

# CLINGING TO THE PAST

OCTOBER 2017

**Presented by: Brian Prentice**



Oliver Wyman's Aviation, Aerospace & Defense practice is the largest and most capable consulting team dedicated to the industry

#### OUR EXPERIENCE

- 241 professionals across Europe and North America
- Deep aviation knowledge and capabilities allow the practice to deliver data-driven solutions and provide strategic, operational, and organizational advice

#### OUR CLIENTS

We have worked with more than  $\frac{3}{4}$  of the industry's Fortune 500 companies, including:

- All major US airlines
- Leading airlines, MROs, OEMs, and independent parts manufacturers in the Americas, Europe, and Asia
- Dominant aerospace and defense firms

#### OUR APPROACH

**Data-driven:** unbiased benchmarking and forecasting tools to establish problems and identify solutions

**Innovative:** ideas that are forward-thinking

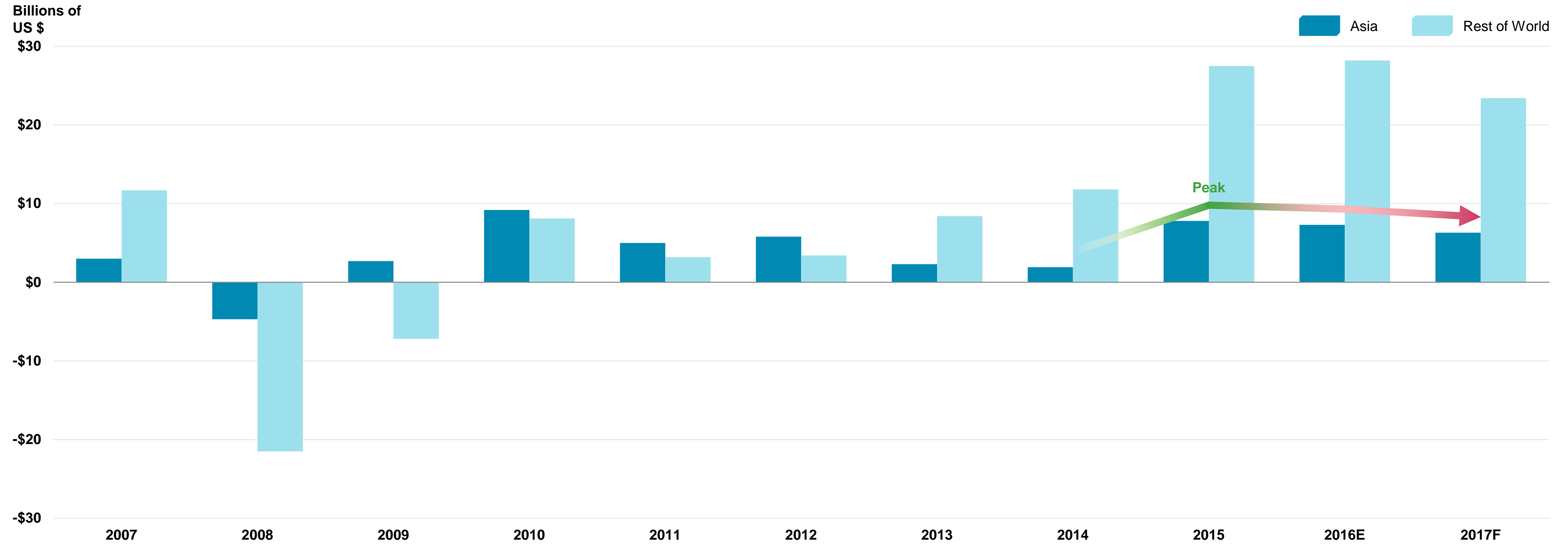
**Actionable:** results-oriented recommendations

**Collaborative:** an emphasis on working with our clients, alongside executives, management, and support teams

# 1 | Taking Care of Business

In recent years the airline industry has achieved record profits, with Asia Pacific, China and India (Asia Pacific) operators returning to sustained profitability.

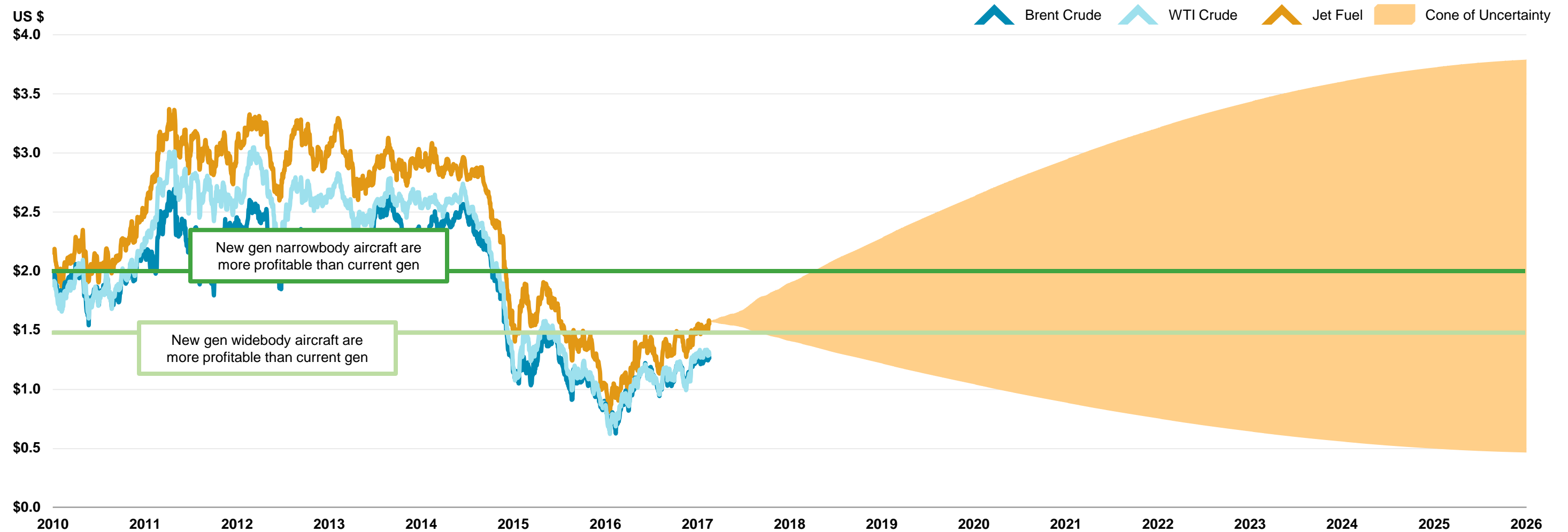
Global Commercial Air Transport Industry Net Profit by Year



Commercial aviation remains a fiercely competitive global market

# Three years of low oil prices have driven record industry profits and allowed operators to invest heavily in the passenger experience

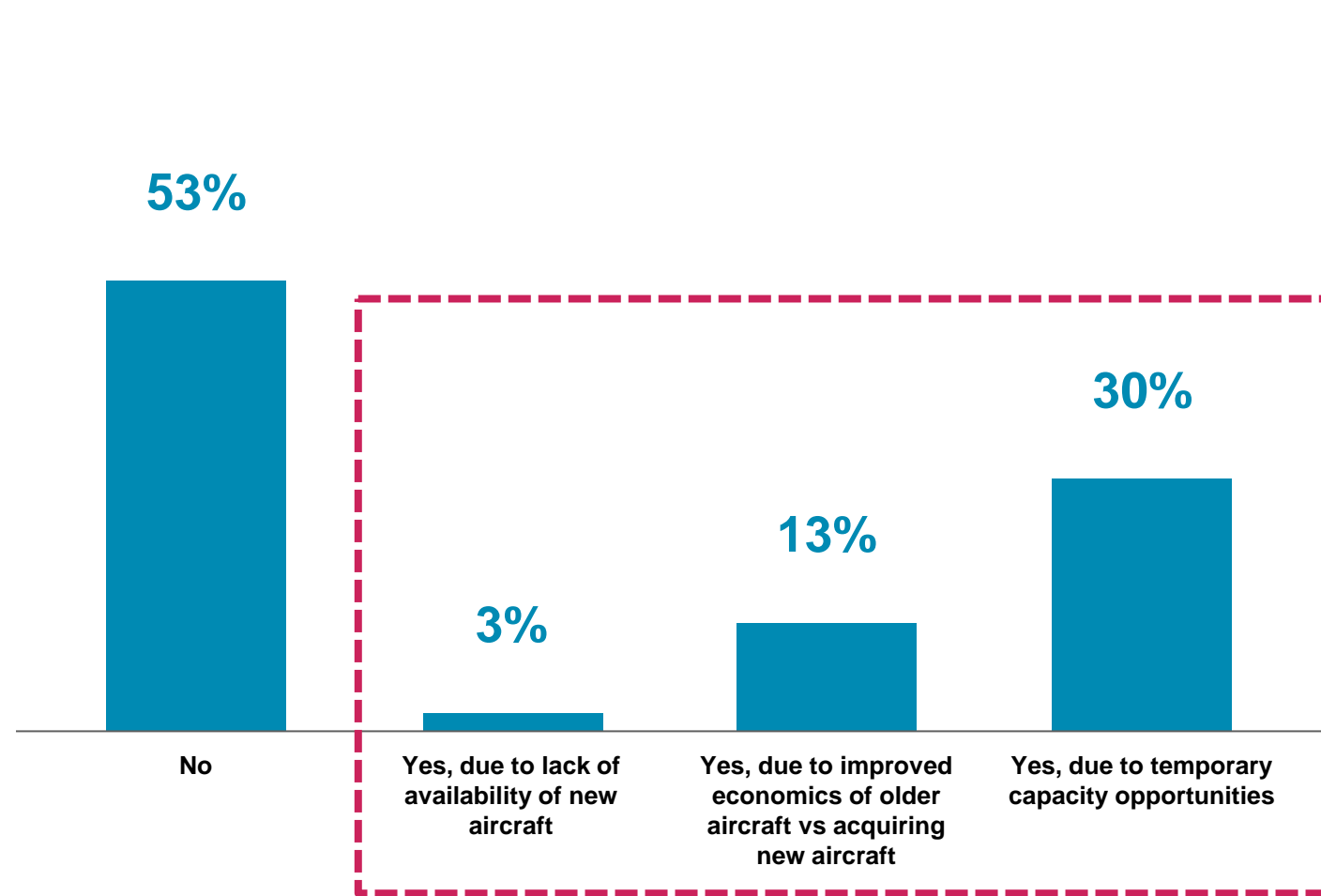
Crude Oil and Jet Fuel Spot Prices per Gallon by Year



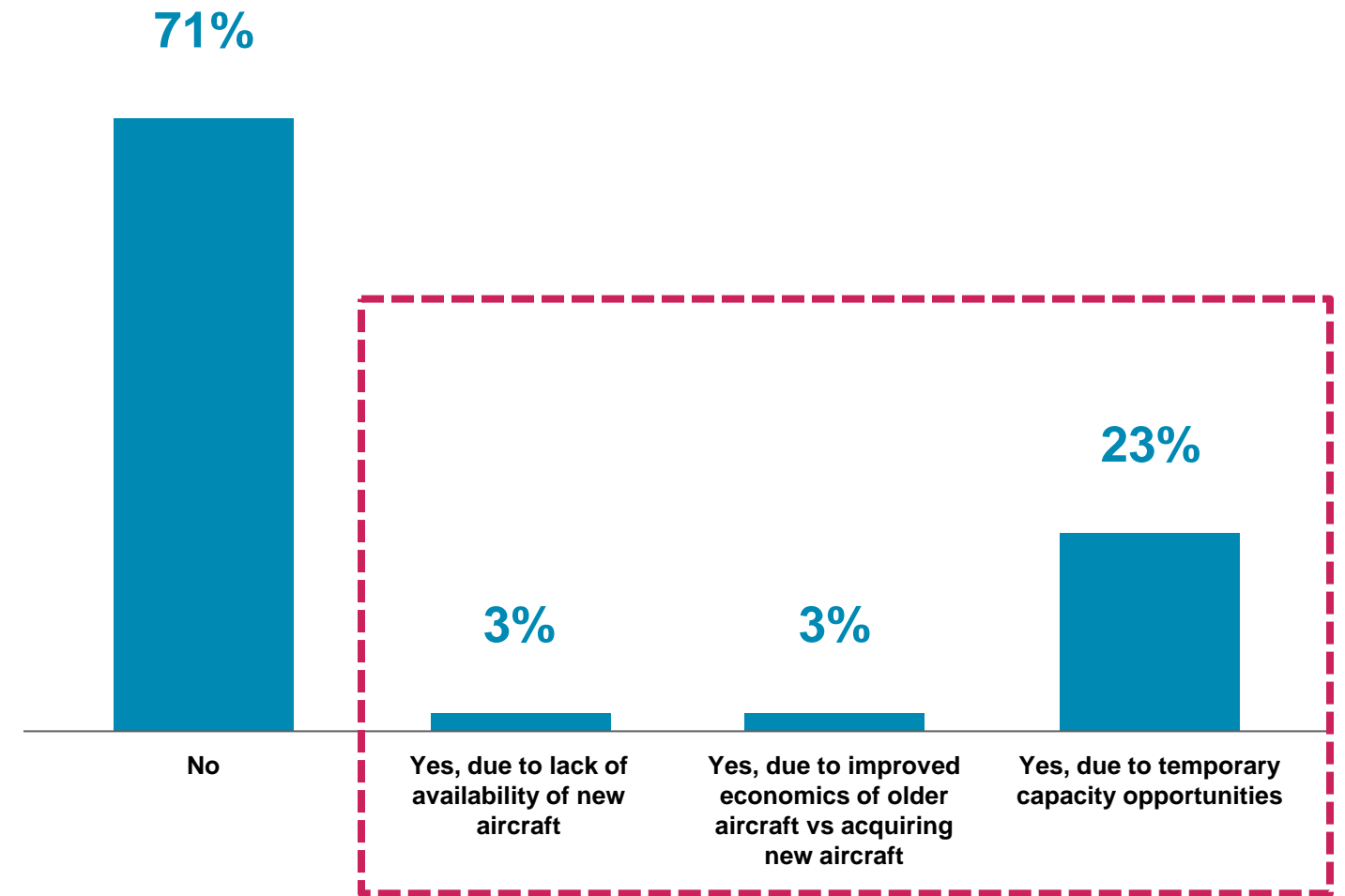
Operators have also adopted new, more expensive labor contracts, which may be a possible source of turbulence in the near future amid a changing economic landscape as the oil market begins to recover

# Nearly half of aircraft operator respondents in our MRO Survey are delaying retirements and nearly one third of respondents are reactivating aircraft they have pulled from long term storage

Q: Are you delaying aircraft retirements?\*

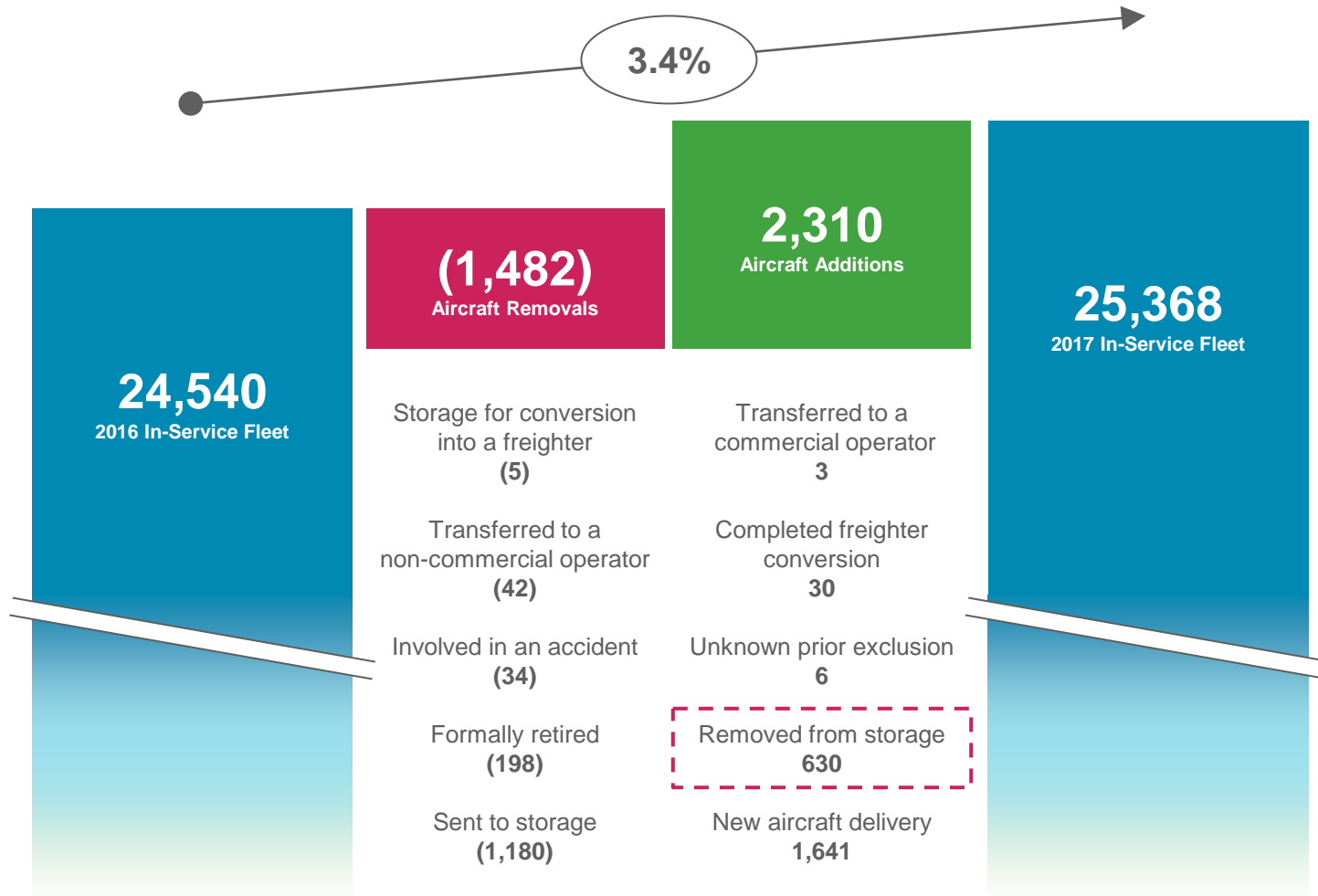


Q: Have you pulled an aircraft out of storage and pressed it into service within the past 12 months? If so, why?\*

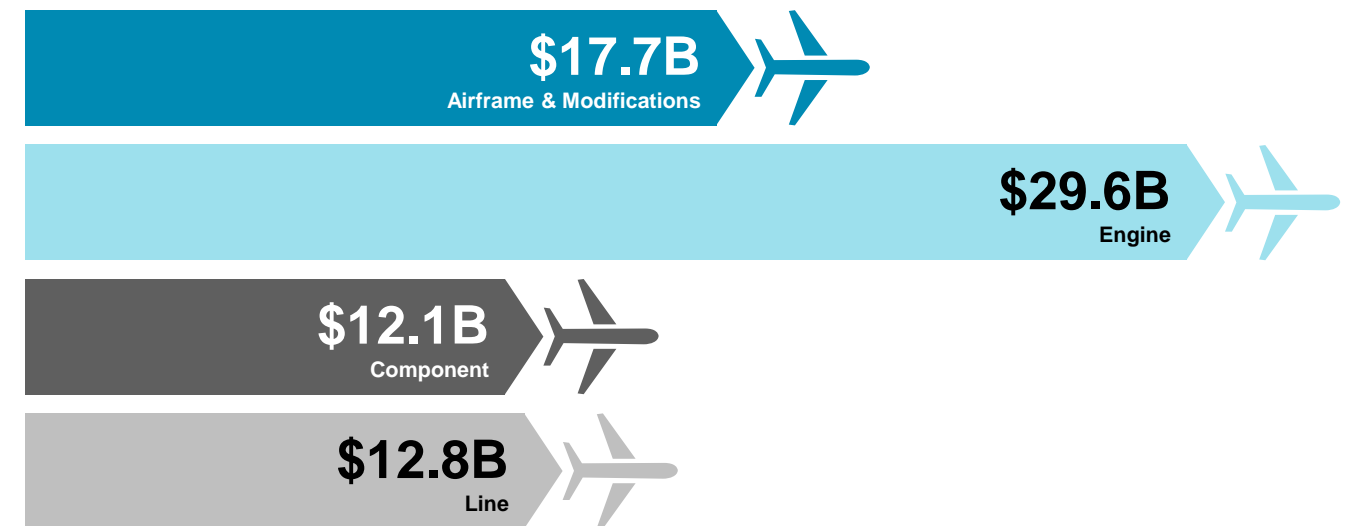


Over the past year, status changes to 3,792 aircraft have lead the global in-service fleet to experience a net growth of 828 aircraft, representing a 3.4% annual growth rate

Year Over Year Changes to the Global Commercial Air Transport In-Service Fleet by Transaction Type



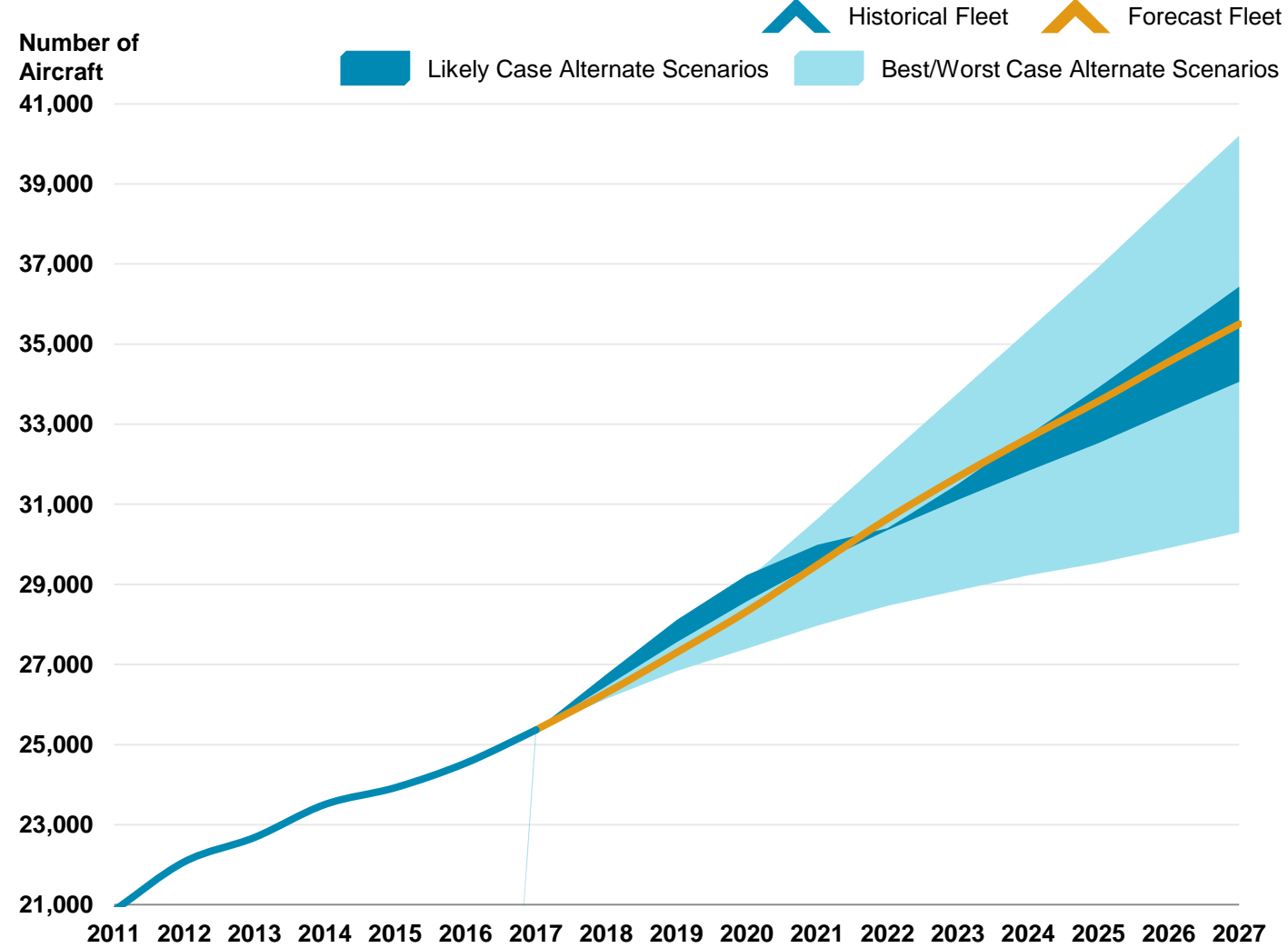
2017 Global Commercial Air Transport MRO Market Forecast by MRO Segment



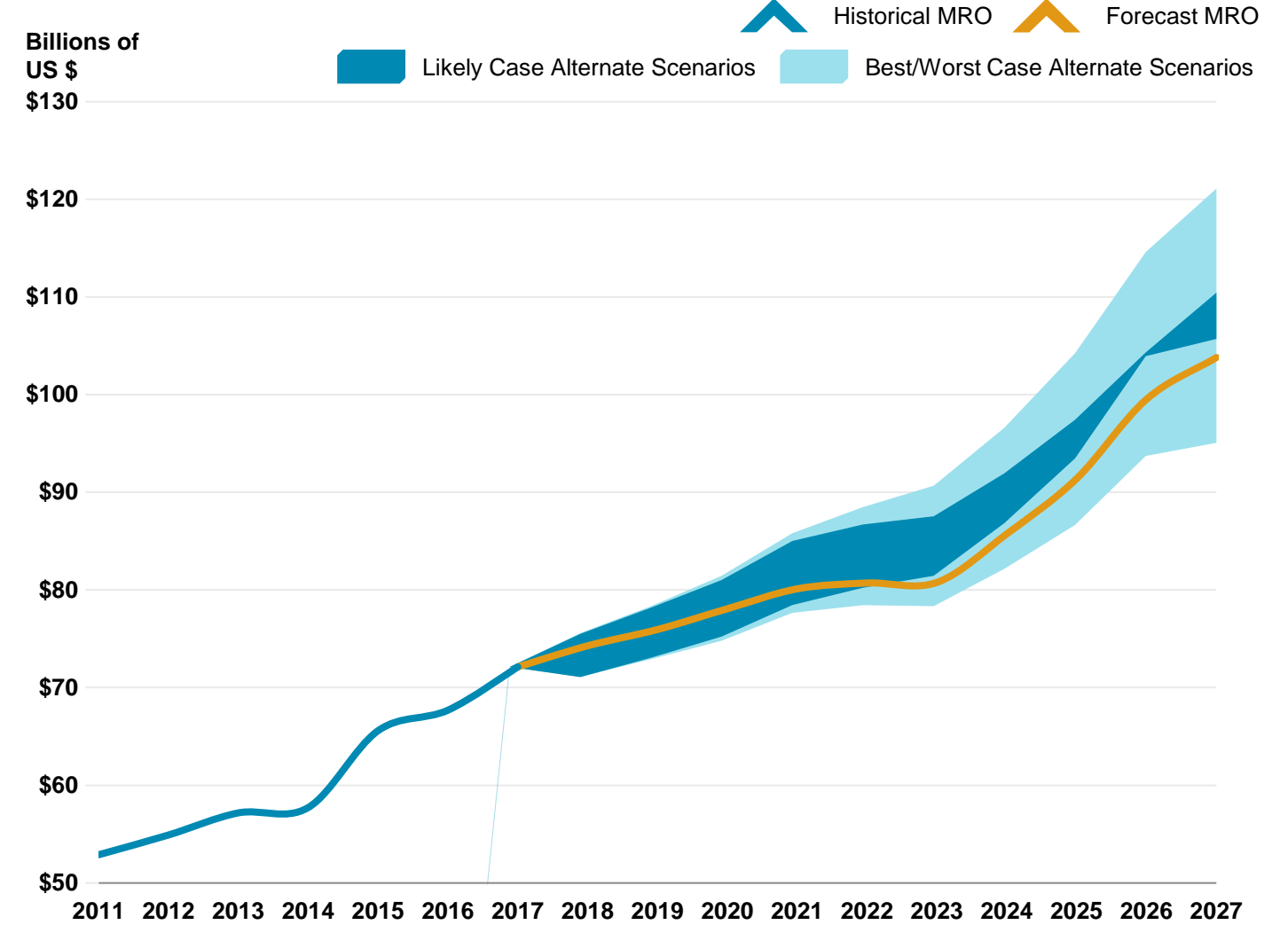
Translating the changing fleet dynamics into MRO, the 2017 market is forecast to be \$72.1B, with engine MRO continuing to be the driver of growth

While the fleet continues to grow, and the industry is recording near historic net profits, uncertainties surrounding economic growth, interest rates, and oil could disrupt and hinder growth

**Global Commercial Air Transport Fleet Forecast by Year**



**Global Commercial Air Transport MRO Market Forecast by Year**

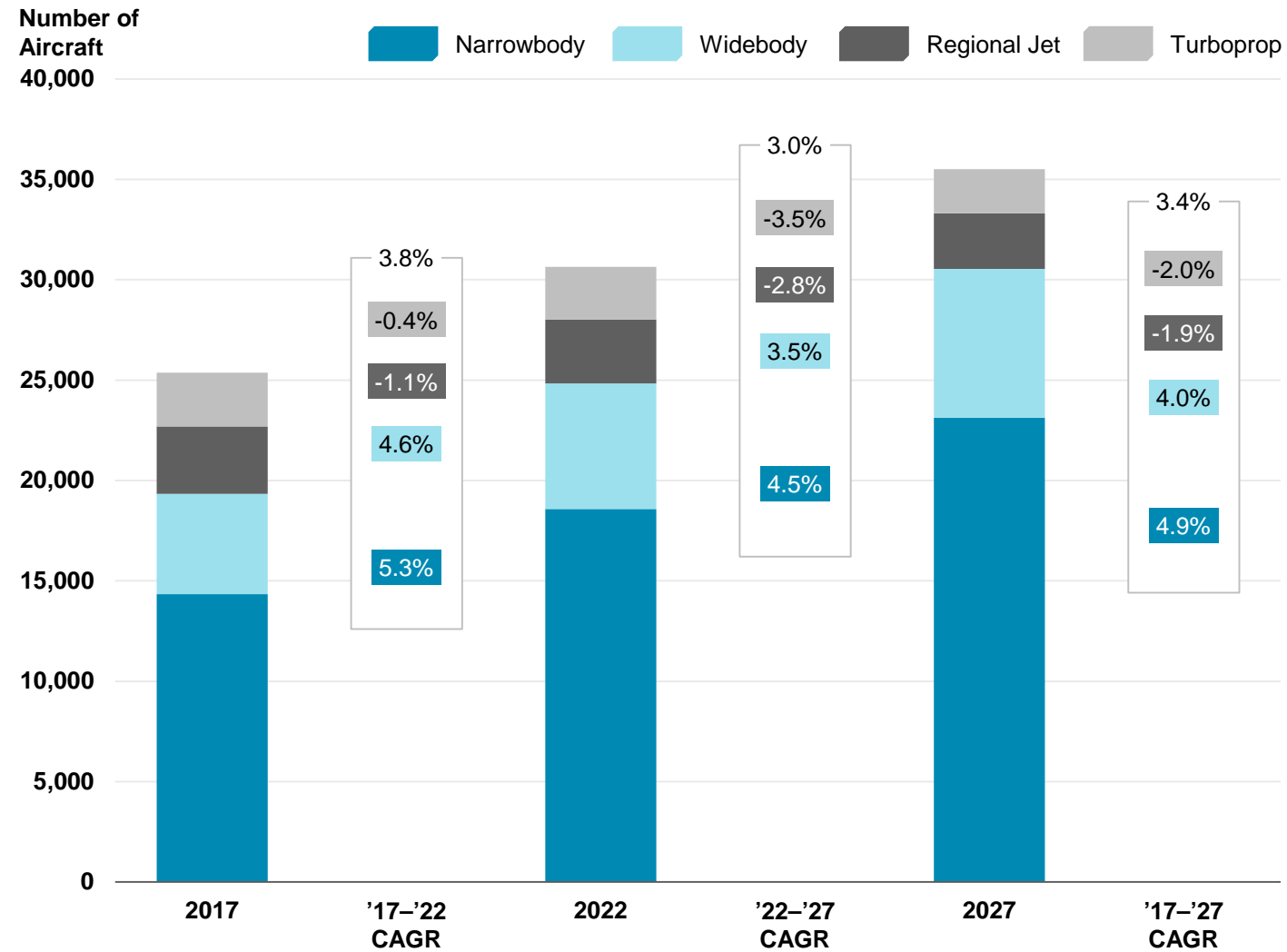


The commercial air transport fleet is forecast to increase by 10,133 aircraft over the next 10 years driving the \$72.1B commercial air transport MRO market to go grow at an average annual rate of 3.7% per year, topping out at \$103.8B in 2027

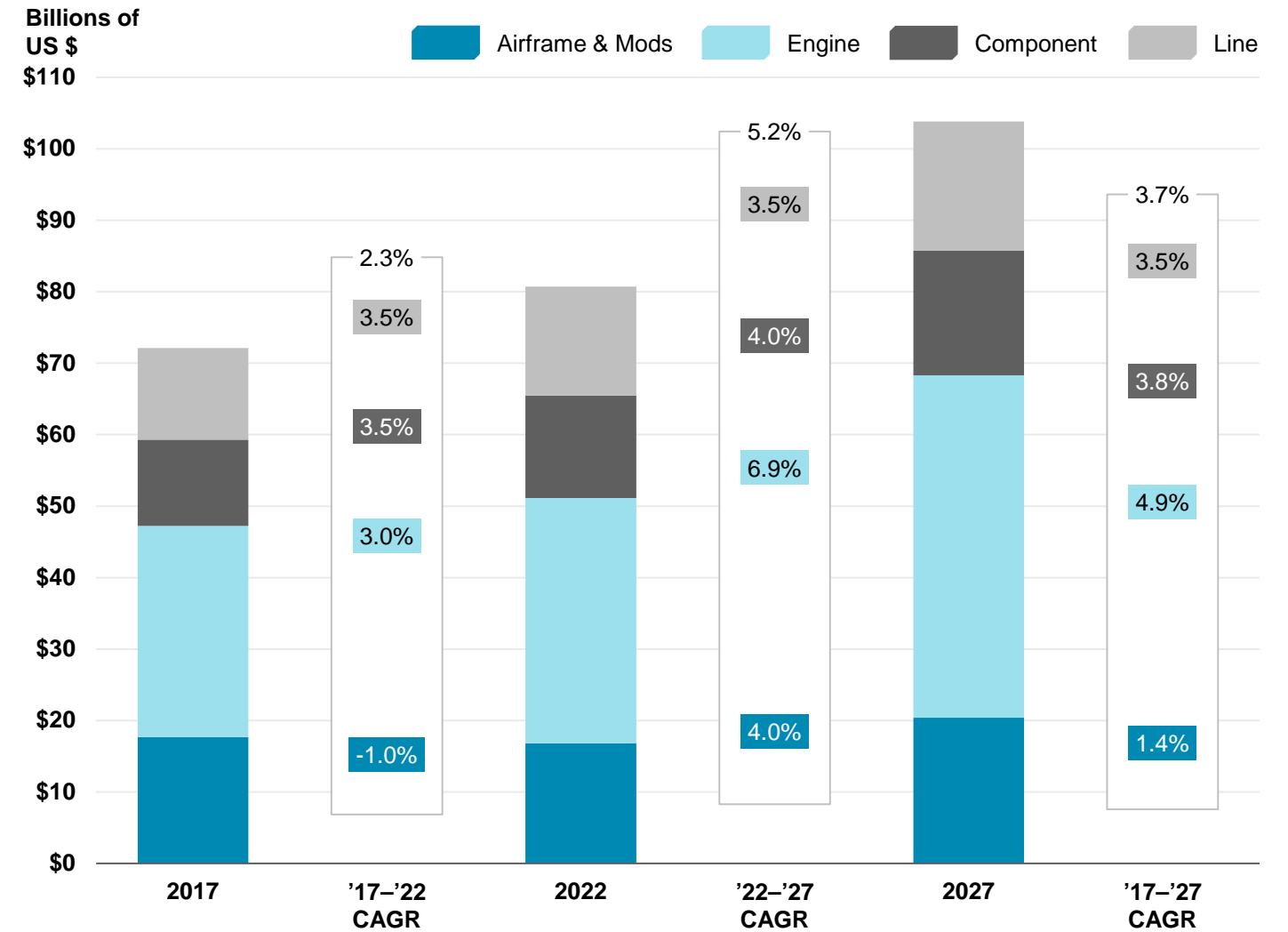


The global fleet is forecast at an annual growth rate of 3.4%, while the MRO market is forecast to grow at an annual rate of 3.7%

**Global Commercial Air Transport Fleet Forecast**  
by Aircraft Class



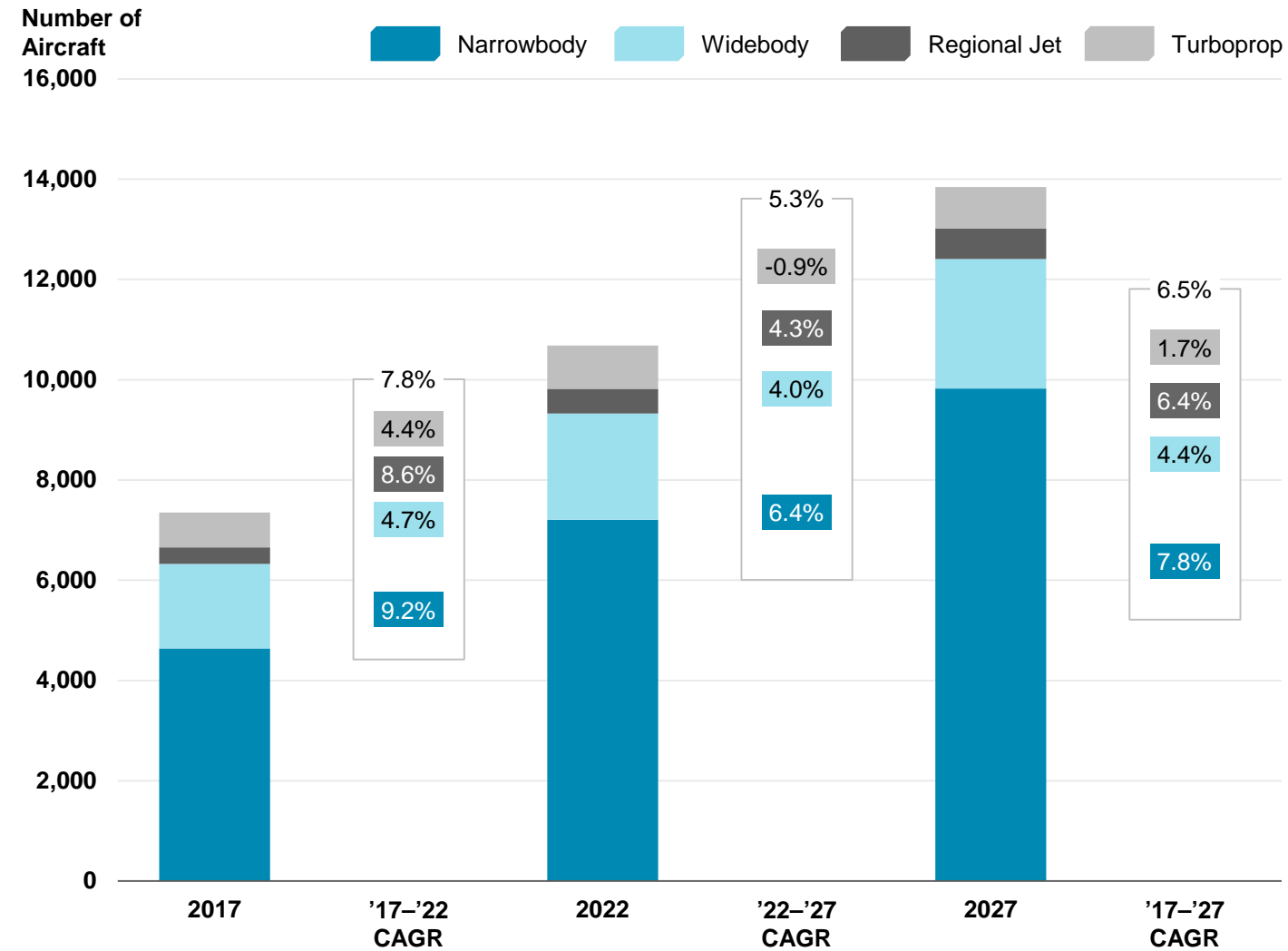
**Global Commercial Air Transport MRO Forecast**  
by MRO Segment



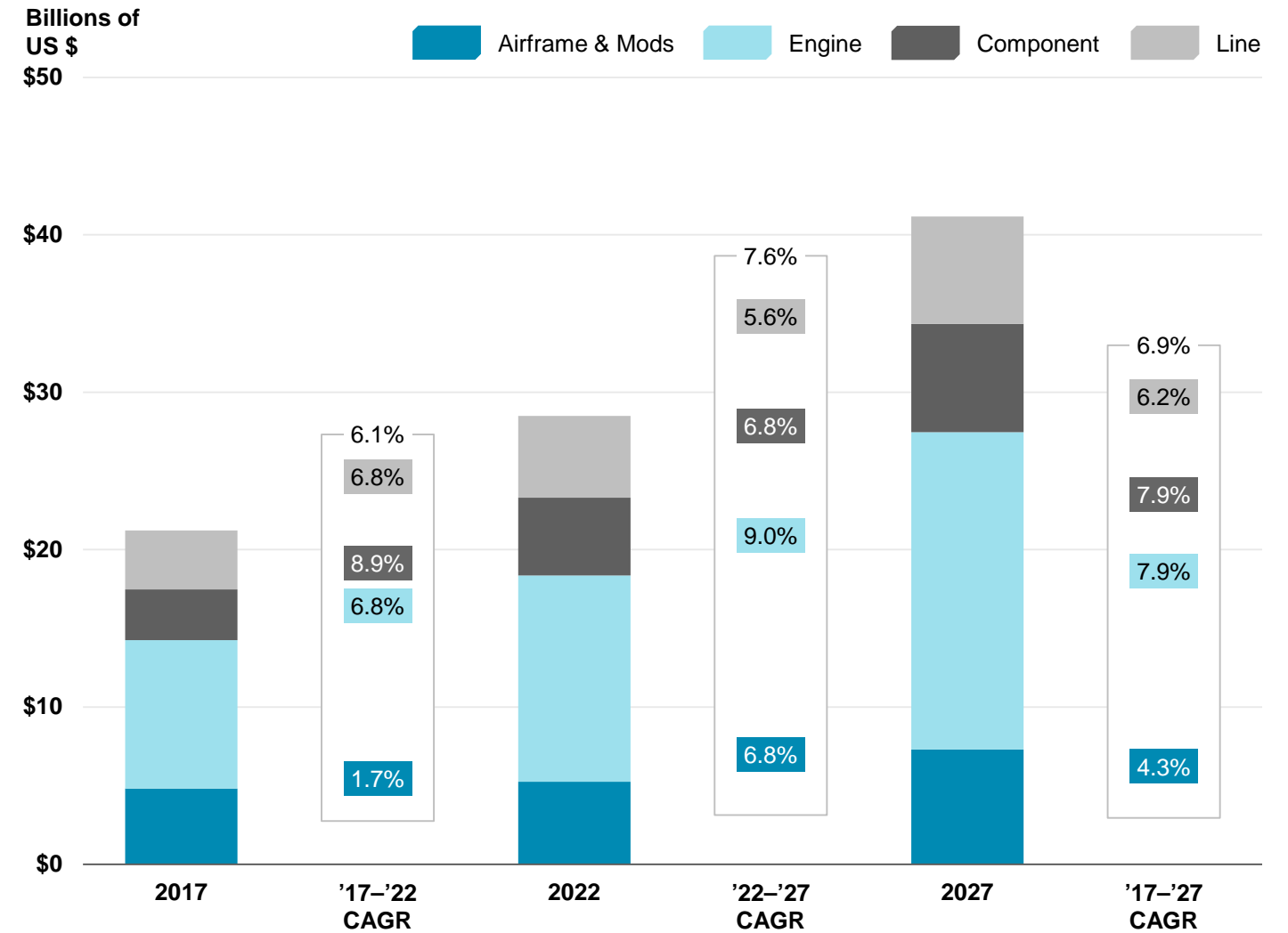
Next gen narrowbody aircraft will dominate the global fleet growth, while expensive engine shop visits will drive the growth in the MRO market.

Asia Pacific is forecast to experience the fastest growth in the world at an average annual rate of 6.5%, reaching a fleet size of nearly 14,000 aircraft by 2027

**Asia Pacific Commercial Air Transport Fleet Forecast**  
by Aircraft Class



**Asia Pacific Commercial Air Transport MRO Forecast**  
by MRO Segment

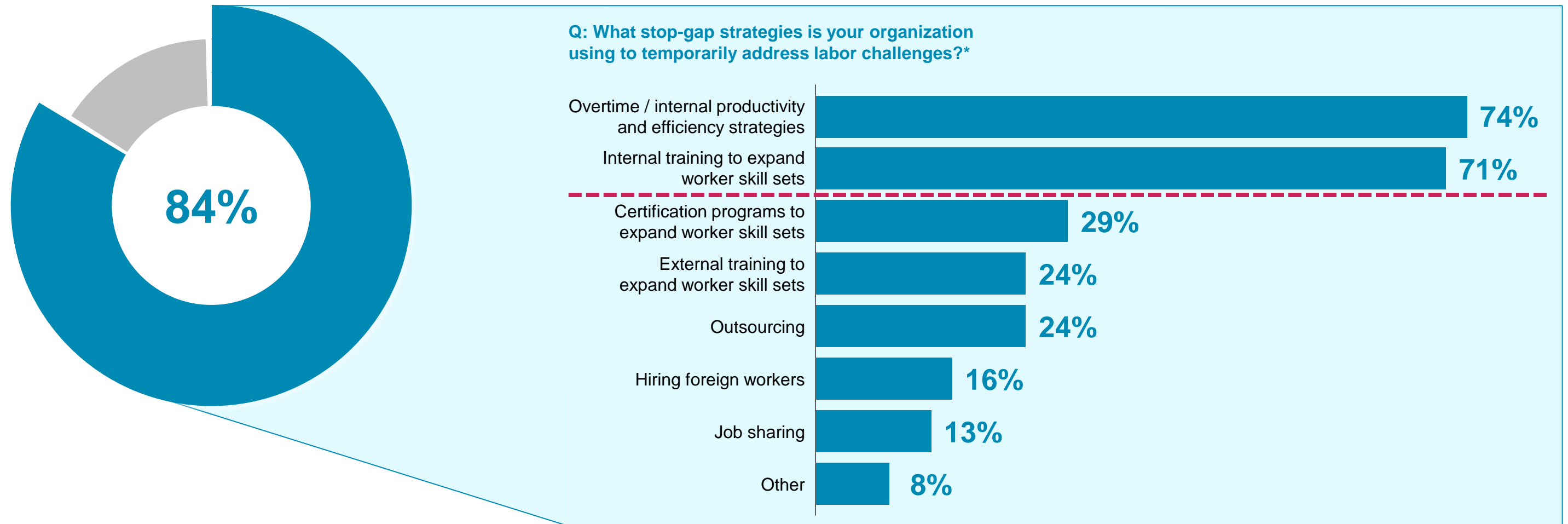


Engines will be the main driver of growth in Asia Pacific with the overall MRO demand increasing from \$21B in 2017 to over \$41B by 2027, a 6.9% annual growth rate

## 2 | Aircraft Technician Shortage

# The Oliver Wyman 2017 MRO Survey found that 84% of respondents across the globe are experiencing labor challenges

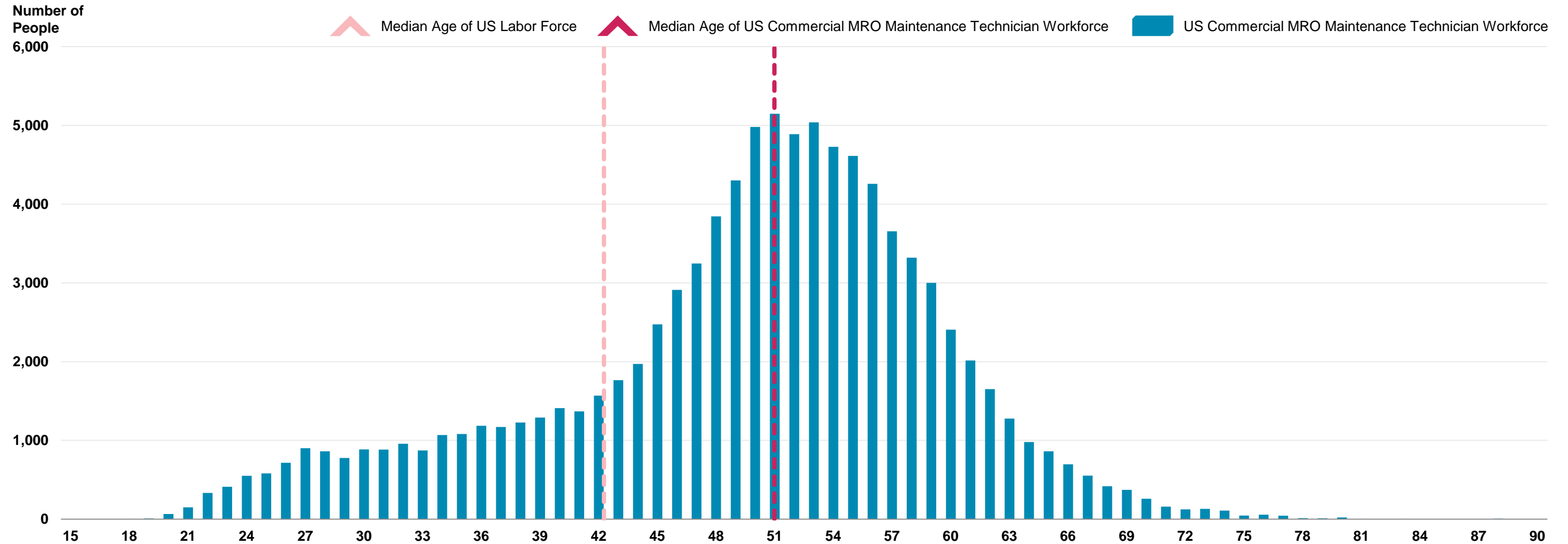
Percent of organizations using stop-gap strategies to temporarily address labor challenges:



Over the long term, reliance on large amounts of overtime is costly, can reduce overall productivity, and unsustainable

In the US, the commercial MRO workforce is comprised of approximately 86,000 maintenance technicians with a median age of 51, nearly 9 years older than the median age of the US labor force

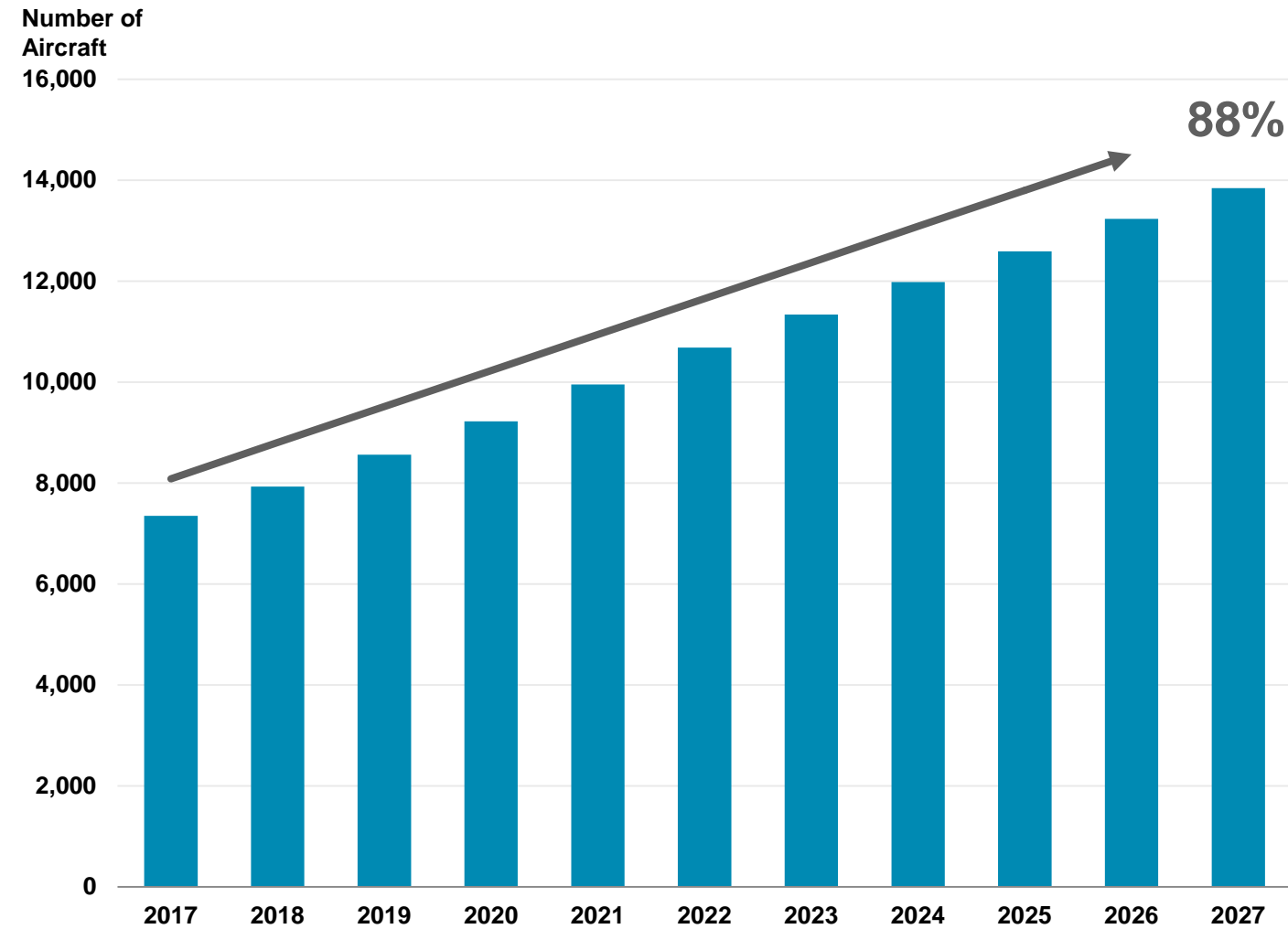
### US Commercial MRO Maintenance Technician Workforce by Age



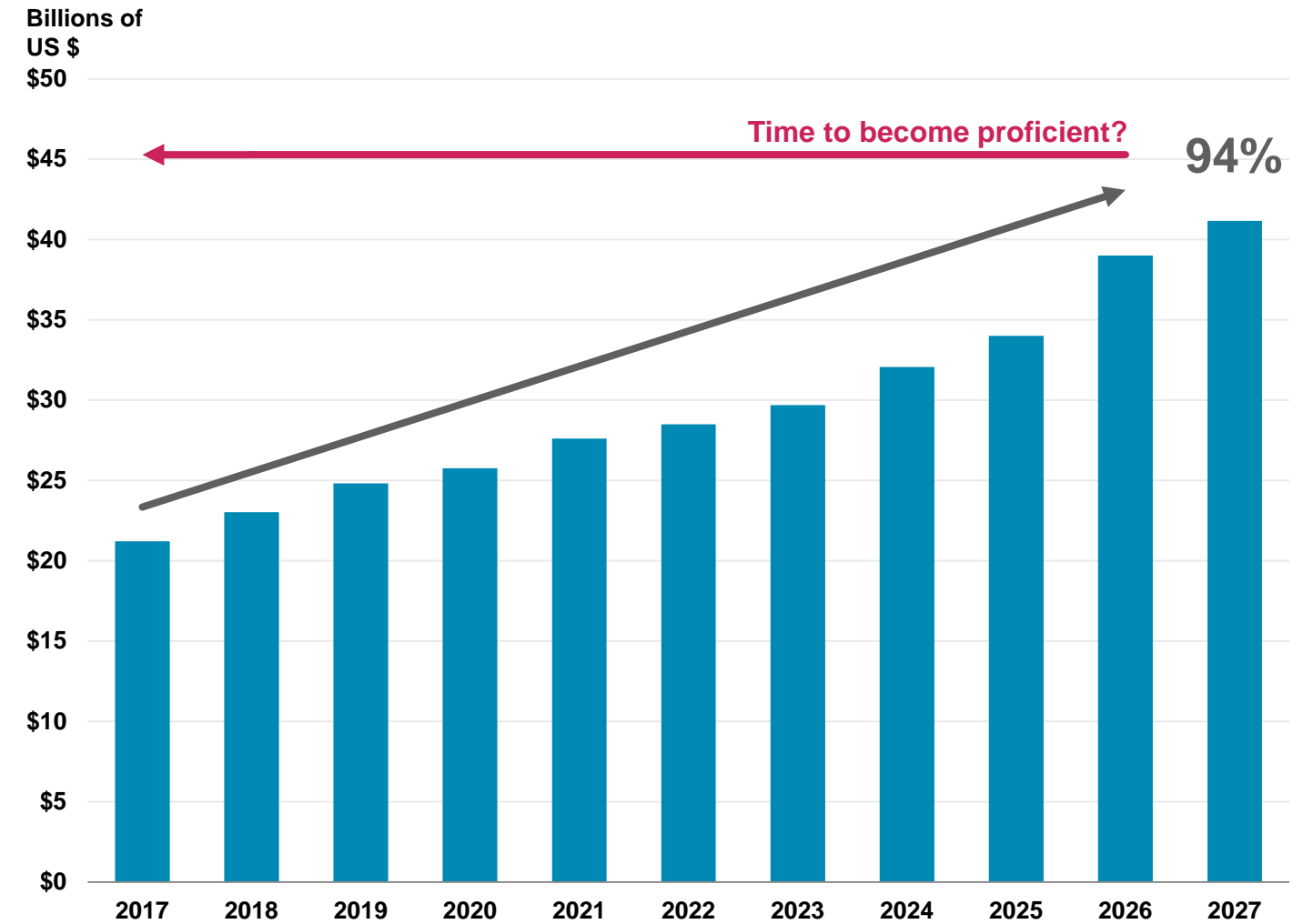
Where data is not as readily available, European airlines and MRO's are reporting similar challenges while Asia Pacific is facing a different challenge with respect to Technicians

In Asia Pacific, assuming the numbers of technicians are correct for today's fleet and given the explosive growth in MRO demand and the time it takes for a mechanic to become proficient, investment in technicians is required

**Asia Pacific Commercial Air Transport Fleet Forecast**  
by Aircraft Class



**Asia Pacific Commercial Air Transport MRO Forecast**  
by MRO Segment



There is reason to think that Asia Pacific may need substantially more technicians soon to prepare for fleet growth

One way to mitigate the impact of the tight labor market is to modernize training for new and existing technicians by using cutting-edge technology to deliver content that is personalized, relevant, and easier to retain



### Personalized L&D resources are ineffective at building long-term knowledge

- They **do not offer a personalized learning experience** for employees to directly apply to their specific roles
- The content is **not easily digestible**
- Employees are expected to **know more than ever before**, but have less time to spend on L&D



### Millennials (and their learning styles) are taking over

- By 2025, millennials will make up **75% of the workforce**
- Millennials prefer **non-traditional** learning methods
- Millennials absorb information more effectively when they are **presented in shorter bursts** and delivered digitally



### Employers are struggling to develop relevant L&D content

- Developing innovative, effective material for employees requires **a lot of time, money, and internal resources**
- A majority of organizations indicate their **biggest challenge** for L&D is ensuring that what is taught is actually utilized on the job
- The **fastest-growing segment** in HR tech spending is now the adoption of new employee learning systems
- At most companies, the learning management system (LMS) is **among the oldest and most challenging to use**

Training should be personalized, proficiency-based, and custom-tailored to employee needs to allow for technicians to focus on individual maintenance units rather than general knowledge that is irrelevant to job duties

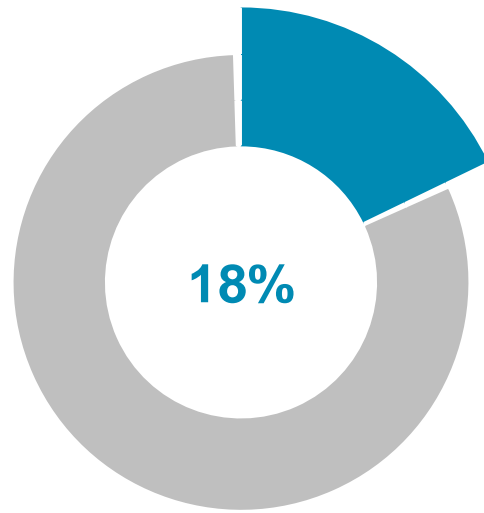
### 3 | Moore Changes Required



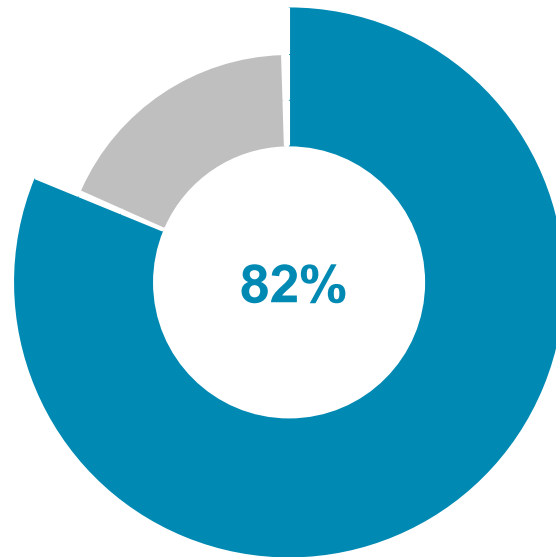
The maintenance technician shortage will make performing maintenance at the right time, and as efficiently as possible more important than ever

Q: Which of the following game changing technologies for the shop / hangar floor are you planning on implementing within the next 3 years?

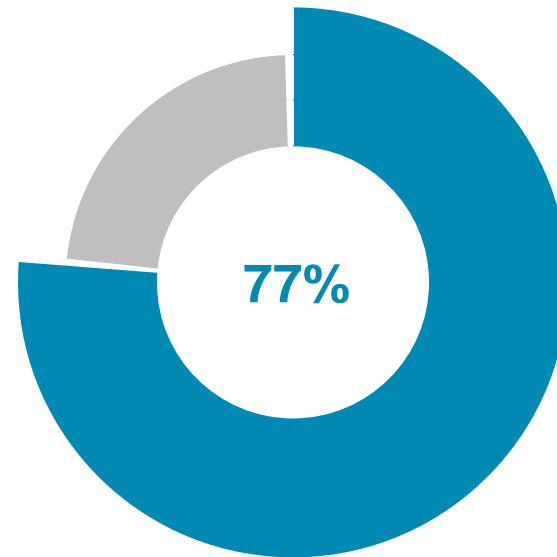
Drone / Robot Supported Maintenance



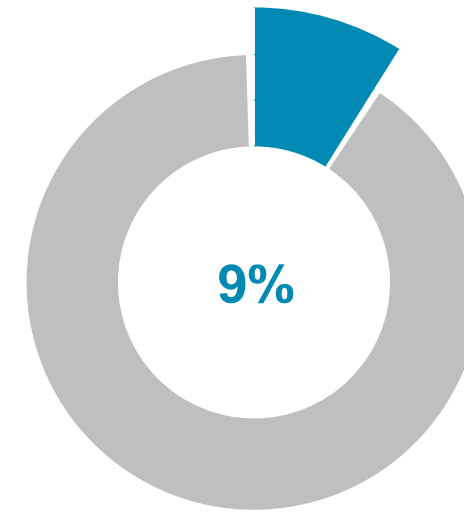
Paperless Shops / Hangars



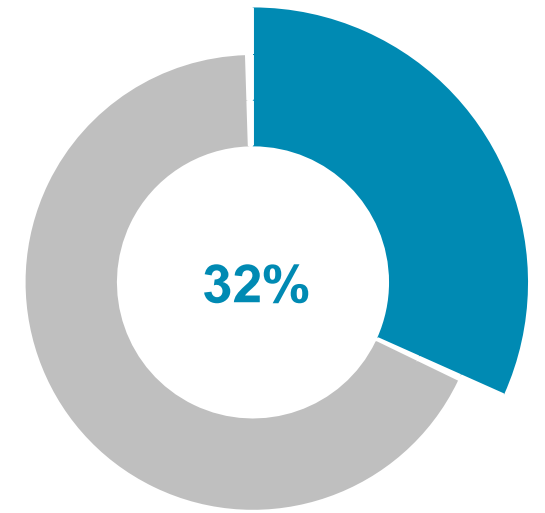
Predictive Maintenance



Smart Sensors (SansEC Sensing)



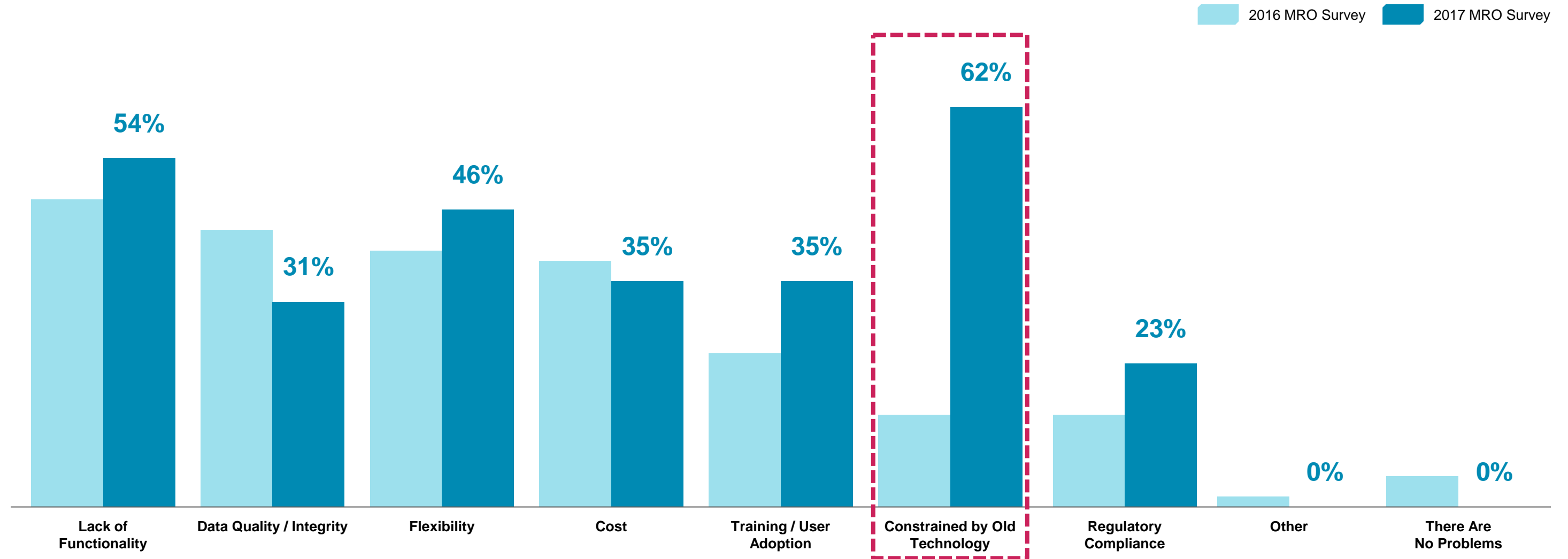
Virtual Maintenance Training



More than three quarters of MRO Survey respondents plan on implementing paperless shops/hangars and predictive maintenance over the next three years – technologies aimed at increasing technician efficiency and productivity and maximizing aircraft availability

While respondents express interest in predictive maintenance, big data, and advanced analytics, there is limited evidence so far as to the benefits, largely due to the industry being plagued with major inefficiencies and a lack of innovation when it comes to information technology

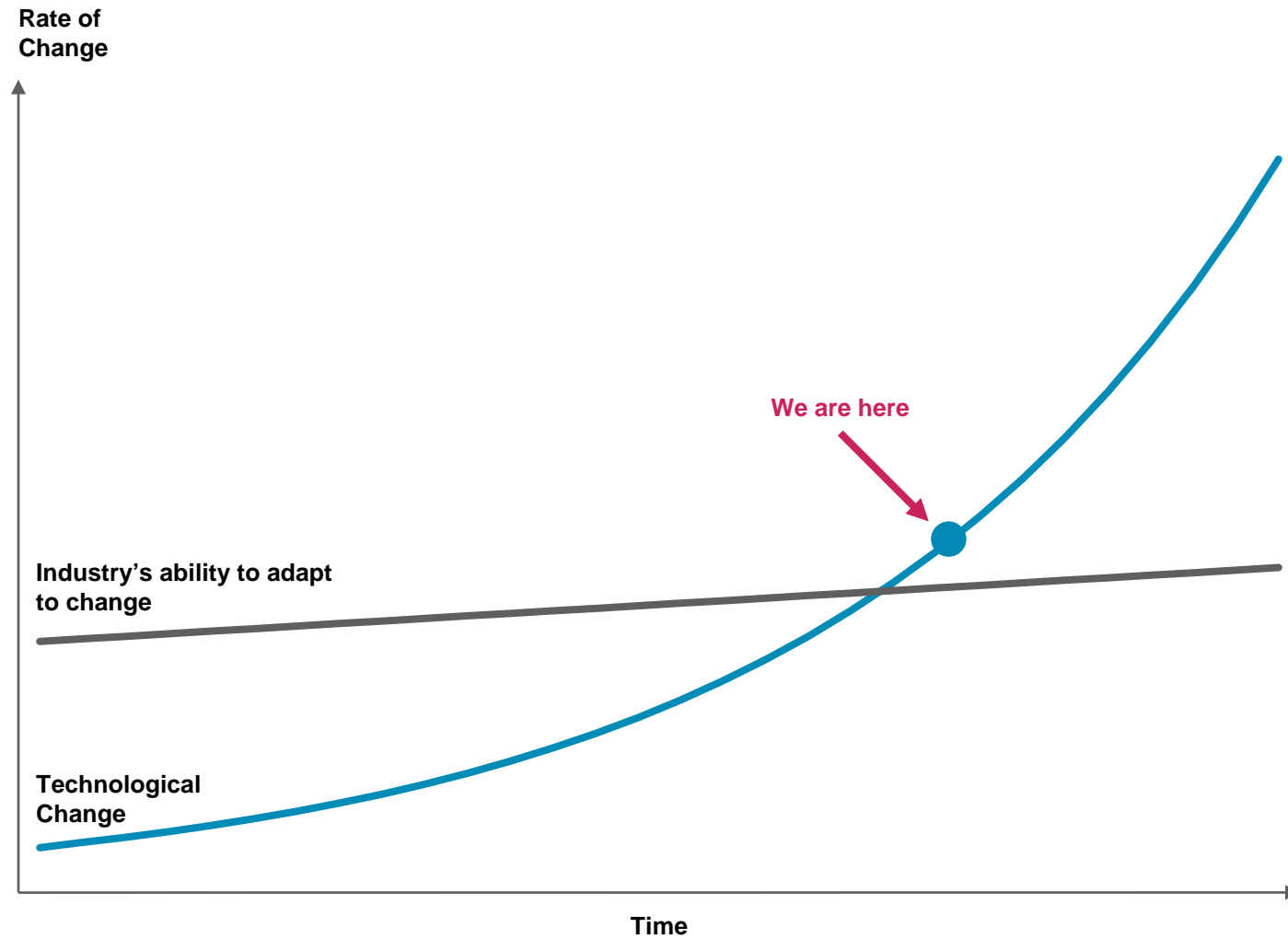
Q: Select the top three (3) problems facing your IT systems today:



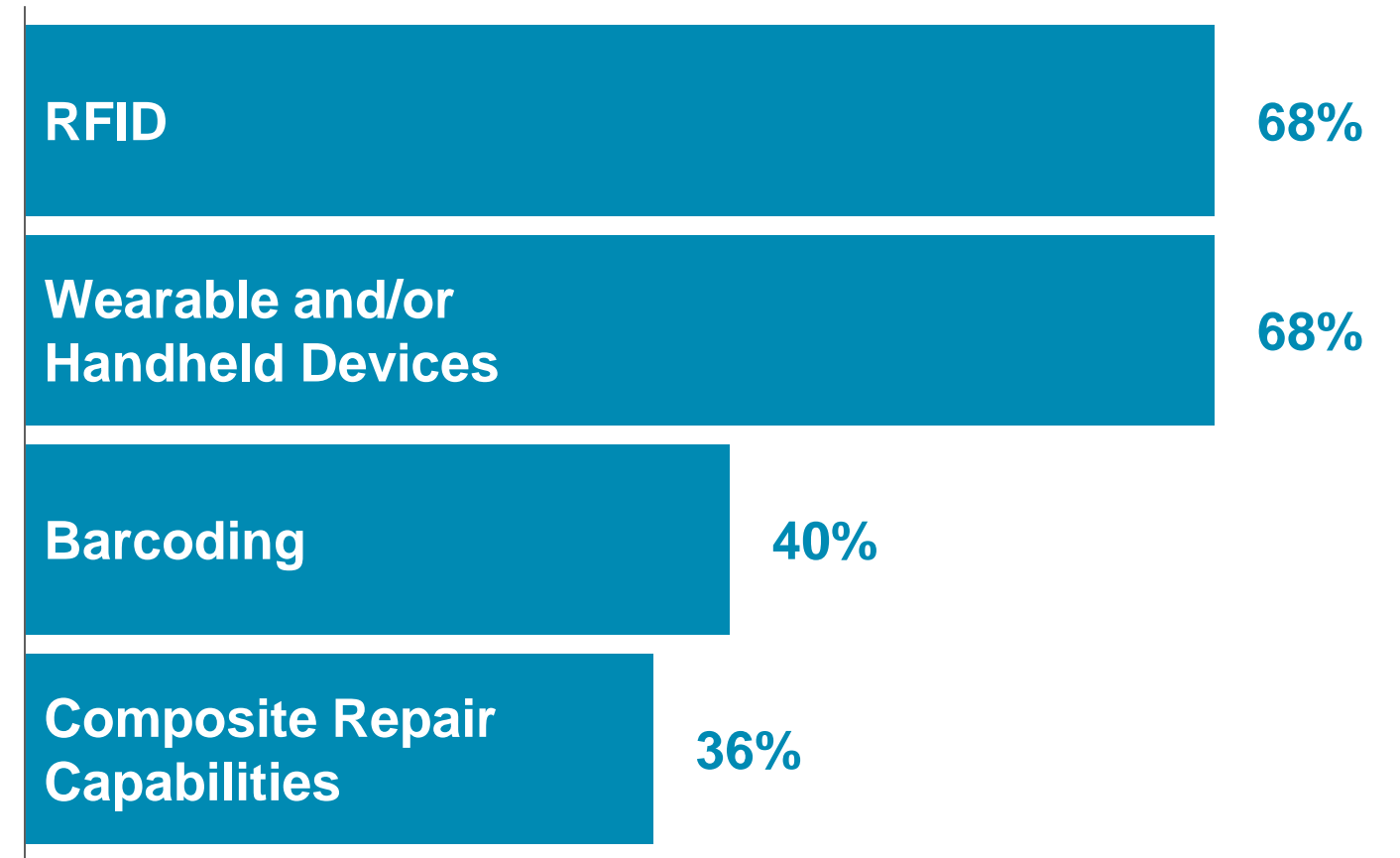
Aircraft designed in 2017 are being maintained by systems designed decades ago and it's starting to show

Today, the rate of technological change is accelerating so fast that it has risen above the average rate at which our industry can adapt to change, preventing us from fully benefiting from all of the new technology that is coming along

**Adaptability to Technological Change**  
Astro Teller Illustrative Graphic



Q: Indicate which new technologies your company is planning to deploy in the next three (3) years?

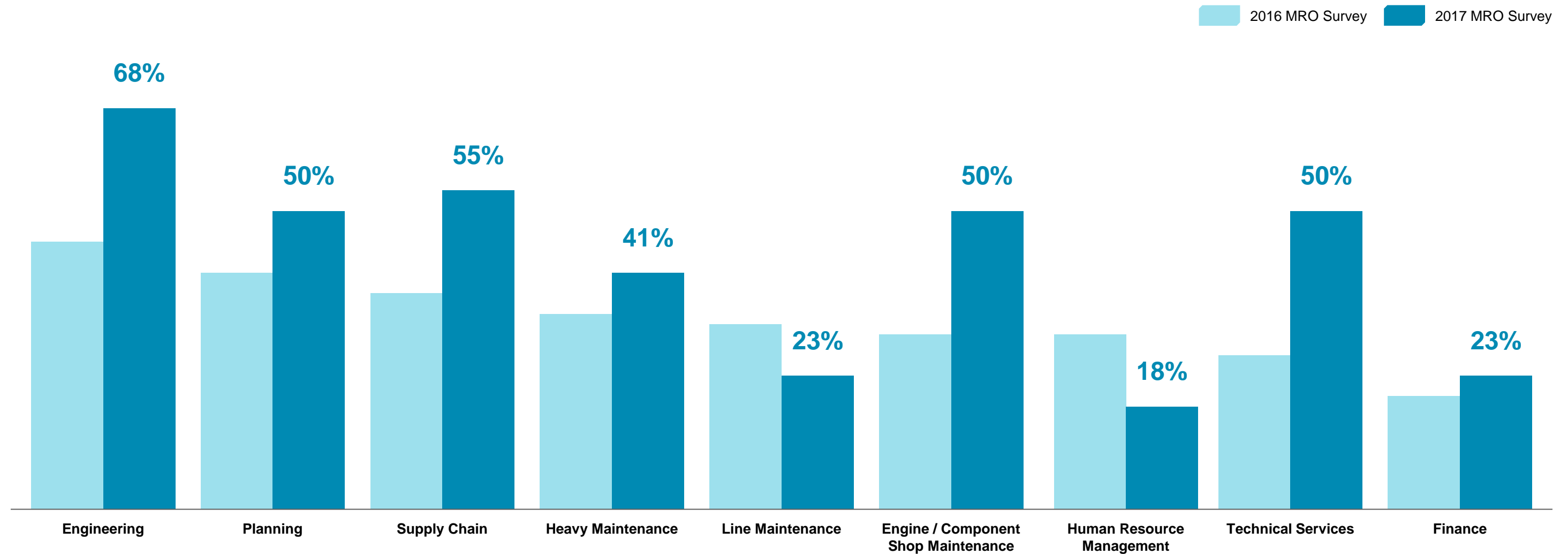


28% New Repair Technology | 24% Additive Manufacturing | 20% Artificial Intelligence (Machine Learning)  
20% Robotics | 12% Drone-Supported Maintenance

This is evident by the fact that the new technologies planning on being deployed over the next 3 years are RFID and wearable and/or handheld devices such as tablets – technologies other industries adapted to several years ago

Most have recognized that they are behind the technology curve and plan to make significant changes to their IT systems over the next few years

Q: Indicate which IT systems have a migration or major upgrade planned within the next three (3) years?

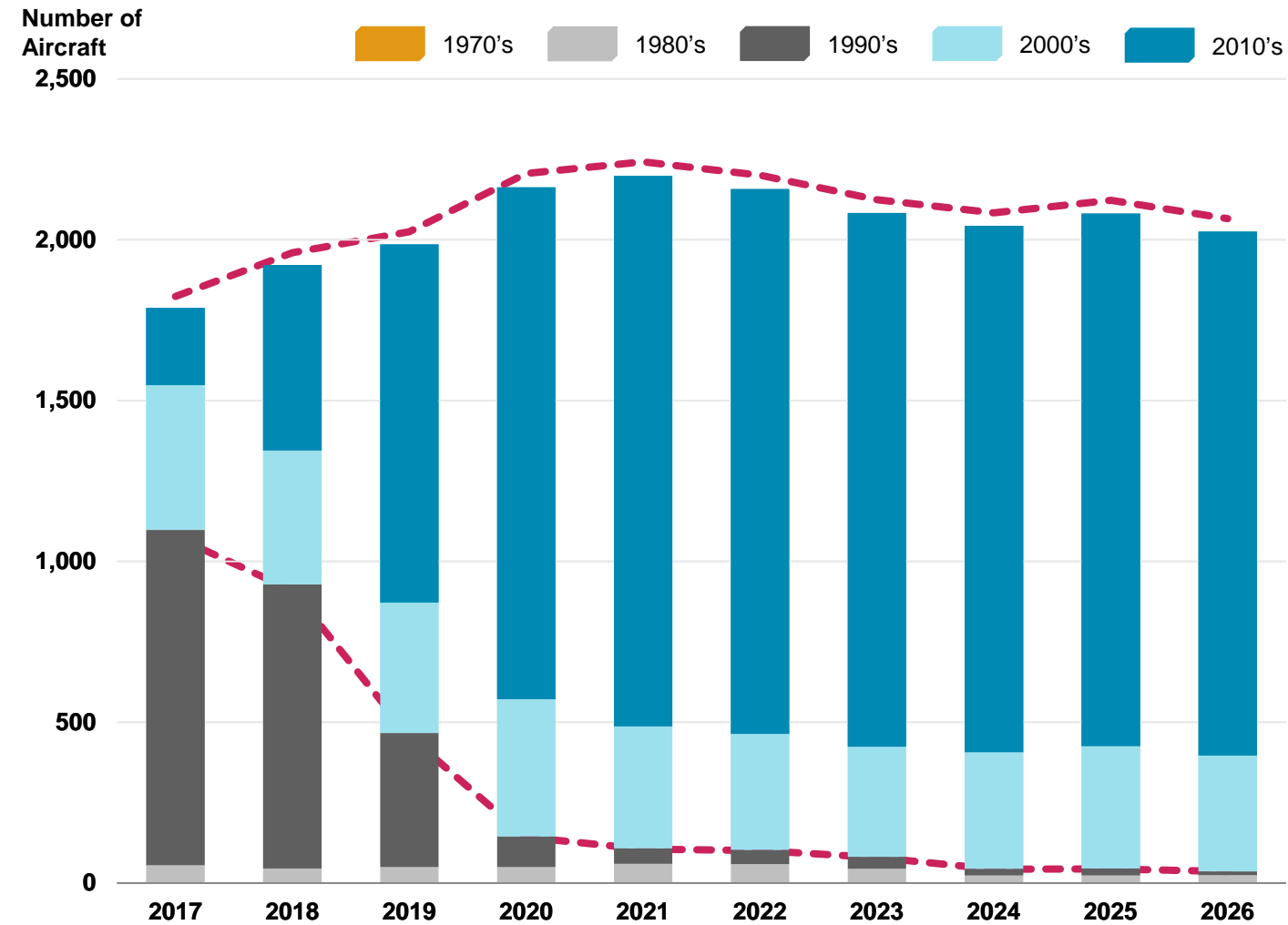


An ever aging IT infrastructure, competing for limited resources, needs to be given higher priority because not only is the fleet getting larger, it is becoming more technologically advanced - fast

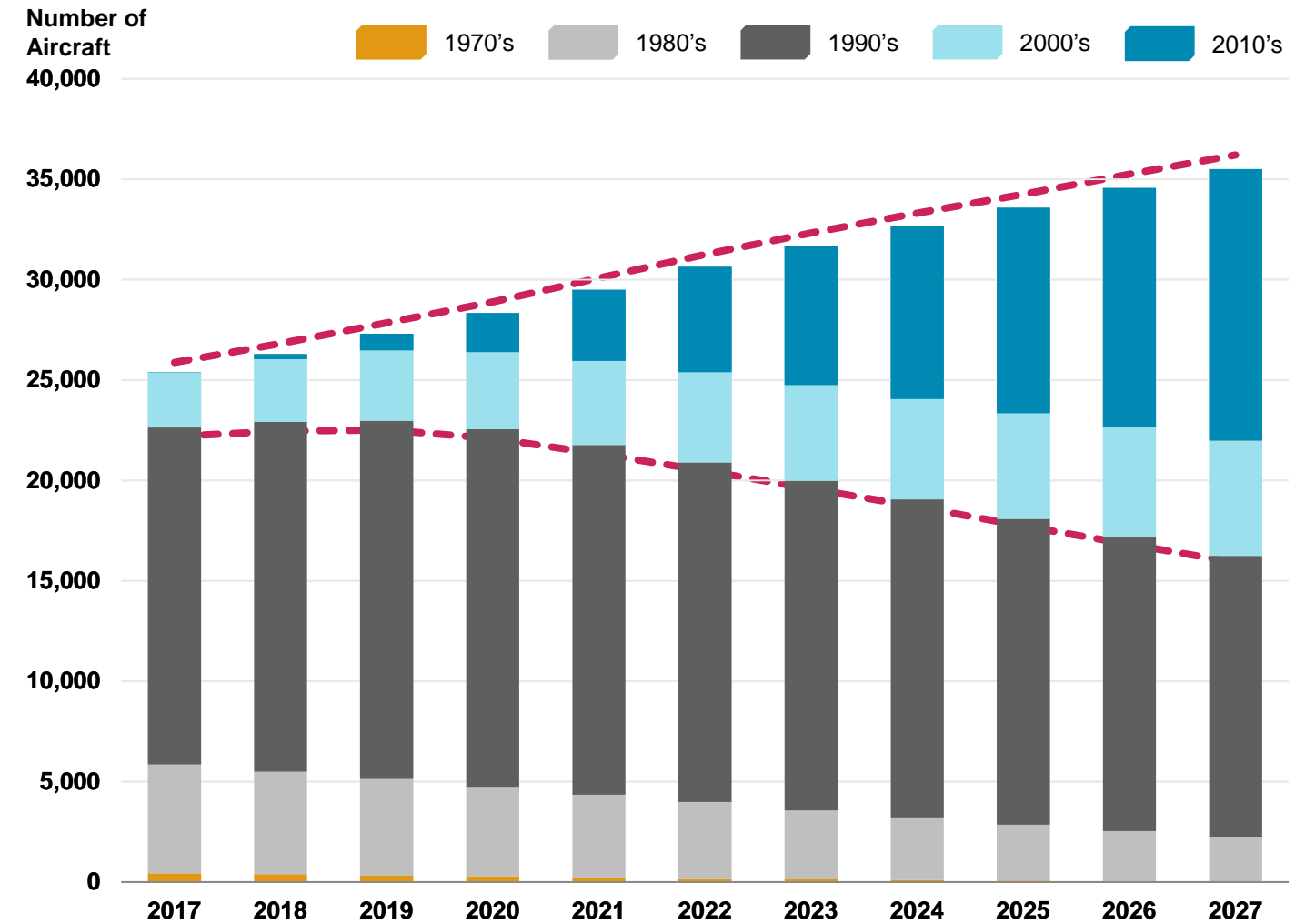
## 4 | The Lean, Digitally Mean Airline Fleet of the Future Takes Shape

As the in-service fleet grows to over 35,000 by 2027, the rapid deployment of aircraft incorporating next generation technology will be the primary agent of change

**Global Commercial Air Transport Delivery Forecast**  
by Aircraft Vintage



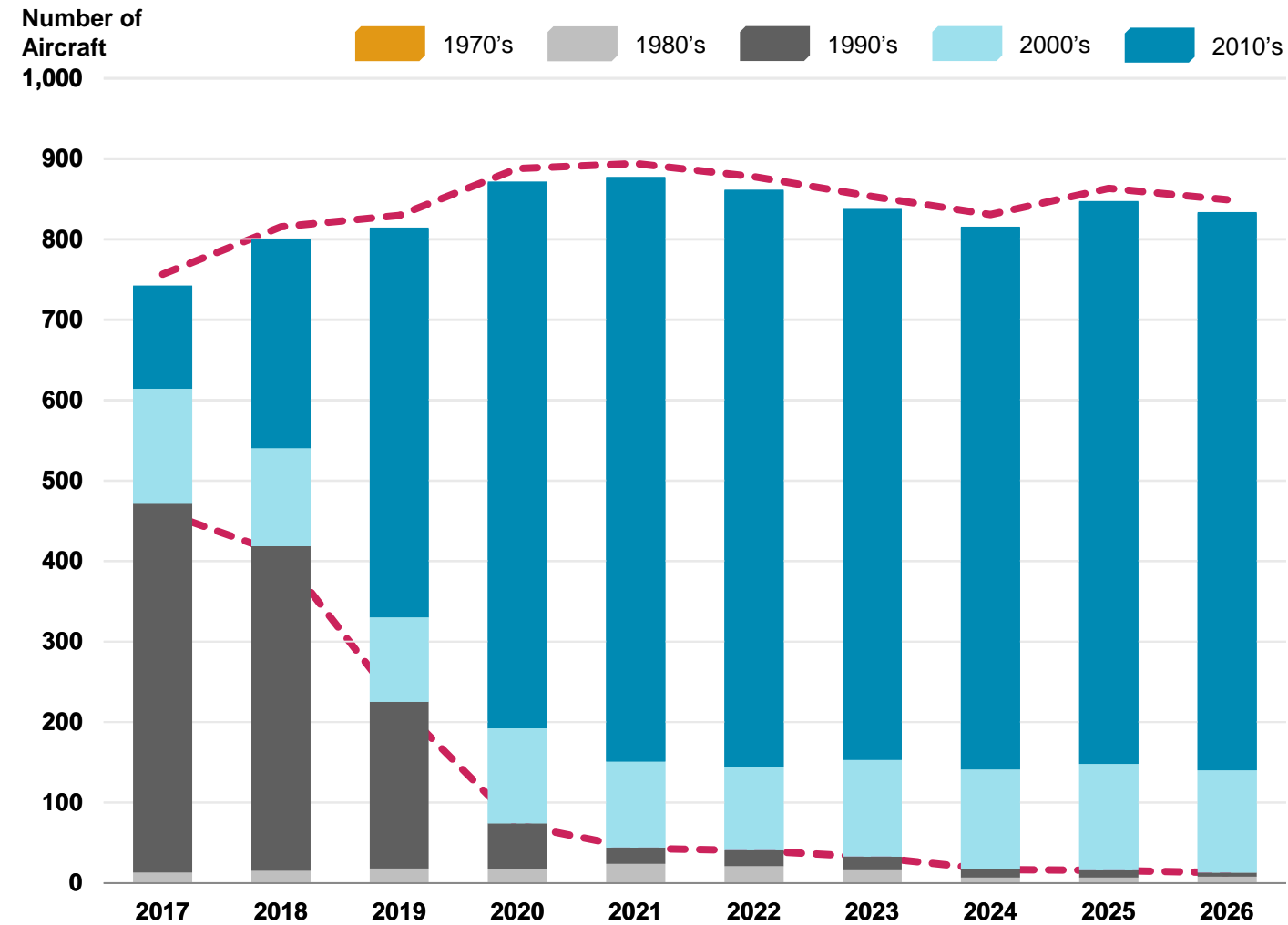
**Global Commercial Air Transport Fleet Forecast**  
by Aircraft Vintage



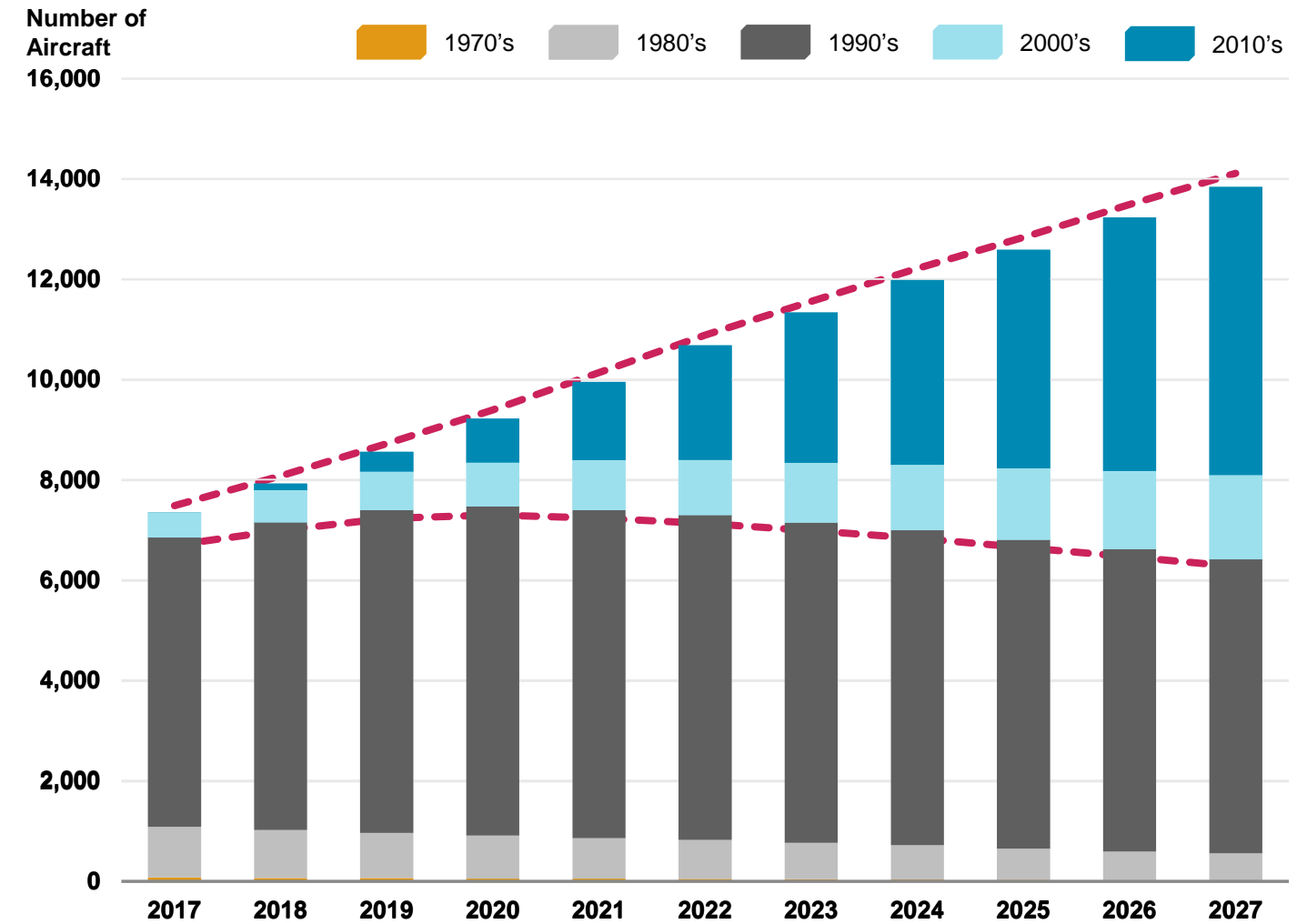
Dealing with the technological shift in the fleet will be an enormous challenge as the new fleets will bring new complexity to the market and further change the skill requirements of the workforce maintaining the fleet

The Asia Pacific in-service fleet will grow from over 7,300 to nearly 14,000 by 2027, as the rapid deployment of aircraft incorporating next generation technology will be the primary agent of change in the region.

**Asia Pacific Commercial Air Transport Delivery Forecast**  
by Aircraft Vintage



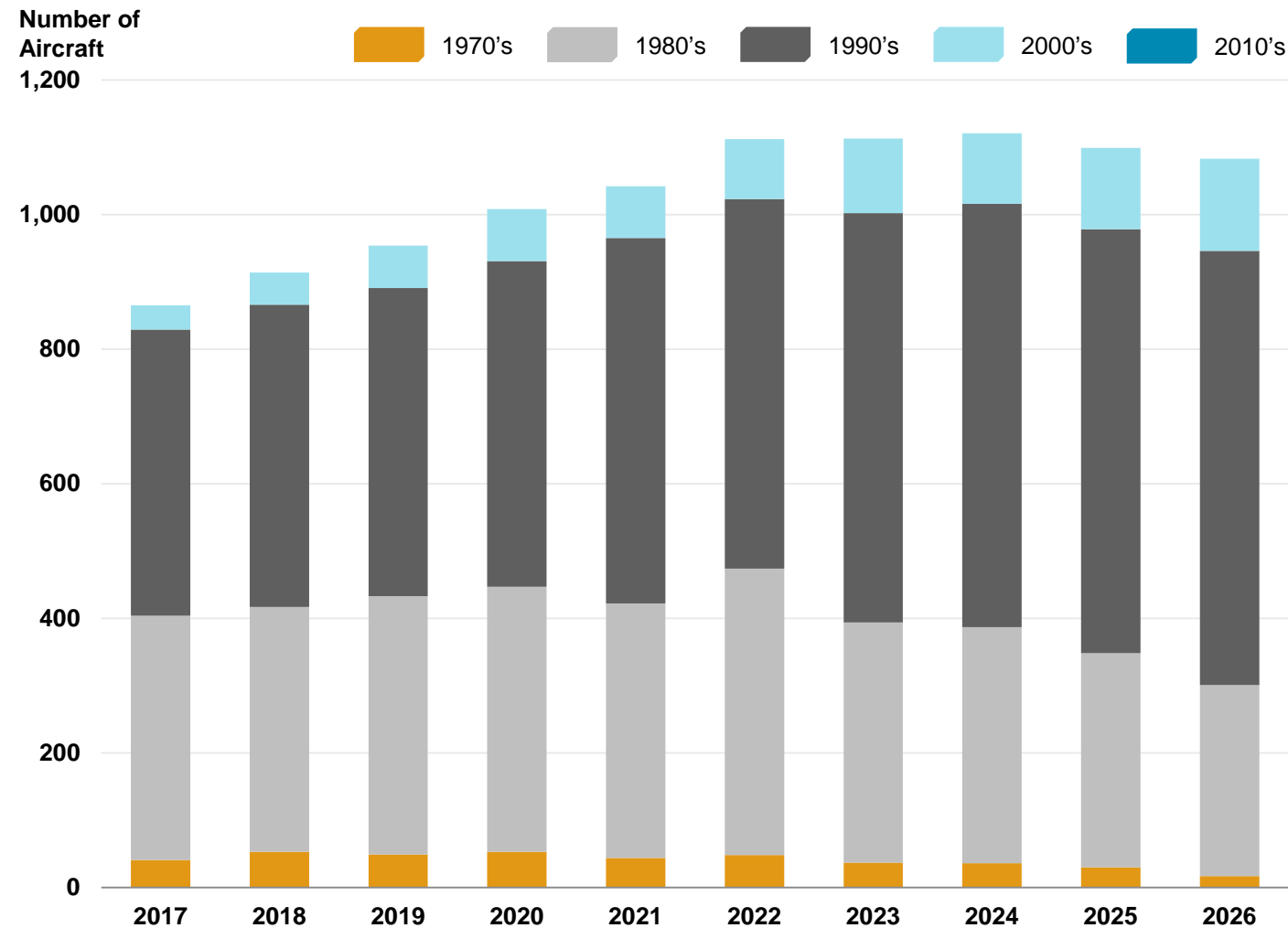
**Asia Pacific Commercial Air Transport Fleet Forecast**  
by Aircraft Vintage



In 2017 only 7% of Asia Pacific's fleet is composed of next generation aircraft. By 2026, the number of next generation aircraft in the region is forecast to outnumber the current generation fleet.

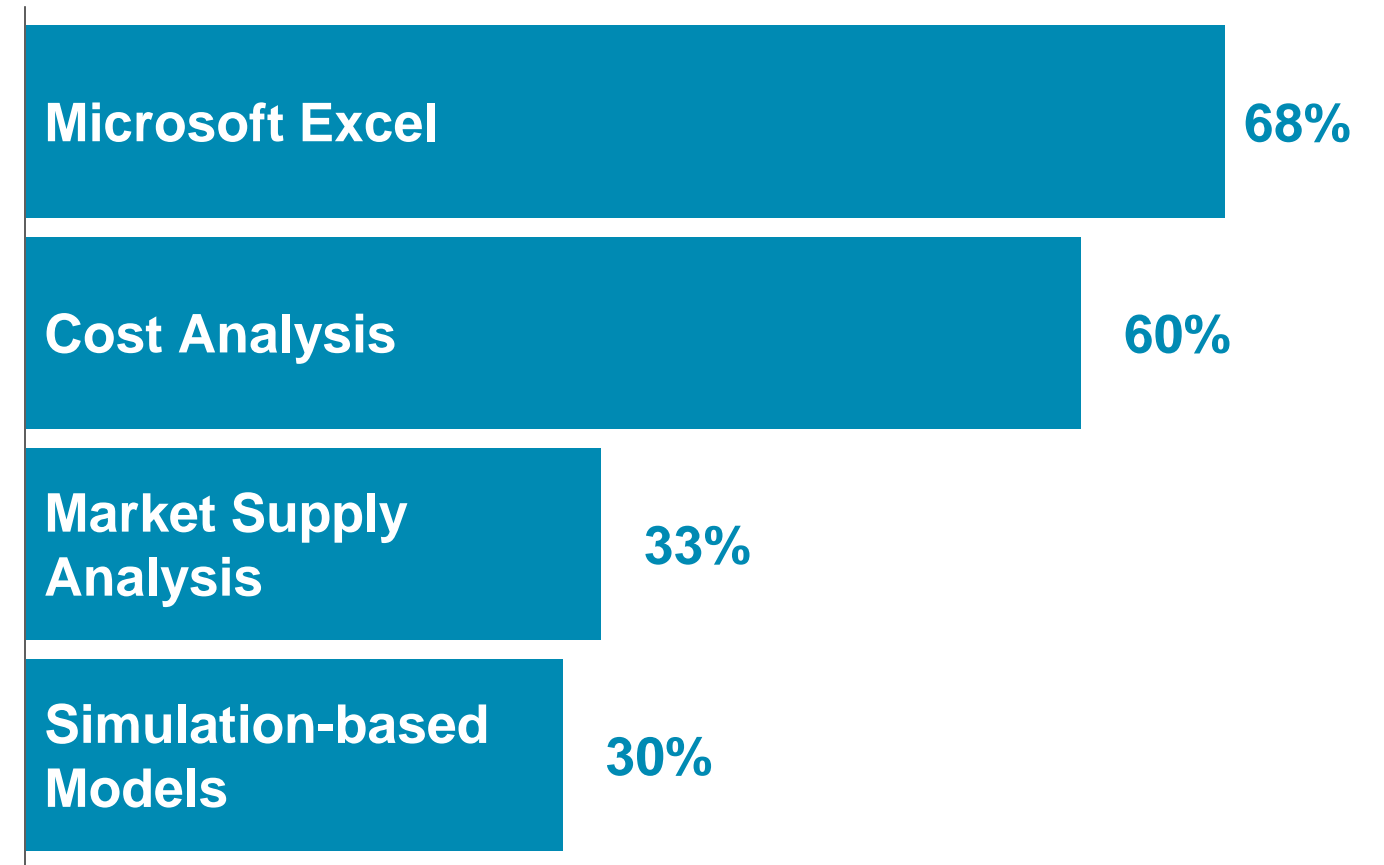
And, even though many have altered fleet plans to take advantage of current market conditions, the number of aircraft removed from the fleet is expected to reach historic levels over the next 10 years

**Global Commercial Air Transport Retirement Forecast**  
by Aircraft Vintage



Approximately 40% of the in-service fleet is forecast to retire by 2027

**Q: What tools do you use to manage the end-of-life?**



End of life planning needs to move into the digital age to account of the complexity of aircraft with different retirement requirements



It's time to break free of antiquated thinking, processes, and systems holding us back from fully benefiting from new technologies.

- The industry has passed the peak of this current financial cycle.
- The aging of the mechanic workforce and rash of anticipated retirements could not come at a worse time for the industry.
- An ever aging IT infrastructure, competing for increasingly limited resources, needs to be given higher priority.
- The sheer number of retirements over the next 10 years will strain the processes and methods currently use to manage the end an aircraft's useful life. End of life planning needs to move into the digital age.

