

# MULTIDISCIPLINARY DESIGN OPTIMIZATION AND DESIGN SPACE EXPLORATION OF AEROSPACE SYSTEMS

Erich Wehrle

Collins Aerospace  
Applied Research & Technology  
Multidisciplinary Design Optimization research group  
Cork, Ireland and Munich, Germany  
Erich.Wehrle@Collins.com

## ABSTRACT

Requirements for sustainable, efficient and economic aviation present the aerospace sector with new design possibilities and constraints. This is highlighted by the aviation industry's ambitious commitment to net-zero carbon emissions by 2050. Therefore, new thinking is needed in aircraft design to accelerate development with special attention to these goals at aircraft as well as system and component levels.

Algorithmic-supported design methods in concert with accurate parametric modeling are powerful tools in the multidisciplinary conception and development of aerospace systems and components. As such, applications range from optimal design of aircraft system architecture and high-performance lightweight structures of fiber-reinforced polymer to optimal parameters for manufacturing systems and optimal flight path design.

This talk will discuss multidisciplinary design optimization and system architecture design exploration of complex aircraft systems. The use of physics-based, parametric modeling and advanced multifidelity surrogating plays central role. The challenges in the application of design exploration and optimization will be outlined and needs for future research in this area motivated.

## BIO

Dr.-Ing. Erich Wehrle leads the Multidisciplinary Design Optimization research group at Collins Aerospace. The team's research focuses on algorithmic support in the design of complex aircraft systems, especially via system architecture exploration and design optimization considering multiple disciplines and physics-based simulation models.

He previously held roles in academia as Assistant Professor at the Free University of Bozen-Bolzano (Italy) and as postdoctoral researcher at the Technical University Munich (Germany) in which his research addressed design optimization of lightweight structures and mechanical systems under a multidisciplinary perspective, including structural analysis, multibody dynamics, crash mechanics and uncertainty. He holds a doctorate and a master in Mechanical Engineering from the Technical University of Munich and a bachelor in Mechanical Engineering from the State University of New York at Buffalo (USA).