Evolution / Optimization Guidelines

IMRBPB

Issue Paper 44 (Issue 3)

These guidelines should be revised when required based upon experience.

IP 44 Issue 3 HIGHLIGHTS

Cover page
Issue 2 changed to Issue 3. Footer text deleted. Date removed

IP 44 Revision Log
Table modified to clarify changes included at each revision

Section 7 – Data Review
Incorporation of IP 116 resulting in deletion of 'Note' in paragraph 7.3 and addition of paragraphs 7.6, 7.7 and 7.8

Appendix A
Minor corrections introduced. Text added to indicate that Working Group members listed are those that developed Issue 1.

General
All pages identified as Issue 3. Marker bars appear against Issue 3 changes only.

IP 44 REVISION LOG

Document Date	Issue	Reason
Apr 25, 2008	Issue 1	
Oct 22, 2008	Issue 2, Rev 0	Addition of Appendix B (definitions)
Nov 19, 2008 (dated Oct 22,2008)	Issue 2, Rev 1	1/ Creation of revision log (2 entries) 2/ Creation "IP 44 revision Flow chart"
Dec 03, 2009 (dated Oct 22,2008)	Issue 2 ,Rev 2	1/ Line added in margin to highlight changes 2/ Revision log updated with single entry for Issue 2
Dec 08, 2011	Issue 3	1/ Revision log expanded to clarify Revision 2 content 2/ Changes made to allow closure of IMRBPB Action Item 08/03 3/ Incorporation of IP 116

IP 44 Revision Flow Chart

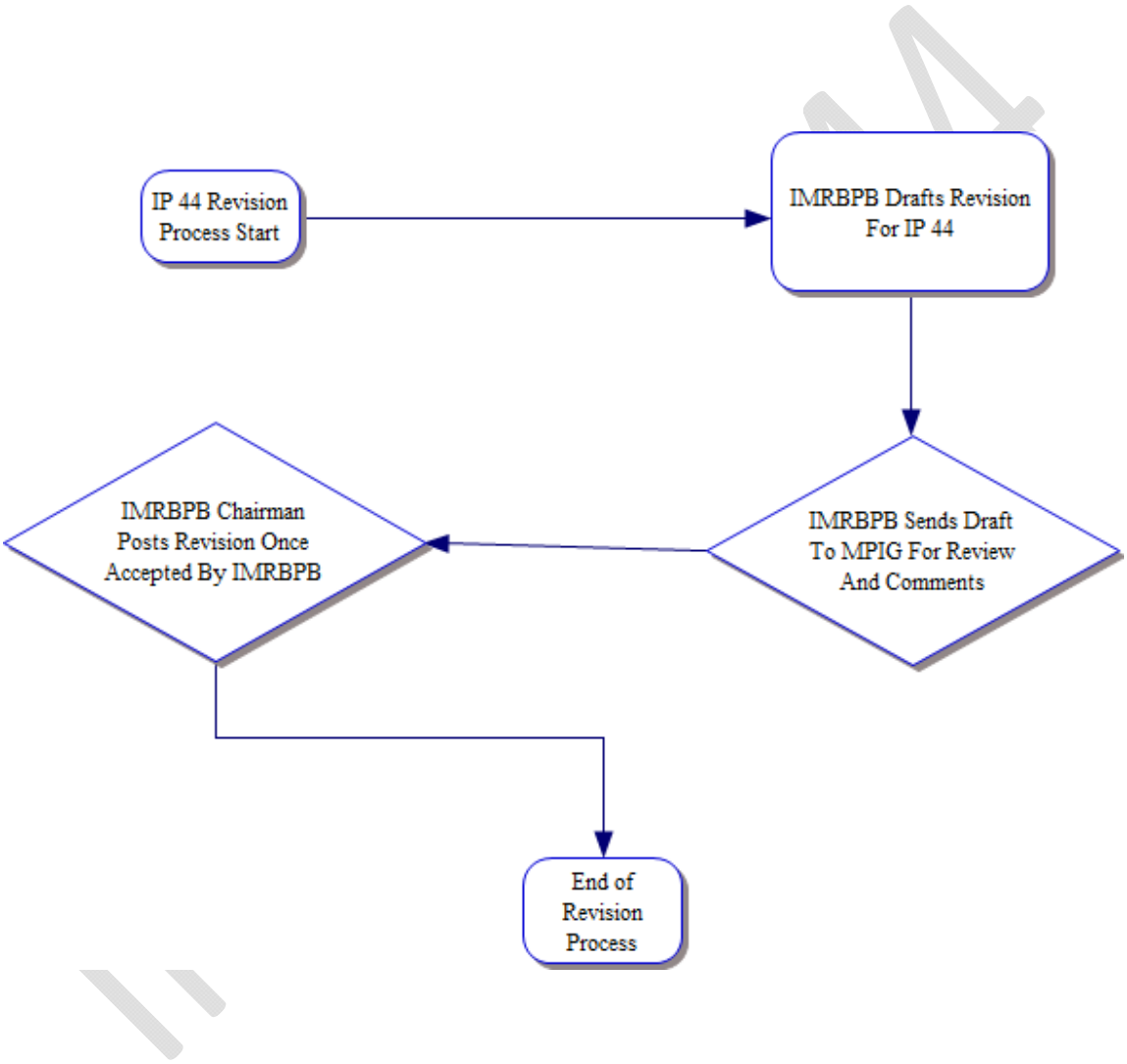

TABLE OF CONTENTS

1.0 Introduction

The guidance in this document is intended for use by those Original Equipment Manufacturer/TC Holder (OEM/TCH) and Maintenance Review Board (MRB)/Industry Steering Committee (ISC) members who are involved with the evolution/optimization of tasks in a current MRB Report (MRBR). This guidance shall be applied for evolution / optimization activities where no official correspondence has been forwarded to the airworthiness authorities or for activities to be finalized (MRBR proposal / MPP submittal) after April 2009. The following framework is provided as guidance within which proposals to amend the MRBR shall be developed and assessed.

The initial MRB report for any new aircraft is developed essentially in the absence of actual in-service experience. As a result the tendency is to be conservative in the decision making process. As service experience is accumulated, task intervals (thresholds/repeats) should be adjusted to reflect the results of actual in-service data.

The OEM/TCH Evolution/Optimization process does not assume any operational control over an operator's maintenance program.

Note: When intervals are stated in this document it includes both threshold and repeat values.

2.0 Purpose

While this guidance is not intended to be exhaustive it shall be utilized as the basis for a Policy and Procedures Handbook (PPH) procedure when the OEM/TCH, MRB, and ISC wish to proceed with evolution / optimization regarding the MRBR process.

Evolution / Optimization of a task through the management of data is a means to assure the continued applicability and effectiveness of the task while at the same time improving the integrity of the MRB process. This policy allows the OEM/TCH to develop and use a process that serves as a continuous analysis and Evolution/Optimization for MRBR. It is based on performance data and experience for model-specific fleets flown by multiple operators under a variety of operating conditions and environments.

3.0 Policy Description

OEM/TCH must meet the policy requirements defined by the regulatory Authorities of the country of origin; and shall define further details and procedure clarifications in the PPH. As the PPH is a living document, a response shall be given within 60 days after ISC acceptance/OEM submission.

Where applicable PPH revisions shall be coordinated and approved by the MRB/ISC.

In-service data both scheduled and unscheduled maintenance findings related to the intent of the MSG-3 task should be evaluated.

Relevance and significance of findings should be weighed.

Data format and content should be standardized (ATA SPEC 2000 chapter 11 or equivalent).

Data quality, integrity, completeness and clarity must be ensured.

Each and every task shall be considered individually.

Original design and engineering specs shall be reviewed as required.

All information's related to continue airworthiness should be reviewed (AD, SB, In-service reports/letters, modifications/repairs, etc.)

MRBR task Evolution / Optimization shall be based on worldwide representative samples that span the operating environment and age groupings of the aircraft.

Interval Evolution / Optimization should be based on risk management. Risk Management is the systematic application of management policies, procedures and practices to the tasks of identifying, analyzing, evaluating, treating and monitoring risk.

Safety management principles shall be used at the OEM level. Safety management is the application of engineering and management principles, criteria and techniques to optimize safety. It is an integrated and comprehensive engineering effort.

Statistical models should be applied to support the Evolution / Optimization exercise.

In a data-driven statistical decision making process, data size is determined based on the level of confidence.

Confidence level refers to the likelihood that the overall fleet performance lies within the range specified by the sample fleet performance. The confidence level is usually expressed as a percentage. For example, a 95% confidence level implies that the probability that the fleet parameter lies within the confidence interval is 0, 95.

For a given confidence level, data size may vary depending on the fleet size and variability of in-service data.

Sufficient data shall be collected by the OEM/TCH that would support the expected confidence level. However, engineering judgment will remain a part of the evaluation.

Statistical analysis should be supported and validated by engineering judgment.

Task effectiveness should be measured and demonstrated. i.e. ability to:

- detect/prevent defects prior to loss of function/structural integrity
- Mitigate risk of exposure to hidden defects

Operator's and regulator's feedback shall be recorded and dispositioned.

The effectiveness and integrity of the process is ensured by collecting in-service data in a ATA SPEC2000 chapter 11 format or equivalent, analyzing it, and comparing the results with existing MRBR task requirements.

This policy allows for Evolution/Optimization of MRBR, scheduled maintenance tasks, intervals, and enhances the use of reliability-driven maintenance analysis processes.

The MRBR is adjusted based on performance data and analysis processes. However, operator reliability programs should still continue to ensure continuous Evolution/Optimization of their maintenance programs.

The OEM/TCH Evolution/Optimization process does not assume any operational control over an operator's maintenance program.

4.0 Responsibilities

Approving Authorities shall be notified in writing by the OEM/TCH Applicant of their intent to begin an evolution / optimization process. This will be in the form of an official correspondence as defined by the approving authorities.

Note: Approving Authorities are those authorities that approve the MRBR.

The Approving Authorities will respond, in writing, to the OEM/TCH of their intent to participate in the Evolution/Optimization exercise for a given fleet or model.

4.1 OEM/TCH (PPH Amendment and ISC/MRB Acceptance /Approval)

OEM/TCH shall include within the PPH the policy requirements and criteria as contained within this document. OEM/TCH shall further define the details and procedural actions necessary to conduct the Evolution / Optimization exercise. This plan shall be coordinated with and approved by the MRB/ISC.

Where documents that support the Evolution / Optimization are incorporated by reference within the PPH, the current document number and revision number must be stated.

4.2 OEM/TCH Data Collection

The OEM/TCH system must include a data quality, data integrity, data quantity, audit system, and historical data tool as defined in the next steps.

4.3 Data Format

The OEM/TCH shall utilize in-service data in a standardized format (ATA Spec 2000 chapter 11 format or equivalent), as deemed acceptable by the regulatory authority, to ensure data quality and integrity. ATA SPEC2000 Chapter 11 is an industry-sanctioned maintenance reliability data communication format. In order to use this format operators would have to transition to this type of format or the OEM/TCH would have to convert the operator data into this standardized format.

4.4 Regulatory Authorities

It is incumbent on the OEM/TCH to demonstrate to the Regulatory Authorities compliance with these guidelines for all and any Evolution/Optimization MRB task adjustment.

5.0 Data Quality

The OEM/TCH should have a system in place that allows for the collection of data found during operator's task accomplishment to be delivered to the OEM /TCH and then entered in a standardized format into their data collection system.

The data collected and used by the OEM/TCH regarding Evolution/Optimization shall include the following information:.

5.1 Aircraft Age

Aircraft age (since delivery) is measured in calendar days, flight hours, or flight cycles, as applicable. MRB Task evolution shall be based on in-service data collected from a representative sample of older as well as newer aircraft incorporating more current production standards and modifications. Fleet age representation shall be summarized in the analysis report.

5.2 Geographical or Operational Environment Representation, as appropriate

MRB task interval adjustments shall be based on in-service data collected from a representative sample which spans all operating environments. The data shall be in proportion to the specific model fleet size of each geographical area; however, it is not necessary to sample all geographical regions nor is it required to collect data from all extreme operating conditions (e.g., extremely hot and sandy (desert), extremely cold (arctic). A brief summary of the operating environments of the sampled aircraft shall be provided in the report.

5.3 Number of Tasks Accomplished

The number of times the task has been accomplished including “nil/no findings” shall be captured and used in the evaluation. Participating operators should provide task findings and non-routine write-ups for the related tasks of the sample fleet for the Evolution / Optimization exercise reporting period.

5.4 Interval of Tasks findings applied

Actual task interval of each participating operator shall be captured and evaluated.

Note: The actual intervals may vary between operators and may be different from MRBR requirement. The impact of these variations shall be assessed and accounted.

5.5 Component Data (Shop Findings, No-Fault-Found Removals and Failures), as applicable.

Information regarding component removal and replacement activity and vendor repair documents should be evaluated, as applicable where available. This information provides the data necessary to perform component failure-mode and life-cycle analysis which is necessary to support the Evolution / Optimization of the tasks associated with the component.

5.6 Correct Mapping to the MRBR task, if applicable.

Non-routine write-ups and in-service findings should be linked to appropriate MRBR tasks, as applicable. Only findings related to the MSG-3 task intent are relevant

5.7 Failure effect category considerations

MRBR task interval optimization is based on principles that reflect the criticality of airplane systems, components, identified during MSG-3 analysis. Failure Effect Categories should be accounted for during the analysis.

5.8 Operational Representation Flight Hour vs. Cycles, Calendar time

Aircraft utilization (flight hours or cycles, as applicable) should be captured and evaluated. Summary of fleet wide service experience high time aircraft (hours, cycles, years), time in-service, daily utilization (high, low, average), etc shall be included in the analysis report.

5.9 Consecutive tasking requirements, if available

To the extent possible, consecutive task check data should be captured to assess reliability of aircraft systems, components, or structural elements related to the MRBR task.

Note that this requirement may be applied to lower interval tasks. Consecutive check data can be impractical for higher interval tasks.

5.10 Unscheduled maintenance findings, as applicable

Mechanical irregularities and the resulting corrective actions captured from pilot reports and maintenance reports should be reviewed, as applicable.

Unscheduled maintenance is a prime indicator of the effectiveness of the scheduled maintenance program.

5.11 Scheduled maintenance findings:

a. Routine maintenance tasks that generate no findings. Tasks that generate no findings are as important as tasks that generate findings in determining failure-mode and life-cycle analysis.

b. Routine maintenance tasks that generate non-routine cards. These findings, which require corrective action, involve structures, area/zonal, and aircraft systems categorized by ATA chapter.

5.12 Unrelated significant findings, if applicable

Operators should capture significant non-routine write-ups generated in the course of an unrelated maintenance task, if applicable. These findings, which require corrective action, may not correlate to a routine maintenance task.

5.13 Four digit ATA code, if available

To the extent possible, operators should provide four digit ATA code for scheduled / unscheduled maintenance write-ups to facilitate transfer of findings to appropriate MRBR tasks.

5.14 Serial Number of Aircraft

Aircraft manufacturer serial number that uniquely identifies each aircraft in the sample fleet shall be provided by the operator.

6.0 Data Integrity

Data Integrity is the quality of correctness, completeness, and compliance with the intention of the creators of the data. It is the condition in which data are identically maintained during any operation, such as transfer, storage, and retrieval. It is achieved by preventing accidental or deliberate, but unauthorized insertion, modification or destruction of data in a database.

6.1 Data Validation

OEM/TCH shall have a data validation which:

a. Verifies that operator data is converted to ATA SPEC2000 chapter 11 or equivalent standard format

b. Ensures that all required data elements and attributes are satisfied for submitted data.

6.2 Audit system

The audit system must ensure that all data must be traceable to the original task.

7.0 Data Review

7.1 Analysis Schedule - Evolution/Optimization timeline

MRB task interval adjustments should be considered after sufficient service experience is accumulated since entry into service. Subsequent task interval adjustments should be considered after additional service experience has been accumulated since the last interval adjustment. In both cases, data sufficiency is measured by the level of confidence as stipulated in these guidelines.

7.2 Statistical Analysis

OEM/TCH shall develop and implement a statistical analysis system to provide justification that a 95% level of confidence has been achieved for the Evolution /Optimization exercise on a task by task basis. Exceptions can be presented and may be approved at the discretion of the approving Airworthiness Authorities.

7.3 Engineering analysis

Engineering analysis will verify that findings are relevant to the scheduled task under evaluation. Non-routine write-ups will be evaluated to determine the significance or severity of findings. Pilot reports and component reliability reports will also be examined to account for line maintenance activities that may be relevant to the task under evaluation. The severity of the findings shall be considered and evaluated.

7.4 Modification Status, AD, SB, SL, etc.

All information related to the task (service bulletins, Airworthiness Directives, service letters, and other in-service reports/resolutions, as applicable) should be reviewed.

Fleet configuration, should also be assessed.

7.5 Internal Review

OEM/TCH shall develop and implement internal quality procedures to review and validate MRBR revision process as defined in the PPH.

OEM/TCH shall develop and implement internal process to validate MRBR revised tasks and/or intervals resulting from evolution or demonstrate that an equivalent written internal process already exists to reach the same intent (not required before April 2010).

7.6 Servicing Tasks

Scheduled servicing (e.g. lubrication /oil replenishment) task data will not normally result in reported related findings. For these tasks, Engineering assessment and analysis is the primary method to be used to support an evolution / optimization. The engineering assessment must take into account the negative long-term effects (e.g. corrosion) resulting from inappropriate servicing intervals.

7.7 Restoration/Discard Tasks

For many restoration/discard tasks, fault findings will not typically be recorded in the performance of the task. In these cases, an engineering assessment of shop/teardown data should be performed. This engineering analysis should assess the rate of wear, corrosion, and degradation of lubricants or other included components.

7.8 Tasks having no, or low, on-aircraft accomplishment

Tasks having no, or low, on-aircraft accomplishment should not be automatically excluded from evolution. These tasks may be reassessed using a combination of the data originally considered in the initial analysis and any additional current data to determine if the task and interval remain applicable and effective.

8.0 Data Correlation

MTBUR, MTBF, PIREPS, non-routines, technical follow-up on open technical issue, and all other pertinent data, as applicable, should be correlated.

8.1 Working Group Activity - Interval Recommendation to the ISC (e.g. Increase, decrease, remain the same, introduction of new task, or task deletion).

MRB task intervals can be escalated based on the results of in-service experience. In addition, tasks should be de-escalated when in-service data supports interval reductions. Task may also be deleted when it is determined that the task is ineffective or the failure mode for which the task was selected never developed due to effective design provisions.

Task deletion, addition, or modification of intent requires new/revised/amended MSG-3 analysis. However, complete re-analysis of the MSG-3 package is not required. Any decision together with justification shall be recorded and traceable in the associated MSG-3 analysis. Applicability and affectivity criteria as specified in MSG-3 shall be observed.

The intervals of Potential Failure Finding tasks (i.e. those looking for degradation) should be less than the shortest likely interval between the point at which a potential failure becomes detectable and the point at which it degrades into a functional failure. (If the specific failure data is available, this interval may be referred to as the P to F interval.). Consecutive task accomplishments should be assessed to show that failures are not occurring before the new initial interval.

Interval determination should be validated with a Maintenance Engineering Analysis based on consideration of all the items listed in the Quality and Quantity of Data.

The process shall be referred or mentioned in the PPH for ISC and Regulatory Acceptance.

(a) ISC Review Acceptance of MRBRP

ISC shall insure all PPH guidance has been followed and applied.

i) MRBRP Review Approval Acceptance by MRB

MRB shall insure all PPH guidance has been followed and applied.

(1) MRBR Release

Appendix A

Issue Paper 44 Working Group Members

EASA	Francis Jouvard
FAA	Kenneth Kerzner Tom Newcombe Lynn Pierce Rick Ralston
TCCA	Cliff Neudorf Bruce Hawes Allan Howell
ANAC	Ademir Antonio da Silva Jose Augusto B. Meirelles

Note: The above mentioned Working Group members developed the first issue of the guidelines. This list will not be updated to reflect those contributing to subsequent issues.

Appendix B

Definitions

Confidence Level: refers to the likelihood that the overall fleet performance lies within the range specified by the sample fleet performance. The confidence level is usually expressed as a percentage.

Non-Routine Task: A task is non-routine when it is not a planned/scheduled task coming from the operator's/manufacturer's maintenance program.

Line Maintenance: Routine check, inspection and malfunction rectification performed en-route and at base stations during transit, turn-around or night stop.

Pilot Report (also known as **PIREP**) - Suspected or known malfunctions or unsatisfactory conditions entered by the flight crew into the aircraft log and which require maintenance action.

Unscheduled Maintenance: That maintenance performed to restore an item to a satisfactory condition by providing correction of a known or suspected malfunction and/or defect.

Evolution / Optimization: Task through the management of data is a means to assure the continued applicability and effectiveness of the task while at the same time improving the integrity of the MRB process.

Risk management: Risk Management is the systematic application of management policies, procedures and practices to the tasks of identifying, analyzing, evaluating, treating and monitoring risk.

Safety management: is the application of engineering and management principles, criteria and techniques to optimize safety. It is an integrated and comprehensive engineering effort.