SYSTEMS AND METHODS FOR CONTROLLING AN ELECTRIC VERTICAL TAKE-OFF AND LANDING AIRCRAFT

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to and the benefit of U.S. Application No. 17/157,580, filed January 25, 2021, the entire contents of which are incorporated herein by reference.

FIELD

[0002] The present disclosure generally relates to aircraft control, and in particular, to control of electric vertical take-off and landing aircraft.

BACKGROUND

[0003] Vertical take-off and landing (VTOL) aircraft are aircraft that can take-off and land vertically and hover, providing the ability to carry travelers directly to their destination. Helicopters are VTOL aircraft that generate lift entirely through their rotors. Some VTOL aircraft have wings and propulsion systems that enable the wings to provide the lift required during forward flight. Some winged VTOL aircraft use separate propulsion systems for vertical thrust for use during take-off and landing and forward thrust for use during cruising. Other winged VTOL aircraft use tiltable propulsion systems that tilt between vertical thrust and forward thrust positions. Electric VTOL aircraft use electric propulsion units to provide thrust for vertical flight and forward flight. Many electric VTOL aircraft include moveable electric propulsion units in which the thrust vector of the propulsion unit can be changed, such as from an upward direction for vertical lift to a forward direction for forward flight. Many electric VTOL aircraft are over-actuated in that there are more actuator degrees of freedom than there are movement degrees of freedom. Control allocation is the problem of distributing control effort among multiple actuators in an over-actuated system. Electric VTOL aircraft often include more propulsion units and other actuators than traditional aircraft and the prolusion units and other actuators strongly affect multiple control axes. Thus, electric VTOL aircraft can pose a greater control allocation problem than traditional aircraft.