

Alternative Solutions for Stressed MROs

Innovating Engine Maintenance

Aviation Week Panel

September 2023

Increasing Pressure on MROs to Deliver Maintenance

- The maintenance landscape today is making it more difficult for MROs to deliver maintenance on time and within budget to customers worldwide
 - o **Surging Demand:** Deferred shop visits, extended life of current gen and teething issues on new-gen
 - o **Constrained Supply Chains:** Lack of USM, long lead-times on repairs and lead times on new parts as well

Factors Contributing to Growing Pressure on MROs

Macro Factors: Supply and Demand

01

COVID-19

Shop visits deferred during the pandemic are going through shop now. Labor force has not fully recovered since the pandemic to meet the rising levels of demand.

02

New Technology

New technology such as the LEAP and GTF still require frequent maintenance to address teething issues. Delays on new aircraft extending life of current gen engines.

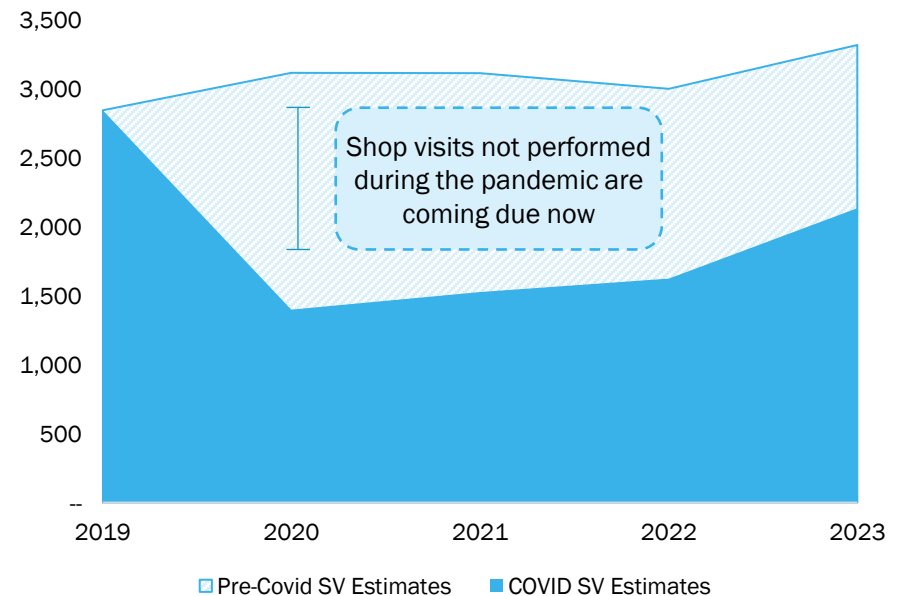
03

Current Technology

V2500 HPT Hub AD and CFM56-7BE HPT Blade SB is driving engines off wing sooner than anticipated, driving further demand for slots at MROs.

Illustrative Example: Deferred CFM56 Maintenance

Similar maintenance story for other engine types





Capacity & demand rising in parallel

... the peak is yet to come

Overcoming the Labor Bottleneck

- The global labor market has tightened significantly since the onset of the COVID-19 pandemic
 - o Many MROs downsized during the pandemic and are struggling to return to previous workforce sizes
 - o Shortages of labor are slowing turn-times at MROs that perform labor-intensive work (i.e., PR/OH Shop Visits)
- Opportunity for MROs that can focus on light worksopes and leverage innovative maintenance solutions

How MROs are Adapting to the Current Landscape

Larger Focus on “Hospital” Maintenance



Dallas facility moved to increase capacity and Berlin established for pure hospitality worksopes.

Increased the established network by building additional facility in Chicago.



Dedicated CFM56 hospital maintenance and engine test center located in Florida, US.

Innovative Maintenance Solutions



Module exchanges are not labor intensive and save significant time/cost

Module	Cost Savings	Exchange Time
Fan	~\$400k	5 days
Core	~\$1,000k	25 days
LPT	~\$500k	6 days

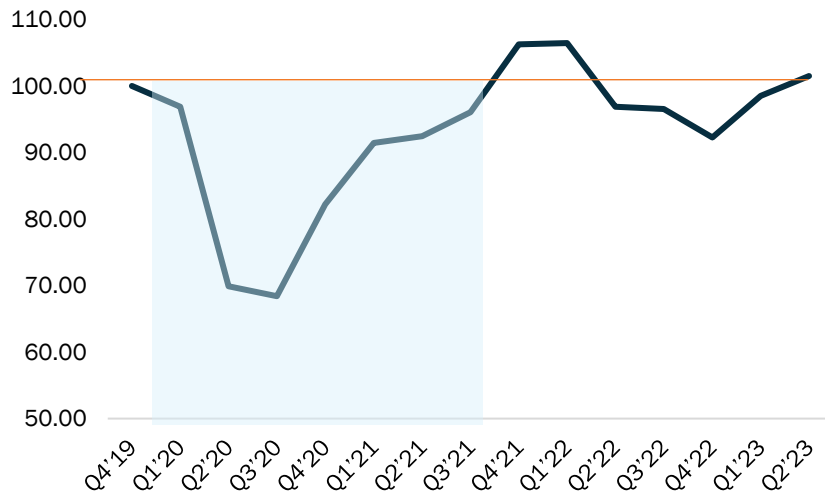
Solutions to the Maintenance Problem

- Operators and asset owners in need of immediate maintenance solutions will have to rely on:
 - o **Avoiding maintenance:** Greentime engine leasing through spot market
 - o **Rethink maintenance:** Leverage quick-turn maintenance solutions like modules
- Otherwise, operators and owners will need to work together to explore other solutions such as exchanges, reduced return conditions or “perpetual power” programs.

Avoiding and Rethinking Maintenance Is Becoming More Popular

Engine Lease Utilization to Pre-Covid Levels ⁽¹⁾

Utilization indexed to 2019 (100 = base level)



Growing Market Demand for Module Solutions on CFM ⁽¹⁾

Modules sold by year since the COVID-19 pandemic

