



CISB

CENTRO DE
PESQUISA E INOVAÇÃO
SUECO-BRASILEIRO



7th Annual Meeting 2017



Results, challenges and perspectives of Chalmers University of Technology Chairs at ITA

Olivier Petit, Chalmers

Tomas Grönstedt, Chalmers

Jesuíno Takachi, ITA

Overview

- *Collaborative area of research*
- *Collaborative projects*
- *Activities outside ITA*

Activities on turbine cooling

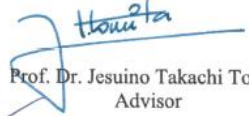
- *T. Grönstedt co-advisor*
- 6-month stay at Chalmers university
- *State-of-the-art cooling concept studied*
 - *pin-fins, impingement and film cooling combined*
 - *heat transfer terrible to predict*
 - *surely instationary when resolved*
 - *prep. for future rig*
 - *continuation on work started at Chalmers*
 - *ITA Student leading: Lucilene Moraes da Silva*
 - *ITA supervisor professor J.T. Tomita*

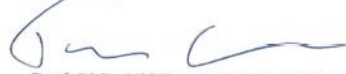
Thesis presented to the Instituto Tecnológico de Aeronáutica, in partial fulfillment of the requirements for the degree of Doctor of Science in the Program of Engenharia Aeronáutica e Mecânica, Field of Aerodinâmica, Propulsão e Energia.

Lucilene Moraes da Silva

NUMERICAL INVESTIGATION OF FILM AND IMPINGEMENT
COOLING TECHNOLOGIES APPLIED IN AEROENGINES

Thesis approved in its final version the signatories below:


Prof. Dr. Jesuino Takachi Tomita
Advisor


Prof. PhD. Ulf Tomas Joakim Grönstedt
Co-advisor

Prof. Dr. Pedro Teixeira Lacava
Prorector of Graduate Studies and Research

Campo Montenegro
São José dos Campos, SP – Brazil
2017

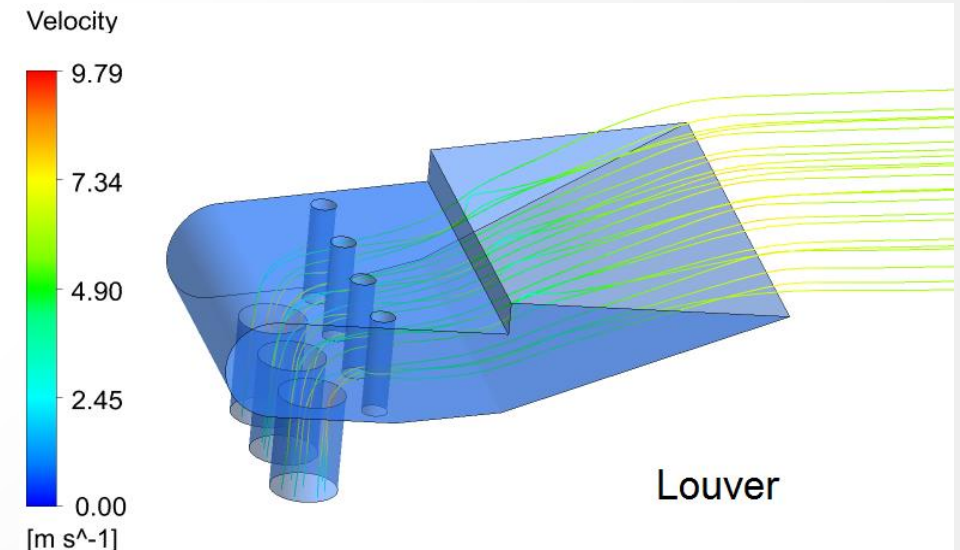
Activities on turbine cooling

- *Draft paper on advanced cooling schemes finished*
- Submitted to AESCTE (Aerospace Science and Technology)
- *State-of-the-art cooling concept studied*
 - *pin-fins, impingement and film cooling combined*
 - *heat transfer terrible to predict*
 - *surely instationary when resolved*
 - *prep. for future rig*
 - *continuation on work started at Chalmers*
 - *ITA Student leading: Lucilene Moraes da Silva*
 - *ITA supervisor professor J.T. Tomita*

NUMERICAL INVESTIGATION OF FILM COOLING HOLES AND IMPINGEMENT COOLING SCHEMES FOR GAS TURBINE APPLICATION

Lucilene Moraes da Silva
Jesuino Takachi Tomita
Cleverson Bringenti
Aeronautics Institute of Technology (ITA)
São José dos Campos, Brazil

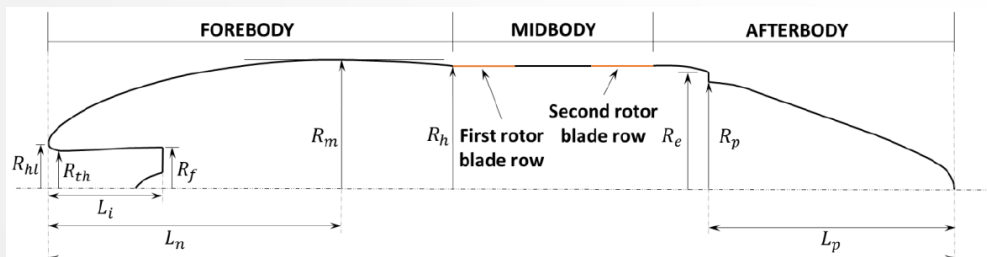
Tomas Grönstedt
Chalmers University of Technology
Göteborg, Sweden



Nacelle

- *How does nacelle shaping influence propeller design range*
- *Optimize nacelle for open rotor installation*
 - *Prepare for joint optimal design (aero on blades and nacelle)*
- *Presented at ISABE conference in London 2017*
 - *ITA student ravel scholarship by CISB*
- *ITA Student involved:* Vinícius Tavares Silva, Lucilene Moraes da Silva
- *Chalmers involvement:*

T. Grönstedt, O. Petit, A. Capitão Patrao



ISABE-2017-22653

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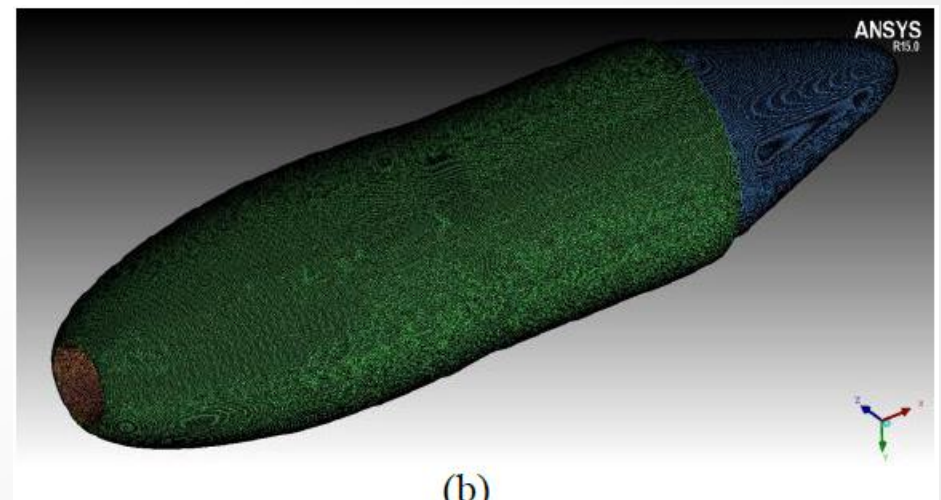
Numerical Simulation of Nacelle Flowfield for Counter-Rotating Open Rotor Propellers

Vinícius Tavares Silva, Lucilene Moraes da Silva, Jesuino Takachi Tomita and Cleverson Bringhenti
viniciustasil@gmail.com

Aeronautics Institute of Technology
Turbomachines Department
São José dos Campos
Brazil

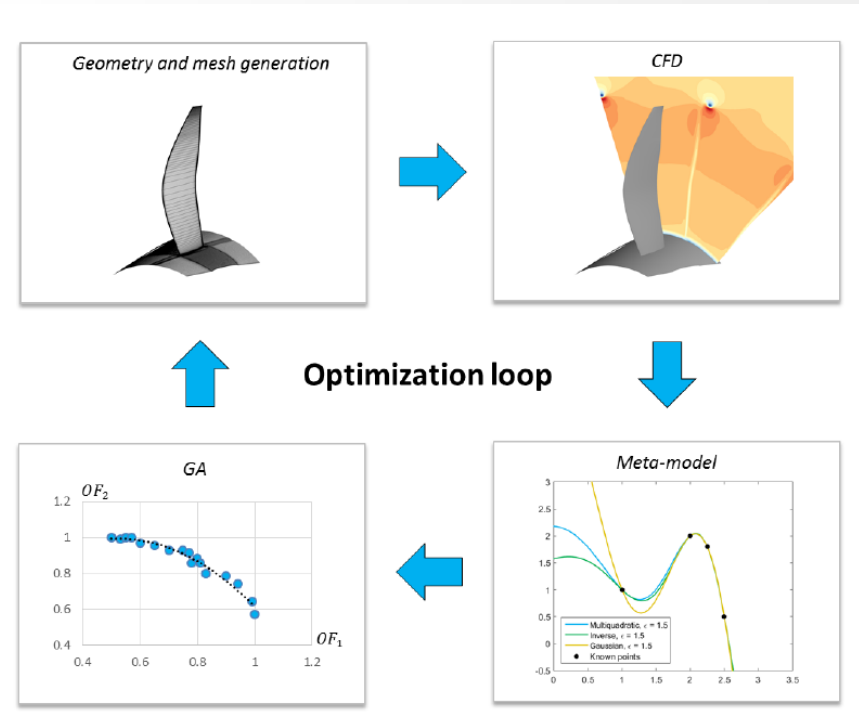
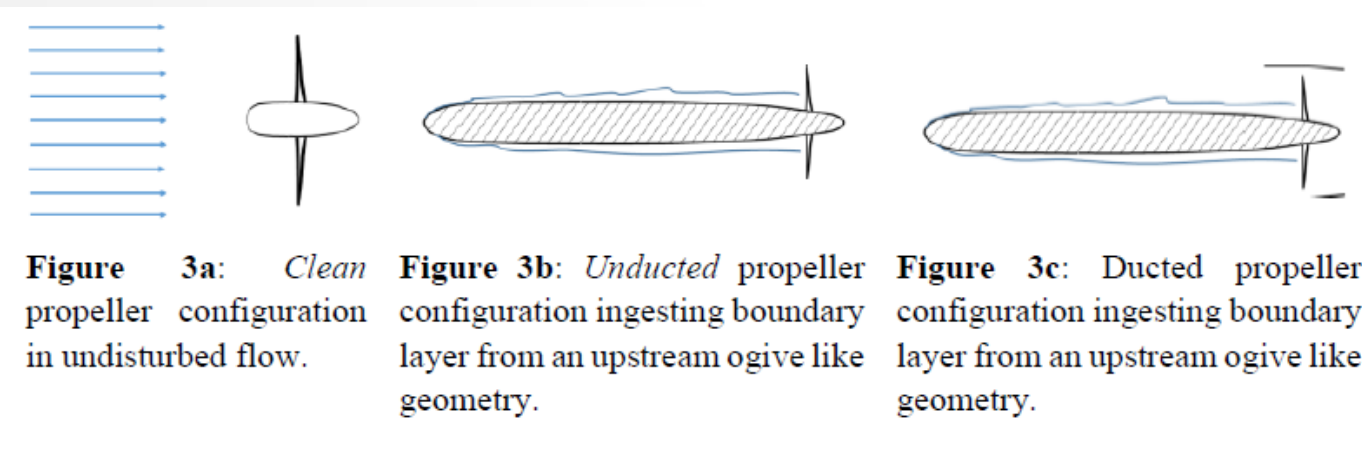
Tomas Grönstedt, Olivier Petit and Alexandre Capitao Patrao

Chalmers University of Technology
Department of Mechanics and Maritime Sciences
Gothenburg
Sweden



INFLOPROP Project

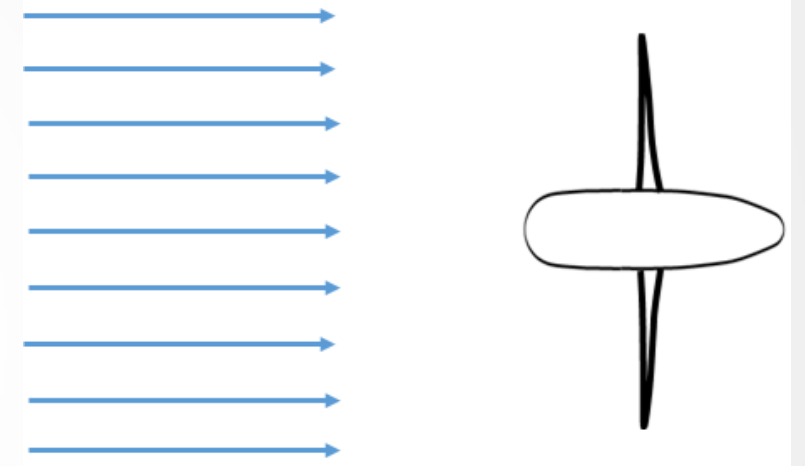
- *Approved project, conjoint financing from FINEP and VINNOVA*
- *Boundary Layer Integration project*
- *Olivier Petit, Chalmers project leader*
- *Collaborative project between EMBRAER, ITA, Chalmers and GKNAES*



INFLOPROP Project

Propeller optimal design

- *ITA Student to be hosted: Fabiola Costa.*
- *Visit to Chalmers University in November.*
- *Develop first high speed propeller concept for proposed Embraer collaborative project (described below).*
- *First demonstration of our joint optimization platform (FT2016 paper).*



Patrao, C. A, Villar, M. G., Tomita, J., T., Bringhamti, C., Avellán, R., Lundbladh A. and Grönstedt T. “An Optimization Platform for High Speed Propellers”, ATC, Paper 24545.



AEROSPACE TECHNOLOGY CONGRESS 2016

Swedish aerospace technology in a globalised world

October 11-12, 2016 - Solna - Stockholm

INFLOPPROP Project

Overview of Propeller design - publication

- *Method paper to describe propeller design*
- *Planned to submit at ASME turboExpo 2018 in OSLO*
- *ITA Student involved: Gustavo Bonolo de Campos, Fabiola Costa*
- *Chalmers involvement: Olivier Petit, Tomas Grönstedt*

Propeller optimal design - publication

- *Develop and optimize first high speed propeller concept for proposed Embraer collaborative project (described below).*
- *Planned to submit at ASME turboExpo 2018 in OSLO.*
- *ITA Student involved: Fabiola Costa.*
- *Chalmers involvement: Olivier Petit, Alexandre Capitão Patraão.*

INFLOPROP Project

Perspectives and challenges

- *VINNOVA financing is solved.*
 - *Participants approval in place*
 - *Start report submitted*
- *Consortium agreement negotiation on-going.*
 - *Challenging to meet the FINEP deadline of 31st October.*
 - *Challenging to sign Brazilian/English agreement for Swedish partners.*
 - *Hope for FINEP financing to be solve by early 2018.*

Noise measurements on Boxprop

- *Collaboration with professor F. Catalano's group*
- *Short first trip in March 2017 to draft plans for joint measurements.*
 - *Preliminary measurements indicate noise reduction for Boxprop*
- *External examiner on master thesis (Leandro Falcao)*



The VINK project

- *Strategic step for collaboration.
NO ITA involvement at this stage*
 - *Building block for further collaboration in place*
- *Whole chain for compressor design*
- *Chalmers, LTH, KTH, GKN*
- *Complete CAD geometry released for compressor.*
 - *Geometry now on WEB*
 - *High Speed Booster Design Data, github.com/nikander/VINK*
- *Starting point for new loss modeling paper being planned.*
- *Presented at ASME 2017, T. Grönstedt*

Proceedings of ASME Turbo Expo 2017: Turbine Technical Conference and Exposition
GT2017
June 26-30, 2017, Charlotte, United States

GT2017-64466

MULTIDISCIPLINARY DESIGN OF A THREE STAGE HIGH SPEED BOOSTER

Marcus Lejon*

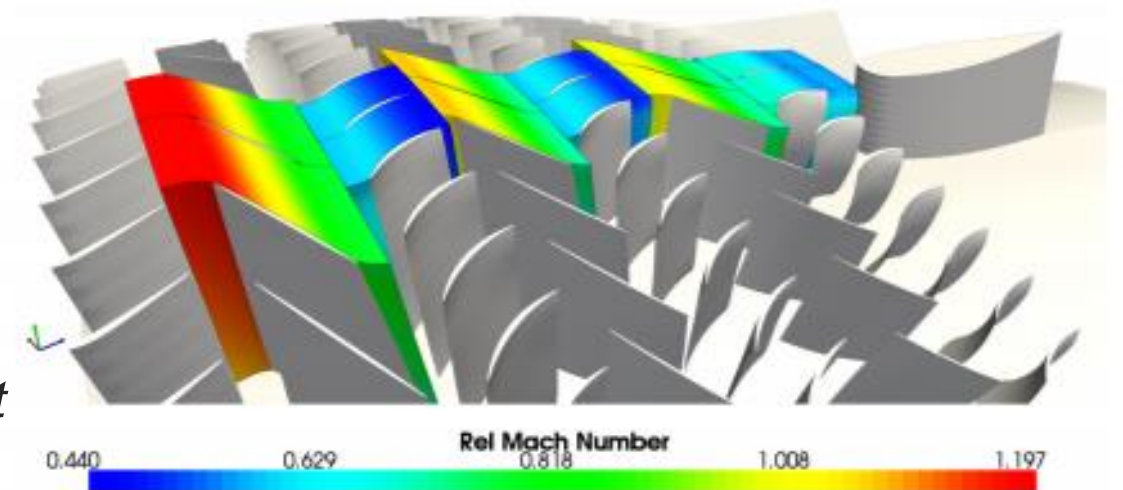
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Tomas Grönstedt

Department of Applied Mechanics
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Gothenburg, Sweden

Nenad Glodic

Paul Petrie-Repar
Department of Energy Technology
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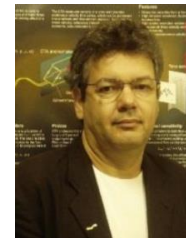


Activities outside ITA

- *Study visits & networking*
 - *Itajubá*
 - *Gavião Peixoto*
 - *Taubaté, GE*
- *USP – Sao Carlos*
 - *Rindo tunnel*
 - *Aero acoustic instrumentation*
 - *Measure noise planned*

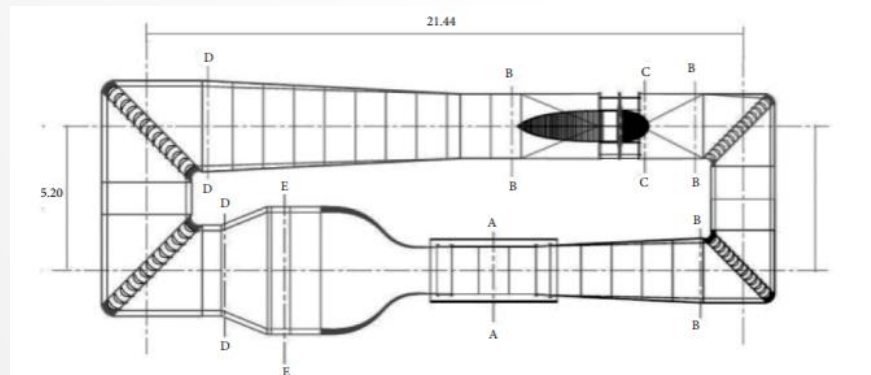


Gavião Peixoto (SP)



P. Catalano (also at ICAO meeting)

Universidade de São Paulo, Departamento de Materiais Aeronáutica e Automobilística



Student collaboration Embraer

- *visit in May 2017*
 - *Lecture on challenges on propeller installation for civil aircraft (based on ITA/Chalmers activities)*
 - *Create interest in professional master program*
 - *Supervise master students on such topic (co-supervised with Embraer staff / ITA staff and Chalmers staff)*
 - *Create summer internship for Chalmers students during 2018*

CHALMERS

