

European Aviation Maintenance Training Committee

Training for the Future in Aviation

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Takeaways

Source: Airbus GMF

Passenger Traffic 2019-2042 CAGR	3.6%
Freight Traffic 2019-2042 CAGR	3.2%
Fleet in service beginning of 2020	22,880 aircraft
Fleet in service in 2042	46,560 aircraft
New deliveries 2023-2042	40,850 aircraft

Airbus Global Market Forecast 2023

AIRBUS



Commercial Market Outlook

2023–2042

42,595

Global Deliveries

1,810

Regional Jet

32,420

Single Aisle

7,440

Wide Body

925

Freighter

Africa

1,025 Deliveries
2042 Total Fleet: 1,555
Traffic Growth: 7.4%

ADD



CPT

China

8,560 Deliveries
2042 Total Fleet: 9,590
Traffic Growth: 11.4%

CAN



PEK

Eurasia

9,645 Deliveries
2042 Total Fleet: 10,640
Traffic Growth: 4.6%

AMS



IST

3.5%

Fleet Growth

Latin America

2,105 Deliveries
2042 Total Fleet: 2,895
Traffic Growth: 5.5%

GRU



PTY

Middle East

3,025 Deliveries
2042 Total Fleet: 3,360
Traffic Growth: 6.0%

DXB



RUH

48,575

2042 Fleet

6.1%

Traffic Growth

North America

9,250 Deliveries
2042 Total Fleet: 10,710
Traffic Growth: 3.8%

LAX



YYZ

Northeast Asia

1,350 Deliveries
2042 Total Fleet: 1,675
Traffic Growth: 5.9%

ICN



NRT

Oceania

705 Deliveries
2042 Total Fleet: 815
Traffic Growth: 5.3%

AKL



SYD

2.6%

GDP Growth

South Asia

2,705 Deliveries
2042 Total Fleet: 2,610
Traffic Growth: 8.1%

BOM



DEL

Southeast Asia

4,225 Deliveries
2042 Total Fleet: 4,725
Traffic Growth: 9.5%

BKK

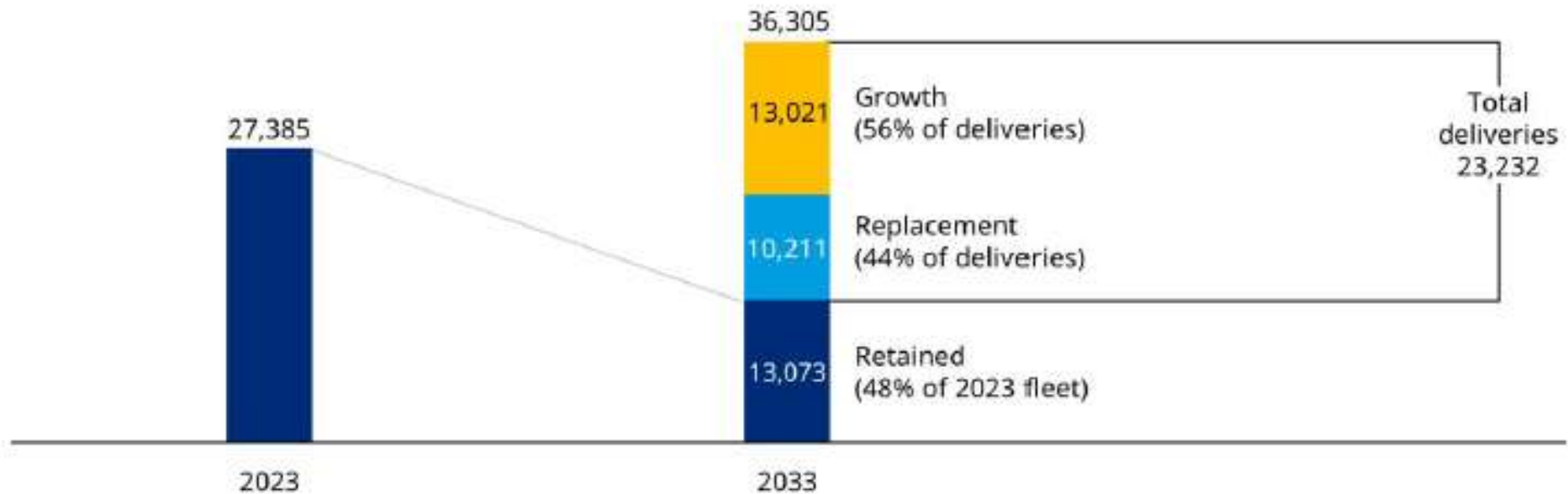


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2.3 M

New Personnel

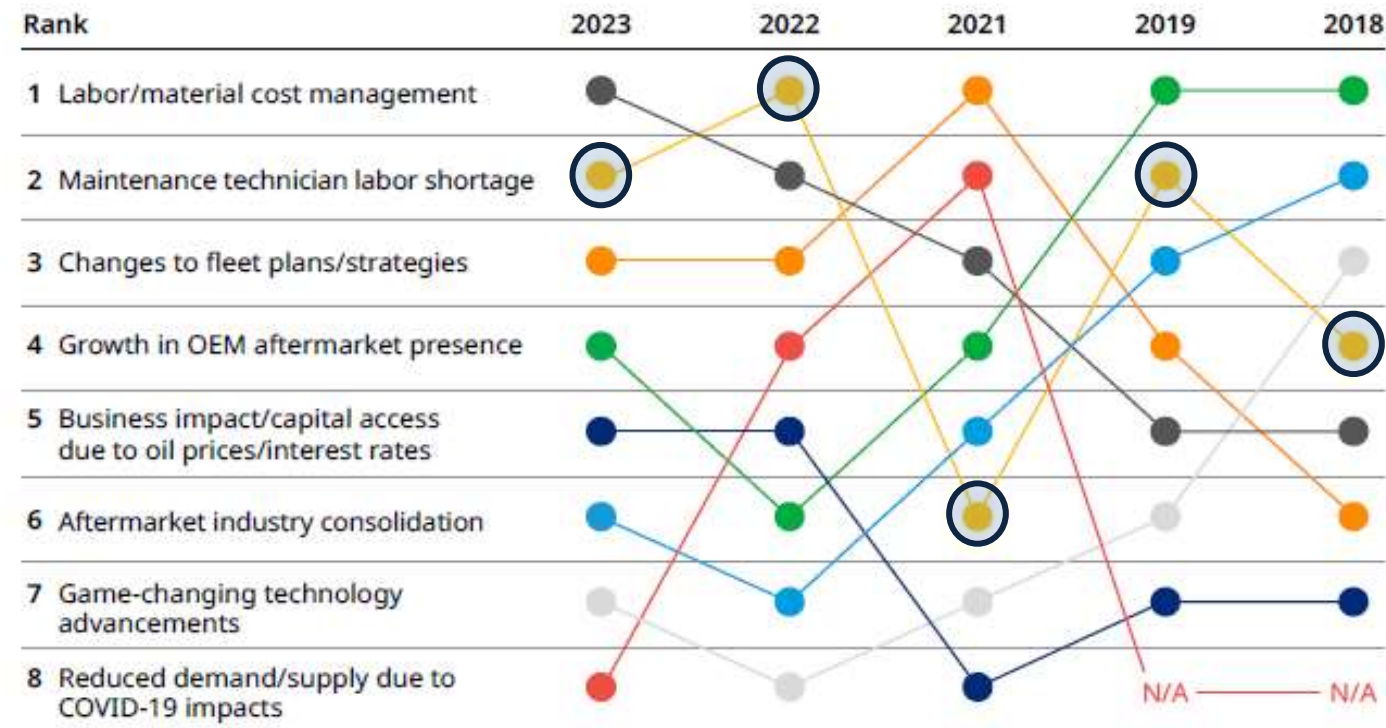
Exhibit 15: Fleet replacement versus growth, 2022-2033



Source: Oliver Wyman analysis

Exhibit 2: Top disruptors, 2018-2023

As ranked by survey respondents



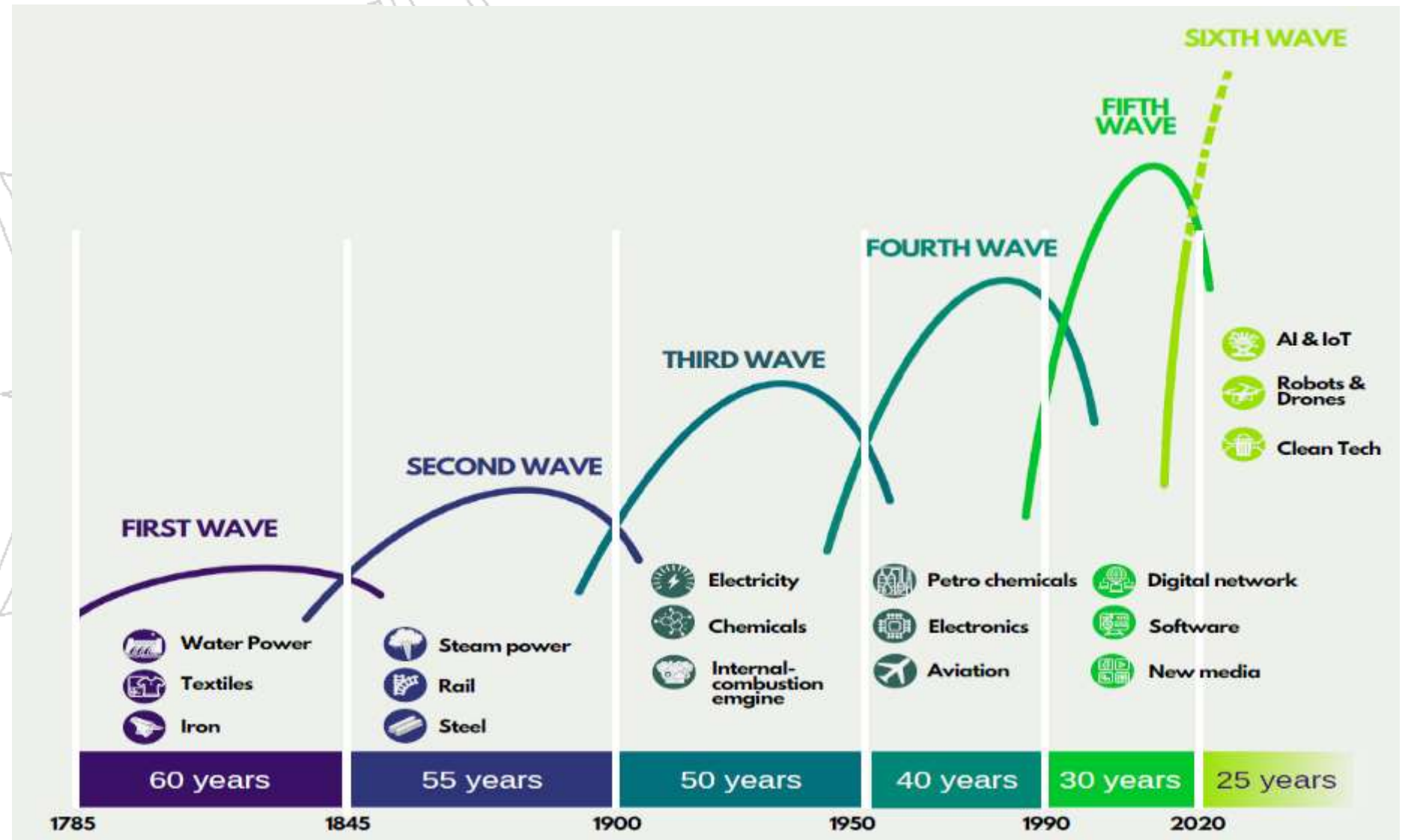
Note: No ranking available for 2020

Source: Oliver Wyman 2023 MRO Survey

IATP Statement

**By 2042,
the aviation industry must not only retain its current engineers
but also recruit an additional 700,000 engineers
to ensure smooth operations**

Waves of innovation

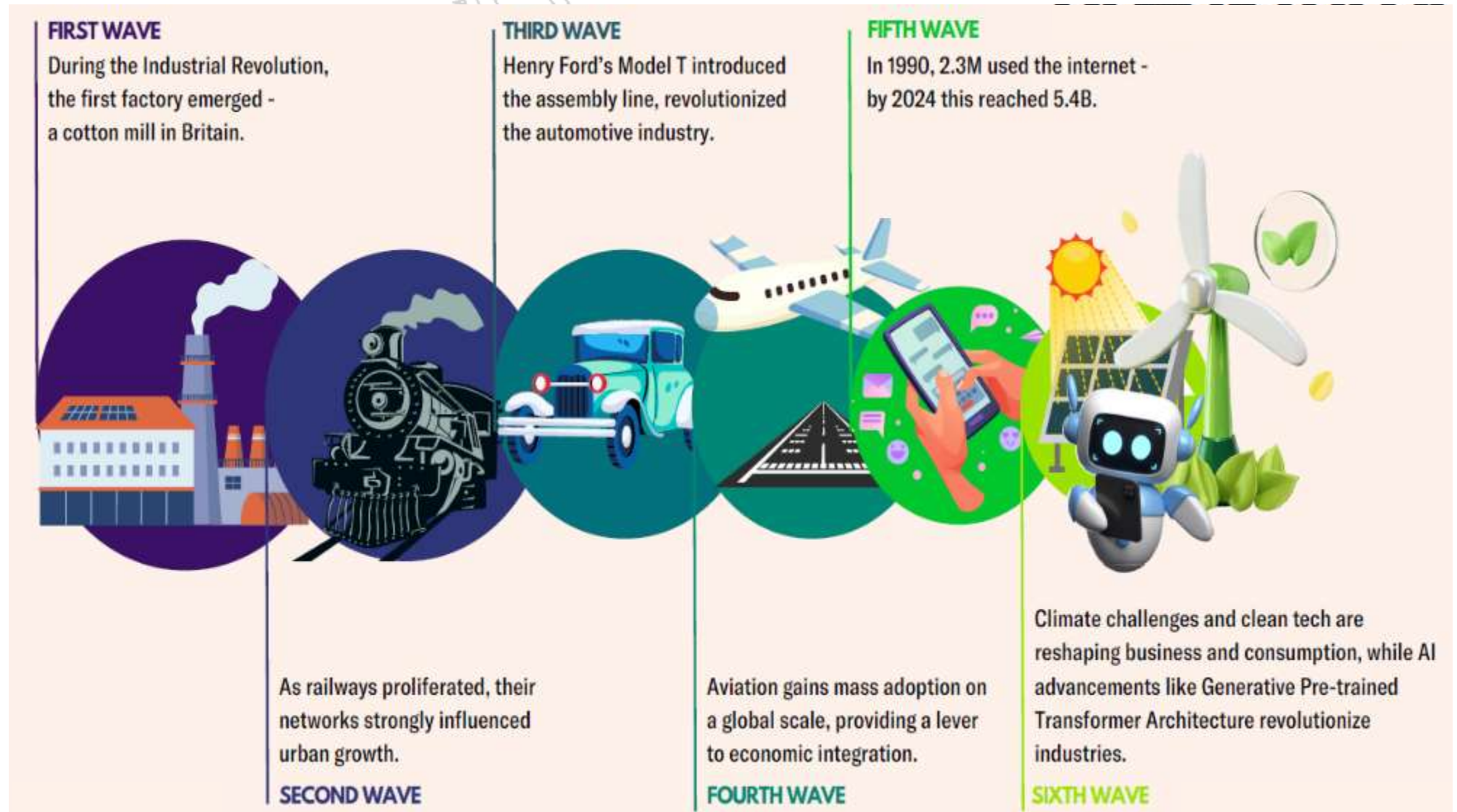


Sources:
Edelston Institute &
Visual Capitalist

October 2024

EATS 2024

Key Break- throughs



Sources: based on
Visual Capitalist

October 2024

EATS 2024



Impact on MRO industry

Just to name a few...

Let's ask Chat GPT....



SIMPLE PROMPT:

“Please name some consequences of the increasing use of artificial intelligence for the MRO industry”

Impact on MRO industry (1/2)

Inventory Management

AI can improve inventory management by predicting the parts and tools required for upcoming maintenance tasks. This ensures that necessary items are in stock, reducing delays and helping manage inventory costs more effectively.

Fault Diagnosis

AI-powered diagnostic tools can quickly and accurately identify issues, reducing the time aircraft spend on the ground. Technicians can be guided by AI to perform precise repairs, enhancing the quality of maintenance work.

Regulatory Compliance

AI can assist in ensuring compliance with aviation regulations by maintaining detailed logs of maintenance actions and system health, which can be easily accessed and audited.

Data Security Concerns

With an increased reliance on digital systems and AI, the risk of cybersecurity threats in aircraft maintenance also rises. Protecting sensitive data related to aircraft maintenance will become a critical priority.

Efficiency in MTCE Scheduling

AI can optimize maintenance schedules based on actual usage and condition of the aircraft components, rather than relying on less efficient periodic maintenance schedules. This not only saves time but also reduces costs by ensuring parts are only replaced or maintained when necessary.

Predictive MTCE Enhancement

AI enables more sophisticated predictive maintenance capabilities. By analyzing data from aircraft sensors and systems in real-time, AI can identify potential issues before they lead to failures, reducing unplanned downtime and improving aircraft reliability.

Cost Implications

Initially, integrating AI into maintenance operations may involve significant investment in technology and training. However, over time, these costs can be offset by the savings from increased efficiency and reduced downtime.

Safety Improvements

By increasing the accuracy and timeliness of maintenance, AI can help reduce the risk of mechanical failures that could lead to accidents, thereby enhancing overall flight safety.

Impact on MRO industry (2/2)

Skill Set Shift

As AI takes over more routine and diagnostic tasks, the skill set required for aircraft maintenance technicians will shift towards more advanced technological proficiency. Continuous training and education will be necessary to keep pace with the new technology.

Job Transformation

While AI may reduce the need for certain manual tasks, it also creates opportunities for more specialized jobs focused on managing and analyzing AI systems. This transformation will require a reevaluation of roles and responsibilities within maintenance teams.

Skills needed for the Future in A/C Maintenance



Technological Proficiency

Knowledge in robotics, AI, and big data will become increasingly important as these technologies are used more for fault diagnosis and maintenance planning.



Sustainability Knowledge

Skills in sustainable practices and technologies to minimize the environmental impact of aviation.



Analytical Thinking

The ability to analyze complex data and draw conclusions for the maintenance and optimization of aircraft.



Interpersonal and Collaborative Skills

Despite technological changes, teamwork and communication remain crucial, especially for the safety and efficiency of maintenance processes.



... on **Skills / Competence**
Requirement of
- aircraft maintenance
personnel

... on skill / competence requirement of aircraft **Maintenance Personnel:**

- **Advanced Technical Training:**
 - Need for advanced training in AI and machine learning technologies used in predictive maintenance and diagnostic tools.
- **Understanding of AI-Driven Tools:**
 - Proficiency in using AI-driven maintenance tools and software that predict and diagnose aircraft issues.
- **Data Interpretation**
 - Skills in analysing and interpreting data from AI systems to identify maintenance needs and potential failures.

... on skill / competence requirement of aircraft **Maintenance Personnel:**

- **Software and Hardware Integration:**
 - Knowledge of integrating AI software with existing aircraft systems and ensuring compatibility.
- **Cybersecurity Protocols:**
 - Familiarity with cybersecurity measures to protect AI maintenance systems and data.

... on skill / competence requirement of aircraft **Maintenance Personnel:**

- **Adaptability:**
 - Ability to adapt to new AI technologies and tools as they evolve, requiring continuous learning and flexibility.
- **Collaboration:**
 - Enhanced collaboration skills to work alongside AI specialists and engineers in maintaining and upgrading AI systems in aircraft.

PAST



EDUCATE
& TRAIN

WORK

RETIRE

30 years

40 years

PAST



EDUCATE
& TRAIN

WORK

RETIRE

30 years

40 years

FUTURE



BASIC
KNOW-
LEDGE
SKILLS

WORK
&
LEARN

RETIRE

25 years



A New Learner Generation

- More and more the behavior of the so-called **Gen-Z** is visible, when carrying out apprentice-ships.
- This behavior change can be seen as disadvantage or advantage, nevertheless it is a fact we have to deal with
- What we see is that the “conventional educations” clearly contradict with the expectations the Gen-Z has, when it comes to education.



(picture taken/copied from the internet)

Let's describe them briefly, they (found on tech guru on the internet)

- ... spend up to 7 ½ hours with socializing (per day)
- ... prefer to work on multi-screens (up to 5 screens)
- ... are entrepreneurs and prefer an independent working environment.
- ... have a college education (50%) and they prefer live-long learning
- ... are philanthropes – 93% chose the company they work for because of the social impact of the company.
- ... are digital natives, e.g. spend an average of 15.4 hours a week with their smart-phones
- ... are interactive – 34% are most interested in improving their people management skills.
- ... **like Tech** – 65% believe that technology makes them feel that everything is possible



We need to progress to Competency-based Training and Assessment!

- Shift from quantity to quality
 - The students and organizational needs are central, not the training hours
 - Students learning techniques are broader than the old content-oriented methods
- Recognition of new teaching technologies
 - VR / AR / E-Learning
- Framework of generic skills don't need to be demonstrated repeatedly within subsequent aircraft type ratings
- Flexibility to anticipate faster on changing circumstances and technologies (Lifelong Learning)
- Ability to cross-train from other industries with complementary competencies easier
- Cost reduction
 - prior learning and previously developed competencies count
 - expedites the training path of the learner (self-paced learning)

How to implement Competency-based Training and Assessment?

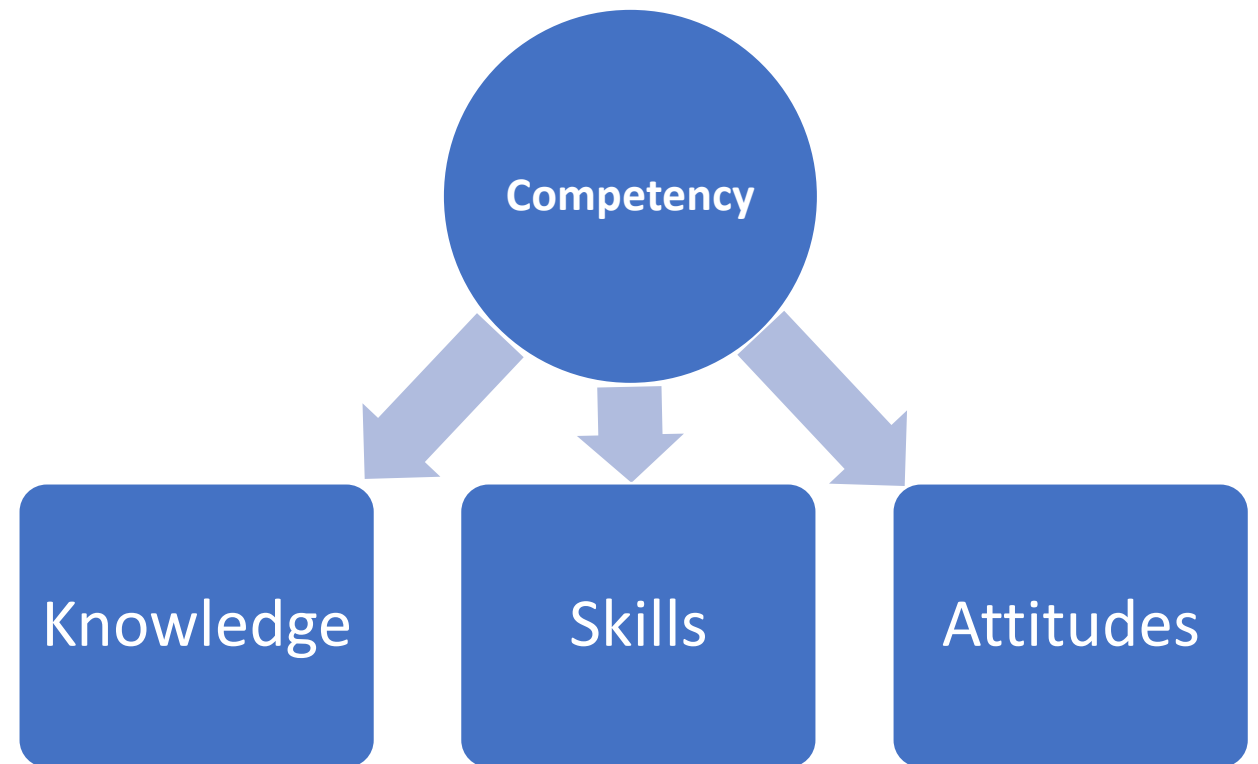
Industry, e.g. MRO defines target competency

- Knowledge, skills and attitude
- Content-parts can be extracted from Part-66



October 2024

Start with the defined Competency and define needed KSA



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Top-down development

Below standard	According to standard	Above standard
	<i>Description of observable behaviour when according to standard</i>	<i>Description of observable behaviour when above standard</i>

CBTA



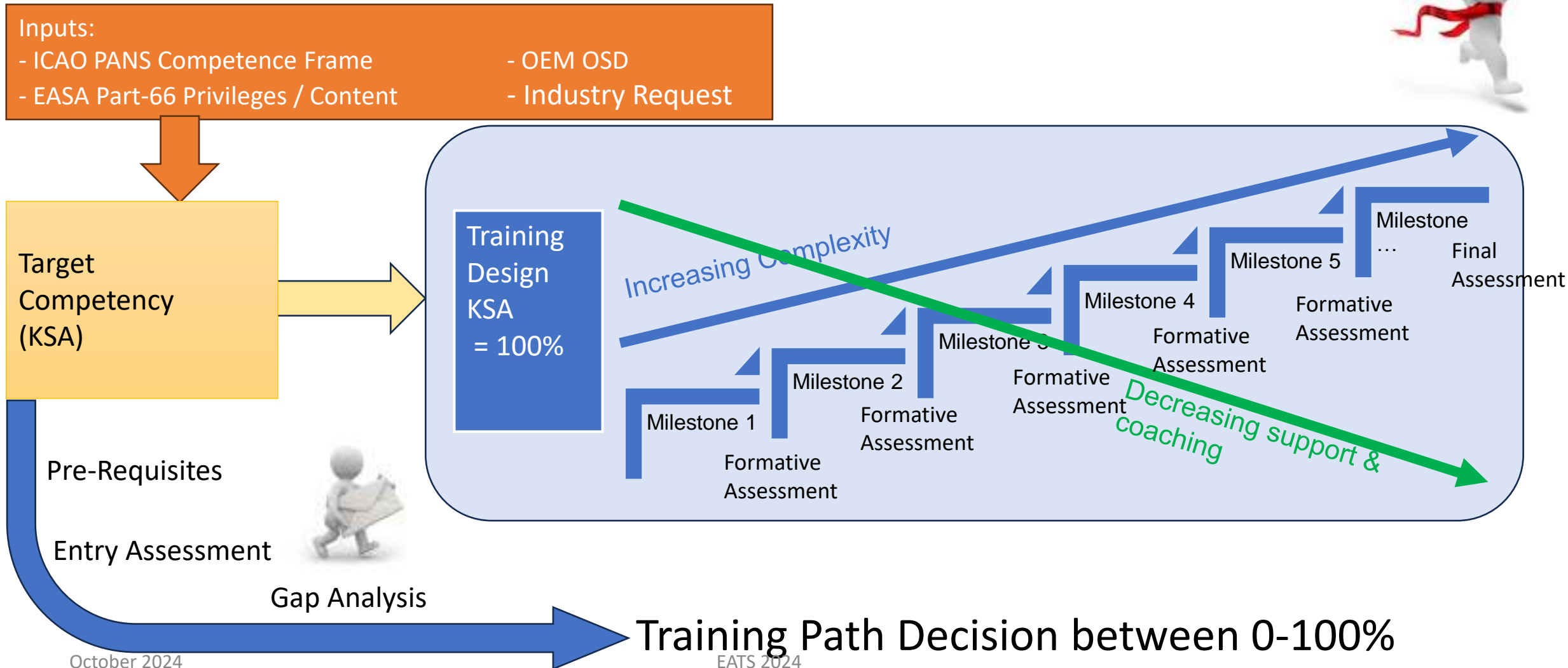
Key Points:

- Each Task category emphasizes different competences.
- Within each category, select tasks using the defined selection criteria.
- Selecting suitable types of tasks is the key to effectively train and assess applicable competences as per the ACM (Adapted Competency Model).

COMPETENCIES	TASK CATEGORIES					
	SGH	R/I	T/S	1	MEL	INSP
Procedures (PRO)	1.1-1.5	1.1-1.5	1.1, 1.3-1.5	1.1, 1.3-1.5	1.1-1.2,1.4	
Work Management (WMT)	2.1-2.5, 2.9	2.1-2.6, 2.9	2.1-2.5, 2.9, 2.10	2.1-2.5, 2.8-2.10		
Situational Awareness (SAW)	3.1, 3.2, 3.5	3.1, 3.2, 3.5, 3.6	3.1-3.6	3.1, 3.3, 3.5, 3.6		
Technical Expertise (TE)	4.1, 4.2, 4.4	4.1-4.4	4.1-4.4	4.1-4.4	4.1-4.4	4.1-4.4
Risk Management (RM)	7.1-7.5, 7.7	7.1-7.7	7.1-7.7	7.1-7.7		
System Thinking (ST)	5.1, 5.2, 5.4	5.1-5.4, 5.6	5.1-5.9	5.1-5.4, 5.6-5.9		
Coordination and Handover (CH)	6.1-6.4	6.1-6.4	6.1-6.5, 6.7	6.1-6.8		
Problem-Solving & Decision Making (PSDM)	9.1-9.9	9.1-9.9	9.1-9.9	9.1-9.9	9.1-9.9	9.1-9.9
Self-Management (SFM)	10.1-10.10	10.1-10.10	10.1-10.10	10.1-10.10	10.1, 10.2, 10.3,10.5, 10.8	
Communication (COM)	11.1-11.4, 11.7, 11.9	11.1-11.9	11.1-11.9	11.1-11.9		
Teamwork (TW)	8.1-8.14	8.1-8.14	8.1-8.14	8.1-8.14		

Adapted competency model. A group of competencies with their associated description and performance criteria adapted from an ICAO competency framework that an organization uses to develop competency-based training and assessment for a given role. (ICAO-Doc-9868 Procedures for Air Navigation Services Training – 3rd Edition 2020)

Training execution



How can AI support CBTA

Competence Profiles

Compute optimal competence profiles for defined tasks and working conditions

Training Development

Matching task categories (INS, R/I, SGH, ...) and criteria's (Complexity, Frequency, Safety, ...) with KSA elements, OBs for milestones to teach defined specific competency and levels in the learning steps and assess what has been achieved at the end.

Individual Learning Paths Management

Compose and monitor individual training paths based on individual level of competences



A pan-“EASA world” industry Association

- Dedicated to Maintenance Training
- Registered in the Netherlands

www.eamtc@org

Main objective:

- Improve safety through training
- To represent the training industry with EASA and other Authorities

A culturally diverse organisation

- Members share mutual goals

Mission Statement

Shaping the future of aviation maintenance training







THANK YOU FOR
YOUR ATTENTION



Hans Mayer
President

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