

ABSTRACT

This study presents the design and implementation of a digital Air Data Test Set (ADTS) based on an embedded system to simulate the pitot system for aircraft airspeed indicator measurements. The system integrates a SparkFun MS5803 pressure sensor with an ESP32 microcontroller, combined with a pressure pump, solenoid valves, relays, LCD I2C display, and 4x4 keypad for user interface. The development process involved data acquisition, real-time signal processing, and precise air pressure control. In order to enhance the measurement stability in the face of fluctuations and minimize noise, the utilization of filtering algorithms such as Moving Average, Exponential Smoothing, and Low-pass Filter is employed. Validation experiments conducted at three distinct locations demonstrated a significant reduction in standard deviation (from ~2000 mbar to ~16 mbar) and Mean Absolute Error (440–671 mbar), indicating improved measurement accuracy. Furthermore, the airspeed simulation yielded a minimal average deviation of 0.4–1.0 knots compared to target values, confirming the system's capability to produce consistent results.

Keywords: Digital ADTS, embedded system, pressure sensor, data filtering, airspeed simulation, ESP32 microcontroller