Composite Engineer's Viewpoint

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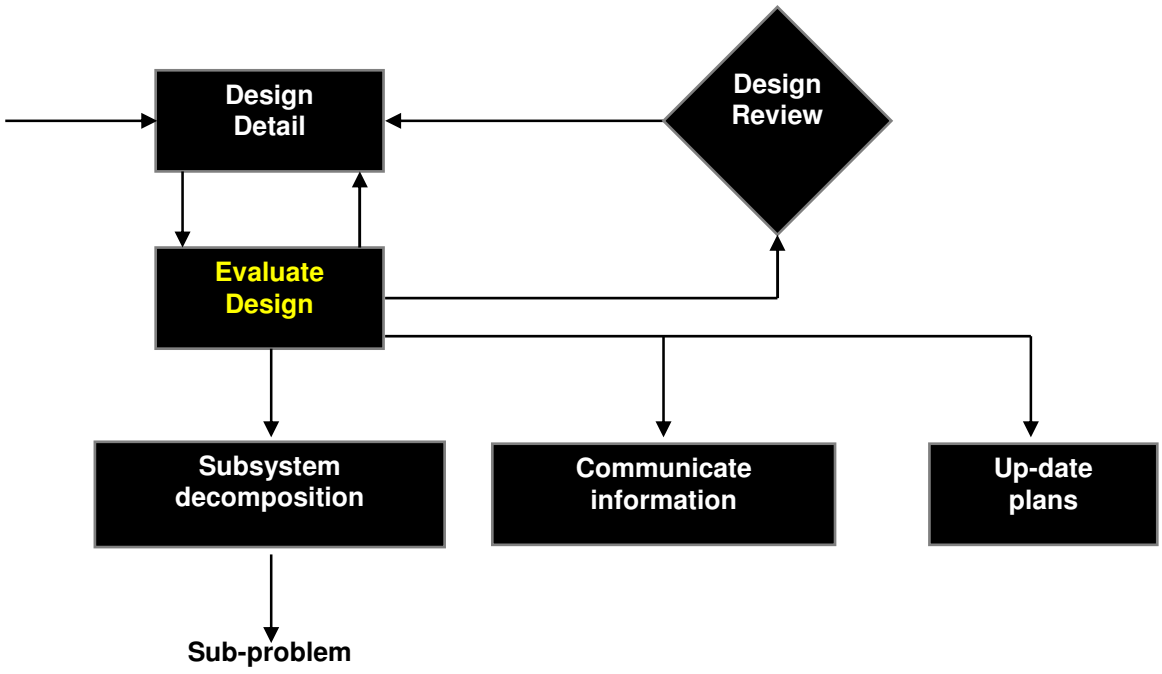
Designing with Composite Materials
Part 8 –Design Review Number 2

Let us now review the design process as it currently stands. Previously we had selected our constituent materials (fibre and resin), and the material form (tape, cloth, etc.), we had decided on the manufacturing process and determined the laminate lay-up configuration to meet the design requirements. Now that we have worked through the design detail we have determined:

- the size and location of holes and cut-out, and determined the effect of their stress concentration;
- all the areas where joints are required, the type of joint needed and the load transfer requirements of the joint assembly;
- the areas where possible interlaminar stresses may be of a concern, and ways to eliminate or reduce the impact of interlaminar stresses;
- where we would like to have sandwich core stiffening; and
- how we will delete or add plies at discrete locations.

With this level of detailed design we again check that the composite structure is still meeting the design specification. This review will take the form of a comparison of the design attributes against the performance and operations requirements. So we again refer back to the original design specification. The following flow chart illustrates how this review will take place as 'Evaluate Design'.



From the tabulated comparison of the design against the design specification we can ask the following questions:

- Is the design meeting the essential customer requirements?
- Does the design satisfy the engineering specification targets?
- Is the design competitive against the benchmarks?
- Should the design process continue or be cancelled?
- Can the design be improved against the customer requirements and engineering specification?
- Is the design too complex in its current form, and should it be decomposed to several sub-problems or sub-systems?
- Do we need to review the design requirements and revised them based on the design detail outcomes?

Your answer to these questions will allow you to make modifications to the composite laminate design detail to meet the design specification, or recommend revisions to the design specification. The cost of any design changes at this stage of the design process are minimal and will actually save substantial resources.

In the next article, we conduct an optimization process on the design. With design optimization we consider changes to the design to reduces weight and cost, but maintain or improve the overall structural performance. An equally importance aspect at this stage of the design process is to check the robustness of the design against small changes in design parameters. I also welcome questions, comments and your point of view. Feel free to contact me via r.heslehurst@adfa.edu.au. I may publish your questions and comments, and my response in future newsletter.