

Guidance on Mounting Cameras on Sailplanes and Powered Sailplanes, AIRW-D024



INTRODUCTION

For a number of years pilots have fitted small cameras to sailplanes in Australia as evident by the many You Tube videos. These cameras have been installed by the pilots with no guidance or airworthiness oversight. This practise has put at risk the sailplane, pilot, third party property and individuals. While the cameras are small the GFA has had experience of disturbed airflow off a camera interfering with the tailplane resulting in inflight buffeting.

To reduce the risk of inappropriate camera installation the GFA has adopted much of the guidance material produced by the Civil Aviation Authority in CAP 1369 "Policy and Guidance on Mounting Cameras on Aircraft".

One of the key challenges faced is that each camera installation needs to be judged on a case by case examination to consider the airworthiness risks that could be posed (including installed sailplane and 3rd party risks), hence it can be difficult to cover all eventualities in guidance without seeming to be overly prescriptive.

In view of the above and in order to be more proportionate guidance has been provide for a route for the approval of light, simple and small camera installations, using a methodology whereby an Annual Inspector will be able to examine the installations and to certify whether an acceptable airworthiness standard has been achieved.

This guidance does not apply to hand-held carry-on cameras, nor devices worn by the pilot e.g. helmet-mounted cameras, which do not require any particular approval when they are used in these hand-held or worn operational modes. However there should be suitable judgement exercised to assure that such equipment does not pose any additional risks including any adverse effect on the wearer's ability to get out of the sailplane in an emergency, obstruct the pilot's view or cause unintentional operation of controls etc, that could affect the pilot's ability to fly the sailplane. Suitable care when handling the camera and use of retention straps is advised to mitigate the risk to the sailplane, its occupants and to third parties that could arise from dropping the camera.

SCOPE

This guidance addresses small camera installations mounted internally or externally on sailplane and powered sailplane structures that are self-contained, (with internal batteries and no external wiring), such as GoPro and similar size cameras that are of small form factor and relatively light, (<250 g including mountings). Such installations would be expected to have low or negligible effect at the sailplane level with regard to mass, centre of gravity, structural strength and drag and would thus be expected to have no appreciable effect on sailplane systems, handling or performance.

Risks to the sailplane and its occupants as well as third party risks posed by the installation including potential camera and mount detachment need to be managed and mitigated by careful installation that will be assessed by the Annual Inspector for acceptability and documented accordingly.

Larger and more complex camera installations, (including multi camera systems, connections to sailplane power / systems), which are likely to have more significant effects on structures, systems, handling and performance etc, are considered outside the scope of this material and thus will constitute modifications requiring approval under the GFA modification process.

This issue of Guidance on Mounting Cameras on Sailplanes and Powered Sailplanes replaces the one issued on 20/04/16

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GUIDANCE ON INSTALLATION ASSESSMENT AND APPROVAL BY AN ANNUAL INSPECTOR

The camera installation will need to be assessed by an Annual Inspector before the first flight in situ on a sailplane. Guidance on acceptable installation practices and the assessment process to be followed are provided in the attached Installation Checklist. In addition to the Check List form a note is to be made in the minor defect section of the maintenance release, referencing the installation of the camera and location.

The decision to permit the camera installation resides with the Annual Inspector. The Annual Inspector should not feel pressured to approve the installation for the pilot and if uncomfortable or unsure about the installation should reject or refer to another Annual Inspector for approval or ask for guidance from the regions RTOA.

If approving for multiple flights the Annual Inspector should consider any on-going airworthiness requirements such as mounting inspections or re-application of the load testing.

No Aerobatics or intentional spins are permitted with the camera installed to the sailplane.

The Annual Inspector may request a flight test in some cases to verify the installation.

GENERAL INSTALLATION REQUIREMENTS AND GUIDELINES

The installation must be inspected by an Annual Inspector who will review the camera installation against the points below and complete and sign the sections below to confirm that the installation is satisfactory.

Step	General installation requirements and guidelines checklist	Tick or n/a
1.	Cameras are physically attached to the airframe using secure mountings. Where clamps are used, care should be taken to ensure that they do not damage the sailplane structure – the use of a suitable intermediate material between the clamp and airframe should be considered.	
2.	Secondary locking of fasteners / connections must be applied – secure with cable ties, or locking wire, nyloc nuts (which should not be re-used). Battery and other camera access compartments should be checked and taped over for additional security.	
3.	Mounting is not on slender components.	
4.	If existing airframe structural fastener locations are picked up then additional installed brackets should be of the same material as the underlying structure and bolts will be need to be lengthened as necessary to remain in safety / maintain suitable thread engagement and protrusion, however it should be ascertained that no external or internal parts or systems including flying controls could be fouled or obstructed by employing longer fasteners. Note that no bracket should be introduced that acts as a packer between major load paths e.g. where the bracket would act as a washer under the bolt head or nut – the size of the bolt should be taken into consideration and all disturbed fasteners must be inspected prior to flight by the Annual Inspector.	
5.	Further to the above, the structural integrity of the sailplane must not be compromised by the installation due to cutting or by drilling of new or enlarged holes.	
6.	The use of suction mountings is not generally acceptable for externally mounted cameras.	
7.	If suction mounts are used inside the cockpit or cabin, a suitable secondary retaining lanyard or strap should be attached to the mounting to prevent damage or a control jam should the primary suction mount become detached.	
8.	Further to the above, the structural integrity of the sailplane must not be compromised by the installation due to cutting or by drilling of new or enlarged holes.	
9.	Cameras mounted inside the sailplane in occupied areas should be installed so as to meet the requisite crash load requirements so that they will not detach and cause injury in the event of an emergency landing - for suction mountings the primary suction mounting and secondary lanyard /strap should be assessed so that each is independently capable of carrying the loading, (see item 13 below). Pull testing should be used to confirm the integrity of the secondary retention to at least 10 times the weight of the unit. Periodic re-checking of the primary mount integrity is advised.	

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10.	<p>Proprietary self-adhesive mounts can be used in accordance with the manufacturer's instructions provided that they are capable of passing the pull test. Installation of a secondary independent lanyard/strap retention feature may also be considered prudent when using these types of mounts. There is also concern that self-adhesive mounts may be subject to environmental deterioration especially for installations used over a long period of time. Both the self-adhesive and the airframe surface coating / interlay medium that it is adhered to are subject to ageing and environmental degradation – careful periodic inspections and a pull test of the mount strength integrity will be performed if there are signs of deterioration – inspections are detailed in the comments section below.</p>	
11.	<p>Mounting must be on fixed surfaces of the airframe, i.e. not on control surfaces or on control system components subject to motion. There must be no interference with flying controls. Cameras should not be fitted in front of or close to flying controls, pitot-static probes or angle of attack sensors, or in locations where flow into or out of system ducts / cowlings etc., may be interfered with or otherwise impeded. Refer to Figure 1 for guidance on the likely wake affected areas.</p> <p>If the camera is fitted in or near the cockpit, it must not interfere with any cockpit controls, nor obstruct the pilot's view of instruments, the pilot's external view or cause a distraction.</p> <p>The camera should be mounted in a position such that if it were to detach from the sailplane or become loose, it will not cause harm to occupants nor impact any critical parts of the sailplane (e.g. propellers, engine, flying control surfaces and systems, airspeed sensors).</p> <p>Push/Pull test requirement – the camera and its attachment mountings should be weighed prior to installation and checked to ensure that the total weight does not exceed 250 g. In order to check the security under flight, ground and emergency landing cases, a spring balance or other suitable method should be used to apply separate loads to the mounted camera of at least:</p> <ul style="list-style-type: none"> • 9 times the weight forwards, • 4.5 times the weight up, • 6 times the weight down, • 3 times the weight port, • 3 times the weight starboard. <p>Loading should be applied for at least 3s with no failure, damage or permanent distress. Higher factors should be considered as appropriate to aerobatic use to include a 9 times weight downwards case. In addition external cameras should be subjected to a proof load test in the drag direction prior to flight - a minimum drag load of 2 kg should be used. The drag load should be checked to be appropriate for the size of the camera and the maximum design speed of the sailplane; for example, (using a drag coefficient on unity at sea level), a 4 cm by 10 cm = 40 cm² cross section normal to a 150 knot airstream would generate ~ 1.5 kg drag load. This value will scale up directly with area so a camera/mount that is 2 times the area will see 2 times the drag load, whilst an increase in the airstream will increase drag by the square of the airspeed, thus 2 times the airspeed gives 4 times the drag. Note that installations mounted in areas affected by propeller slipstream will need to be designed to withstand increased drag loads.</p>	
12.	<p>Continued Airworthiness monitoring of the mounting and camera installation is to be carried out at regular intervals – this is detailed in the comments section below. Careful periodic inspection should check the integrity and security of the camera mounting hardware. Parts that show signs of deterioration must be rectified or replaced.</p> <p>In order to reduce the risk of electromagnetic interference (EMI) with sailplane systems, cameras that are equipped with wireless interface and activation systems (including WiFi / Bluetooth and similar wireless technologies with potential for transmitting EMI) should be placed in a 'flight safe mode' with the wireless functionality disabled; a limitation note to this effect should be recorded by the Annual Inspector below for the attention of the pilot/owner.</p>	

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Additional comments and limitations related to the checklist above	
Checklist number	Comments

Instructions for Continuing Airworthiness

Annual Inspector Sign-Off	
All sections of the form completed	
Attached installation sketch and a list of parts	
Location of installation	
Name (PRINT)	
Annual Inspector's GFA Number	
Date	
Signature	

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Figure 1 Areas which may affect the performance and operation of the sailplane.

