Designing composite airframes for repairs

In general, repairs of composite structures are difficult

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Why composite materials are attractive

Composite materials allow for :

- decrease in number of airframe components
- maintaining high accuracy of components of complex geometry
- high strength over mass ratio due to directional properties of composites and careful stress analysis, design, and manufacturing

The price that must be paid

Not easy for repairs because of need for maintaining both the original structure and configuration of reinforcement for strength and stiffness purposes

How to tackle the problem

- identify typical damage depending on mission of an aircraft, then

- develop design guide, since

repair problems can be made easier if sufficient consideration to possible future repairs is given in design stage

For example one should consider:

- manufacturing breakdown
- choice of materials e.g. matrix system
- choice of structure e.g. laminate instead of sandwich (if possible)
- choice of joining methods, e.c.t.

and many other ways to achieve the goal

So, the question is: How to make composite airframes more repairable maintaining attractiveness of composite materials?

Once one knows how to achieve the goal

Trade off is needed

In general, such an approach will result in mass increase.

Therefore, there will be need for some optimisation procedure taking under consideration all ups and downs (e.g. possible repairs less expensive but worst performances)

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