Installation and Operating Instructions for the ACI Surface Mounted Stall Warning System.

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ACI SURFACE MOUNTING STALL WARNING UNIT TYPE T1b

INSTALLATION AND OPERATING INSTRUCTIONS

INTRODUCTION:
Stall/spin accidents are among the most common serious accidents reported by the FAA, AAIB, and other authorities. They are frequently fatal.
This stall warning system is intended for light aircraft with stalling speeds between 35 knots (40mph) and 65 knots (75mph). Due to its surface mounting concept it is relatively easy to fit to aircraft already in service and adjust for speed of actuation by flight trials.

There are 3 principle elements: a sensor unit on the wing, an interconnecting cable, and an audible alarm/terminal box in the cockpit. The sensor unit is fitted on the lower leading edge of the wing and due to the surface mounting design **no wing skin cut out is required**. Vertical adjustment to obtain operation at the required speed is achieved by initially attaching to the wing leading edge with duct tape, and conducting flight tests. Once the correct vertical position has been established the sensor is permanently fixed with 6-32 (3mm) bolts or self tapping screws. No two aircraft will necessarily require precisely the same position and each must be tested and adjusted independently. The position finally chosen must allow a safety margin and 8-10 knots above the stall speed is usually regarded as adequate. Note that 10 knots can be rapidly lost in small low inertia aircraft.

Note - Please do not use pop rivets to secure the sensor unit to the wing. The shock produced during riveting could be transmitted to the switch module and trigger premature failure which may not be immediately apparent. Damage of this type is easily diagnosed and units damaged in this way are not covered under the product warranty.

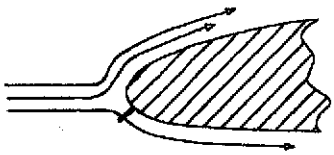


DIAGRAM 1

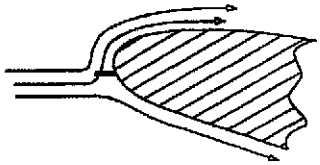
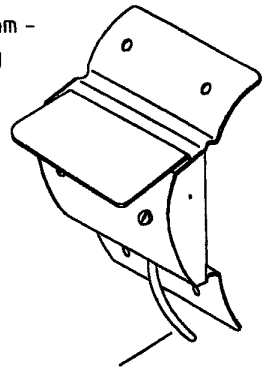


DIAGRAM 2

PRINCIPLE OF OPERATION:
During normal flight the airflow over the leading edge of the wing is as shown in diagram 1, which also shows the position of the sensor vane. During flight close to the stall, the airflow pattern changes to the state shown in diagram 2, and the changed flow pattern raises the sensor vane to the point where the sensor switch will operate and trigger the audible alarm in the cockpit

DIAGRAM 3

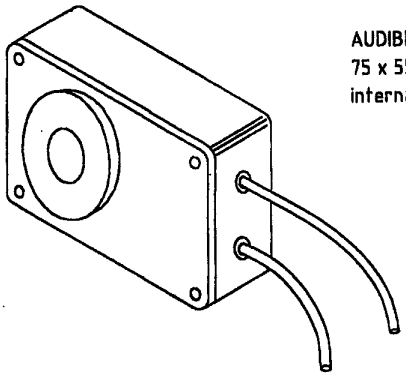
SENSOR
mounting plate 60 x 28mm -
bend to conform to wing
leading edge profile



cable to audible alarm box

DIAGRAM 4

AUDIBLE ALARM BOX
75 x 55 x 25mm
internal fuse 200mA



cable
to sensor

0.5 amp 2 conductor cable to 9 - 12 V

ACI Type T1b stall warning unit

INSTALLATION CONSIDERATIONS

A) Sensor see diagram 3

The sensor unit can be fitted on either wing. It should be mounted at about 3ft (600mm) outboard of the propeller arc, whether the engine installation is tractor or pusher. The initial vertical position for the first trial flight should be shown as diagram 5. A position copied from an identical aircraft is obviously a good starting point. The mounting plate should be carefully bent using leather vice jaws to achieve a snug fit on the leading edge. The cable entry hole in the underside of the wing should be drilled approximately 2 inches (50mm) behind the bottom of the mounting plate, this will allow for sensor vertical position adjustment during flight testing.

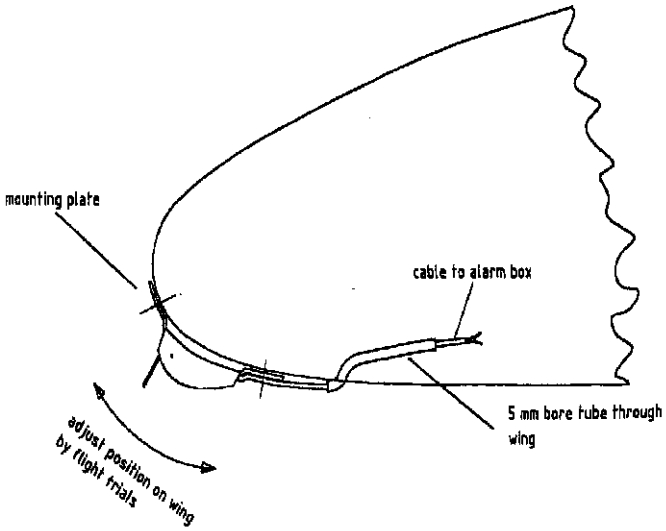


DIAGRAM 5

B) INTERCONNECTING CABLE

The interconnecting cable must pass through the wing structure and into the cockpit and instrument panel. Routing will vary greatly depending on the aircraft structure, but the cable must be fed through a smooth ¼ inch bore aluminium or plastic tube to allow easy withdrawal of the cable plus sensor for repair/servicing. This tube also provides the necessary protection against cable chafe. Joins in the cable should be avoided as far as possible for reliability reasons.

A) AUDIBLE ALARM UNIT – see diagram 4

The audible alarm unit has sufficient sound output to be heard in an enclosed cockpit when wearing headsets. In a quiet cockpit it may be necessary to put one layer of adhesive tape over the diaphragm to reduce sound output. The unit should be positioned so that the sounder diaphragm is pointing into the cockpit and mounted on or just below the instrument panel. The 2 terminal blocks inside the unit provide connection points for the 2 wire sensor interconnect cable and 2 wire 12 volt power cable form the aircraft battery (or a dedicated 9-12 volt portable battery) see diagram 6. When connecting to the aircraft 12 volt supply it is essential that this is made direct to a fused supply from the master switch and not to an auxiliary switch that could be accidentally switched off. The alarm unit itself also contains a fuse to protect against shorts to the sensor cable. During the flight testing stage it is important to be able to disconnect the power supply should the sensor be set to trigger at too high an airspeed and cause distraction to the pilot.

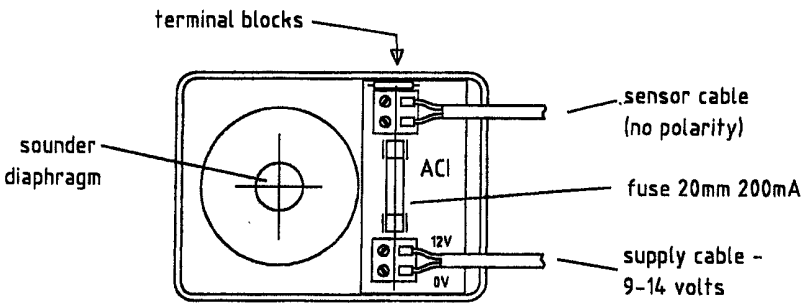


DIAGRAM 6

INITIAL INSPECTION/TEST AND INSTALLATION

On receipt the components should be examined for any obvious signs of damage. The sensor interconnect cable should be connected without need for polarity to the marked terminal block in the alarm/terminal box. A 9 volt to 12 volt DC supply or battery should also be connected to its terminal block in the terminal box – see diagram 6 – and note the necessary 12 volt/OV (+ and -) polarity. By gently operating the vane the audible alarm can be switched on and off. With proper function demonstrated, and full study of the above considerations completed, proceed with installation. If in any doubt at this stage, consult your inspector.

FLIGHT TESTING:

With the installation complete, the electrical function should again be proved by gently operating the vane to sound the alarm. During the test flights the aircraft should be flown to a safe altitude and appropriate pre-stall precautions and checks carried out. The procedure should be to slowly reduce speed to about 10 knots above the known stall speed. If the alarm sounds at say 20 knots above the stall speed, the sensor unit must be moved down and re-taped. Conversely if the alarm does not trigger, the sensor unit will have to be moved up and re-taped. As a very approximate guide, 1/8 inch might equal 10 knots. Several flights may be required to firmly establish a suitable position. Please note that duck tape loses its adhesive qualities very rapidly in the open and thus should be replaced if testing is carried out for more than a few days.

IN SERVICE

A Pre-Flight check must be carried out by lifting the vane to sound the audio alarm. This **must** be added to the pilots check list**.** Note the sensor **cannot** be regarded as operational in icy conditions.

During ground manoeuvring in blustery wind conditions the audio alarm may sound occasionally.

During the ground run in a tailwheel aircraft, air from 'ground effect' may cause the alarm to sound until the aircraft has come to a halt.

When leaving the aircraft a final lift of the vane is a good check that the aircraft master switch is turned off.

No maintenance is required in service other than to keep the sensor in clean condition and annually apply a drop of engine oil to each end of the vane shaft.

TROUBLE SHOOTING

For testing purposes the sensor can be considered to be a simple on/off switch. The sensor wiring has no polarity.

If the sensor vane is moved gently between its stops and the alarm buzzer fails to operate:-

1. Inside the alarm box, use a voltmeter to check that supply voltage is present at the 12v terminal block and also at both ends of the fuse.
2. Replace 200ma fuse if necessary, after rechecking sensor wiring.
3. Remove sensor wired from sensor terminal block and connect a short piece of wire directly across the terminal block. This stimulates a closed sensor switch, and the alarm buzzer should sound continuously.
4. If the buzzer sounds, the fault lies in the sensor, or wiring to the sensor – check any connections, and use the meter on ohms setting to check if sensor switch opens and closes with each vane operation.
5. If the buzzer does not sound, the fault lies within the alarm box. Possible faults are poor 12v supply connections at the terminal, failure of the buzzer unit, or cracked/damaged tracks or solder connections on the terminal board.

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