



Dedicated to innovation in aerospace

**Structural integrity as enabler towards  
sustainability in aviation**

Ligeia Paletti



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**Are we really talking about sustainability even at ICAF?**

Ligeia Paletti



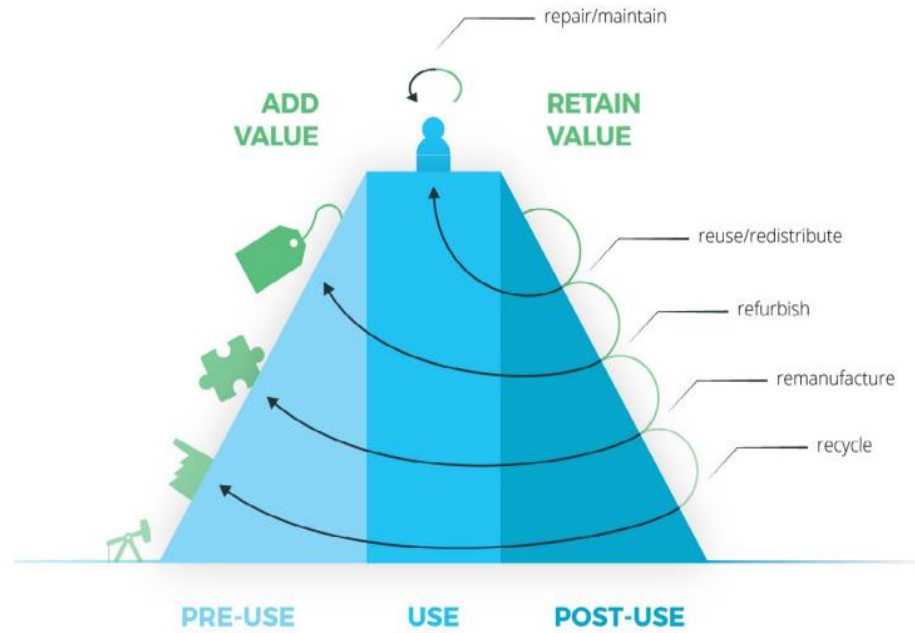
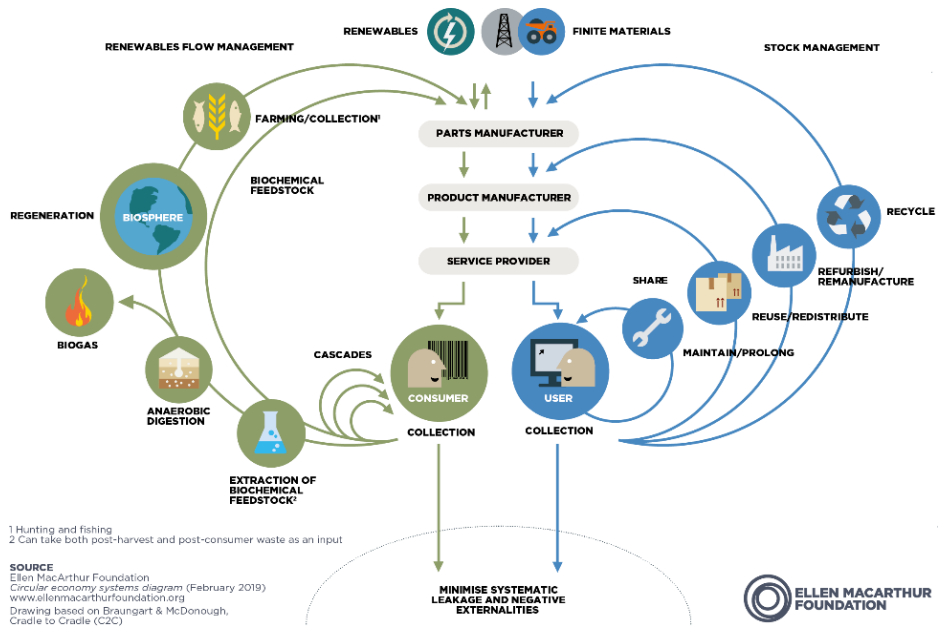
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**...and in a Digital Engineering session?**

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# Circular economy





**Sustainability  
community**

**Structural  
integrity  
community**

## Already heard in the last couple of days...

- Sustainability as the only way for aviation to survive
- New energy sources
  - Hydrogen embrittlement
- New materials and components
- New manufacturing processes
- Old (testing) methods applied to new applications
- New forms of mobility





# New architectures




# New loads

- Design loads
- Thermal and environmental loads
- Increase in turbulence and bad weather

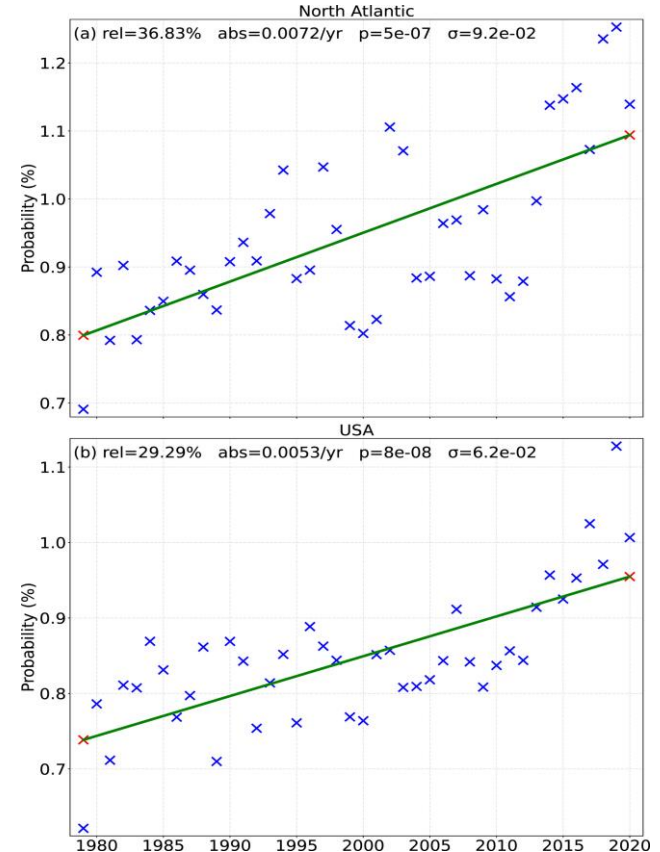
## Geophysical Research Letters\*

Research Letter |  Open Access |  

Evidence for Large Increases in Clear-Air Turbulence Over the Past Four Decades

Mark C. Prosser  Paul D. Williams, Graeme J. Marlon, R. Giles Harrison

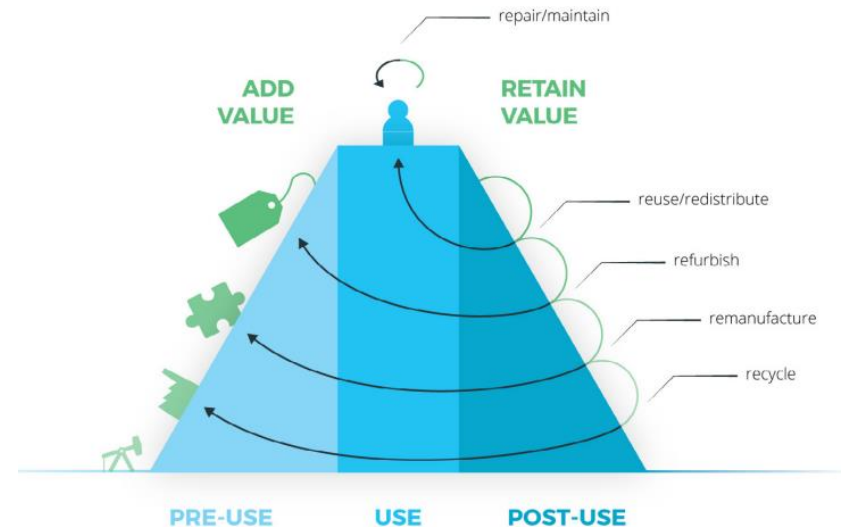
First published: 08 June 2023 | <https://doi.org/10.1029/2023GL103814>





# Digital engineering used in structural integrity is also used in sustainability

- Life cycle management tools
  - LCC and LCA as well
- Virtual...
  - Testing
  - Material design
  - Manufacturing
- Digital twin
  - Digital product passport



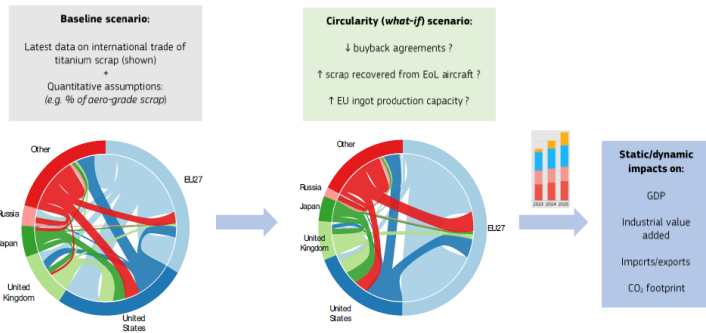
# Digital twin / Digital product passport



Less scrap/resources



Spare part management



Supply chain management

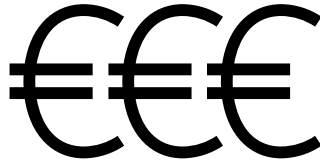
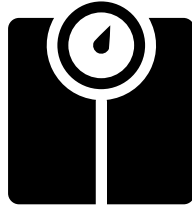
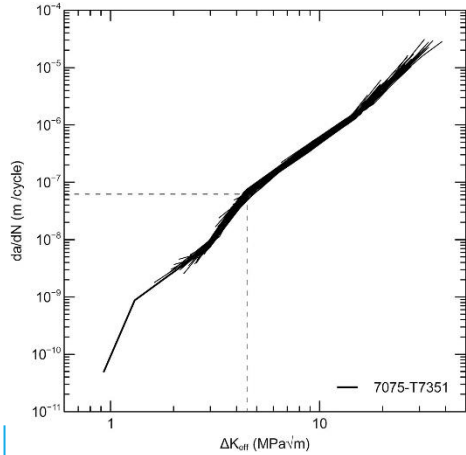


Maintenance

# Really cool... Another requirement

- Weight
- Performance
- Safety
- Costs
- Maintainability
- Manufacturability
- Fuel consumption
- Payload
- ...
- And now sustainability???





## SUSTAINABLE DEVELOPMENT GOALS



# Digital engineering





Economics  
Safety  
Lightweight

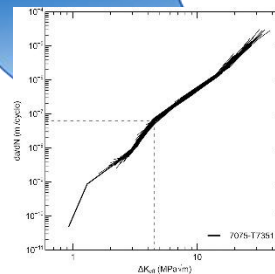
Fuel consumption  
Usage of resources  
Climate impact

Structural integrity  
Jobs  
...



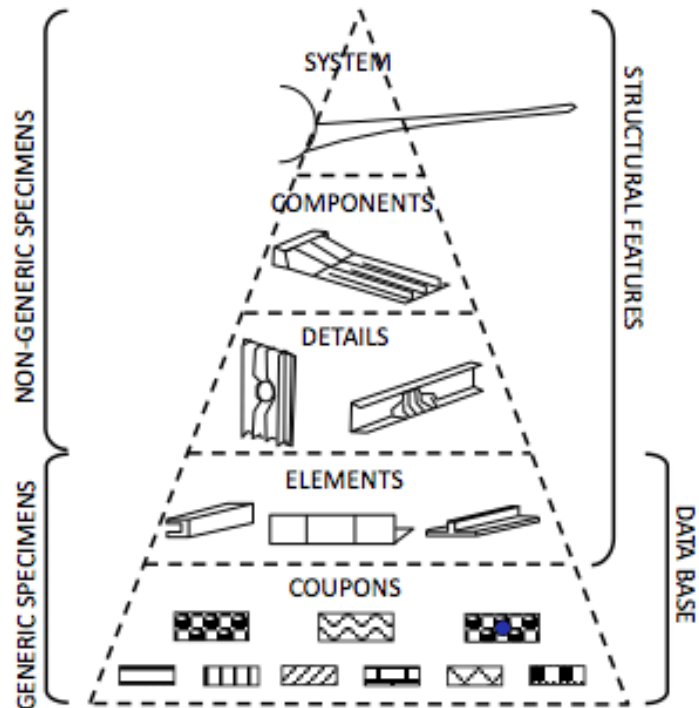
# A bunch of thoughts to ponder on and discuss further...

- What does sustainability means for fatigue, damage tolerance and structural integrity?
  - And vice versa
- How to translate sustainability in requirements for engineers to use?
  - Are there more than those already used with ICAF community?
- F&DT&SI tools including sustainability?
  - Decision making mindsets or tools?
  - Design tools?
  - MDO, MBSE, etc. for structural integrity & sustainability?



A multiscale problem...

...with even more dimensions

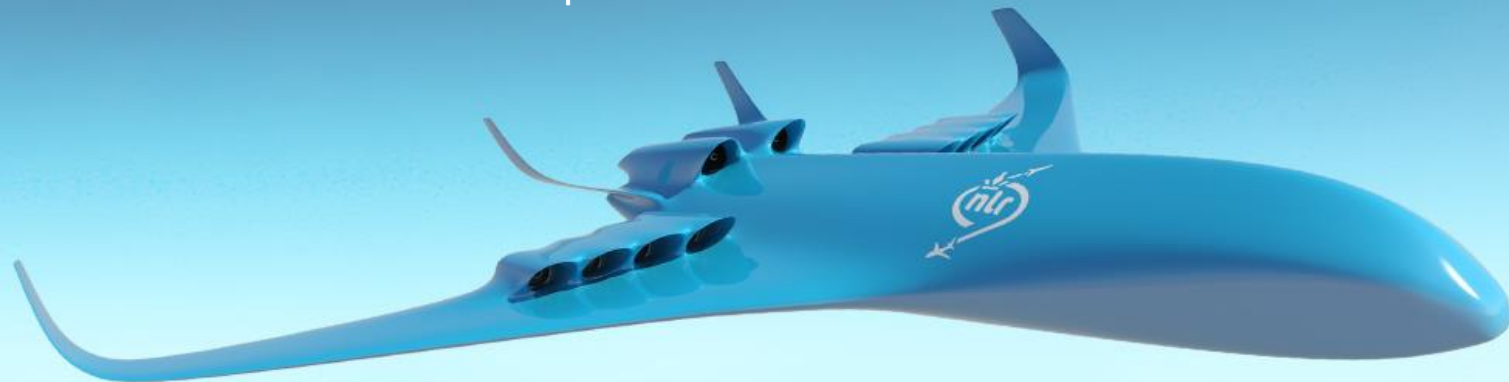




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# Fully engaged

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