



Navigating Chaos

Aircraft Markets and Big Supply Challenges

Richard Aboulafia, Managing Director

October 7, 2025

Presentation to:

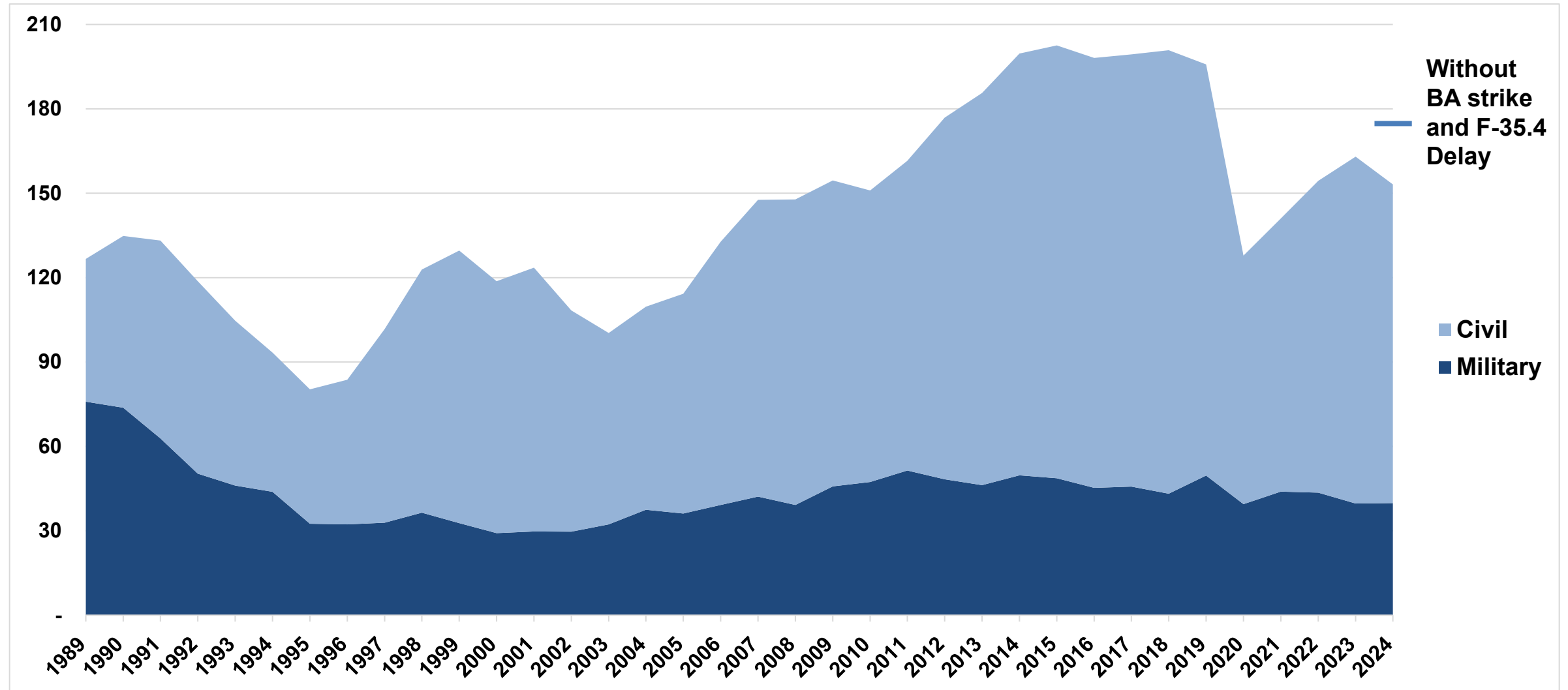


ATA e-BUSINESS PROGRAM



Deliveries: Growing pains

Historical deliveries with preliminary 2024 numbers; 2025 \$ Billions



General factors impacting the supply chain – some are sporadic, others are structural

Summary of General Supply Chain Factors

Material and Parts Shortage

Raw materials – specifically titanium forgings and castings – have increased in cost by up to 40%, which is compounded by capacity shortage.

Tier 3 suppliers are also struggling to produce at rates to support high volume commodities like interiors.

Skilled Labor Shortage

The impacts of early retirements during COVID paired with non-competitive wages have resulted in a much younger, less skilled workforce.

Value chains like airframe, engine and aerostructures assembly that are highly labor intensive are suffering the most.

Lack of Investment

Thousands of smaller Tier 2/3 suppliers have customers have failed to invest in additional capacity as their business case isn't compelling enough for credit institutions.

Additional uncertainty regarding aircraft OEM rate projections have disincentivized suppliers from being the first to invest.

Unsustainable Business Models

Aerostructures suppliers have no aftermarket exposure and therefore have suffered heavily from uncertain rates and razor thin margins.

Engine OEMs disincentivized to increase production units that come in at a negative margin.

Sporadic Issue

Significant Issue

Structural Issue

Stretched Aviation Agencies

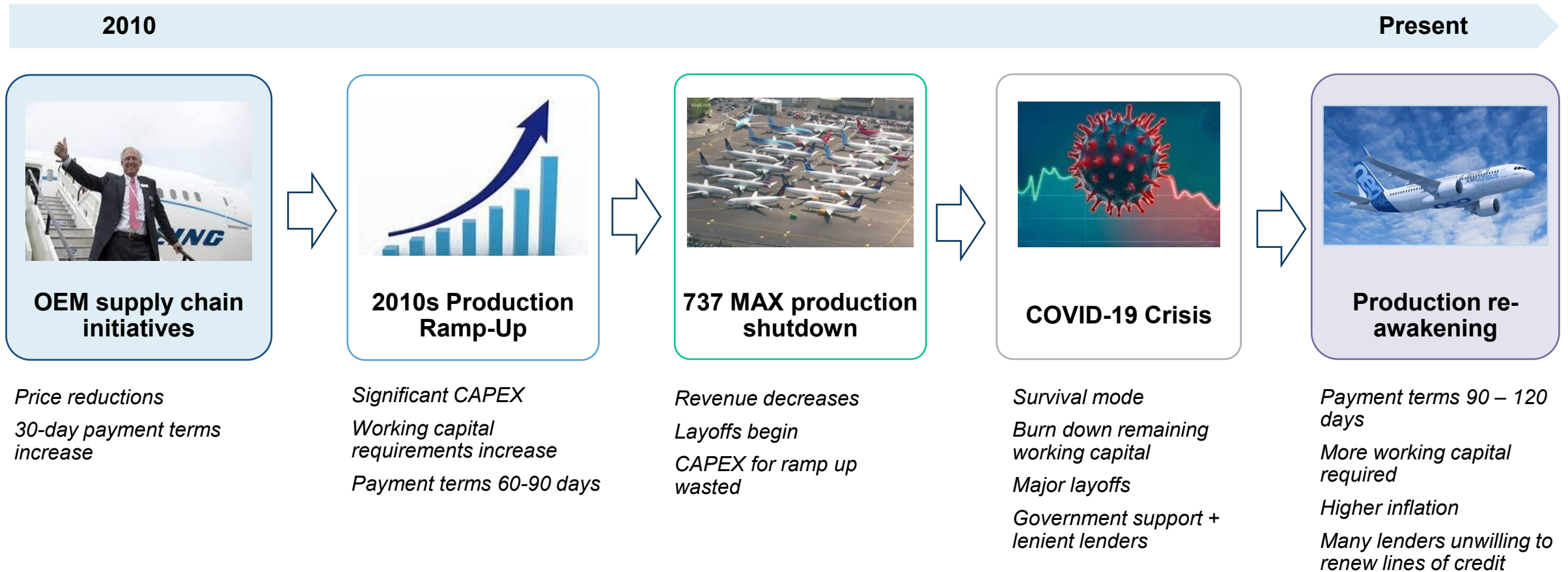
EASA and FAA understaffed; slows down certification and supply chain

Wild Card: Geopolitics

- Ramp-up of military industrial activities
- Tariffs

An unfortunate series of events whipsawed commercial aerospace suppliers and diminished working capital...

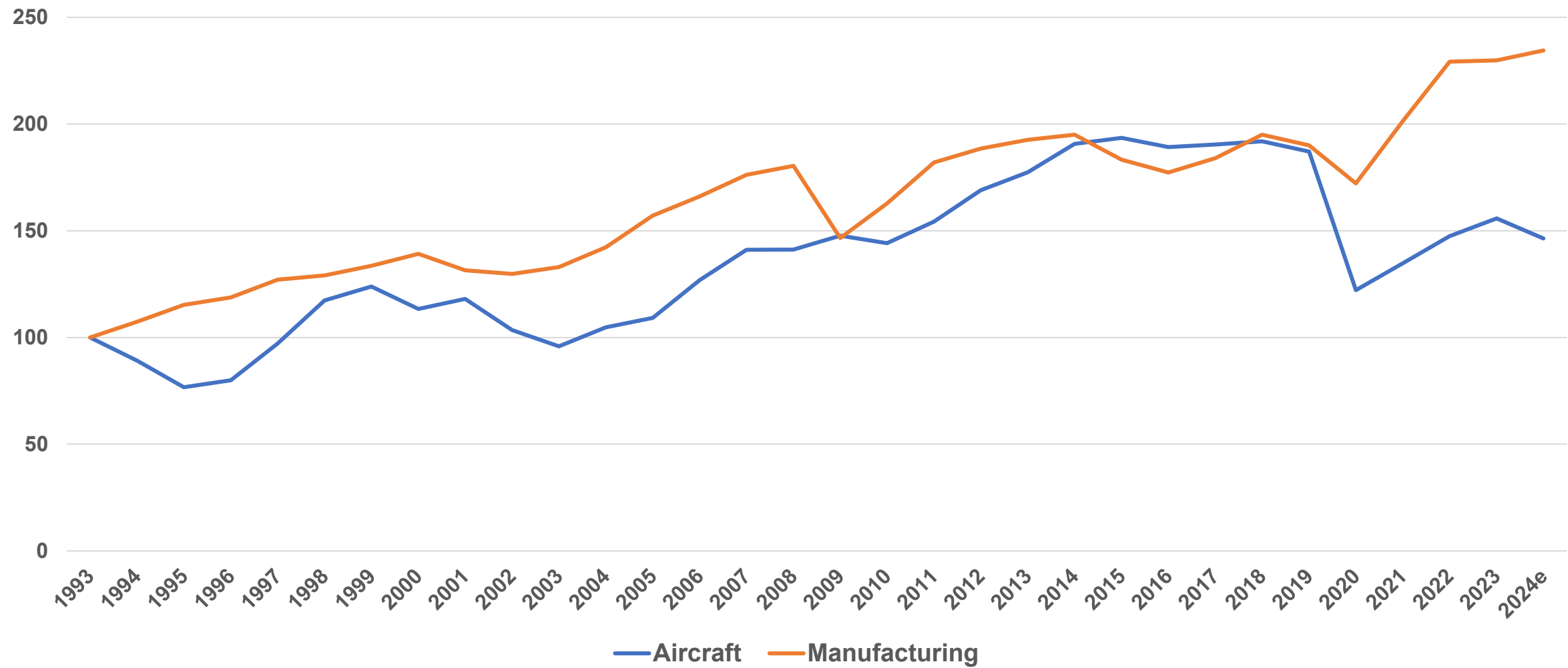
Events Impacting Commercial Aerospace Supplier Working Capital



Sub-tier suppliers are bleeding financially

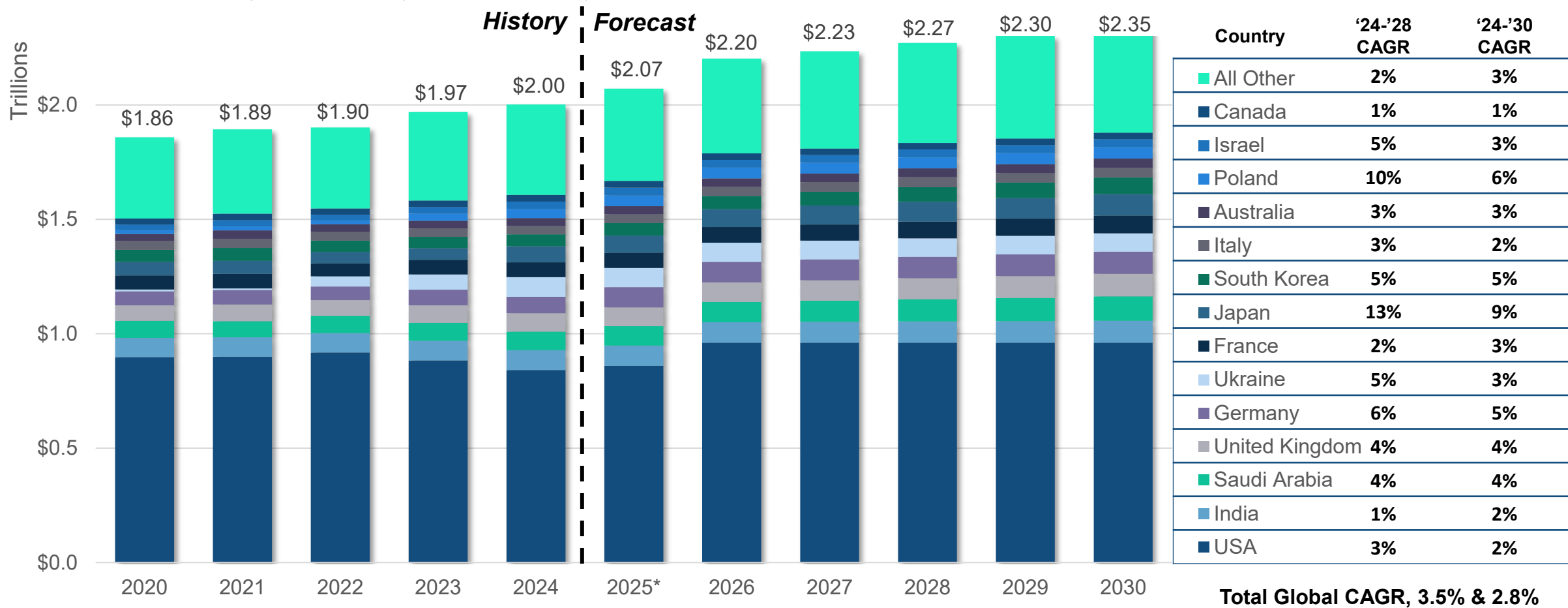
Aircraft output v. everything else: mind the gap

Shipments: total manufacturing by value V. aircraft deliveries, indexed to 1993 output



Global defense spending growing at ~3%; More upside than downside

Total Defense Spending* 2020-2030 (Constant 2024 \$)



*US 2025 continuing resolution budget

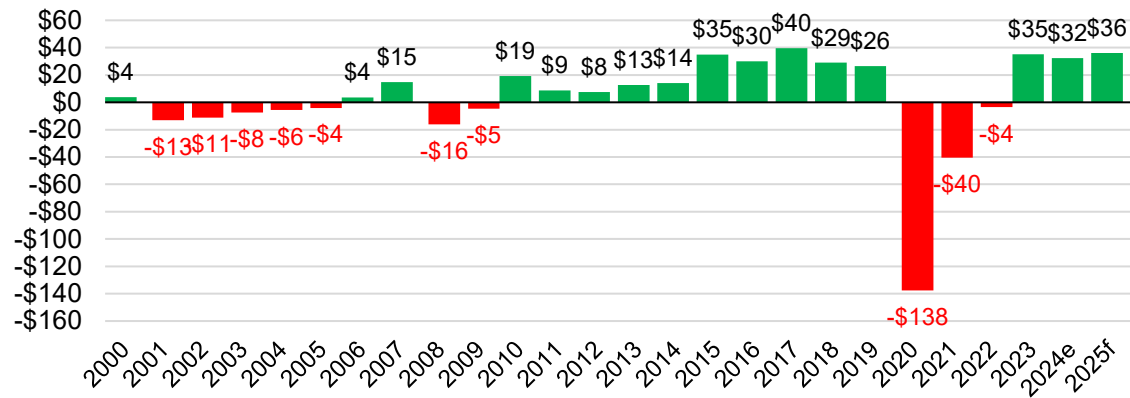
Impact of the US Government Shutdown on Aerospace

Status: Oct 5th

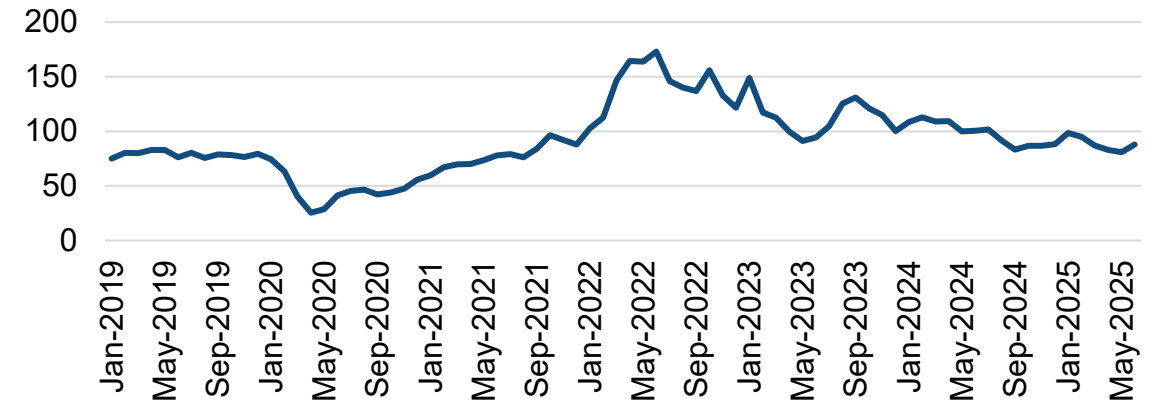
| | Short-Term Impact (days–weeks) | Medium-Term Impact (1–6 months) | Long-Term Impact (>6 months) |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Civil Aviation / Air Transport / BGA | FAA staff furloughs → delays in certifications, STCs, airworthiness directives. Reduced support for inspections & approvals. Delays BA production 38->42 allowance processes | Training of new air traffic controllers paused → growing operational inefficiencies. Airlines face backlog in adding aircraft/routes. Delays BA production and 737/777 certification processes | Structural shortage of controllers worsens; recurring certification delays raise airline & OEM costs. U.S. reliability questioned vs. EASA. |
| Defense / Military | Payments to contractors may be delayed; new contract awards postponed. Delayed sustainment / availability | Development/testing of new programs slowed (fighter jets, UAVs, satellites). Supply chain cash flow stress, esp. SMEs. | Cumulative delays in procurement cycles, higher program costs, weakened international confidence in U.S. export timelines. |
| Space (NASA & Commercial) | Non-essential NASA research halted. ISS operations & mission-critical tasks continue. Commercial launch licensing approvals paused. | Artemis, lunar, and Earth-observation projects delayed. Commercial operators (SpaceX, Blue Origin, ULA, Rocket Lab) face schedule slips. | Lost momentum in U.S. space leadership; risk of falling behind Europe/China on exploration & commercial launch cadence. |
| Supply Chain | Component approvals and testing paused. SMEs reliant on government contracts face cash flow strain -> further delays / impact production, deliveries / MRO | Accumulated backlog at FAA/NASA/DoD labs slows new technology qualification. Payments delayed, smaller firms / SMEs most exposed. | Weakening of supply chain resilience, potential exit of SMEs. European/Japanese suppliers gain relative advantage. |
| Cross-Sector | Temporary disruptions in operations and approvals. | Significant backlogs, increased costs, and strained workforce capacity. | Structural reputational damage: repeated shutdowns undermine confidence, deter foreign investment, and slow innovation. |

Airlines are projected to post ~\$36B net profit on ~\$980B revenue in 2025; the USD has appreciated 8-9% vs. BRL/MXN in past year, a headwind for those with USD-denominated costs in Brazil/Mexico

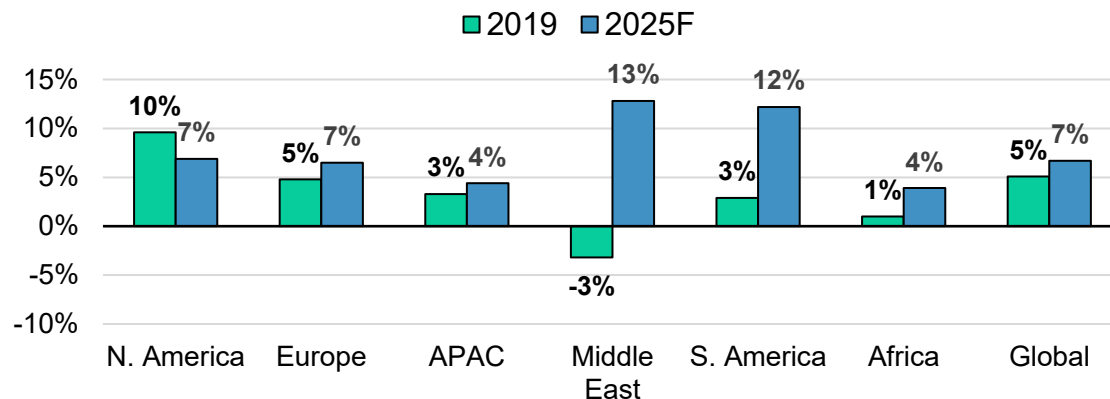
Global Airline Net Profit Results (\$B)



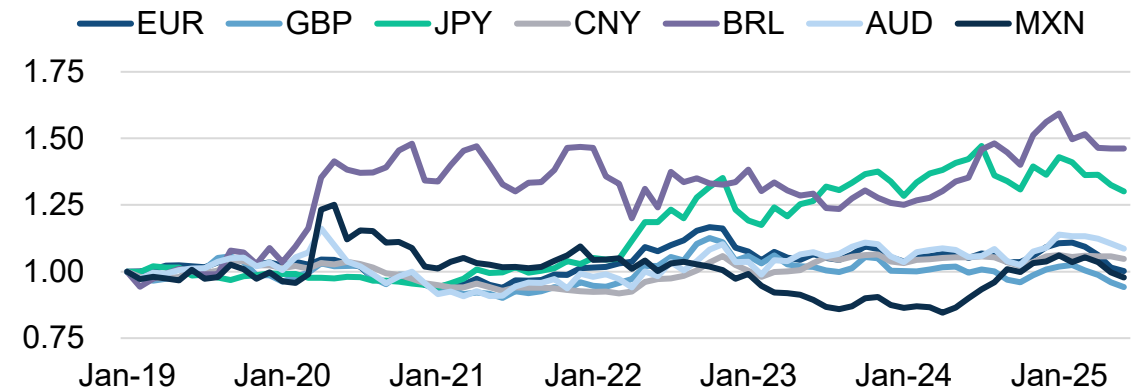
Historical Jet-A Spot Prices (\$USD per barrel)



2019 vs. 2025F Airline Operating Margin, by Region

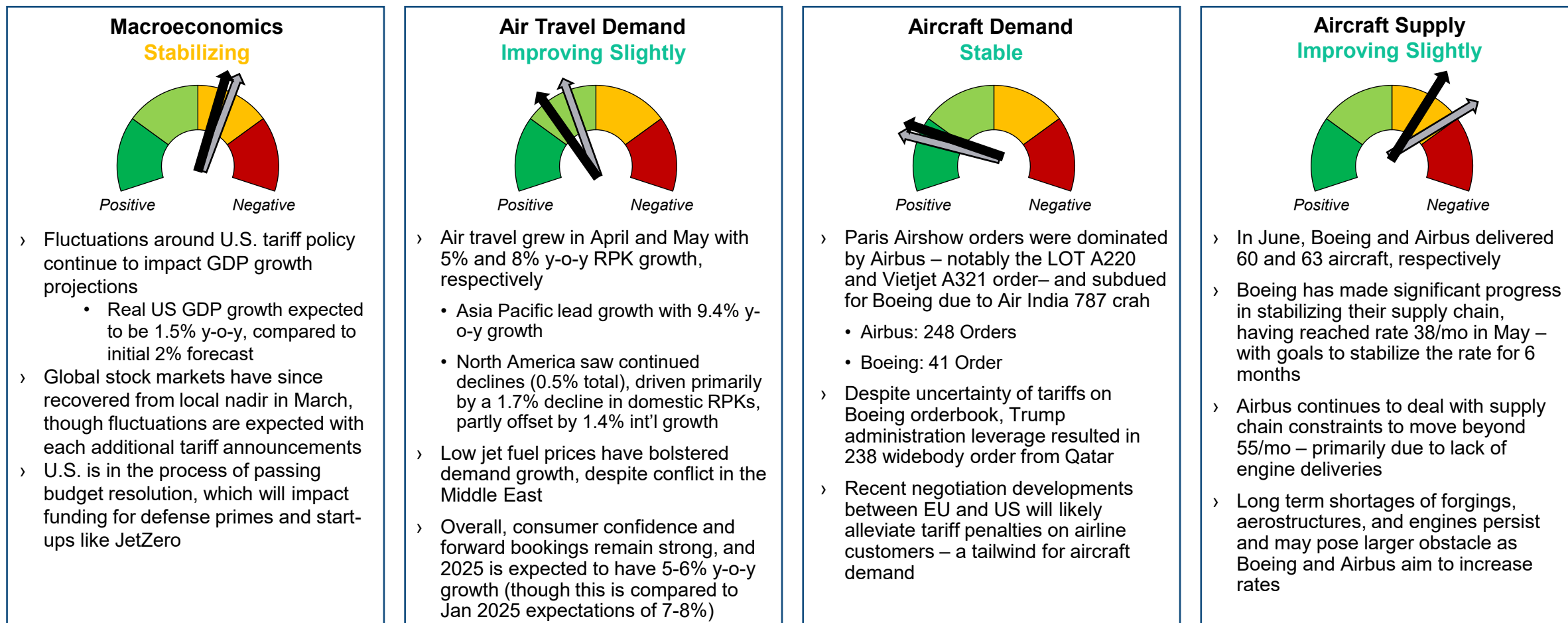


Index of Major Currencies vs. US Dollar (Jan 2019 = 1.00)



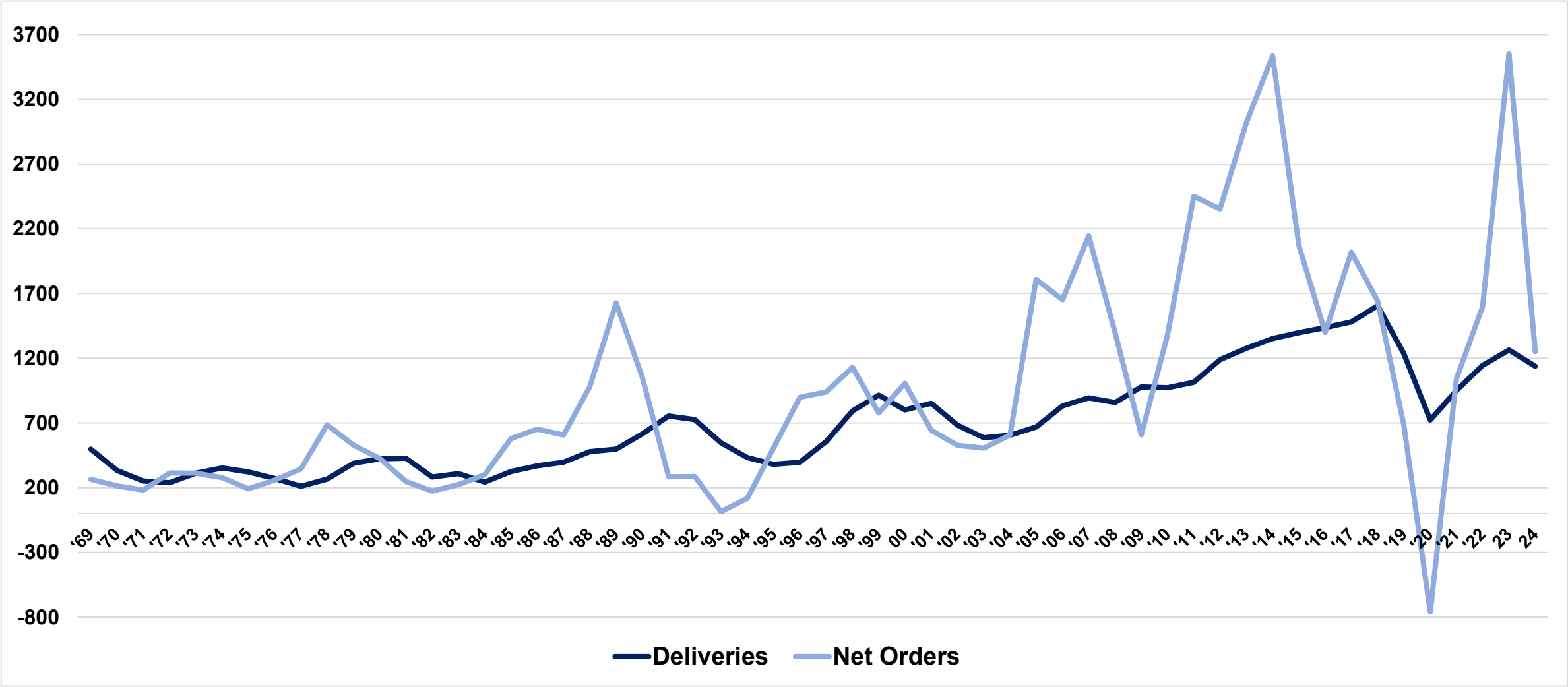
After a chaotic first quarter, macro indicators have improved with higher air travel demand and a stronger supply chain

↑ Q1 2025 Rating ↑ Q2 2025 Rating **Q2 2025 Macro Aerospace Indicators**

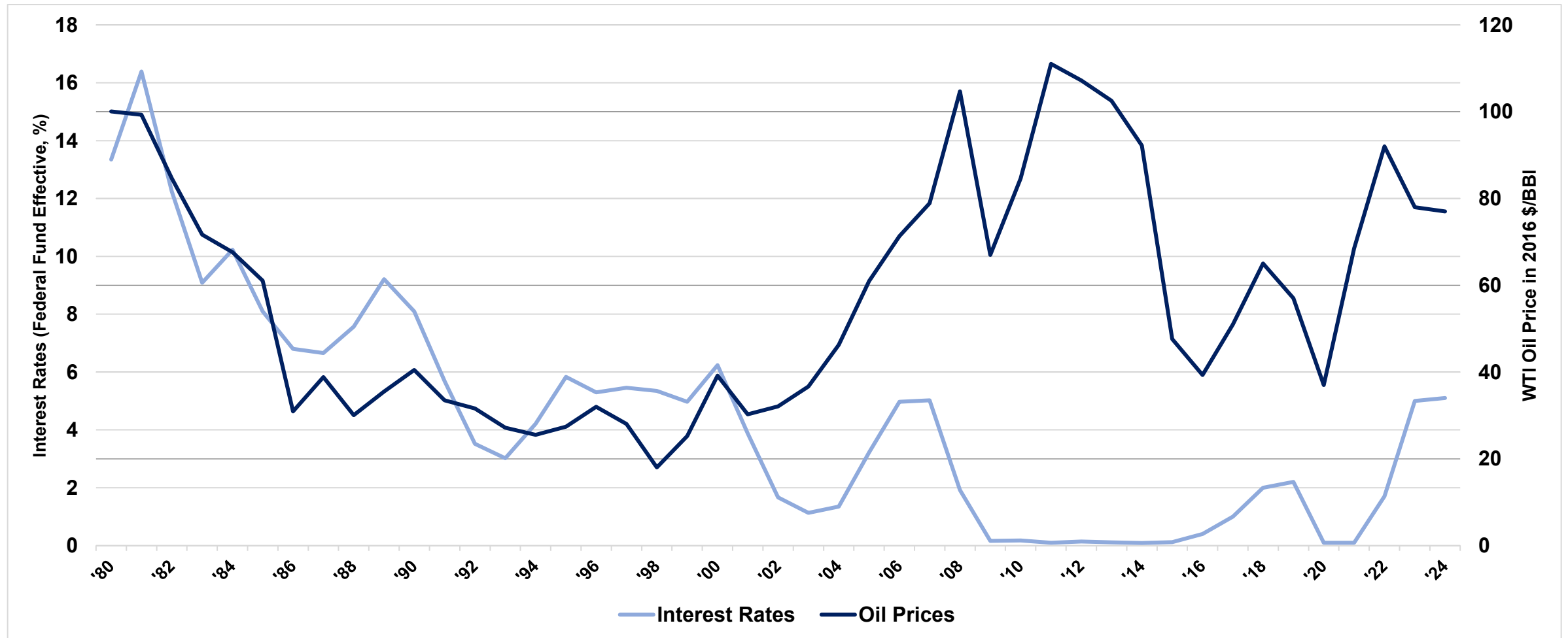


Book-to-bill is great again...not that there's much point to ordering jets

Large Jetliner Orders and Deliveries, 1969 – 2024

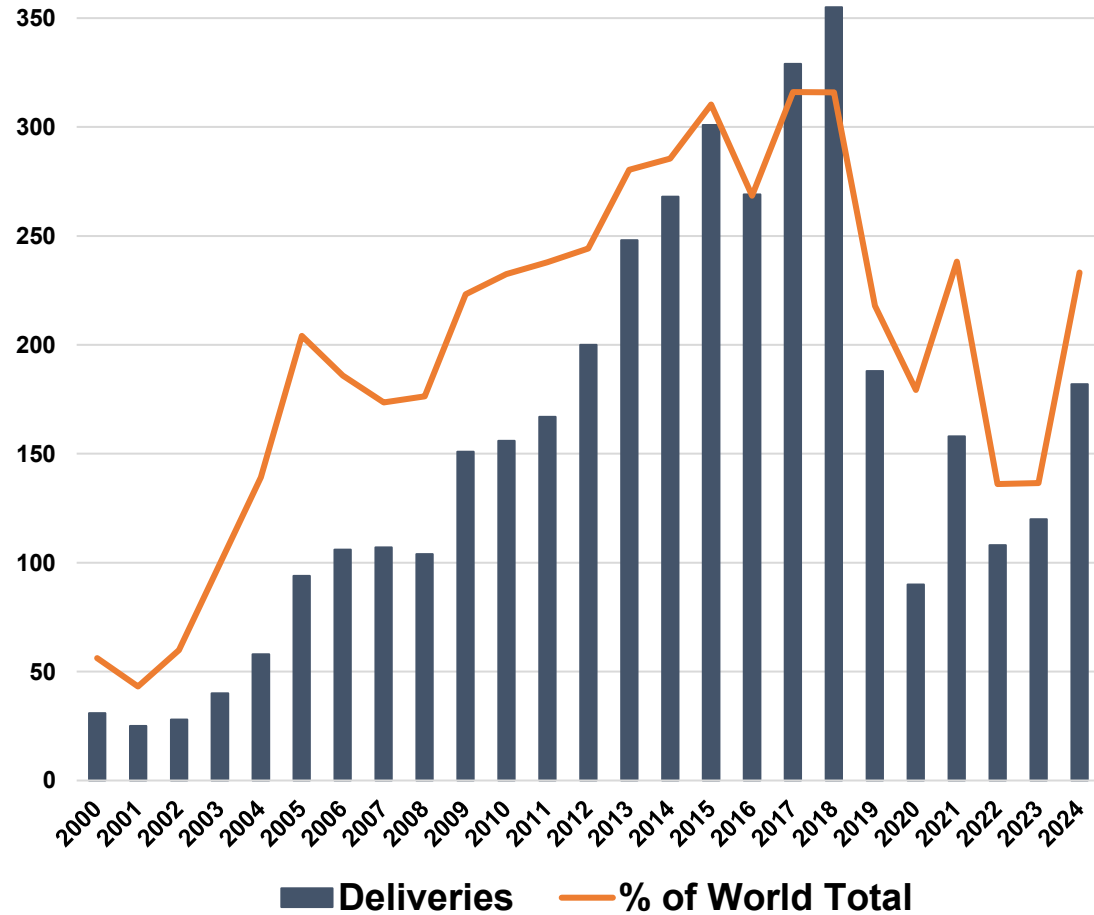


Ideally, interest rates $< 3\%$ and oil \$50-85/bbl; the ratio matters most, and is in positive territory (for Jetliner sales)

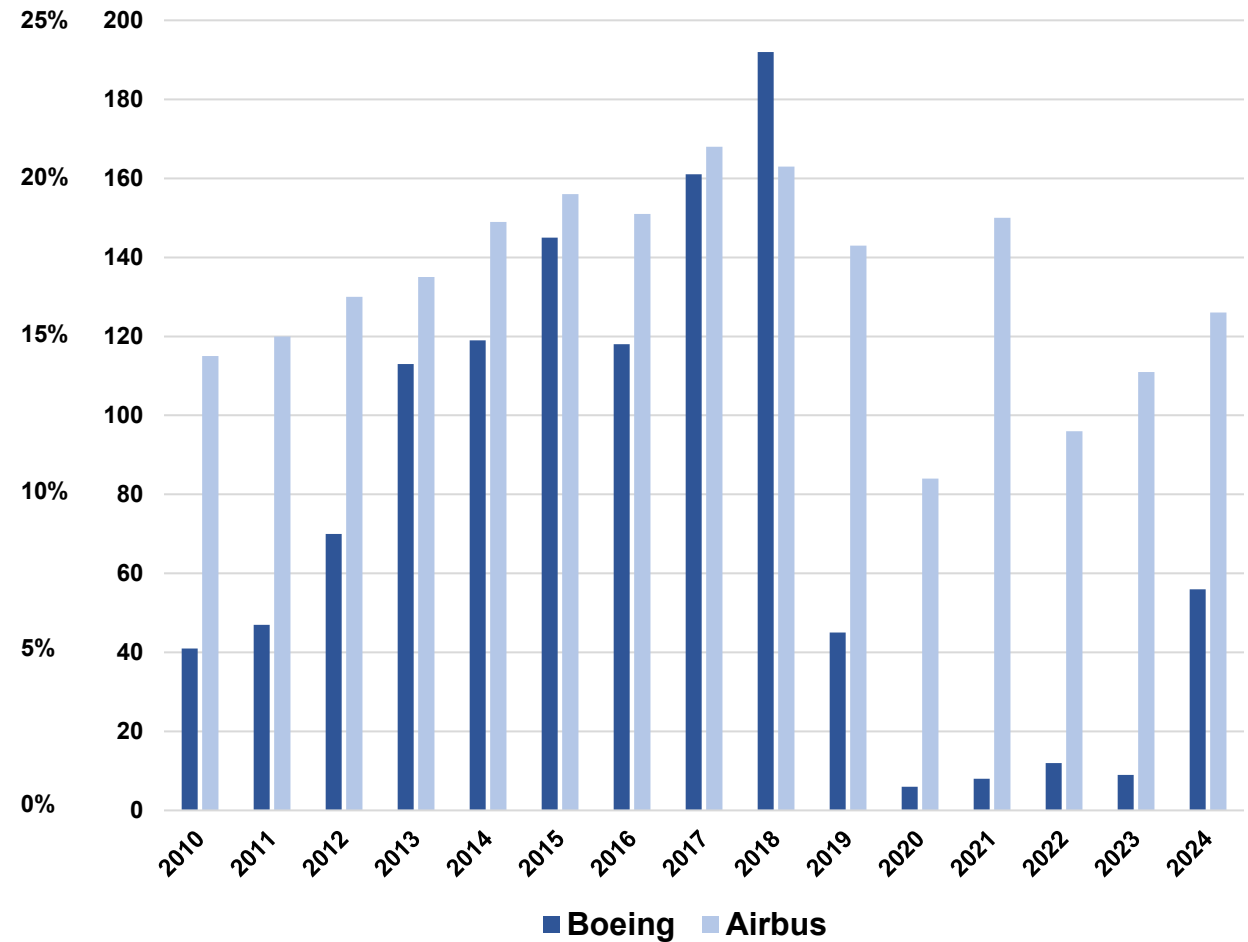


China was back...that's at risk now






The China market



Deliveries to China by OEM

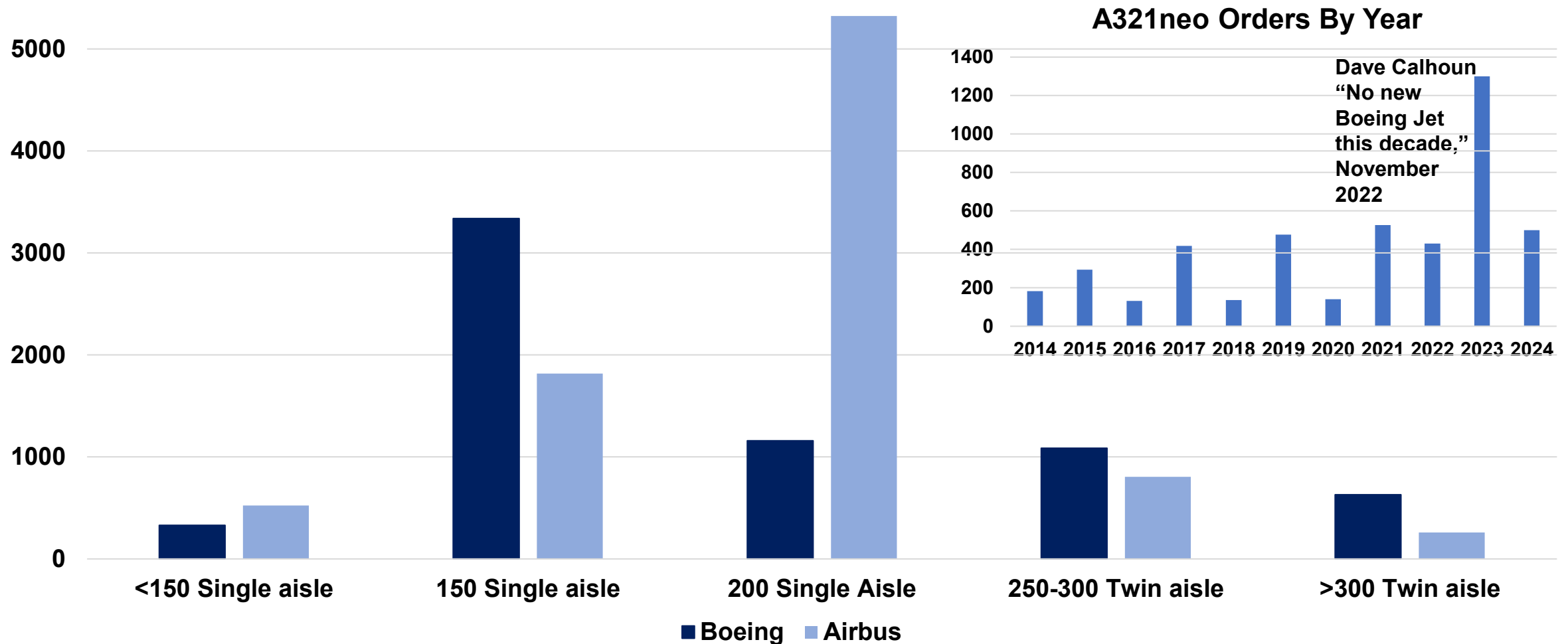


The battle for long haul supremacy: Cutting the same pizza into too many slices?

|  |  |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Gulf SuperConnectors | Turkey | Saudi Arabia | India | Aspiring Regional Players |
| <ul style="list-style-type: none"> › Emirates, Etihad, Qatar › Doubling down on who they are › 777-X...the new A380. But suddenly single aisles? | <ul style="list-style-type: none"> › Same great geography as Gulf, much greater O&D traffic › Broader government aero-nationalism ...military too › But financing, inflation are concerns | <ul style="list-style-type: none"> › Same great geography as Gulf, no O&D traffic › All the money needed, under Vision 2030 diversification plan › Complication: need to reinvent aviation industry, invent tourism industry and venues, and create an open society | <ul style="list-style-type: none"> › They want their traffic back › Air India under new management › Indigo looking to expand abroad › Past precedent (Jet AW, Kingfisher) not encouraging | <ul style="list-style-type: none"> › Ethiopia, Jordan, Morocco, Egypt › They'd also like their traffic back › They'd like more regional connecting business, too › Financing a concern |

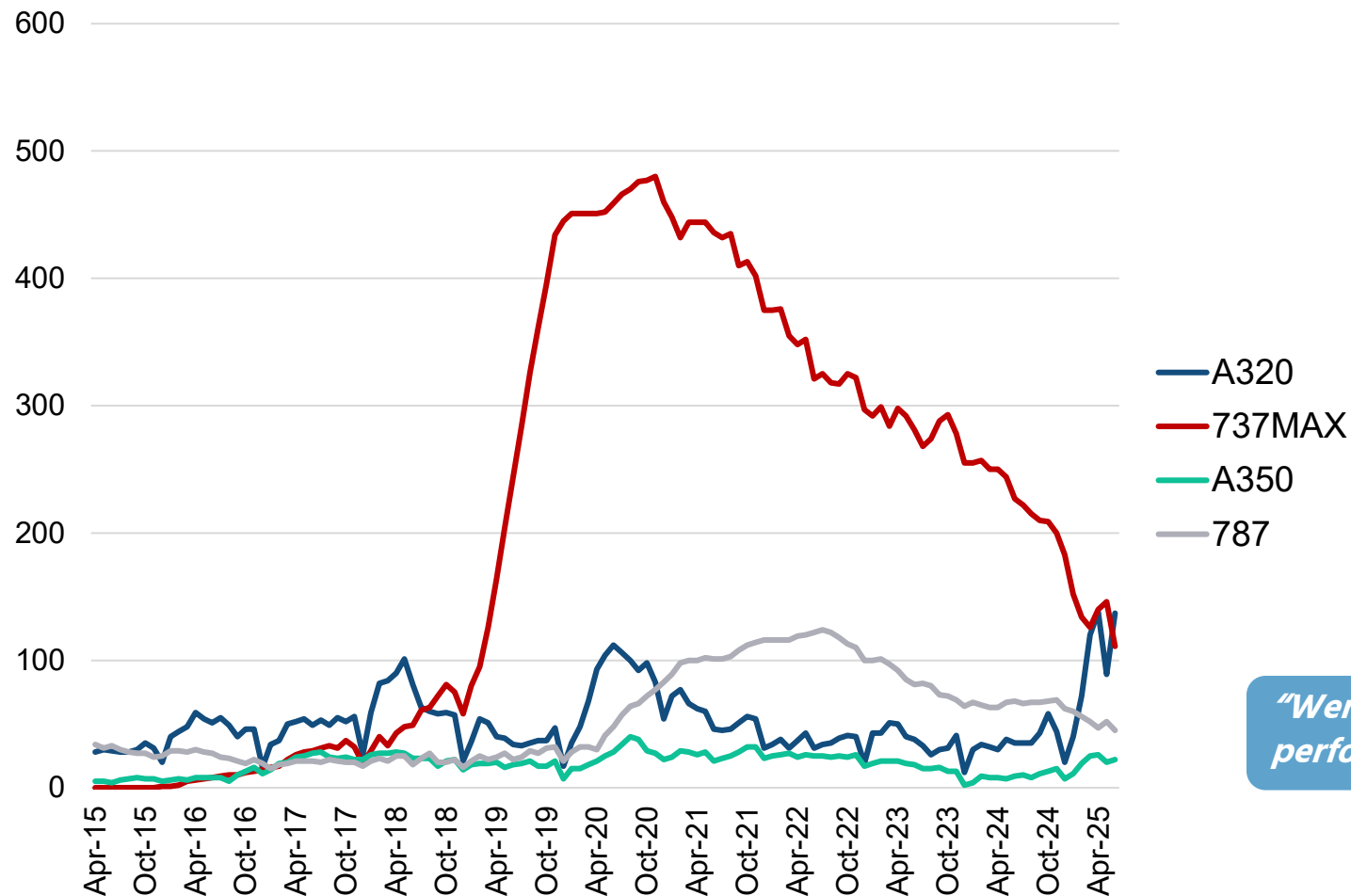
The market seems to really like a large single aisle fleet strategy

Airbus and Boeing Jetliner Backlogs, January 2025



A320neo inventory has exceeded MAX inventory. 111 (BOE) and 137 (AI) are waiting at OEM; engines appear to be the primary culprit, as well as interiors to a lesser extent

2015-2025 Aircraft OEM Inventories – Built But Not Delivered Aircraft



Comments

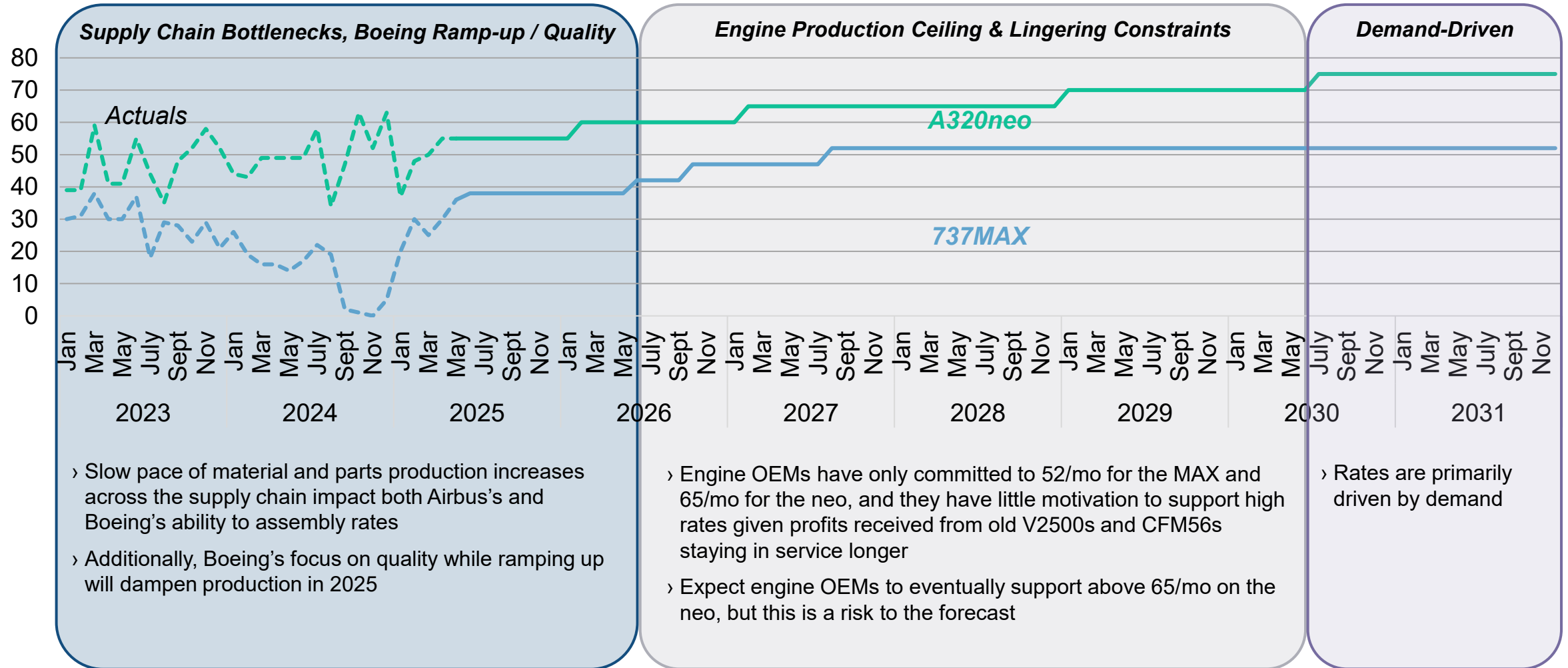
- › 737MAX inventory at 111 aircraft as of June 2025. Continued drawdown is critical to enable higher production rates without adding to inventory.
- › Inventory of undelivered A320neo aircraft now at 137 aircraft as of June 2025.
- › Reasons behind narrowbody inventory spike include:
 - “Gliders” awaiting engines
 - China’s temporary ban on deliveries of Boeing aircraft, which was rescinded in early June 2025
 - Interiors to a lesser extent. Premium-heavy A321XLR most likely to be most impacted
- › 787 inventory also normalizing towards pre-2020 levels of 20-30 aircraft.

“Were it not for those engine-less aircraft, our delivery performance would be slightly above plan right now.”

Christian Scherer, Airbus Commercial Aircraft
June 11, 2025 Briefing

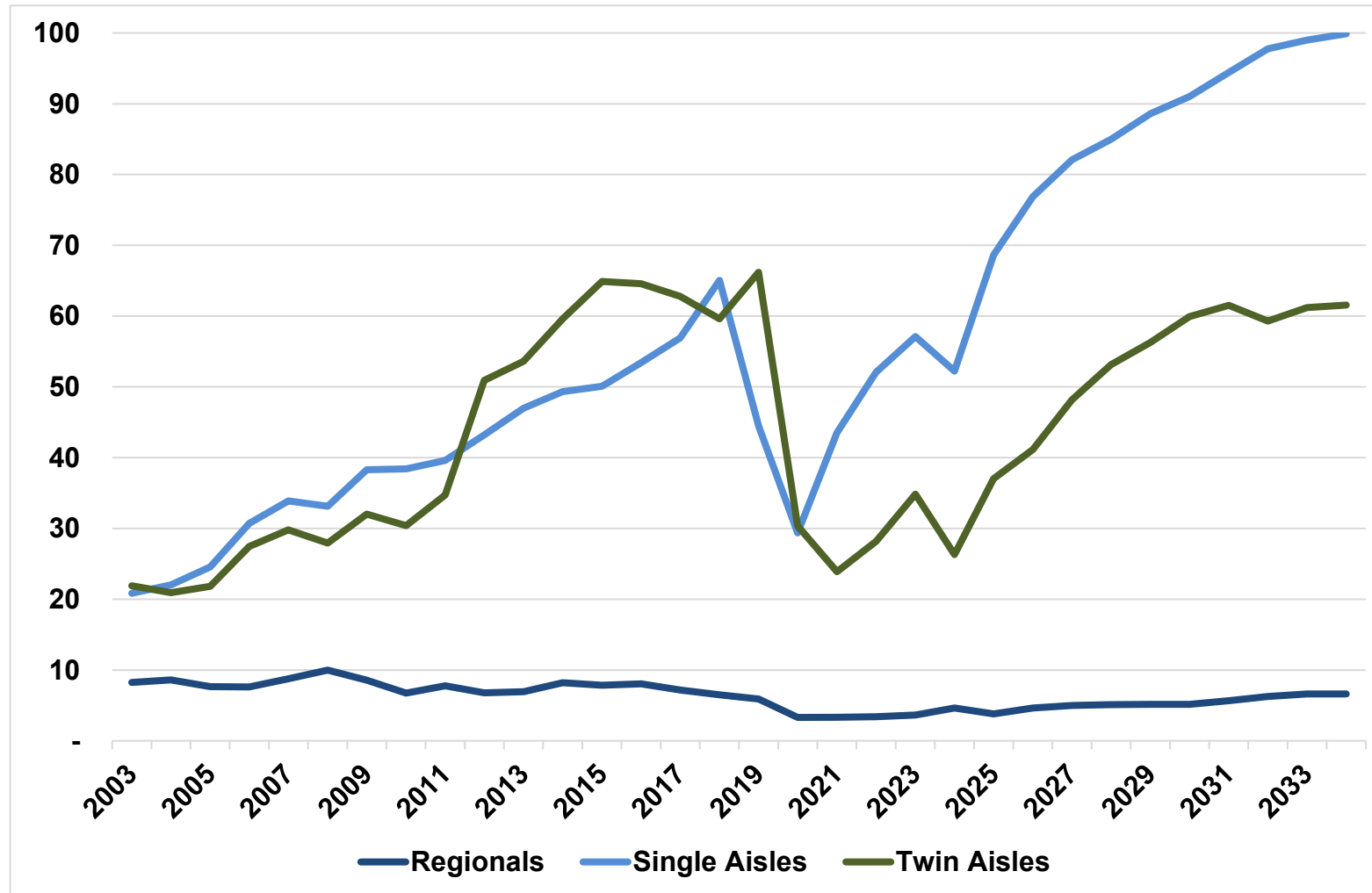
We forecast a slow steady increase in output over the coming years

A320neo & 737MAX Monthly Production Rate Forecast and Key Rate Determinants *



Jetliners coming back in an uneven K-shaped recovery

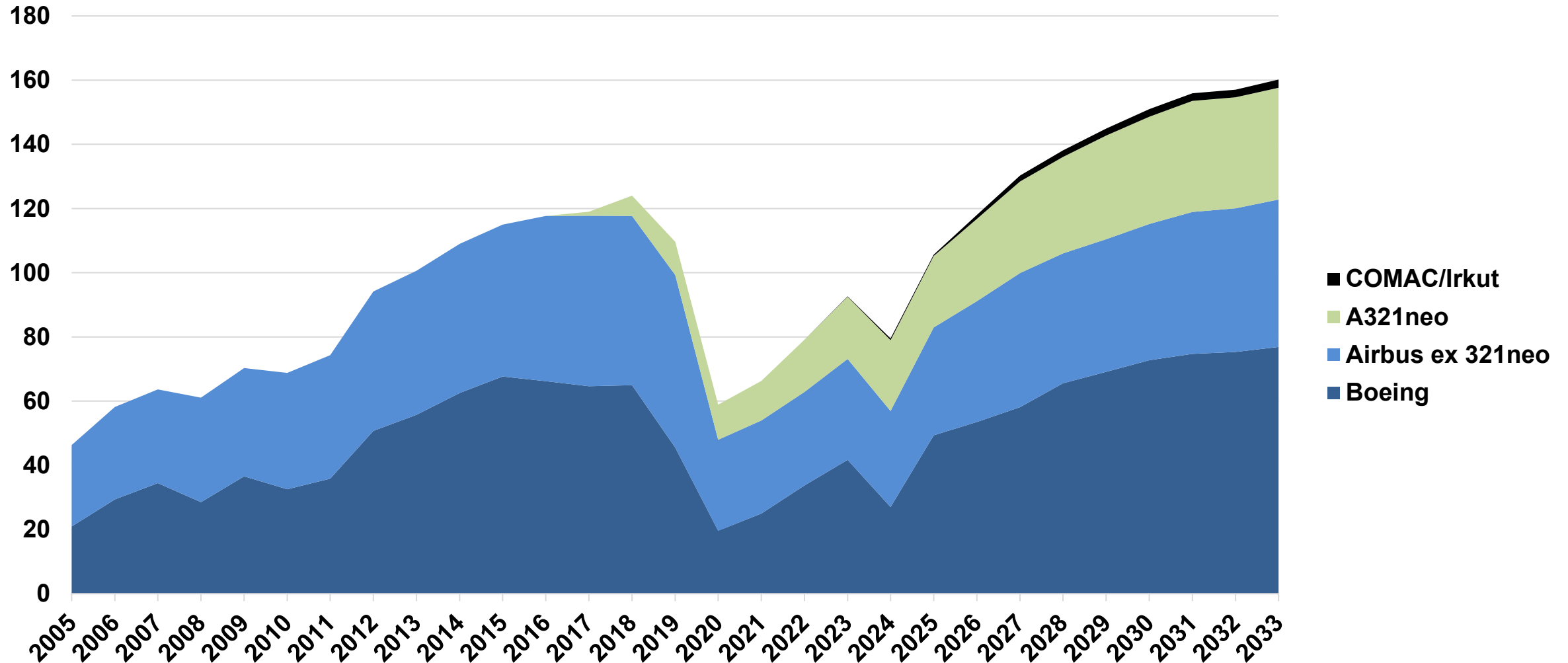
Deliveries in 2025 \$ Billions



- › Implications and comments:
- Volume begets volume
 - TA return to peak after 2034... we think
 - That isn't good for Boeing, but it might motivate a new jet sooner
 - That might be good for dedicated freighters
 - That isn't good for TA product development, except for NEOs

Airbus seizes first place as middle market grows

Jetliner Market Shares by Deliveries, 2005 – 2033; 2025 \$ Billions



There are no concrete product roadmaps for the next generation narrowbody from any of the OEMs

AIRBUS



A350neo?/A350F



A220-500?



Next Gen Narrowbody



ZEROe?



787F



787/777 Derivatives?



Next Gen Narrowbody



Truss Braced Wing?



TPNG?



Next Gen Narrowbody?



C929



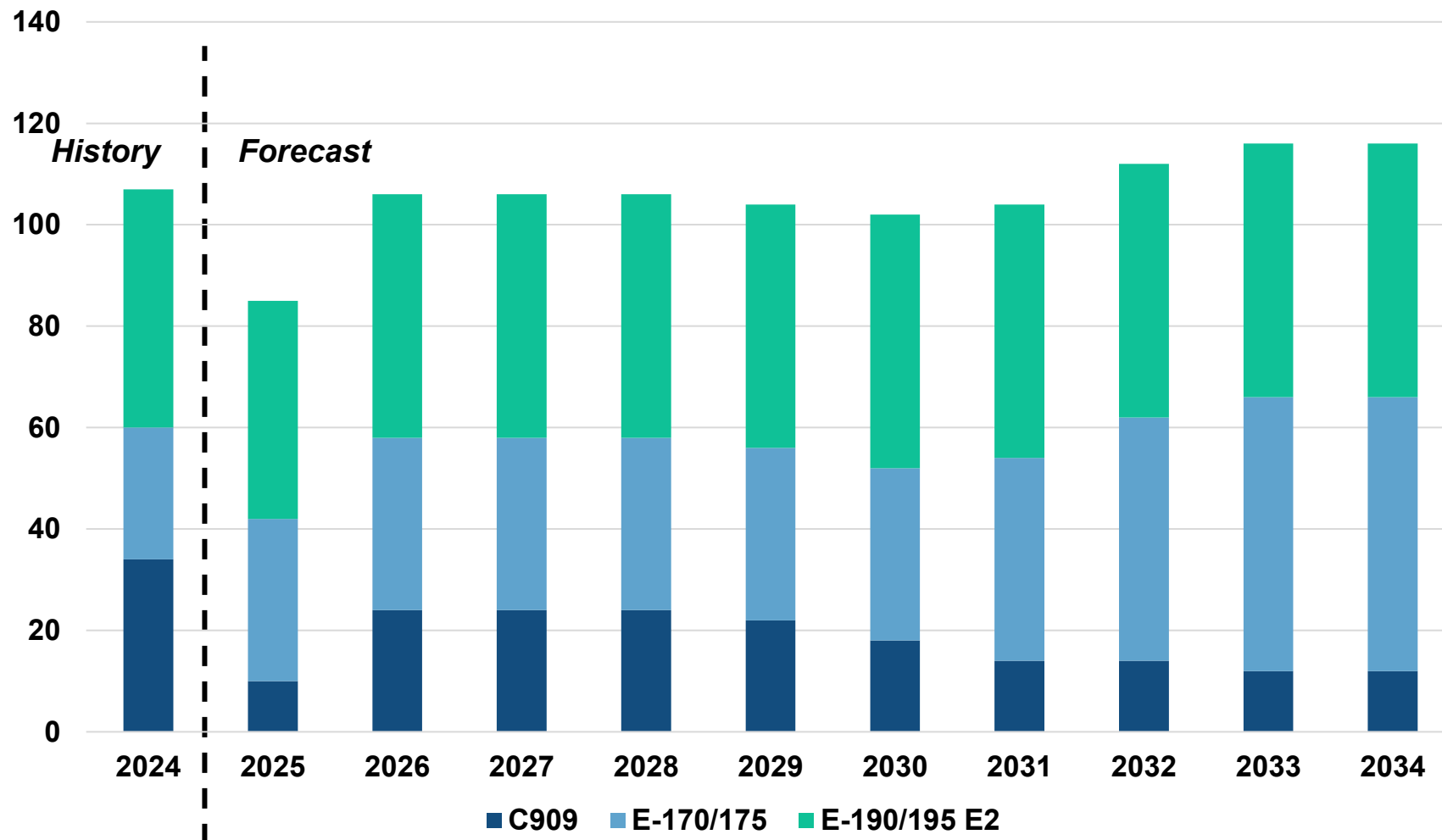
C919 Derivative (with CJ1000)



C939?

The RJ market is dominated by Embraer's E175 and 190/195E2

2024-2034 Production by Aircraft Model (# of Aircraft)

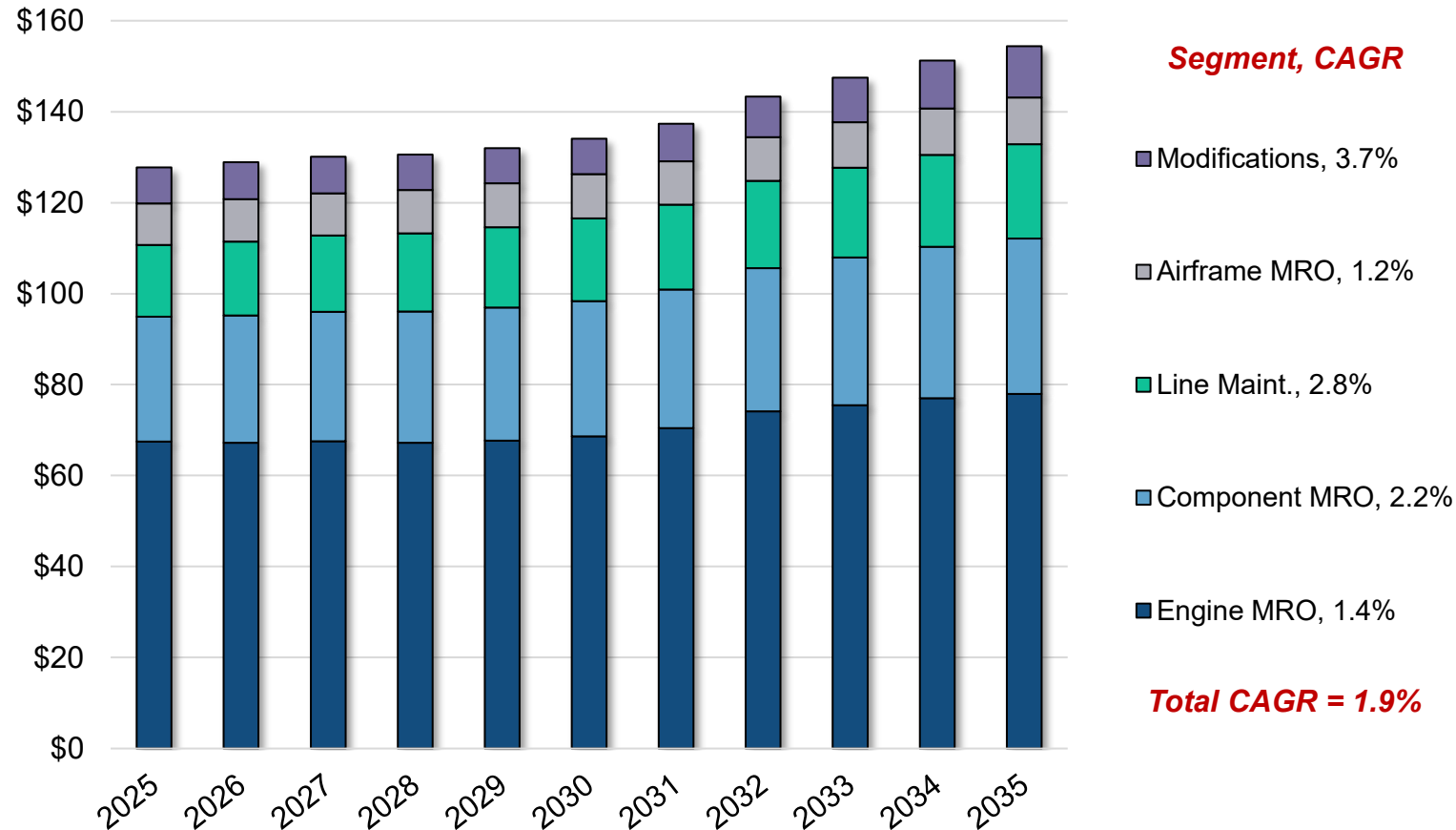


Comments

- › The RJ market produces at least 100-115 aircraft p.a. for the following decade – or 1,230 aircraft in sum
- › Because of the low production expected for 2025 the CAGR is a 4% p.a.
- › This adds up to a \$33b aircraft value cumulated 2025-2034
- › The COMAC C909 (ex ARJ21) will see decreasing production rates.
- › Note: Airbus A220 (ex CSeries) is defined as a N/B Jet

Air transport MRO will grow 1.9% CAGR to ~\$154 billion in 2035 in real terms; engine MRO demand will accelerate in the early 2030s as new-gen volumes grow

2025-2035 Air Transport MRO Demand, by MRO Activity (2024 \$B)



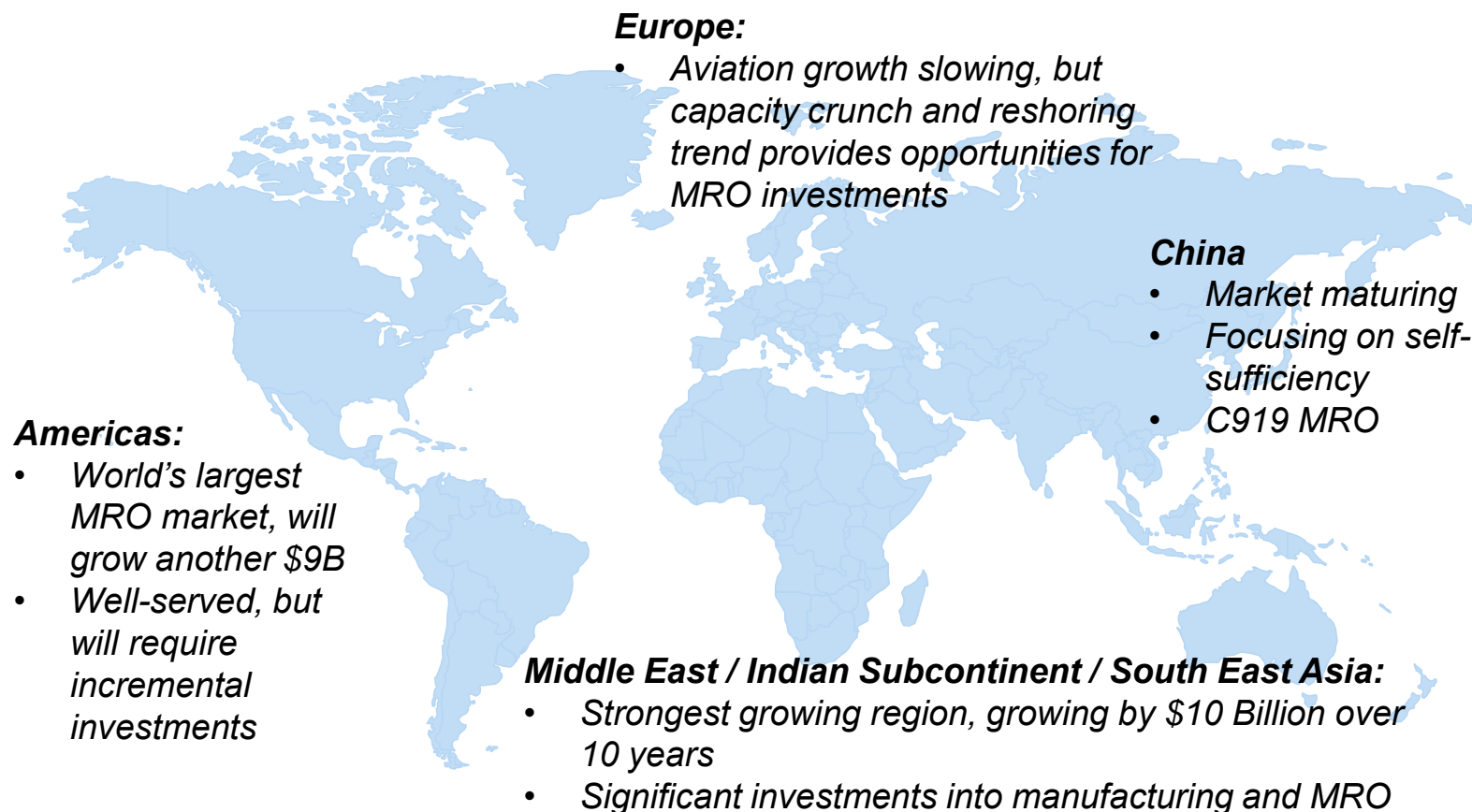
Comments

- › Overall engine MRO spend (53% of total) expected to be steady in real terms in mid/late-2020s due to downstream effects of COVID, MAX grounding, supply chain challenges and delivery delays.
- › Peak CFM56-5B/7B shop visits shifted from 2025-2026 to 2027-2028 as fleets have remained in-service longer than expected.
- › Recovery in airline profitability driving more spending on interior retrofit projects.
- › Freightor conversions expected to cool off the COVID-era peak.
- › No price increases included in the outlook, although high-single-digit escalations expected near-term for material-intensive activities like engine and component MRO. For labor-intensive activities, mid-single-digit escalations expected for most of forecast period.
- › Price increases are key source of growth in profits for OEMs, but impact should be neutral for MROs who pass any price increases along to customers.

MRO will grow by 21% over the next decade driven by huge investments across the globe

2025-2035 Air Transport MRO Outlook (\$B)

Global MRO Spend*



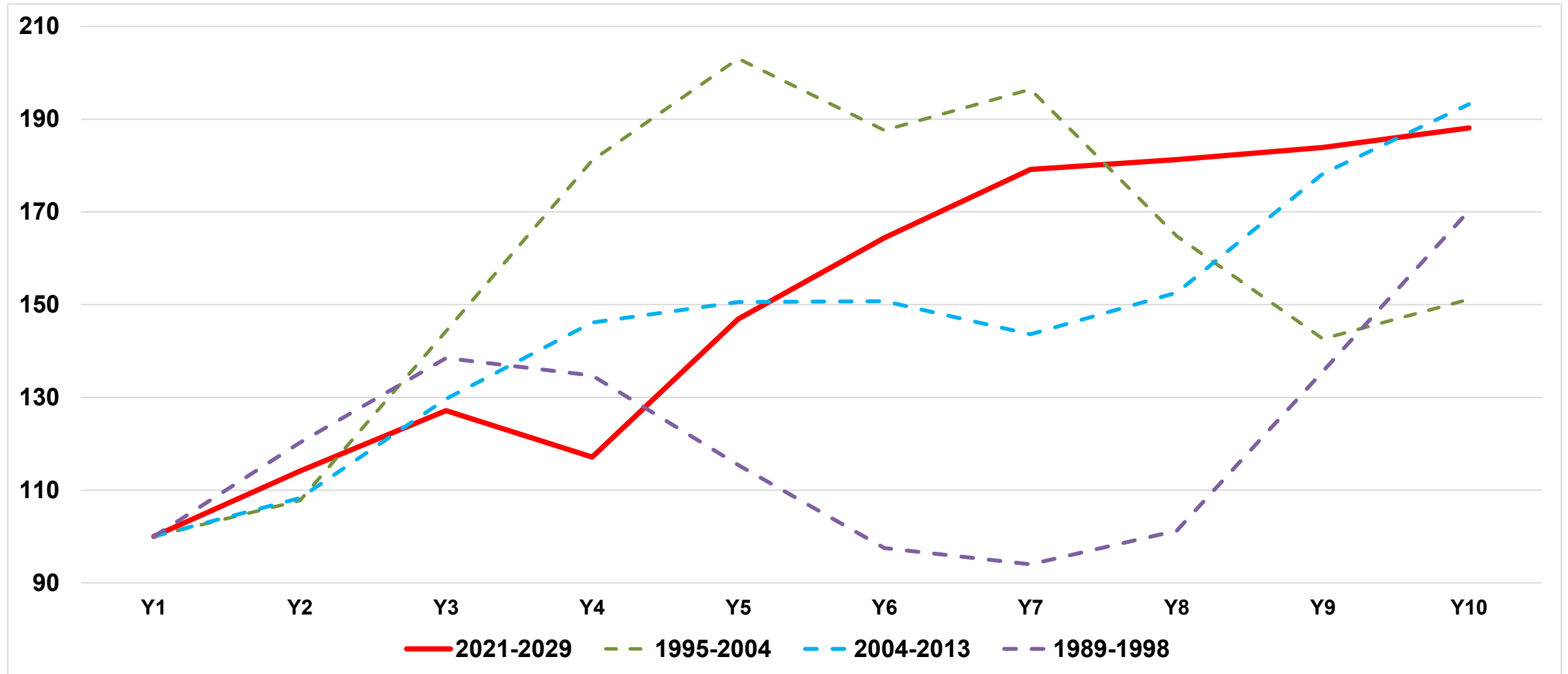
| Region | 2025* | 2035* |
|----------------|----------------|----------------|
| Africa | \$3.8 | \$5.1 |
| Asia Pacific** | \$22.4 | \$28.2 |
| China | \$20.1 | \$20.4 |
| India | \$3.5 | \$7.3 |
| Europe | \$26.8 | \$28.1 |
| Latin America | \$ 6.8 | \$8.8 |
| Middle East | \$13.7 | \$16.8 |
| North America | \$30.5 | \$39.7 |
| Total | \$127.4 | \$154.4 |

Key Issues determining future MRO Landscape

- › Infrastructure investments
- › Supply chain challenges
- › Labor pipelines
- › Process efficiencies / Digitalization
- › Strong Price/Cost increase

A better, more stable recovery (partly thanks to production delays)

Civil recoveries compared (production, not deliveries), in the long run; indexed to base year; constant dollars



Thank You!



Richard Aboulafia
Managing Director
raboulafia@aerodynamicadvisory.com

+1 (734) 773-3899

106 E. Liberty St., Ste 300

Ann Arbor, MI 48104

www.aerodynamicadvisory.com