



Issue Paper (IP)

IP Number: CIP IND 2018-04 (V1, 2)

Initial Date: 19/NOV/2018

Revision / Date: R03 / 28/FEB/2023

Effective Date (DD/MMM/YYYY):

Retroactivity (Y/N): N

Title:	SSI selection and analysis organization guideline
Submitter:	RMPIG/MPIG

Applies To:	
MSG-3 Vol 1	X
MSG-3 Vol 2	X
IMPS	

Issue:

A consistent approach for SSI selection and analysis organization should be identified.

Problem:

Currently, MSG-3 document structures section does not provide clear guidance for selection and analysis organization of SSI(s). Section 2-4-1, subsection (1) contains the definitions of the SSI and explains the difference with PSE and Other Structure but does not provide any guidance on how to Select an SSI and how to organize the analyses.

This could lead to overcomplicated analysis, unnecessary increase in task numbers, lower intervals, and access issues.

In addition, the requirement of IP 192 (Structure analyses requirement on structures that, if failed or detached in flight, could, through secondary damage, compromise continued safe flight and landing) should be reflected in the procedure section.

Some examples of possible problems:

- SSI selected based on manufacturing process drawings.
- SSI selected for LH/RH identical structure items and increased task numbers.
- SSI selected based on worst material and finish protection rating and penalized the whole area with unnecessary low interval.
- SSI boundary selected regardless of different accidental damage sources or environmental conditions and may penalize the whole area with unnecessary low interval.
- Separate SSI selected for each component within the same assembly with same ratings, access, and zone, creating extra SSIs and tasks.

This IP presents in two parts:

Part (A) contains recommendations and guidelines to apply structural analysis.

MSG-3 structural analysis must be applied to:

- All aircraft structure selected as SSI;
- Structures that if failed or detached in flight, could, through secondary damage, compromise continued safe flight and landing.



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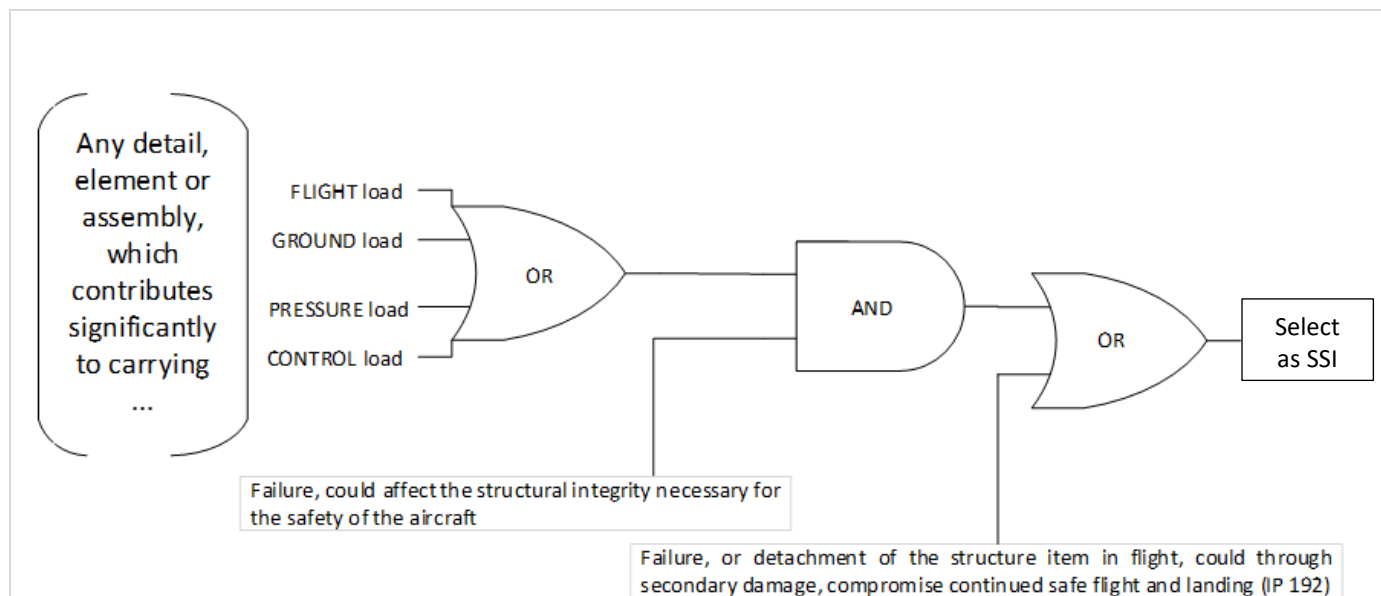


Figure 1. SSI analysis requirement (Vol.1)

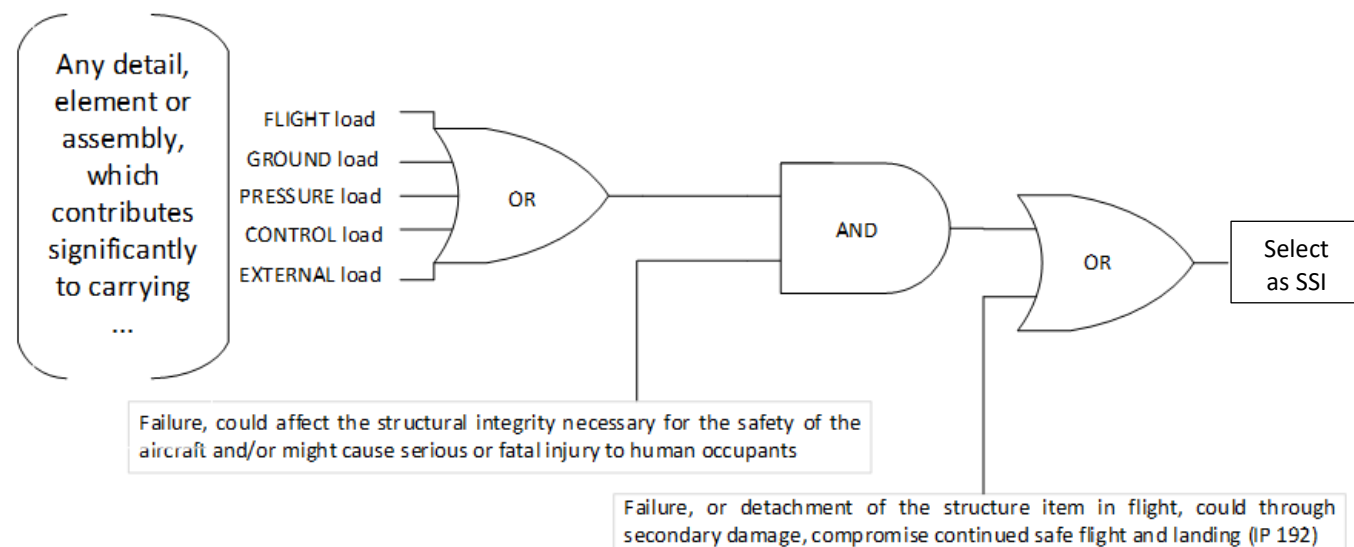


Figure 2. SSI analysis requirement (Vol.2)

Part (B): Organizing the analyses of SSI(s)

Organizing the analyses of SSI(s) consists of the main steps as follows:

- To analyse structure at the most appropriate level of breakdown in order to avoid unnecessary analysis while being able to properly assign all ratings
- To inspect the structure with the most effective tasks

To develop the most efficient scheduled maintenance requirements, the boundaries of SSIs can be fine-tuned after they have been selected. The aim is to identify the highest manageable SSI boundary level. i.e.,



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one which is high enough to avoid unnecessary analysis, but low enough to allow the item to be properly analysed and ensure that all ratings (Refer to section 2-4-5) can be assigned.

This part consists of recommendations for inclusion in the PPH to help MSG-3 analysts to organize the SSI analyses and is not required to be implemented into the MSG-3 document.

Recommendation (including Implementation):

PART (A): SELECTION OF THE SSI

➤ **Section 2-4-2;**

7. Zonal Inspections

Change categorized to selected as follows:

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

➤ **Section 2-4-4;**

1. Procedure

Update the procedure steps “a.” and “b.” 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. The manufacturer partitions the aircraft into structural items. This process continues until the complete aircraft structure has been addressed.
- b. The manufacturer categorizes selects each item as structurally significant (SSI) or Other Structure, on the basis of the consequences to aircraft safety of item failure or malfunction as per the following steps (D1).

Step 1.

As per the definition of the SSI, the questions for SSI selection could be formulated as below:

*Applicable to
Vol. 1*

- Could the failure of the structure item which contributes significantly to carrying FLIGHT or GROUND or PRESSURE or CONTROL LOAD(s) affect the structural integrity necessary for the safety of the aircraft?

*Applicable to
Vol. 2*

- Could the failure of the structure item which contributes significantly to carrying FLIGHT or GROUND or PRESSURE or CONTROL LOAD(s) or EXTERNAL LOAD affect the structural integrity necessary for the safety of the aircraft and/or might cause serious or fatal injury to human occupants?

The SSI selection questions will be applied to all structural items identified in section “a.”



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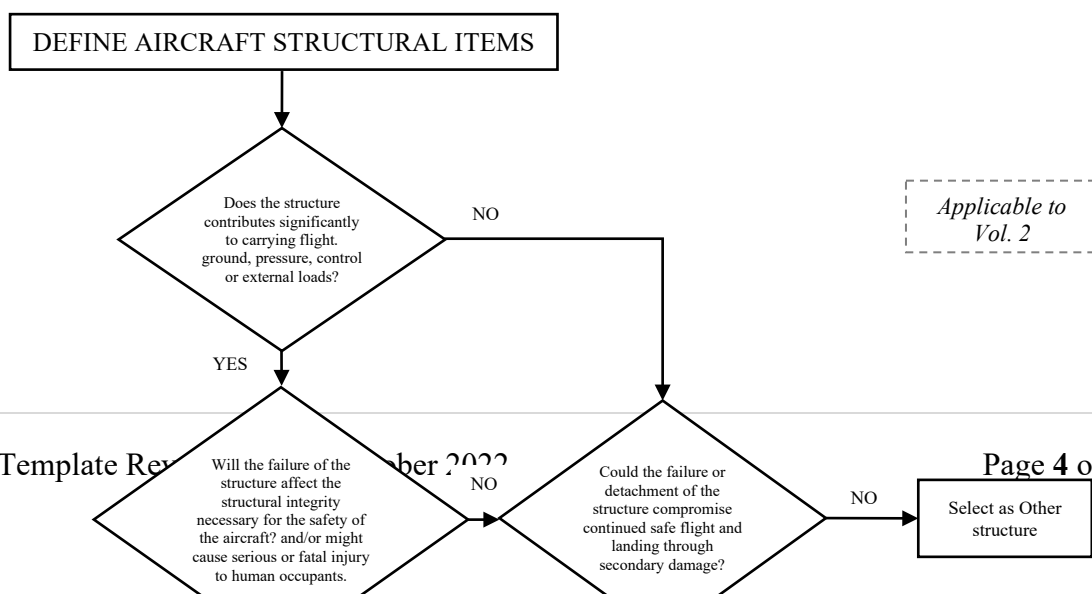
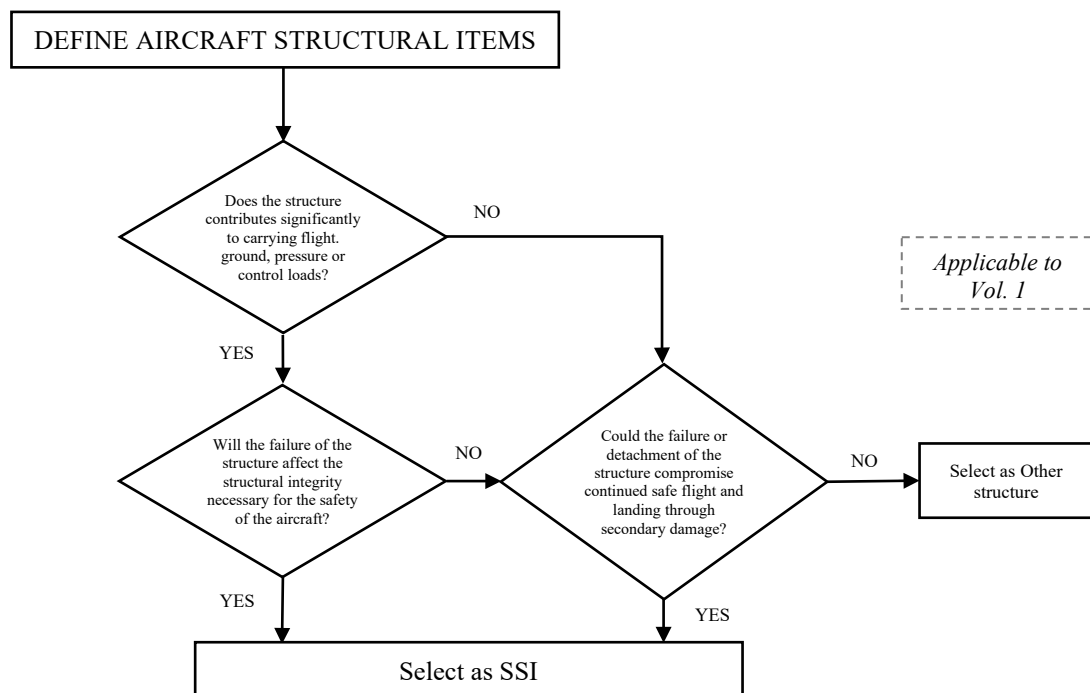
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Step 2.

In the event that the answer to the above question is "YES", SSI analysis is required and those structure items need to be included on the SSI list, otherwise, should be selected and listed as "Other Structure".

Based on the inputs from the design office through simulations, safety hazard analysis, fatigue test results, and in-service experience with similar designs, Structures Working Group (SWG) may also require structural analysis (AD/ED/CPCP) to be performed on structures that, if failed or detached in flight, could, through secondary damage, compromise continued safe flight and landing. In this case, Items should be selected as SSI and included in the list for review.





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Step 3.

The resulting identification of structure items per Step 2 is now considered as the "Candidate SSI List", and is presented by the manufacturer to the Working Group for review.

Step 4.

The Working Group will review and finalize the Candidate SSI List and, through application of MSG-3 analysis, validate the selected SSIs or (if required) propose modification of the SSI list to the ISC. The primary aim of the Working Group review is to verify that no structural item has been overlooked, and that the right highest manageable level for the analysis has been chosen.

During SSI analyses, changes to this list is likely to be necessary. Therefore, the SSI list must be a living document and should be referenced in the PPH.

➤ **Section 2-4-4;**

1. Procedure

Change “categorized” to “selected” in steps “d.” and “e.” as follows:

- d. Items categorized selected as Structural Significant Item (SSI) (P3) are listed as SSI's. They are subjected to AD/ED/CPCP analysis (either as metallic or non-metallic structure).
- e. Items categorized selected 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).



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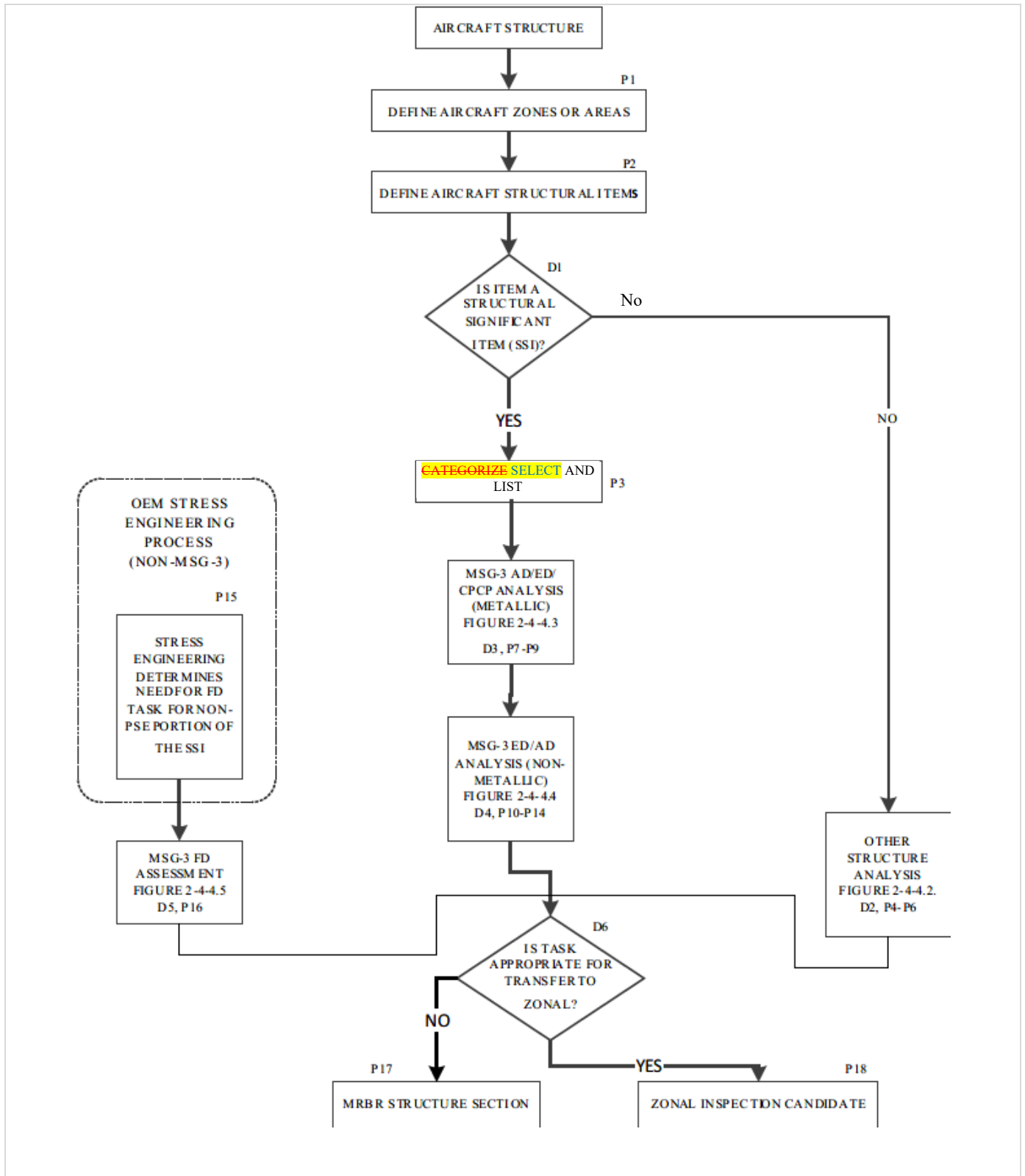
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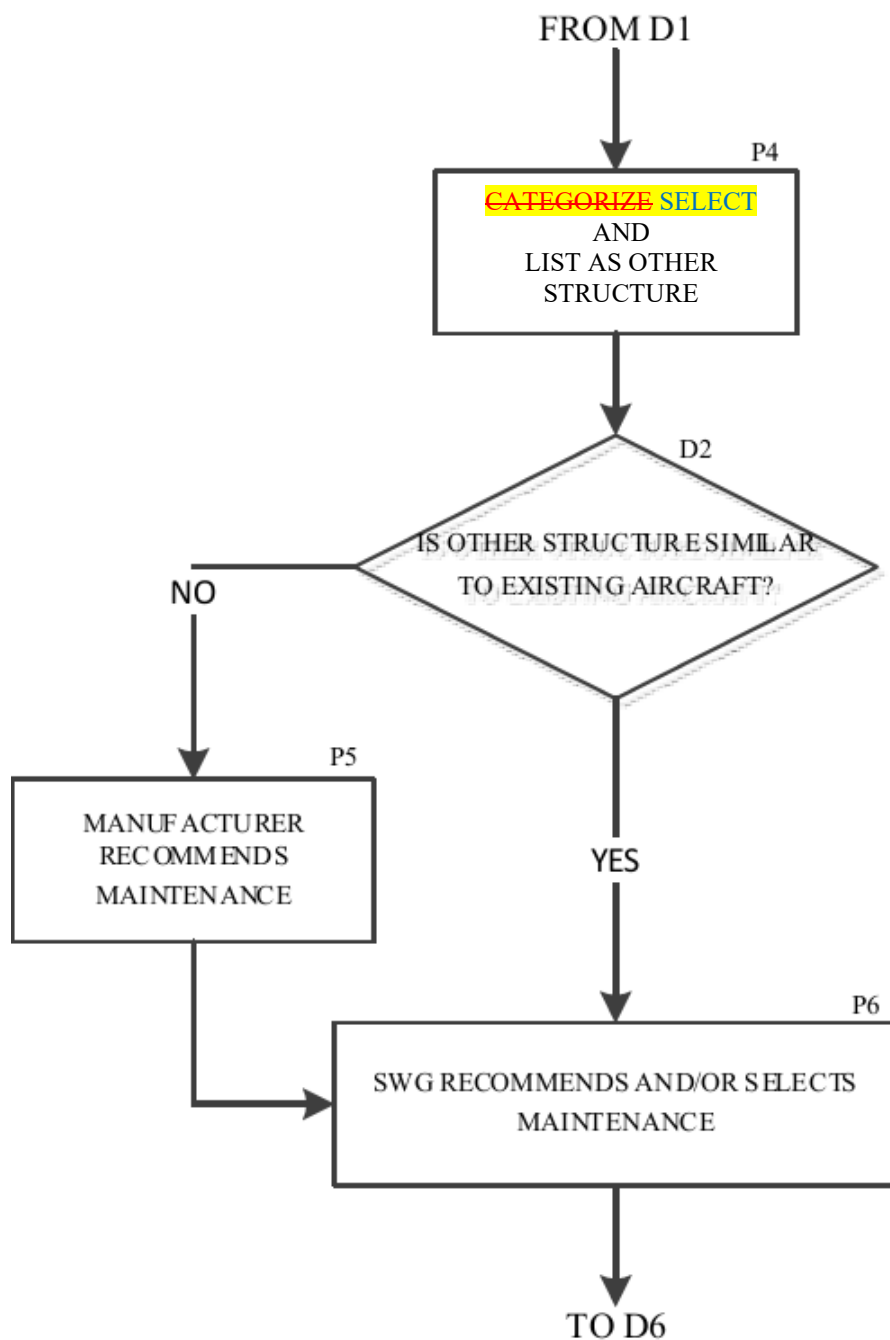
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➤ **Figure 2-4-4.2. Other Structure Logic Diagram**
Change “categorized” to “selected” in the flowchart





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PART (B): ORGANIZING THE SSI ANALYSES

To organize the SSI analyses in a way to allow to be efficient, several factors including but not limited to Zone, Access, Standard Numbering System (SNS), Material properties/surface protection system, Accidental damage sources, Environment, Potential impact of AD(s) on residual strength, Susceptibility to fatigue, Detectability, Density of the area and, in-service experience from similar designs should be considered.

The aim is to identify the highest manageable SSI boundary level. i.e., one which is high enough to avoid unnecessary analysis, but low enough to allow the item to be properly analysed and ensure that all ratings (Refer to section 2-4-5) can be assigned.

To organize SSI boundaries in order to have efficient tasks analysis, the following criteria should be considered by the MSG-3 analysts when breaking down the aircraft structures into the SSIs:

- Zone; when applicable, the SSI boundary should be harmonized with the zone boundary. This will help the possible transfer of applicable tasks from structures to zonal in the future.
- Access; SSI boundary should be defined in a way that the structure is accessible from the same access point(e.g. below the floor/above the floor). In addition, the analyst should consider system installations, wiring and access panels within a zone, to split the area into more than one SSI, if required.
- ATA iSpec 2200 or S1000D SNS; The ATA chapter should not be the determining factor in setting the boundary of an SSI. Based on the design, there is a possibility that an SSI falls into different chapters or subchapters of SNS.
- Identical structures for the left and right sides; one SSI should be selected to cover both the left and right sides of the symmetrical structure. Minor differences between the LH and RH could still be covered within one SSI, so long as it does not impact the analysis ratings. If required, separate LH and RH tasks can still be selected to reduce MH requirements per task and facilitate zonal transfer capabilities.
- Material characteristics, and surface protection system; since the structures ED analysis is a conservative approach by selecting the worst-case scenario, the SSI boundary should be defined in a way that will not penalize the whole area of inspection with a low interval due to one component's material or surface protection system. When beneficial, the part with the lowest material



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characteristic and/or surface protection ratings may be covered by a separate analysis within the same SSI or in a separate SSI to cover the worst case.

- Corrosion Inhibiting Compound (CIC); Selection of the SSI or analysis boundary should take into account the application of the CIC in production (and/or need for re-application in service). For the part containing CIC, it may be useful to conduct a separate analysis or select a separate SSI.
- Effects of accidental damage sources and environmental conditions; when applicable, the SSI boundary should be defined in a way that will cover all the structure items with the same vulnerability to accidental damage sources and environmental conditions. When required, a new MSG-3 analysis or a separate SSI and dedicated task may be selected to cover the worst-case, preventing penalizing the whole area with a lower interval.
- Potential impact of AD on residual strength may be used to define the SSI boundary.
- Susceptibility to fatigue; for non-PSE SSIs, the boundary may be determined in accordance with the potential fatigue influence identified by the manufacturer stress engineering.
- Assemblies; when there is an assembly with multiple structure items which have the same material, surface protection ratings, same AD/ED exposure, same access, same ATA chapter, and same zone, it is highly recommended that all the assembly structure items be covered within a single SSI and not multiple SSIs for each component.
If assemblies are selected to be SSI, all relevant load bearing elements need to be included and analysed, this may include bearings, bushings, bolts, fasteners, retainers etc. based on the amount of load carried by this element and the effect of failure.
Attention should be given to different point of interactions (i.e.; the possibility of the Galvanic corrosion, fatigue ... etc.)
- Detectability: Establish the SSI boundaries based on the ability to detect accidental damage or environmental deteriorations to have efficient inspection task level (i.e.; GVI, DET, SDI)
- Density of the area: Establish the SSI boundaries based on the density and restrictions of the area for inspection.
- In-service experience from similar designs: Analyst should always consider any in-service data when establishing the SSI boundary and split the SSI if required.
- Removable structural items: Structures that are removable can be interchanged or can be stored for a long period of time. It is therefore necessary for task threshold and interval to be assigned to these items rather than the aircraft. The inspection of removable structural items is controlled by serial number identification or equivalent alternative on the item life card.



International MRB Policy Board

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NOTE: *The original CIP proposal was submitted by Bell and Airbus Canada*

IMRBPB Position:

Date:

Position:

**Recommendation for
Implementation:**

Status of the Issue Paper:	<input checked="" type="checkbox"/>	Active
	<input checked="" type="checkbox"/>	Incorporated in MSG-3 / IMPS (with details)
	<input checked="" type="checkbox"/>	Archived