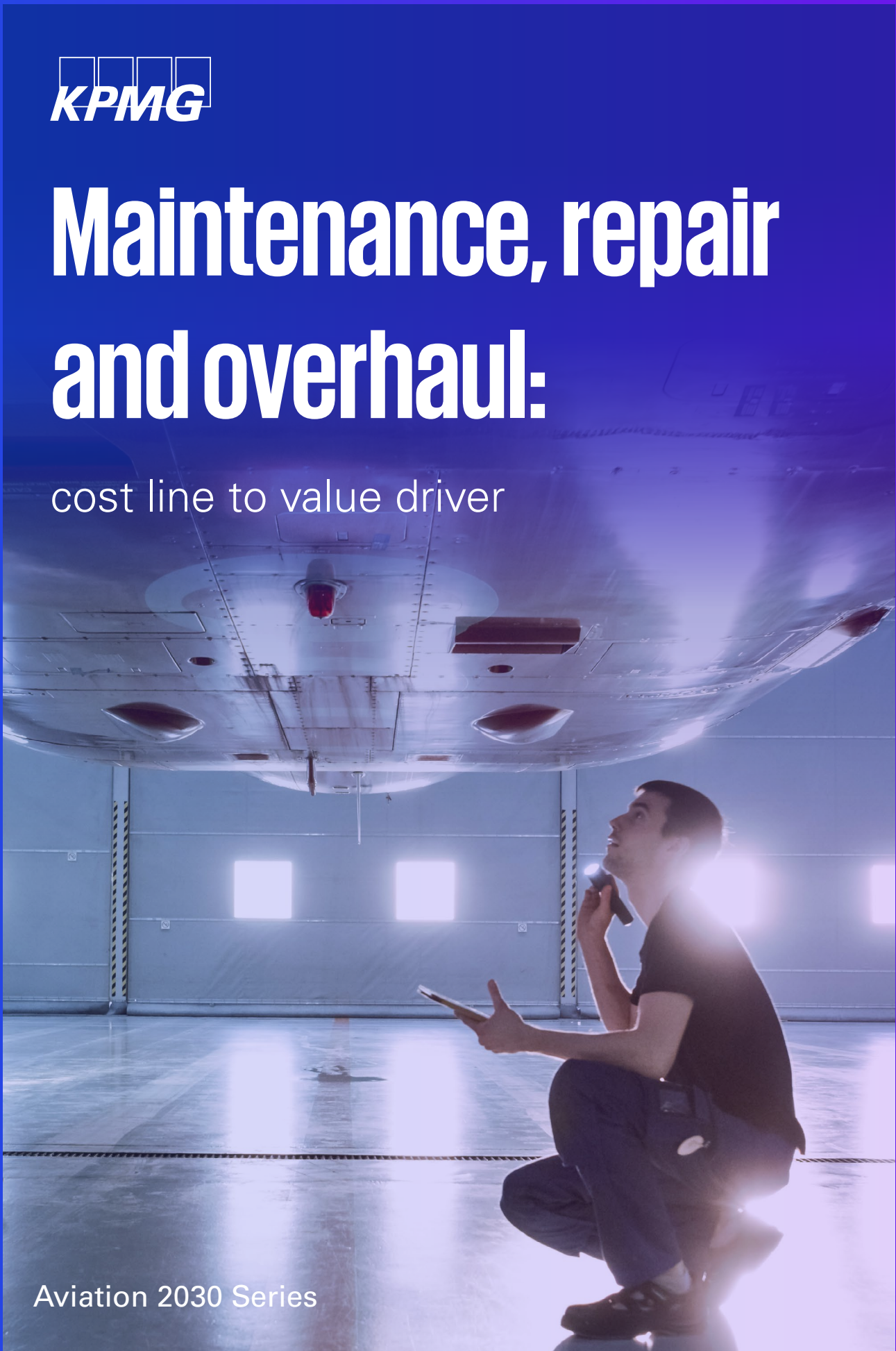




Maintenance, repair and overhaul:

cost line to value driver



Aviation 2030 Series



As demand continues to outpace capacity, maintenance, repair and overhaul is shifting from cost line to value lever across the global aviation ecosystem.

Executive summary

Why now:

Global fleet growth, delivery delays, and the lower durability profile of new-generation engines are combining with post-pandemic labour gaps to create a structural MRO bottleneck. Turnaround times have lengthened, shop slots are scarce, and parts availability remains tighter than pre-pandemic - yet under-utilised regional capacity still exists where distance-to-shop economics and capability mismatch get in the way.



Headline messages

- Demand is structurally ahead of supply.** Production shortfalls and record backlogs mean operators are keeping aircraft in service for longer, resulting in higher maintenance intensity.
- Engines remain the primary pinch point.** New-generation engine families continue to require more frequent and complex shop visits than originally projected, driving pressure on capacity and increasing the need for coordinated planning.
- Digital capabilities are becoming a differentiator.** Predictive maintenance, AI-assisted inspection, and digital work-packs are helping operators convert unscheduled events into scheduled ones, improve first-time-fix rates, and reduce disruption.
- Commercialisation accelerates.** Investors, airlines, lessors and OEMs increasingly view MRO as a strategic value-creation lever, leading to new contract models, data-enabled services and joint ventures.
- Sustainability and circularity are reshaping economics.** Used Serviceable Material (USM), facility energy transitions and waste-reduction practices now offer resilience and cost advantages, not just compliance benefits.

Signals to watch: MRO spend around USD120bn in a typical year on track to ~USD156bn by 2035; engine shop-visit turnaround times materially higher than pre-COVID; Airbus and Boeing backlogs at records, pushing older aircraft to fly longer.

Introduction - Why MRO is under the spotlight

Air travel demand has already resumed its growth trajectory beyond pre-pandemic levels, while production has lagged. OEM supply constraints, quality actions and engine availability have extended delivery timelines and amplified maintenance demand as fleets age in service.



The workforce gap is structural.

Many technicians exited during the pandemic; certification pipelines lag replacement needs, and ageing demographics mean expertise leakage.



Digitisation is the bright spot.

Predictive maintenance, AI-assisted inspection, document search and digital work-packs are cutting turnaround times and raising first time fixes where embedded into daily operations.

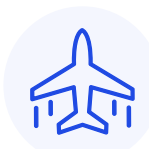


Capital is following the super-cycle

After years of being a relatively unloved part of the value chain, highly fragmented across independent operations, MRO is attracting increased M&A interest. Lessors and private equity are leaning into engines/components and regionally advantaged platforms, seeking predictable volumes and room to scale.



01. The changing face of MRO



Market structure & OEM strategies. With engines commanding a disproportionate share of aftermarket value and reliability headwinds on new-generation platforms, engine OEMs are asserting deeper aftermarket control, competing more directly with independents and airline shops for revenue.

Durability realities.

- **GTF:** Powder-metal inspection regimes created hundreds of incremental shop visits and elevated aircraft-on-ground (AOG) exposure in a typical year, though recent sentiment suggests improving shop performance.
- **LEAP:** Dust-environment durability kits and reverse-bleed systems aim to extend time-on-wing and normalise maintenance burden; near-term deliveries/retrofits complicate capacity planning.

Fragmentation and proximity. MRO remains regionally fragmented and proximity-sensitive; distance-to-shop costs, engine family mix, and customs/logistics create local scarcities alongside under-utilised bays elsewhere.

Sustainability pressures. Circularity is mainstreaming: USM markets are expanding as operators manage cost and lead times while advancing environmental commitments.

Digital stack maturation. Airlines are scaling predictive maintenance (engines and systems), digital twins, and AI-assisted inspections - moving unscheduled events into scheduled windows and easing spares exposure.

Distance-to-Shop Economics - Why under-utilised capacity can coexist with global scarcity

Ferry costs, customs lead times, capability mismatches by engine family, and local logistics SLAs mean that bays in the “wrong” location struggle for utilisation even while global slot scarcity persists. Align fleet mix, logistics, and certification to unlock regional capacity.

02. Commercialisation & diversification



From time-and-materials to outcomes. Contracts are shifting to uptime/dispatch-reliability SLAs, with shared-savings turnaround time improvement and penalties for rework. Data rights and interoperability clauses are becoming pivotal.

Data/IP monetisation. Providers with rich reliability datasets and configuration histories can monetise insights - benchmarks, predictive risk scoring, inventory optimisation - creating differentiated margins.

Adjacencies that matter.

- USM and teardown/green-time optimisation to de-risk parts scarcity and cost;
- AOG response platforms and pooled rotatable programmes to mitigate slot and logistics risk;
- Facility modernisation and robotics to amplify technician productivity and quality.

Capital & partnership models. Expect continued private investment in engines, components, modifications and test systems - segments with recurring repair volumes and scaling headroom. Joint ventures among OEMs, airlines and independents will unlock kit, know-how and balance channel power.

Talent model evolution. Multi-skill pathways, academy partnerships, competency-based training and augmented reality (AR)/remote assist will define throughput. Time-to-productivity becomes a board-level KPI.

First-time-fix - the KPI that moves the needle

Digital work-packs, parts kitting, AI-assisted inspection, calibrated tooling, and AR support. Each 1–2 percentage-point uplift compresses turnarounds and releases slot capacity without new bays.

03. Case studies & signals

01 Airline insource vs. outsource.

Carriers facing persistent slot risk and complex fleets bring heavy checks or specific engine capabilities in-house for control and schedule integrity; others leverage specialist independents/OEM affiliates for learning curves and parts access - success hinges on outcome-based contracts and data-sharing.

02 OEM-led models

Coordinated fleet plans have sequenced inspections/repairs and added capacity on affected engines; durability kits on competing platforms aim to extend time-on-wing but require tight planning to avoid near-term bay congestion.

03 Regional hubs.

Middle East and Asia are scaling predictive operations and large-format hangar ecosystems, integrating analytics with planning to minimise unscheduled downtime.

What worked: clear data interfaces; early parts kitting; standard digital work-packs; first time fix playbooks.

Watch-outs: IP lock-in; slot discipline; skills ramp; customs/logistics lead times (especially for engines).

04. Implications across the ecosystem



Airlines

- Contract for outcomes and data rights, not just labour-hour cost structures.
- Hedge slot risk by diversifying MRO partners and securing access to used serviceable material (USM) and rotatable pools.
- Embed predictive maintenance outputs into planning, materials and operations to convert more events into scheduled work.

Lessors and financiers

- View maintenance as asset value protection: forward plan shop visits, re-time redelivery requirements and validate digital and ESG maturity within maintenance partners.
- Underwrite USM and teardown strategies, and actively monitor programme specific durability updates.

OEMs and tiered suppliers

- Balance channel control with ecosystem capacity by enabling data access and selectively certifying independent repairs where appropriate.

- Prioritise durability upgrades and spares availability to stabilise time on wing across maturing fleets.

Independent MROs

- Choose a clear path: specialise or scale.
- Publish a digital and first time fix improvement roadmap; invest in USM-enabled parts strategies.
- Form partnerships where capital intensity - especially in engine capability - creates barriers to growth.

Airports

- Enhance zoning, bonded logistics and energy infrastructure to attract and sustain MRO activity.

Regulators and policymakers

- Modernise certification and competency based training routes to widen technician pipelines.
- Implement improved circularity standards, including USM traceability and data-governance frameworks.

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