



Australian Government

Civil Aviation Safety Authority

I, JOHN FRANCIS McCORMICK, Director of Aviation Safety, on behalf of CASA, make this instrument under regulation 38 of the *Civil Aviation Regulations 1988*.

[Signed John F. McCormick]

John F. McCormick
Director of Aviation Safety

4 July 2013

Civil Aviation Order 100.5 Amendment Instrument 2013 (No. 1)

1 Name of instrument

This instrument is the *Civil Aviation Order 100.5 Amendment Instrument 2013 (No. 1)*.

2 Commencement

This instrument commences on 1 August 2013.

Note For subregulations 38 (2) and 5 (3) of CAR 1988, the instrument was gazetted on the day it commenced.

3 Amendment of Civil Aviation Order 100.5

Schedule 1 amends Civil Aviation Order 100.5.

Schedule 1 Amendments

[1] Paragraph 1.1

substitute

Subject to paragraph 1.2, this section applies to all Australian aircraft in respect of which an Australian certificate of airworthiness is in force, other than an aircraft to which Part 42 of the *Civil Aviation Safety Regulations 1998* applies

[2] Paragraph 9.1

substitute

For subregulation 38 (1) of the Regulations, CASA directs the registered operator of an Australian aircraft to comply with the maintenance requirements for the aircraft and its aeronautical products, including life-limits, as established under the approved design for the aircraft or product.

Note Contravention of a CASA maintenance direction under this subsection is a strict liability offence under regulation 38 of the Regulations.

[3] After subsection 10, the Note

insert

11 Additional maintenance requirements

- 11.1 This subsection contains CASA directions for subregulation 38 (1) of the Regulations.

Note Contravention of a CASA maintenance direction under this subsection is a strict liability offence under regulation 38 of the Regulations.

- 11.2 Subject to subsection 12, the registered operator of an Australian aircraft (the **operator**) must comply, and ensure compliance, with each additional maintenance requirement set out in Appendix 1 as it applies to or for the aircraft (the **relevant aircraft**).

12 Transitional requirements for additional maintenance

- 12.1 For subclauses 3.2 and 3.4 of Appendix 1, the first pitot-static system leaks tests required after 1 August 2013 must be carried out not later than the date when whichever of the following first occurs:

- (a) the day that is 24 months from the date of the last **verified** pitot-static system leak test that is at least of a standard equivalent to that under clause 1 in Attachment 1 to Appendix 1; or
- (b) if there is no such verified pitot-static system leak test — when the first pressure altimeter tests mentioned in subclause 4.2 required after 1 August 2013 are carried out or should be carried out under subsection 12.2; or
- (c) if paragraph 3.4 (b) or 3.4 (c) of Appendix 1 applies — the first occasion after 1 August 2013 of the change or modification mentioned in paragraph 3.4 (b), or of the maintenance mentioned in paragraph 3.4 (c).

- 12.2 For subclauses 4.2 and 4.4 of Appendix 1, the first pressure altimeter tests required after 1 August 2013 must be carried out within 24 months after the date on which the last pressure altimeter tests required under the following were carried out, or should have been carried out, before 1 August 2013:

- (a) Airworthiness Directive AD/INST/8 Amdt 4;
- (b) Airworthiness Directive AD/INST/9 Amdt 6.

- 12.3 For subclauses 4.6 and 4.7 of Appendix 1, the first automatic pressure altitude encoder tests required after 1 August 2013 must be carried out not later than the date when whichever of the following first occurs:

- (a) the first pressure altimeter tests mentioned in paragraph 12.2, and in conjunction with those tests; or
- (b) if subclause 4.8 applies — the first occasion after 1 August 2013 of the removal or the installation of, or a change to, or a modification to, a system component or the system interwiring.

- 12.4 For subclauses 5.2 and 5.4 of Appendix 1, the first airspeed indicator tests, including determination of the scale error of the aircraft's installed airspeed indicator, required after 1 August 2013 must be carried out:

- (a) not later than the day that is 48 months from the date of the last verified airspeed indicator test that is at least of a standard equivalent to that under subclause 5.3 in Appendix 1; or
- (b) if there is no such verified airspeed indicator test — when the first pressure altimeter tests mentioned in subclause 4.2 required after 1 August 2013 are carried out or should be carried out under paragraph 12.2.

- 12.5 For subclauses 6.2 and 6.4 of Appendix 1, the first determination of the accuracy of the aircraft-installed system for measuring fuel required after 1 August 2013 must be carried out:
- (a) not later than the day that is 48 months from the date of the last verified determination of the accuracy of the aircraft-installed system for measuring fuel that is at least of a standard equivalent to that under subclause 6.3 in Appendix 1; or
 - (b) if there is no such verified determination of accuracy — when the first pressure altimeter tests mentioned in subclause 4.2 required after 1 August 2013 are carried out or should be carried out under paragraph 12.2.
- 12.6 In this subsection:
- verified*** in relation to a test means recorded in one of the following for the relevant aircraft:
- (a) the aircraft log book;
 - (b) the approved alternative to the aircraft log book;
 - (c) the approved alternative to a particular section of the aircraft log book.

Appendix 1

Additional maintenance requirements — pitot-static systems, pressure altimeters, airspeed indicators and fuel quantity gauges

Note For the timing of first tests under this Appendix after 1 August 2013, see subsection 12 of this Order.

1 Definitions

For this Appendix:

exempted aircraft means an aircraft with an approved system of maintenance (***SOM***) under regulation 42M of CAR 1988, or with a maintenance schedule under regulation 41 of CAR 1988, but only if the SOM or the schedule incorporates instructions for the continuing airworthiness of instruments and instrument systems fitted to the aircraft that would otherwise be subject to the additional maintenance requirements set out in clauses 2 to 6 of this Appendix.

tests, for an instrument or instrument system, means the procedures, in accordance with this Appendix, and used in conjunction with the relevant aircraft manufacturer's approved data, that are required to confirm the accuracy and correct functioning of the instrument or system.

Note The tests described in this Appendix are not comprehensive or exclusive test procedures and for this reason must be used in conjunction with the relevant aircraft manufacturer's approved data.

2 Balloon etc. intervals

Despite the interval mentioned in any other provision to this Appendix, where a provision to this Appendix applies for an aircraft that is a balloon or a thermal airship without an approved SOM, the interval is not to exceed 36 months.

Note Under civil aviation legislation and for this Appendix, a balloon or a thermal airship falls within the scope of the word "aircraft" unless specifically excluded.

3 Pitot-static systems

- 3.1 This clause applies to an aircraft except an exempted aircraft.
- 3.2 Tests must be carried out on an aircraft for pitot-static system leaks.
- 3.3 For subclause 3.2, the tests must be carried out in accordance with each of the testing procedures set out in clause 1 of Attachment 1 to this Appendix.
- 3.4 The tests mentioned in subclause 3.2 must be performed:
 - (a) at intervals not exceeding every 24 months; or
 - (b) if any pitot-static system components, including instruments, are changed or modified — at the same time as the change or modification, and then at intervals not exceeding every 24 months after that time; or
 - (c) if maintenance is carried out on the pitot-static system that involves disconnection of any of the pitot-static lines — at the same time as the maintenance, and then at intervals not exceeding every 24 months after that time.

4 Testing pressure altimeters and air data computers

- 4.1 This clause applies to an aircraft except an exempted aircraft.
- 4.2 Subject to subclause 4.3, the pressure altimeters installed in an aircraft must be tested in accordance with:
 - (a) each of the testing procedures set out in clause 2 of Attachment 1 to this Appendix; or

- (b) each of the applicable testing procedures of a recognised foreign national airworthiness authority (*NAA*) listed in regulation 21.012 of CASR 1998 that is the NAA of the state of design for the aircraft.
- 4.3 For an aircraft certificated for single-pilot operations:
 - (a) the pilot's pressure altimeter must be tested under subclause 4.2; and
 - (b) any other pressure altimeter that is not tested must be appropriately placarded to that effect.
- 4.4 The pressure altimeter tests mentioned in subclause 4.2 must be carried out at intervals not exceeding every 24 months.

Note 1 Test errors must not exceed those specified for pressure altimeters in Attachment 1 to this Appendix.

Note 2 Appropriate test equipment may allow pressure altimeter tests to be carried out either while the altimeter is installed on the aircraft, or in a workshop.
- 4.5 Any air data computer installed in an aircraft must be tested in accordance with the manufacturer's maintenance manual.

Note Electronic displays do not require testing.

Automatic altitude reporting equipment correspondence checks

- 4.6 If any of the following devices are installed in an aircraft:
 - (a) an automatic pressure altitude encoder;
 - (b) an air data computer;
 - (c) any equivalent device reporting directly to air traffic control (*ATC*) via the aircraft's transponder;the device must be tested in accordance with each of the testing procedures set out in clause 3 of Attachment 1 to this Appendix.

Note Test errors must not exceed those specified in Attachment 1 to this Appendix for the relevant encoders, computers or other devices.
- 4.7 Subject to subclause 4.8, the automatic pressure altitude encoders mentioned in subclause 4.6 must be tested in conjunction with the aircraft's pressure altimeter tests mentioned in subclause 4.2.

Note See subclause 4.4 for the interval.
- 4.8 If the following apply:
 - (a) an aircraft uses a separate direct reading altimeter for the primary control of altitude;
 - (b) the aircraft has an automatic altitude reporting system comprising a separate automatic pressure encoder, air data computer, or other equivalent device reporting directly to ATC via the aircraft's transponder;then the reporting system must be tested in accordance with subclause 4.6 on each occasion of the removal or the installation of, or a change to, or a modification to:
 - (c) a system component; or
 - (d) the system interwiring.

5 Airspeed indicator

- 5.1 This clause applies to an aircraft except an exempted aircraft.
- 5.2 The airspeed indicator tests, including determination of the scale error of the aircraft's installed airspeed indicator must be determined through testing in accordance with subclause 5.3.

- 5.3 For subclause 5.2, the scale errors at the major graduations of the scale must not exceed ± 4 knots up to the maximum speed of the aircraft, when tested first with the pressure increasing, and then with the pressure decreasing. During the test, operation of the airspeed indicator must be smooth and continuous.
- 5.4 Airspeed indicator tests, including determination of the scale error of the aircraft's installed airspeed indicator, must be performed at intervals not exceeding every 48 months.

6 Fuel quantity gauges

- 6.1 This clause applies to an aircraft except an exempted aircraft.
- 6.2 The accuracy of an aircraft-installed system for measuring fuel (the **system**) must be tested and determined.
- 6.3 For subclause 6.2, the determination must be made in accordance with the following test requirements:
 - (a) subject to the tolerances mentioned in this subclause — the indicated quantity of fuel must equal the actual fuel in the fuel tank less the unusable quantity of fuel;
 - (b) fuel quantity gauges must be checked for accuracy at all major graduations;
 - (c) subject to paragraph (d) — scale errors at empty must not exceed $+ 0.5\%$ or $- 5\%$ of the nominal fuel tank capacity;
 - (d) for a system where it is impracticable to correct the empty reading — scale errors at empty must not exceed $+ 0.5\%$ or $- 8\%$ of the nominal fuel tank capacity;
 - (e) if either of the following apply:
 - (i) scale errors or the ungaugable quantity of fuel exceeds $\pm 5\%$ of the nominal fuel tank capacity; or
 - (ii) the gauge is calibrated in fractions of fuel tank capacity;
then, a placard must be displayed adjacent to the fuel quantity gauge showing:
 - (iii) the corrected readings at all major graduations; and
 - (iv) the ungaugable quantities of fuel;
 - (f) fuel quantity gauges must be checked with the aircraft positioned to simulate level flight attitude;
 - (g) for paragraph (f):
 - (i) electrically operated gauges must have normal system voltages applied; and
 - (ii) the fuel quantity at each calibration point must be made by:
 - (A) measurement of the fuel added to the fuel tank; or
 - (B) a dip or drip stick previously calibrated for the fuel tank;
 - (h) during the test, the motion of any fuel quantity gauge must be smooth and continuous.
- 6.4 Determination of the accuracy of the system must be performed:
 - (a) at intervals not exceeding every 48 months; and
 - (b) if any system component or system interwiring is changed or modified — at the same time as the change or modification, and then after that at intervals not exceeding every 48 months.

Note See subclauses 3.3, 4.2 and 4.6 in Appendix 1.

Testing procedures for:

**Pitot-static systems
Pressure altimeter systems
Air data computers
Automatic pressure altitude encoders
Other transponder devices**

Clause 1 Pitot-static system test

(1) Static pressure systems

Performance of the test procedures set out below, with all static instruments connected, must ensure that any leakage present is within the tolerance specified for the procedure.

- (a) Visually inspect the ports, plumbing, accessories and instruments connected to the static system. Repair or replace those parts which are defective, for example, broken “B” nuts, cracked flare sleeves, deteriorated flexible tubing and quick disconnects, bad valves etc. If purging is necessary, use compressed air or nitrogen to remove foreign matter which may have accumulated in the tubing. Ensure that all static instruments are disconnected before commencing to purge.
- (b) Ensure that no alterations or deformations of the airframe surface are present that would affect static air sensing. This is of particular importance for RVSM aircraft.
- (c) Check any static port heaters to assure proper operation.
- (d) If an aircraft has more than 1 static system, test each system separately to assure its independence and that the leak rate for each system is within tolerance.
- (e) Connect the test equipment directly to the static ports, if practicable. If not practicable, connect to a static system drain or tee connection and seal off the static ports. If the test equipment is connected to the static system at any point other than the static port, it must be made at a point where the connection may be readily inspected for system integrity after the system is returned to its normal configuration.
- (f) Determine that any leakage is within the tolerances mentioned in paragraph (g) or (h) (as the case requires).
- (g) For unpressurised airplanes — evacuate the static pressure system to a pressure differential of approximately 33 hPa or to a reading on the altimeter that is 1 000 feet above the aircraft’s elevation at the time of the test. Without additional pumping for a period of 1 minute, the loss of indicated altitude must not exceed 100 feet on the altimeter.
- (h) For pressurised airplanes — evacuate the static pressure system until a pressure differential equivalent to the maximum cabin pressure differential for which the airplane is type certificated is achieved. Without additional pumping for a period of 1 minute, the loss of indicated altitude must not exceed 2 per cent of the

equivalent altitude of the maximum cabin differential pressure or 100 feet, whichever is greater.

- (i) On completion of the static pressure system test, ensure that all static port seals are removed.

(2) Pitot-systems

- (a) The pitot system is tested for leaks by applying a pressure at the pitot head sufficient to cause the airspeed indicator to read 120 knots, or the maximum indicated speed, whichever is the greater.
- (b) There must be no discernible lag in the movement of the airspeed indicator pointer with the application of the pressure, as such a lag indicates restrictions in the piping.
- (c) There must be no decrease in the reading when the system is sealed for at least 10 seconds.

Clause 2 Tests for altimeters and air data computers

Note For testing of air data computers, see subclause 2 (8) below.

(1) Environmental conditions test

- (a) Vibration (intended to minimise the effects of friction). If suitable test equipment is available, each test for performance may be conducted with the instrument installed in the aircraft. If suitable test equipment for an installed test is not available, or if the instrument fails the installed test, the instrument must be removed from the aircraft and tested or retested with vibration applied.
- (b) Temperature. When tests are conducted with the temperature substantially different from ambient temperature of approximately 25°C, allowance must be made for that temperature difference.

(2) Scale error test

- (a) With the barometric pressure scale at 1 013 hPa, the altimeter must be successively subjected to pressures corresponding to the altitude specified in Table 1 up to the maximum, normally expected, operating altitude of the aircraft in which the altimeter is, or is to be, installed.
- (b) The reduction in pressure must be made at a rate not in excess of 20 000 feet per minute to within approximately 2 000 feet of the test point.
- (c) The test point must be approached at a rate compatible with the test equipment.
- (d) The altimeter must be kept at the pressure corresponding to each test point for at least 1 minute, but not more than 10 minutes, before a reading is taken.
- (e) The error at all test points must not exceed the tolerances specified in Table 1.

Table 1 Scale error

Altitude	Equivalent pressure	Tolerance
	Hectopascals	± (feet)
-1 000	1050	20
0	1013	20
500	995	20
1 000	977	20
1 500	960	25
2 000	942	30
3 000	908	30
4 000	875	35
6 000	812	40
8 000	753	60
10 000	697	80
12 000	644	90
14 000	595	100
16 000	549	110
18 000	506	120
20 000	466	130
22 000	428	140
25 000	376	155
30 000	301	180
35 000	238	205
40 000	188	230
45 000	147	255
50 000	116	280

(3) Hysteresis test

- (a) The hysteresis test must begin within 15 minutes of the altimeter's initial exposure to the pressure corresponding to the upper limit of the scale error test in subclause (2). While the altimeter is at this pressure, the hysteresis test is to commence.
- (b) Pressure must be increased at a rate simulating a descent in altitude at the rate of 5 000 to 20 000 feet per minute until within 3 000 feet of the first test point (50 per cent of maximum altitude).

- (c) The test point is then to be approached at a rate of approximately 3 000 feet per minute. The altimeter must be kept at this pressure for at least 5 minutes, but not more than 15 minutes, before the test reading is taken.
- (d) After the reading has been taken, the pressure must be increased further, in the same manner as before, until the pressure corresponding to the second test point (40 per cent of maximum altitude) is reached. The altimeter must be kept at this pressure for at least 1 minute, but not more than 10 minutes, before the test reading is taken.
- (e) After the reading has been taken, the pressure must be increased further, in the same manner as before, until atmospheric pressure is reached.
- (f) The reading of the altimeter at either of the 2 test points must not differ by more than the tolerance specified in Table 2 in subclause 2 (4) from the reading of the altimeter for the corresponding altitude recorded during the scale error test prescribed in subclause (2).

(4) **After effect test**

Within 5 minutes following the completion of the hysteresis test set out in subclause (3), the reading of the altimeter (corrected for any change in atmospheric pressure) must not differ from the original atmospheric pressure reading by more than the tolerance specified in Table 2.

Table 2 Test tolerances

Test	Tolerance (feet)
Case leak test	±100
Hysteresis test:	
First test point (50 per cent of maximum altitude)	75
Second test point (40 per cent of maximum altitude)	75
After effect test	30

(5) **Friction test**

- (a) The altimeter is to be subjected to a steady rate of decrease of pressure approximating 750 feet per minute.
- (b) At each altitude listed in Table 3, the change in reading of the pointers after vibration (using a light tapping of the instrument panel adjacent to the altimeter if the altimeter does not have an integral vibrator) must not exceed the corresponding tolerance listed in Table 3.
- (c) If the altimeter fails the friction test while installed on the aircraft, the altimeter must be removed and retested.

Table 3 Friction

Altitude (feet)	Tolerance (feet)
1 000 -	±70
2 000 -	70
3 000	70
5 000	70
10 000	80
15 000	90
20 000	100
25 000	120
30 000	140
35 000	160
40 000	180
50 000	250

(6) Case leak test

The leakage of the altimeter case, when the pressure within it corresponds to an altitude of 18 000 feet, must not change the altimeter reading by more than the tolerance shown in Table 2 in subclause 2 (4) during an interval of 1 minute.

(7) Barometric scale error test

At constant atmospheric pressure, the barometric pressure scale must be set at each of the pressures (falling within its range of adjustment) that are listed in Table 4, and this must cause the pointer to indicate the equivalent altitude difference shown in Table 4 within a tolerance of plus or minus 25 feet.

Table 4 Pressure-altitude difference

Pressure (hectopascal)	Altitude difference (feet)
952	-1 727
965	-1 340
982	-863
999	-392
1013	0
1033	+531
1046	+893
1049	+974

(8) **Air data computers test**

- (a) The tests set out in subclauses (1) to (7) do not apply for air data computers or for systems similar to air data computers (a *similar type*).
- (b) Paragraph (c) sets out the tests for the following altimeters:
 - (i) an altimeter that is an air data computer or similar type with associated computing systems;
 - (ii) an altimeter that incorporates air data correction internally.
- (c) An altimeter mentioned in paragraph (b), must be tested as follows:
 - (i) in the manner, and to the specifications, provided by the manufacturer of the equipment or aircraft in which the altimeter is installed;
 - (ii) in accordance with the instructions for continuing airworthiness incorporated in a modification approval for the equipment or aircraft in which the altimeter is installed.

Clause 3 Automatic pressure altitude encoders and ATC transponder system integration test

Automatic pressure altitude encoder test and other transponder devices

Measure the automatic pressure altitude value at the output of the installed ATC transponder when interrogated on Mode C at a sufficient number of test points to ensure that the altitude reporting equipment, altimeters, and ATC transponders perform their intended functions as installed in the aircraft. The difference between the automatic reporting output and the altitude displayed at each altimeter must not exceed 125 feet.
