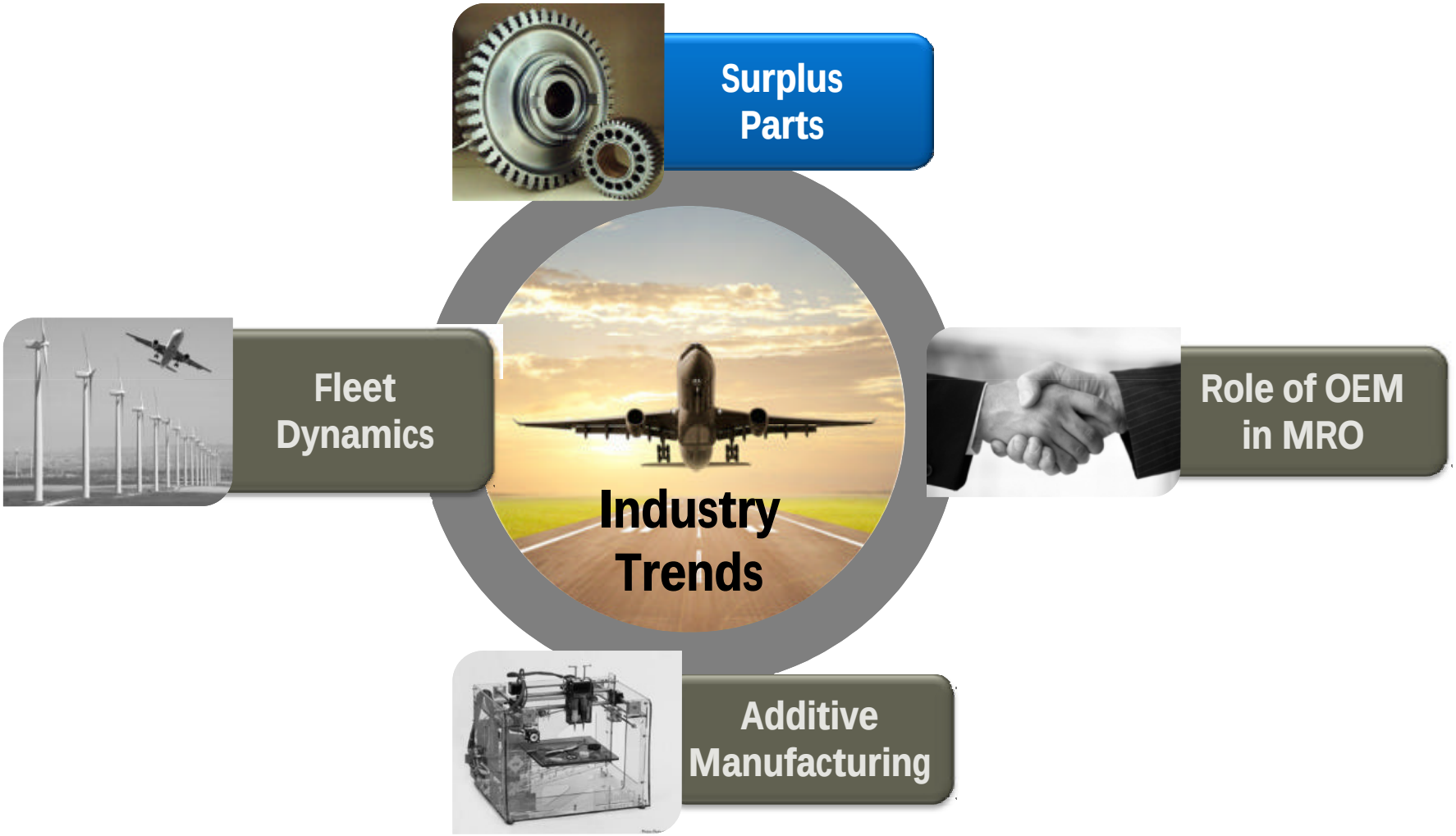
Four key MRO industry trends to watch…



Source: ICF SH&E

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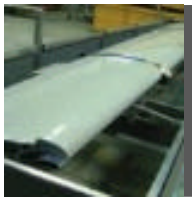
Today, spending on air transport surplus parts is approximately $3 billion

Air Transport Surplus Parts Market*
~$3 Billion



Typically slow moving structural parts

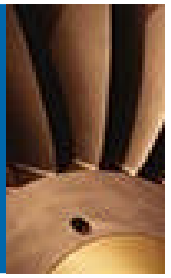
Airframe

5%

65%

Engine

Surplus material for engines predominantly consist of piece parts (e.g., LLPs)



Components

30%

Component surplus are primarily rotables LRUs; Demand is driven by AOGs, BER and provisioning

Source: ICF SH&E

* Sales to end customers; excludes intra-dealer sales

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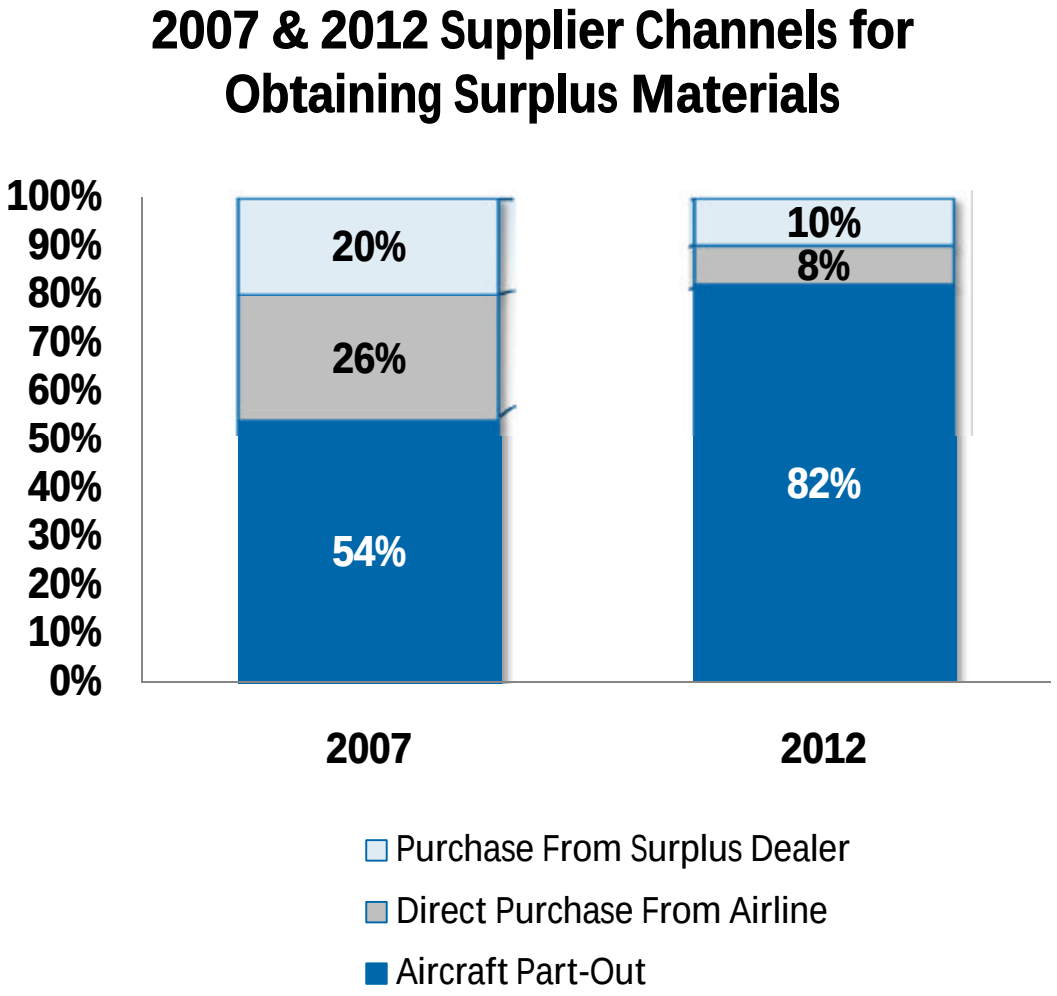
Surplus dealers now obtain over 80% of their inventory from parting-out aircraft…



ICF SH&E Insight

- Leaner airline inventories
- Improved material planning (and MRO IT capabilities)
- Increased component pooling agreements
- OEM after-market material control strategies

Source: ICFI SH&E Analysis

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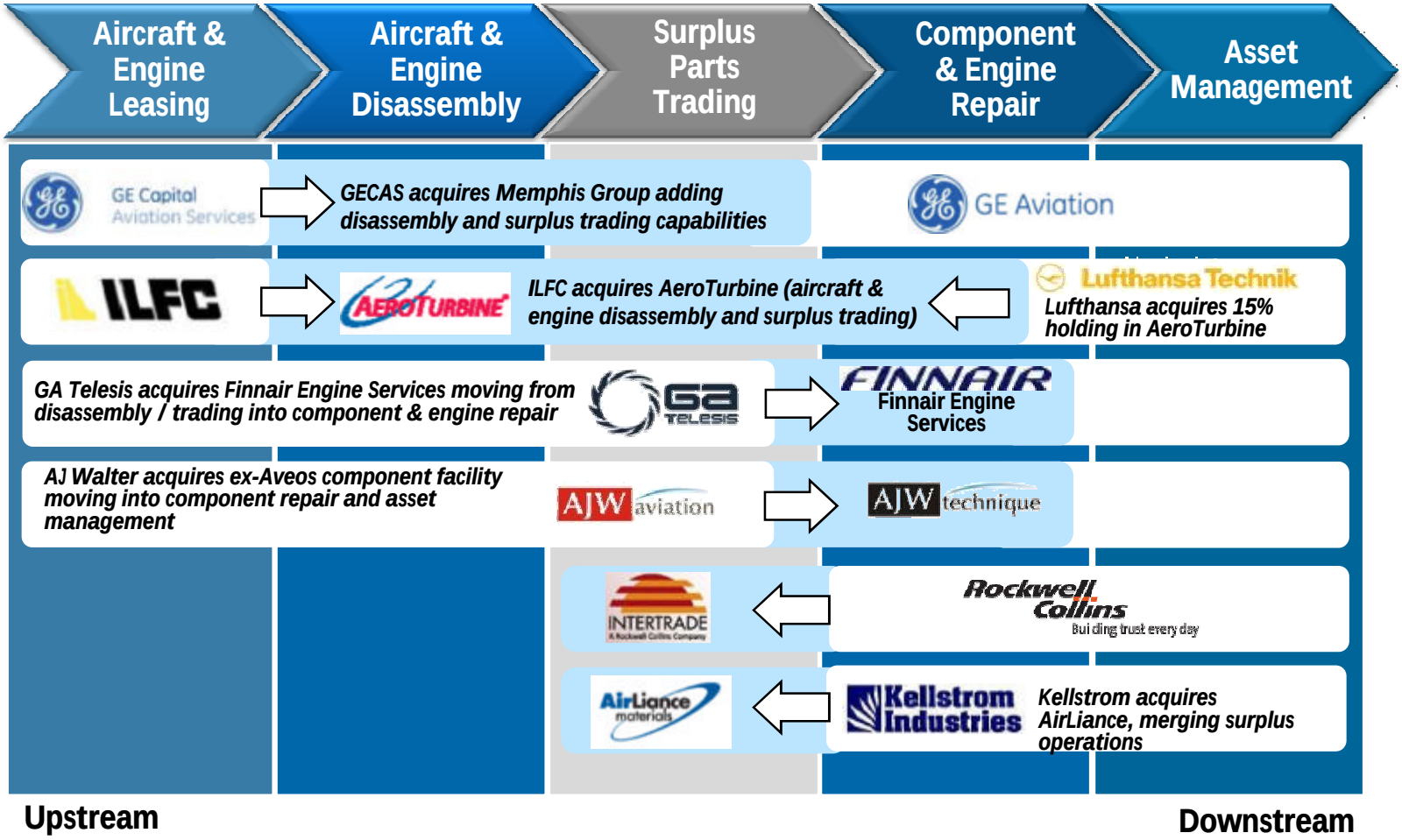
The surplus parts value chain is evolving as suppliers pursue integrated solutions



Source: ICF SH&E

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Four key MRO industry trends to watch…

Source: ICF SH&E

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Relationships between the various MRO suppliers continue to evolve

Airframe OEMs

- Grow aftermarket services revenue
- FHS, GoldCare, MRO Network
- Part consignment programs

Engine & Component OEMs

- Focus on controlling IP
- Continue successful capture of market share (especially for new gen equipment)
- Increased support in growth regions via licensed service centers

Integrators

- Scale
- Engine/ Component JV opportunities?
- Evaluation of core vs. non-core

Independent MROs

Evaluating strategic options

- Seek partnerships?
- Niche competitor?
- PMA/DER usage?
- Access to new aircraft IP?

Source: ICF SH&E

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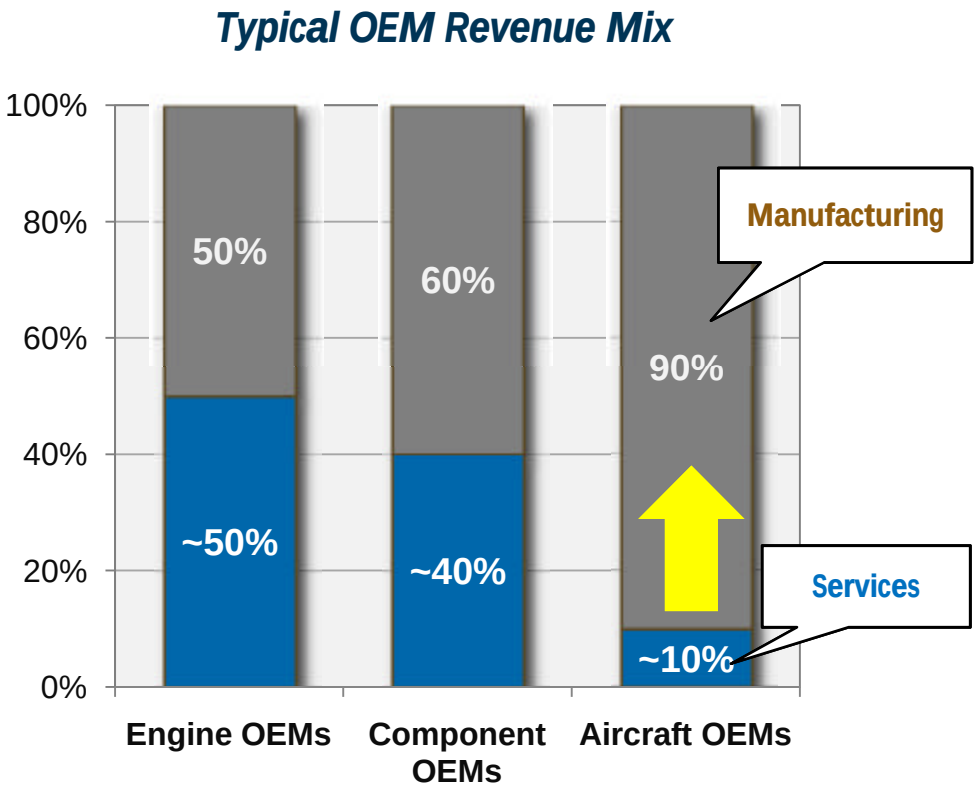
Aircraft OEMs are fast becoming major MRO players…



- The EADS Vision 2020 goal is 25% services revenue by 2020
- Two major acquisitions in 2011: Satair and Vector Aerospace
- Numerous FHS contracts

- Launched EDGE in 2012 to create coordinated services brand
- Major player in flight training, distribution, and consumables management
- Two new GoldCare contracts

Sources: ICF SH&E Analysis, EADS Vision 2020

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Component OEMs are increasingly embracing licensed service centres and/or partnerships to address growth regions

Recent Examples of Component OEM Agreements

MOOG

SR Technics

LIEBHERR

AAR

Rockwell Collins

SR Technics

UTC Aerospace Systems

Lufthansa Technik

ST Aerospace

- The engine licensed service centre network model is being replicated by component OEMs (e.g., following success of CF34/AE3007/CFM56 networks)
- Some of the recent signings focus on support for new aircraft such as 787
- The licensed service centre model has several benefits for OEMs
  - ➢Reduced need for bricks and mortar
  - ➢Access integrated support customers
- *The upshot:* creates opportunities for well-positioned independent MROs on new generation equipment

Source: ICF SH&E / Company press releases

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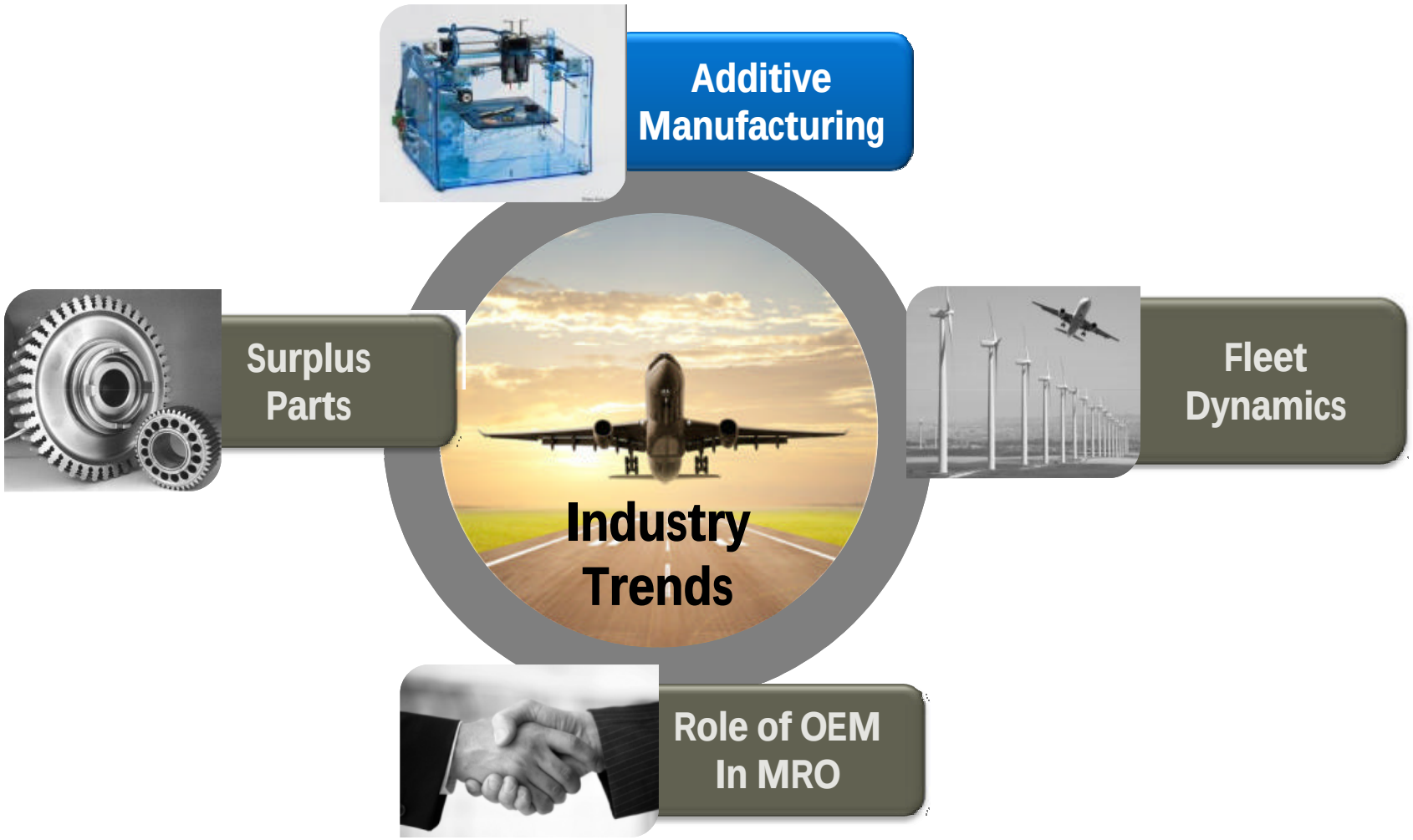
Four key MRO industry trends to watch…



Source: ICF SH&E

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Additive manufacturing is a long-term trend to watch in MRO; Aeroengines are a near-term opportunity

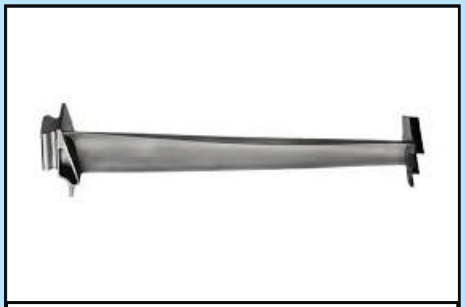
Examples of Additively Manufactured Aeroengine Parts

Fuel Nozzles

CFM Leap Fuel Nozzles

- Improved performance, reduce part count, better durability
- JV with Parker Aerospace will make ~~LEAP fuel nozzles~~

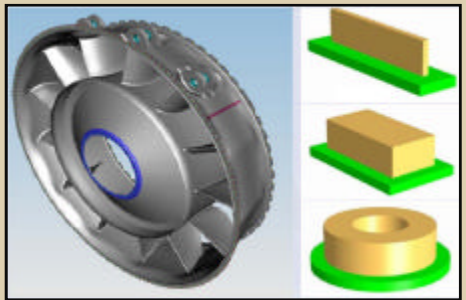
LPT Blades/Vanes



GENX Ti-Al LPT Blade (Avio)

- Reduced material production on expensive Ti-Al parts
- Not in production

Housings/Features



Housings/Casing Features

- External features added to forgings
- Reduces material waste and complexity

Applications are currently limited to complex-geometry static parts

Source: ICF SH&E analysis, GE Aviation, Avio, EU Project Merlin (Rolls-Royce)

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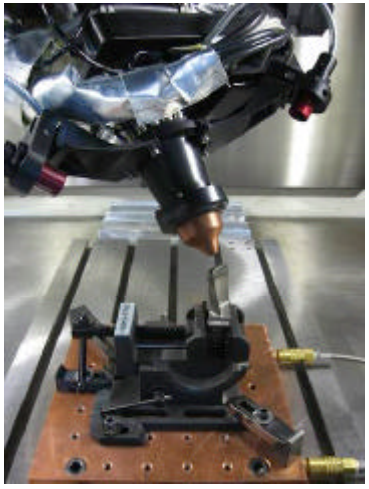
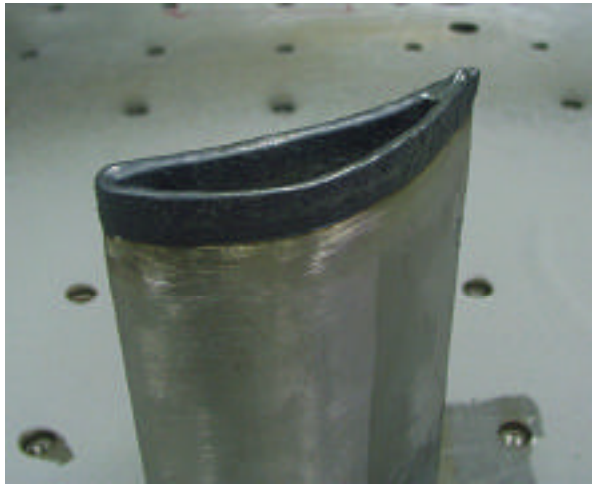
Additive manufacturing is also being used for repairs

Repair of Turbine Components Using Direct Metal Deposition (DMD)



Turbine blade squealer tip is built up using DMD



As deposited DMD turbine blade tip

Rebuilt turbine blade tip

DMD includes a patented closed loop feedback control of the deposition process

Source: DM3D, MT Additive

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