Group/project: | *Group 3 - Unmanned Vertical Lift for Medical Equipment Distribution*

PM/SE peer review provided by: Group 5 – Personal Air Transport

This document contains the peer review grading sheet for the Systems Engineering and Project Management items addressed in the Design Synthesis Exercise as listed in the title.

Instructions for peer review

Please provide peer review towards the PM/SE aspects of the DSE reports of your peers, as allocated to you. Per deliverable / criterion, provide at least 1 tip (improvement suggestion) and 1 top (accomplishment).

Consider the following guidelines (but addressing points beyond these guidelines is expected, especially for the deliverables not covered in these explicit guidelines):

- Functional Flow Diagram (FFD)

    o Does the FFD adhere to standard formatting and syntax?

    o Does the FFD include functions in a logical sequence?

    o Does the FFD include functions to a sufficient level of detail for understanding the project from a functional point of view?

- Functional Breakdown Structure (FBS)

    o Does the FBS adhere to standard formatting and syntax (e.g. proper grouping of functions)?

    o Is the FBS sufficiently detailed (at least up to 3 levels)?

    o Does the FBS translate generic functions to DSE-specific functions (i.e., is the connection with the specific DSE mission statement made, including flow down to detailed functions)?

    o Are the common functions of different mission phases grouped together?

- Requirements Discovery Tree (RTD) & requirements tree

    o Does the RDT adhere to standard formatting?

    o Is there a complete specification of mission and system requirements (either in the RDT or in a dedicated list of requirements)?

    o Do the requirements adhere to the 'requirements on requirements'?

    o Are the customer-provided (user-)requirements properly analysed, and, if need be, extended with requirements from the functional, market, risk and sustainability analysis?

    o Are sub-system requirements given, provided they affect the top-level system choices?

- Design Option structuring (tree) - DOT
    - o Is / are the DOT(s) logically arranged?
    - o Is / are the DOT(s) used to think broadly about design generation, i.e., does it include feasible as well as 'blue-sky' concepts?
    - o Is the initial screening (= trade off) provided, and are the concepts that will enter the mid-term phase provided?
- Market analysis
    - o Does the market analysis include stakeholder identification, market segmentation and initial size estimation?
    - o Does the market analysis include competitor analysis (including SWOT and/or competitive positioning of the own product)?

5 – Functional Flow Diagram(s)

Tip:

- The top-level functions should be numbered with integer and **zero decimals**. E.g. 1 should be changed to 1.0
- Use a reference function at the beginning and end of 2nd, 3rd and 4th level function sequence.
- Use AND gate when functions are to be done simultaneously. E.g. AND gate can be used for functions in 3.2.1.2

Top:

- Different colors used for functions makes it easy to read and sufficient level of detail is provided for each function.

6 – Functional Breakdown Structure

Tip:

- Function 3.3.1 should be grouped under function 3.2(Pre-flight operations) as pre-flight vehicle check should be done before starting the delivery of the payload.
- Common procedures like take-off, cruise and landing can be grouped together so when mentioning them multiple time it can be easier to find the processes for that function.

Top:

- Sufficient level of detail is provided for each function.

7 – Requirements Discovery Tree & Requirement Structuring

Tip:

- Some of your requirement statements contain multiple requirements, these should be split up.
- Some of your requirements also implicitly give a solution to a problem, which should not be done at this stage of the design (For example: FU-SYS-12, -14, -15 and -16).
- A lot of your requirements are directly based on JARUS CS-UAS. Having one requirement stating that the system shall adhere to these guidelines might be better for the non-key or non-driving ones to have a better view on your specific requirements.

Top:

- There is a very good explanation for the regulatory context of your requirements.
- You also provide a clear link between the discovery tree and the tables by the way you structured them.
- This is a very complete list of requirements.

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8 – Technical Resource Budgets

Tip:

- In section 8.3, in the paragraph 'propulsion system', the text refers to relation 8.3. I assume it is supposed to be 8.4, as relation 8.3 is about weight estimation.
- Contingency values only discussed for power. No mentions about weight contingency values. Although safety factors are mentioned.
- A table displaying all budget results would be nice in order to have a clear overview.

Top:

- Justification for every (empirical) relation used in the budgeting.
- Detailed explanation of reliability and accuracy of the used relations and estimations.

9 – Technical Risk Assessment

Tip:

- Corrective and preventative action is detailed for many risks but there is no new estimation of Risk Level (likelihood and/or consequence). This would help to estimate the effectiveness of the strategies chosen.

Top:

- Clear and detailed explanation of the SORA risk strategy.
- Clear color coding for risk levels. This makes a risk map unnecessary.

10 – Design Option Tree(s)

Tip:

- You should do some pruning of your DOT to determine the clear loser design options, to make your overall concepts easier to create.
- Some aspects of your tree seem even further split up into subtrees, although there is no clear distinction between when the splitting in aspects and the actual design options start.
- You do not provide overall concepts for consideration in the midterm and trade-off phase.

Top:

- All the expected aspects for a drone seem well covered. There is a broad exploration of these aspects as well. All aspects are also explored deeply enough for this stage of the project.

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11 – Contingency Management

Tip:

- Brief mention of a reserve (contingency values) but no values determined for some budgets (mass, cost).
- The last sentence of section 8.5 suggests that it is necessary to know the exact number of expected hours for computing in order to come up with contingency values. However, contingency deals with the unexpected nature of these parameter. They should be defined before having detailed knowledge, as they should be reduced over time in the project. For the power budget this is already nicely done.

Top:

- Dedicated section on contingency management with a plan for the future of contingency management in the project.

12 – Market Analysis

Tip:

- Not all stakeholders are clearly identified in the market analysis. Only customers are identified. All stakeholder must be identified, and their requirements must be complied.

Top:

- A detailed description of the competitors are provided and the price point estimation is done in detail.

25 – Sustainable Development Strategy

Tip:

- In environmental sustainability it can be further detailed how are you going to perform the life cycle assessment (using LCA software's or using data base for materials).
- Different considerations are discussed to mitigate the impact on the environment. These considerations should be quantified for each concept you come up with so they can be implemented in the trade-offs efficiently.
- It should be mentioned that how are you going to make sure that these strategies are implemented. Is someone assigned this task or is it the job of the entries group that these strategies are kept in mind throughout the design process.

Top:

- All pillars of sustainability have been considered and sufficient strategies, especially for social sustainability part have been developed.