FINAL PROJECT

DYNAMIC ANALYSIS OF SEVERAL AIRCRAFT WINGLETS WITH COMPUTATIONAL AND EXPERIMENTAL COMPARISONS

Submitted to The Mechanical Engineering Department of Andalas University in Partial Fulfillment of The Requirement for The Degree of Sarjana Teknik (S. T.)

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PADANG, 2020

APPROVAL FORM

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ABSTRACT

Old generation aircraft have a removed winglet that streamlines the outer end of the wing. As a result of removed winglets, most aircraft suffered losses during flight. Many researchers have identified the effects of winglets on aircraft during flight. Research nowadays has clearly stated that winglets provide greater lift, lower fuel consumption, and smoother fluid flow. Meanwhile, rarely data proved the effect of winglets on the ability to respond to vibration. Hypothetically, the addition of winglets will change the value of system mass and change the geometry of the system itself. An object which has mass and stiffness in elastic conditions certainly vibrated. As a result, the system dynamic responses will be altered mathematically. This altered condition will make the dynamic response of aircraft-wing only is different from aircraft-wing-winglets when the aeroelasticity phenomenon occurs.

To see the dynamic response of several winglets, The A300-100, A330-300, and A350-1000 original model will re-sketch into a 1: 0.006 geometry with SC (2)-0610 as a model airfoil. The re-sketch process will turn out the model for has a different rib, spar, and skin while the original shape of each winglet maintains original. The model will proceed to the Impact Hamer Test and Software Simulation.

The dynamic response shows that The A300-100 is the easiest model to bend while The A330-300 is the easiest model to twist. Due to applied external force, The A350-1000 decelerated better and has the least bending.

Keywords : Impact Hammer Test, Software Simulation, Dynamic Response