Abstract

The present work is concerned with the accurate modeling of transport airplanes. This is of primary importance to reduce aircraft development risks and because multi-disciplinary design and optimization (MDO) frameworks require an accurate airplane modeling to carry out realistic optimization tasks. However, most of them still make use of tail volume coefficients approach for sizing horizontal and vertical tail areas. The tail-volume coefficient method is based on historical aircraft data and it does not consider configuration particularities like wing sweepback angle and tail topology. A methodology based on static stability and controllability criteria was elaborated and integrated into a MATLAB application for airplane design. Immediate advantages with the present methodology are the design of realistic tail surfaces and properly sized airplanes. Its validation was performed against data of five airliners ranging from the regional jet CRJ-100 to the Boeing 747-100 intercontinental airplane. An existing airplane calculator application incorporated the present tail-sizing methodology. In order to validate the updated application, the Fokker 100 airliner was fully conceptually designed using it.

Keywords

Aircraft design, Tailplane design, Aircraft stability and control.