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Wind Tunnel Tests of a New Commuter Aircraft

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Abstract

Tecnam Aircraft Industries and the Department of Industrial Engineering (DII) of the University of Naples "Federico II" are deeply involved in the design of a new commuter aircraft. The wind tunnel tests campaign of the so called "P2012 Traveller" aircraft has been performed in the wind tunnel facility of the DII. Tests of a 1:8.75 scaled model have been performed on different configurations through a 3-component longitudinal and lateral directional internal strain gage balance, in order to estimate both longitudinal and lateral directional stability and control derivatives of the aircraft under investigation. Reynolds number during tests was about 0.55 million. Tests have been performed with transition strip placed on the all lifting surfaces(wing and tail-planes) at about 5% of the local chord. Many tests have been performed for different aircraft configurations with the aim to estimate the effects of the different components on the aerodynamic characteristics of the aircraft, (i.e. flaps rudder deflection, fuselage, nacelles, landing gear and winglets). Have been tested also 3 different positions of the horizontal plane, in order to evaluate its right positioning respect to the wing and ensure a good value of longitudinal static margin. Finally the complete aircraft lateral-directional stability and control derivatives have been evaluated, and the winglets effect on aircraft lateral stability has been highlighted.

1 Introduction

Commuter aircraft market is today related to old model. The major airlines in this segment have been demanding a replacement for many hundreds of "heritage" airplanes in the FAR23/CS23 category currently in service around the world - as many are now coming to the end of their useful commercial life. GAMA (General Aviation Manufacturer Association) 2011 Statistical Databook & Industry Outlook [1], which is usually a very useful and impressive source of data and statistics for general aviation, reports that the average age of general aviation registered aircraft is 46 years for single-engine piston powered aircraft and 15 years for single-engine turboprop aircraft. The average age for twin-engine 8-12 seats aircraft is 42 years for piston powered models and about 29 years for twin-engine turboprop commuter aircraft. These impressive data dramatically show the need of new aircraft model which will be characterized also by the application of new technologies like composite, light structures, new engines (with lower weight and lower fuel consumption) and new avionics and flight control systems. The main idea behind the