PITOT-STATIC TESTING

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E-1. Preliminary Pitot-Static System Inspection Requirements:

Energized Pitot-Static Heaters can damage pitot tubes and injure personnel.

(1) Ensure the Pitot Heater(s) are disabled before connecting the test set hoses to the Pitot Tube(s).

(2) Check pitot-static tube(s) for cracks, deterioration and distortion prior to connecting Pitot- Static Test Set.

(3) Check indicators for damage (Airspeed Indicators, Vertical Speed Indicators and Altimeters.

(4) Drain pitot-static system drain points.

(5) Inspect tubing and fittings where accessible.

E-2. Pitot-Static System Leak Testing:

This testing is necessary to certify altimeters when installed in the helicopter.

NOTE

When testing the pitot-static system(s) with the test set connected to the static system(s) the test will cause the range limits of the Airspeed Indicator(s) to be exceeded. Therefore, it is important to test the pitot-static system(s) for leaks prior to performing static system(s) test (s). If this is not accomplished, leakage observed during the static system(s) leak test could actually be in the pitot-static system(s).

NOTE

During the performance of the leak test of the pitot-static system(s) the airspeed indicator(s) tolerance/parameters shall also be tested.

(1) Connect the DPS400 Pitot-Static Ramp Tester to the pitot-static tube for the TH-57B. For the TH-57C the two (2) independent systems can be tested one at a time by connecting each system directly to the test set. The acceptable alternative method is to simultaneously test both systems utilizing a "Y" adapter. The adapter provides for a single point connection for both of the pitot-static systems prior to being connected to the tester.

(2) Apply power to the test set.

(3) Increase the pitot-static regulator to obtain a reading on the test set of 100 knots indicated airspeed.

(4) Verify that the leak rate does not exceed 3 knots per minute indicated airspeed.

(5) Verify that the airspeed indicators in the helicopter read within the tolerances of the Indicated Airspeed Scale Error Chart. If out of tolerance, change the defective indicator.

(6) Testing for airspeed indicator scale error is to be accomplished any time an airspeed indicator is changed.

Table E-01
Indicated Airspeed Scale Error Chart

DPS-400 TEST SET INDICATED AIRSPEED - KNOTS	AIRSPEED INDICATOR TOLERANCE
40	38 - 42
60	58 - 62
80	78 - 82
100	96 - 104

E-3. Static System Leak Testing:

The following text details the TH-57 B and C model helicopter.

(1) General: Connect the test equipment directly to the Static Ports, if practical. If not, connect the static test lines directly to a static system drain or tee connection and seal the static ports. *Do not apply adhesive tape directly to the static port surfaces.* If the test equipment is connected to the static system at any point other than the static ports, it should be connected at a point where the connection may be readily inspected for system integrity after the system is returned to its normal configuration.

The pitot-static system for the TH-57 helicopter is vented to ambient and will cause the airspeed indicator to increase when performing testing on the static system. Testing within the normal airspeed range is not adequate to allow the altimeter to reach 1,000 feet above field elevation. In this case ensure that both the pitot-static and static systems are connected to the test set.

(a) When using the test set, evacuate the static system at a rate not to exceed the maximum reading of the Vertical Speed Indicator (3,000 feet per minute) until the indication on the altimeter increases to 10,000 feet above field elevation as required by the test sheet.

If the static system has a severe leak, closing the vacuum source may cause a rate of descent in excess of the limits of the Vertical Speed Indicator (VSI). Therefore, the vacuum source must be closed gradually while observing the VSI. If a rapid rate of descent develops, use the vacuum control to ease the system back to ambient pressure/field elevation. Correct the leakage problem before proceeding any further with the testing.

(b) Close the vacuum supply. Allow the system to stabilize for one (1) minute. Observe the instrument (altimeter) reading for one (1) *additional* minute. The reading shall not change by more than 100 feet.

(c) At the conclusion of the leak test, return the system to ambient pressure/field elevation at a rate of descent that is within the prescribed limits of the VSI.

(d) If the static ports had to be sealed to accomplish the test, remove all static port seals after completion of the static system test.

(2) Reassembly and Record Keeping:

(a) Restore the pitot-static and static systems to their normal configuration.

(b) Remove all static port seals.

(c) Complete required forms and VIDS/ MAFS as appropriate.

E-4. Altimeter Testing:

The following text is inclusive of all altimeters.

(1) Visual Inspections: Check the general appearance of the altimeters for obvious defects such as:

(a) Bent or broken setting knobs.

(b) Cracked or loose glass.

(c) Cracked or broken case.

(d) Peeling paint on dial or pointers.

(e) Evidence of corrosion.

(2) Knob Test: Check the following:

(a) Knob, pointers and barometric scale should turn smoothly without binding, but with sufficient drag to ensure that setting will not shift with normal vibration.

(b) Pulling or pushing on the knob while turning shall not cause disengagement of either the pointers or barometric scale.

When performing any of the testing on the system, do not exceed a rate of climb or decent of greater then 3,000 feet per minute. This is the limit of the Vertical Speed Indicators (VSIs) used in the TH-57. The limit can be exceeded providing the VSIs have been disconnected and the lines capped.

NOTE

In light of the facts that the altimeter(s) utilized in the TH-57 are not equipped with built in vibrators and the instrument panels are also not equipped with vibrators a source of vibration is required in order to obtain accuracy of the instruments during this procedure. In order to satisfy the requirement loosen and partially extend the altimeter(s) from the instrument panel and agitate the instrument being tested by rolling a screw driver handle back and forth on/ along the side of the case while performing this test. The allowable tolerance for the unit being checked is the same as units equipped with a vibrator.

(3) Barometric Scale Error Test: Perform the following:

(a) Connect the DPS400 Pitot-Static Ramp Tester to the pitot-static and static system (s), as appropriate. Adjust the pressure control on the test set to obtain a test pressure of "Sea Level" –"0" (zero) feet of altitude. With normal vibration applied to the altimeter(s), set the barometric scale window at 29.92 inches of mercury. The altimeter(s) should read "Sea Level" –"0" (zero) feet of altitude $\pm$ 25 feet of altitude. If the reading obtained is outside of the limits, adjust the altimeter(s) to obtain the desired reading. Record the indicated altitude in the space provided on the Altimeter Calibration/ Certification Form.

(b) With normal vibration applied, set the barometric scale at each of the other seven (7) barometric pressures specified on the Altimeter/ Calibration/Certification Form. Note and record the indicated altitude in the space provided on the Altimeter/ Calibration/Certification Form. The altimeter reading, above or below sea level, for each barometric test point should agree within ± 25 feet of the true difference when it is applied to the altitude reading obtained and recorded with 29.92 inches of mercury set in the barometric scale window. The Altimeter/Calibration/ Certification Form provides the true difference in feet for each of the specified barometric pressure checkpoints by adding the sea level baseline reading to the absolute altitudes. For example if the indicated altitude at 29.92 inches of mercury was +20 feet, then at 29.00 inches of mercury (Absolute Altitude = -863 feet) the True Difference column is -843 feet (-863 feet absolute altitude at 29.00 inches + 20 feet the reading at sea level baseline 29.92 inches). The altimeter reading should read 843 ± 25 feet <u>below sea level</u>.

(4) Barometric Correlation versus Altimeter Setting: Perform the following steps and checks:

Energized Pitot-Static Heaters can damage pitot tubes and injure personnel.

(a) Ensure the Pitot Heater(s) are disabled before connecting the test set hoses to the Pitot Tube(s).

(b) Connect the test equipment to the pitot-.static system(s), as appropriate.

(c) Adjust the pressure control on the test set to produce a test pressure of 29.92 inches of mercury. This function is an automatic feature on the DPS400 Pitot-Static Ramp Tester.

(d) Allow at least one minute for the pressure to stabilize.

<u>NOTE</u>

Resetting of the internal altimeter barometric scale shall be performed only by qualified personnel specifically trained to perform the requirements of this MED/ Procedure.

<u>NOTE</u>

Adjustments made involving the altimeter barometric window setting are only authorized on those altimeters that are no longer within the vendor's warranty period. Warranty data can be determined from information contained on the sticker/seal installed over the area containing the adjustment provisions or from data available from the records.

(e) Verify on the unit under test to ensure that with the barometric scale set at 29.92 inches of mercury they correspond with the indication of the test set. If the indication does not agree with the reading of the test set, reset the internal barometric scale on the unit under test to agree with the test set.

<u>NOTE</u>

Unrelated to these procedures but of prime importance to any future related altimeter discrepancies is the data recorded in the BARO Scale Error portion of the Altimeter Calibration/Certification Form. This information is the result of the test done with the test set pressure set to "Sea Level" - "0"(zero) feet of altitude.

NOTE

Discrepancy verification is accomplished at any field elevation by setting the test set altitude to "Sea Level" – "0" (zero) feet.

NOTE

The recorded data can then be utilized to compare and confirm the validity of the altimeter(s) against the eight (8) known/ historical barometric scale settings. Likewise any minor deviations that may have occurred since the last calibration can be compensated for by adjusting the barometric window to the recorded values without disturbing the rest of the system.

(5) Case Leak Test: Perform the following steps and checks (record the results of the test, as appropriate, on the Altimeter Calibration/ Certification Form):

(a) Ensure the barometric scale is set to 29.92 inches mercury.

The altimeter used in the TH-57 is limited to a maximum altitude of 20,000 feet.

(b) Adjust the DPS400 Test Set until 20,000 feet is indicated on the altimeter, even though the maximum altitude for the TH-57 is 13,500 feet.

(c) Increase the pressure at a rate of descent **not to exceed** 3,000 feet per minute until the altimeter reaches 18,000 feet.

(d) Close the vacuum supply and allow the pressure to stabilize for a minimum of one (1) minute. The leakage rate at 18,000 feet shall not exceed 100 feet per minute.

NOTE

A leakage rate in excess of 100 feet per minute may indicate a leak in the altimeter case. If the leakage rate is excessive isolate the altimeter from the static system. Connect the test set directly to the altimeter and perform the Case Leak Test again.

(e) Return the pressure to ambient/field elevation at a rate of descent not to exceed 3,000 feet per minute.

(f) Any excessive jumping or sticking during ascent or descent will be cause for rejection of the altimeter.

E-5. Scale Error and Friction Checks:

Perform the following steps and checks. Record the results of the test, as appropriate, on the Altimeter Calibration/Certification Form):

Before beginning the test, it is necessary to be aware of and consider the rate of decent change requirements. The rate is not critical during the ascending tests, but is specified as between 5,000 to 20,000 feet per minute during the descending portion for the Hysteresis Test, which follows the following Scale Error and Friction Tests.

A. Scale Error Check: Perform the following:

(1) Disconnect and cap the lines connected to the Vertical Speed Indicator(s).

Be sure that the barometric scale of the test set and the altimeters being tested are set at 29.92 inches of mercury.

(2) With the system vented to ambient, carefully record the current barometric pressure and altimeter setting.

NOTE

These values will be used later for After Effect Test.

(3) With the test set properly connected to the static system, operate the test set controls to establish the first test point, -1,000 feet. Maintain the test pressure for a minimum of one minute but not more then 10 minutes. Record the reading. The allowable tolerance at – 1,000 feet is ± 20 feet.

(4) Reduce the pressure (increase altitude) to the next checkpoint (0 feet). Allow at least one, but not more than 10 minutes for the pressure to stabilize. Check that the unit being tested is within the allowable tolerance. See test sheet.

(5) Continue the testing of the unit verifying all test points included on the Altimeter/ Calibration/Certification Form to the maximum altitude specified on the test sheet.

B. Friction Test: Proceed as follows:

NOTE

The Friction Test may be combined with Scale Error Check.

(1) Reduce pressure (***increase altitude***) at a rate of ascent of approximately 750 feet per minute.

(2) When the test set reaches 1,000 feet, first friction test point, maintain the pressure and record the results.

(3) Apply vibration to the unit being tested. The change in the reading of the altimeter being tested after vibration has been applied shall not exceed a tolerance of ± 70 feet at 1,000 feet.

(4) Continue the combined Scale Error, Friction Tests and Encoding Tests in the same manner for each test point specified on the Altimeter Calibration/Certification Form until all test points are checked within the allowable tolerances:

E-6. Hysteresis Test:

Perform the following steps and checks (record the results of the test, as appropriate, on the Altimeter Calibration/Certification Form). Within 15 minutes after reaching the desired maximum test altitude for the Scale Error Test, begin increasing pressure (decrease altitude) at the rate of descent prescribed below.

(1) The test begins starting at 13,500 feet. A rate of descent of 3,000 feet per minute is required. The test readings shall be recorded at 6,750 and 5,400 feet.

(2) After five or more minutes, with vibration being applied to the unit being tested, the observed reading shall not differ by more than ± 75 feet between the test set and the unit being tested.

(3) When the test set is stabilized at the second test point, after not less than one minute but no more than 10 minutes, the unit being tested shall not differ from the reading observed on the test set by more than the allowable tolerance of ± 75 feet.

E-7. After Effect Check:

Perform the following steps and checks (record the results of the test, as appropriate, on the Altimeter Calibration/Certification Form).

(1) Continue the descent in the same manner as described during the Hysteresis Test (3,000 feet per minute rate of descent) until the system has reached and is vented to ambient pressure/field elevation.

(2) Within five minutes of reaching ambient pressure/field elevation at the completion of the Hysteresis Test, determine the current barometric pressure altimeter setting as indicated on the test set.

(3) Compare current barometric setting with that observed and recorded prior to start of Scale Error Test. If the barometric pressure has changed since beginning the test, determine the amount and direction of change.

(4) Change the setting of barometric scale, (29.92 inches of mercury), of the unit being tested by the same amount and in the same direction as determined in the step above.

(5) With vibration being applied to the unit being tested, record the reading. The difference between this reading and the reading recorded prior to the start of the Scale Error Test shall not exceed an allowable tolerance of ± 30 feet.

(6) Reassembly and Record Keeping: Accomplish the following:

(1) Upon completion of satisfactory testing, disconnect all test equipment.

(2) Restore the pitot-static and static systems to their normal configuration. Ensure that the VSI's are reconnected. Perform a static system leak check to ensure system integrity.

(3) Complete the required certification forms and VIDS/MAFs, as appropriate.

E-8. Altitude Reporting System Test:

Utilizing an ATC-600 test set perform the following tests recording the results of the test, as appropriate, on the Altitude Reporting System Certification Form. Use a separate test form for each transponder.

NOTE

Steps "1" through "6" of this Section, require the Transponder(s) Squawk Code to be set at 0000.

(1) Test #1, Reply Frequency: Verify the transponder reply frequency is 1090 ± 3 MHZ

(2) Test #2, Suppression:

(a) Verify the transponder does not respond to more than one percent of the ATCRBS interrogations when the amplitude of P_2 pulse is equal to the P_1 pulse.

(b) Verify the transponder replies to at least 90% of the ATCRBS interrogations when the amplitude of the P_2 pulse is 9 DB less than the P_1 pulse.

(3) Test #3, Receiver Sensitivity: Verify the minimum triggering level of the radiated signal is - 69 to - 77 DBM ± 3 DBM.

(4) Test #4, Difference Between Mode 3/A and C: Verify that the difference between the mode 3/A and the mode "C" receiver sensitivity does not exceed 1 DB.

(5) Test #5, Radio Frequency (RF) Peak Output Power: Verify that the transponder RF peak output power of the radiated signal is at least 125 watts.

(6) Test #6, Identification Test: Verify that identification is transmitted for a minimum of 20 seconds when triggered.

(7) Test #7, Transponder Code Test: Select and verify the transponder codes specified on the Altitude Reporting System Certification Form.

E-9. Automatic Pressure Altitude Reporting Equipment Correspondence Test

(1) Set Pilot's Altimeter to 29.92 in Hg.

(2) Apply vibration to pilot's altimeter and approach transition point at a rate less than 250 ft/min.

(3) Use DPS-400 to set the transponder Mode C output to the test altitude as displayed on the ATC-600.

(4) Record the indicated altitude on Pilot's altimeter (tolerance is ± 125 ft) in Block 4 of the Altitude Reporting System Certification Form.

NOTE

All mode C bits are accounted for by the listed test altitudes.

(5) Perform test and record values ascending and descending.

E-10. Assembly/Documentation

(1) Assembly and Record Keeping: Accomplish the following:

(a) Upon completion of satisfactory testing, disconnect all test equipment.

(b) Assemble aircraft in accordance with applicable maintenance manual.

(2) Documentation: Complete the required certification forms and VIDS/MAFs, as appropriate.