IATA MCC 2014

Component Maintenance – Best Practices

An Airline Perspective
Agenda

Component Maintenance: Best Practises

- ON – WING PERFORMANCE
- COMPONENT RELIABILITY
- OFF-WING MANAGEMENT
- REPAIR CYCLE
- PARTS MANAGEMENT
Best Practises for Component Maintenance

This presentation is based on an IATA document –

- a joint & contributory effort by IATA MCTF member airlines discusses CMC breakdowns, best practises and illustrations as *considerations* to reduce airline DMC associated with component costs

- The document is certainly *not* “all inclusive” and an operator must consider its specific conditions, operating environment, contracts and policies when adopting suggested improvements.
Component Cost Drivers

Component Maintenance Costs (CMC) are a significant cost driver for airlines.

- IATA published data (2012 & 2013) indicate that 23% of Direct Maintenance Costs (DMC) are attributed to Components

- Given the significant apportion of DMC to Component maintenance spend, this paper is premised on and explores the following:
  - Breakdown of **CMC into subcategories**
  - Benchmark best practises
  - Identify improvements to existing component maintenance & repair arrangements with suppliers
  - Highlight opportunities to enhance cost control over component maintenance
Component Performance Expectations

1. Predictable Technical and Cost Performance
2. Rapid and Successful Solutions
3. Cost Effective Outcomes
Component Maintenance – Best Practises

CMC Sub Categories

CMC

ON-WING PERFORMANCE

RELIABILITY
- Time on Wing
  - Life Limits
  - Soft Limits
- Predictability
- Modification Effectiveness
- Maintenance Practises

OFF-WING MANAGEMENT

REPAIR CYCLE
- Repair/OH Costs
- TAT
- Scrap Rates
- NFF

PARTS Management
- Ownership costs
- Fleet Configuration
- Price Escalation
- Warranty
Component Maintenance: Best Practises

ON – WING PERFORMANCE

COMPONENT RELIABILITY

OFF-WING MANAGEMENT

REPAIR CYCLE

PARTS MANAGEMENT
• Component Reliability

  – Increasing Component reliability leads to longer time on wing and lower life cycle costs

    ▪ Compare component reliability to overall fleet reliability, understand the cost of schedule interruptions, analyse solutions, and prioritize service bulletins based on the impact to its fleet and create a customized, prioritized list of improvements

  – Reliability Influences:
    ▪ Life Limits
    ▪ Predictability of failures
    ▪ Modification Effectiveness
    ▪ Maintenance Practises
Time on Wing

- In principle, the longer a component remains on wing, the lower the life cycle costs of the component with reduced repair cycles in the life of the component.
- Component On-condition is monitored via effective scheduled maintenance programs (e.g. General Visual Inspections)
- TOW is also determined by OEM/Vendor mandated Life Limits, and Operator introduced Soft-times limits

- Life Limits - Life Limited Parts are mandated by Instructions for Continuing Airworthiness (ICA) that specify the life on wing
- Soft Limits - operator introduced “on-wing limit” for a component which triggers the removal before a failure is expected
On-Wing Performance - Influences

• Predicting Component Failures
  – Predictive Maintenance tools, such as Airplane Health Management (AHM), Fault History Data Base (FHDB) and Airman predict impending component failure which reduce time on wing but enhance aircraft operational performance (OTP).

  – Predictive Maintenance practises can impact costs through repair cycles costs and impact of No Fault Found (NFF)

  – Data analysing tools such as Weibull also deliver predictive time-on-wing through statistical analysis of operator Reliability data
On-Wing Performance - Influences

- Modification Effectiveness
  - On wing performance can be influenced by effectiveness of modifications implemented during service (SB, SL, VSB etc.)
  - Utilise industry standard tools for Cost Benefit Analysis and Risk Analysis and justify modification implementation
  - Establish Modification Policy to clearly consider pay back periods, warranty, pooling, leasing arrangements
  - Focus on Free-of-Charge (FOC) modification offered by Vendors/OEMs
    - Consider Labour Costs (MH), shipping, Receipt/Insp, certification
    - Factor in potential repair costs in shop, Shop testing in the Cost Benefit Analysis of the modification evaluation process
  - Implement a Modification Review or Effectiveness monitoring process as a decision gate to continue or stop modification programs
• **Maintenance Practises**

  Maintenance Practises are a significant influence on On-wing performance

  – Robust Troubleshooting & Fault Isolation processes prevent unnecessary costs associated with removal of serviceable components

  – Discuss standard practises and data sharing with other operators

  – Participate in OEM Web forums to share experiences and support accurate fault isolation of recurring defects
Component Maintenance: Best Practices

ON – WING PERFORMANCE

COMPONENT RELIABILITY

OFF-WING MANAGEMENT

REPAIR CYCLE

PARTS MANAGEMENT
Off-Wing - Management

• **Repair Cycle**
  Airlines with well established repair cycle and inventory management procedures are best placed to have transparency and control over off-wing component costs
  – Effective management of components in the repair cycle is key to containing shop associated costs
    ▪ Logistics/shipping, TAT, (Shop) Reporting, Documentation
  – Scope Repair Vs Overhaul costs in defining component on-wing expectation

• **Turn Around Time (TAT)**
  – Defining TAT into shop agreements/contracts assist with spares holdings requirements and improve management of the repair cycle
  – Total TAT= Shop TAT + ancillary requirements (Shipping, Customs, R/I etc.)

• **Beyond Economical Repair (BER)**
  – Threshold at which to scrap the component since the repair costs and beyond economical repair must be considered and established with shop contracts
  – Consider ‘Scrap fees’ if applicable to BER components
  – Consider Lead times, loan fees for on-the-margin decisions before tagging BER
NFF - No Fault Found

- NFF are a substantial contributor to component costs resulting from No Fault Found with a component that is bench tested in shop
- Operator efforts to reduce NFF and negotiate NFF-fees will minimise associated costs
- Monitor NFF rates to improve system fault isolation/prediction and unnecessary removal of serviceable components and associated high repair costs

NFF Contributors:

- Predictive & Prognostic Maintenance
- Fault Isolation Processes (Troubleshooting)
- Multiple component removals to address single system failure
- Bench testing processes at shop facilities (static/dynamic testing)
- Rogue units
Cost of Ownership

- Cost of Ownership of components is driven by inventory management policy
- Stock holding and location of inventory may have direct or indirect operational impact and ability to recover from component failures
- Component pooling is a medium to reduce capital costs

• Component Pooling

- Component pooling (closed or open loop) arrangements with service providers should consider operator modification policy & component reliability programs

Modification / Reliability Standard

- Specify modification standards for components in the pooling arrangement despite Part Number inter-changeability
- Correlate reliability driven soft limits with remaining life of components that enter the pool
Fleet Configuration

- Fleet Configuration control is another factor that impact part provisioning

- Inventory provisioning for multiple fleet types can be a cost control complexity
  - One-Way / Two-Way Inter-changeability, Mod Status, upgrades

- Reduce differences in aircraft configuration to control inventory related costs
  - Maintain fleet commonality even within aircraft families / models

Price Escalations

- Annual escalation of component list pricing can lead to hidden costs

- Contracts management and established discounts will initiate a cap on price escalations
Warranty Management

- Establish a robust and effective warranty procedure to assess / submit / manage warranty claims

- Ensure warranty-claimable costs are identified and recovered within contractual timeframes

  - Incorporation of service literature (e.g. Service Bulletins (SBs) and Service Information Letters (SIL)) including claims for material and/or labour

  - Business costs incurred as a consequence of OEM products not performing to specification or an agreed maintenance guarantee

  - Specific terms and conditions of OEM Product Support Agreements (PSAs) and Aircraft/Engine purchase contracts which may include claims for material, labour and/or freight costs related to component warranty repair activity or other warranty rectification activity

  - Airframe maintenance activity during heavy checks. For example some Aircraft OEMs provide a standard consumable allowance in excess of $$ per check

  - Follow-up of disputed & open claims where warranted and establish effective reporting of recoveries
Summary

- Component maintenance costs account for over 23% of Direct Maintenance Costs of Airlines

- The paper highlights the complexities & certain contributing factors associated with component cost management, and suggests industry practises where applicable

- On-wing performance is driven by component reliability and is influenced by modification effectiveness. Initiate Effectiveness monitoring processes post mod/soft time implementation

- Predictive/Prognostic maintenance, Life Limits and Maintenance practises determine the time on wing which impact OTP but must be intelligently managed to reduce component related costs

- Off-wing management of the repair cycle is an important element to reducing related costs

- Maintain transparency over NFF rates, FOC modifications, TAT cycles and BER thresholds

- Consider component pooling standards, simplified fleet configuration and pricing escalations into contractual agreements

- Establish Warranty processes to effectively implement cost recoveries
Acknowledgements

Thank You