



AEROSPACE RECOMMENDED PRACTICE

ARP921™

REV. B

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Superseding ARP921A

Flight Test Procedures for Static Pressure Systems
Installed in Subsonic Transport Aircraft

RATIONALE

This Technical Report contains no changes from the previous revision, other than the addition of a Stabilization Notice Page. This document has been determined to contain stable technical information which is not dynamic in nature.

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FOREWORD

Changes in the revision are format/editorial only.

1. SCOPE:

This SAE Aerospace Recommended Practice (ARP) covers the test procedures and equipment for performing flight testing on pitot-static systems installed in subsonic transport type aircraft.

1.1 Purpose:

The purpose of this document is to present recommendations for the flight testing of static pressure systems as installed in subsonic transport type aircraft.

2. REFERENCES:

1. Federal Aviation Agency, Systems Research and Development Service Report, Flight Calibration of Aircraft Static Pressure Systems, Report Number RD-66-3, dated February 1966
2. Ikhtiari, Paul A. and Marth, Verlyn G.; Trailing Cone Static Pressure Measurement Device, pp. 93-94, Journal of Aircraft, Vol. 1, No. 2, March 1964
3. Shrager, Jack J.; Test of Trail Cone System to Calibrate Static Ports for Barometric Altimeters, FAA, NAFEC Report RD-64-156, December 1964
4. Shrager, Jack J.; Limited Survey of Commercial Jet Aircraft Altimeter System Error by Pacer with Trailing Cone, FAA NAFEC Report RD-64-157, December 1964

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5. Air Transport Association of America Report, Recommendations on Flush Static Port Maintenance, dated December 1963
6. Air Transport Association of America Report, Recommendations on Design of Pitot/Static Systems for Transport Aircraft, dated January 1964
7. "An Investigation of the Effect of Random Fuselage Wall Irregularities on Flush Static Pressure Port Calibrations"; Werner and Teigen, WADC Technical Report 57-365 (ASTIA 130-805), April 1957
8. "Aircraft Skin Contour Measurements Adjacent to Flush Static Ports on Military Transport Type Aircraft"; DeLeo, Hagen and Thompson, Rosemount Engineering Co., Technical Report 4622B, April 1962
9. "Trailing Cone Systems Applications"; L. D. Crowley, Douglas Aircraft Co., Technical Memorandum TM-4158, dated August 1967
10. Anonymous: "Lo-Lag Trailing Cone System"; Technical Memorandum 4099, Douglas Aircraft Company, Long Beach, California, February 1966
11. DeLeo, R. V., Cannon, P. J., and Hagen, F. W.; "Evaluation of New Methods for Flight Calibration of Aircraft Instrument Systems; Part I, Analysis of Altimeter, Airspeed and Free-Air-Temperature Systems"; Report 6591, Rosemount Engineering Company, Minneapolis, Minnesota, June 1959. (Also issued as WADC Technical Report 59-295, Part I.)
12. DeLeo, R. V. and Hagen, F. W.; "Evaluation of New Methods for Flight Evaluation of Aircraft Instrument Systems; Part III, Development of Altimeter, Airspeed and Free-Air-Temperature Calibration Systems"; Report 26123, Rosemount Engineering Company, Minneapolis, Minnesota, September 1961. (Also issued as WADC Technical Report 59-295, Part III.) (ASTIA 268780)
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14. Gracey, W.; "Measurement of Static Pressure on Aircraft"; Report 1364, National Advisory Committee for Aeronautics, Langley Aeronautical Laboratory, Langley Field, Virginia, 1958
15. Gracey, W., Jewel, J. W. Jr., and Carpenter, G. T.; "Measurement of the Errors of Service Altimeter Installations During Landing-Approach and Take-Off Operations"; Technical Note D-463, National Aeronautics and Space Administration, Langley Research Center, Langley Field, Virginia, November 1960
16. Gracey, W. and Stickle, J. W.; "Calibrations of Aircraft Static-Pressure Systems by Ground-Camera and Ground-Radar Methods"; Technical Note D-2012, National Aeronautics and Space Administration, Langley Research Center, Hampton, Virginia, August 1963

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17. Mickle, D. A. and Soderquist, R. H.; "Trailing Cone Method of Measuring Static Source Position Error; Evaluation and Calibration Phase"; First Interim Report FT2123-56R-64, Naval Air Test Center, Patuxent River, Maryland, August 1964
18. Nairn, J. B.; "Results of Trailing Cone Tests on PAA Jet Aircraft"; Report SC-65-6, Pan American World Airways, Miami, Florida, September 1965
19. Russell, W. M.; "Trailing Cone Tests in Large Turbojet"; Technical Report RD-66-15, Navigation Development Division, Approach and Landing Branch, Federal Aviation Agency, Washington, DC, March 1966
20. Shrager, J. J.; "Calibrating Static Pressure Systems at Low Altitudes"; Report No. RD-64-37, Experimentation Division, National Aviation Facilities Experimental Center, Atlantic City, New Jersey, March 1964. (AD 603205)
21. Shrager, J. J.; "Test of Trail Cone System to Calibrate Static Ports for Barometric Altimeters"; Report No. RD-64-156, Experimentation Division, National Aviation Facilities Experimental Center, Atlantic City, New Jersey, December 1964
22. Shrager, J. J.; "Limited Survey of Commercial Jet Aircraft Altimeter System Position Error by Pacer with Trailing Cone"; Report No. RD-64-157, Experimentation Division, National Aviation Facilities Experimental Center, Atlantic City, New Jersey, December 1964
23. Silsby, N. S. and Stickle, J. W.; "Flight Calibrations of Fuselage Static-Pressure-Vent Installations for Three Types of Transports"; Technical Note D-1356, National Aeronautics and Space Administration, Langley Research Center, Hampton, Virginia, May 1962
24. Watson, E. T., Jr.; "Trailing Cone Reference System"; Report No. DEV-3674, Douglas Aircraft Company, Long Beach, California, November 1964

2.1 Regulator Documents:

- 2.1.1 SAE Documents: The following SAE documents, of the issue in effect on the date of application for certification, form a part of this Aerospace Recommended Practice to the extent noted herein:

ARP920 Design and Installation of Pitot-Static Systems for Transport Aircraft
ARP975 Maintenance Procedures for Pitot-Static Systems for Transport Aircraft

- 2.1.2 Federal Aviation Agency Documents: The following documents, of the issue in effect on date of application for certification, form a part of this Aerospace Recommended Practice to the extent noted herein.

Federal Aviation Regulation - Part 25	Air Worthiness Standards: Transport Category Airplanes
Part 43	Maintenance, Preventive Maintenance, Rebuilding and Alteration
Part 91	General Operating and Flight Rules
Part 121	Certification and Operation: Air Carriers and Commercial Operators of Large Aircraft
Advisory Circular AC 43-203A	Altimeter and Static System Tests and Inspections, effective June 6, 1967

In the event of conflict between this document and the above documents, the regulatory documents shall apply.

3. PITOT-STATIC SYSTEM GROUND TESTS:

Prior to flight testing of any pitot-static system, such system should have been tested in accordance with the recommendations of ARP975.

- 3.1 Prior to flight testing of any pitot-static system, at least one member of the flight crew should perform a visual inspection of the pitot-static system sensing orifice installations external to the aircraft. All pitot-(static) tube protective covers shall have been removed. There shall be no tape or other protective device covering flush static orifices. In addition, the aircraft should not be allowed to take off if there is any evidence of any deformity of the pitot-(static) tube or skin surrounding any flush static orifice. The static port installation and surrounding surface irregularities shall not exceed the tolerances as specified in ARP975.

4. FLIGHT CALIBRATION AND TEST PROCEDURES:

4.1 General:

Several techniques have been developed for the calibration of aircraft pitot-static systems. The primary objective of these test methods is to determine by flight test the static system (position) error and airspeed error over the performance envelope (speed, altitude, weight range and configuration) for which the aircraft is designed.