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C4Or1B-01: [Invited] Fuel Cell-Based Hydrogen Aircraft Architecture

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NASA aeronautics goals include pioneering new technology to increase commercial aircraft efficiency and reduce emissions from air travel. The feasibility of using fuel cells and on-board cryogenic hydrogen systems in combination with electric motors for commercial transport aircraft has been examined in the past at NASA and in the aircraft industry. Growing emphasis on increasing efficiency and implementation of zero emission air transportation resulted in the development of strategic programs on hydrogen aviation, including developing new capabilities at the airports, expansion of hydrogen infrastructure, and fuel cells manufacturing both in the US and EU. A NASA cross-organizational multidisciplinary project team developed an integrated conceptual and experimental methodology to realize a medium-range hydrogen aircraft design based on fuel cells, advanced power management and distribution, and cryogenic hydrogen storage systems combined with an integrated aircraft concept of operations both during the flight and at the airports. The resulting analyses identified possible aircraft architecture options, sizes and layouts for propulsion subsystem and propellant tankage, taking into account appropriate weight scaling factors for a medium-range aircraft carrying 100-200 passengers flying 1000 - 5000 km.

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