23rd Conference of the Italian Association of Aeronautics and Astronautics
AIDAA2015
Politecnico di Torino, 17-19 November 2015
E. Carrera, M. Cinefra, A. Pagani, M. Petrolo and E. Zappino (Editors)
www.aidaa2015.it

THERMAL INVESTIGATION OF A NACELLE INTERNAL AND EXTERNAL FIELDS IN PUSHER CONFIGURATION

Antonio Carozza, Giuseppe Mingione, Gennaro Serino, Giuseppe Pezzella,

Dipartimento di Meccanica dei Fluidi,
Centro Italiano Ricerche Aerospaziali, Capua, Italia, 81043
e-mail: a.carozza@cira.it , web page: http://www.cira.it

Abstract. *The ESPOSA project "Efficient Systems and PrOpulsion for Small Aircraft" funded by the European Commission within the 7th Framework Programm and coordinated by PBS from the Chezk Repubblic and with the participation of 40 European industries, research center and universities has the objective to develop and integrate novel design and manufacture technologies for a range of small gas turbine engines up to 1000 kW, to provide aircraft manufacturers with better choice of modern propulsion units. Several aircraft and engine have been selected as test beds for the study. One of this was the EM-1 ORKA aircraft that will be equipped with the 180kW TP 100 turboprop engines from Czech company PBS Velká Bíteš . An aeronautical engine is a complex machine composed of different components operating at different temperatures that in conjunction with the nacelle creates a crowded region with the coupled heat transfer mechanisms to be covered by the nacelle cooling/ventilation system, therefore one of the critical issues is the engine/nacelle coupled thermal study. High fidelity, fully coupled, "aero-thermal" models must be addressed in the design process of such a kind of engine. In this paper a procedure has been set-up and tested to evaluate nacelle temperature and check that nacelle skin temperature remains under critical values.*

Key words: heat conduction, nacelle thermal analysis, heat radiation, conjugate heat transfer analysis, computational fluid dynamics.

1. Symbols

GTE	Gas Turbine Engine
ESPOSA	Efficient Systems and Propulsion for Small Aircraft
$\vec{v}$	velocity vector [m/s]
ρ	density[kg/m^3]
μ	viscosity[Pa· s]
α	thermal diffusivity[m^2/s]