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MSG-4 Overarching Structure IMRBPB

Dec 2024

MSG-4 Value Proposition

MSG-4 will provide a clearly defined process to determine the minimum scheduled maintenance for safe and reliable flight, while optimizing aircraft availability and reducing cost of maintenance. This will apply for all aircraft types, creating a platform for development and future innovation.

MSG-4 will remove gaps identified within the current MSG-3 methodologies and enable analysis of future and emerging aircraft technologies. While allowing seamless integration with design processes with simplified traceability to design requirements and clear guidance and best practices on how to properly start the analysis procedures.

MSG-4 Functional Approach

Principle Ideas:

1. Retain everything that works about MSG-3.
2. Remove the independent and concurrent starts for the different MSG analysis methods.
3. Align with ARP4754B – Guidelines for Development of Civil Aircraft and Systems
4. Introduction of a fully functional approach to the start of the analysis
 - It's hard to define function while also excluding anything structural.
 - A function can be to carry loads, transmit loads, to provide L/HIRF protection.....
5. Continue to undertake all analyses at the highest manageable level
6. Simple solution which resolves recommendation from the White Paper:
[Introduction of new workflows allowing for integration and co-dependency of systems and structures.](#)

The proposed approach for MSG-4 could result in the realization of further benefits:

- Encouraging the introduction of MSG concepts earlier in the product design.
- Aligning definitions across the industry, specifically when relating to Condition Based Maintenance.
- Strengthening of ties with bodies including IATA and SAE by aligning guidance material

MSG-4 Functional Approach

The proposed MSG-4 process:

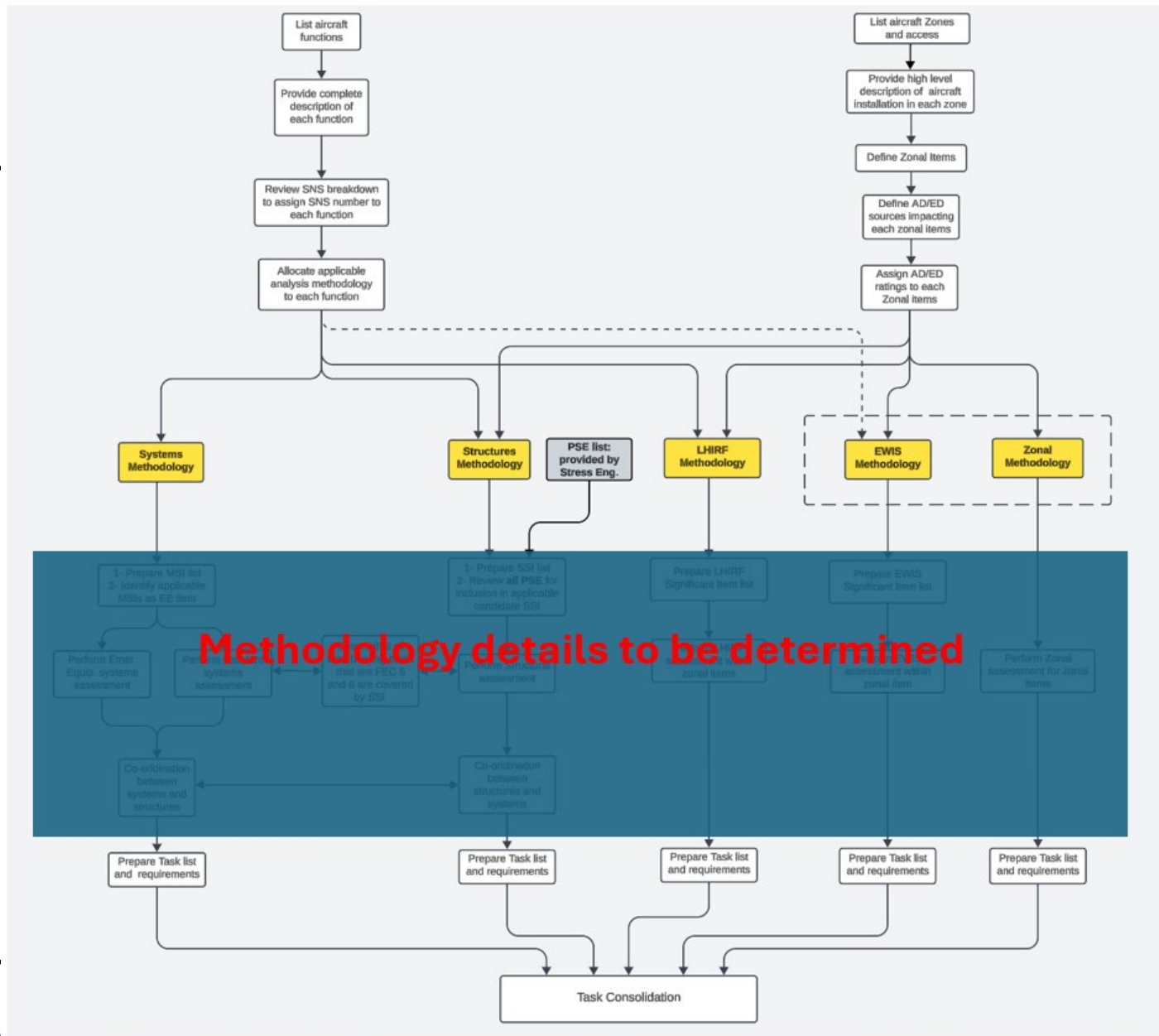
- develops scheduled maintenance tasks via use of a guided logic approach,
- results in a task-oriented program.
- builds on the foundations of MSG-3 and its top-down approach,
- introduces a guided logic flow with common starting points for all MSG Analysis methodologies.
- removes the independent, concurrent starts for MSG-3 methodologies and introduces an overarching structure to the whole analysis.
- introduces systems engineering principles to the complete analysis

The proposal consists of the first step of the analysis and stops at the start of each MSG-4 analysis procedure (Systems, Structural, L/HIRF, Zonal and Electrical Wiring Interconnection Systems (EWIS)). These analysis streams themselves will be the subject of further work and will be defined in future white papers.

Aircraft Functions flow: a true top-down analysis and aligns with the initial steps from ARP4754B Guidelines for Development of Civil Aircraft and Systems, which starts with the need to define and identify Aircraft Functions.

Zonal flow concentrates on the physical hardware and provides the starting point for Zonal and EWIS analysis methods, while additionally acting as 'catch all' for the other MSG Analysis Methodologies.

MSG-4



MSG-4

a) Func. #	b) Aircraft Function Title	c) Detailed Function Description	d) SNSs (CH-sub CH)	e) LRU/ Structures Item list	f) Analysis methodology allocated	g) Justification for methodology selected	h) Load bearing items for this function, if Structures assessment not selected;
0001	Provide Roll Control Capability	The function uses aircraft hydraulic energy along with control signals to affect the physical roll attitude of the aircraft. The aircraft utilises 4 aileron surfaces (2 per wing named <u>inbd</u> and <u>otbd</u>), each with 2 aileron PCUs that use hydraulic power and control signals to actuate the aileron surface that they are connected to.	27-10	<ul style="list-style-type: none"> • Aileron surface (as LRU) • Aileron PCU • Wiring (if necessary) • Tubes (if necessary) 	Systems: Yes Structures: No Emer. Equip.: No L/HIRF: No		<ul style="list-style-type: none"> • Aileron surface (as LRU)
0002	Provide means for carrying roll aerodynamic loads	The function uses 4 aileron surfaces (2 per wing named <u>inbd</u> and <u>otbd</u>) that are connected to the wing via 3 aileron fittings and 2 PCUs attached to the wing rear spar to transfer aerodynamic loads from the aileron surface to aircraft.	57-60 27-10	<ul style="list-style-type: none"> • Aileron surface (as LRU) • Aileron rod • Aileron fitting • Items of wing supports roll control loads 	Systems: Yes Structures: Yes Emer. Equip.: No L/HIRF: No	Systems methodology selected to cover wear concerns for moving parts.	
0003	Provide means to transmit and absorb ground loads during landing and ground maneuvers		32-10 32-10 32-10 32-50	<ul style="list-style-type: none"> • MLG Shock strut • MLD drag brace • MLG axle • MLG wheels 	Systems: Yes Structures: Yes Emer. Equip.: No L/HIRF: No	Structures methodology selected to ensure harmonization for corrosion failure modes.	<ul style="list-style-type: none"> • MLG Shock strut • MLD drag brace • MLG axle
0004	Provide means for carry landing loads		32-10 32-20 32-50	<ul style="list-style-type: none"> • MLG Shock strut • MLD drag brace • MLG axle 	Systems: Yes Structures: Yes Emer. Equip.: No L/HIRF: No	Systems methodology selected to cover wear concerns for moving parts.	
0005	Provide means to carrying pitch trim aerodynamic loads		55-10 27-40	<ul style="list-style-type: none"> • HS surface (as LRU) • HSTA 	Systems: Yes Structures: Yes Emer. Equip.: No L/HIRF: No	Systems methodology selected to cover wear concerns for moving parts.	<ul style="list-style-type: none"> • HS surface (as LRU) • HSTA



MSG-4 Summary

Consideration is given to the following for inclusion in MSG-4:

- Retain what works with MSG-3.
- Removal of the independent and concurrent starts for the different MSG analysis methods.
- Introduction of a fully functional approach to the start of the analysis.
- Continue to undertake all analyses at the highest manageable level.
- Alignment of MSG logic with SAE ARP4754B- Guidelines for the Development of Civil Aircraft and Systems.

It is determined that the proposed approach for MSG-4 could result in the realization of further benefits:

- Encouraging the introduction of MSG concepts earlier in the product design.
- Aligning definitions across the industry, specifically when relating to Condition Based Maintenance.
- Strengthening of ties with bodies including IATA and SAE by aligning guidance material.



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