INVESTIGATION OF THE STABILITY PERFORMANCE OF AN UNMANNED AERIAL VEHICLE (UAV) WITH BOTH DOUBLE DIHEDRAL AND DOUBLE SWEPT MORPHING WING

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ABSTRACT

Fixed-wing Unmanned Aerial Vehicles (UAVs) are an aircraft concept that has been the focus of recent studies in terms of stability and control. The stability of fixed-wing UAVs with morphing aerodynamic components has also been extensively studied. The stability and control performance of the UAV changes as a result of the morphing of the control surfaces or wing geometry. In extreme conditions, the cruise flight of the UAV is out of equilibrium and the UAV is subject to disturbances. As a result, the UAV is planned to provide a stable action in accordance with the design requirements and strives to return to the equilibrium position from which it moved away as a result of the disturbance. In other words, the aircraft has a stable behavior. If the aircraft returns to the equilibrium position without using control surfaces, this is called fixed stick motion and the aircraft is designed to return to the equilibrium position without using any trim surfaces. In this study, the effect of changing the wing structure on the stability performance of a UAV is investigated. Changes in the damping ratio value and undamped natural frequency values of the UAV with double dihedral and double swept angles on the wing will be analyzed. This work also has been supported by Erciyes University Scientific Research Projects Coordination Unit under grant number FDK-2025-14354.

Keywords · Double Dihedral · Double Swept · Morphing Wing · UAVs

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