Session 4: 3D characterisation and materials modelling

Full 3D mapping of material properties
As-manufactured components or test coupons
NDT-based performance modelling to determine residual strength
Use of FE models to determine the important metrics for NDT to measure

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4a NDT Requirements, or what is needed to define them? – **Prof Robert Smith**
4b Current status of modelling of defects and failure in composites. – **Prof Stephen Hallett**
4c Current 3D characterisation and importance of metrics. - **Prof Robert Smith**
4d Breakout groups – What are the requirements for NDT measurements?
4e De-brief from breakouts
4f Panel discussion

Session 4f. Panel discussion

What does 3D non-destructive characterisation success look like?

Panel members:

Prof Robert Smith (Chair).
Prof Stephen Hallett.
Dr Barbara Gordon.
Prof Ian Lane.
Dr Richard Freemantle

- What does 3D non-destructive characterisation success look like?
- What range of material properties will cover all possible failure mechanisms?
- Is ‘better-informed concessions’ a suitable target for early adoption?

Discussion notes:

- Would modelling be a better target than concessions as lower risk
- Modelling becoming more widely used and could be used to test more cases than could be done physically
- Accurate definition of failure modes could enable this but likely to always require some testing
- NDE requirements could become another set of constraints into this framework
- Could the future be certification by analysis rather than analysis supported by test
- Regulator to become involved in the development process – the boundary between this and certification is blurring
- If analysis of NDE data and integration into models were quick enough then consideration against design intent could be conducted. But missing link is what is the residual lifetime of the part.
- Progression up the technology development pyramid can be quite difficult – unknowns effected the rate at which this could be done. Programme timescales limit what can be implemented.
- Parameters are recorded but a 3D tool would lessen the burden on NDT operators and help communicate data through to other engineers
- More data can be provided but interpretation of this data could be difficult in already qualified parts. If new defects are discovered which we have lived with before what do we do with that information?
- Could learn from mechanical test vs what we can measure vs what we can model
- An anomaly discovered might not be a defect in the current design but could in future design. Need to feed that back into the design process.
- More information, but a large task to understand that data and reach conclusions. It takes time and effort to do this and if this doesn't add knowledge then might not be worth doing. Having the right information is more important.
- Current defect testing is conservative.

- Giving more information to concession process could be a start to implementing 3D methods
- A path to this could be to separate the assessment path, go through the current process then go through the new process
    - Is there something we are missing in current process?
    - Is there something which we missed but isn't important?
    - Is the data we can generate not required?
- Increasing resolution may not be required in each component, the contextual application of the data is more important
- The significance of defects can change over time, what isn't significant at the moment could become significant in future designs
- There is still a requirement for academia to improve defect detection and characterisation (and also to increase resolution) for future designs
- Triggers to failure modes derived from NDE could be used in virtual test platform
- Integrate NDE into the design process rather than just the production process