

DISSEMINATION OF KNOWLEDGE PLAN

Research title: Application of thermoplastic materials for improvement of structural performance of aerostructures

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Thematic area: Green Aviation/New Concepts in Aeronautics

ITA Graduate Program of Aeronautical and Mechanical Engineering, Field of Aeronautical Design, Structures and Aerospace Systems-PG-EAM-1.

1 Impacts of the Mission on the PG-EAM Program

1.1 Dissemination of knowledge

The course AE-206 “Manufatura e Fractografia de Compósitos Poliméricos Estruturais Avançados” will be modified, including new chapters dealing with:

- Welding techniques applied to thermoplastic structural joints.
- Draping simulation and modeling of thermoforming processes.

The objective is to engage graduation students at ITA on relevant research topics, focused on thermoplastic composites applied to aerospace structures.

1.2 Research activities

Consolidation of new collaborative research lines at ITA focused on modeling of thermoforming processes, draping simulation and joining techniques on thermoplastic composites, under the SPIRIT initiative.

The São Paulo Initiative on Research Into Thermoplastic Composites (SPIRIT) is an initiative proposed with the objective of establishing a local network for collaborative research on thermoplastics composites materials, with aim on a long term supply chain collaboration to successfully implement thermoplastic composites aerospace applications. The main goals of the SPIRIT initiative are:

- Create a Brazilian Thermoplastic Composites ecosystem: Embraer, Alltec, ITA, UNESP, LEL-IPT, IAE and Toray Advanced Composites collaboration to stimulate and accelerate thermoplastic composites innovation on Embraer fleet.
- To prepare for future adaptation and application of thermoplastic composites on a larger scale on Embraer platforms (structures and interiors);

- To build a BRAZ local resource pool with in-depth knowledge and experience in thermoplastic composite materials, processes and design;
- To connect this strong BRAZ TPC ecosystem to established thermoplastic composites networks (e.g. University of Twente and TPRC).

1.3 Strengthen of collaboration between University of Twente – ITA

Participation in shared supervision of bachelor and graduation students will allow a greater interaction between the universities, boosting the interchange of students, focused on research topics of common interest. The results of such collaboration shall be consolidated by publications on journals and international conferences on the field.

1.4 Evidence of on-going collaboration between University of Twente – ITA

Since 2017 a double degree program is running between the two institutes, where students defended their MSc theses to obtain two diploma's: one from the University of Twente (Ir. or MSc Mechanical Engineering), and the second from the Instituto Tecnológico de Aeronáutica (ITA) (MSc Aeronautical & Mechanical Engineering). In 2017, three students from University of Twente travelled to Brazil after they had finished their MSc courses in Twente for another series of courses at ITA and a research project to finalize their master in 2018.

- Bart van den Akker studied the performance of post-buckling fatigue loaded panels with co-bonded stiffeners under the supervision of Prof. Maurício Donadon and Dr.Ir. Richard Loendersloot as UT co-advisor;
- Pim Waasdorp studied the behaviour of streaks in the turbulent and shear layer of a panel with a backward facing step, supervised by Prof. André Cavalieri and with Dr. Leandro de Santana as UT co-advisor;
- Joran Driesen studied the experimental characterization of a Shape Memory Alloy wire actuator, under supervision of Prof. Luiz Góes, Dr. Osmar Santos and Dr.ir. Richard Loendersloot as UT co-advisor.