

Installation of instruments and equipment which are not part of the minimum equipment

1 General

Instruments and equipment which are not part of the minimum equipment (such as gliding computers or loggers): These items may be installed, as long as it is guaranteed, that they themselves or their effect on the aircraft do not impair safe operation.

Additionally installed equipment must not affect the items belonging to the Minimum Equipment. Flight and navigation instruments must be clearly arranged and plainly visible to the pilot. This means that the airspeed indicator and the altimeter must be located at a prominent place on the instrument panel.

2 Electrical system

The instructions in the Maintenance Manual concerning the **electrical system** have to be regarded. The electrical system must be able to cope with the additional load. This regards the capacity of the batteries, the cross sections of the wires and the fuses. In powered sailplanes with battery ignition system, the capacity of the batteries and generators must be large enough to meet the simultaneous demands of the engine ignition system and the greatest demands of any other electrical system components that draw from the same source.

Overload protection (fuses, circuit breakers) must be provided for each item of electrical equipment. No protective device may protect more than one circuit essential to flight safety. This means that the additional equipment should not be protected by a protective device which protects an item of the minimum equipment.

If a main protective device is installed for the battery this device must be selected high enough for the max. current of all equipment operating at the same time.

Each electric connecting wire must be routed, attached and connected adequately so as to minimize the probability of short circuits and fire hazards.

Current for one instrument must not exceed 3A.

3 Pneumatic installation

Maintenance Manual instructions concerning the pneumatic lines and ports have to be regarded. After work on the **pneumatic installation**, the system has to be checked for tightness.

4 Installation of instruments and equipment

Instruments and equipment must **be securely attached** in the sailplane, must neither endanger the pilot, nor hinder bailing out, nor weaken the structure.

4.1 Installation of instruments and equipment installed in the places provided by the design

These places are the instrument panel, the console below the instrument panel, mounting threads or bolts at the canopy frame and at the right hand side cockpit side panels (DG types).

4.1.1 Instruments in the instrument panel

Instruments weighing more than 1kg (2 lbs.) must be supported by more than just the four screws in the instrument panel.

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4.1.2 Equipment mounted on the canopy

If equipment is mounted on the canopy special care must be taken that canopy jettison is not impaired. To accomplish this any wire must be equipped with a plug in the vertical part. All plugs must be able to disconnect with low force, max. 10 N (2 lbs.).

DG and LS single seaters: The wires must be long enough for the canopy to be lifted in the front for a min. 10 cm (4 in.) before the wires are tight.

DG 2-seaters: The wires must be long enough for the canopy to be lifted in the front for a min. 10 cm (4 in.) before the wires are tight.

Equipment shall only be mounted at the fastening threads in the canopy frame provided by the design (all DG types and some LS types) or at the instrument cover (glare shield, only LS types).

Max. mass of the equipment: 1 kg (2 lbs.).

4.2 Installation of instruments and equipment at other places

The attachment of every item of mass that could injure an occupant, if it came loose in a minor crash landing, must bear the following loads – unless higher loads are specified in the Maintenance Manual:

Load direction	Load
upward	4,5
forward	9
sideward	3
downward	4,5

Suitable places for attaching equipment are all parts of the main structure (particularly bulkheads, baggage compartment floors, glass fibre or carbon fibre fuselage skin, etc.).

The attachment must not weaken the structure. Therefore, when there are no holes for screws present, an attachment with clamps or with a correct glue joint is adequate.

If no attachment certified for the load is present and can be used, load tests must be made – a load test for every direction, to which the equipment can become loose.

For the load test, the weight of the equipment (and if applicable the weight of other parts attached to the same structural member) must be multiplied with the load factor given above. The load is applied for 3 seconds. After relieve of load no permanent deformations may remain. The test may be performed at room temperature.

5 Specific instructions

5.1 Electrical equipment and its aerials

Electric equipment and its aerials may neither in themselves nor by their mode of operation or by their effect upon the operating characteristics of the aircraft and its equipment constitute a hazard to safe operation.

Every item of electrical equipment has to be checked for reciprocal influence by systematically turning off and on and operating all other instruments.

The equipment and its control and monitoring devices must be arranged so as to be easily controllable. Their installation must be such that they are sufficiently ventilated to prevent overheating

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5.2 Transponders

Transponders may be installed, when they are TSO, JTSS or ETSO certified. The mounting parts and wire harnesses provided by the manufacturer have to be used. Those instructions have to be regarded, which are supplied in the Maintenance Manual and in separate Technical Notes concerning transponder installation.

When ATC airborne equipment has been installed, or is being installed, inspections related to this equipment always have to be done by inspectors licensed for avionic.

5.3 Emergency Location Transmitters (ELT)

As far as the Maintenance Manual does not offer more specific instructions: Emergency Location Transmitters (ELT) should be installed in a protected area (e.g. between the wings). The aerials must be placed on a location, where it is not shielded by carbon fibre laminate. The wire between ELT and aerial should not be routed over an unduly long distance, due to the risk of rupture in a crash.

Caution: The aerials supplied with 406 MHZ ELT's usually need a ground plane if not mounted on a metal structure. As the aerials are usually quite long an internal installation in a sailplane or powered sailplane is impossible in most cases. This means special aerials are needed according to the instructions in the maintenance manual or in a special technical note.

5.4 Oxygen equipment

Oxygen equipment must be approved. Oxygen equipment must be free from hazards in itself, in its method of operation, and its effect upon other components. The oxygen bottles must be installed according to the Flight Manual or Maintenance Manual. There must be a means to allow the crew to readily determine during the flight whether oxygen is being delivered to the dispensing equipment and the quantity of oxygen available in each source of supply.

5.5 Anti collision lights (ACL)

Anti collision lights may be installed at a suitable place. Night flight equipment is not intended to be installed.

6 Weight and balance

After installation provide a new weighing report by calculation or by executing a new weight and balance. Alter the equipment list.

File weighing report and equipment list into the aircraft logs.

Enter the data in the weighing report in the flight manual (if existent).

Enter min. cockpit load in the cockpit data placard if load changed.