

ACCIS Conference

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Aeroelastic Tailoring using Novel Composite Structural Designs

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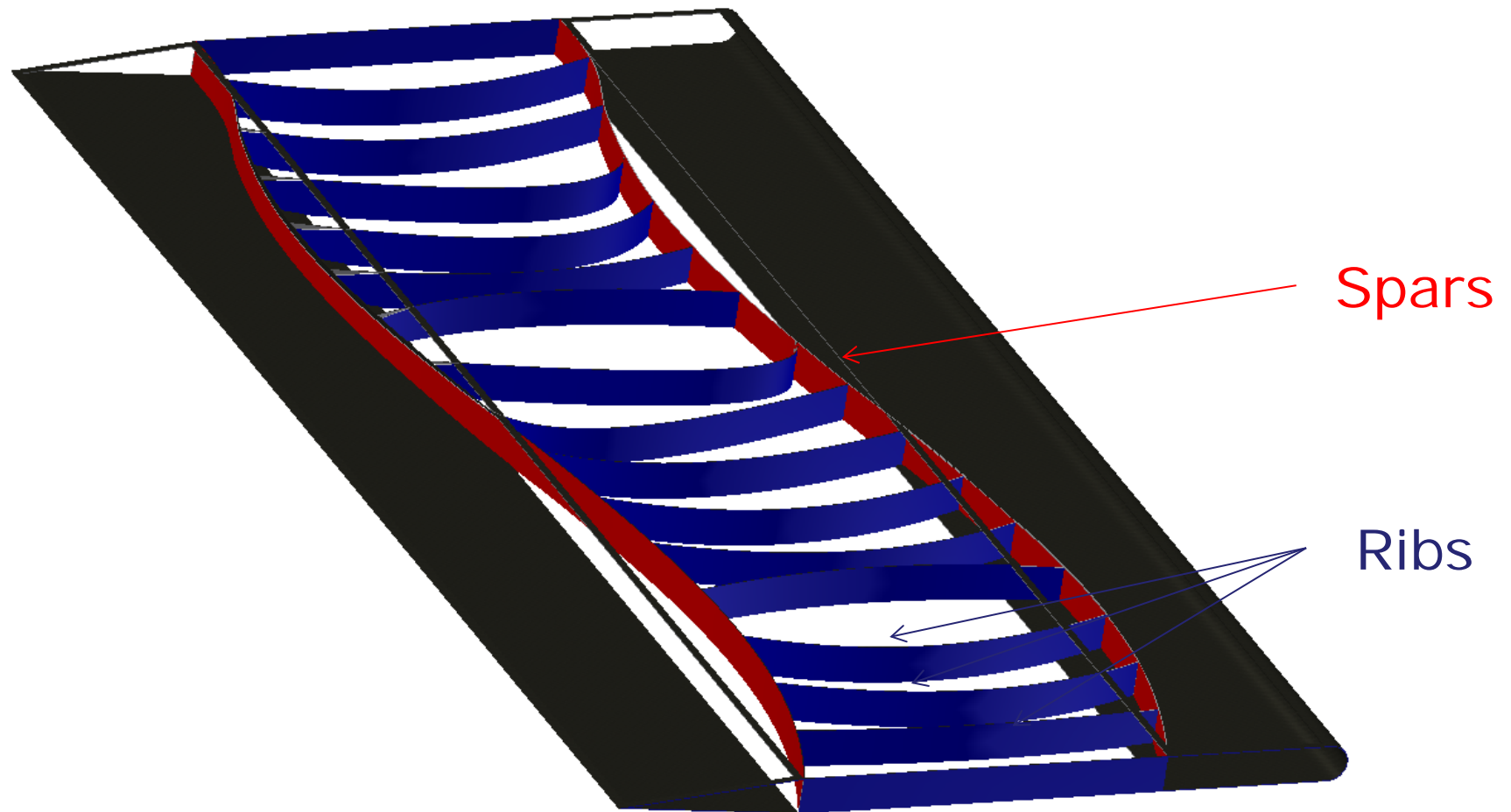
² RAENG Airbus Sir George White Professor of Aerospace Engineering

³ Professor of Lightweight Structure

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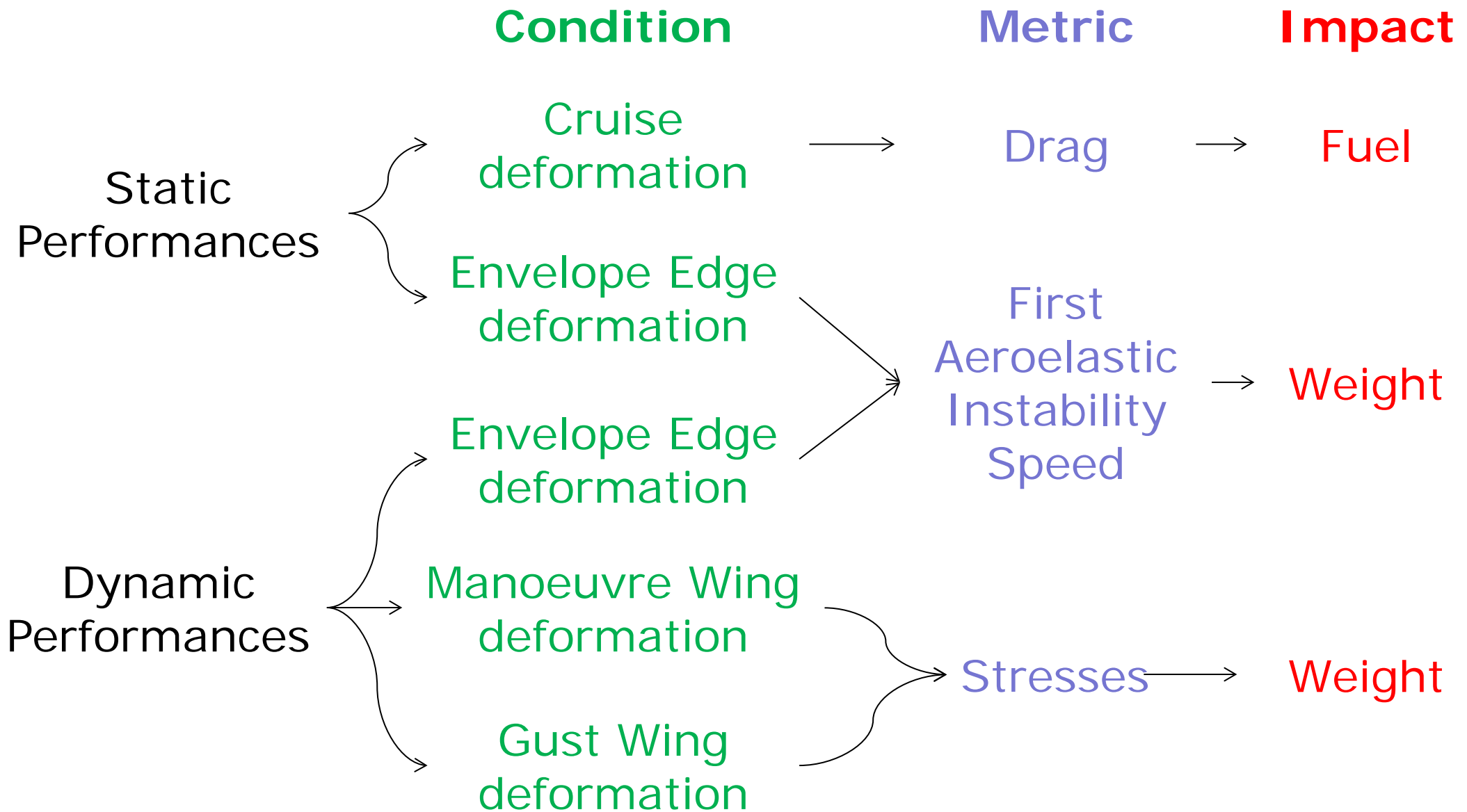
- Research Question
- Research Strategy
- Initial Study
- Conclusions

Research Question



Better Wing:
Improved performances at reduced weight

Performances of Interest

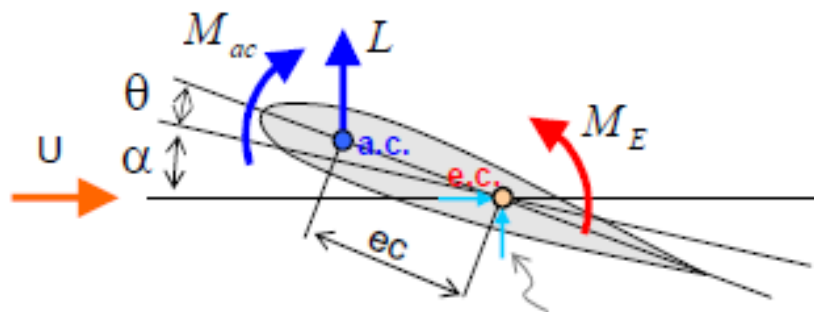


Aeroelastic Phenomenon Considered

*First Aeroelastic
Instability Speed*

Divergence
(Static)

Flutter
(Dynamic)



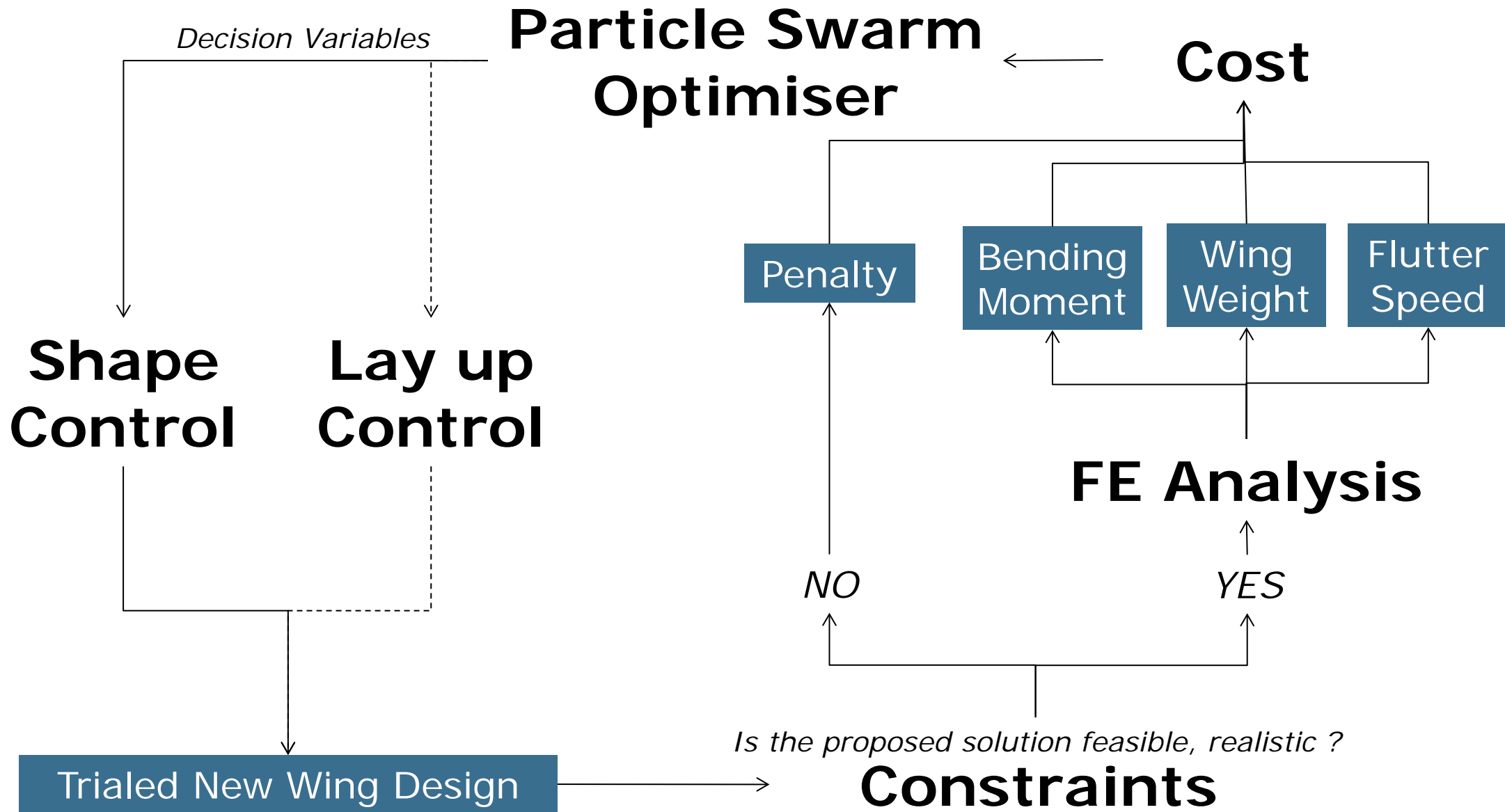
$$M_{ac} > M_E$$



Coupling of 2 modes to extract energy from airstream

Controlled using EI, EJ

Research Strategy



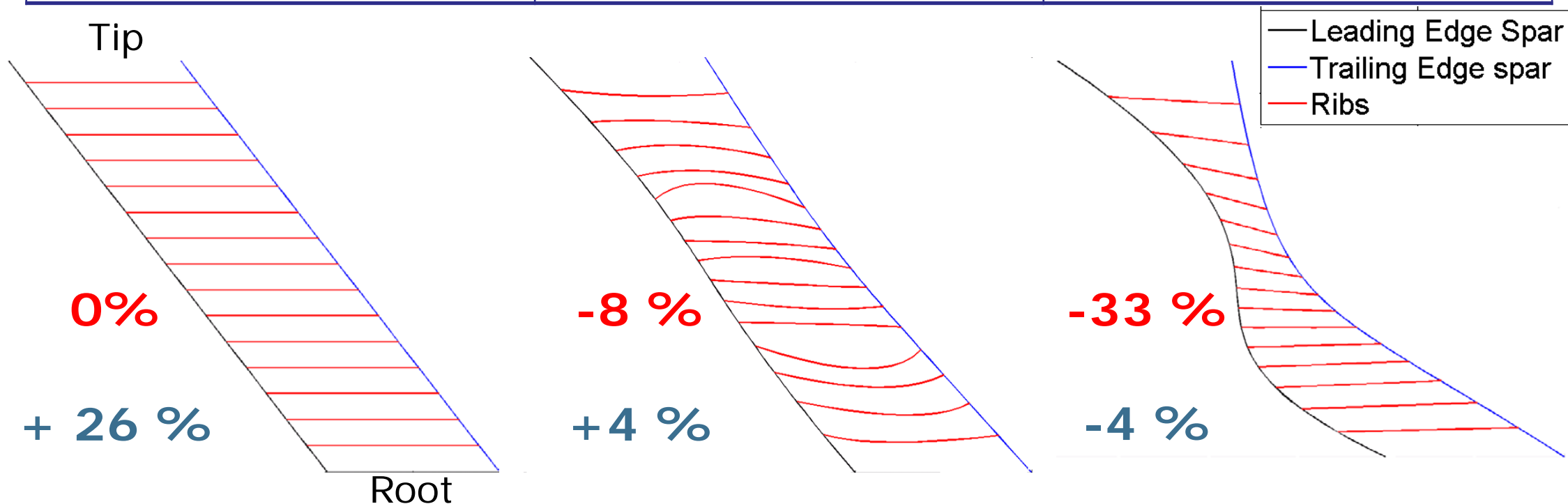
Example of Optimisation Results

- Sample Results on Forward Swept Wing

Conventional Straight Structure, **Optimised Skin Laminate**

Optimised Wing Structure, Balanced & Symmetric Laminate

Spar Optimised Wing Structure, Balanced & Symmetric Laminate

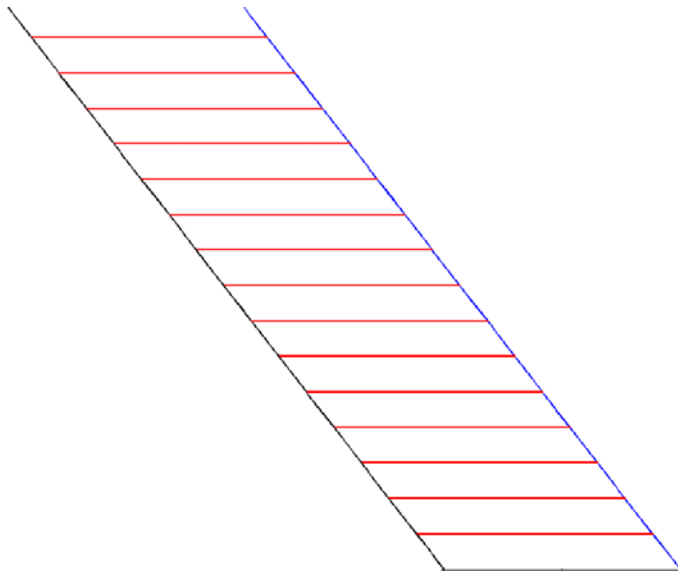


Wing Weight Improvement*
Divergence Speed Improvement*

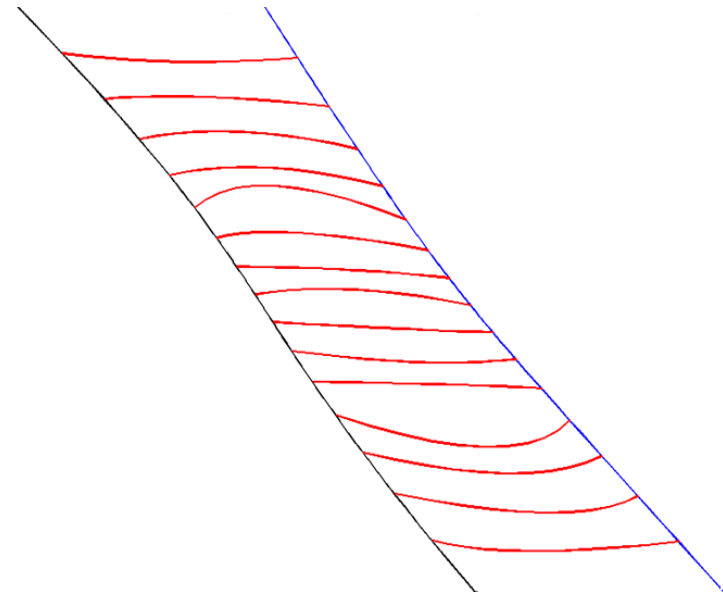
*: Compared to a Conventional Straight Structure, Balanced & Symmetric Skin Laminate

Conclusion

- Structural members shape optimisation is an aeroelastic tailoring method
- Improvements comparable to improvements due to stacking sequence aeroelastic tailoring
- Both tailoring methods can be coupled to harvest maximum aeroelastic performance improvements



$V_{\text{divergence}} = 173.4.6 \text{ m/s}$, Mass = 51.81kg



$V_{\text{divergence}} = 180.2 \text{ m/s}$, Mass = 47.48kg

Thank you for listening!
Any Questions?



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