technical Service Engineer

Job Functions	Roles
Manufacturing	1. Aerospace (Mechanical) Engineering Technician 2. Aerospace Engineer 3. Senior CADCAM Engineer 4. Assistant CADCAM Engineer 5. CADCAM Engineer 6. Calibration Engineer/Lab Engineer 7. Calibration Senior Technician/Lab Senior Technician 8. Calibration Assistant Technician/Lab Assistant Technician 9. Calibration Technician/Lab Technician 10. Assistant CMM Engineer 11. CMM Engineer 12. CMM Quality Inspector 13. CNC Machinist Supervisor (Machining & Wire-cut) 14. Junior Machining Technician (Machining & Wire-cut) 15. Technician (Machining & Wire-cut) 16. Machinist (Machining & Wire-cut) 17. Senior CNC Programmer 18. Assistant CNC Programmer 19. CNC Programmer 20. Design Section Manager 21. Design Engineer 22. Document Controller 23. General Manager / Managing Director / Vice President (Manufacturing) 24. General Worker / Operator 25. Head of Engineer 26. Head of Plant 27. Head of Quality 28. Assistant Jigs/Fixture & Tooling Engineer 29. Jigs/Fixture & Tooling Engineer 30. Senior Jigs / Fixture & Tooling Engineer 31. Senior Tooling Technician 32. Manufacturing Engineer / Production Engineer (Assembly) 33. Senior Manufacturing Engineer / Senior Production Engineer (Assembly) 34. Manufacturing Engineer / Production Engineer (Manufacturing) 35. Senior Manufacturing Engineer / Senior Production Engineer (Manufacturing) 36. Manufacturing Manager 37. Manufacturing Planning Manager 38. Manufacturing Planning Supervisor 39. Manufacturing Planning Assistant 40. Manufacturing Planning Executive 41. Senior Manufacturing Planning Executive 42. Assistant Materials & Process Engineer 43. Materials & Process Engineer 44. Senior Materials & Process Engineer 45. NDT Level 3 Engineer 46. Senior NDTLevel 3 Engineer 47. NDTEngineer 48. NDTSpecialist 49. NDTInspector 50. NDTOperator 51. NDTTechnician 52. NDT Manager Level 3 53. Operations Manager / Production Manager 54. Senior Operations Manager / Senior Production Manager / Senior Manufacturing Manager 55. Painting Technician 56. Senior Painting Technician 57. Planning Executive/Production Planner 58. Assistant Process Engineer 59. Process Engineer 60. Senior Process Engineer 61. Assistant Process Technician 62. Process Technician 63. Senior Process Technician 64. Production Team Leader 65. Production Supervisor 66. Production Executive 67. Quality Assurance Manager & Quality Control Manager 68. Senior Quality Inspector 69. Assistant Quality Inspector 70. Quality Inspector 71. Quality Management System Engineer/ Quality Assurance Engineer/Auditor 72. Senior Quality Engineer 73. Quality Engineer 74. Quality Management System Manager 75. Quality Manager 76. Sheet Metal Technician 77. Assistant Metal Technician

Job Functions	Roles
Manufacturing	78. Staff Process Engineer 79. Store Assistant 80. Supplier Quality Engineer 81. Senior Technician (Assembly) 82. Technician (Assembly) 83. Senior Technician (Manufacturing) 84. Technician (Manufacturing) 85. Welding Manager/Coordinator 86. Welder 87. Senior Welder 88. Sustainability Engineer (Emerging Role) 89. Computing Researcher (Emerging Role) 90. Advanced Materials Scientist (Emerging Role) 91. Additive Manufacturing Technician (Emerging Role)

Skills Clusters and Skills

Skills Category	Skills Clusters
BASIC SKILLS Essential skills required for a person to be fit for a job	**Innovation and Delivery** • Adaptability and Resiliency • Business Acumen • Change Management • Critical Thinking • Innovative Thinking • Learning Agility • Digital and AI Fluency • Cognitive Skills • Sustainability Awareness • Planning and Organising
	Social Intelligence • Empathy • Coaching and Mentoring • Communication • **Conflict Management** • Influencing and Negotiation • Teamwork and Collaboration

Skills Clusters and Skills (Continue)

Skills Category	Skills Clusters	
SPECIFIC SKILLS Skill relating to a specific task or situation. It involves both understanding and proficiency in such specific activity that involves methods, processes, procedures, or techniques	**Agile and Continuous Improvement**	
	• 5S Techniques	• Continuous Improvement
	Manufacturing and Production	
	• Additive Manufacturing • Basic Manufacturing • Computer-aided Manufacturing • Fundamental of Manufacturing Processes • Fundamental of Production Processes • Manufacturing Painting • Manufacturing Process Management • Manufacturing Tools and Equipment Proficiency	• Manufacturing Welding • Metallic Material Characterisation • New Engine Build Process Application • Non-metallic Materials Manufacturing • Error Proofing • Production Line Set-Up • Production Planning • Production System Tool
	Engineering and Maintenance	
	• Aircraft Batteries Maintenance • Aircraft Cabin Equipment and Furnishing Maintenance • Aircraft Communication Systems Maintenance • Aircraft Electrical Equipment and Accessories Maintenance • Aircraft Fuel and Engine Systems Maintenance • Aircraft Hydraulic Components Maintenance • Aircraft Instrument Systems Maintenance • Aircraft Landing Gears Maintenance • Aircraft Maintenance Monitoring • Aircraft Navigation and Automated Flight Systems Maintenance • Aircraft Pneumatic Components Maintenance • Aircraft Sensing Components Maintenance • Aircraft Wheels and Brakes Maintenance • Aircraft/Component Maintenance • Airframe Systems Maintenance • Engineering Application	• Basic Tool and Maintenance Equipment Proficiency • Basic Painting • Calibration and Lab Equipment Usage & Maintenance • Calibration Operation • Chemical Processing • Coordinate Measuring Machine (CMM) Operation • Coordinate Measuring Machine (CMM) Programme • Coating • Composite Repair Technique • Computer Numerical Control (CNC) Programming • Elastomer Seals Application • Electrical Termination, Connection and Measurement • Electrical Wiring Interconnection Systems Maintenance • Engine Cleaning • Engine Disassembly and Assembly • Engine Rigging and De-rigging • Engineering Change Control • Engineering Problem Solving

Skills Category	Skills Clusters	
SPECIFIC SKILLS Skill relating to a specific task or situation. It involves both understanding and proficiency in such specific activity that involves methods, processes, procedures, or techniques	**Engineering and Maintenance**	
	• Engineering Work Instructions and Technical Drawings • Engines and Components Handling, Inspection and Packing • Equipment Usage and Maintenance • Fuel Accessories Components Maintenance • Aircraft Technology Management • Geometric Dimensioning and Tolerancing • Composite Inspection • Inspection Tool Calibration and Maintenance • Jigs and Fixtures Design • Laser and Optics Application • Machining Operations • Manual Dexterity • Material Joining • Mathematical Concepts Application • Nacelle Mechanical Structures Maintenance • Painting Tool and Equipment Usage • Preventive Maintenance • Hangar/ Workshop Productions Management • Principles and Practical Aspects of Specialised Processes	• Specialised Processes Methodologies (Surface Treatment) • Welding Precision and Compliance Monitoring • Specialised Processes Methodologies (NADCAP) • Specialised Processes Methodologies (Painting) • Sealants Application • Sheet Metal Operations • Specialised Processes Methodologies (Composite) • Specialised Processes Methodologies (Processor & Equipment) • Specialised Processes Methodologies (Gage Repeatability and Reproducibility) • Specialised Processes Methodologies (Manufacturing) • Specific Tool and Equipment Proficiency • Tolerance Inspection • Tool Room Equipment Maintenance • Troubleshooting • Welding Equipment and Maintenance Proficiency
	Research and Development	
	• Applied Research and Development Management	• Technical Report Writing
	Technology Management	
	• Artificial Intelligence Application	• Augmented Reality Application
	Business Operation Management	
	• Asset Management • Documentation Management and Control	• Knowledge Management

Skills Clusters and Skills (Continue)

Skills Category	Skills Clusters
SPECIFIC SKILLS Skill relating to a specific task or situation. It involves both understanding and proficiency in such specific activity that involves methods, processes, procedures, or techniques	**Business Operation Management** • Product Lifecycle Management
	Technical Design and Architecture • Automated System Design • Computer-aided Design
	Data Development and Implementation • Big Data Analytics • Computer-aided Design
	Business Development and Strategy • Business Opportunities Development
	Health, Safety, and Environment (HSE) • Carbon Footprint Management • Chemical Mixing Procedure • Eco-Design Principles • Environmental Awareness • Material Safety Data Sheet (MSDS) • Sustainable Business Practices • Sustainable Manufacturing • Workshop Practices
	Quality Management • Contamination Control • Defect Management • Non-Destructive Testing (NDT) Operation • Non-Conformance Management • Non-metallic Materials Testing • Product Acceptance Criteria • Product Qualification • Product Quality • Quality Functions • Quality Management System Coordination • Quality Operation • Quality Standards for Aerospace Industry Requirements • Quality Standards for Aviation and Airworthiness Requirements • Retest Requirement • Verification and Validation
	Customer, Vendor, and Stakeholder Management • Vendor Management

Skills Category	Skills Clusters
SPECIFIC SKILLS Skill relating to a specific task or situation. It involves both understanding and proficiency in such specific activity that involves methods, processes, procedures, or techniques	**General Business Management** • Cost Management • Resource Management • Budget Management • Business Networking • Organisational Awareness
	Risk Management, Compliance, and Governance • Cyber Risk Management • Minor Repair Airworthiness Requirements • Non-Destructive Testing (NDT) Technique and NDT Written Practice • Risk Governance
	Supply Chain Management • Distribution Planning • Procurement Items Management • Supplier Management • Supply Chain Solutioning
	Automation and Robotics • Image Processing and Industrial Vision Inspection • Robotics and Automation Application
	Project and Process Management • Process Control • Process Control Design • Process Control Engineering • Project Management • Repair Processes in Particular Part 21 Subpart J
	People Management and Development • People and Performance Management
	Warehouse and Inventory Management • Inventory Control Management

In-Demand Skills

The in-demand skills in the Aerospace sector include:

Areas	Skills
AI & DIGITAL	• Artificial Intelligence Application • Augmented Reality Application • Automated System Design • Big Data Analytics • Computer-aided Design • Enterprise Database System Administration • Image Processing and Industrial Vision Inspection • Robotics and Automation Application
GREEN ECONOMY	• Carbon Footprint Management • Eco-Design Principles • Environmental Awareness • Sustainable Business Practices • Sustainable Manufacturing

Below are the non-exhaustive skills relevant to the Aerospace Sector:

Engineering Application	**Chemical Processing**	**Electrical Termination, Connection and Measurement**
Basic Tool and Maintenance Equipment Proficiency	**Coordinate Measuring Machine (CMM) Operation**	**Electrical Wiring Interconnection Systems Maintenance**
Basic Painting	**Composite Repair Technique**	**Engine Cleaning**
Calibration and Lab Equipment Usage and Maintenance	**Computer Numerical Control (CNC) Programming**	**Engine Disassembly and Assembly**
Calibration Operation	**Elastomer Seals Application**	**Aircraft Batteries Maintenance**

These skills are essential for the workforce to remain competitive and adapt to the sector's evolving demands. As the Aerospace sector continues to advance, it will be essential for the workforce to uphold high standards of quality and innovation. Detailed information is available in the appendix.

Role and Skills Analysis by Impact Level

The impact assessment for the Aerospace sector has identified 189 key roles, categorised into 10 highly impacted, 162 medium impacted, and 11 low impacted roles, along with six (6) emerging roles. Highly impacted roles face a significant risk of convergence of displacement due to evolving trends, while emerging roles are expected to drive future advancements and innovations within the sector. The study further explores how AI, Digital, and Green Economy are reshaping these roles, offering detailed insights into viable career pathways and the essential skills needed for the Aerospace workforce to thrive in this changing landscape.

Impact Assessment on 189 Roles in the Aerospace Sector

	High	Medium	Low	Emerging
AI/Digital	• **High opportunity** to **automate** • **Low human intervention**	• **High opportunity** to **automate** • **High human intervention**	• **Low opportunity** to **automate** • **High or low human intervention**	
Green Economy	• **Job no longer required** due to impact on the environment • **May or may not** have **opportunity to diversify**	• **Job still required** despite impact on the environment • **Opportunity to diversify exist**	• **Job still required** despite impact on the environment • **No opportunity to diversify**	New job positions created due to technological advancements, sector trends, and societal changes help organisations drive innovation, adopt sustainable practices, and stay competitive and compliant with evolving regulations and market demands.
Outcome	**Roles facing convergence or displacement** Need to pivot to adjacent role and reskill	**Roles are evolving** Need to upskill to deliver beyond what would traditionally be expected	**Roles not severely impacted** Need to continue improving to keep self relevant	
	10 Roles	**162 Roles**	**11 Roles**	**6 Roles**
Proportion of Roles	**5%**	**89%**	**6%**	

Roles Analysis Summary and Key Takeaways

	HIGH	MEDIUM	LOW
AI and Digital The evaluation of AI and Digital's impact on job roles in Aerospace assesses the potential for automation, how advanced the technologies are, and to what extent human intervention is required.	• The sector does depend on AI and digital technologies to enhance daily work tasks. However, for highly impacted roles, these technologies have the potential to fully automate responsibilities currently managed by humans. • Highly impacted roles within the sector involve administrative and repetitive tasks in workshops, hangars, and storage facilities, as well as documentation duties. AI and Digital technologies have the capability to replace these tasks entirely.	• A range of AI and Digital technologies are available within the sector, and these technologies assist industry players in their daily tasks, enhancing efficiency, quality, and safety. • The high percentage of medium impacted roles highlights substantial technology adoption in the sector. However, roles in MRO and aero-manufacturing still require technicians and engineers to operate, monitor, and maintain these technologies. Many of these activities remain highly physical, where the use of robotic or digital assistance is still difficult, emphasising the continued reliance on skilled human labour. • The sector is optimistic that the optimisation and adoption of AI and digital technologies will continue to rise.	• Despite the availability of a wide range of technology in the market, there are still roles with low automation potential that require significant human intervention. • The low percentage of low impacted roles within the sector suggests that these positions require a more hands-on approach. Typically, these are entry-level roles within MRO and aero-manufacturing.
Green Economy The evaluation of the Green Economy's impact on job roles in Aerospace assesses how environmental considerations affect these tasks and whether these roles can be diversified into other areas	• There are no roles in the Aerospace sector that are highly impacted by Green Economy, as no roles are at risk of convergence of displacement despite environmental considerations.	• Several roles are positioned to directly influence and shape Green Economy agendas. These roles will need to develop skills in environmental sustainability and ensure continuous operational improvement in alignment with green agendas.	• The evaluation of low-impact roles in the sector suggests that these positions neither directly affect nor significantly influence Green Economy agendas. Only minimal upskilling is needed to keep these roles aligned with Green Economy priorities.
Role Examples	Store Assistant, Document Controller	Repair / Process Engineer, Technician (Component Repair & Overhaul – Avionics)	Trainee Aircraft Maintenance Technician, Composite Engineer/Specialist

Overview of Roles by Impact Level

The impact study focuses on roles that are heavily influenced by advancements in AI, Digital, and Green Economy, aiming to identify viable career paths and necessary skills essential for the Malaysian workforce. It also highlights emerging roles that are driven by these trends to help bolster the sector's competitive advantage and future resilience.

HIGH — 10 Roles

Aircraft Engine/ Component Maintenance

1. General Worker/ Operator
2. Store Assistant
3. Planning Assistant/ Supervisor

Aircraft Maintenance

4. General Worker/ Operator
5. Store Assistant
6. Planning Assistant/ Supervisor

Fleet Management/ CAMO

7. Planning Assistant/ Supervisor

Manufacturing

8. Document Controller
9. General Worker/ Operator
10. Store Assistant

MEDIUM — 162 Roles

Aircraft Engine/ Component Maintenance

1. Technical Service Manager
2. Engineering Service Engineer/ Technical Service Engineer
3. Senior Engineering Service Engineer/ Senior Technical Service Engineer
4. Accountable Manager
5. Senior Non-Destructive Testing (NDT) Level 3 Engineer
6. Non-Destructive Testing (NDT) Level 3 Engineer
7. Head of Operation
8. Operations Manager
9. Senior Operations Manager/ Senior Technical Manager
10. Planning Manager
11. Planning Executive
12. Senior Planning Executive
13. Quality Manager
14. Senior Quality Engineer
15. Repair Engineer/ Process Engineer
16. Senior Repair Engineer/ Senior Process Engineer
17. General Manager/ Managing Director/ Vice President (Aircraft Engine/ Component Maintenance)
18. Senior Technician (Component Repair & Overhaul - Avionics)
19. Senior Technician (Component Repair & Overhaul - Mechanical)
20. Senior Technician (Engine / Engine Component Repair & Overhaul)
21. Quality Engineer
22. Special Process Engineer
23. Technician (Component Repair & Overhaul - Avionics)
24. Technician (Component Repair & Overhaul - Mechanical)
25. Technician (Engine/ Engine Component Repair & Overhaul)
26. Aircraft Technician - Engine and Engine Component/ Workshop Planner
27. CAT A Licensed Approved Mechanic

Aircraft Maintenance

28. Airworthiness Review Staff
29. Engineering Manager
30. Technical Publication Officer
31. Technical Record
32. Foreman/ Operations Manager/ Programme Manager
33. Assistant Foreman/ Lead Maintenance Engineer/ Superintendent
34. Maintenance Control Centre (MCC)/ Maintenance Operation Centre (MOC) Engineer
35. Non-Destructive Testing (NDT) Level 3 Engineer
36. Senior Non-Destructive Testing (NDT) Level 3 Engineer

Overview of Roles by Impact Level (Continue)

37. Planning Manager
38. Planning Executive
39. Senior Planning Executive
40. Programme Director/ Senior Operations Manager
41. Quality Manager
42. Quality Assurance Engineer/ Inspector
43. Quality Assistant
44. Senior Quality Engineer
45. Engineering Service Manager/ Technical Service Manager
46. Engineering Service Engineer/ Technical Service Engineer
47. Senior Engineering Service Engineer/ Senior Technical Service Engineer
48. Non-Destructive Testing (NDT) Engineer Level 2
49. Non-Destructive Testing (NDT) Senior Engineer/ Foreman
50. Non-Destructive Testing (NDT) Senior Technician Level 1
51. General Manager/ Managing Director/ Vice President (Aircraft Maintenance)
52. Senior Technician (Avionics)
53. Senior Technician (Mechanical)
54. Senior Workshop Engineer
55. Workshop Engineer
56. Aircraft Technician - Structure/ Sheet Metal
57. CAT A Certifying Technician
58. Conformance Engineer
59. Licensed Aircraft Engineer - Cat B1 (Mechanical)
60. Licensed Aircraft Engineer - Cat B2 (Avionics)
61. Licensed Aircraft Engineer - Cat C
62. Aircraft Painting Technician
63. Technician (Avionics)
64. Technician (Mechanical)
65. Technician with Company Authorisation
66. Aircraft Technician Systems
67. Quality Engineer

Fleet Management/ CAMO

68. Maintenance Management Engineer
69. Maintenance Controller/ Technical Operations Representative
70. Operations Manager
71. Planning Manager
72. Programme Director
73. Planning Executive
74. Senior Planning Executive
75. Quality Manager
76. Senior Technical Service Engineer
77. Technical Service Engineer
78. General Manager/ Managing Director/ Vice President (Fleet Management)
79. Senior Quality Engineer
80. Technical Service Manager
81. Quality Engineer

Manufacturing

82. Aerospace (Mechanical) Engineering Technician
83. Aerospace Engineer
84. Senior Computer-Aided Design Computer-Aided Manufacturing (CADCAM) Engineer
85. Assistant Computer-Aided Design Computer-Aided Manufacturing (CADCAM) Engineer
86. Computer-Aided Design Computer-Aided Manufacturing (CADCAM) Engineer
87. Calibration/ Lab Engineer
88. Calibration/ Lab Senior Technician
89. Calibration/ Lab Assistant Technician
90. Calibration/ Lab Technician
91. Assistant Coordinate Measuring Machine (CMM) Engineer
92. Coordinate Measuring Machine (CMM) Engineer
93. Coordinate Measuring Machine (CMM) Quality Inspector
94. Computer Numerical Control (CNC) Machinist Supervisor (Machining & Wire-cut)
95. Junior Machining Technician (Machining & Wire-cut)
96. Technician (Machining & Wire-cut)
97. Machinist (Machining & Wire-cut)
98. Senior Computer Numerical Control (CNC) Programmer
99. Assistant Computer Numerical Control (CNC) Programmer
100. Computer Numerical Control (CNC) Programmer
101. Design Section Manager
102. Design Engineer
103. Assistant Jigs/ Fixture & Tooling Engineer
104. Jigs/ Fixture & Tooling Engineer
105. Senior Jigs/ Fixture & Tooling Engineer
106. Senior Tooling Technician
107. Manufacturing Engineer/ Production Engineer (Manufacturing)
108. Senior Manufacturing Engineer/ Senior Production Engineer (Manufacturing)
109. Manufacturing Manager
110. Manufacturing Planning Manager
111. Manufacturing Planning Supervisor
112. Manufacturing Planning Assistant
113. Manufacturing Planning Executive
114. Senior Manufacturing Planning Executive
115. Non-Destructive Testing (NDT) Level 3 Engineer
116. Senior Non-Destructive Testing (NDT) Level 3 Engineer
117. Non-Destructive Testing (NDT) Manager Level 3
118. Operations Manager/ Production Manager
119. Senior Operations Manager/ Senior Production Manager/ Senior Manufacturing Manager
120. Painting Technician
121. Senior Painting Technician
122. Planning Executive/ Production Planner
123. Assistant Process Engineer
124. Process Engineer
125. Senior Process Engineer
126. Assistant Process Technician
127. Process Technician
128. Senior Process Technician
129. Production Executive
130. Quality Assurance Manager & Quality Control Manager
131. Senior Quality Inspector
132. Assistant Quality Inspector
133. Quality Inspector
134. Quality Management System Engineer/ Quality Assurance Engineer/ Auditor
135. Quality Management System Manager
136. Quality Manager
137. Sheet Metal Technician
138. Assistant Sheet Metal Technician
139. Staff Process Engineer
140. Supplier Quality Engineer
141. Senior Technician (Manufacturing)
142. Technician (Manufacturing)
143. Welder
144. Senior Welder
145. General Manager/ Managing Director/ Vice President (Manufacturing)
146. Head of Engineer
147. Head of Plant
148. Head of Quality
149. Manufacturing Engineer/ Production Engineer (Assembly)
150. Senior Manufacturing Engineer/ Senior Production Engineer (Assembly)
151. Assistant Materials & Process Engineer
152. Materials & Process Engineer
153. Senior Materials & Process Engineer
154. Non-Destructive Testing (NDT) Engineer
155. Non-Destructive Testing (NDT) Specialist
156. Non-Destructive Testing (NDT) Inspector
157. Non-Destructive Testing (NDT) Operator
158. Non-Destructive Testing (NDT) Technician
159. Production Supervisor
160. Senior Quality Engineer
161. Quality Engineer
162. Welding Manager/ Coordinator

LOW

11 Roles

Aircraft Engine/ Component Maintenance

1. Welding Technician (Approval Holder)
2. Component Workshop Maintenance Technician/ Mechanic
3. Workshop Trainee Maintenance Technician/ Mechanic
4. Trainee Maintenance Technician
5. Composite Engineer/ Specialist
6. Composite Technician

Aircraft Engine/ Component Maintenance

7. Trainee Aircraft Maintenance Technician
8. Aircraft Maintenance Engineer Apprentice

Manufacturing

9. Production Team Leader
10. Senior Technician (Assembly)
11. Technician (Assembly)

EMERGING

6 Roles

1. Sustainability Engineer
2. Computing Researcher
3. Advanced Material Scientist
4. Additive Manufacturing Technician
5. Data Engineer
6. Drone Pilot

Highly Impacted Roles and Career Pathways

Highly Impacted Roles Analysis

Highly Impacted roles in the Aerospace sector are those most influenced by AI and Digital technologies, with a strong potential for automation. As advanced technologies increasingly reduce the need for human intervention, these roles—often involving administrative and repetitive tasks in workshops, hangars, storage facilities, and documentation management—are becoming more automated. Functions like inventory control, housekeeping, and routine maintenance are now efficiently handled by AI and digital systems. To stay relevant, the workforce must prioritise re-skilling and upskilling in these evolving technologies.

AI is revolutionising industries by automating routine tasks, freeing up professionals to focus on strategic decision-making and innovation. This transformation necessitates professionals to acquire new skills in AI integration, data interpretation, and advanced analytics to collaborate effectively with AI systems, ensuring continuous improvement while maintaining regulatory standards.

Case Studies for Highly Impacted Roles

Roles	Impact and Case Studies
Store Assistant	AI technology automates inventory management and stock rotation, reducing human error. Digital tools, on the other hand, streamline inventory tracking with real-time updates on stock levels and facilitate accurate record-keeping. • **IBM's MRO Inventory Optimisation (IO)** is a cloud-based solution that offers users a clear and detailed view of their MRO inventory management and performance. It enables users to streamline and enhance their MRO inventories, efficiently manage work orders, and accurately forecast supply chain demands.[36]
General Worker / Operator	Autonomous robots equipped with AI can automate workshop maintenance and equipment transportation tasks more efficiently and consistently. • **Boeing's manufacturing facilities** use Automated Guided Vehicles (AGVs) to transport parts across the factory floor, reducing the physical burden on workers and allowing them to focus on more technical tasks.[37]
Document Controller	AI-powered document management systems (DMS) can automatically organise, update, and retrieve documents, ensuring that all records are current and easily accessible. Digital systems can maintain detailed audit trails of document access and modifications, simplifying compliance reporting and audits. • **Lockheed Martin** uses AI-powered document management systems to automatically categorise, update, and retrieve documents. These systems integrate with their quality management systems, ensuring compliance with AS9100 and NADCAP standards.[38]
Planning Assistant / Planning Supervisor	AI-driven inventory management systems can provide real-time updates on stock levels, predict shortages, and automate reordering processes. Meanwhile, digital platforms can manage supplier relationships and streamline the procurement process. • **Rolls-Royce** uses AI and IoT sensors to monitor inventory and predict maintenance needs. This ensures that the right parts are available when needed, reducing downtime and improving efficiency.[39]

36. IBM, *IBM MRO Inventory Optimisation*, <https://www.cyngn.com/blog/fundamentals-of-automated-guided-vehicles>
37. Erin Thompson, *Fundamentals of Automated Guided Vehicles*, CYNGN, 5 March 2024, <https://www.cyngn.com/blog/fundamentals-of-automated-guided-vehicles>
38. Dynamsoft, *Lockheed Martin Chooses Dynamic Web TWAIN for Its Intranet Quorum Solution*, <https://www.dynamsoft.com/Company/lockheedmartin-gov-bpm-case-study.aspx>
39. Rolls-Royce, *How AI scales up IoT capability in turbofan jet engines*, <https://www.rolls-royce.com/media/our-stories/discover/2020/intelligentengine-how-ai-scales-up-iot-capability-in-turbofan-jet-engines.aspx>

Highly Impacted Roles Career Pathways

Roles

Additional Skills Required

Possible Roles for Transition Within the Sector

STORE ASSISTANT

Key Responsibilities:
Responsible for managing and executing production plans and schedules to ensure that products are delivered to customers on time and within the planned schedule.

AI / DIGITAL SKILLS

1. **Robotics and Automation Application:**
   As automation grows, understanding robotics will help store assistants adapt to more advanced roles. This knowledge is essential for managing automated systems now common in industries like manufacturing, logistics, and retail.

2. **Automated Manufacturing Maintenance:**
   As manufacturing becomes more automated, maintenance roles now focus on managing and troubleshooting these systems. Developing skills in this area will help store assistants ensure efficient operations and minimise downtime in automated environments.

GREEN SKILLS

1. **Sustainable Manufacturing:**
   Understanding sustainable practices is key for roles focused on reducing environmental impact. This skill helps store assistants implement waste reduction, resource conservation, and sustainability in production processes.

Possible Roles for Transition Within the Sector

Process Technician and Assembly Technician

Possible Roles for Transition into Other Sectors

Forklift Operator
Sector:
Food Manufacturing and Services

Assembly, Test and Packaging Operator
Sector:
Electrical and Electronics

Warehouse Storekeeper/Inventory Coordinator
Sector:
Food Manufacturing and Services

Logistics and Transportation Coordinator
Sector:
Wholesale and Retail Trade

GENERAL WORKER / OPERATOR

Key Responsibilities:
Performs general tasks such as cleaning and maintaining the premises, assisting with equipment operation, and transporting aircraft parts and materials. Adheres to SOPs as well as health, safety, and quality regulations, and contributes to ongoing improvement efforts to enhance workplace efficiency.

AI / DIGITAL SKILLS

1. **AI Application:**
   Understanding AI is becoming essential across sectors. For general workers, AI skills enable them to work with technologies that automate and optimise processes. This knowledge is key for transitioning into roles involving data analysis, predictive maintenance, or smart systems, now common in manufacturing, logistics, and operations.

2. **Augmented Reality (AR) Application:**
   AR is revolutionising tasks in training, maintenance, and quality control. Learning AR applications allows general workers to move into roles that enhance efficiency, reduce errors, and improve training. This skill is valuable in industries like manufacturing, where AR aids in visualising complex assemblies and providing real-time guidance.

Possible Roles for Transition Within the Sector

Technician
(Engine / Engine Component Repair & Overhaul)

Assembly Technician

Possible Roles for Transition into Other Sectors

Forklift Operator
Sector:
Food Manufacturing and Services

Assembly, Test and Packaging Operator
Sector:
Electrical and Electronics

Highly Impacted Roles Career Pathways

(Continue)

Roles	Additional Skills Required		Possible Roles for Transition Within the Sector	Possible Roles for Transition into Other Sectors
	AI / DIGITAL SKILLS	GREEN SKILLS		
DOCUMENT CONTROLLER **Key Responsibilities:** Responsible for managing and safeguarding all quality-related documentation, ensuring adherence to quality management systems and compliance with industry standards. Coordinates document control procedures and maintains accurate records for distribution to relevant parties.	1. **AI Application:** As AI automates document management and data processing, understanding AI can enhance a Document Controller's ability to work with advanced systems. By gaining AI skills, they can transition into roles that automate workflows, improve data accuracy, and leverage AI insights for decision-making, which is key for staying relevant in increasingly digital, data-focused roles.	1. **Environmental Awareness:** As organisations focus on sustainability, environmental awareness is vital across all sectors. For a Document Controller, this knowledge aids in developing and managing eco-friendly practices like reducing paper usage, managing electronic waste, and ensuring compliance with environmental regulations. This skill is particularly valuable in roles related to sustainability reporting, compliance, and environmental management, where understanding the environmental impact of operations is essential.	 Technical Publication Officer  Technical Record	 Compliance and Governance Specialist Sector: Global Business Services
PLANNING ASSISTANT / SUPERVISOR **Key Responsibilities:** Plans and schedules aircraft engine and component maintenance, manages work orders, assists in resource allocation for servicing and recovery efforts, assigns maintenance tasks to subcontractors, oversees inventory management, and ensures the timely delivery of spare parts to meet project milestones.	1. **Big Data Analytics:** In planning and supervision roles, analysing large datasets is increasingly important. Big Data Analytics enables Planning Assistants or Supervisors to make informed decisions based on trends and insights from complex data. Acquiring this skill allows them to transition into roles involving strategic planning, demand forecasting, or supply chain optimisation, where data-driven decisions are essential. It also helps improve efficiency, reduce costs, and identify process improvement opportunities across industries.	1. **Carbon Footprint Management:** As organisations emphasise sustainability, reducing carbon footprints becomes essential. For a Planning Assistant or Supervisor, understanding carbon footprint management is key for planning and implementing strategies to minimise environmental impact. This skill is especially valuable in industries like manufacturing, logistics, and supply chain management, where energy efficiency, waste reduction, and sustainable resource use are of high importance.	 Maintenance Controller/ Technical Operations Representative  Maintenance Management Engineer	 Planning Technician Sector: Energy and Power

Projected Number of Highly Impacted Employees

According to the TalentCorp Demand Model Projection, approximately 16% (3,500) of employees will be at risk in the next three (3) to five (5) years due to highly impacted roles:[40]

Summary of Highly Impacted Roles

Aircraft Engine/ Component Maintenance	Aircraft Maintenance	Fleet Management / CAMO	Manufacturing
• General Worker / Operator • Store Assistant • Planning Assistant / Supervisor	• General Worker / Operator • Store Assistant • Planning Assistant / Supervisor	• Planning Assistant / Supervisor	• General Worker / Operator • Document Controller • Store Assistant

Findings

Based on TalentCorp's Demand Model Projection,[41] the workforce in Aerospace's core business is expected to reach approximately 15,745 by 2029. According to assessments by industry experts, it is estimated that around 4% of these employees, or approximately 397 individuals, may face job risks within the next three (3) to five (5) years due to roles significantly affected by technological changes.[42]

With AI playing an increasingly important role in the Aerospace sector, particularly in areas such as MRO and manufacturing, there is growing demand for professionals in key roles such as **Data Engineer, Sustainability Engineer, Computing Researcher, Advanced Materials Scientist, Additive Manufacturing Technician**, and **Drone Pilot** to possess skills in data analysis, machine learning, and AI algorithm development. The workforce must be capable at leveraging AI tools to analyse large datasets, predict outcomes, and optimise processes effectively.

As digitalisation continues to permeate the sector, digital literacy across all levels of the workforce is becoming increasingly essential. Employees must be proficient in using digital tools, and cybersecurity skills will act as the shield, guarding sensitive Aerospace data from potential breaches.

The development and implementation of green technologies, including renewable energy sources and waste reduction through reusing materials, will require innovation and technical expertise. This involves enhancing research and development capabilities to create sustainable alternatives to traditional manufacturing processes, ensuring the sector progresses toward increasingly important environmentally friendly practices.

Over the next three (3) to five (5) years, AI and digital technologies will significantly impact these roles. As AI becomes more integrated into daily operations, professionals will need to adapt to the automation of routine tasks, advancements in data analysis, and the optimisation of production processes. Developing skills in AI, machine learning, and digital systems management will be essential for staying competitive and contributing effectively to the sector's growth. Embracing digital transformation will be key to driving efficiency, improving product quality, and advancing sustainable practices within the Aerospace sector.

40. Impact Study Industry Survey
41. Department of Statistics Malaysia and TalentCorp Demand Model Projection
42. Impact Study Industry Survey

Medium and Low Impacted Roles

Medium Impacted Roles Analysis

Unlike highly impacted roles that have a higher risk of becoming obsolete due to the minimal need for human intervention, medium impacted roles in the Aerospace sector focus primarily on leveraging technology to optimise and enhance precision in aircraft maintenance and manufacturing processes. These roles require skills in operating machinery and streamlining work assignments to maximise productivity and efficiency. As the sector increasingly adopts automation technologies, it is essential for employees to develop proficiency in these areas.

ARTIFICIAL INTELLIGENCE	**AI integration is modernising Aerospace's MRO and manufacturing processes. Employees need to understand AI-driven systems that predict defects in aircraft engines or components, optimise maintenance planning, and automate design processes. Despite AI's growing role, human intervention remains essential for hands-on tasks, custom designs, troubleshooting, and ensuring compliance with safety and quality standards.**
DIGITAL	**The sector is progressively adopting digital technologies to streamline resource management, documentation, and monitor real-time updates on maintenance and manufacturing. Human intervention is still required for validating digital records, managing exceptions, and resolving complex operational challenges. Maintaining data integrity and addressing unforeseen issues are vital responsibilities in these roles.**
GREEN ECONOMY	**Developing and implementing green practices, such as using biofuels and composites made from renewable sources, requires innovation and technical expertise. Employees must focus on R&D to create sustainable alternatives to traditional manufacturing and MRO processes. Driving innovation and applying technical knowledge to develop eco-friendly solutions that meet the standards of the sector are essential for success.**

Job Clusters	Medium Impacted Roles	Skills
Aircraft Engine / Component Maintenance	• Accountable Manager • Aircraft Technician - Engine and Engine Component/ Workshop Planner • CAT A Licensed Approved Mechanic • Technical Service Manager • Engineering Service Engineer / Technical Service Engineer • Senior Engineering Service Engineer / Senior Technical Service Engineer • General Manager / Managing Director / Vice President (Aircraft Engine / Component Maintenance) • Head of Operation • Senior Non-Destructive Testing (NDT) Level 3 Engineer • Non-Destructive Testing (NDT) Level 3 Engineer • Operations Manager • Senior Operations Manager / Senior Technical Manager • Planning Manager • Planning Executive • Senior Planning Executive • Senior Quality Engineer • Quality Engineer • Quality Manager • Repair Engineer / Process Engineer • Senior Repair Engineer / Senior Process Engineer • Special Process Engineer • Senior Technician (Component Repair & Overhaul - Avionics) • Technician (Component Repair & Overhaul - Avionics)	**Specific Skills** • Additive Manufacturing • Aircraft Electrical Equipment and Accessories Maintenance • Aircraft Navigation and Automated Flight Systems Maintenance • Automated System Design • Computer-aided Design • Eco-Design Principles • Engineering Problem Solving • Enterprise Database System Administration • Image Processing and Industrial Vision Inspection • Specialised Processes Methodologies (Composite) • Sustainable Business Practices **Basic Skills** • Adaptability and Resiliency • Business Acumen • Change Management • Coaching and Mentoring • Digital and AI Fluency • Influencing and Negotiation

Job Clusters	Medium Impacted Roles	Skills
Aircraft Engine / Component Maintenance	• Senior Technician (Component Repair & Overhaul - Mechanical) • Technician (Component Repair & Overhaul - Mechanical) • Senior Technician (Engine / Engine Component Repair & Overhaul) • Technician (Engine / Engine Component Repair & Overhaul)	**As above**

Illustration of impact of AI and Digital on job tasks

Technician (Component Repair & Overhaul - Avionics)

AI and digital tools are transforming the aerospace Technician (Component Repair & Overhaul - Avionics)'s role by automating diagnostic processes, improving repair precision, and enhancing data management. Technicians now use AI-driven diagnostic systems to identify faults more quickly and accurately, reducing turnaround times. Digital tools facilitate precise repairs and calibrations, ensuring components meet stringent performance standards. Additionally, digital documentation systems enhance record-keeping, compliance, and collaboration across teams, leading to more efficient and reliable avionics maintenance and overhaul processes.

Job Clusters	Medium Impacted Roles	Skills
Aircraft Maintenance	• Aircraft Technician Systems • Aircraft Technician - Structure / Sheet Metal • Airworthiness Review Staff • CAT A Certifying Technician • Conformance Engineer • Engineering Manager • Engineering Service Manager / Technical Service Manager • Engineering Service Engineer / Technical Service Engineer	**Specific Skills** • Additive Manufacturing • Aircraft Electrical Equipment and Accessories Maintenance • Aircraft Navigation and Automated Flight Systems Maintenance • Automated System Design • Computer-aided Design • Eco-Design Principles • Engineering Problem Solving • Enterprise Database System Administration • Image Processing and Industrial Vision Inspection • Specialised Processes Methodologies (Composite) • Sustainable Business Practices

Job Clusters	Medium Impacted Roles	Skills
Aircraft Maintenance	• Senior Engineering Service Engineer / Senior Technical Service Engineer • Foreman / Operations Manager / Programme Manager • Assistant Foreman / Lead Maintenance Engineer / Superintendent • General Manager / Managing Director / Vice President (Aircraft Maintenance) • Licensed Aircraft Engineer - Cat B1 (Mechanical) • Licensed Aircraft Engineer - Cat B2 (Avionics) • Licensed Aircraft Engineer - Cat C • Maintenance Control Centre (MCC)/ Maintenance Operation Centre (MOC) Enginee • Non-Destructive Testing (NDT) Engineer Level 2 • Non-Destructive Testing (NDT) Senior Engineer/Foreman • Non-Destructive Testing (NDT) Senior Technician Level 1 • Non-Destructive Testing (NDT) Level 3 Engineer • Senior Non-Destructive Testing (NDT) Level 3 Engineer • Aircraft Painting Technician • Planning Manager • Planning Executive • Senior Planning Executive • Programme Director / Senior Operations Manager • Quality Manager	**Basic Skills** • Adaptability and Resiliency • Business Acumen • Change Management • Coaching and Mentoring • Digital and AI Fluency • Influencing and Negotiation

Job Clusters	Medium Impacted Roles	Skills
Aircraft Maintenance	• Quality Assurance Engineer/ Inspector • Quality Assistant • Senior Quality Engineer • Quality Engineer • Technical Publication Officer • Technical Record • Senior Technician (Avionics) • Technician (Avionics) • Senior Technician (Mechanical) • Technician (Mechanical) • Technician with Company Authorisation • Senior Workshop Engineer • Workshop Engineer	**As above**

Illustration of impact of AI and Digital on job tasks

Non-Destructive Testing (NDT) Level 3 Engineer

AI and digital tools are transforming the role of the aerospace Non-Destructive Testing (NDT) Level 3 Engineer by enhancing defect detection, data analysis, and reporting accuracy. AI-powered imaging and analysis tools improve the identification of structural anomalies, providing more precise and reliable results. Digital platforms facilitate the efficient collection, storage, and retrieval of NDT data, enabling real-time analysis and streamlined reporting. This transformation enhances the effectiveness of inspections, reduces the likelihood of human error, and supports better-informed decisions, ultimately contributing to improved safety and integrity of aerospace components.

Job Clusters	Medium Impacted Roles	Skills
Fleet Management/ CAMO	• General Manager / Managing Director / Vice President (Fleet Management) • Maintenance Management Engineer • Maintenance Controller / Technical Operations Representative • Operations Manager • Planning Manager • Programme Director	**Specific Skills** • Additive Manufacturing • Aircraft Electrical Equipment and Accessories Maintenance • Aircraft Navigation and Automated Flight Systems Maintenance • Automated System Design • Computer-aided Design • Eco-Design Principles • Engineering Problem Solving • Enterprise Database System Administration

Job Clusters	Medium Impacted Roles	Skills
Fleet Management/ CAMO	• Planning Executive • Senior Planning Executive • Senior Quality Engineer • Quality Engineer • Quality Manager • Technical Service Manager • Senior Technical Service Engineer • Technical Service Engineer	**Specific Skills** • Enterprise Database System Administration • Image Processing and Industrial Vision Inspection • Specialised Processes Methodologies (Composite) • Sustainable Business Practices **Basic Skills** • Adaptability and Resiliency • Business Acumen • Change Management • Coaching and Mentoring • Digital and AI Fluency • Influencing and Negotiation

Illustration of impact of AI and Digital on job tasks

Maintenance Controller / Technical Operations Representative

AI and digital tools are transforming the role of the aerospace Maintenance Controller/Technical Operations Representative by enabling real-time monitoring, predictive maintenance, and enhanced communication. AI systems analyse aircraft data to predict maintenance needs, allowing controllers to schedule interventions proactively and minimise downtime. Digital tools provide comprehensive, real-time insights into aircraft status and maintenance activities, facilitating faster decision-making and more efficient coordination with maintenance teams. This transformation improves operational efficiency, reduces unexpected delays, and ensures higher standards of aircraft reliability and safety.

Job Clusters	Medium Impacted Roles	Skills
Manufacturing	• Aerospace (Mechanical) Engineering Technician • Aerospace Engineer • Senior Computer-Aided Design Computer-Aided Manufacturing (CADCAM) Engineer • Assistant Computer-Aided Design Computer-Aided Manufacturing (CADCAM) Engineer	**Specific Skills** • Additive Manufacturing • Aircraft Electrical Equipment and Accessories Maintenance • Aircraft Navigation and Automated Flight Systems Maintenance • Automated System Design • Computer-aided Design • Eco-Design Principles • Engineering Problem Solving • Enterprise Database System Administration • Image Processing and Industrial Vision Inspection

Job Clusters	Medium Impacted Roles	Skills
Manufacturing	• Calibration Engineer/ Lab Engineer • Calibration Senior Technician/Lab Senior Technician • Calibration Assistant Technician/Lab Assistant Technician • Calibration Technician/Lab Technician • Assistant Coordinate Measuring Machine (CMM) Engineer • Coordinate Measuring Machine (CMM) Engineer • Coordinate Measuring Machine (CMM) Quality Inspector • Computer Numerical Control (CNC) Machinist Supervisor (Machining & Wire-cut) • Junior Machining Technician (Machining & Wire-cut) • Technician (Machining & Wire-cut) • Machinist (Machining & Wire-cut) • Senior Computer Numerical Control (CNC) Programmer • Assistant Computer Numerical Control (CNC) Programmer • Computer Numerical Control (CNC) Programmer • Design Section Manager • General Manager / Managing Director / Vice President (Manufacturing) • Head of Engineer • Head of Plant • Head of Quality • Assistant Jigs/Fixture & Tooling Engineer	**Specific Skills** • Image Processing and Industrial Vision Inspection • Specialised Processes Methodologies (Composite) • Sustainable Business Practices **Basic Skills** • Adaptability and Resiliency • Business Acumen • Change Management • Coaching and Mentoring • Digital and AI Fluency • Influencing and Negotiation

Job Clusters	Medium Impacted Roles	Skills
Manufacturing	• Planning Executive • Senior Planning Executive • Senior Quality Engineer • Quality Engineer • Quality Manager • Technical Service Manager • Senior Technical Service Engineer • Technical Service Engineer • Senior Jigs / Fixture & Tooling Engineer • Senior Tooling Technician • Manufacturing Engineer / Production Engineer (Assembly) • Senior Manufacturing Engineer / Senior Production Engineer (Assembly) • Manufacturing Engineer / Production Engineer (Manufacturing) • Senior Manufacturing Engineer / Senior Production Engineer (Manufacturing) • Manufacturing Manager • Manufacturing Planning Manager • Manufacturing Planning Supervisor • Manufacturing Planning Assistant • Manufacturing Planning Executive • Senior Manufacturing Planning Executive • Assistant Materials & Process Engineer • Materials & Process Engineer • Senior Materials & Process Engineer • Non-Destructive Testing (NDT) Level 3 Engineer • Senior Non-Destructive Testing (NDT) Level 3 Engineer	**As above**

Job Clusters	Medium Impacted Roles	Skills
Manufacturing	• Non-Destructive Testing (NDT) Engineer • Non-Destructive Testing (NDT) Specialist • Non-Destructive Testing (NDT) Inspector • Non-Destructive Testing (NDT) Operator • Non-Destructive Testing (NDT) Technician • Non-Destructive Testing (NDT) Manager Level 3 • Operations Manager / Production Manager • Senior Operations Manager / Senior Production Manager / Senior Manufacturing Manager • Painting Technician • Senior Painting Technician • Planning Executive/ Production Planner • Assistant Process Engineer • Process Engineer • Senior Process Engineer • Assistant Process Technician • Process Technician • Senior Process Technician • Production Supervisor • Production Executive • Quality Assurance Manager & Quality Control Manager • Senior Quality Inspector • Assistant Quality Inspector • Quality Inspector • Quality Management System Engineer/ Quality Assurance Engineer/Auditor	**As above**

Job Clusters	Medium Impacted Roles	Skills
Manufacturing	• Senior Quality Engineer • Quality Engineer • Quality Management System Manager • Quality Manager • Sheet Metal Technician • Assistant Sheet Metal Technician • Staff Process Engineer • Supplier Quality Engineer • Senior Technician (Manufacturing) • Technician (Manufacturing) • Welding Manager/ Coordinator • Welder • Senior Welder	As above

Illustration of impact of AI and Digital on job tasks

Painting Technician

AI and digital tools are transforming the role of aerospace Painting Technicians by enhancing accuracy and efficiency in the painting process. Advanced AI algorithms can analyse and adjust spray patterns in real time, ensuring uniform coating and reducing waste. Digital tools, such as automated spray systems and robotics, streamline the application process and improve consistency. Additionally, data analytics and machine learning help technicians predict maintenance needs and optimise processes. This allows them to focus on quality control and complex problem-solving rather than routine tasks, enhancing overall productivity and precision in aerospace painting.

Process Engineer

AI and digital tools are significantly transforming the role of aerospace Process Engineers by streamlining process design, optimisation, and monitoring. AI-driven analytics provide deeper insights into process performance, enabling engineers to identify inefficiencies and make data-driven improvements. Digital twins and simulation software allow for virtual testing and refinement of processes before implementation, reducing the need for costly physical trials. Additionally, real-time monitoring systems and automated controls enhance the ability to manage complex processes with greater precision and responsiveness. This shift directs engineers towards strategic innovation and continuous improvement.

Quality Engineer

AI and digital tools are transforming the role of aerospace Quality Engineers by significantly improving inspection accuracy and efficiency. Machine learning algorithms and computer vision systems can detect defects and anomalies with high precision, reducing the reliance on manual inspections. Digital tools like automated measurement systems and data analytics platforms enable real-time monitoring and analysis of quality metrics, facilitating faster decision-making and corrective actions. These advancements allow Quality Engineers to focus more on strategic quality improvements and root cause analysis, further enhancing overall product reliability and safety.

Low Impacted Roles

Low Impacted roles in the Aerospace sector are the least affected by advancements in AI, Digital, and Green Economy and are still very much human-centric. These positions often involve hands-on tasks that are challenging to automate and are not directly linked to the implementation of sustainability initiatives or regulatory compliance. They typically include roles that demand manual dexterity, on-site presence, and direct engagement with aircraft or equipment, such as specific maintenance tasks, manual inspections, and physical assembly tasks.

AI & DIGITAL	**While AI and digital tools enhance the precision of aircraft maintenance and manufacturing processes, providing real-time monitoring and digitised access to manuals, the core responsibilities in these roles still rely heavily on human skill and expertise. As a result, these positions remain less susceptible to automation and continue to demand significant manual effort and craftsmanship.**
GREEN ECONOMY	**While these roles may contribute indirectly to environmental goals by supporting overall operations, they do not directly drive the adoption of green practices or technologies. Their impact on Green Economy efforts is minimal, as they are not involved in developing or implementing sustainable materials, energy-efficient technologies, or environmentally friendly manufacturing processes.**

Job Clusters	Low Impacted Roles	Skills
Aircraft Engine/ Component	• Composite Engineer/ Specialist • Composite Technician • Component Workshop Maintenance Technician / Mechanic • Workshop Trainee Maintenance Technician / Mechanic • Trainee Maintenance Technician • Welding Technician (Approval Holder)	**Specific Skills** • Basic Tool and Maintenance Equipment Proficiency • Augmented Reality Application • Hangar/ Workshop Productions Management • Quality Management System Coordination • Manual Dexterity • Sustainable Manufacturing • Workshop Practices **Basic Skills** • Cognitive Skills • Communication • Conflict Management • Critical Thinking • Innovative Thinking • Teamwork and Collaboration

Illustration of impact of AI and Digital on job tasks

Composite Engineer/ Specialist

AI and digital tools are revolutionising the role of aerospace Composite Engineers and Specialists by enhancing the design, analysis, and manufacturing of composite materials. Advanced simulation software and AI algorithms enable more precise modelling of composite behaviours, optimising material properties and performance before physical testing. Digital tools streamline the production process through automation and real-time monitoring, improving consistency and reducing waste. AI-driven quality control systems help ensure the integrity of composite components, allowing engineers to focus on innovation and problem-solving rather than routine tasks.

Job Clusters	Low Impacted Roles	Skills
Aircraft Maintenance	• Trainee Aircraft Maintenance Technician • Aircraft Maintenance Engineer Apprentice	**Specific Skills** • Basic Tool and Maintenance Equipment Proficiency • Augmented Reality Application • Hangar/ Workshop Productions Management • Quality Management System Coordination • Manual Dexterity • Sustainable Manufacturing • Workshop Practices **Basic Skills** • Cognitive Skills • Communication • Conflict Management • Critical Thinking • Innovative Thinking • Teamwork and Collaboration

Job Clusters	Low Impacted Roles	Skills
Manufacturing	• Production Team Leader • Senior Technician (Assembly) • Technician (Assembly)	**Specific Skills** • Basic Tool and Maintenance Equipment Proficiency • Augmented Reality Application • Hangar/ Workshop Productions Management • Quality Management System Coordination • Manual Dexterity • Sustainable Manufacturing • Workshop Practices **Basic Skills** • Cognitive Skills • Communication • Conflict Management • Critical Thinking • Innovative Thinking • Teamwork and Collaboration

Illustration of impact of AI and Digital on job tasks

Senior Technician (Assembly)

AI and digital tools are transforming the role of aerospace Senior Technicians (Assembly) by enhancing precision, efficiency, and problem-solving capabilities. Advanced digital tools and automated systems facilitate more accurate assembly processes, reducing manual errors and ensuring tighter tolerances. This shift enables senior technicians to focus more on complex problem-solving and process optimisation, rather than routine tasks. This ultimately improves overall assembly quality and operational efficiency.

Projected Numbers of Medium and Low Impacted Employees

Approximately 96% (10,000)[43] non-highly impacted employees require upskilling related to AI, Digital and Green Economy:

- Employees in these roles will need to upskill and continuously improve to stay relevant and deliver beyond traditional expectations.
- Based on the assessment and industry feedback, a total of 16 basic skills and 145 specific skills were identified for the Aerospace sector, with 6% being related to AI and Digital skills, and another 4% to Green skills.
- Upskilling is essential for **89%** of roles classified as medium impacted roles to progress and perform beyond traditional expectations.
- While upskilling is not mandatory for the **6%** of roles designated as low impacted, continuous self-improvement is recommended to maintain relevance and make informed decisions, particularly by staying updated on emerging trends.

In-Demand Skills for AI, Digital, and Green Economy

Training Programmes Available

AI/ Digital Skills

AI/Digital skills that are essential for roles to adopt for business operations enhancements and overall workforce productivity improvements

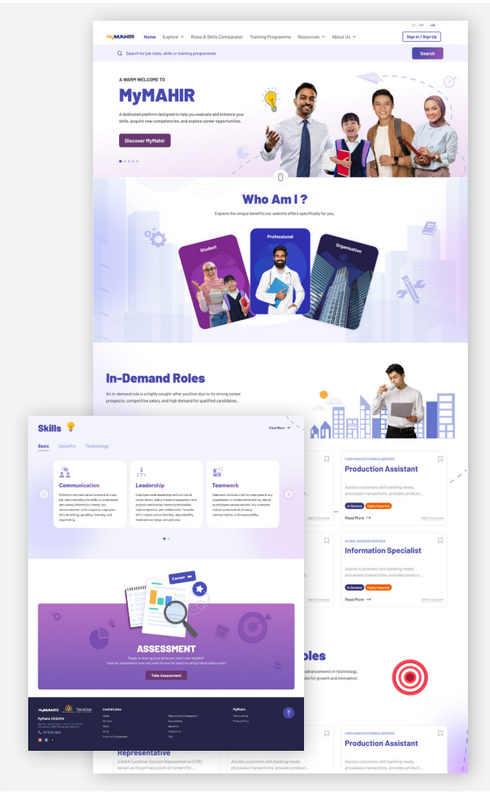
- Artificial Intelligence Application
- Automated System Design
- Big Data Analytics
- Computer-aided Design
- Augmented Reality Application
- Enterprise Database System Administration
- Robotics and Automation Application
- Image Processing and Industrial Vision Inspection

Green Skills

Green skills that are needed for roles to integrate sustainability efforts and initiatives into business operations

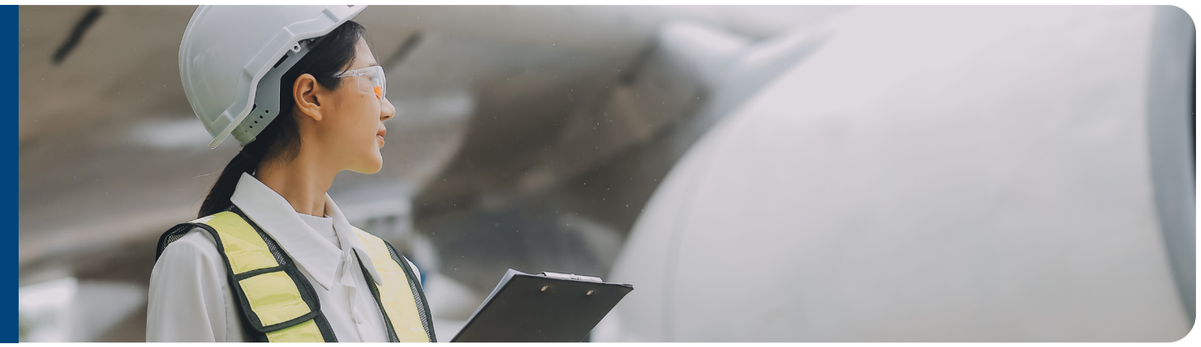
- Carbon Footprint Management
- Eco-Design Principles
- Sustainable Manufacturing
- Environmental Awareness
- Sustainable Business Practices

List of proposed training programmes is accessible on the **MyMAHIR platform**.



43. Department of Statistics Malaysia (DOSM) and TalentCorp Demand Model Projection

Emerging Roles



Global Presence of Emerging Roles in the Aerospace Sector

Globally, the Aerospace sector is soaring into a new era of transformation, fuelled by technological innovation, sustainability goals, operational efficiency, cybersecurity, and regulatory compliance. The emerging roles are essential in steering these changes, ensuring that the sector remains competitive, safe, and sustainable in a rapidly evolving global market. These roles not only address current challenges but also lay the foundation for future advancements, making the Aerospace sector more resilient and adaptable to upcoming technological and environmental shifts.

Sustainability Engineer

Sustainability Engineers in the Aerospace sector are dedicated to developing and implementing strategies aimed at minimising environmental impact. Their work includes designing more efficient aircraft, promoting the use of SAF, and ensuring adherence to environmental regulations. In the **United Kingdom (UK)**, leading aerospace companies such as **Rolls-Royce**, **Airbus**, and **Boeing** are collaborating with universities on sustainable projects, for example, using composite materials and biofuels to reduce emissions.[44] These engineers are instrumental in helping the sector meet its goal of reducing GHG emissions by 50% by 2050.

Case Studies[45]

BOEING

Sustainability Engineering in Aerospace:
Boeing's sustainability efforts include reducing carbon emissions through the use of more fuel-efficient aircraft, integrating sustainable materials in production, and improving operational efficiency across their supply chains.

Boeing has also committed to achieving net-zero carbon emissions by 2050 through initiatives such as carbon offsetting and investing in sustainable aviation fuels.

Computing Researcher

Computing Researchers in aerospace drive innovation by developing advanced algorithms and machine learning models that enhance aircraft design, maintenance, and operations. Their expertise spans predictive maintenance, autonomous flight systems, and optimising flight paths to maximise fuel efficiency. This role is essential for integrating AI into various aspects of aerospace technology, contributing to safer and more efficient operations. The **United States (US)** stands as a global leader in aerospace research and technology, with a wide network of organisations and institutions advancing the field.[46]

Case Studies[47]

easyJet

Development of algorithms into Digital Twin capabilities:
EasyJet upgraded its MRO IT platform using model-based AI to construct a digital twin that represents the airline's fleet and maintenance activities. This digital twin technology is designed to forecast future maintenance trends and potential actions.

EasyJet integrated Aerogility with its current MRO management and transaction systems, utilising the platform's model-based AI engine and connections to analyse MRO data. This integration aids in making more informed and efficient maintenance decisions more quickly.

Advanced Materials Scientist

Advanced Materials Scientists develop innovative materials that enhance the performance, safety, and efficiency of aerospace components. They focus on creating materials that are lighter, stronger, and more resistant to extreme conditions. In Europe, Airbus stands out for its use of advanced materials, employing materials scientists to develop and implement materials such as carbon fibre reinforced polymers (CFRP) in their aircraft. This approach significantly reduces weight and improves fuel efficiency.[48]

Case Studies[49]

NASA

Integration of Smart Materials:
Researchers at **NASA** have focused on creating self-healing materials that mimic natural processes, such as the ability of skin to heal after being cut. These materials are particularly valuable for use in harsh aerospace environments, where structural damage can occur. The research involves integrating nanotechnology and smart materials to enhance the durability and safety of aircraft and spacecraft. Aerospace innovations in material science are enabling structures to self-repair minor damage, thereby prolonging their lifespan and reducing maintenance costs.

44. JEC, *EconCore works with Airbus, the Technical University of Denmark (DTU) and Fraunhofer on a new green and sustainable type of rudder for an Airbus A320 aircraft based on thermoplastic honeycomb sandwich composites*, 1 May 2023, <https://www.jeccomposites.com/news/spotted-by-jec/econcore-works-with-airbus-the-technical-university-of-denmark-dtu-and-fraunhofer-on-a-new-green-and-sustainable-type-of-rudder-for-an-airbus-a320-aircraft-based-on-thermoplastic-honeycomb-sandwich/>; Boeing, Boeing joins Virgin Atlantic-led team to fly world's first 100% Sustainable Aviation Fuel flight from London Heathrow to New York JFK, 28 November 2023, <https://www.boeing.co.uk/news-releases/2023/boeing-joins-virgin-atlantic-led-team>
45. Neil Perry, *Boeing's Sustainability Plan Helping Aviation Decarbonise, Sustainability Magazine*, 27 June 2024, <https://aerospacetechreview.com/mro-it-case-studies-how-me-programs-are-making-airlines-better/>
46. Soledad Le Clainche et al., *Improving aircraft performance using machine learning: A review, Elsevier*, April 2023
47. James Careless, *MRO IT Case Studies: How M&E Programmes Are Making Airlines Better, Aerospace Tech Review*, Jun 7, 2023, <https://aerospacetechreview.com/mro-it-case-studies-how-me-programs-are-making-airlines-better/>
48. Airbus, *Future materials: At the heart of advanced aerospace concepts*, <https://www.airbus.com/en/innovation/future-aircraft/future-materials>
49. NASA Technology Transfer Programme, *Materials and Coating: Multi-layered Self-healing Material System for Impact Mitigation (LAR-TOPS-122)*, <https://technology.nasa.gov/patent/LAR-TOPS-122>

Additive Manufacturing Technician

Additive Manufacturing Technicians leverage 3D-printing technology to produce complex aerospace components swiftly and cost-effectively. They specialise in creating lightweight, durable parts that improve aircraft performance. This technology is pivotal for rapid prototyping and the production of spare parts, especially in military applications. Countries such as the **US** and **Germany** are at the forefront of additive manufacturing in aerospace, with leading companies like **Boeing** and **Airbus** driving advancements in this field.[50]

Case Studies[51]

BOEING

Additive Manufacturing for lighter aircraft element:
In the Aerospace sector, parts need to be precise, tough, and lightweight. 3D printing, or additive manufacturing, excels in creating complex, strong, and lightweight components. It also allows for on-demand production of customised parts, reducing the need for large inventories and minimising costs.

Boeing has utilised additive manufacturing for its 787 Dreamliner, including redesigning hydraulic tube supports to be both lighter and stronger through this technology.

Data Engineer

Data Engineers are responsible for managing and analysing large datasets to enhance the decision-making processes. Their role in developing and maintaining data pipelines and infrastructure to support big data analytics is essential for improving operational efficiency and safety. The implementation of digital twins and real-time analytics exemplifies how these engineers contribute to the sector. In the **US**, the 'Aerospace Corporation's Data Science and Artificial Intelligence Department' supports the nation's space agencies by developing models and tools, conducting research, and transitioning models into production to aid in decision-making processes and enhance mission success.[52]

Case Studies

BOEING AIRBUS

Data Integration:
Boeing and **Airbus** use big data and IoT-enabled sensors to collect vast amounts of data from aircraft systems, which is then analysed to predict component failures and optimise maintenance schedules. This approach reduces unplanned downtime, enhances flight safety, and improves operational efficiency.

Drone Pilots

Drone Pilots operate UAVs for various applications, including surveillance, mapping, inspections, and delivery services. The increasing use of commercial drones has driven a significant demand for skilled drone pilots. The US, China, and several European countries have seen substantial growth in the deployment of drones for both civilian and military purposes. In the US, Drone Pilots are essential in inspecting infrastructure such as pipelines, power lines, and bridges. For example, companies like Boeing and Northrop Grumman leverage drones to enhance surveillance and reduce manual inspection efforts. These UAVs are able to operate in hazardous environments, providing real-time data, and improving safety and efficiency.[53]

Case Studies[54]

DELTA

Drone Technology in MRO:
Delta Air Lines has been integrating drone technology into its MRO operations. Starting with trials in 2017, Delta, in collaboration with Dutch drone specialist Mainblades, developed a system where drones perform general visual inspections to detect damage such as dents, scratches, and lightning strikes on aircraft.

These drone inspections have significantly reduced the time and labour required compared to traditional manual methods, which are not only time-consuming but also pose safety risks to technicians

50. Byron Blakey-Milner, *Metal additive manufacturing in aerospace: A review, Elsevier*, November 2021
51. Sahil Aswani, *Pioneering the Future: How Boeing and Airbus are Transforming Aircraft Manufacturing with Advanced Technologies*, 2 July 2024, <https://www.linkedin.com/pulse/pioneering-future-how-boeing-airbus-transforming-aircraft-aswani-ojmdf/>
52. Aerospace, *Shaping The Future Of Space With Data Science & Artificial Intelligence*, 9 June 2022, <https://www.airforce-technology.com/features/revealed-the-aerospace-and-defence-companies-leading-the-way-in-drones/?cf-view>
53. Airforce Technology, *Revealed: The aerospace and defence companies leading the way in drones*, 19 January 2022, <https://www.airforce-technology.com/features/revealed-the-aerospace-and-defence-companies-leading-the-way-in-drones/>
54. Lindsay Bjerregaard, *Delta TechOps Drives Progress On Drone Inspections, Aviation Week Network*, 9 October 2023, <https://aviationweek.com/mro/emerging-technologies/delta-techops-drives-progress-drone-inspections>

Demand Projection for Emerging Roles

Based on the survey conducted during the study, the headcount of organisations varies according to company type. For Multinational Corporations (MNCs), data was not available. Public Listed Companies (PLCs) reported headcounts ranging from 700 to 2,300 employees, while SMEs had between 25 and 200 employees. Government-Linked Companies (GLCs) had headcounts ranging from 10 to 15 employees.[55]

As Malaysia's Aerospace sector evolves with the increasing influence of AI, Digital, and Green Economy, six (6) emerging roles have been identified as key drivers of this transformation, namely **Sustainability Engineer, Computing Researcher, Advanced Material Scientist, Additive Manufacturing Technician, Data Engineer,** and **Drone Pilot**. These roles have emerged in response to technological advancements, industry trends, and societal shifts, positioning organisations to excel in innovation, adopt sustainable practices, and navigate evolving regulations and market demands.

The demand for such emerging specialists is expected to grow as companies increasingly recognise the benefits of emerging technology and sustainability practices in a dynamic market environment.[56]

Public Listed Companies (PLCs):	Government Linked Companies (GLCs):	Small and Medium-Sized Enterprises (SMEs):
700 - 2,300	10 - 15	25 - 200

Projected Demand for Emerging Roles for each organisation in the next three (3) to five (5) years

	Multinational Corporations (MNCs)	Public Listed Companies (PLCs)	Small and Medium-Sized Enterprises (SMEs)	Government Linked Companies (GLCs)
Sustainability Engineer	Not available	6	2	Not applicable
Computing Researcher	Not available	6	Not applicable	Not applicable
Advanced Material Scientist	Not available	11	Not applicable	1
Additive Manufacturing Technician	Not available	21	2	Not applicable
Data Engineer	Not available	6	3	3
Drone Pilot	Not available	Not applicable	2	Not applicable

55. Talentcorp sector survey on Impact Study Validation Workshop
56. Ibid

Findings

Sustainability Engineer
A sustainability engineer's role involves designing and implementing aerospace programmes that prioritise recycling, energy efficiency, waste reduction, and the development of eco-friendly technologies and materials, all aimed at minimising the environmental impact of aviation.

Computing Researcher
A Computing Researcher's role involves developing advanced aerospace solutions through simulations, predictive algorithms, AI integration, and high-performance computing to enhance system performance and safety in the aviation industry.

Advanced Material Scientist
An Advanced Material Scientist's role focuses on developing and applying innovative materials for aerospace use, ensuring they meet industry standards through rigorous testing, understanding failure mechanisms, collaborating across disciplines for seamless integration, and assessing their environmental impact throughout the lifecycle.

Additive Manufacturing Technician
An Additive Manufacturing Technician's role focuses on producing high-performance aerospace parts through advanced 3D printing processes, managing the entire workflow from printer calibration to post-printing treatments, and contributing to research in additive manufacturing advancements.

Data Engineer
A Data Engineer's role involves constructing and overseeing data infrastructure that guarantees seamless, accurate, and standardised data integration and flow from diverse sources, while maintaining databases and ensuring data quality for insightful analytics.

Drone Pilot
A Drone Pilot's role involves operating drones for detailed inspections and surveillance in aerospace settings, capturing data to support maintenance and safety, and overseeing drone maintenance and technical operations.

Chapter 5:

Recommended Initiatives

The findings from our impact study assessment have yielded valuable insights into the evolving landscape shaped by AI, Digital, and Green Economy trends within Malaysia's Aerospace sector. Eight (8) initiatives were developed through extensive collaboration with key stakeholders, including government bodies, industry leaders, academia, and training providers. Recognising that the workforce is the pulse of the Aerospace sector, these initiatives are designed to steer the sector forward by harnessing the opportunities identified and addressing the challenges brought about by the transformative trends. By aligning with the needs and aspirations of each stakeholder group, we aim to foster innovation, nurture talent, and promote sustainable practices. We further aim to empower Malaysia's Aerospace sector to not only thrive in the present but also lead the way toward a future marked by steady growth and continued global competitiveness.

The initiatives are grouped into four (4) categories based on the leading and enabling entities: **Government**, **Industry Players**, **Academia**, and **Training Providers**.

Summary of 8 Recommended Initiatives

Government

IN1
Provide Funding and Incentives

IN2
Develop Policy and Regulation that are Supportive of the Adoption of AI and Digital by the Sector

Industry Players

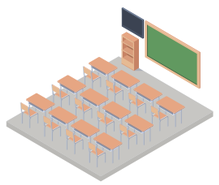
IN3
Implementation of Continuous Learning and Development Programmes

IN4
Collaborate between Industry, Government, Academia, and Training Providers

Academia

IN5
Develop Industry-Relevant Curriculum

IN6
Promote Micro-Credential Courses



Training Providers

IN7
Develop Training Content Needed by the Sector

IN8
Offer Diverse Delivery Methods

Government

IN1 Provide Funding and Incentives

This initiative leverages government support to drive innovation and workforce development in Malaysia by enhancing funding for AI, Digital, and Green Economy.

Initiatives	Case Studies
IN1.1 **Allocate funding and resources for sustainable aerospace technology research** • Government to allocate dedicated funding for long-term research projects on sustainable aerospace technologies. • This funding will support the development of cutting-edge sustainable technologies within the Aerospace sector, fostering innovation and maintaining Malaysia's competitive edge in this sector. • Collaboration between academia, industry, training providers, and government will be prioritised to ensure that research efforts are aligned with national goals and industry needs.	**UK Aerospace Sector's Green Funding Initiative:** The UK government announced a GBP400 million (RM2.29 billion) funding package to support aerospace research and technology aimed at making air travel greener. This initiative includes developing high-performance engines, new wing designs, and ultra-lightweight materials to reduce fuel consumption.[57]
IN1.2 **The Government, through relevant human capital development agency, to establish co-funding model** • Establish a co-funding model to encourage greater private sector investment in upskilling and reskilling programmes. • By sharing financial responsibility, the model can lower barriers for companies to invest in workforce development, particularly in high-demand areas such as AI, Digital technologies, and Green Economy. • Co-funding arrangements would also allow the government to strategically align training programmes with national economic priorities, ensuring that the Malaysian workforce remains competitive and adaptable in a rapidly evolving job market.	

57. Department for Business, *Energy & Industrial Strategy, UK Aerospace Sector to Benefit from £400 Million Funding to Go Green*, July 2020, <https://www.gov.uk/government/news/uk-aerospace-sector-to-benefit-from-400-million-funding-to-go-green>

Initiatives	Case Studies
IN1.3 **Government to provide tax incentives** • Government to provide tax incentives for organisations investing in AI, Digital, and Green Economy initiatives to upskill/ reskill employees, especially Aerospace SMEs. • Soft landing programmes can be initiated by the government to incentivise industries that partake in AI, Digital, and Green Economy initiatives. Income tax exemptions can range from 70%-100% for a period of five (5) or 10 years. • Such tax incentives will encourage organisations to invest in workforce development, particularly in high-demand areas like AI and digital technologies. • These incentives will lower financial barriers for companies, making it easier for them to engage in upskilling and reskilling programmes, thereby enhancing the nation's competitiveness and sustainability.	**Grants to support Aerospace Components Development:** The Malaysian government is offering RM50 million in matching grants to support the development of aerospace components. To attract new aerospace companies and promote expansion, it will extend income tax incentives and investment tax allowances until 31 December 2025.[58]

Benefits

Funding and incentives for the Sector:
Government funding and incentives for the Aerospace sector, particularly in MRO and manufacturing, can drive innovation by enhancing infrastructure, equipment, and software, as well as increasing R&D and training for the workforce. These measures enable the value chain to expand into high-value R&D jobs, thereby contributing to revenue growth in the sector. While incentives vary by country, they typically include financial support, tax breaks, and grants.

Economic Growth and Competitiveness:
Tax incentives can stimulate investment in the Aerospace sector, leading to increased economic activity. This can result in higher GDP growth as the sector expands and contributes more to the overall economy. By receiving tax exemptions, Aerospace companies that engage in MRO and manufacturing can adopt these technologies, which can enhance the competitiveness of the national economy on a global scale. Additionally, by offering tax incentives, governments can attract international aerospace companies to set up operations domestically. This can enhance the country's position in the global aerospace market, increasing exports, and improving trade balances.

58. Malaysian Investment Development Authority (MIDA), *MoF: Govt allocates RM50 mln matching grants to support aerospace components development*, October 2022, <https://www.mida.gov.my/mida-news/govt-allocates-rm50-mln-matching-grants-to-support-aerospace-components-development-mof/>

IN2 Develop Policy and Regulation that are Supportive of the Adoption of AI and Digital by the Sector

This initiative focuses on developing policies and regulations that actively support the adoption of AI and digital technologies in the Aerospace sector, ensuring a conducive environment for innovation, competitiveness, and sustainable growth.

Initiatives	Case Studies
IN2.1 **Government to establish a central coordinating body for policy streamlining** • Establish a central coordinating body that includes representatives from key agencies, and industry associations such as MAIA, and selected key industry players. • This coordinating body would be responsible for streamlining policies and optimising resource allocation for AI, Digital, and Green Economy initiatives. • Additionally, it would facilitate regular industry roundtables and innovation hubs to encourage collaboration between industry players, academia, and government stakeholders. • Alternatively, another approach is to leverage the existing MyMAHIR Future Skills Talent Council (FSTC) as the coordinating body by expanding its mandate to include streamlining policy.	**National Institute of Standards and Technology (NIST):** In the US, NIST leads and participates in the development of technical standards, including international standards, that promote innovation and public trust in systems that use AI.[59] **Singapore's AI Governance Framework:** Singapore has implemented a comprehensive AI Governance Framework designed to promote the ethical and responsible use of AI technologies. This framework provides detailed guidelines for private sector organisations to ensure transparency, accountability, and fairness in their AI systems.[60]
IN2.2 **Government to create a dedicated oversight body for AI technology governance** • Government to establish an oversight body for public and private sector contributions in the design, development, use, and governance of AI technologies and systems. • This body will ensure that AI technologies are developed and deployed responsibly, with attention to ethical standards and public safety. • It will also foster collaboration between the public and private sectors, ensuring that AI advancements are aligned with national priorities.	

59. National Institute of Standards and Technology, *Innovation Unleashed*, <https://www.nist.gov/>
60. Personal Data Protection Commission, *Compendium of Use Cases: Practical Illustrations of the Model AI Governance Framework*, 2020

Initiatives	Case Studies
IN2.3 **Government to initiate curriculum reform emphasising on research and innovation, design, and entrepreneurial skills for the development of new technologies** • Government to mandate education institutions to revamp curricula by integrating hands-on research projects, design thinking modules, startup incubation programme, and offering mentorship programme led by experienced entrepreneurs and industry experts. • This will promote a shift from workforce-oriented mindset to a culture of innovation and entrepreneurship, fostering creativity, critical thinking, and problem-solving skills which are essential for the development of new technologies. • By embedding entrepreneurship and innovation at the core of education, students will be encouraged to explore ideas and turn them into viable business ventures. This mindset shift will empower graduates to contribute to the creation of new technologies and enterprises, driving Malaysia's economic growth and global competitiveness.	

Benefits

Expertise and Experience:
Industry players can offer valuable insights into the practical implications of regulatory changes and job creation, ensuring that policies are informed by the latest technological advancements and the sector's standards.

Standards and Transparency:
The oversight body will ensure that AI technologies are developed and deployed in accordance with ethical standards and public safety considerations. This helps to mitigate risks and build public trust in AI technologies.

Mitigation of Automation Risks:
By focusing on research, innovation, design, and entrepreneurship, it helps position Malaysia to move up the value chain. As automation and AI increasingly take over routine and assembly-line tasks, roles centred around creativity, innovation, and complex problem-solving are less susceptible to automation. This ensures that the workforce is equipped with skills that are in high demand and difficult to replace with machines, reducing the risk of job displacement and protecting Malaysia's economic resilience.

Benefits

Retention of High-Value Industries:
Developing a culture of innovation and entrepreneurship helps anchor high-value industries in Malaysia, making them less likely to relocate to countries offering cheaper labour. By fostering a workforce capable of driving technological advancements and creating proprietary technologies, Malaysia can retain industries that rely on skilled labour and innovation.

Higher Salaries and Economic Growth:
Graduates equipped with research, design, and entrepreneurial skills are better positioned to add significant value to products and services, leading to higher salaries and rewards. As these graduates contribute to the development of new technologies and enterprises, they enhance productivity and innovation within the economy. This increased value creation not only benefits individual workers but also drives up Malaysia's GDP contributions, leading to overall economic growth and improved standards of living.

Industry Players

IN3 Implementation of Continuous Learning and Development Programmes

This initiative addresses the talent gap by prioritising the continuous development of the workforce through ongoing education and professional growth initiatives. It creates targeted programmes that adapt to the evolving needs of the sector, ensuring employees remain highly skilled and relevant.

Initiatives	Case Studies
IN3.1 **The industry is to support employee learning in emerging AI technologies by leveraging e-learning platforms and AI-driven learning to provide comprehensive in-house training** • The Aerospace sector, including MRO, is to leverage e-learning platforms and AI-driven learning through online courses, virtual reality (VR), and augmented reality (AR) technologies to supplement practical training. • The industry can work with e-learning providers to customise content to match the specific needs of the company. This could include creating industry-specific modules, integrating company case studies, and aligning learning paths with job roles. • These platforms offer employees flexible learning opportunities, enabling them to engage in training at their own pace, while benefiting from immersive experiences.	**Lockheed Martin uses VR technology integrated with e-learning platforms:** Lockheed Martin offers immersive maintenance training for aerospace technicians. AI algorithms analyse technicians' training needs and create personalised learning paths, which include interactive VR scenarios for complex maintenance tasks. AI-driven analytics monitor training outcomes, allowing Lockheed Martin to continuously adapt and enhance training programmes based on technician performance.[61]

61. Lockheed Martin, *Immersive Training Devices: Blending Real and Simulated Worlds Together*, April 2023, <https://www.lockheedmartin.com/en-us/news/features/2023/immersive-training-devices-blending-real-and-simulated-worlds-together.html>

Initiatives	Case Studies
IN3.2 **Implement AI and data analytics to create personalised learning experiences and monitor training outcomes** • The industry is to use AI to create personalised learning paths for employees and apply data analytics to track progress and effectiveness. • The industry can implement AI algorithms that can analyse learning content to match it with individual learning needs based on employees profile, roles, and past performance. • Personalised learning paths will ensure that training is tailored to individual needs, maximising its impact on employee development.	
IN3.3 **Industry to conduct soft skills workshops focusing on leadership, communication, collaboration, teamwork, critical thinking, and business acumen** • The industry is to assess the current soft skills gaps within their employees. This can be done through surveys, interviews, and feedback from both management and employees. • Once key areas for improvement are identified, workshops can be organised to address these gaps. These workshops should cover effective communication techniques, strategies for collaboration and teamwork, critical thinking exercises, and insights into business operations and decision-making. • These workshops will be essential for enhancing basic skills among employees in the MRO and manufacturing sectors. • Strengthening soft skills will improve workplace dynamics and overall productivity, ensuring that employees can effectively navigate complex business environments.	**Airbus Leadership University:** Airbus has a training programme for its employees that offers leadership and management training. Airbus also provides technical training and career development opportunities to ensure employees are proficient in the latest aerospace technologies and practices.[62]

62. Airbus, *Airbus Leadership University*, <https://brand.airbus.com/en/guidelines/sub-identities/airbus-leadership-university>

Benefits
Adapting to Technological Advancements: The swift pace of technological innovation, including AI and automation, is revolutionising industries. Continuous upskilling enables workers to adapt to new skills, tools and processes, while maintaining their value and employability. It further helps employees to be more productive as they can focus on high value services when repetitive tasks are automated by AI. **Industry-Specific Modules:** Customising content to include industry-specific modules and company case studies ensures that training is directly relevant to the company's needs. This targeted approach helps employees understand how emerging AI technologies apply to their specific roles and industry challenges. **Alignment with Job Roles:** Aligning learning paths with job roles ensures that training is focused on the skills and knowledge required for each position, enhancing job performance and career development. **Boost Innovation and Problem-Solving:** Continuous soft skill learning and exposure to new ideas encourage employees to think creatively, critically and innovatively. This fosters a culture of continuous improvement, teamwork, collaboration and proactive problem-solving, driving business growth.

IN4 Collaborate between Industry, Government, Academia, and Training Providers

This initiative aims to create a synergistic partnership among industry, government, academia, and training providers to enhance industry competitiveness and develop industry-aligned curricula and training programmes.

Initiatives	Case Studies
IN4.1 **The industry is to collaborate actively with each other, as well as with government, academia, and training providers, to promote cross-knowledge transfer** • Some possible collaborations include curriculum development, mentorship opportunities, guest lecturers from the industry, workshops, and joint research projects. • Industry players will be able to share detailed industry and aerospace regulatory requirements and identify innovative or new approaches in training and syllabus development.	**Growing collaboration between academia and industry in India's aerospace and defence sector:** These partnerships aim to foster innovation, research, and development by leveraging academic expertise and industry resources. Key areas of focus include indigenous technology development, skill enhancement, and knowledge exchange, which are essential for strengthening India's aerospace and defence capabilities. Such collaborations also help bridge the gap between theoretical knowledge and practical application, ultimately contributing to the country's self-reliance in these strategic industries.[63]

63. Mahankali Srinivas Rao, *Academia-industry collaborations in India's aerospace and defence sector, Your Story,* April 2024, <https://yourstory.com/2024/04/academia-industry-collaborations-india-aerospace-and-defence-sector>

Initiatives	Case Studies
• These partnerships will promote cross-knowledge transfers among industry players, as well as with government entities, regulatory bodies, academia, and training providers, particularly in the areas of MRO and manufacturing. • By fostering collaboration, these initiatives will enhance the industry's competitiveness and contribute to the growth of the national economy.	

Benefits

Industry-aligned Curricula:
Industry involvement in curricula will help develop well-prepared graduates, fostering industry-academia relationships, and driving economic growth. By ensuring that educational programmes are relevant and up-to-date, such partnerships can help meet the evolving demands of the job market and contribute to sustainable development goals.

Talent Pipeline for the Industry:
Collaborating with training providers helps create a pipeline of skilled professionals who are trained in the specific technologies and skills relevant to the industry.

Customised Training for the Industry Needs:
Industry input can ensure that training programmes are tailored to the actual needs of businesses, resulting in a workforce with the right skills and knowledge.

Academia

IN5 Develop Industry-Relevant Curriculum

This initiative requires reforms and adjustments to enhance curricula, ensuring that the content is practical, up-to-date, and relevant to the industry, particularly for courses related to automation, digital technology, and sustainability.

Initiatives	Case Studies
IN5.1 **Higher learning institutions are to ensure that tertiary education syllabuses are industry-driven** • Higher learning institutions are to ensure that curricula are practical, up-to-date, and aligned with industry needs by involving industry experts in the curriculum development process. • This collaboration will ensure that the content of courses, particularly those related to automation, digital technologies, and sustainability, remains relevant and practical. • By integrating industry expertise, educational programmes can better prepare students for the demands of the workforce, ensuring they possess the skills needed in a rapidly evolving job market.	**Singapore Institute of Technology (SIT) and Singapore Airlines Engineering Company (SIAEC) Collaboration:** SIT collaborated with SIAEC to develop an Aircraft Systems Engineering degree programme. The programme includes modules on automation in aircraft maintenance, digital technologies for predictive maintenance, and sustainable practices in aerospace engineering.[64]
IN5.2 **Develop internship and apprenticeship programmes that provide students with hands-on experience through industry-driven projects** • Higher learning institutions are to collaborate with industry to develop internship and apprenticeship programmes. • These programmes will allow students to gain valuable hands-on experience and apply theoretical knowledge to practical situations, such as aircraft maintenance, flight testing, and component manufacturing.	**Cranfield University and Airbus Partnership:** Embry-Riddle Aeronautical University partners with Boeing to offer comprehensive internship and apprenticeship programmes. Students are given the opportunity to work at Boeing's facilities, engaging in projects related to aircraft maintenance, avionics, and flight systems.[65]

64. Singapore Institute of Technology, *Aircraft Systems Engineering*, <https://www.singaporetech.edu.sg/undergraduate-programmes/aircraft-systems-engineering>
65. Embry-Riddle Aeronautical University, *Boeing Joins Embry-Riddle's Aviation Maintenance SkillBridge Program for Transitioning Military Personnel*, June 2023, <https://news.erau.edu/headlines/boeing-joins-embry-riddles-aviation-maintenance-skillbridge-program-transitioning-military-personnel>

Initiatives	Case Studies
• By integrating industry-driven projects into the syllabus, students will have opportunities to engage in practical problem-solving, making them more competitive in the job market.	

Benefits

Increased Institutional Prestige:
Institutions that proactively align their curricula with industry standards and trends are often recognised as leaders in educational innovation. This alignment can attract more students, increase enrolment, and enhance the institution's standing in academic rankings.

Enhanced Practical Skills and Industry Readiness:
By ensuring that the syllabus is driven by the specific needs of the Aerospace sector, higher learning institutions can produce graduates who are equipped with the specialised skills and knowledge required by aerospace employers. This alignment increases the employability of graduates.

Strengthened Industry-Academia Relationships:
By forming partnerships with aerospace companies, higher learning institutions can establish valuable relationships that lead to joint research projects, funding, and enhanced learning resources. These partnerships can also provide access to cutting-edge technologies and industry insights.

IN6 Promote Micro-Credential Courses

This initiative—promoting micro-credential courses—is essential for equipping experienced employees with specialised skills that meet current demands of the sector.

Initiatives	Case Studies
IN6.1 **Higher learning institutions to promote micro-credential courses** • Active promotion of micro-credential courses can address the growing demand for specialised skills in various fields within the Aerospace sector. • By offering short, targeted courses, institutions can provide students and professionals with the opportunity to acquire specific competencies quickly and efficiently within AI, Digital and Green Economy.	**The Aviation Aerospace Australia micro-credential programme:** This programme is designed by industry experts to provide targeted, practical training for professionals in the Aviation and Aerospace sectors. The courses cover essential topics such as fatigue management, air traffic management, and aviation safety, with input from industry professionals to ensure relevance and applicability. These micro-credentials offer learners a fast, efficient way to gain or enhance specific skills that are directly aligned with industry needs, fostering a pipeline of skilled talent for the sectors.[66]

66. Aviation Aerospace Australia, *Find your Flight Path: The new aviation and aerospace fundamentals short courses*, <https://www.aviationaerospace.org.au/designed-by-industry>

Initiatives	Case Studies
• Micro-credentials, which focus on practical skills and knowledge, enable learners to enhance their qualifications and remain competitive in a rapidly evolving job market.	

Benefits

Immediate and Future Skill Development:
As aerospace roles evolve with technological advancements, micro-credentials help learners remain competitive by equipping them with up-to-date, practical skills that are directly aligned with industry demands. This continuous upskilling ensures that the workforce remains adaptable to changing job requirements.

Accelerated Learning:
These short, focused courses allow students and professionals to rapidly gain specific competencies without the time commitment of traditional degree programmes, making them ideal for continuous learning.

Training Providers

IN7 Develop Training Content Needed by the Sector

This initiative focuses on developing training content that aligns with the evolving needs of the sector, emphasising the latest advancements in AI, Digital, and Green Economy to bridge skill gaps.

Initiatives	Case Studies
IN7.1 **Training providers to develop high quality training programmes that are in demand by the Aerospace sector** • Design, develop, and deliver comprehensive training programmes that focus on reskilling and upskilling the workforce in critical areas such as AI, Digital, and green technologies. • These programmes should be tailored to meet the evolving demands of the Aerospace sector, equipping professionals with advanced skills and knowledge in emerging technologies.	**Dviation Training Centre:** Dviation Training Centre is a one stop Malaysian-based provider, and has conducted over 1,849 training sessions and trained more than 10,000 aviation and aerospace professionals. With an average of 30 years of industry experience among its instructors and a portfolio of 120 available courses, the centre ensures that graduates have aircraft access for on-job-training.[67] **Allied Aeronautics Training Centre:** Allied Aeronautics Training Centre is an approved maintenance training organisation accredited under *Jabatan Pembangunan Kemahiran Malaysia*. Their training modules, trainers, as well as facilities are monitored and audited by the Civil Aviation Authority of Malaysia (CAAM).[68]

67. Dviation Training Centre, <https://www.dviation.com/>
68. Allied Aeronautics Training Centre, <https://aatc.com.my/>

Initiatives	Case Studies
IN7.2 **Training providers need to align their training courses towards achieving certification** • Develop training programmes that are strategically aligned with recognised industry certifications and approved by CAAM, ensuring that trainees gain credentials that enhance their career progression opportunities. • These programmes should be designed to meet certification requirements and should provide practical, hands-on experience that prepares individuals for real-world challenges.	**France's Aero Ground Training:** Aero Ground Training provides maintenance training for Airbus, ATR, Boeing, Embraer, and Hawker & Fokker. From initial courses to continuation training, all sessions are conducted in English, with practical training carried out on real aircraft.[69]

Benefits

Credential Enhancement for Trainees:
Having training programmes aligned with recognised industry certifications and approved by the CAAM provides trainees with valuable credentials. These certifications enhance career progression opportunities and boost employability in the Aerospace sector.

Alignment with Sector Demands:
Tailoring programmes to meet the evolving demands of the Aerospace sector will help address specific skill gaps and prepare professionals for emerging technologies, ensuring that the industry remains competitive and innovative.

69. Aero Ground Training, <https://www.agt.aero/>

IN8 Offer Diverse Delivery Methods

This initiative recommends offering a mix of aerospace training methods–online, in-person, and hybrid–while integrating digital twin technology to provide interactive, immersive simulations and practical experience. This approach is tailored to diverse learning needs and enhances overall training effectiveness.

Initiatives	Case Studies
IN8.1 **Training Provider to implement various delivery methods** • Training providers are to incorporate multiple delivery methods, including online, in-person, and hybrid models. This approach will accommodate different learning preferences and schedules, making the training more accessible and flexible for a wider audience. • Training providers can utilise digital twin technology via virtual reality to develop interactive training scenarios where participants can manipulate variables, observe outcomes, and practice maintenance or engineering tasks in a virtual environment. This hands-on approach will enhance understanding and application of aerospace concepts.	**Training and Simulation by ST Engineering:** ST Engineering harnesses technology and innovation to create a more sustainable world. It delivers simulation, gaming, and networking technology while ensuring training safety and efficiency. By using immersive technology, these programmes enable digital learning transformation, empowering both learners and instructors.[70]

Benefits

Enhanced Learning Experience:
Providing a variety of delivery methods allows participants to choose the format that best suits their learning style, leading to more effective training outcomes and enhanced learner engagement.

70. ST Engineering, <https://www.stengg.com/>

Taking into account the Initiatives proposed, moving forward, these are the

Top 5 Initiatives

needed to kickstart the workforce transformation towards AI, Digital, and Green Economy to ensure their successful implementation

1 GOVERNMENT

The government to allocate fundings and provide tax incentives to encourage organisations to invest in workforce development in AI, Digital, and Green Economy areas.

2 GOVERNMENT

The government to reform curricula to emphasise research, innovation, design, and entrepreneurship by integrating hands-on projects, design thinking, and mentorship, fostering a culture of creativity and problem-solving to drive new technology development.

3 INDUSTRY PLAYERS

Industry to collaborate with government, academia, and training providers on curriculum development, mentorship, and research projects to facilitate cross-knowledge transfer.

4 ACADEMIA

Learning institutions should ensure curricula are industry-driven by involving experts in the development process, keeping courses in areas like automation, digital technologies, and sustainability relevant and practical to better prepare students for the evolving job market.

5 TRAINING PROVIDERS

Training providers should develop comprehensive programmes focusing on reskilling and upskilling in AI, Digital, and Green technologies to meet the evolving demands of the Aerospace sector and equip trainees with advanced skills in emerging technologies.

Conclusion

The **Aerospace sector** stands out as a unique field where its workforce remains the nucleus of the sector. It embraces evolving trends with a discerning focus, prioritising safety, quality, and efficiency above all.

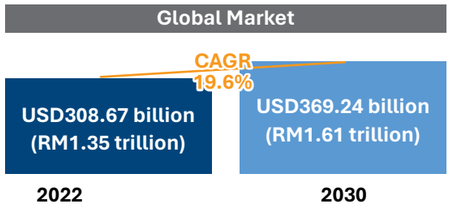
The **global Aerospace market** has witnessed remarkable growth, reaching **USD308.67 billion (RM1.35 trillion)** in 2023 and projected to hit **USD369.24 billion (RM1.61 trillion) by the end of 2024**, driven by a robust CAGR of 19.6%. This resurgence post-pandemic highlights a surge in air travel demand, technological progress, emerging economies, evolving social trends, and favourable interest rates.[71]

Malaysia's Aerospace sector reflects this global momentum. Contributing **RM1.4 billion to the nation's GDP in 2022**, it showcases impressive growth with a CAGR of 17.6%. While still growing compared to more established sectors, it holds significant promise, driven by rising air traffic and demand for MRO services and aero-manufacturing. Recognised by the NIMP2030 as a **strategic and high-value sector**, Malaysia's Aerospace sector stands as a key player in Southeast Asia, pivotal to national development and investment priorities. Notably, Malaysia is Airbus' third largest market in the Asia-Pacific region, following China and India, and serves as the largest supplier base for Airbus in Southeast Asia.[72]

As highlighted in this study, advancements in AI, Digital, and Green Economy are making waves and will demand significant workforce changes over the next three (3) to five (5) years. While the Aerospace sector remains more human-centric compared to other fields, it will still be impacted and must prepare for this transformation to stay competitive on the global stage. Our impact study has identified that **10 roles** (5%) are **highly impacted** by AI, Digital, and Green Economy, **162 roles** (89%) are **moderately impacted**, and **11 roles** (6%) are **minimally impacted**. Additionally, **six (6) emerging roles**, eight (8) in-demand AI and digital skills, and five (5) in-demand green skills have been pinpointed as key drivers of future advancements and innovations within the dynamic Aerospace sector. Certain roles could become obsolete or diminished in relevance, prompting the study to identify viable career pathways and essential skill sets for the Malaysian workforce, ensuring they are ready for future challenges and opportunities.

Looking ahead, embarking on this journey of continuous adaptation and innovation will be vital in preparing the Aerospace workforce for ongoing advancements in AI, Digital, and Green Economy. To achieve this, the **MyMAHIR FSTC** will conduct regular needs assessments to identify immediate and future workforce skills gaps, analyse talent demands by sector and educational level, propose strategies, determine essential sector-specific skills, and periodically update these skills in response to technological advancements and evolving operating environments. Additionally, the council will align the educational system with the sector's needs while actively **fostering collaboration among Government, Industry Players, Academia, and Training Providers** to enhance Malaysia's competitiveness and promote sustainable growth in the Aerospace sector. Furthermore, this alignment will further strengthen the positioning of the Aerospace sector, particularly MRO and manufacturing, as a driver of national prosperity and international recognition.

The global Aerospace market has witnessed remarkable growth



Key trends impacting existing roles:

The study identified 10 job roles that will be highly impacted by these trends, along with 6 emerging roles, and 13 in-demand skills essential for future advancements.

71. The Business Research Company, *Aerospace Global Market Report 2024*, February 2024
72. Ministry of Investment, *Trade and Industry, New Industry Master Plan 2030: Aerospace Industry*, 2023

Validation Workshop

Validation Workshop





















Abbreviations

Abbreviations

ACM	Aerospace Composites Malaysia
AGPs	Automated Guided Painters
AI	Artificial Intelligence
AIM	Aerospace Industries Malaysia
AIROD	Aircraft Inspection, Repair, and Overhaul Depot
AM	Autonomous Maintenance
AMIC	Aerospace Malaysia Innovation Centre
AMMI	Association Of Malaysian Medical Industries
APAC	Asia Pacific
AR	Augmented Reality
ASEAN	Association Of Southeast Asian Nations
CAAM	Civil Aviation Authority Of Malaysia
CAMO	Continuing Airworthiness Management Organisation
CAD	Computer-aided Design
CADCAM	Computer-Aided Design Computer-Aided Manufacturing
CAGR	Compound Annual Growth Rate
CBAM	Carbon Border Adjustment Mechanism
CFRP	Carbon Fibre Reinforced Polymers
CMM	Coordinate Measuring Machine
CNC	Computer Numerical Control
CREST	Collaborative Research In Engineering, Science & Technology
DMS	Document Management Systems
EADS	European Aeronautic Defence and Space Company
ELM	Engineering Lifecycle Management
ESG	Environment, Social, And Governance
eVTOL	electric Vertical Takeoff and Landing
FAI	First Article Inspection
FDD	Fault Detection And Diagnosis
FEA	Finite Element Analysis
FPQ	First Part Qualification
FSTC	MyMAHIR Future Skills Talent Council
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GLCs	Government Linked Companies
HPC	High Performance Computing
ICT	Information and Communications Technology
IR4.0	The Fourth Industrial Revolution
KESUMA	Ministry of Human Resources
KLIA	Kuala Lumpur International Airport
LLMs	Large Language Models
MAB	Malaysia Airlines Berhad
MAIA	Malaysian Aerospace Industry Association
MCC	Maintenance Control Centre
MDEC	Malaysia Digital Economy Corporation
MES	Manufacturing Execution System
MIDA	Malaysian Investment Development Authority
MITI	Ministry of Investment, Trade And Industry
ML	Machine Learning
MNCs	Multinational Companies
MOC	Maintenance Operation Centre
MRB	Material Review Board
MRO	Maintenance, Repair, And Overhaul
MSDS	Material Safety Data Sheet
MyDIGITAL	Malaysia Digital Economy Blueprint
MyNSR	Malaysia National Skills Registry
NDT	Non-Destructive Testing
NETR	National Energy Transition Roadmap
NIMP 2030	New Industrial Master Plan 2030
NIST	National Institute Of Standards And Technology - US
NLP	Natural Language Processing
NOSS	National Occupational Skills Standard
OEE	Overall Equipment Effectiveness
PCA	Personal Competency Assessment
PLCs	Public Listed Companies
PM	Preventive Maintenance
PPV	Process Performance Verification
QMS	Quality Management System
R&D	Research And Development
RMKe-12	Twelfth Malaysia Plan
ROI	Return On Investment
RPK	Revenue Passenger-Kilometres
SAE	Sepang Aircraft Engineering
SAF	Sustainable Aviation Fuels
SDGs	Sustainable Development Goals
SIAEC	Singapore Airlines Engineering Company
SIT	Singapore Institute Of Technology
SMEs	Small And Medium-Sized Enterprises
TP	Tooling Qualification
TUSAS	Turkish Aerospace Malaysia
UAV	Unmanned Aerial Vehicles
UK	United Kingdom
US	United States
VR	Virtual Reality
YAB	Yang Amat Berhormat

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D'viation Group

Innopeak

Invest Selangor Berhad (SDAICO)

Malaysia Aerospace Industry Association (MAIA)

Malaysia Airlines Berhad Engineering Services

Malaysian Space Agency (MYSA)

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