On-Board Microgrids for the More Electric Aircraft

AICRAFT transportation holds a tremendous importance in today's society. Considering the international roadmaps for the intensification of the air travel and the targets concerning the environmental impact, aircraft efficiency has been in the spotlight of scientific research for more than two decades.

Electrification of the aircraft subsystems and, in the future, of the propulsion appears to be the way forward to reach these ambitious goals. This Special Section collects contributions related to the more electric aircraft (MEA) technologies, from the power systems to the actuation systems. An overview of the general technologies for the MEA with discussion about future trends is given in [item 1) of the Appendix].

Electric machines constitute the core of the actuation systems. In particular, [item 2) of the Appendix] deals with a redundant system, whereas [item 3) of the Appendix] proposes a sensorless algorithm for a starter/generator system.

In the field of redundant electrical drives, [item 4) of the Appendix] presents a modulation scheme for a dual converter to extend the operating range.

The power systems aspects are determining in a marked way the performance of the MEA and researchers have been studying novel solutions such as the variable voltage bus concept presented in [item 5) of the Appendix], where the voltage is changed online to increase the power processing capabilities of the wing-ice protection systems.

Power electronics dominates the on-board microgrid, and several control systems are interacting. The constant power load characteristics caused by the power electronics constitute a challenge for the system stability as well. A relevant part of the Special Section is dedicated to the optimization of actual systems, as presented in [items 6)–11) of the Appendix].

Considering the extremely high safety requirements for the aircraft, protection mechanisms will play a predominant role in achieving these goals, especially for dc grids, as shown in [items 12) and 13) of the Appendix].

In order to optimize the fuel consumption as well as paving the way to complete aircraft electrification, the storage system research of [items 14) and 15) of the Appendix] focuses on battery, fuel cells, and supercapacitor power management, as well as protection devices discussed in [item 16) of the Appendix].

Topologies are still an important topic for the management of the on-board microgrid, considering that dc and ac systems are present, as analyzed in [item 17) of the Appendix].

Another research area that has been growing in the past years, hardware simulations, is also bound to affect the aerospace sector, as shown in [items 18) and 19) of the Appendix].

The topic of reliability is addressed in [item 20) of the Appendix], where a lifetime-based control is adopted on the aircraft microgrid.

Overall, we are extremely pleased to have managed this Special Section On On-Board Microgrids for the More Electric Aircraft, and we are confident that the covered topics will stimulate researchers around the world to investigate even more exciting solutions.

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APPENDIX
RELATED WORK

1) G. Buticchi, S. Bozhko, M. Liserre, P. Wheeler, and K. Al-Haddad, "On-board microgrids for the more electric aircraft—Technology review," *IEEE Trans. Ind. Electron.*, vol. 66, no. 7, pp. 5588–5599, Jul. 2019.
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