Postdoc position in Electrical/Electronic Engineering

WBG-based Converters: Challenging Applications in All Electric Aircraft

EMBRAER/ITA/FAPESP/UNICAMP **FLYMOV** - **Engineering Research Center for the Aerial Mobility of the Future (ERC-AMF)**, #2021/11258-5, supported by FAPESP (São Paulo Research Foundation) and EMBRAER

Home Institution: School of Electrical and Computer Engineering, Universidade Estadual de Campinas - FEEC/UNICAMP (https://www.fee.unicamp.br/), Campinas, SP, Brazil.
Supervisor: Prof. Dr. José Antenor Pomilio

Apply no later than August 31, 2024

The FLYMOV seeks motivated and well-qualified young researchers for a postdoc position in WBG-based Converters: Challenging Applications in All Electric Aircraft.
The activities will be developed at the Power Conditioning Laboratory at FEEC/UNICAMP https://www.s-drupal.fee.unicamp.br/dse/antenor/lcee

The main research themes corresponding to scientific and technological challenges for developing this post-doc Project are listed below.
General Objective: Ensure compliance with the operation of power converters with WBG devices in an electric aircraft environment. The purpose is to study the impacts of the WBG devices in the power electronics converters (PEC) used as propulsion motor drivers and for interconnecting energy sources. The studies will encompass aspects related to EMC, dv/dt and di/dt effects on cables, motors, and other components, transistor drivers, reliability, etc. Experience with motor modeling and multilevel inverters is desirable. The specific challenges and goals are:

1) Development of simulations and design tools
   a) Development of simulation and calculation tools for dimensioning PECs with WBG devices.
   b) Application of tools for the design of propulsion PEC and converters for the power supply system.
2) Development of testing procedures for the PECs, focusing on aspects related to the WBG devices.
   a) EMC tests should be developed according to aeronautical standards when available.
   b) Definition and application of procedures for testing small-scale systems with propulsion engine and HVDC (1 to 2 kV) bus.
   c) Definition and application of procedures to mitigate harmful effects on loads and system components related to the behavior of WBG devices

As a long-term project, it is possible that, over time, other research themes will emerge. This can happen due to changes and new technological availability, according to the results obtained in simulation studies and experimental prototypes.

EXPECTED RESULTS AND CONTRIBUTIONS
Upon completion of the research project, the following results are expected:

1. Provision of design and dimensioning tools for power converters with WBG devices to ERC-AMF, also applicable to full-size systems.
2. Identification of facilities for EMC tests according to specific standards. Training of the technical team.
3. Procedures to mitigate harmful effects on loads and system components related to the behavior of WBG devices

4. Training of highly qualified human resources for research and development activities in the field of power electronics applied to aeronautical propulsion.
5. Dissemination of knowledge related to electrified aircraft, particularly power converters with WBG devices. Dissemination through scientific articles and other means of communication.

Required Skills

Ph.D. in Electrical/Electronic Engineering, emphasizing power electronics. Candidates must have excellent skills and experience in power electronics (topologies, control, modulation, etc.); modeling and control of power converters; simulation tools for electrical circuits, power electronics, electric machines (Cadence/Orcad, PSIM, Plecs, Matlab/Simulink, etc.); software (digital signal processing, programming of microcontrollers, FPGAs and DSPs, C/C++, Python); power electronics hardware development (topologies, protections, interfaces, PCB layout, EMC and thermal management, etc.). Experience with multilevel inverters and motors is desirable. Additionally, fluency in English and basic communication skills in Portuguese are mandatory.

How to Apply: Applications must be made **exclusively by e-mail until August 31, 2024**. Applications should be directed to Prof. José Antenor Pomilio (antenor@unicamp.br), indicating as subject "Application for FLYMOV PD_2024_candidate name".

For application, candidates are required to provide the following attached documents (in pdf):
(i) Motivation Letter emphasizing the experience on the required skills (up to 3 pages).
(ii) Two reference letters from professors, advisors, etc.
(iii) Curriculum Vitae with personal data and published articles evidencing the abilities to conduct the project (up to 5 pages).
(iv) Ph.D. diploma or approval certificate.
(v) Evidence of fluency in English and basic communication skills in Portuguese.

This opportunity is open to candidates of any nationality. The candidate may enroll in one of the following modalities:
a) be a Brazilian citizen.
b) Foreigners residing in Brazil with a temporary or permanent visa and no employment relationship.
c) the foreign candidate residing in a foreign country must provide evidence of a residential address abroad. It is necessary to add this document when submitting the candidature.

Selection: The selection will be made primarily based on (1) the curriculum of the candidates and the motivation letter; (2) publications in high-quality journals and conferences; (3) the documentation as asked in the previous paragraphs; (4) if necessary, a personal or video conference interview with the candidates, where their abilities in the issues will be verified, and other aspects may be discussed.

The selected candidate will receive a **FAPESP Post-Doctoral fellowship** of R$12.000,00 monthly and a research contingency fund, equivalent to 15% of the annual value of the fellowship, which should be spent on items directly related to the research activity. Transportation and installation support will also be provided to candidates moving from cities farther than 350 km.

Duration: 24 months (estimated from January 1st, 2025), possible to renew.