

Validating a Flight Test Method for Propeller Thrust Estimation

Nicholas J Lawson FRAeS CEng

Professor of Aerodynamics and Airborne Measurement

In aircraft certification and airborne test, there can be a requirement to measure the engine thrust of a propeller based propulsion system, to confirm aircraft performance or analyse propulsion characteristics. In a test bed environment on the ground, a number of options are available for testing a turboprop propulsion system, including direct measurement of power or thrust, through suitable load sensors and dynamometers. In the airborne environment, however, these approaches are not applicable and measurement of thrust can present a challenge. The simplest method is to measure airborne characteristics such as engine torque and rpm and aircraft airspeed and then by using engine and propeller data, an estimate of engine thrust is made. In this case, validation of the thrust estimate is still required and a drift down flight test technique can be employed to validate the thrust calculation, by using data from the aircraft in a clean configuration and with a gear down configuration. In the following paper, this thrust estimation technique for a Jetstream 31 turboprop aircraft is described and both CFD and flight test drift down data is used to validate the flight test method and direct a discussion of possible sources of error.