

TITLE OF THE INVENTION
**APPARATUS AND METHOD FOR MEASURING OUTSIDE AMBIENT
TEMPERATURE**

BACKGROUND OF THE INVENTION

(a) Field of Technical Art

The present invention relates to apparatus for measuring outside ambient temperature (OAT) during ground temperature tests for aircraft, and in particular, to a portable device used for the accurate measuring of outside ambient temperature. The present invention also relates to a method for measuring outside ambient temperature during ground temperature test for aircraft.

(b) Description of the Prior Art

In most ground temperature tests for aircraft, the outside ambient temperature (OAT) has to be measured as a reference point. Commonly, temperature sensors for measurement of outside ambient temperature are positioned either directly under the aircraft's wings or other shaded locations around the aircraft. The drawbacks of the conventional apparatus and methods are the inaccurate temperature readings as a result of radiation from the ground, other heat emitting objects, for instance, engine exhaust from the test aircraft, and/or other interference. For ground temperature test for aircraft, the test is normally conducted during the hottest part of the day with the aircraft parked under an open (un-shaded) apron. If the outside temperature measurement point is not positioned at an appropriate position, the outside temperature measurement point could affect the aircraft's temperature analysis subsequently. This is because the current temperature measurement point is not properly shielded from any potential radiation effects, in particular the effect of ground radiation, and hence there exists a possible heating of the air around the temperature measuring point. FIG. 1 is a schematic view showing the typical outside ambient temperature measurement points 12, 14, on aircraft currently carried out using conventional measuring methods. The temperature sensors for

measuring outside ambient temperature are positioned under the wings of the aircraft or other shady locations around the aircraft. Due to the irradiation from the ground, the temperature readings are inaccurate.

US Patent No.: 5449234 issued to Gregory H Gipp on 12 September 1995 disclose a method and device for sensing the temperature of the surrounding air. The measuring device is insulated from other environment effects, and therefore the measuring device is complicated in structure and may not be portable. The measuring device includes a non-metallic housing and a conditioning circuit for the temperature measurement.

The conventional method and device do not provide a standardized reference point of measuring outside ambient temperature, and accordingly, it is an object of the present invention to provide a device of measuring ambient temperature.

SUMMARY OF THE INVENTION

In one aspect, there is provided an apparatus for measuring outside ambient temperature, said apparatus comprising

- a supporting stand;

- a shielding device (30) including an upper shield and a lower shield mounted on said support stand;

- an outside ambient temperature measurement device having a hollow enclosure provided with a plurality of holes, located between said upper shield and a lower shield, said outside ambient temperature measurement device comprising an enclosed housing having an air inlet and an air outlet and defining an air flow path therebetween, a temperature sensor located in said air flow path and a fan located in said air flow path for drawing air through said air inlet along said flow path and out said air outlet.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 depicts a conventional method of positioning a temperature sensor to measure outside ambient temperature.

FIG. 2 is a perspective view of an apparatus for measuring outside ambient temperature during ground temperature test .

FIG. 3 is a perspective view of the outside temperature measurement as the apparatus of FIG. 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 2, there is shown an apparatus for measuring outside ambient temperature during ground temperature test for aircraft. The apparatus 100 comprises a supporting stand assembly (20), a shielding device (30), and an outside ambient temperature measurement device (40). The supporting stand assembly (20) includes a tripod stand (22) and a vertical support (24).

As shown in FIGS. 2 and 3, the shielding device (30) includes an upper shield (32) and a lower shield (34) mounted perpendicularly to the vertical support (24) . The upper shield (32) and the lower shield (34) are spaced apart along the vertical support (24). The shielding device (30) is made of canvas material which can eliminate the possible solar or ground radiation during the test. The upper shield (32) and the lower shield (34) are of a size which is sufficient to block away or cut off any direct or indirect solar or ground radiation during the standard measuring times, i.e., from 8am to 4pm of the test day.

The outside ambient temperature measurement device (40) is positioned in between the upper shield (32) and the lower shield (34) at the vertical support (24). The measurement device (40) comprises a hollow enclosure (42) enclosing

a temperature sensor (44) mounted to the inner wall of the hollow enclosure (42), and an induced fan (46) mounted at the lower end of the hollow enclosure (42). The temperature sensor (44) is located at the centre section of the hollow enclosure (42) and is located about 1.5m to 1.7m above the ground. The measurement device (40) further comprises an upper shield plate (48) and a lower shield plate (50). The upper shield plate (48) covers the top portion of the hollow enclosure (42), and the lower shield plate (50), having an opening, supports the lower section of the hollow enclosure (42) and provides shielding from radiation from the ground. The induced fan (46) is mounted across the opening.

The hollow enclosure (42) is coated white and is made of fiberglass material or the like. A plurality of holes (33) are provided on the upper section of the hollow enclosure (42), acting as air inlets to the hollow enclosure (42). The temperature sensor (44), may be a thermocouple. The temperature sensed by the temperature sensor 44 is then recorded by a data logging system (49) within the cylindrical tube (42). The induced fan (46) is battery-operated and is installed at the lower section of the cylindrical tube (42).

The ambient air is drawn in by the induced fan (46) to the hollow enclosure (42) via the holes (33) on the (42), passing the temperature sensor (44) where the temperature of the ambient air is measured. The measurements are recorded at the data logging system (49).

The ambient air is prevented from heating by solar and ground radiation by means of the upper shield (32), the upper shield plate (48) and the lower shield plate (50), and the lower shield (34).

During ground temperature test for aircraft the apparatus (100) is first positioned at a distance of about 5-10m away from the aircraft to eliminate possible interference during the ground temperature test. The shielding device

(30), including the upper shield (32) and the lower shield (34), of the apparatus (100) is adjusted to ensure the shielding device (30) eliminates the solar or ground radiation on the outside ambient temperature of the apparatus (100). Next, the plurality of holes (33) on the cylindrical tube (42) and the induced fan (46) are checked to ensure there is not blockage to the holes (33) (acting as air inlet) by foreign objects. Ambient air is drawn into the outside ambient temperature measurement device (40) via holes (33) and the temperature is sensed by the temperature sensor (44) and the measurements recorded by the data logging system (49). The functionality on the temperature sensor (44), data logger system (49); and the induced fan (46) are checked.

Whilst the above temperature apparatus (100) has been described in relation to use with aircraft ground temperature tests, it is suitable to measure outside temperature in any application where interference from solar, ground or other forms of radiation may normally disturb measurements.

The foregoing description should be considered as illustrative only of the principles of the invention. Numerous modifications and changes will readily occur to those skilled in the art, and it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

CLAIMS

1. An apparatus for measuring outside ambient temperature, said apparatus comprising
 - a supporting stand;
 - a shielding device (30) including an upper shield and a lower shield mounted on said support stand;
 - an outside ambient temperature measurement device having a hollow enclosure provided with a plurality of holes, located between said upper shield and a lower shield, said outside ambient temperature measurement device comprising an enclosed housing having an air inlet and an air outlet and defining an air flow path therebetween, a temperature sensor located in said air flow path and a fan located in said air flow path for drawing air through said air inlet along said flow path and out said air outlet.
2. The apparatus as claimed in Claim 1, wherein the plurality of holes are used as air inlets, allowing withdrawal of ambient air to the hollow enclosure.
3. The apparatus as claimed in Claim 2, wherein the plurality of holes are made on the upper portion of the hollow enclosure.
4. The apparatus as claimed in Claim 1, wherein the upper shield plate being coated covers the top end of the hollow enclosure.
5. The apparatus as claimed in Claim 1, wherein the outside temperature measurement device having a hollow enclosure provided with a plurality of holes, further comprises a data logger for recording the temperatures measured by the temperature sensor.

6. The apparatus as claimed in Claim 1, wherein the upper shield plate and the lower shield plate are coated with white paint.
7. The apparatus as claimed in Claim 1, wherein the temperature sensor is a thermocouple.
8. The apparatus as claimed in Claim 1, wherein the upper shield and the lower shield are made of canvas material.