Aircraft Maintenance Reliability Driven Optimization

Considerations related to improvements driven by the collection and analysis of Reliability Data

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Operators have the opportunity to engage with the reliability program to whatever depth they decide is appropriate – at the entry level this consists of demonstrating the effectiveness of the maintenance program, whereas at a deeper level it can become the source of a justification for an operator initiated escalation of a task or number of tasks.

The specifics regarding the type of information to be collected should be directly related to the goal of the Reliability Program with the outcomes being a consolidated assessment related to the ongoing well being of the program. In addition to provide focus on any trends or exceptional events requiring engineering attention.

Operator Initiated Check Escalation

An airline through the continuous data collection and analysis process may identify an opportunity to initiate a check interval escalation. Increased fleet size, scheduling requirements or available downtime may also initiate a review for a possible check interval escalation.

Considerations

The escalation and sampling programme must conform to the interval and programme limitations approved by the local regulatory authority.

Maintenance is one of the most significant costs within an airline operation so the opportunity to reduce the expenditure without compromising the safety or economic viability is worth considering.

For operators with a fleet size in excess of 10 aircraft, (Considered the entry level for ROI) it is worth to consider the feasibility and benefits of Escalation of the Maintenance Program

GUIDELINES FOR INTERVAL ESCALATION:

The escalation and sampling programme must conform to the interval and programme limitations approved by the local regulatory authority.

In order to ensure that an airline has gained sufficient experience with a fleet type at the current check interval prior to an interval escalation, it is desirable to develop criteria for minimum requirements for a corroborative sampling programme.

As a guideline the corroborative sampling programme will be performed on minimum of two aircraft at not less than 90% of the present limit.

Until the corroborative sampling is successfully completed, the present interval cannot be considered mature and the check interval cannot be further escalated.

The target for interval escalation should be carefully set by the airline and will be confirmed by a review of check findings on the sample aircraft before approving the new limit for the entire fleet.

A too ambitious escalation may result in high number of dropout items, which may defeat the purpose of the interval escalation.

A Minimum of two aircraft should be selected as sample to evaluate the effect of the new target interval before it is approved.

To be eligible as samples, checks should achieve at least 90% of the target interval.

Prior to approving and implementing a new interval an airline shall undertake the following steps

INITIATE PLANNED SAMPLING PROGRAMME

This process step is initiated when the proposed check at its present interval has matured such that a further check interval escalation may be considered. Select the sample aircraft to evaluate the results of the increased interval before the interval escalation is approved for the whole fleet.

Sample aircraft may be escalated by the maximum escalation increment for purposes of sampling.

The airline must also examine all mandatory maintenance tasks that are planned as part of the check programme for the sample aircraft (i.e. ADs/CNs, Certification Maintenance Requirements (CMR), Airworthiness Limitations (ALS), ETOPS requirements, if applicable and physical check of time expiry dates) and hard-time unit changes to ensure that they can withstand the interval escalation.

All mandatory tasks, which cannot withstand the interval escalation (dropout items), may have to be controlled individually at the current interval or accomplish them at a lower routine check

Review results of planned sampling

Following accomplishment of the check on the sample aircraft the airline shall review the significant non-routine findings.

In case where findings do not support the new interval, the interval can still be escalated, but the dropout items will remain at the existing or lower interval as required.

Approval of new interval

Upon successful completion of above steps the new interval can be approved in accordance with the airline's procedure approved by their regulatory authority.

A reasonable period of time, must be allowed to elapse between the attainment of one check interval and the initiation of a further escalation programme. This is to permit the newly established interval to mature and generate confidence that potential problems have not been overlooked.

Analysis of maintenance programme efficiency

The maintenance programme efficiency is a combination of many factors. Key performance indicators (KPIs) should be selected to monitor significant variables against set targets. These KPIs can also be used to measure the effectiveness of corrective actions.

The following list summarizes some of the suggested KPIs:

Financial impact of maintenance programme change

The financial impact of adding, deleting task or changing task/check interval can easily be estimated. The actual costs associated with maintenance programme changes should be monitored. In case of significant discrepancy between the estimated and actual costs an investigation should be launched to determine the root cause.

Impact of service bulletin (SB) incorporation

For recommended service bulletins the benefits of incorporation of the SB shall be determined.

The benefits are a result of reduced number of PIREPs, improved dispatch reliability or component standardization to reduce the number of spares.

SB cost models have been established by the OEMs that can be used to calculate the return on investment (ROI).

During embodiment of SBs, especially on large fleets, it is advisable to monitor the performance of modified aircraft to ensure that the estimated benefits both in performance and cost are achieved.

In case of significant discrepancy between the estimated and actual benefits an investigation should be launched to determine the root cause.

Line Maintenance KPIS

Routine and non-routine manhours

Through an effective maintenance programme management, relying on data collection and analysis, proactive incorporation of reliability improving modifications and maintenance programme adjustments the ratio of non-routine manhours can be reduced.

In case this is not achieved, an investigation should be launched to determine the root cause.

Unscheduled manhours

Unscheduled manhours are a result of PIREPs, which can cause flight delays or cancellations due to troubleshooting a snag and taking corrective action. If a fix cannot be completed the aircraft can still operate within the MMEL limitations, but often with a penalty.

Number of PIREPs and associated manhours should be monitored and in case of negative trends the root cause has to be determined and addressed through the airline's reliability process.

Dispatch reliability and number of PIREPs

As discussed above there is a correlation between PIREPs and dispatch reliability. PIREPs can cause flight delays or cancellations depending on factors such as available downtime, manpower, tooling, test equipment, spare parts.

Aircraft health condition monitoring can improve dispatch reliability by actively monitoring aircraft faults prior to aircraft arrival. The airline's reliability programme shall be used to analyze PIREPs, delays and cancellations to determine appropriate corrective action.

Base Maintenance KPIS

Estimated versus actual downtime and manhours

For base maintenance checks the actual downtime and manhours is a good measure of maintenance programme efficiency, but it is also influenced by the productivity of the maintenance organization and findings during the check.

A good maintenance programme will attempt to reduce the number of non-routine manhours by addressing check findings and incorporating significant drivers in the scheduled maintenance programme.

In case of significant gap between the estimated and actual downtime and manhours, the cause shall be investigated.

Analysis of Maintenance Programme Efficiency

Actual manhours versus MPD manhours

Even though MPD manhours do not cover all aspects of accomplishment of scheduled maintenance tasks, they can be used as a baseline to determine the airline's manhours against each task

The MPD figures do not include preparatory work such as aircraft cleaning, positioning work stands, procuring consumable materials, connecting ground power carts, correction of defects found during task accomplishment, correction for lost time and manpower efficiency.

Routine and non-routine manhours

Through an effective maintenance programme management, relying on data collection and analysis, proactive incorporation of reliability improving modifications and maintenance programme adjustments the ratio of non-routine manhours can be reduced.

This will also have a positive impact on the check downtime and manhours. (In case this is not achieved, an investigation should be launched to determine the root cause.)

DIRECT MAINTENANCE COST (DMC)

Direct maintenance costs can be reported through standard DMC toolset which allows the airline to benchmark with their own historical data or compare with industry best practices.

The DMC report captures line maintenance, heavy maintenance, component and engine maintenance costs. Using the DMC report cost drivers can be identified which will allow the airline to collaborate with the OEMs and vendors to implement cost reduction initiatives.

If you would like to arrange an EASA Compliant Reliability Training Course please email team@sassofia.com or see www.sassofia.com for more details of how SAS may help you.