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CHAPTER 3

Distributed Hydrogen-Fueled Propulsion for HALE UAVs

Synergies between an integrated airframe, distributed propulsion, and power management system affect the integrated system power requirement, production, and distribution. Researchers carried out a design space exploration to assess the influence of distributing motor-driven fans on three different airframes: a tube-and-wing, a triple-fuselage, and a blended wing-body. What was found was a drop in specific fuel consumption due to the engine design point change—from nearly flat to a 25%-increase in maximum endurance when moving towards heavier takeoff masses. This chapter discusses the improved endurance of a blended-wing-body design for the given distributed propulsion system.

CHAPTER 4

Rotary Power Beyond the Wankel

A prototype four-chamber, Otto-cycle rotary engine—named the Szorenyi engine—was constructed and tested in 2008. The stator of the Szorenyi engine shares similarities with the Wankel engine; however, the geometric shape of the rotor is a rhombus, which deforms as it rotates inside the contour of the rotor. The result is a rotary engine with four combustion chambers. Unlike the Wankel, which is rev limited due to excessive crankshaft bending from the centrifugal forces of the eccentric rotor, the Szorenyi rotor is balanced and is not rev-limited. This chapter discusses the development and testing of this new stator and rotor design.