Application Note

DMA Air Data Test Sets – Helicopter Instrument Calibration/Validation

THE APPLICATION

VALIDATION OF HELICOPTER FLIGHT-DECK INSTRUMENTATION

Airspeed, Altitude and Rate of Climb instruments provide essential data critical to the safe operation of helicopters. Measurements from pitot-static tubes that are mounted on the fuselage gather fundamental physical data in the form of Static and Dynamic (or Total) pressures. Cockpit-mounted gauges convert these pressures directly to display data on the flight status of the helicopter.

Ensuring that these instruments are functioning correctly and accurately is essential to the flight worthiness and safety of the helicopter and this validation is done by licensed Aircraft Maintenance Engineers. They periodically check these instruments for accuracy during helicopter downtime – between flights, when undergoing routine or corrective maintenance – according to the prescribed test regime in the Aircraft Maintenance Manual (AMM).

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

Such validation is performed by Aircraft Maintenance, or Ground Support, Engineers using an instrument known as an Air Data Test Set (ADTS).

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The ADTS can be described as three main elements – 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. Because of the flight parameters of a Helicopter, dedicated ADTS are used specifically for this type of aircraft, where rates of climb are higher and maximum airspeed and altitude are lower.

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 helicopters operated at an airfield may need to be addressed by a single dedicated ADTS. These helicopters may have different performance and service duties, so the ADTS needs the flexibility to validate many different pressure ranges and service conditions. Similarly, on the helicopter, the pitot tubes that are used 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. Integral leak-test procedures ensure that any leakage in the connection is quickly detected and resolved before calibration and validation begins. This can often be a time-consuming and frustrating task if the ADTS is not easy to use.

Having an Air Data Test Set that is intuitive, repeatable and highly trustworthy, as well as being quick to use will 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.

Various AC and DC power supplies are often present, so it is important to make the instrument compatible and having a battery back-up for emergencies, where all sources of power are lost, is important to ensure validation process can continue or be terminated safely. Including a battery power source adds to the challenge of keeping the weight and size compact whilst offering operational flexibility and this battery can be easily removed for the "Flying Spanner" or Maintenance Engineer who has to fly overseas from his base in an emergency Aircraft On Ground (AOG) situation. The lightweight, compact ADTS effectively becomes "carry-on" hand luggage.

Application Note

Typical Users:

Helicopter operators need to validate their on-board instrumentation, in accordance with regulations and their Aircraft Maintenance Manuals (AMM), and rely on local Aircraft Maintenance teams to perform the testing across their fleet. These aircraft could be for Commercial, Military or Emergency Services duty and the fleet may consist of many various types. This operation could be done during Line or Base Maintenance procedures.

Often a Metrology Department, a Tooling team or "the Radio Shop" would be responsible for these instruments. The airfield may also have facilities for workshop validation of the instruments and DMA offer a comprehensive laboratory ADTS variant.

THE SOLUTION

DMA (D.MARCHIORI) MPS43H AIR DATA TEST SET EXCELS IN THIS APPLICATION

- ✓ Smallest RVSM fully automatic ADTS available
- ✓ Customised MPS43 specifically for Helicopter use
- ✓ Rugged, Portable and splash-proof
- ✓ Less than 4 kg weight
- ✓ 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 DMA MPS43H is a unique second-generation instrument where the first-class capabilities of precision and performance are integrated into a remarkably small enclosure, designed for helicopter use.

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, splash-proof, 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, as well as Airspeed Slew Rate and Engine Pressure Ratio cover most helicopter applications. Up to 30 User test profiles, each

with 26 test points, are programmable, enabling repetitive tests to be easily performed with high repeatability and minimal operator intervention.

Full RVSM compliance ensures the optimal performance that the user demands.

30 minutes operation from the battery, assures safe shutdown if the power supply is interrupted, enabling the instrument to be shutdown safely.

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

Pitot-Static Adaptors:

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

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.

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 a family-run specialist business who have been manufacturing aircraft test equipment since 1938. Evolution Measurement are proud to represent DMA in UK, Scandinavian 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