TERA2020 - Rationale, Objectives and Design Algorithm

PRESENTER: K. Kyprianidis - Cranfield University
CONTRIBUTORS: B. Lehmayr - University of Stuttgart,
X. Lei - Chalmers University of Technology,
A. Alexiou - National Technical University of Athens

Abstract

A Techno-economic, Environmental and Risk Assessment (TERA) approach during the conceptual and preliminary design process of complex mechanical systems will soon become the only affordable, and hence, feasible way of producing optimised and sound designs, if the whole spectrum of possible impacts (economic, environmental etc) is to be taken into account. To conceive and assess engines with minimum environmental impact and lowest cost of ownership in a variety of emission legislation scenarios, emissions taxation policies, fiscal and air traffic management environments, a TERA approach tool is required. TERA2020 for NEWAC is a software tool that spans aero engine conceptual design and preliminary design. It addresses major component design as well as system level performance for a whole aircraft application. It helps to automate part of the aero engine preliminary design process using a sophisticated explicit algorithm and a modular structure.

TERA2020 considers a large number of disciplines typically encountered in conceptual design, such as: engine performance, engine aerodynamic and mechanical design, aircraft design and aerodynamic performance, emissions prediction and environmental impact, engine and airframe noise, as well as production, maintenance and direct operating costs. Individually developed modules are integrated in an optimiser environment. A large amount of information is available after each design iteration, which can be used for many purposes such as technology impact assessment, sensitivity and parametric studies, multi-objective optimisation etc. TERA2020 minimises internal iterations in order to speed up the execution of individual engine designs by using an explicit algorithm. Environment constraints can be applied through the optimiser, to determine the acceptability/feasibility of each engine design, and then home in on the best engines according to user specified objective functions.