IATA Maintenance Cost Conference
Bangkok, September 14th 2016

The Impact of Increased OEM Influence on Cost and Residual Value in the Engine Aftermarket

Richard Hough – EVP Technical
Engine Lease Finance Corporation
Engine Lease Finance Corporation (ELFC)

- Founded: 1989
- Ownership: Mitsubishi UFJ Lease & Finance (100%)
- Headquarters: Shannon, Ireland
- Business: Engine Lessor
- Portfolio: ~300 engines with a book value of $2bn+
- Customers: Global base of airlines, MRO’s and leasing companies
- Products:
  - Sale and Leaseback
  - Funding of Contracted Deliveries
  - Engine Acquisition and Sales
  - Short-Term Leases for Shop Visit Support
  - AOG Support
  - Engine and Portfolio Management Services
In 1995 Engine OEM’s had 15% of a $6.25bn MRO market
In 2005 - 45% of a $12.5bn MRO market
In 2015 - 55%+ of a $25bn MRO market
In 2025 OEM will have ??? of an estimated $37bn MRO market
## Engine Market Structure

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Position of Power (Pre-Purchase)</th>
<th>Position of Power (Post-Purchase i.e. Aftermarket)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OEM – Airline</td>
<td>➢ Airline dominant.</td>
<td>➢ OEM dominant.</td>
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<tr>
<td></td>
<td></td>
<td>➢ Some airline strength through ability to select aftermarket services.</td>
</tr>
<tr>
<td>OEM – Lessor</td>
<td>➢ Lessor dominant.</td>
<td>➢ OEM dominant.</td>
</tr>
<tr>
<td>OEM – MRO</td>
<td>➢ No relationship.</td>
<td>➢ OEM dominant.</td>
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<tr>
<td></td>
<td></td>
<td>➢ Some MRO power through ability to install alternate materials and repairs.</td>
</tr>
<tr>
<td>OEM – USM Parts Company</td>
<td>➢ No relationship.</td>
<td>➢ Relationship is a mixture of competition and collaboration. On balance the OEM is dominant.</td>
</tr>
<tr>
<td>OEM – Alternate Material / Repair Company</td>
<td>➢ No relationship.</td>
<td>➢ No relationship but conflict exists.</td>
</tr>
</tbody>
</table>
OEM’s have used a multi faceted approach to achieve a dominant aftermarket position:-

1. Increase in OEM owned MRO supply
2. Proliferation of flight hour agreements
3. Reduction in repair availability and restrictions on performing repairs
4. Effective elimination in the use of PMA & DER in gas-path
5. Continuous enhancements, modifications and upgrades
6. Control of new parts prices and increased presence in used serviceable material market
7. Discounting of value for Non OEM maintained engines e.g. “TruEngine” and “Pure-V”
Aftermarket MRO Capacity

Data shown for shops having overhaul capacity for turbofan engines for regional (excl. ALF502/ALF507), narrowbody or widebody aircraft. Engine fleet is for comparable engines.
OEM Aftermarket MRO Capacity

GE (Strother)
GE (Celma)
GE Wales
GE Caledonian (Prestwick)
GE Malaysia
GE Evergreen (Taipei)

Snecma (Mexico City)
Snecma (Brussels)
Snecma (San Quentin)
Snecma (Morocco)
Snecma (Sichuan)

P&W (Columbus)
P&W (East Hartford)
P&W TEC (Istanbul)
P&W (Christchurch)
P&W (Shanghai)
P&W (Singapore)

RR Canada (Montreal)
RR Derby
RR East Kilbride
RR ITP (Spain)
RR N3 (Arnsstadt)
RR HEASL (Hong Kong)
RR SAESL (Singapore)
Proliferation of Flight Hour Maintenance Agreements

• “Over 90% of Rolls-Royce large engine fleet is covered by our TotalCare service agreements.” – RR.plc 2015 Annual Report

• “Today nearly 60 percent of the installed V2500 engine fleet and over 80 percent of future deliveries are backed by a V-Services agreement.” – IAE Website

• Today, with a mature and large maintenance network for the CFM56, these contracts represent less than half of the total. We expect strongly more than half for Leap.” – CFMI President 2015 Paris Airshow

• “Pratt & Whitney expects more migration to long-term aftermarket support contracts with OEMs. The OEM claims 50% market penetration on such agreements covering the PW2000, PW4000 and V2500” - Vice President Aftermarket Operations (Inside MRO – May 2014).
Future for Flight Hour Maintenance Agreements

- Chart includes:
  - airline orders only (no lessors)
  - only orders where engine selection has been made
  - Firm orders only (no options)

- Maintenance contracts predominantly agreed at point of sale for aircraft engine.

- Very long term agreements 10 – 20 years.

Airline Orders as of July 2016

- B737MAX (LEAP-X)
  - 17% Engine Only
  - 83% Engine + Maint.

- A320 LEAP-X
  - 33% Engine Only
  - 67% Engine + Maint.

- A320 PW1100
  - 70% Engine + Maint.
1. Restrictions on Intellectual Property

• Information contained in maintenance and repair manuals has decreased

=> more difficult for non OEM MROs to repair parts without advice from the OEMs.

• Repairs developed by the OEMs are being provided to MRO’s who sign up for licence agreements……. At a cost !

2. Limitations on Repairability

• Highly complex airfoils are less likely to be repairable economically

• Are new materials e.g. Ceramic Matrix Composites and new manufacturing processes e.g. additive manufacturing open to repair ?
• More restrictive IP = growth in alternate materials and repair ?............................

• Non OEM approved material and repairs have largely been pushed out of engine gaspaths through a combination of:-

  ➔ OEM fleet hour agreements

  ➔ OEM MRO footprint

  ➔ Commercial agreements for material supply with major independent MRO’s

  ➔ “Systems Issues” campaigning

  ➔ Threat of warranty invalidation for use of non OEM approved material
Non OEM approved material and repairs are unlikely to be an option for next generation engines because:

1. Barrier to market entry – look at current OEM success
2. Tenure of fleet hour agreements – who can wait that long and maintain engineering capability?
3. Parts are increasingly complex and may not be repairable – designed as consumables?
• How many engine models have had significant mid life performance upgrades?
  – CFM56 /3 and E
  – V2500 S1 and S2
  – PW4000-100 “Advantage”
  – Trent 700EP and EP2
  – LEAP Upgrade to Low Px Compressor in 2017
  – PW1000-JM Improvements to blade profiling & contours by 2019

• Primary objective of these upgrades is fuel burn, but all come at a maintenance cost due to hardware replacement and workscope enhancement

• Engine models are being stratified into sub models each with distinctive hardware differences
  – Reduces size of market for repairs
  – Natural barrier to entry for repair development
New Material

- SV Costs are typically 70-80% material and the balance being labour & repair
- Graph reflects LLP Parts Escalation
  - Research shows LLP cost escalation generally reflects top 50 line items
  - => LLP escalation is a good indicator for material price inflation
- Reviewed LLP increases since 2006 on 16 engine models from all OEM’s:
  - Model Average Range 5.5% - 7.5% p.a.
  - Overall Average 6% p.a.
  - Material prices double every 11 years!
• Broad market of 70-80 players but OEM entities \ divisions are now major players

• Aligned with OEM shops as natural customers

• Have ability to determine market price and paperwork requirements

• Strong market presence combined with paperwork demand requirements drive a lot of used material into scrap

**OEM market position drives previously usable material towards scrap**
Discounting the Value of Non OEM maintained engines

- Branding such as CFMI & GE’s TRUEngine™ and IAE’s Pure-V™ seek to create value distinction between OEM v non-OEM maintenance
  - Enticements include “enhanced” warranty and customer support
  - Self Declaration but no OEM liability for errors

- Management of “Critical Influencing Parts” – much more targeted anti PMA\DER attack
  - Focuses on Life Limited Parts
  - Increased trace paperwork - SB’s issued with stated requirements
  - Applied retrospectively back to birth

- Very aggressive tactic to eliminate the use of significant PMA\DER

- Rules created by the OEM and have changed regularly

- Significant mis-information and spin regarding market demand
Historical Residual Value Model (0% Inflation)
How the OEM has significant influence over the cost of ownership:

- Controlling the price of replacement spare parts (OEM is the sole reseller)
- Increasing monopoly on the MRO aftermarket (FHA’s and facility network)
- Actively trying to eliminate the availability of non OEM approved parts
- Actively trying to control the repairs that can be developed
- Seeking to dictate the trace paperwork required for used serviceable material (beyond regulatory requirements)
- Seeking to dominate the availability of surplus used serviceable material
How the OEM is influencing Residual Value:-

⚠️ Flight hour agreements reduce liquidity = reduction in residual value

⚠️ “Badging” of engines based on OEM criteria doesn’t add anything; differentiation only seeks to devalue those that don’t have it.

⚠️ Reduction in part repair capability = reduced end of life value of engine carcass

⚠️ Dominant footprint on the MRO market
  + Presence in USM markets
  + Dictating paperwork requirements
  + Controlling repair standards
  = increasing amount of used material sent to scrap
  = reduced end of life value of engine carcass
Conclusion

OEM Influence = Erosion of Choice

Erosion of Choice = 1. Higher Cost of Ownership
2. Lower Asset Residual Value
Thank you for your attention.

Questions?