International Maintenance Review Board Policy Board (IMRBPB)
Issue Paper (IP)

Initial Date (DD/MMM/YYYY): 10/01/2013
IP Number: IP 141
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Applies To:	
Vol 1:	
Vol 2:	
Both:	X

Title: CPCP for Safe Life Items

Submitter: EASA, MRB Section

Issue: A Corrosion Prevention and Control Programme (CPCP) is required for all primary aircraft structure and currently developed during the MRB process. Recently there have been some issues with CPCP tasks for non damage-tolerant (i.e. safe life) items, indicating that the current MSG-3 wording may require improvement.

Problem: The following bullets do summarize the Problem:

- Corroded metallic items will fail earlier due to fatigue than uncorroded items.
- Fail-Safe Items are usually tested and certified for a service life of the uncorroded item or a certain limited level of corrosion.
- Documented in-service experience shows that fatigue failure of Safe Life Items, caused by premature crack initiation due to corrosion, is still an issue
- This is partly an economic issue, but mostly a safety issue
- Unless the design of the aircraft does reliably prevent corrosion, maintenance has to limit corrosion to a level which does not interfere with the certified life of the part.
- EASA regulation does require to control corrosion also for safe-life parts which are likely to be affected by corrosion
- As the current regulation and older maintenance related documents do mention: only the **combination of inspections and discard** will allow to apply the safe-life philosophy :
  The life limit takes care of discarding an item before it develops FD
  Inspections for AD/ED/CPCP take care that the condition of the item is in line with the assumptions used when determining the life limit
- Normally the MSG-3 Structures Analysis Procedure (Chapter 2-4) should cover all this.

However, there are still current MRBR existing where this has not been fully taken into account, there are safe life items with a documented history of corrosion issues and/or premature failure which are not adequately analysed and not adequately covered by ED/CPCP tasks.

This illustrates the need for improvement.

See the attached Appendix for more detailed information

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Recommendation (including Implementation):

Basically the MSG-3 wording does address the issue, so no major change is required.

However, experience with existing MRBR shows that a little more guidance might be required to clarify

- That the CPCP has to cover all metallic SSI, damage tolerant and safe-life
- That even if no MRB task is required for safe-life items to detect FD, ED/AD/CPCP tasks might be required to prevent FD prior to the certified safe-life limit.
  (prevent premature crack initiation not covered by the certification tests)
- That a CPCP threshold beyond the safe life does not allow to control corrosion, because the task will never be performed.
  However if justified by an according ED analysis supported by in-service experience, such thresholds may be acceptable, meaning corrosion is prevented by timely discard before the protection system has broken down, but should be supported by an age-exploration (sampling) program.

EASA proposes to add 4 sentences / remarks to the MSG-3 Structures Chapter.

Note: The wording proposed for paragraph 2-4-2.6 "*prevents the items to reach their safe-life age*" and paragraph 2-4-4.1 bullet q. "*ensure that the item will reach its safe-life limit*" are taken from the RCM Nowlan-Heap Report.

As the CPCP is a "self adjusting" programme, no retroactive application of this IP is required for existing programmes, if the baseline programme has already been subjected to a CPCP review.

4. Fatigue Related Sampling Inspections

Transport aircraft with the highest number of flight cycles are most susceptible to initial fatigue cracking in the fleet. This means that adequate inspections on such aircraft will provide the greatest benefits for timely detection of fatigue damage. Such sampling inspections are developed on the basis of appropriate statistical variables, including:

a. The number of aircraft inspected.

b. The inspection methods and repeat intervals.

c. The number of flight cycles completed.

A list of SSIs that are suitable for a fatigue related sampling inspections will be established by the Structures Working Group and submitted to the Industry Steering Committee for approval and inclusion in the MRB report proposal. Full details of the fatigue related sampling inspections will be established by a joint operator/ manufacturer task force, based on the manufacturer's technical evaluations, prior to aircraft exceeding the fatigue damage threshold(s).

5. Corrosion Prevention and Control Programs (CPCP)

A Corrosion Prevention and Control Program should be established to maintain the aircraft's resistance to corrosion as a result of systematic (e.g. age related) deterioration through chemical and/or environmental interaction. This Program applies to damage tolerant and safe-life structures.

The program is expected to allow control of the corrosion on the aircraft to **Corrosion Level 1** or better. The CPCP should be based on the ED analysis, assuming an aircraft operated in a typical environment. If corrosion is found to exceed Level 1 at any inspection time, the corrosion control program for the affected area must be reviewed by the operator with the objective to ensure Corrosion Level 1 or better.

6. Age Exploration Program

An age exploration program may be desirable to verify the aircraft's resistance to corrosion deterioration before the Corrosion Prevention and Control Program Task Thresholds.
For Safe-Life items with a life limit below the CPCP Threshold, an age exploration program may be necessary to verify that no premature crack initiation due to corrosion prevents the items to reach their safe-life limit.

To improve on the specific task intervals for non-metallic significant structure, an age exploration program may be desirable to verify the rate of structural deterioration.

Guidelines for age exploration should be established by the Structures Working Group and submitted to the Industry Steering Committee for approval and inclusion in the scheduled structural maintenance tasks and intervals.

7. Zonal Inspections

Some parts of the inspection requirements for SSIs and most of the items categorized as Other Structure can be provided by the zonal inspections (Ref. [Section 2-5]).

Tasks and intervals included in the zonal inspections should be based on operator and manufacturer experience with similar structure. For structure containing new materials and/or construction concepts, tasks and intervals may be established based on assessment of the manufacturer's recommendations.

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1. Procedure

The procedure for developing structural maintenance tasks is shown in the logic diagram (Ref. [Figure 2-4-4.1]) and described by a series of process steps (P1, P2, P3, etc.) and decision steps (D1, D2, D3, etc.) as follows:

a. The structural maintenance analysis is to be applied to all aircraft structure which is divided into zones or areas (P1) and structural items (P2) by the manufacturer.

b. The manufacturer categorizes each item as structurally significant (SSI) or Other Structure, on the basis of the consequences to aircraft safety of item failure or malfunction (D1).

c. The same procedure is repeated until all structural items have been categorized.

d. Items categorized as Structural Significant Item (SSI) (P3) are listed as SSI's. They are to be categorized as safe-life or damage-tolerant (D5), and are additionally subjected to AD/ED/CPCP analysis (either as metallic or non-metallic structure).

e. Items categorized as Other Structure (P4) are compared to similar items on existing aircraft (D2). Maintenance recommendations are developed by the Structures Working Group (SWG) for items which are similar and by the manufacturer for those which are not, e. g., new materials or design concepts (P5). All tasks selected by the SWG (P6) are included in the scheduled structural maintenance (P20).

f. The manufacturer must consider two types of AD/ED analysis; for metallic structure (P7-P9) and for non-metallic structure (P10-P14). Each SSI may consist of one or the other, or both.

g. Inspection requirements for timely detection of Accidental Damage (AD) and Environmental Deterioration (ED) are determined for all metallic SSIs (P7). These can be determined for individual SSIs or groups of SSIs which are suitable for comparative assessments on the basis of their location, boundaries, inspection access, analysis breakdown, etc. The manufacturer's rating systems (Ref. [Subject 2-4-5]) are used to determine these requirements. The manufacturer may propose a validated S-SHM application(s) as long as it satisfies the detection requirement(s).

h. For each SSI containing metallic structure (damage tolerant or safe-life), the maintenance requirements are determined (P8) such that the expectations of the CPCP (Ref. [Heading 2-4-2.5]) are fulfilled.

i. The inspection requirement of the ED analysis is compared with the requirement of the CPCP (D3). If they are similar or identical, the ED task will cover the CPCP requirement. If the CPCP task requirement is not met, the ED task has to be reviewed and/or additional and separate CPCP tasks have to be determined (P9).

j. The process (P7, P8, P9) is repeated until all metallic SSIs are examined.

k. Each SSI containing non-metallic structure is assessed as to its sensitivity to Accidental Damage (AD) or not (D4), on the basis of SSI location, frequency of exposure to the damage source, and location of damage site.

l. SSIs containing non-metallic structure classified as sensitive to Accidental Damage (AD), are assessed for frequency of exposure to each likely damage source and the likelihood of multiple occurrence (P10), and its impact on the Environmental Deterioration (ED) analysis (P11).

m. When applicable, AD impact on the ED analysis is considered when the SSI is assessed for sensitivity to structural composition (P12) and sensitivity to the environment (P13), considering the material type.

n. Inspection requirements for timely detection of damage (e.g., delamination and disbonding) are determined for all SSIs containing non-metallic structure (P14). The manufacturer's rating systems (Ref.[Subject 2-4-5]) are used to determine these requirements. The manufacturer may propose a validated S-SHM application(s) as long as it satisfies the detection requirement(s).

o. All tasks resulting from AD/ED analysis ([Figure 2-4-4.3] and/or [Figure 2-4-4.4]), selected by the SWG, are included in the structural maintenance (P20).

p. The manufacturer categorizes each SSI as damage tolerant or safe-life (D5).

q. For each item categorized as safe-life, the manufacturer determines the safe-life limit (P15) which is included in the aircraft Airworthiness Limitations (P19). No fatigue related inspection is required to assure continuing airworthiness. However, AD/ED/CPCP tasks selected (P20) might be required to ensure that the item will reach its safe-life limit.

r. All remaining SSIs are damage tolerant and the manufacturer determines if timely detection of fatigue damage is dependent on scheduled inspections (P16). Scheduled fatigue related inspection may not be required for SSIs designed to carry the required load with damage that will be readily detectable during routine operation of the aircraft (D6).

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IMRBPB Position:

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Position: Accepted

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Recommendation for implementation: NIL

Retroactive: ~~Y~~/ N

Important Note: The IMRBPB positions are not policy. Positions become policy only when the policy is issued formally by the appropriate National Aviation Authority.