



# Design and Integration of an Hybrid Electric Fan Propulsion System

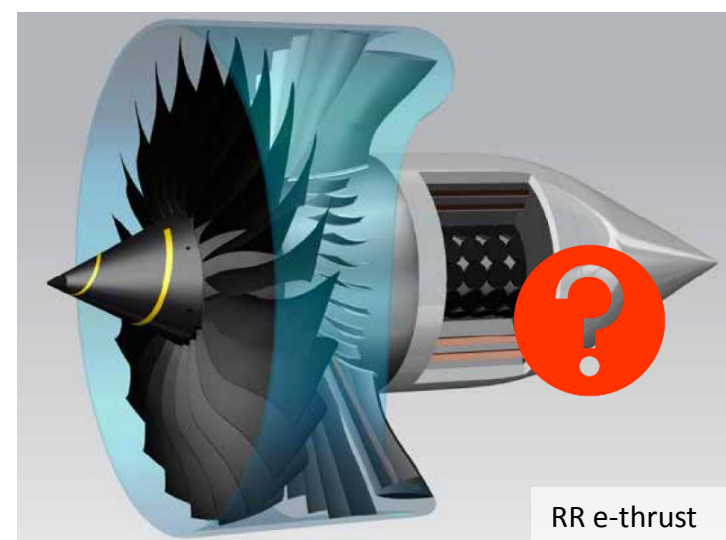
The works aims at exploring the design space of a short nacelle with an electric fan system for a hybrid aircraft, optimising its overall geometry and performance

## Introduction

- Electrification is a concrete option for future civil aviation propulsion systems. Concrete interest of companies
- Main key points of hybrid propulsion:

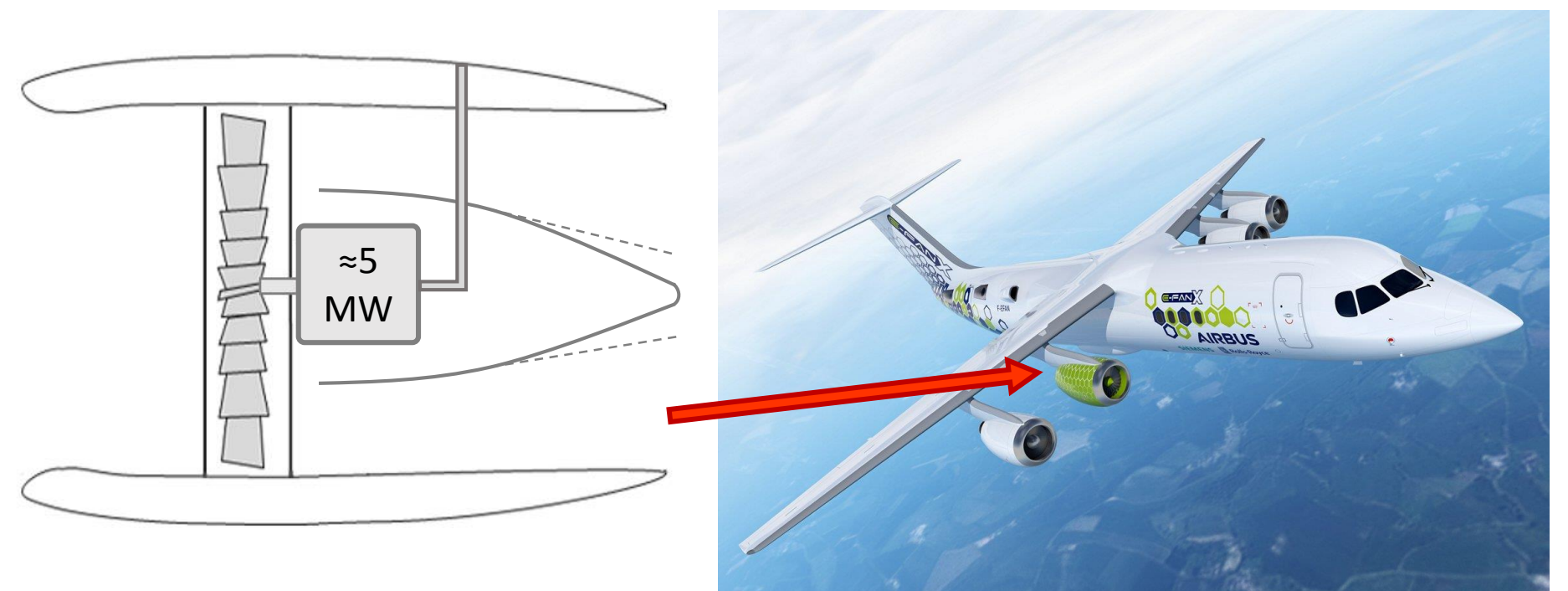
efficiency	emissions	integration
cost	TRL	weight

- Deletion of gas turbine core opens uncharted design area
- Significant amount of research ongoing for short-range applications : E-FanX, NASA X-57. First prototypes flying



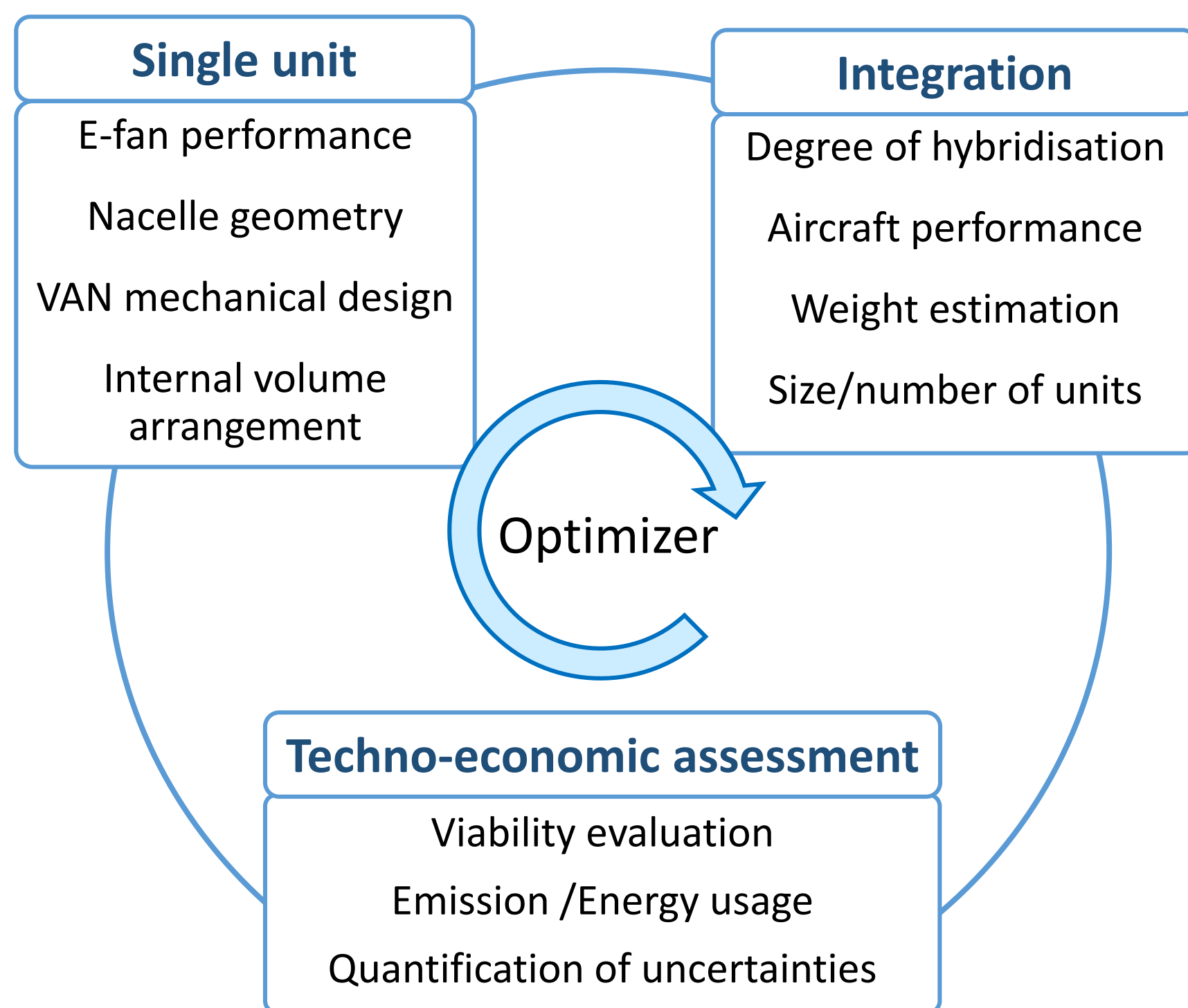
## Objectives

- Assess DP/OD performance of an electric fan
- Design and model an dedicated short nacelle  
External and internal aerodynamic arrangements
- Evaluate usage options for core volume:  
Internal mechanism for VAN/battery pack
- Find optimum system configuration and energy usage on a given mission/aircraft selection



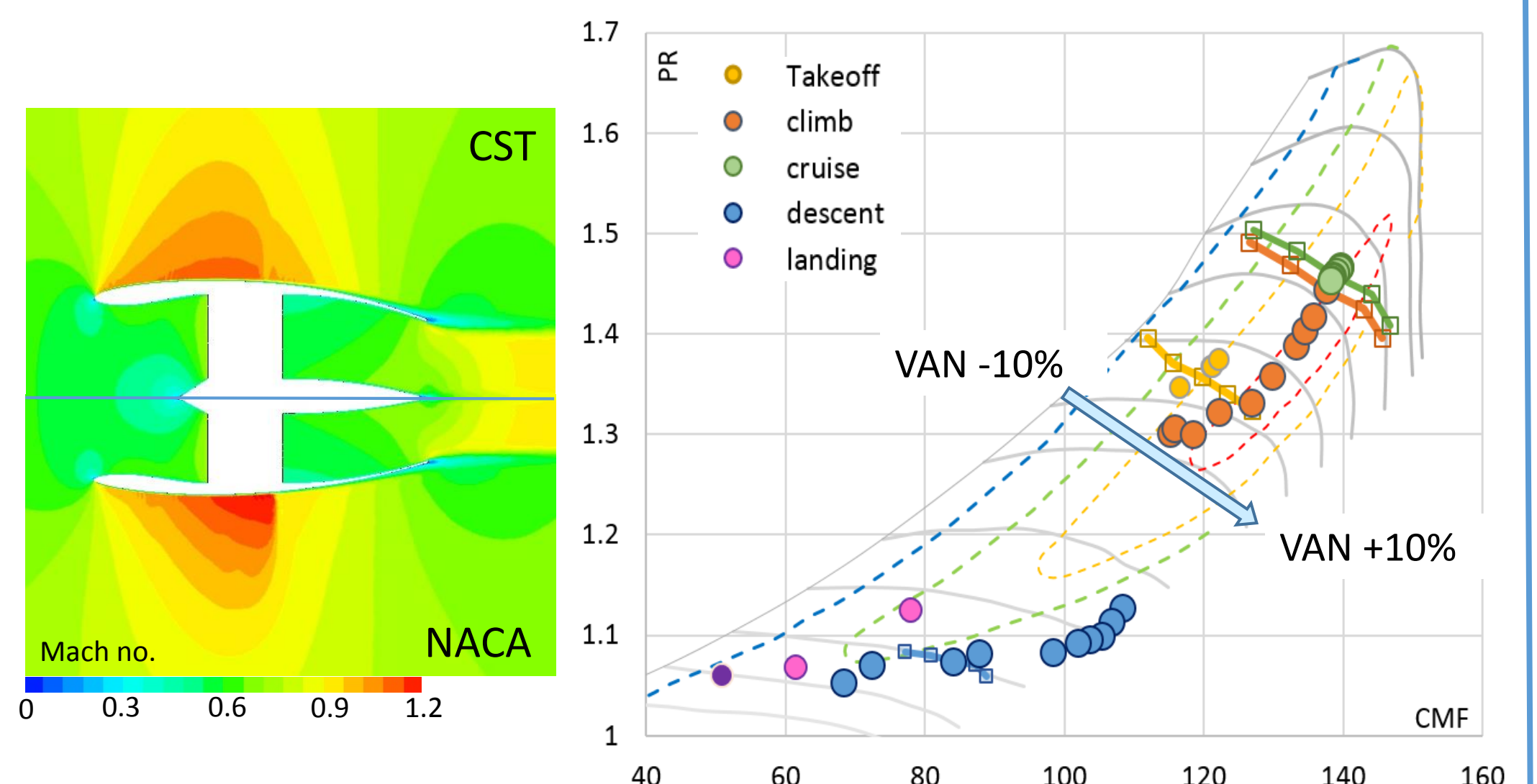
## Methodology

- 3 interchangeable areas of work (TERA approach)



## Results

- Created a tool for E-fan performance modelling:
- VAN improves OD operability
- Up to -15% power demand allows lighter electric equipment and reduced weight
- Test cases for nacelle geometry using NACA vs CST curves ( $y = C_{(x)}S_{(x)} + \delta_{(x)}$ ) : the latter reduces external shock formation



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Key references:

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