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MSG-3 clean-up & standardizations

Dubai, UAE
May 2025

Introduction / Scope

➤ Introduction:

- An accomplished / heavy user of the MSG-3 document provided some recommended changes in February
 - Matthew K. Fay - Associate Technical Fellow/Senior Technical Lead Engineer Reliability, Maintainability & Systems Health (RM&SH) Engineering @ Boeing Defense, Space & Security
 - Matt has been an MPIG member since 2003, develops programs for military products, and trains military personnel on MSG-3
 - Overview provided for MPIG/RMPIG in March

➤ The changes fall into the following categories:

- Typographical/grammatical
- Standardize flow chart symbology
- Errors discovered through standardizing flow chart symbology

Introduction / Scope

- A4A / MPIG would like to take advantage of the upcoming revision to make the improvements noted
 - Typographical/grammatical
 - Standardize flow chart symbology
 - Errors discovered through standardizing flow chart symbology
- These improvements are not material and are categorized as “housekeeping.”
- We seek concurrence/position from the IMRBPB

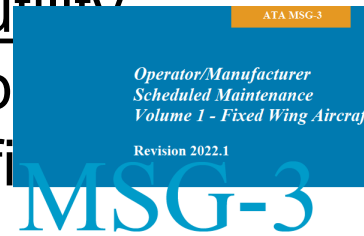
Note:

For navigation and utility, the diagrams illustrated in this file have links at the bottom right corner to navigate to the full-size PDF file

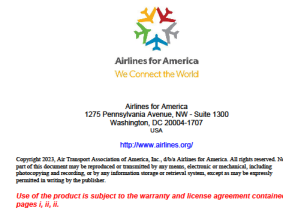
Introduction / Scope

For general navigation and utility:

- Text changes introduced by the revision of the logic diagrams are in this file



- The structure diagram was in this PowerPoint file for orientation purposes



- The diagrams illustrated in this file have links at the bottom right corner to navigate to the full-size PDF file

Typographical/grammatical/corrections

- The phrases “failure cause” and “failure causes” were mistakenly capitalized as “Failure Cause” or “Failure Causes”
 - Propose changing to lowercase unless capitalization is grammatically necessary
- The word “classic” as in “classic task” was incorrectly rendered with a Leading Capital “Classic”
 - Propose changing to lower case unless otherwise grammatically required
- The word AHM on page 19 was rendered in red font. Revised to black font
 - Propose changing red font to black

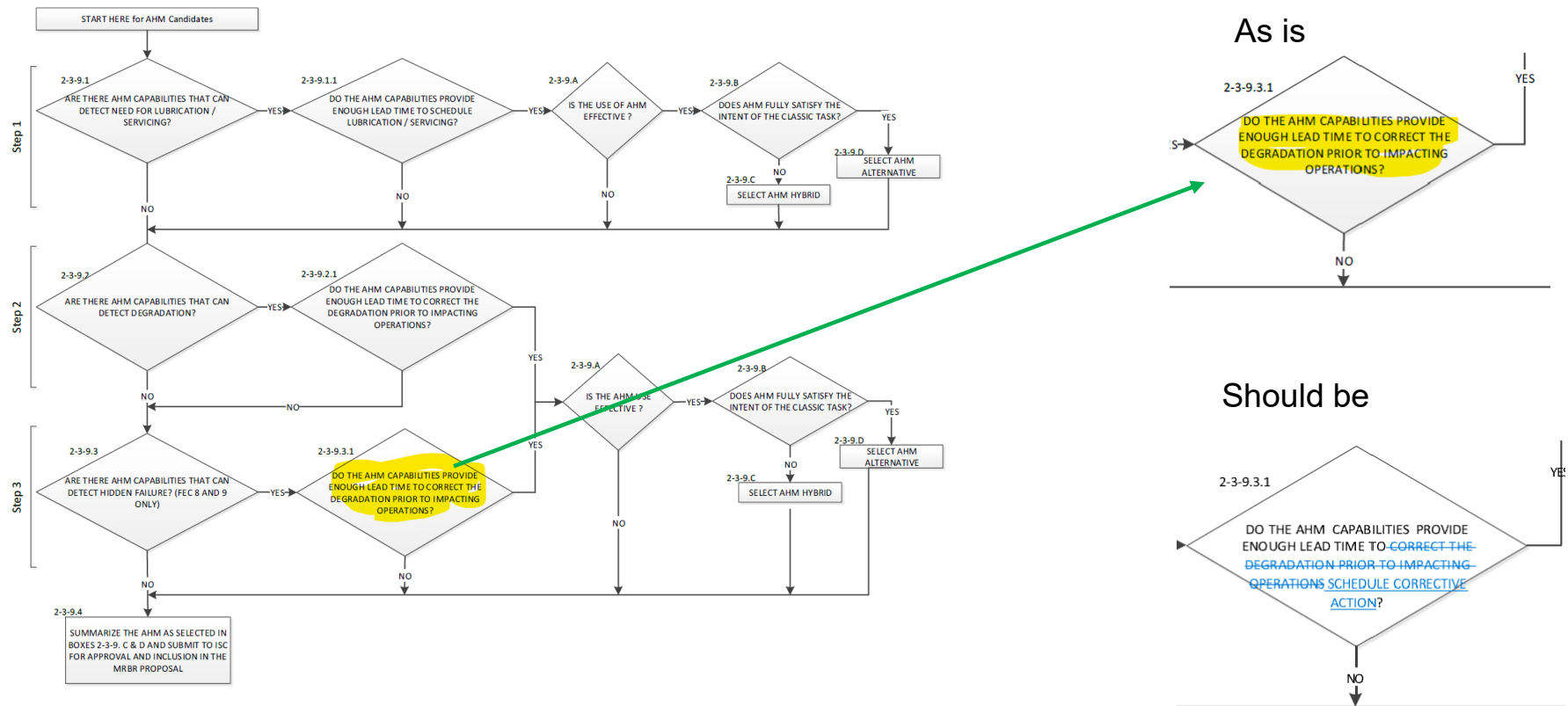
Typographical/grammatical/corrections

Diamond Box 2-3-9.3.1

- Text reads: “DO THE AHM CAPABILITIES PROVIDED ENOUGH LEAD TIME TO CORRECT THE DEGRADATION PRIOR TO IMPACTING OPERATIONS?”
- Text should read: “DO THE AHM CAPABILITIES PROVIDE ENOUGH LEAD TIME TO SCHEDULE CORRECTIVE ACTION?”
- This matches page 46, Step 3, Box 2-3-9.3.1: given this is a Hidden Functional Failure. See slide diagrams with “As is” “should be” extracts

Typographical/grammatical/corrections

Figure 2-3-9.1. Systems/Powerplant MSG-3 Logic Diagram – Level 3 Analysis



Typographical/grammatical/corrections

This matches page 46, Step 3, Box 2-3-9.3.1

Box 2-3-9.3.1: DO THE AHM CAPABILITIES PROVIDE ENOUGH LEAD TIME TO SCHEDULE CORRECTIVE ACTION?

The AHM must allow the operator to identify the loss of the hidden function in order to prevent a safety, operational or economic impact in combination with a second failure (including back-up). Appropriate lead time will depend on affected function and level of redundancy. Consideration should be similar to those used in determining the interval of a failure finding tasks in level 2 analysis (e.g. consider the length of exposure time to a hidden failure and the potential consequences if the hidden function is unavailable.)

In answering the question consideration should be given to the AHM procedure which must provide detailed instructions about the mitigation action to be launched in case an alert has been triggered. This action can range from a one-time inspection up to a component replacement and needs to be followed by the operator as defined.

In answering the question consideration should be given to the ease in which corrective action can be applied and the time required for preparation (e.g. accomplished at an out-station/line maintenance or in a hangar, availability of parts).

Documentation and active management of the failure must be addressed by the operator.

Typographical/grammatical/corrections

- Error was discovered while condensing/integrating the Structures logic
- Page 55, Section 2-4-4
 - 1. Procedure
 - Paragraph e.
 - Process step (P5) is used twice:
 - once in Figure 2-4-4.2. (Page 58) – where the text reads: “MANUFACTURER RECOMMENDS MAINTENANCE” and
 - once in Figure 2-4-4.3. (Page 59) – where the text reads: “NO ADDITIONAL REQUIREMENTS NECESSARY”

This creates a conflict. To resolve the conflict the second instance (Figure 2-4-4.3. (Page 59)) is renumbered as (P10), and the existing process steps P-10 thru P-18 (pages 55-56 and respective figure/s) are renumbered P-11 thru P-19, respectively.

(Note – Paragraph e. contains another error – the last sentence ended with “...either become a zonal inspection candidate (P17) or will be included in the scheduled structural maintenance (P18).” The numbers for these two process steps were inadvertently swapped. They need to be corrected as well as renumbered.

Typographical/grammatical/corrections

➤ Page 55 Section 2-4-4

➤ 1. Procedure

➤ Paragraph e.

- 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 evaluated for zonal transfer (D6) and will either become zonal inspection candidate (P17) or will be included in the scheduled structural maintenance (P18).
[Change to P19](#)

Last sentence "...either become zonal inspection candidate (P17) or will be included in the scheduled structural maintenance (P18)." The numbers for these two process steps were inadvertently swapped. They need to be corrected as well as renumbered).

- 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.

[Change to P11-P15](#)

- 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).
[Change to P11](#) [Change to P12](#)

- 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.
[Change to P13](#) [Change to P14](#)

- n. Task 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).

[Change to P15](#)



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Typographical/grammatical/corrections

➤ Page 56 Section 2-4-4

Now integrated into one single figure: 2-4-4.1.

- o. All tasks resulting from AD/ED analysis ~~([Figure 2-4-4.3] and/or [Figure 2-4-4.4])~~, including S-SHM tasks selected by the SWG, are evaluated for zonal transfer (D6) and will either become zonal inspection candidate (P17) or will be included in the structural maintenance (P18).
Change to P19
- p. The manufacturer stress engineering determines need for FD task for non-PSE SSIs (or non-PSE portions of the SSI) (P15). This can be documented in the PPH or the individual SSI and will be determined by each TCH. Change to P16
- q. Details of these fatigue related task requirements, including validated S-SHM application(s), are presented to the SWG (or equivalent body) who determines if they are acceptable (D5).
- r. Improved task requirement (e.g. change in inspection levels – visual inspections, nondestructive inspections, S-SHM, interval, access, procedure) may be proposed to the manufacturer (P16). If the manufacturer stress engineering confirms that no FD task is identified for non-PSE portions of SSI, no further FD MSG-3 assessment is needed. This cor.....
Change to P17
documented in the PPH or at individual SSI level.
- s. Tasks from AD, ED, FD, and other structure analyses are evaluated for zonal transfer (D6) and will either become zonal inspection candidate (P18) or will be included in the scheduled structural maintenance (P17).
Change to P19
- t. The resulting maintenance requirements for all structure from step “s” are submitted to the ISC for approval and inclusion in the MRB Report proposal.

Typographical/grammatical/corrections

This logic is spread over 5 separate figures/pages (P.57: 2-4-4.1, P.58: 2-4-4.2, P.59: 2-4-4.3, P.60: 2-4-4.4, P.61: 2-4-4.5)

Figure 2-4-4.1: Structure MSG-3 Logic Diagram

Page 57
2-4-4.1

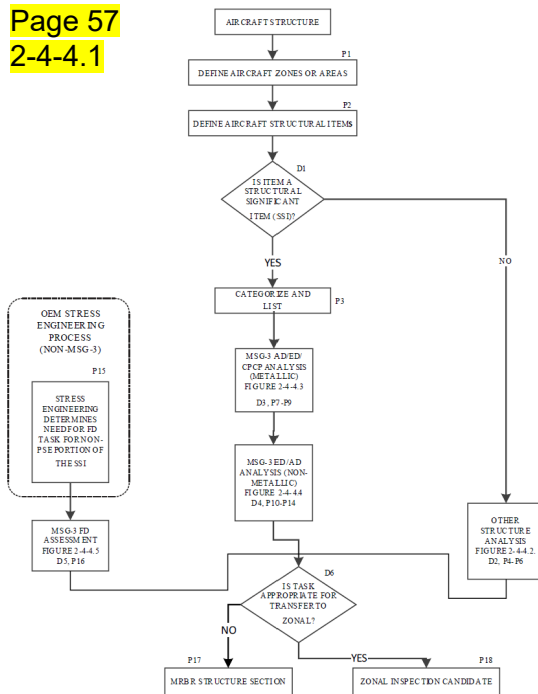


Figure 2-4-4.2: Other Structure Logic Diagram

Page 58
2-4-4.2

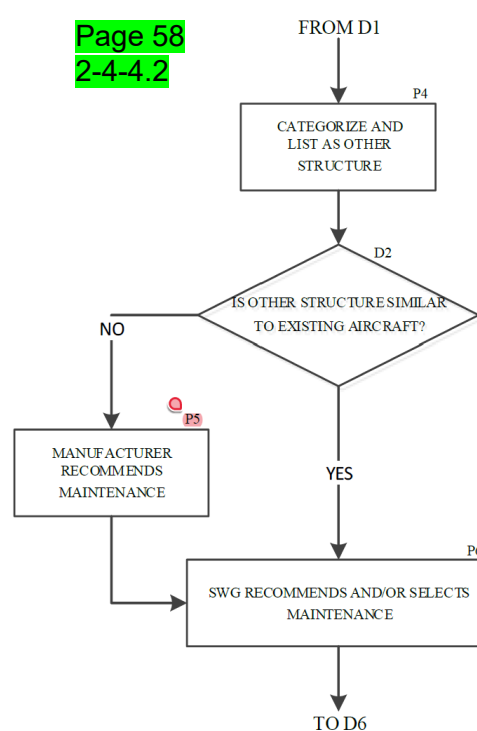
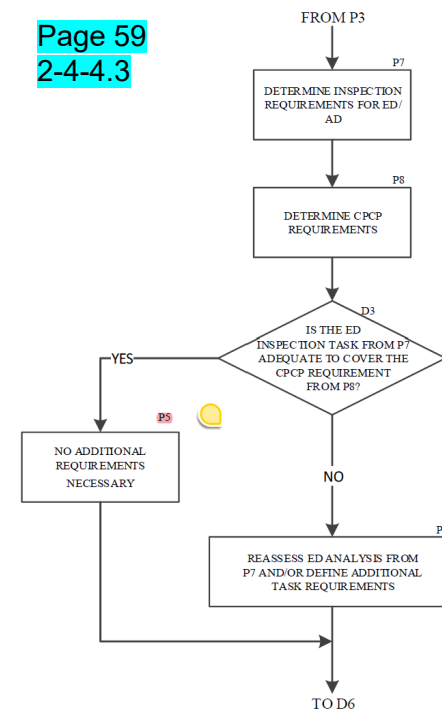


Figure 2-4-4.3: Accidental Damage and Environmental Deterioration (Metallic) Logic Diagram

Page 59
2-4-4.3



Typographical/grammatical/corrections

This logic is spread over 5 separate figures/pages (P.57: 2-4-4.1, P.58: 2-4-4.2, P.59: 2-4-4.3, P.60: 2-4-4.4, P.61: 2-4-4.5)

Figure 2-4-4.4. Accidental Damage and Environmental Deterioration (Non-Metallic) Logic Diagram

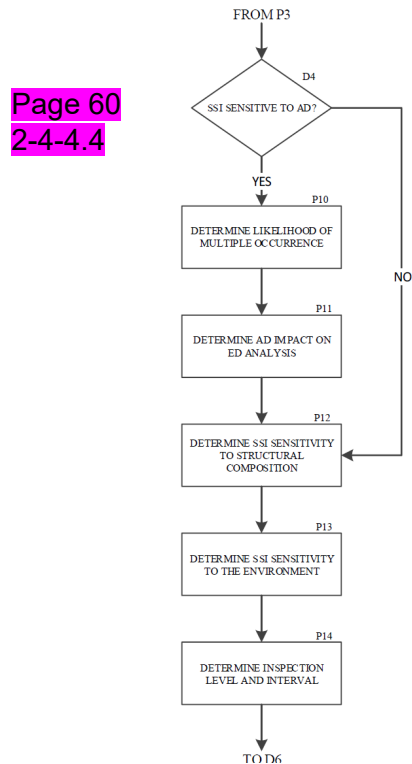
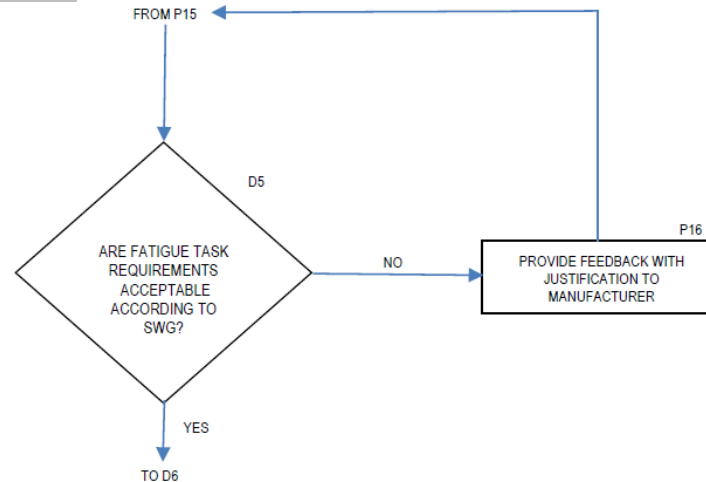


Figure 2-4-4.5. Fatigue Damage Analysis Logic Diagram

Page 61
2-4-4.5



Standardize flow chart symbology

- The last 6 slides illustrate the current decision tree fragmentation and errors induced because of it (*repeated from slide 8*) :
 - Process step (P5) is used twice:
 - once in Figure 2-4-4.2. (Page 58) – where the text reads: “MANUFACTURER RECOMMENDS MAINTENANCE” and
 - once in Figure 2-4-4.3. (Page 59) – where the text reads: “NO ADDITIONAL REQUIREMENTS NECESSARY”

This creates a conflict. To resolve the conflict the second instance (Figure 2-4-4.3. (Page 59)) is renumbered as (P10), and the existing process steps P-10 thru P-18 (pages 55-56 and respective figure/s) are renumbered P-11 thru P-19, respectively.

 - Paragraph e. contains another error – the last sentence ended with “...either become zonal inspection candidate (P17) or will be included in the scheduled structural maintenance (P18).” The numbers for these two process steps were inadvertently swapped. They need to be corrected as well as renumbered).
 - A consolidated/standardize flow chart would have prevented these errors
 - The following slides will provide a summary of changes for each of the decision trees as a function of consolidation and standardization followed by the proposed standardized decision tree.
-

Summary of structure flow chart consolidation

- Revise the primary logic flow figures for Structures Logic from multiple sub-figures to a single comprehensive figure
 - Condensed from 5 separate figures into one integrated figure
 - Corrected dual use of process step P5
 - renumbered second use of process steps number P5 to P10
 - renumbered existing process step numbers P-10 thru P18 to P11 thru P19 respectively
 - corrected mis-numbering (swap) of process steps P17 (now P18) and P18 (now P19) at the end of paragraph “e.” on page 55

Figure 2-4-4.1. Integrated MSG-3 Structure Analysis Logic Diagram

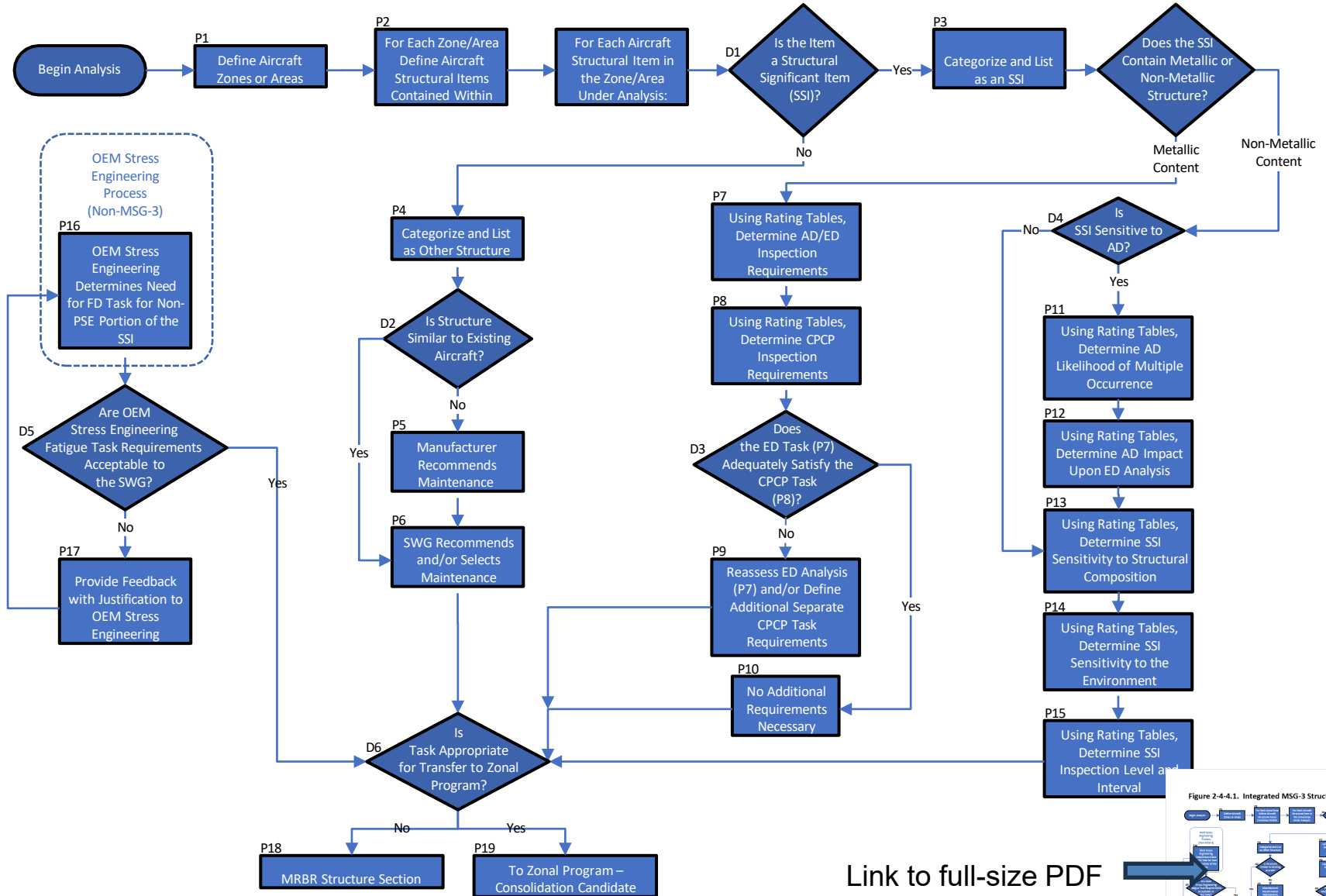
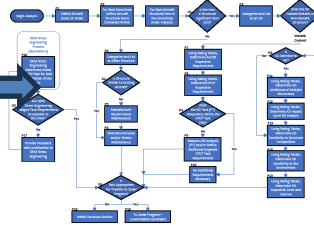


Figure 2-4-4.1. Integrated MSG-3 Structure Analysis Logic Diagram



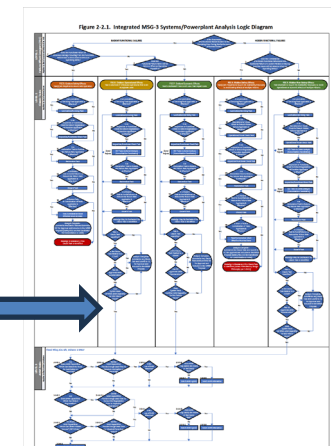
Link to full-size PDF



Summary of Systems / Powerplant Consolidation

- Revise the primary logic flow figure for Systems/Powerplant Logic to change from multiple sub-figures to a single comprehensive figure
 - Condensed from a two-page figure into one integrated figure
 - (May need to be printed as a foldout – 17”x11”)
 - Added the new “Level 3” analysis
 - Added missing process steps to forward FEC 6, 7, and 9 GVI/VCK to Zonal for possible task consolidation
 - Added screening steps needed to pass from level 2 to level 3 analysis

**Figure 2-2.1.
Integrated MSG-3
Systems/Powerplant
Analysis Logic
Diagram**



Summary of Zonal Consolidation

- Revise the primary logic flow figures for Zonal Logic to change from multiple sub-figures to a single comprehensive figure
 - Condensed from 2 separate figures into one integrated figure
 - Color-coded to differentiate the Enhanced Zonal analysis from the Standard Zonal analysis

Figure 2-5-1.1. Integrated MSG-3 Enhanced/Zonal Analysis Logic Diagram

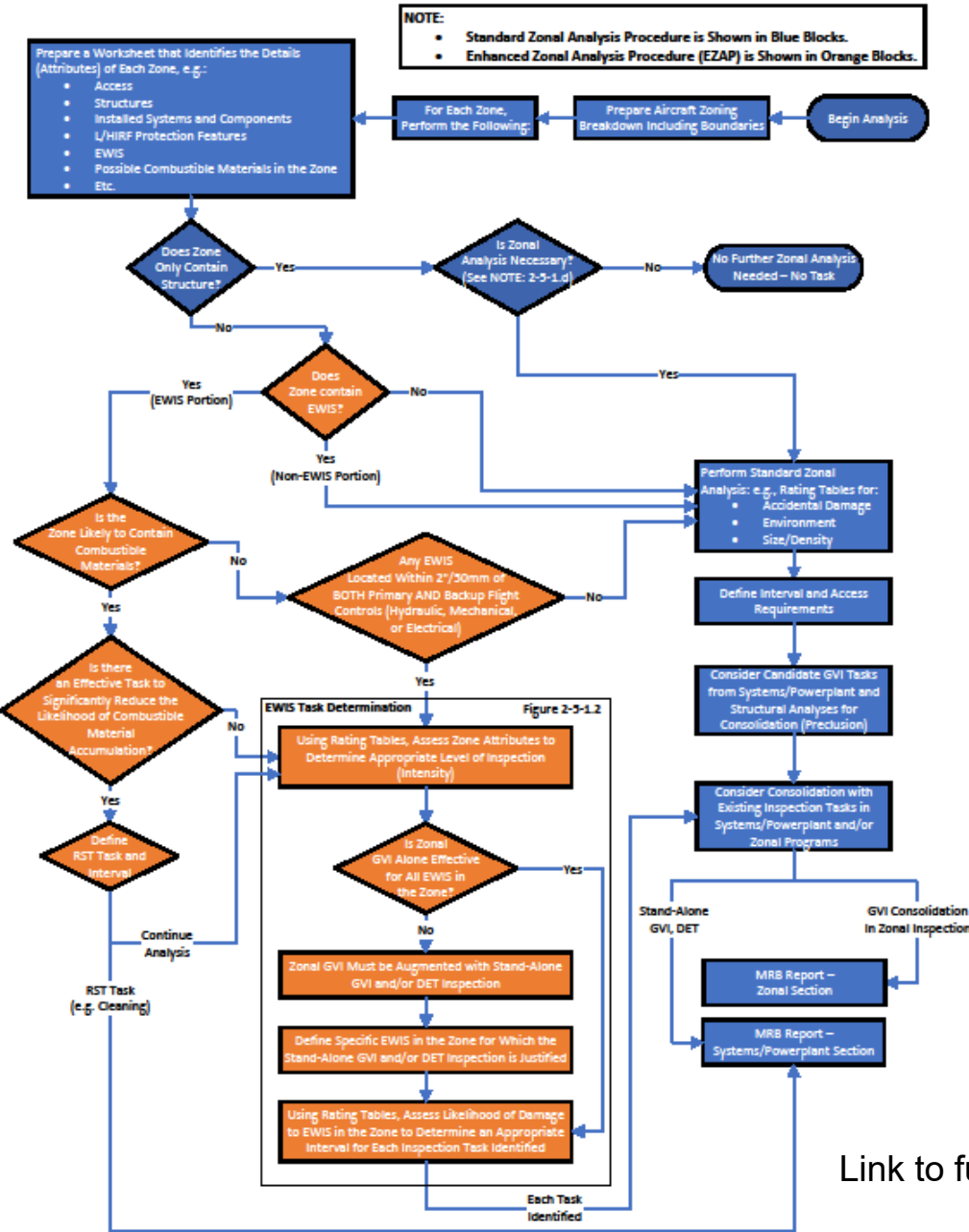
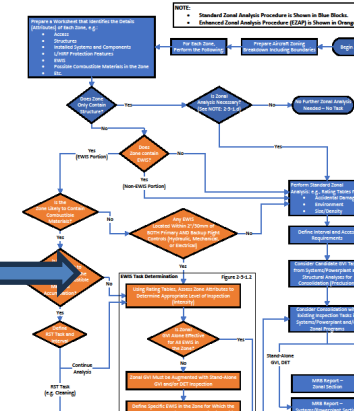


Figure 2-5-1.1.
Integrated
MSG-3
Enhanced/Zonal
Analysis Logic
Diagram

Figure 2-5-1.1. Integrated MSG-3 Enhanced/Zonal Analysis Logic Diagram



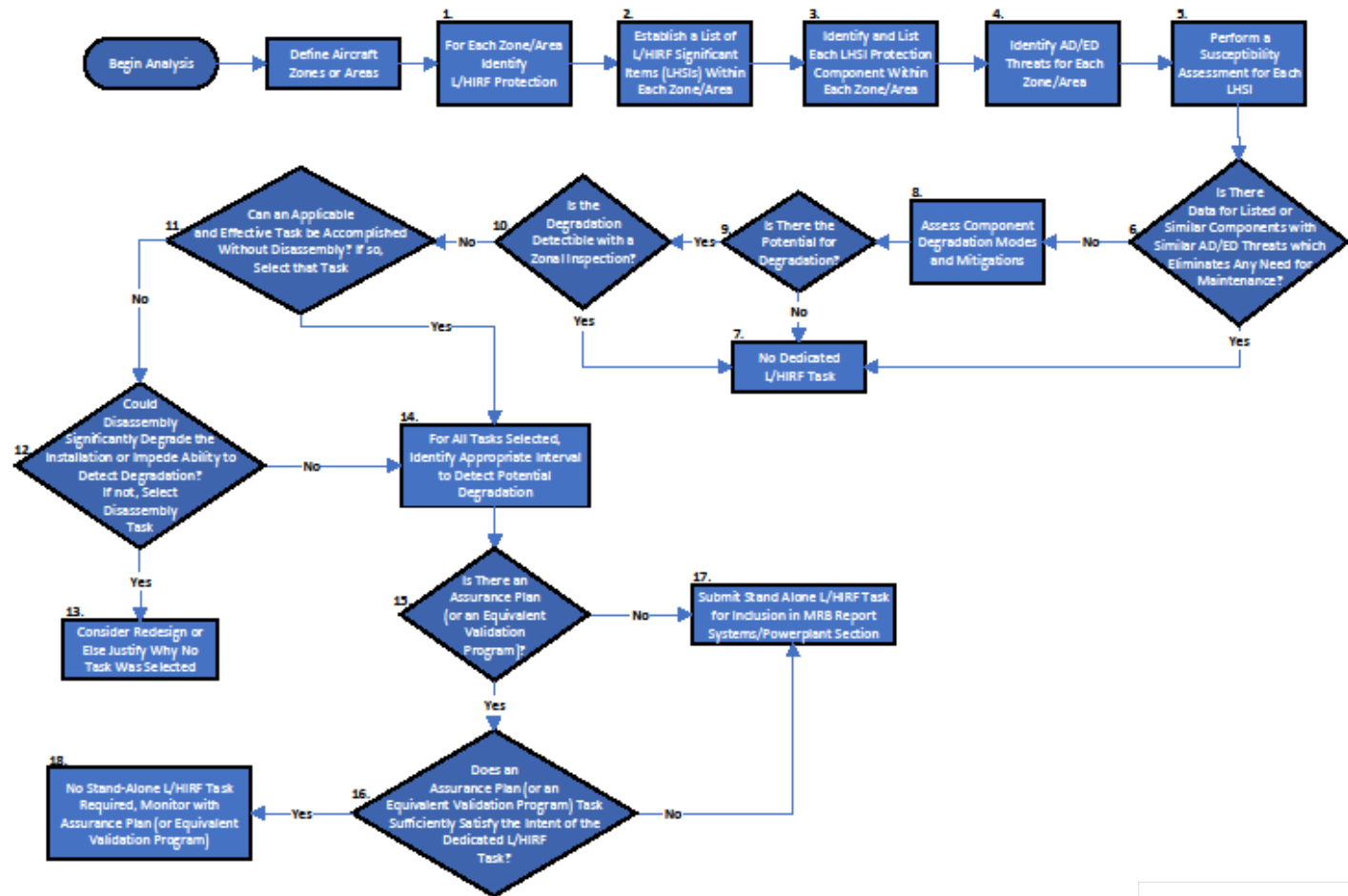
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Summary of LHIRF Consolidation

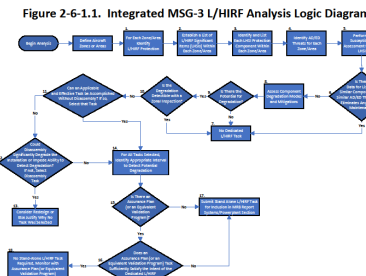
- Revise the primary logic flow figures for L/HIRF Logic to change from multiple sub-figures to a single comprehensive figure
 - Condensed from 2 separate figures into one integrated figure
 - Combined steps 7. And 10. Into a single block for clarity
 - Deleted step 10 from text of page 72 and renumbered Steps 11 through 19 to Steps 10 through 18 respectively

Figure 2-6-1.1. Integrated MSG-3 L/HIRF Analysis Logic Diagram



**Figure 2-6-1.1.
Integrated
MSG-3 L/HIRF
Analysis Logic
Diagram**

[Link to full-size PDF](#)





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