

SINGAPORE

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APRIL 17, 2024

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CEMS & ABB

Sustainability & Digitalization for the Aviation Industry



Team Presentation



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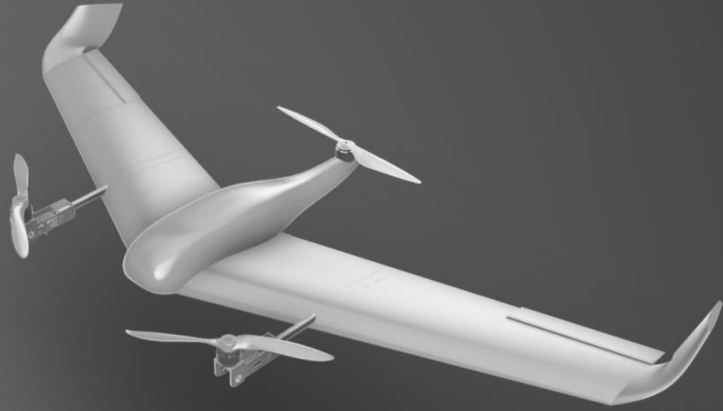


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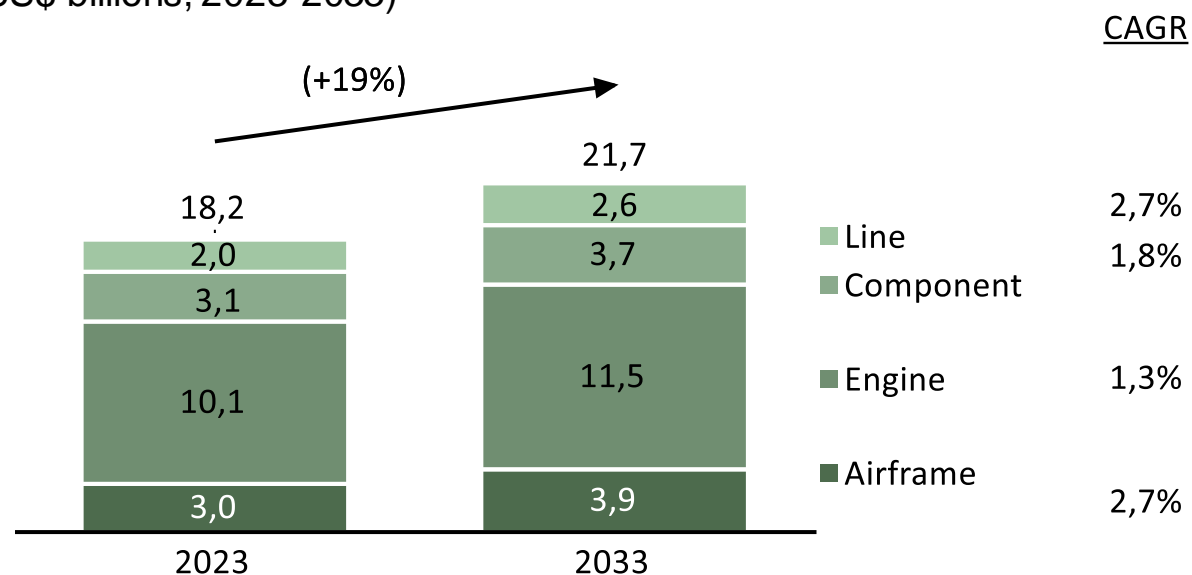


01

Market Analysis

The MRO market in Asia Pacific is expected to grow ~19% by 2033

Asia Pacific MRO demand forecast by part
(US\$ billions, 2023-2033)



2023 marked a **speedup in fleet recovery in a region heavily dependent on the international** segment; The MRO demand in 2023 recovers beyond the 2019 peak of \$17 billion to \$18 billion. Between 2023 and 2033, demand is expected to grow at an average CAGR of 1.8%

Asia Pacific MRO market concentration



Market will remain fragmented, with a lot of SMEs gaining more traction

The MRO market shows continuous growth, with strong demand drivers but challenges limiting capacity

Key factors influencing the MRO market for the next 10 years



Shortage in the labor market, production and maintenance delays

Shortfall of aviation workers (including mechanics) is a global problem, leading to supply chain disruptions in all stages of the value chain and increasing operating costs (global rise in fuel, labor and spare parts)



CO2 emissions

With the increasing demand for airtravel, aviation will face the likelihood of rising emissions, lacking a solution to reduce it other than use of SAF (sustainable aviation fuel)



Increase in demand for MRO

Deferred maintenance over last three years coming due and global projected 33% increase in aircrafts by 2033, with a larger percentage being based in Asia (36% vs. historical 30%). Increase in aircraft utilization will also drive MRO demand (except for airframe with calendar checkups, other parts are tied to hours flown)



Global conflicts

Global MRO supply chain has been disrupted by wars (mainly Russia's invasion of Ukraine), with lack of sufficient metals in the market for production of parts. Increase of lead time and salvage of parts – use of more PMA (parts manufacturer approval components)

The MRO market can be segmented according to the main parts of the aircraft – line, component, engine and airframe



Line

Routine maintenance and inspection of aircraft on the ground, such as refueling, cleaning, and minor repairs



Component

Maintenance and repair of the components and parts of aircrafts, such as landing gears, avionics, hydraulics, and electrical systems



Engine

Maintenance and repair of the engines and the related systems of the aircraft, such as fuel, oil, and air



Airframe

Maintenance and repair of the airframe and the structure of the aircraft, such as the fuselage, wings, and tail

All the segments have been facing important changes due to lack of labor and technological advancement



Robotics and automation



AI & natural language processing

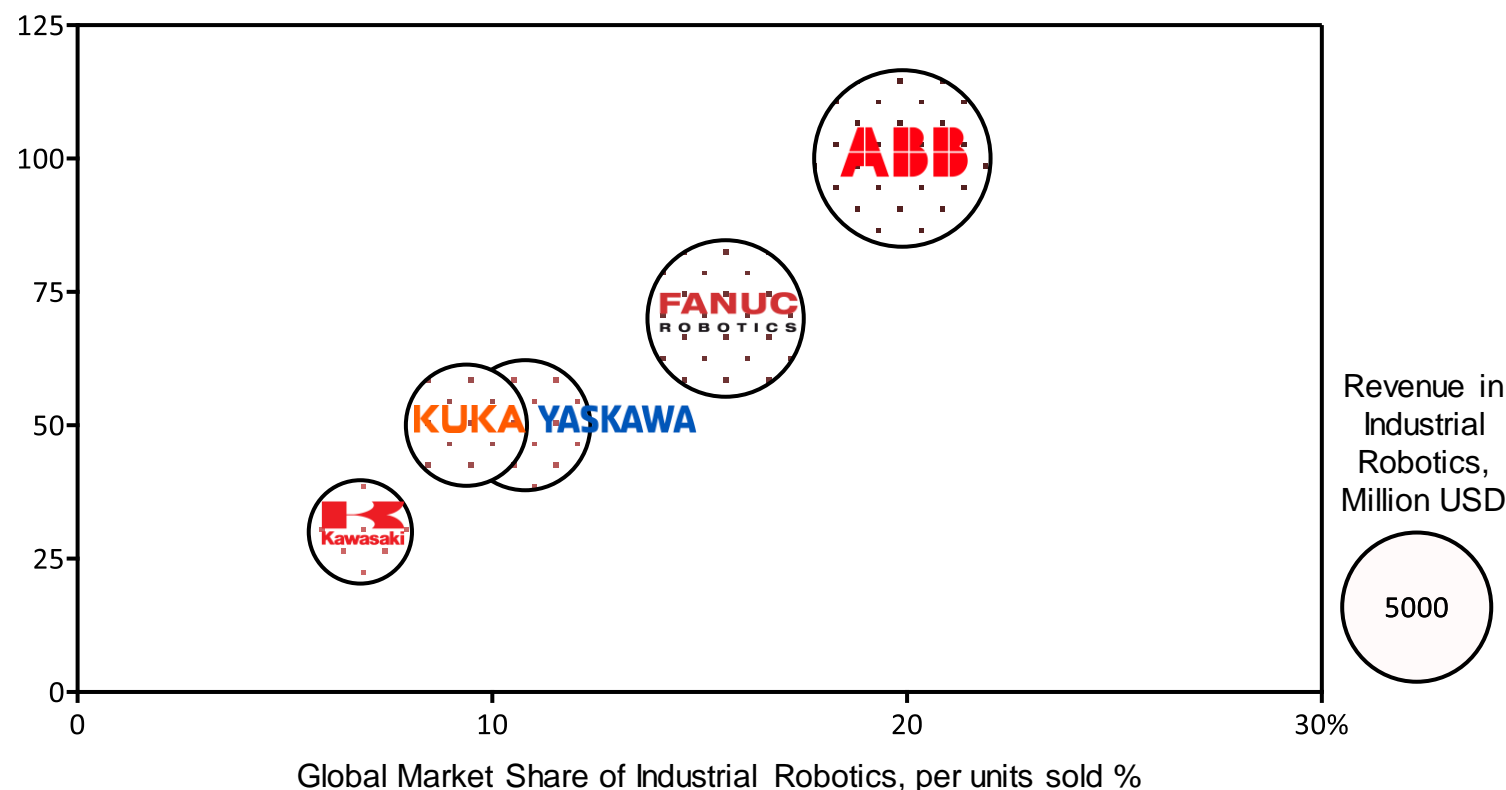


Virtual & augmented reality

Competition analysis: Key market players in APAC region for robots and automation in aviation

Key Market Players within Asia Pacific for robots in aviation, 2022

Coverage of Solutions, %



APAC region is the **fastest-growing market for robotics** and automation, with a projected **CAGR of 15.4%** from 2020 to 2027, reaching \$198.4 billion by 2027

Highly competitive and diverse market; about 250 players, including global, regional, and country-niche players

The **big four industrial robotics players hold about 55% of the market revenue share**



02

ABB Capabilities

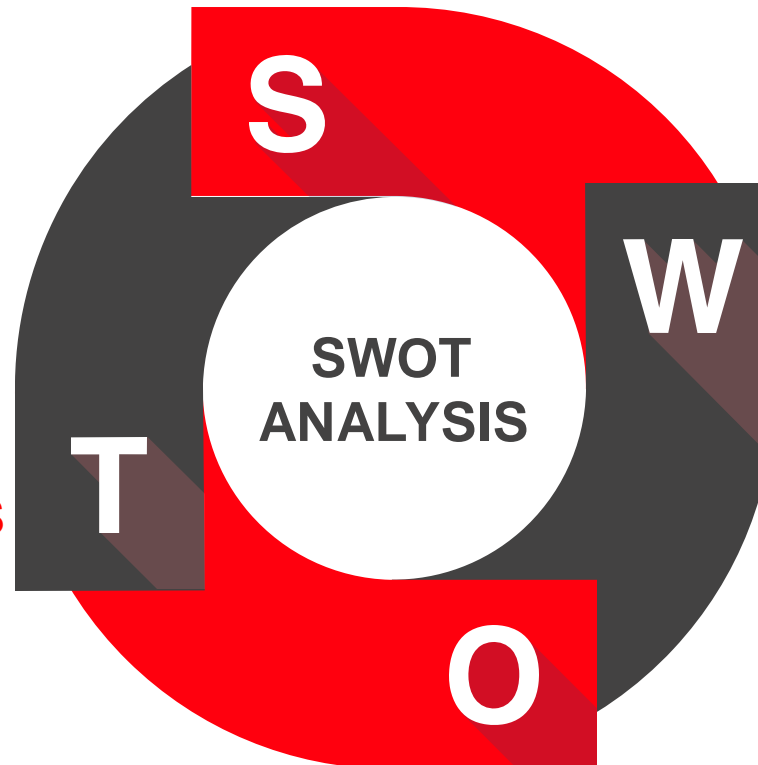
ABB's expertise in digitalization and automatization combined with its strong global brand are crucial in acquiring new clients

STRENGTHS

- Strong **brand** recognition and **global presence**
- Diversified **product portfolio** (revenues)
- **Competitive advantage** through product innovation
- Strong **financial position**, allowing for key investments, e.g., acquisition of B&R in 2017

THREATS

- **Competition** from other global robotics
- **Supply chain** interruptions, like raw materials
- Changing **regulatory and political environment**



WEAKNESSES

- **Dependence** on European market
- Increasing **complexity** of its **portfolio** of products and services
- **Slower innovation** cycle than peers

OPPORTUNITIES

- **Expansion** into growing markets, such as SEA
- **Digitalization & automation**: expertise can be used for product innovation & improving tailored offering
- **Labor shortage**: ABB as ideal partner
- **Mergers & Acquisition**: mix of internal and external innovation

After Singapore Airshow: What's the next ?



Digital Transformation & innovation

- Thale enhance the smart factory capability of Singapore
- Elbit system company offers multi-purpose UAV
- Starburst Aerospace supporting innovation program



Sustainability aviation

- Airbus 's Singapore sustainable aviation Hub
- A sustainable aviation fee (SAF) levy will be implement in 2026
- Corporate with McKinsey for in-depth Sustainable Development Solutions



Recovery of Future MRO

- Pratt & Whitney Expands Eagle Service Asia (ESA) facility in Singapore
- Rolls-Royce's aggressive Trent family upgrade program.
- Thai Airways, Taiwan's Starlux Airline increase the orders from Airbus and Boeing



Strong Development in China's Aviation Industry

- First debut of COMAC 's C919 and ARJ21
- China-Singapore Bilateral Aviation Form

ABB can leverage the major trends by adopting in key areas, such as:

ABB ability™ solution adopted in the aviation industry

Power Electronics machine & Decarbonization

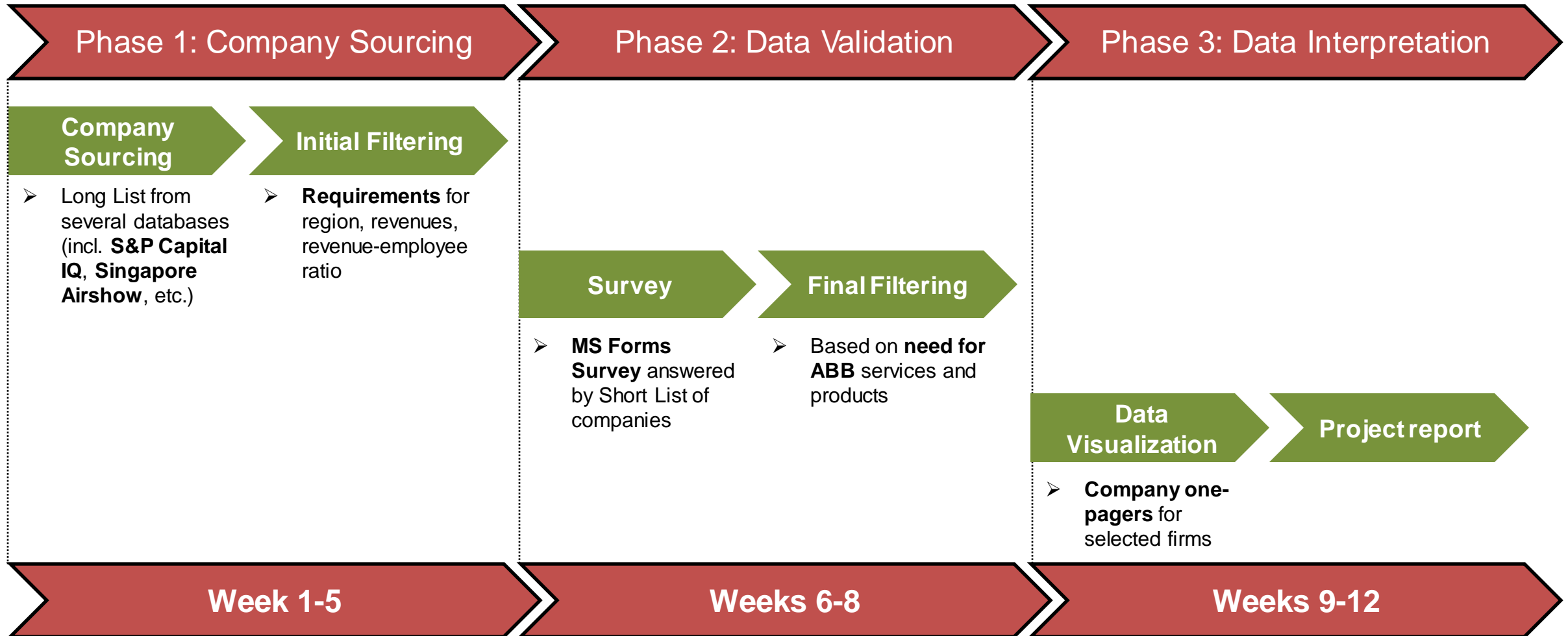
Enhance partnership with Chinese aviation sector



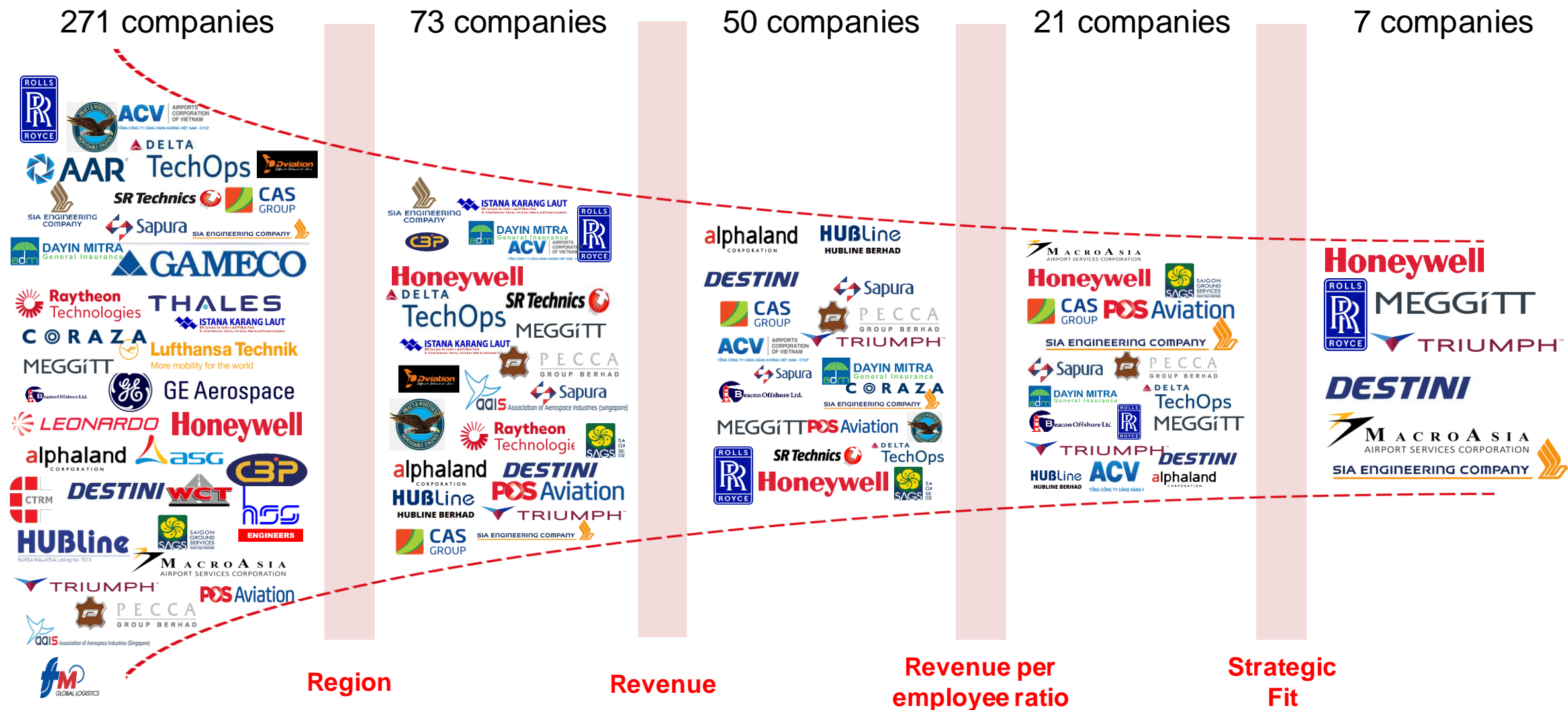
03

Customer Analysis

Our approach to identifying potential clients for ABB in Aviation



7 companies were selected as best strategic targets for ABB



Notes: only companies from SEA were considered for initial list

17.04.2024

Strategic fit was based on companies processes and its alignment with ABB offerings

	Honeywell	RollsRoyce	Meggitt	SIA	Destini	MacroAsia	Triumph
Airfoil blade welding and tip blending						✓	✓
Airfoil blade weldment blending						✓	
Airfoil defect inspection/identification			✓		✓	✓	✓
Masking process (pre-treatment)						✓	
Vane adhesive dispensing						✓	
Airfoil Honeycomb stripping		✓					
Sand blasting	✓				✓	✓	
Plasma spray	✓		✓	✓		✓	
Engine screw dismantling	✓	✓	✓			✓	✓
Engine hub staking and assembly		✓	✓	✓		✓	✓
Airfoil parts automation	✓						✓
High pressure waterjet cleaning	✓	✓	✓	✓		✓	
CNC machine tending		✓					✓
Metal polishing and deburring				✓		✓	
Spray painting	✓	✓	✓	✓	✓	✓	
Grit blasting	✓		✓	✓	✓	✓	
Dry ice blasting	✓		✓	✓		✓	

- Companies selected have at least **4 MRO processes** that could benefit from ABB automatization solutions
- **MacroAsia** is the player with **largest synergies** with ABB

Notes: table is a preliminary understanding of the processes offered by each player; discussion with the commercial team of each company is essential to obtain more precise conclusions

Honeywell Ltd

Company Description

Established in 1885, the company specializes in providing a robust portfolio of technological solutions for the aerospace industry, focusing on power units, engine manufacturing, fuel efficiency, sensor switches, and navigation.

"90% of aircraft in the world use Honeywell avionics"



Key Metrics

	Revenue (in S\$)		# Employees		Headquarter
	47 bn		27'000		USA

Honeywell



Portfolio/Active Markets

-  Electronic solutions, engines and power systems, MRO of aerospace components
-  Singapore is the HQ of its APAC operations

Strategic Fit with ABB

- Decades of experience in making coating, plating and insulator, matched with ABB's plasma spray and surface treatment technique
- Engine Product Lifecycle synergy
- Honeywell's independent Health and Usage Monitoring Systems , ABB has the potential involved in the cleaning and maintenance process

Contact information

- Tel : +65 6861 4533
- Email : Xinyu.Guo@honeywell.com
- Address: 161 Gul Circle , 629619, Singapore

Rolls – Royce Pte Ltd

Company Description

Rolls-Royce is the world's leading engine supplier, has been present in Singapore since the 1950s. The Seletar campus in Singapore is the only Wide Chord Fan blade manufacturer in the APAC region.

"We account for more than 15% of Singapore's aerospace industry"

Key Metrics



Revenue (in S\$)

28 bn



Employees

2'300



Headquarter

UK

Strategic Fit with ABB

- 'Carestore' service: provide engine management programme & engine health monitoring. ABB could engage in the engine's MRO process.
- In 2023, Rolls-Royce cut off 6% of its workforce, aiming to eliminate redundancies and reduce costs. ABB can offer robotic automated tech to help improve cost efficiency.



Portfolio/Active Markets



Engine manufacturing to maintenance, providing MRO services for the entire product cycle



USA, UK, Germany, India, Singapore, Japan

Contact information

- Tel: +65 6240 3333
- Email: SE_Asia@rolls-royce.com
- Address: 1 Seletar Aerospace Crescent, 797575, Singapore

SIA Engineering Company (SIAEC)

Company Description

SIAEC was established in 1992. Formed from the engineering arm of Singapore Airlines (SIA), SIAEC is the foremost provider in Asia, offering complete MRO services for current and new generation wide and narrow-body aircraft

Key Metrics



Revenue (in S\$)
796 mn



Employees
5'500



Headquarter
Singapore

Strategic Fit with ABB

- SIAEC's dedicated paint hangar, provides aircraft exterior stripping and repainting services in a controlled environment, making high paint quality.
- Strong Partnerships with large space companies.
- Mature engine and components MRO service process.

SIA ENGINEERING COMPANY



Portfolio/Active Markets



MRO services in airframe, line, cabin, fleet management, components and engines



Asia Pacific, Americas, Europe and Middle East

Contact information

- Tel :+65 65416794
- Mail: siaec_commercial@singaporeair.com.sg
- Address: 31, Airline Road, Singapore 819831

Parker Meggitt

Company Description

Meggitt designs and manufactures high performance components and sub-systems for the aerospace, defense, and energy markets. 2022 Parker Hannifin completes acquisition of Meggitt, both of them participate in MRO and , providing precision engineered solutions for aviation industry

Key Metrics



Revenue (in S\$)

2,5 bn



Employees

9'000



Headquarter

UK

Strategic Fit with ABB

- Priority target for 2024 is to continue managing raw material and labor cost inflation in the global supply chain.
- Increase of Meggitt's backlog order in 2023.
- Meggitt's EFC100 series of products have requirements for brushing and spraying machines.



MEGGITT



Portfolio/Active Markets



Engine, civil aircraft , helicopters, business jets



USA, UK, Europe, APAC

Contact information

- Tel : +65 6511 7200
- Mail: jeffrey.miller@parker.com
- Address: 1a Seletar Aerospace Link, Singapore 797552

MacroAsia Corporation

Company Description

MacroAsia Corporation, through its subsidiaries Lufthansa Technik Philippines, Inc. (LTP), engages in the aviation-support businesses in the Philippines, especially MRO services. With strong sustainability, MacroAsia Corporation has a high reputation and wins awards as a provider of world-class MRO services.

Key Metrics



Revenue (in S\$)

177 mn



Employees

6'912



Headquarter

Philippines



MACROASIA CORPORATION



Portfolio/Active Markets



Aircraft overhaul, major modifications, cabin reconfiguration, and aircraft painting.



Manila, Philippines

Strategic Fit with ABB

- High sustainability (Environment & Social)
- High investment in MRO facilities, high demand for MRO facilities
- Employee wages and benefits being its second largest economic distribution (35.28%) → Demand for ABB's products to reduce labour costs and increase efficiency
- High Strategic fit → 16 offerings out of 19

Contact information

- Tel: (02) 8840-2001/(02) 8840-1892
- Email: info@macroasiacorp.com
- Address: 12th Floor, PNB Allied Bank Center, 6754 Ayala Avenue, Makati City 1226, Philippines

Triumph Aviation Services Asia

Company Description

Triumph Aviation Services Asia, Ltd. provides repairs and overhauls complex aircraft operational components in Thailand. TASA offers a wide range of MRO services to meet the combined needs of commercial aviation. It is strategically located in Chonburi, Thailand, less than 90 minutes from Bangkok and U-Tapao International Airport.

Key Metrics

 Revenue (in S\$)	 # Employees	 Headquarter
43 mn	451	Thailand

Strategic Fit with ABB

- Strong specialization in MRO
- Can serve multiple aircraft types, different facilities
- Flight Control Surfaces & Machining -- ABB's surface spray and cleaning tech. Flap IMRO -- ABB's airfoil blade manufacture and assemble tech
- Different team for each of the technology, potential gap in demand vs. supply



Portfolio/Active Markets

-  Flight Control Surfaces & Machining, Structures, Brakes & Wheel/Components, Field Service solutions, Laser Welding
-  Chonburi, Thailand

Contact information

- Tel: +66 33 265 000
- Email: tasa-tradingteam@triumphgroup.com.
- Address: 700/160 Moo 1, T. Bankao, A. Pantong, Chonburi, 20160, Thailand

Destini Berhad

Company Description

Destini Berhad, an investment holding company, provides engineering solutions worldwide. The company's MRO and training segment offers MRO services for aviation, automobile, and safety and tabular handling equipment. Major division Destini Aviation achieved notable progress in obtaining contracts for MRO of Royal Malaysian Air Force equipment.

Key Metrics



 Revenue (in S\$)	 # Employees	 Headquarter
51 mn	466	Malaysia

Strategic Fit with ABB

- Specialized in blasting, painting
- Government support by the Malaysia Armed forces and other government agencies
- Clients are primarily Malaysian armed forces and law enforcement and governing authorities--> stable product demand




Portfolio/Active Markets

-  Sand blasting, painting & Engine fire extinguishers & Baroscopic inspection, etc.
-  Southeast Asia, mainly Malaysia

Contact information

- Tel: +60 3 7734 6347
- Email: aviation@destinigroup.com
- Address: 4, Jalan Kerawang U8/108, Kawasan Perindustrian Tekno Jelutong, 40150 Shah Alam, Selangor Darul Ehsan



Key OEM suppliers

Airbus and Boeing suppliers are also potential clients for ABB in the MRO aviation segment



Relies mostly on the company's internal expertise to provide direct MRO services to its clients. Has built a portfolio based on M&As and Joint Ventures, all consolidated by Boeing Global Services Branch

Key partners



上海波音航空改装维修工程有限公司
**BOEING SHANGHAI
AVIATION SERVICES CO., LTD.**



Similarly, Airbus has its own dedicated organization for its MRO activities and has recently launched the Airbus MRO Alliance (AMA), which comprises MRO members with high standards and a proven expertise.

Key partners



Boeing Global Services (BGS)

Company Description

BGS was created in 2016 to consolidate services branches from Boeing. Offers comprehensive solutions (including a full suite of MRO services) for commercial, defense, and space customers

Key Metrics



Revenue (in S\$)

4,6 bi



Employees

n/a



Headquarter

Singapore

Strategic Fit with ABB

- ABB's expertise in industrial analytics and AI could enhance BGS by offering logistic automation, diagnostic and predictive maintenance technology, robotics for line checks and major modifications, engineering data access, etc.
- Sinergy in high level of concern for sustainability matters



Portfolio/Active Markets



Flight operations, maintenance and engineering, airplane parts and training solutions



Operates in 70 countries worldwide

Contact information

- Tel: +1 866-473-2016
- Address: Singapore 11

Boeing Shanghai Aviation Services

Company Description

Boeing Shanghai Aviation Services is a joint venture among Boeing, the Shanghai Airport Authority and China Eastern Airlines established in 2006.

Provides a comprehensive range of services that support all Boeing models.

Key Metrics



Revenue (in S\$)
na



Employees
800



Headquarter
Shanghai

Strategic Fit with ABB

- ABB's automation solutions can enhance efficiency in **heavy maintenance tasks** for Boeing aircrafts
- ABB's precision engineering can improve the reliability of **component repairs**, including composites, interiors, and structures
- ABB's robotics for **paint and interior refurbishment** can offer higher quality and faster turnaround times



Portfolio/Active Markets



Line and heavy maintenance, engineering and planning, component repair and overhaul services



China and broader APAC region

Contact information

- Tel: 021 2021 5000
- Email: info@ctrm.com.my
- Address: 118 Feiao Rd, Shanghai - China

Composites Technology Research Malaysia (CRTM)

Company Description

CRTM was incorporated on 20 November 1990 by the Ministry of Finance Incorporated and was acquired by DRB-HICOM in 2013. CRTM began its operation with the assembly and manufacturing of a composites light aircraft but has increasingly diversified its operations. CRTM is also a key supplier for Airbus in Malaysia.

Key Metrics



Revenue (in S\$)

203mn



Employees

530



Headquarter

Malaysia



Portfolio/Active Markets



Aerospace manufacturing, composites testing, R&D and R&T, composites repair



Southeast Asia, mainly Malaysia

Strategic Fit with ABB

- ABB's automation solutions can enhance efficiency in **heavy maintenance tasks** for Airbus aircrafts
- ABB's precision engineering can improve the reliability of **component repairs**, including composites, interiors, and aircraft seats

Contact information

- Tel: +60 3 788 00256
- Email: info@ctrm.com.my
- Address: Composites Technology City Batu Berendam, Melaka, 75350 Melaka, Malaysia

SME Aerospace

Company Description

SME Aerospace is a Malaysia-based premier manufacturer within the aircraft industry with its comprehensive “One-Stop” centre for metal fabrication, machining, and assembly. SME Aerospace is in a niche position to offer a competitive solution to the world global supply chain. It is a subsidiary company of National Aerospace and Defence Industries Sdn Bhd.

Key Metrics



	Revenue (in S\$)		# Employees		Headquarter
	115mn		570		Malaysia

Strategic Fit with ABB

- ABB’s automation solutions can enhance efficiency in **component assembly** but also for **metal forming & fabrication**
- ABB’s precision engineering can improve the reliability of **component repairs**



Portfolio/Active Markets

-  Aerostructure & component assembly/processes (heat treatment, laboratory & NDI), metal forming & fabrication
-  Southeast Asia, mainly Malaysia

Contact information

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- Email: enquiry@smea.com.my
- Address: LOT 14643, Jalan Kuala Selangor, U 19, 47000 Shah Alam, Selangor, Malaysia

Sepang Aircraft Engineering (SAE)

Company Description

SAE is an MRO centre based in Sepang, Malaysia, that is a fully owned Airbus subsidiary. It is an integral part of the Airbus Customer Services network in the Asia Pacific. In addition to commercial aircraft services, SAE provides spare parts and technical support services to the Royal Malaysian Air Force's fleet of A400M military airlifters.

Key Metrics



Revenue (in S\$)
20 mn



Employees
480



Headquarter
Malaysia



Portfolio/Active Markets

- Base and heavy maintenance, aircraft livery painting, components repair, aircraft weighing services for the A320ceo and neo families
- Malaysia and broader South Pacific region

Strategic Fit with ABB

- ABB's automation solutions can enhance efficiency in **heavy maintenance tasks** for Airbus aircrafts
- ABB's robotics for **paint and interior refurbishment** can offer higher quality and faster turnaround times
- ABB's precision engineering can improve the reliability of **component repairs**, including composites, interiors, and structures

Contact information

- Tel: +60 3 8787 2231
- Email: commercial@sepangaircraft.com
- Address: Lot PT16 Jalan KLIA S7, Southern Support Zone, KLIA, 64000 Sepang, Selangor, Malaysia

ST Engineering

Company Description

ST Engineering is a major player in the global MRO market with extensive experience on Airbus platforms.

ST Engineering is a Singaporean multinational technology and engineering group that operates in the aerospace, smart city, defense, and public security sectors. The company has extensive experience on Airbus platforms.

Key Metrics



Revenue (in S\$)
8 bn



Employees
24'000



Headquarter
Singapore



Portfolio/Active Markets



Commercial and military aircraft MRO services, aviation asset management, digital solutions



Worldwide, focus on APAC region

Strategic Fit with ABB

- Small overlap of solutions with ABB, but have worked together before (AGV Project in the New Tuas Port)
- Support to airframe services, from line and heavy maintenance to structural repairs
- ABB's diagnostic tools and smart technologies can improve the efficiency and accuracy of engine or advanced component maintenance, repairs and overhaul

Contact information

- Tel: + 65 6861 65662
- Address: 249 Jalan Boon Lay, Singapore 619523

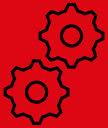


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Key Insights and Conclusion

Summary

1



MRO Market

- MRO market is expanding steadily, fueled by **robust demand**.
- Challenged by **capacity constraints** such as labor shortages and carbon emissions.
- The Asia Pacific area is predicted to see a **19% increase** in the MRO industry by 2033.
- Key influential factors to consider: 1. global **MRO supply chain disruption** by war 2. an expected **increase in operating costs** due to rising fuel, labor, and spare part prices 3. **rising CO2 emissions** in the absence of significant technological solutions (SAF).

2



ABB's Capabilities & Limitations

- Expertise in **digitalization and automation**.
- High **reputation**.
- Diversified **product portfolio**.
- A **sound financial position** that permits large investments & acquisition.
- **Challenges:** 1. other global **competitors** 2. **supply chain interruptions** 3. **changing regulatory and political environments**.

3



Customer Analysis

- **7 MRO companies** were selected as final potential partners out of 271 companies.
- Among the analyzed companies, **MacroAsia** was identified as having the largest synergies with ABB's offerings.
- **5 key OEM suppliers** are believed to be able to establish a close partnership with ABB.

Final strategic recommendations

1 Target MRO companies

- **Efficiency Enhancement & Engine solutions**

Honeywell



ABB's products could be used to optimize the automation and digitalization of engine MROs and increase company productivity.

- **Surface & Maintenance Specialization**



ABB can target their surface treatment service needs such as blasting, spraying, painting, as well as their potential needs for specialized maintenance.

- **Sustainability & Overall Operations**



ABB's products are suitable for improving the efficiency of the company's employees and the sustainability issues that need to be considered in the operation of such a large company.

Final strategic recommendations

2 Key OEM suppliers

- **Enhance Comprehensive MRO Services**



ABB can focus on providing them with automated solutions that benefit them for predictive maintenance and improve their overall MRO service quality.

- **Heavy Maintenance Tasks & Component Repairs**

ABB's precision engineering and automation solutions may increase productivity in their key service areas: heavy maintenance tasks and component repair.



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Questions?



Appendix

PESTEL Analysis: MRO Segments

Political

Delays with ASAM initiative to create a single air transport market in the region; political influence of OEMs, **conflicts and tensions worldwide** - South China Sea dispute, Russia and Ukraine

P

Economic

Market recovery from COVID-19(**global fleet at 98% with projected expansion of 33% until 2033**), continuous economic growth of APAC region but fluctuations in exchange rates and inflation. Risen in carrier expenses due to fuel, labor (12% increase since 2019) and spare parts (catalog prices have risen between 10-20%)

E

Social

Lack of skilled workforce availability in all APAC countries. Increasing **demand for LCCs (low-cost carriers)** and **domestic travel** in APAC region; increase of fuel-efficient and less noisy engines; rising demand for **more spacious and comfortable airframes**

S

Technological

Demand for **better technology to optimize production and reduce working force** (digital twin, augmented reality, big data, predictive maintenance); newer fuel-efficient engines and airframes (carbon fibers, nanocom). Higher use of PMA components, which are produced by manufacturers other than original producer, to reduce lead time and costs

T

Environmental

Increase in **preference of airlines for MRO services with reduced environmental impact** (ICAO initiatives – e.g., CORSIA); concern for footprint of components; tendency of stricter environmental regulations in most APAC countries

E

Legal

Stricter standards and guidelines set by the International Civil Aviation Organization (ICAO); evolvement of local laws of **intellectual property rights for avionics software**; legal considerations related to warranty agreements, disputes and litigations

L

ABB's wide portfolio of products & services helps tackle various industry challenges



Strategic fit was based on companies processes and its alignment with ABB offerings

	Honeywell	RollsRoyce	Meggitt	SIA	Destini	MacroAsia	Triumph
Airfoil blade welding and tip blending						✓	✓
Airfoil blade weldment blending						✓	
Airfoil defect inspection/identification			✓		✓	✓	✓
Masking process (pre-treatment)						✓	
Vane adhesive dispensing						✓	
Airfoil Honeycomb stripping		✓					
Sand blasting	✓				✓	✓	
Plasma spray	✓		✓	✓		✓	
Engine screw dismantling	✓	✓	✓			✓	✓
Engine hub staking and assembly		✓	✓	✓		✓	✓
Airfoil parts automation	✓						✓
High pressure waterjet cleaning	✓	✓	✓	✓		✓	
CNC machine tending		✓					✓
Metal polishing and deburring				✓		✓	
Spray painting	✓	✓	✓	✓	✓	✓	
Grit blasting	✓		✓	✓	✓	✓	
Dry ice blasting	✓		✓	✓		✓	