CISB | CENTRO DE PESQUISA E INOVAÇÃO SUECO-BRASILEIRO

Cooperation Brazil-Sweden In Aeronautics and Defence


PROGRESSO

INTRODUCTION

Aeronautics is a highly strategic area of technology both for Brazil and Sweden. Brazil is one of the four most prominent producers of civil aircraft in the world. Sweden, on the other hand, is a very successful producer of military aircraft as well as a supplier of assemblies for civil aircraft.

Additionally, aeronautics is an industry, which heavily relies on advanced technologies with strong spillover effects extended not only to its core technologies but also to a whole cloud of technology surrounding it, extending far beyond the aeronautical area, e.g., automotive industry, ICT and many others.

The full impact of aeronautical R&D explained by Eliasson (2010)[1] aeronautical R&D represents a very important component in national innovation systems. To take it into a more real perspective, Eliasson uses a “spillover multiplier” to quantify the spillover effect in the Gripen project to at least 2.6, meaning that for every Swedish Crown investment in its development, 2.6 dollars came back to the society.

Given the extensive industrial collaboration between Brazil and Sweden currently initiated in this field, it is also critical to have strong collaboration in key academic research areas together with industry. Ambitions, throughout Brazil and Sweden are to acquire capabilities to develop the next generation of aircraft. By fostering research and innovation relations, there is a unique long term opportunity to develop these capabilities through collaboration.

[1] Gunnar Eliasson, Public Procurement as Industrial Policy; SAAB, Stockholm, May 24.2010

FOSTERING THE COOPERATION

The Swedish-Brazilian Research and Innovation Center (CISB), which is an open innovation arena and also a reference in the internationalization of R,D&I between Brazil and Sweden, has launched calls to select proposals for financial support to international missions. This enables researchers to meet potential partners abroad to visit their research groups and allows for discussions and design of joint projects between Brazil and Sweden within the Aeronautical and Defence sectors.

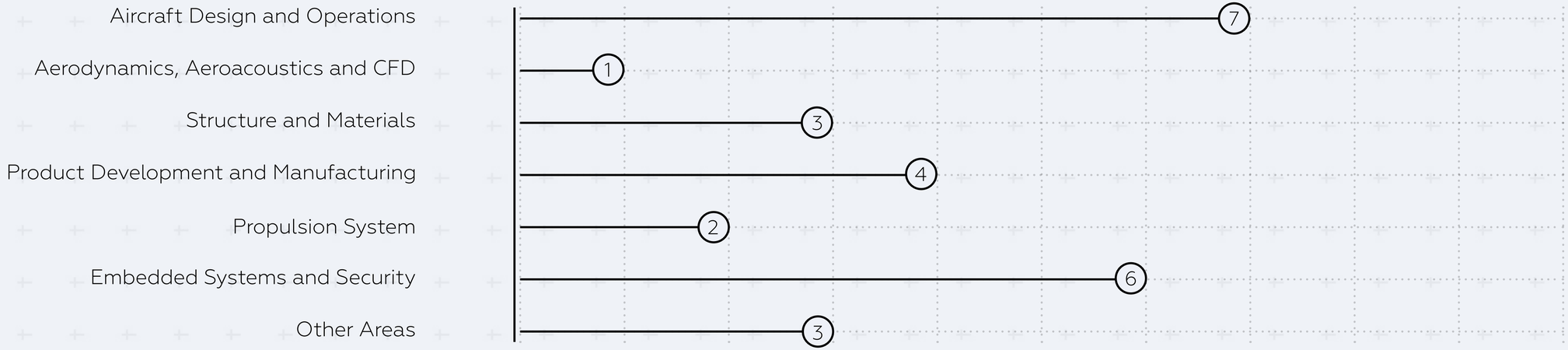
The aim is to integrate industrial and academic partners from both countries in order to develop an R,D&I agenda to strengthen relations between the institutions, promote and contribute to the creation of networks that ensure long-term collaboration while promoting innovation in the area of Aeronautics and Defence in Brazil.

The CISB initiative of launching calls came during the planning of the 1st Brazilian Swedish Workshop in Aeronautics and Defence, as the great interaction among participants pointed out the need to encourage and provide the continuity of the discussions of such ideas. The calls represent an innovative format of support since CISB is financing international missions based on the core concept of “seed money” that enable researchers from Brazilian institutions to go to Sweden and researchers from Swedish institutions to come to Brazil.

These are the first areas identified for collaboration: Aircraft Design and Operations; Aerodynamics, Aeroacoustics & CFD; Structures and Materials; Product Development and Manufacturing; Propulsion Systems; and Embedded Systems & Security.

A Total of 26 Proposals Were Approved

Number of Approved Proposals x Main Areas



Total Number of International Missions

To Sweden

42

To Brazil

Description of Approved Proposals

Project 01

Techniques of security and software engineering for development of aeronautics embedded systems

Abstract: The main technological areas include Security and Software Engineering for Embedded Systems development in Aeronautics industry. The goal is to investigate research projects topics that lead to projects in embedded systems and security. Nowadays, there are many approaches and techniques addressing the issues in a variety of disciplines, including: Software Engineering, Formal Methods, Real-time Systems, and Security. However, in aeronautics industry, special attention must be given due to strict security and safety requirements. In Brazilian aeronautics industry, there is a growing need of having a more effective competence in these areas. In many reports and white papers, it is recognized that the knowledge in these areas is critical to the success of many Brazilian technological programs. The expected results are processes, workflows, architectures, design techniques, and software to help the development of embedded systems, with special concern to security for the industrial partners. It is expected that the results will contribute to aeronautics industry in its ability to develop challenging projects in these areas.

Project Area

Embedded systems and security

Main Applicant

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Leader Institution(s)

ITA – Technological Institute of Aeronautics

Partners

ITA – Technological Institute of Aeronautics
KTH – Royal Institute of Technology
LiU – Linköping University
EMBRAER
Saab AB

Project 02

Techniques for software development of aeronautics embedded systems

Project Area

Embedded systems and security

Main Applicant

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Leader Institution(s)

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Partners

LiU - Linköping University
ITA - Technological Institute of Aeronautics
EMBRAER
Saab AB

Avionic systems of today are undergoing a revolutionary change with addition of more complex software and hardware, e.g. multi-core processors, and networking in systems of systems. In this collaborative project we will explore the possibilities of collaboration between the teams at ITA and the Real-time Systems Laboratory within Dept. of Computer and Information Science at Linköping University. The topics of collaboration and subjects of presentations range over four areas: a) Reusable models and platform-based development for avionic architectures, b) Risk-based analysis of safety and security using system models and models of attacks or threats to safety, c) Evaluation of time-determinism in integrated modular avionics (IMA) systems with multi-core processors, and d) Architectural modelling languages enabling description of complex fault modes, and their efficient formal analysis for evaluation of fault tolerance properties.

Project 03

Intelligent Flight Simulator Project

Project Area

Other areas

Main Applicant

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Leader Institution(s)

UFABC – Federal University of ABC

Partners

UFABC – Federal University of ABC
LiU – Linköping University
Spectra Tecnologia
Municipality of São Bernardo do Campo

Flight simulators are extensively used for pilot training and also for research in various aerospace subjects, particularly in flight dynamics and man-machine interaction. These pieces of engineering range from the simplest ones, which resemble video games, to the high-end civil full flight simulators and military full mission simulators with wide-view high-resolution visual systems. Commercial and military flight simulators are used to help training of pilots and crew. These devices use the most advanced technology, having motion platforms for cues of real motion. Platform motions complement the image display and are very important in creating a virtual sensation of flying. For example, in cloud, external visual cues are non-existent and cues of real motion are even more important. An important component in the project are the hydraulic actuators, and in the state of the art in this subject are the variants of the six-jack Stewart platform for cues of initial acceleration. Modern platforms can provide about 35o of the three rotations pitch, roll and yaw, and about one metre of the three linear movements heave, sway and surge. The objectives of this project are: 1) develop an intelligent system (software) that can adapt to a given number of flight parameters in order to support variations during development in airplane design; 2) build a concept model by attaching these pieces of software to electromechanical control system; 3) included in the model are the display systems, which will not be developed, but chosen from available technology. We expected to get a test model that allows us to test the main developed ideas and their settings, as well as a basis for the development of a complete and thorough project.

Project 04

Simulation of Composites for applications in the aeronautical industry

Project Area

Product development and manufacturing

Main Applicant

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Leader Institution(s)

FCC - Fraunhofer Chalmers Centre

Partners

Chalmers University of Technology
USP - EESC - University of São Paulo
Saab AB

The use of structural composite materials in the design of aircraft structures is increasing as a result of the demand for cost efficient solutions. The use of composite materials can reduce the overall weight of the aircraft and it can also reduce the number of individual parts to be assembled by providing larger, more integrated parts. In this project proposal, we will investigate the possibility of simulating process variations of manufacturing of structural composites followed by geometry assurance using variation simulations. The specific composite and process and assembly simulations are to be coordinated with the industrial partner (Saab AB). As an example, the process simulation may include an infusion process by simulating the free surface resin flow. We may also investigate the curing process and how this affects the resulting structural properties. In all simulations, a focus is to acquire accurate solutions for the final non-nominal geometry.

Project 05

Project Area

Embedded systems and security

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Leader Institution(s)

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UNICAMP – University of Campinas

Partners

ITA – Technological Institute of Aeronautics
UNICAMP – University of Campinas
KTH – Royal Institute of Technology

Dynamic adaptive real-time embedded systems and accelerated test

Considering that avionics industry moves towards the integrated modular avionics (IMA) adoption, this proposal addresses the “dynamic adaptive real-time embedded system”. A number of works can be found in the literature considering reconfigurable real-time embedded systems. Just to mention some, there are the ERA project (Embedded econfigurable Architectures); MORPHEUS project (Multi-purpOse dynamically Reconfigurable Platform for intensive HEterogeneoUS processing); and ACROSS Project (ARTEMIS CROSS-Domain Architecture). Some critical systems are expected to present at maximum, one failure in 109 hours. One procedure to produce failure results in a reasonable time is to use accelerated test methods. It is an innovative procedure, scarcely mentioned in technical literature. One of the proponents has a previous experience in accelerated test of a CMOS memory, using radiation.
One of the goals is to achieve system reconfiguration to deal with the dynamic real-time evolution of the target system (i.e. redundancy/safety in avionics systems). Moreover, it is being planned to explore/investigate some heterogeneous configurations like safety-critical multiprocessor System-on-Chip (MPSoC) and even network on chip (NoC) using low-power high-performance FPGAs to tackle the hardware reconfiguration aspect. The dependability aspects of FPGA-made architectures (reconfigurable architectures and other architectures with FPGAs) will be tested by accelerated test methods. From the system design point-of-view, MBD (model-based design) could be used taking advantage of UML MARTE (Modeling and Analysis of Real-time Embedded Systems) and SysML (Systems Modeling Language). Therefore, the reconfigurable computing applied to avionics real-time embedded systems can expand system processing power, safety, scalability, and redundancy. Also, the accelerated test will allow system-engineering level experimental comparison among possible architectures. It is expected that the system will be able to adapt itself regarding time (e.g., scheduling reconfiguration) and spatial features (e.g., hardware reconfiguration) and also considering dependability aspects.

Project 06

Towards SMARTer Cities

Project Area

Other areas

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Leader Institution(s)

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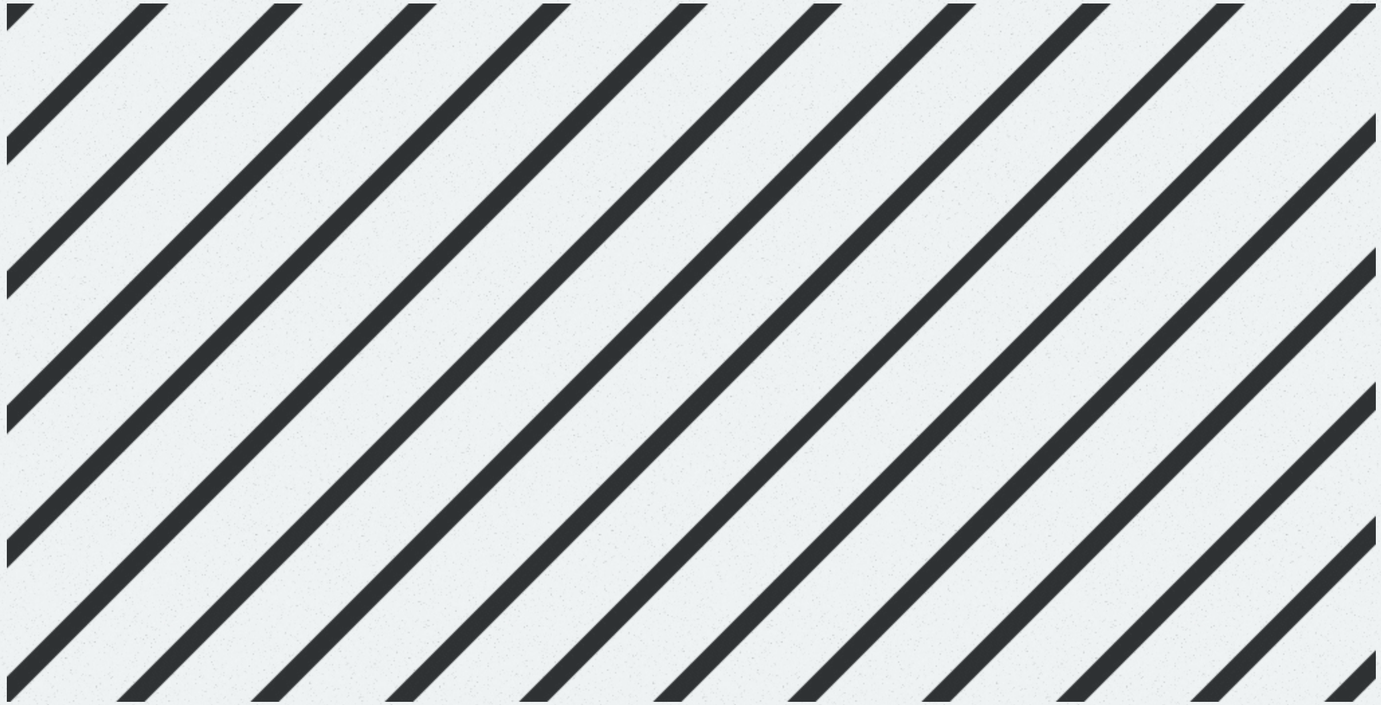
FEI university Center

Partners

UFABC – Federal University of ABC
KTH - Royal Institute of Technology
LeverTech



Project 07

Conceptual design of advanced military engine

The project will initiate work on a Chalmers/ITA/MDH/SAAB simulation platform for future military engine conceptual design through two ITA master students. The project will also support developing a larger project on conceptual design targeting year 2035+ power plants.

Project Area

Propulsion system

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Leader Institution(s)

Chalmers University of Technology

Partners

ITA – Technological Institute of Aeronautics
Chalmers University of Technology
MDH – Mälardalen University
Saab AB

Project 08

Artificial Bandits and Wigmen

Project Area

Embedded systems and security

Main Applicant

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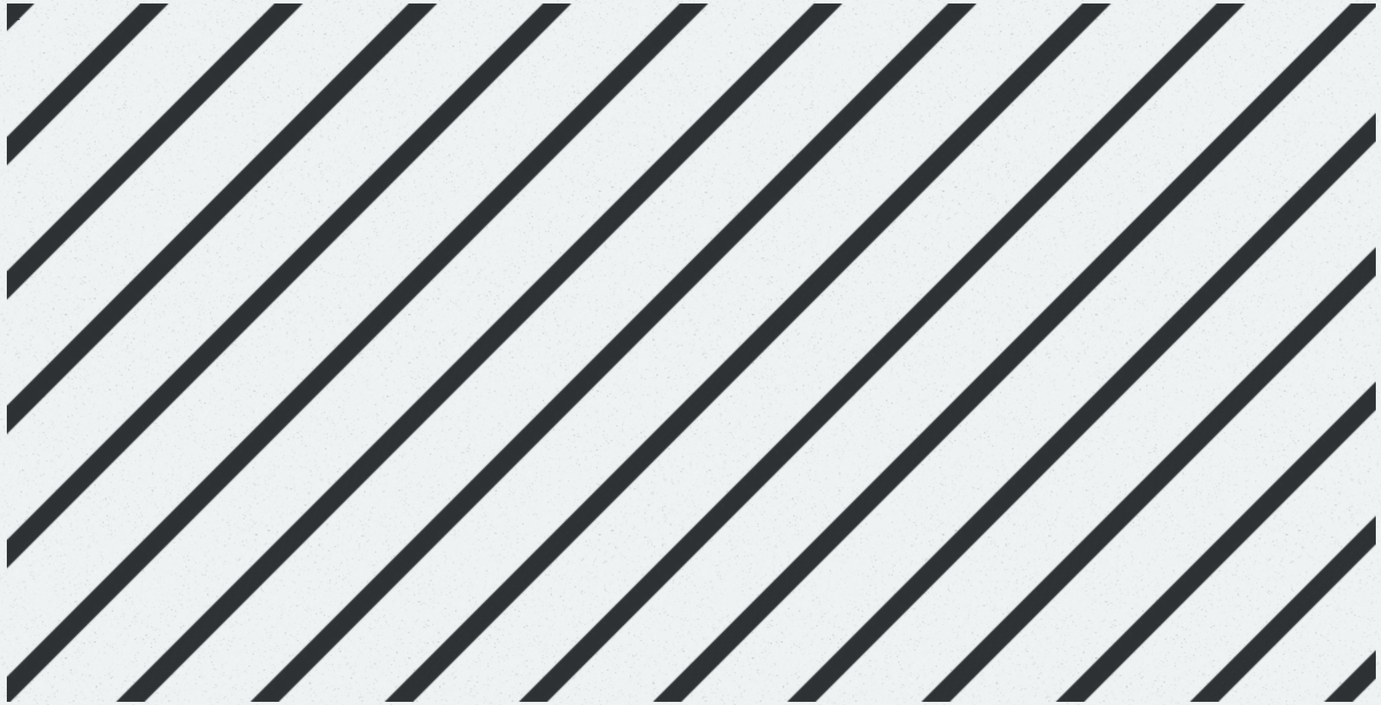
Leader Institution(s)

KTH - Royal Institute of Technology

Partners

ITA - Technological Institute of Aeronautics
KTH - Royal Institute of Technology
Saab AB
AEL Sistemas



Project 09

Verification of Fault-Tolerant Embedded Systems with Reconfigurable SelfHealing Hardware using a Correct-by-Construction Design Flow

HAPs (High Altitude Platforms) offer a promising new technology that combines the benefits of terrestrial and satellite communication systems for the delivery of broadband communications to users at a low cost. Designers face the challenges of constructing such systems because the design process is costly and time-consuming, in particular because of verification and validation difficulties. HAPs are highly sensitive to failures in software, hardware or guidance sensors and actuators. Realtime fault diagnosis and intelligent fault-tolerant hardware systems are very important to improve the reliability of these systems. Therefore, new design methods and tools are needed to aid developers to ensure the consistency of such complex systems and exploit advanced hardware platforms. The main goal of this project is to use a correctby-construction design flow in order to perform the design and verification of faulttolerant embedded systems with reconfigurable self-healing hardware. In particular, two main applications will be used. The first one is a HAP and the second one is a controlled parachute guidance system for delivering payloads.

Project Area

Embedded systems and security

Main Applicant

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Leader Institution(s)

UnB – University of Brasilia

Partners

UnB – University of Brasilia
KTH – Royal Institute of Technology
Ruhr-Universität Bochum
Saab AB
DFChip

Project 10

Logistics and Maintenance Engineering Lab

Project Area

Aircraft design and operations

Main Applicant

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Leader Institution(s)

LTU - Luleå University of Technology

Partners

Technological Institute of Aeronautics - ITA
LTU - Luleå University of Technology
ILA - Institute of Aeronautics Logistics
Saab AB
AKAER Aeronautical Engineering Company
Systecon AB

For more than 50 years, the Instituto Tecnológico de Aeronáutica - ITA is recognized as reference in terms of Aeronautics and Airspace Engineering in Brazil. However, it is also noticed that some fundamental areas of expertise are not receiving the same level of attention if compared with the ITA's past as well as with some of ITA's competitors. Recently, It was found quite important not to miss the opportunity related to major Defense Programs that the FAB and Industry (Saab and Embraer) will have to manage and support for the next 30-50 years in terms of Logistics and Maintenance Engineering. The Saab Gripen NG Program and the Embraer KC-390 Program both have all their life-cycles ahead and lots of costs involved to supporting them. It is possible that the Brazilian Air Force alone would not be able to properly and comprehensively study the problem and, consequently, there is a huge potential for applied research in the areas of logistics engineering, maintenance engineering and systems engineering, all related to the development of these two Weapon Systems (among others) and their Logistic Support Systems. The proposal is to develop a Laboratory with Systems like the Gripen, the KC 390, and their Logistics Support described and decomposed to the component level in terms of all Reliability, Availability, Maintainability and Safety Factors (RAMS Factors) and cost performance. Everything embedded in one or more appropriate Software Tools to work as a Logistic and Maintenance development rig, platform or model. This laboratory would serve both for the development of practical and applied research on a really big problem for the Brazilian Air Force (FAB), for Embraer and for Saab, but also with potential for the development of vast academic research.

Project 11

Maintenance Planning Methodologies for Military Aircraft

The purpose of this research is to develop decision support methodologies and tools for military aircraft scheduled maintenance development, in order to facilitate and enhance the capability of making effective and efficient decisions and thereby achieve a more effective maintenance program.

Project Area

Aircraft design and operations

Main Applicant

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Leader Institution(s)

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Partners

ITA – Technological Institute of Aeronautics
LTU – Luleå University of Technology
ILA – Institute of Aeronautics Logistics
Saab AB
AKAER Aeronautical Engineering Company

Project 12

Project Area

Embedded systems and security

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Leader Institution(s)

UFRGS – Federal University of Rio Grande do Sul

Partners

UFRGS – Federal University of Rio Grande do Sul
PUC Minas – Catholic University of Minas Gerais
KTH – Royal Institute of Technology
Saab AB
EMBRAER

Structuring a cooperation in three research and innovation project proposals

This project aims at reinforcing and establishing a formal cooperation between Brazilian and Swedish academic and industrial partners in the area of software and systems for avionics. This project is a follow-up to the 1st Brazilian Swedish Workshop in Aeronautics and Defense, where we have discussed and agreed on a number of topics of common interest that will be detailed in the mission supported by this grant. The goal of this first mission is to exchange more detailed information about respective expertise among Brazilian and Swedish partners. Moreover, specific research, innovation and social challenges will be discussed towards the preparation of a formal plan of cooperation to be submitted to future funding calls. The three research and innovation projects considered in this proposal cover both technical and non-technical aspects of the Brazilian-Swedish cooperation:

i) Requirements management, validation and verification of avionic software Systems;
ii) Early performance analysis for avionic platforms;
iii) Cultural differences and women in avionics.

Project 13

Design and Commissioning of a Snake Robot for Aeronautical Manufacturing Operations

An experimental 10 degree-of-freedom snake robot has been designed and built at ITA for operating in confined aeronautical spaces such as wings. A number of functions have been already implemented: trajectory planning, FOD, side stick control and off-fine programming. The aim of this project is to design and build a second generation of such a robot that will have 7 degrees of freedom, more robust motors and links to attend other aeronautical manufacturing operations, namely sealing aero parts and installing aero fasteners.

Project Area

Product development and manufacturing

Main Applicant

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Leader Institution(s)

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Partners

ITA – Technological Institute of Aeronautics
LiU – Linköping University
INTELECTRON
AKAER Aeronautical Engineering Company

Project 14

Advanced civil engine integration

Project Area

Propulsion system

Main Applicant

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Leader Institution(s)

ITA – Technological Institute of Aeronautics

Partners

Chalmers University of Technology
ITA – Technological Institute of Aeronautics
EMBRAER

Short term objectives: contribute to establish a first Chalmers master student Embraer cooperation through two summer interns as described below. Develop cooperative environment between ITA students (undergrad and professional masters) and Chalmer's. Define a larger project on engine integration. Long term objectives: Establish a joint ITA / Chalmers / Embraer cooperation on engine installation and technology assessments for ultra-high bypass ratio engines (geared concepts, open rotor propellers and innovative low noise and integration concepts), through the definition and proposal of a larger project.

Project 15

Hybrid nanostructured composites for enhanced mechanical properties

Project Area

Structure and materials

Main Applicant

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Leader Institution(s)

UFABC – Federal University of ABC

Partners

UFABC – Federal University of ABC
Saab AB

The use of nanostructures, such as nanoparticles, to improve different properties of polymeric materials has been an important research subject in recent years. Nanoparticles such as nanoclays, carbon nanotubes or nanosilicas have shown to improve mechanical, thermal and many other physical properties not only in polymeric materials, but in fiber reinforced composites as well. Even though fiber reinforced polymer nanocomposites are materials with great mechanical properties for most applications, they still have some drawbacks, such as not so high impact strength, risk of delamination, among others. Different strategies have been used for improving the impact strength of laminated composites, such as blending with rubber particles or decreasing interfacial adhesion for improved fiber pullout mechanism. Another possibility is using nanoparticles, which in certain situations can improve the toughness of the matrix, as well as other mechanical properties, such as elastic modulus or mechanical strength. However there are still some challenges to overcome, such as the need to improve the dispersion and control the orientation of the nanoparticles in the nanoscale. One possibility is to prepare hybrid composites containing multiple nanoparticles, with structures and shapes that, when combined, can promote synergistic effects not available when using a single nanoparticle type. This strategy can be further improved by applying external fields, such as electrical or magnetic, to make the particles align in one, two or even three desired directions, in combination to 3D fiber reinforced composites. Very recent preliminary studies from my group on epoxy nanocomposites have shown that the combination of different nanoparticles shows improved properties over single nanoparticle counterparts. Therefore these studies can be further developed by including the effects of the addition of multiple nanoparticles to 1-, 2- or 3-dimensional fiber reinforced composites, in order to improve properties such as mechanical strength and toughness. Focusing on these ideas, this project proposes to study the effect of mixed nanoparticles on the mechanical properties of fiber reinforced laminated composites.

Project 16

Project Area

Aircraft design and operations

Main Applicant

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Leader Institution(s)

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Partners

ITA – Technological Institute of Aeronautics
LiU – Linköping University
USP – EESC – University of São Paulo
Saab AB
EMBRAER

Supersonic Aerodynamics for Aircraft Conceptual Design – Development of Computational Tools

This project aims to add a high fidelity tool, that calculates supersonic aerodynamic coefficients, on SANCA program that was developed earlier by Prof. Alvaro Abdalla (EESC-USP) in your Post-Doctoral work at the Linköping University / Sweden. The tool should establish current and new methodologies that predict aerodynamic coefficients at supersonic conditions. For new methodologies wind tunnel and CFD data will be referenced to validate the method. The tool will be developed by coordinated activates among Linköping University (LiU), School of Engineering of São Carlos (EESC-USP), Technological Institute of Aeronautics (ITA), SAAB and EMBRAER.

Project 17

Development of 3D Printing of Metallic Parts for the Aircraft Industry

Project Area

Product development and manufacturing

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Leader Institution(s)

ITA – Technological Institute of Aeronautics

Partners

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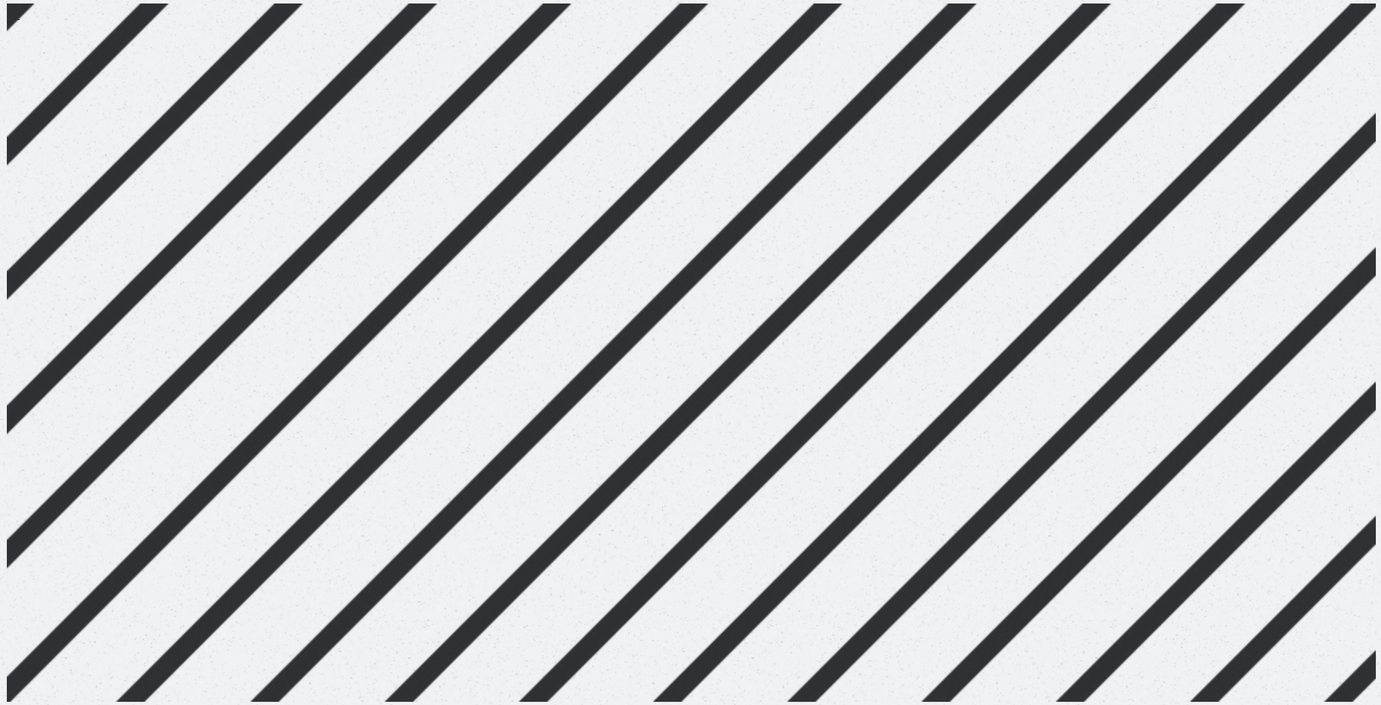
KTH – Royal Institute of Technology
DigitalMetal AB



Project 18

System safety and reliability in the conceptual design phase

Project Area

Aircraft design and operations

Main Applicant

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Leader Institution(s)

LiU – Linköping University

Partners

LiU – Linköping University
LTU – Luleå University of Technology
Saab AB
UFSC – Federal University of Santa Catarina

System safety and reliability have huge impact on design and operation of complex products, such as for example as an aircraft. To better understand how these issues should be addressed in the early stages of development would help optimize both the performance of the system, but also the life cycle cost including operations and maintenance costs. Despite the fact that a lot of research is being conducted within the system safety and reliability domains many challenges still exist. Much focus is on techniques and methodologies applied in different areas (like e.g. nuclear, aviation, hydroelectric power plants, new technologies etc.) but there is little work done on how these methods should be applied in early design stages, or how reliability data could be applied in order to optimize the system from an operations and maintenance perspective, e.g. optimal design for maintainability. Reliability, maintainability and safety are factors that impact the economy and usability during the entire lifecycle. The design phase is the stage at which the characteristics of future systems and products are determined; therefore it is important that designers should take safety, reliability and maintainability into account during the early design work. These are topics addressed in the proposed project. Furthermore, a general objective is to promote long-term collaboration between the partners and specifically to formulate a joint innovative application for further research.

Project 19

Laminar flow design and surface quality requirements (LaFloDeS)

Project Area

Aerodynamics, aeroacoustics and CFD

Main Applicant

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Leader Institution(s)

KTH - Royal Institute of Technology
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Partners

Saab AB
KTH - Royal Institute of Technology
USP - EESC - University of São Paulo

As a large part of the drag of an aircraft (40%) is related to skin friction, decreasing that will have significant effects towards reduction of fuel consumptions, pollution and direct operational costs. One of the viable solutions to achieve lower friction drag is to increase the portion of lifting surfaces and nacelles with laminar flow. This is a relevant issue for the transport aircraft as well as for long-endurance unmanned vehicles. Manufacturing of wings and nacelles with NLF design requires more stringent control of machined and joint tolerances, i.e. surface irregularities such as steps, gaps, surface waviness and surface finish. The present lack of knowledge on acceptable tolerances for NLF finishing standards results in tolerance specifications being over-prescribed at the design stage. This may introduce difficulties during manufacturing, incur additional more expensive machining/manufacturing tools and certainly adds unwanted overheads, for example maintaining the designer specified surface quality during the life-time operation of the surface. Due to increase restriction on fuel consumption, capability of design and manufacturing of NLF wings can strengthen position of an aircraft industry. The project will contribute to improved understanding of requirements for surface irregularity for aircraft with natural laminar flow (NLF). The project will deliver upstream research that will improve the technology base for future innovative concepts and breakthrough technologies that will lead to possibilities for implementation of natural laminar flow technology in the next generation of civil aircrafts. The problem is approached through combined numerical and theoretical efforts. A wide range of numerical tools with different degree of complexity will be used to investigate different flow cases. This includes Direct Numerical Simulations (DNS), Linearized Navier–Stokes computations, global stability analysis.

Project 20

Multicriteria optimization of composite control surfaces and doors

The main objective of the project is to optimize control surfaces and bay doors for minimum weight. Structural design criteria, manufacturability criteria and cost criteria must be included in the optimization procedure. Constraints in terms of stiffness and failure indices must be satisfied. The possibility of using new, but commercially available, materials should be investigated together with AFP automated fiber placement method. A very important outcome of the project is the proposal of innovative methodologies that could be used to optimize composite control surfaces and bay doors. The new methodologies shall be able to handle manufacturability and cost criteria as well as the more traditional structural criteria. The possibility of using new materials shall be considered if these new materials prove to be more flexible from a fabrication point of view.

Project Area

Structure and materials

Main Applicant

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Leader Institution(s)

ITA – Technological Institute of Aeronautics

Partners

Saab AB
AKAER Aeronautical Engineering Company
ITA – Technological Institute of Aeronautics
KTH – Royal Institute of Technology
LiU – Linköping University

Project 21

Future Combat Aircraft Design Study and Demonstration, FADEMO

The objective of this project is the development of a scaled fighter that will serve to test different technologies for future combat aircraft design. This project will serve to bring different groups together to contribute with different subprojects. It will provide an opportunity to further develop subscale prototyping and flight test capability. The activities will be focused in preparation and instrumentation of an existing demonstrator (Generic Future Fighter, GFF at LiU) for a subscale flight test mission including the evaluation os a different sort of technologies and aeronautical design concepts. The result shall lead to the definition of a larger project that would continue to the end of 2016, the GFF2, considering additionally: (i) aeroelastic and dynamic scaling; (ii) prototype with variable (relaxed) static margin; (iii) SAS implementation to fly in a relaxed stability configuration; (iv) model identification on the basis of flight test data.

Project Area

Aircraft design and operations

Main Applicant

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Leader Institution(s)

ITA – Technological Institute of Aeronautics
LiU – Linköping University

Partners

ITA – Technological Institute of Aeronautics
LiU – Linköping University
USP – EESC – University of São Paulo
UFSC – Federal University of Santa Catarina

Project 22

Composite material 3D woven fabric for reinforcement of mechanical joints and other stress concentrations

The objective of the project is to investigate the use of epoxy reinforced with a 3D woven carbon fabric for doublers in (a) mechanical joints and (b) stress concentrators such as openings, lugs etc. The design of these types of structural components is driven by strength. On the other hand, typically, the design of aeronautical structures is driven by stiffness requirements (buckling, natural frequencies, etc.). The main idea of this project is to make the stiffness and strength requirements compatible by locally using 3D fabrics that are not prone to delamination. Better design of these components avoids overdesigning leading to reduction of weight and cost.

Project Area

Structure and materials

Main Applicant

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Leader Institution(s)

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LTU – Luleå University of Technology

Partners

ITA – Technological Institute of Aeronautics
IPT – LEL – Technological Research Institute
LTU – Luleå University of Technology
Biteam AB

Project 23

Off-the-shelf Solutions for Automated Composite Manufacturing

Project Area

Product development and manufacturing

Main Applicant

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Leader Institution(s)

LiU - Linköping University

Partners

LiU - Linköping University
ITA - Technological Institute of Aeronautics
Saab AB
AKAER Aeronautical Engineering Company
IPT - LEL - Technological Research Institute
EMBRAER

Literary reviews of academic publications and studies of current manufacturing facilities of Swedish aerospace companies show that there are two dominating manufacturing approaches for automated composite manufacturing, Automatic Tape Laying (ATL) or Automatic Fiber Placement (AFP). Both ATL and AFP are associated with high investment cost and also limitations to what product geometries are possible to manufacture. There is a need for cost efficient automated solutions that bridge the gap between manual and the domination automation solutions and that is suitable for low and medium production volumes. This project aims at exploring technologies and concepts that can be used for automated handling of prepreg materials and that are suitable for low volume production of aircraft components. The project aim to map other research fields and manufacturing types that today use automated manufacturing equipment and that could be adapted for composite manufacturing. The results will contribute to an improved technological readiness level of existing basic demonstrators. The possibility to perform an explorative study in the Brazilian industrial environment and in collaboration with IPT's and ITAs laboratories, this case will contribute to bridging the research groups in Brazil and Sweden.

Project 24

Project Area

Other Areas

Main Applicant

Prof. Dr. Patrícia Cristina do Nascimento Souto

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Leader Institution(s)

FMU - Metropolitan Faculties United

Partners

KTH - Royal Institute of Technology

Combitech AB

Creating knowledge from the differences: communicating practical knowledge amongst Brazilian and Swedish professionals in Gripen-technology-transfer

The current research project is concerned with how Swedish and Brazilian professionals can fully benefit from each other's practical or experience-based knowledge to enrich and potentiate their creation of knowledge during the Gripen-technology-transfer process. For such, the purpose of the current qualitative research is to deepen and extend the understanding of how Swedish and Brazilian professionals or engineers create knowledge from or make sense of other's practical knowledge and what accounts for differences in such practices. In this sense, the research includes but is not limited to understand Swedish and Brazilian professionals' communication and creation of practical engineering and managerial knowledge, and how each of them and both together engage and attend to their knowing-in-practice differently. The constructed understanding will inform, inspire, ground, facilitate and support the Swedish-Brazilian professionals' participations in knowledge creation, the design of the challenging Swedish-Brazilian knowing/learning from each other's practical/tacit knowledge during the Gripen-technology-transfer process, and an approach to develop intercultural-knowing-skills through a practice-based understanding of differences. Practical contributions will also include an advanced practice-based understanding of Swedish-Brazilian differences in their knowing-practices that can help harnessing such differences as generative forces in the Gripen-technology-transfer process. Theoretical Contributions mainly include the following: (a) a practice-based understanding of differences in work practice or knowing-in-practice of Swedish and Brazilian engineers and professionals, and (b) the extension and deepening of the theory of tacit knowledge creation and communication (tacit knowing or knowing theory), skills acquisition, open/collaborative/interactive innovation, and intercultural collaborative work and knowledge creation.

Project 25

New Methodologies for Conceptual Design of Aircraft – Supersonic Aerodynamics

Project Area

Aircraft design and operations

Main Applicant

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Leader Institution(s)

USP – EESC – University of São Paulo

Partners

LiU – Linköping University
Saab AB

In summary, the “final phase” of the work done during the term of post-doctoral scholarship in the amount of 6 months can be described as:
1. The integration of OMMPCA program / Brazil with Hopsan / LiU program resulting in SANCA program.
2. Development of a SANCA interaction module with 3D CAD programs.
3. Start of SANCA program tests working with the conceptual design of a military attack aircraft. Calculate the supersonic aerodynamic drag and plots Sears–Haack diagram.
4. Start testing in order to calculate the variation of performance of aircraft by modifying the F-100 engine diameter and therefore the diameter of the aircraft fuselage section.
5. Final presentation of SANCA program for technicians and directors of Saab industry, Brazilian students and researchers participating in the Science without Borders program, fellows of CNPq/CISB during the Meeting Saab in Linköping.

Project 26

Efficient Hydraulic Hybrid Systems for Aeronautical Applications, EHHAA

This proposal aims to plan the continuity of ongoing activities linked to the calls CNPq/CISB/SAAB N° 55/2012 and CNPq/CISB/SAAB N ° 69/2013. Two PhD candidates from Federal University of Santa Catarina – Laboratory of Hydraulic and Pneumatic Systems (LASHIP) are working on the digital hydraulic approach for aircraft hydraulic systems. The obtained results until now are very promising and further development mainly regarding to dynamic modelling and experimental evaluation are necessary to be concluding about the success of the proposed solutions.

Project Area

Aircraft design and operations

Main Applicant

Prof. Dr. Victor Juliano De Negri

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Leader Institution(s)

UFSC – Federal University of Santa Catarina

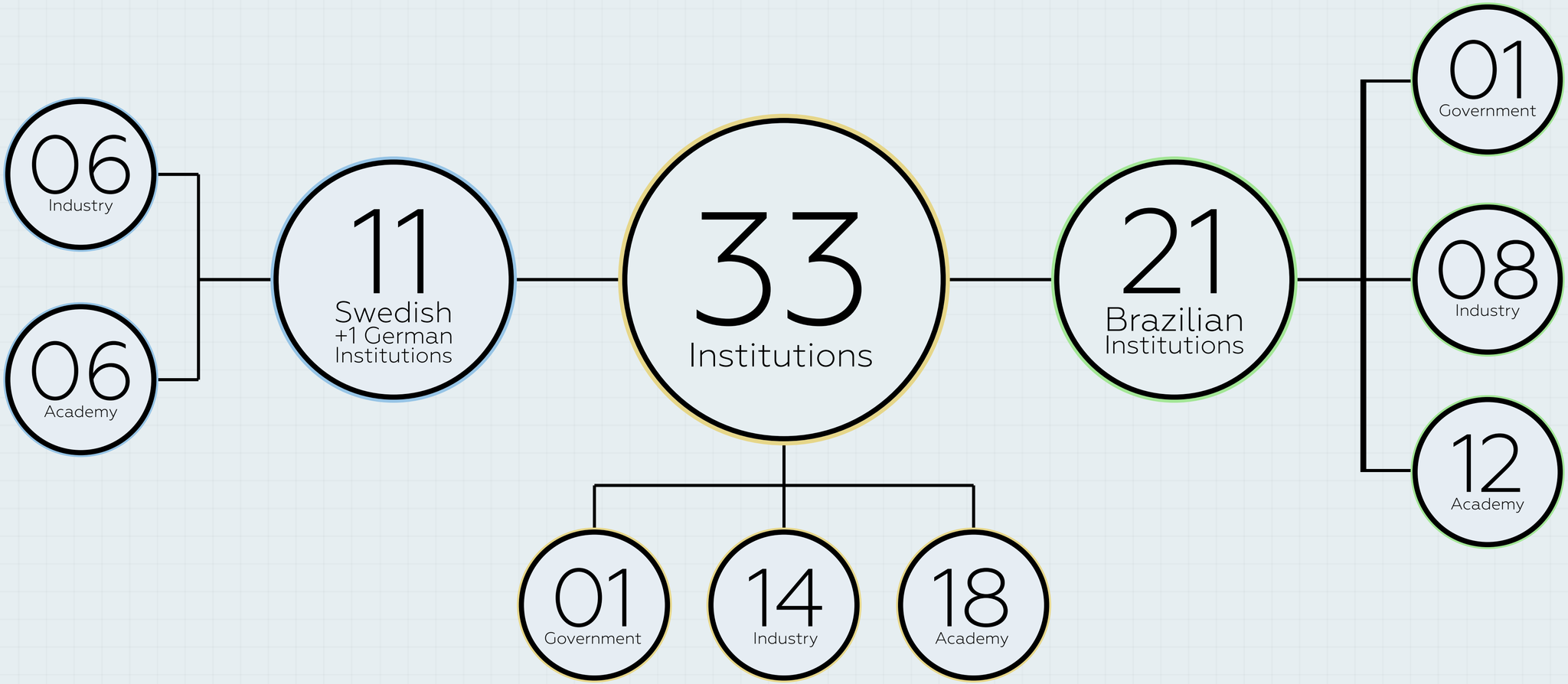
Partners

LiU – Linköping University
Saab AB

Institutions Involved in the Proposals Approved

Institutions	Triple Helix	Country	Proposals Involved
Saab AB	Industry	Sweden	18
ITA - Aeronautics Institute of Technology	University/Institute	Brazil	15
LiU - Linköping University	University/Institute	Sweden	11
KTH - Royal Institute of Technology	University/Institute	Sweden	10
EMBRAER	Industry	Brazil	6
AKAER	Industry	Brazil	5
USP - EESC - University of São Paulo	University/Institute	Brazil	5
LTU - Luleå University of Technology	University/Institute	Sweden	4
Chalmers University of Technology	University/Institute	Sweden	3
UFABC – Federal University of ABC	University/Institute	Brazil	3
UFSC - Federal University of Santa Catarina	University/Institute	Brazil	3
ILA - Institute of Aeronautics Logistics	University/Institute	Brazil	2
IPT - LEL - Technological Research Institute	University/Institute	Brazil	2
UFRGS - Federal University of Rio Grande do Sul	University/Institute	Brazil	1
UnB - University of Brasilia	University/Institute	Brazil	1
AEL Sistemas	Industry	Brazil	1
Biteam AB	Industry	Sweden	1
DFChip	Industry	Brazil	1
DigitalMetal AB	Industry	Sweden	1
Equatorial Sistemas	Industry	Brazil	1
FCC - Fraunhofer Chalmers Centre	University/Institute	Sweden	1
INTELECTRON	Industry	Brazil	1
MDH - Mälardalen University	Industry	Sweden	1
LeverTech	Industry	Brazil	1
PUC Minas - Catholic University of Minas Gerais	University/Institute	Brazil	1
Ruhr-Universität Bochum	University/Institute	Germany	1
Municipality of São Bernardo do Campo	Government	Brazil	1
Spectra Tecnologia	Industry	Brazil	1
Systecon AB	Industry	Sweden	1
UNICAMP - University of Campinas	University/Institute	Brazil	1
Combitech AB	Industry	Sweden	1
FEI - University Center	University/Institute	Brazil	1
FMU - Metropolitan Faculties United	University/Institute	Brazil	1

OVERVIEW OF INSTITUTIONS



STRATEGIC PARTNERSHIP INVOLVED IN THE COOPERATION

CISB | CENTRO DE PESQUISA E INOVAÇÃO SUECO-BRASILEIRO

The Swedish-Brazilian Research and Innovation Centre (CISB), acts as an open innovation arena, that aims to attract innovative ideas; create a neutral environment that fosters collaboration; promote the integration of diverse fields of knowledge; establish connections between actors of the triple helix of Sweden and Brazil; manage projects of multi-institutional research and disseminate knowledge.

More information: www.cisb.org.br

INNOVAIR STRATEGIC INNOVATION PROGRAMME AERONAUTICS

INNOVAIR is Sweden's national strategic innovation program for aeronautics. The aim is to coordinate and support stakeholders from industry, universities, institutes, associations and government agencies active in the aerospace sector. The main objective is to promote favorable conditions for a strong aerospace industry in Sweden and to strengthen the aerospace sector through increased collaboration, research and demonstrator programmes.

More information: http://innovair.org/en

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