

DMA Air Data Test Sets – Validating Critical Aircraft Instrumentation



THE APPLICATION

VALIDATION OF AIRCRAFT FLIGHT-DECK INSTRUMENTATION

The safety of all aircraft relies on the pilot having accurate measurement of critical data available to confirm Airspeed, Altitude and Rate of Climb. These devices gather data from pitot-static tubes that are mounted on the fuselage or wings to gather fundamental physical data in the form of Static and Dynamic (or Total) pressures. Gauges in the cockpit convert these pressures directly to readings that indicate the flight status of the aircraft.

Ensuring that these instruments are functioning correctly and accurately is critical to the safe operation of the aircraft and this validation is done by Ground Support crew who periodically check these instruments for accuracy during aircraft downtime – between flights or undergoing routine maintenance.

The measurement performance of these gauges can deteriorate with time, or when subjected to impact or daily wear & tear, and an independent set of instruments needs to be used to verify the critical flight deck instruments. Should these periodic checks identify performance issues with the flight deck instruments, it's essential to know this before the next flight and it may require informing the pilot, changing the instrument quickly or even grounding the aircraft.

This validation exercise is performed by Aircraft Maintenance, or Ground Support, Engineers using a device known as an Air Data Test Set (ADTS). The ADTS consists of three main components – the Control Unit, which generates and measures the pressures and directs the user through a defined test routine, a set of quick-connect pressure hoses and a set of pneumatic adaptors to connect to the aircraft pitot-tubes. Sometimes vacuum, generated by the ADTS, is used to secure these in-place.



The Measurement Challenge:

Fundamental to the operation of the ADTS, is the high-performance pressure measurement system within the Control Unit. This is where a pre-determined series of air pressures (simulating the operational envelope of the aircraft) are generated, measured, and compared to the instruments on the aircraft and where a quick decision on the acceptability of the aircraft readings, and hence the clearance to fly, is determined.

A wide range of aircraft that are operated at an airfield need to be addressed by a single ADTS. These aircraft have different performance and service duties, so the ADTS needs the flexibility to validate many different pressure ranges. Similarly, on the aircraft, the installed pitot tubes can vary in size, shape and fitment, meaning a flexible range of adaptors is required.

Connecting the adaptors to the control unit, flexible, light and rugged tubing is used that must be relied-upon to remain leak-free in repeated use under arduous conditions.

Operation of the Air Data Test Set needs to be intuitive, repeatable and highly trustworthy, as well as quick, in order to minimise the time needed for such tests. It's a major advantage in terms of use if the ADTS is compact and lightweight; a small size means that the device can be placed on the operators lap in the cockpit, keeping pressure tube runs short and convenient and allowing the operator to see both the ADTS displays and the cockpit instruments simultaneously.

Being able to work seamlessly with various AC and DC power supplies is important to make the instrument truly universal and having a battery back-up for emergencies where all sources of power are lost is important to ensure validation process can continue. Including a battery power source adds to the challenge of keeping the weight and size compact whilst offering operational flexibility.

Typical Users:

Aircraft operators need to validate their on-board instrumentation, in accordance with regulations and their Aircraft Maintenance Manuals (AMM), so would rely on local Ground Support and Aircraft Maintenance teams to perform the testing across their fleet. These aircraft could be Commercial (passenger/cargo), Military or Emergency Services - whether fixed wing or rotary aircraft.

Often a Metrology Department, a Tooling team or "the Radio Shop" would be responsible for these instruments. Additionally, the airfield may have facilities for workshop validation of the instruments and, for this, a convenient and comprehensive laboratory variant of the ADTS is used.

THE SOLUTION

DMA (D.MARCHIORI) AIR DATA TEST SETS EXCEL IN THIS APPLICATION

- ✓ Smallest RVSM fully-automatic ADTS available
- ✓ Convenient portable solution (less than 4.5kg)
- ✓ Static, Dynamic & Vacuum connections
- ✓ Integral pumps for pitot-tube pressurisation
- ✓ Intuitive flexible menu for set-up and operation
- ✓ Highly legible colour touch screen display
- ✓ Convenient push-button keypad
- ✓ Optional remote hand-held configurators
- ✓ Bluetooth and Laptop configuration options
- ✓ AC/DC/Internal battery power sources



An Ultra-Compact Flight line tester, the MPS43B is a unique second-generation instrument where the first-class capabilities of precision and performance are all integrated into a remarkably small enclosure.

The flat panel, with an integral power switch, gives enhanced environmental protection. It enables users to enjoy the air data testing characteristics, and experience the compact size and portability, not possible by more conventionally designed products.

The rugged lightweight enclosure meets the demanding requirements of the aerospace industry and offers unmatched cost and ownership benefits not available from alternatives.

A wide range of pressure ranges for P_s , P_t , Q_c and RoC are available to cover most aircraft applications. Up to 30 User test profiles, each with 26 test points, are programmable, enabling repetitive tests to be easily performed with high repeatability. Full RVSM compliance ensure optimal performance that the user expects

1+ hours of operation from the battery, assures continuous use, even if the power supply is interrupted, enabling the measurement task to be completed seamlessly.

A fully automated test routine checks the system for leak-free installation and then moves onto a range of pressure conditions, recording the data into an easy to view table on-screen and comparing these readings with the prescribed limits within the AMM.

The most extensive range of pitot-static adaptors, with lightweight, translucent, flexible hoses, are available for DMA ADTS - as well as those from other manufacturers. These ensure a quick and easy connect to the aircraft to minimise risk of leakage and to save time. These are standard fitments for most aircraft and pitot types and covering static sockets and single pitot-tubes, as well as Angle of Attack (AoA) and multifunction Smart Probes.



Application Note



A leak-tight seal is achieved using the vacuum from the ADTS or with the supplied suction cups. Kits are housed in a compact rugged case for ease of transportation. Custom adaptors are also readily available from DMA and Evolution Measurement.



Some of DMA's extensive range of Pitot-static adaptors

Additional complementary products within the range, include Laboratory Air Data Test Sets, Digital Tachometer Testers, Portable stand-alone Pressure Generators and Digital 3-axis tilt tables.

DMA are based in Aprilia, near Rome, in Italy, are family-run specialist business who have been manufacturing aircraft test equipment since 1938. Evolution Measurement are proud to represent DMA in UK, Scandinavia and French markets, providing sales and support from our UK and French offices. We look forward to hearing from you.

For more Information:

View the extensive product range and download the datasheets:

<https://www.evolutionmeasurement.com/product-category/aerospace/>

Or tell us about your applications: Evolution Measurement Ltd. 7 Regents Court, South Way, Walworth Business Park Andover, Hampshire SP10 5NX Telephone: +44 (0) 1264 316470

Email: enquiries@evolutionmeasurement.com