BRITISH MICROLIGHT AIRCRAFT ASSOCIATION

TECHNICAL INFORMATION LEAFLET

NO: 109 **ISSUE 5** **NOV 2020**

STANDARD MINOR MODIFICATION – GPS INSTALLATION
(INCL. GPS-ENABLED HANDHELD DEVICES)

Introduction

This leaflet contains the required information to permit straightforward fitment of a GPS in a microlight aeroplane. It covers the fitment of both removable and fixed GPS units, as well as the fitment of both removable and fixed GPS mounts. A GPS-enabled handheld device, such as a tablet or mobile phone, is considered a removable GPS unit for the purposes of this leaflet.

This leaflet permits only certain ways of installing a GPS. This is because these ways are known to be straightforward, risk and hassle free. This doesn't mean that there aren't other ways of fitting a GPS, but if you wish to do it in another way, this must be done through a more conventional mod application (at greater cost) and more information than is required here may be requested by the BMAA technical office.

Notwithstanding the simple approach taken by this TIL, it is the aircraft owner's responsibility to ensure that all materials used in a modification are of adequate quality, that proper aircraft engineering standards are applied, that this modification does not create any safety problem when combined with any other modification to the aircraft, and that no relevant information has been withheld from the BMAA or inspector.

Permitted Options

1 GPS Unit type
- 1.1 The GPS is to be a removable type such as a "Garmin 96", "Garmin 296" etc., or…
- 1.2 The GPS is to be a GPS-enabled handheld device, such as an "Apple iPad", or…
- 1.3 The GPS is to be a panel-mount type.
- 1.4 Weight and balance change accounted for as appropriate.

2 GPS Mount type
- 2.1 The GPS mount may be integrated to the GPS Unit, or…
- 2.2 The GPS mount may be separate to the GPS Unit, or…
- 2.3 The GPS may have not a mount and may instead be a self-contained unit.
- 2.4 The GPS must not hinder emergency egress from the aircraft.

3 Antenna type
- 3.1 The GPS may have an integral antenna, or…
- 3.2 The GPS may have an additional separate antenna.

4 Power Supply
- 4.1 The GPS may have an internal or integral battery **without** the ability to be charged by the aircraft power supply, or…
- 4.2 The GPS may have an internal or integral battery **with** the ability to be charged by the aircraft power supply, or…
- 4.3 The GPS may be powered by an external battery and/or a regulator attached to an auxiliary power supply socket, or a dedicated fused supply of the correct voltage (not necessarily 12v).
- 4.4 If a dedicated switch is present it must be appropriately rated. It must be placarded.
- 4.5 Operation sense for the switch must be down for off and placarded so.

5 GPS Location
- 5.1 A panel-mount GPS is to be mounted **in** the instrument panel.
- 5.2 A removable GPS is to be located in the cockpit, out of the airflow, and, in particular…
- 5.3 The GPS is to be mounted in or on the instrument panel, or...
- 5.4 The GPS is to be mounted on the front strut using a ram mount, or…
- 5.5 For any aircraft where the GPS is to be mounted on a bracket, this must be without drilling of any primary structure.

6 Antenna Location
- 6.1 The antenna is to be located out of the airflow.

7 Radio Interference

7.1 Check the radio system (if fitted) to ensure no excessive interference is present.

Essential Safety Checks

1 GPS

1.1 When installing a GPS, on no account should primary structure be cut, drilled or altered in any way. If in doubt, ask.

1.2 The GPS (including any mounting brackets and integral batteries) must be weighed.

1.3 A load test, using scales or a spring balance to 9 times the instrument weight forwards, 4.5 times the instrument weight up and down, 3 times the instrument weight to port and starboard must be carried out.

1.4 If the GPS is removable and is **not** positively restrained by a **fixed** mount, there must also be a retaining lanyard attached to both the aircraft and the GPS, to stop it becoming a hazard if it comes loose. This must be short enough to prevent it snagging the pilots as they enter or leave the cockpit.

1.5 When panel-mounting a GPS, if a new cut-out is required, this is only acceptable if the panel is not load bearing primary structure. If unsure contact the manufacturer or the BMAA Tech Office, it is critical to make certain first and cut later. There must be enough space around the instruments so that there is adequate mechanical strength left in the panel to carry the additional weight. Obviously, this means that with a thick metal panel the GPS can be far closer to other instruments than with a thick GRP panel for example (instruments with backing plates that are screwed into the panel are unlikely to have a significant weakening effect). In addition to the load test of check 1.3, test the panel in the area of the GPS with 9 times the combined weight of the GPS and its adjacent instruments forward (spread the load over an area when performing this test). If there is any question as to whether the whole panel can cope with the additional weight, repeat the test with 9 times the combined weight of all the instruments[3].

2 Cabling

2.1 If powered or charged via the auxiliary power supply socket it is the pilot's responsibility to secure the cable and ensure that it cannot pose a danger to the control of the aircraft, since any such cable is not considered part of the modification.

2.2 If wired directly into the aircraft's electrical system, the GPS must be connected to its power supply via an in-line fuse and a switch (such that it is easy for the pilot to turn off the power supply to the installed instrument in flight). The fuse rating must be between 1.5 and 2 times the maximum current draw of the GPS, and placarded on, or adjacent to, the fuse holder. The switch can be a separate switch or the supply can be routed via the master switch. In the case of a separate switch, it must be clearly placarded with its function (for example 'GPS') and its sense (on/off), which must be down for off. Cables between the GPS and the power supply must be firmly secured.

2.3 Any cables bridging de-riggable parts of the aircraft must have quick release fasteners at the join.

2.4 No holes must be drilled in any metal or primary structure for cables to pass through.

2.5 No holes must be cut in the sail for cables to pass through.

2.6 Cables, if passing through the wing, must be routed so that they cannot snag any flying controls.

[3] *Further information on load testing may be found in the document TIL 27.*

3 Antenna

3.1 Any additional separate antenna is to be attached to the aircraft using Velcro, cable ties or similar. Cables must be fixed securely so as not to impede free movement in/out of the aircraft, and must conform to the safety checks in section 2.

3.2 The antenna must be mounted out of the airflow.

4 Aircraft Weight and Balance

4.1 The last weight report must be checked to ensure that the additional weight of the installation won't put the aircraft overweight.

4.2 For a 3-axis microlight aircraft, the inspector must calculate, from the known weight and position of the new instrument the empty CG change, and satisfy themselves that this will not in any condition make the aircraft go outside the permitted CG limits. If a W&CG report is not held for the aircraft, one must be prepared or BMAA HQ contacted for the file copy (Note: it is an ANO requirement that whenever an aircraft is weighed, details of the weighing are included in the aircraft logbook).

4.3 The inspector must make an amended weight and balance entry in the aircraft logbook.

5 Radio Interference

5.1 If a radio is fitted, check that the GPS does not cause excessive interference. A small increase in the use of the radio's squelch control to suppress GPS 'noise' is acceptable, but if the squelch cannot completely remove the interference, or the quality of received transmissions is significantly affected by the GPS, remedial action is required.

What to do once you have fitted your GPS

In conjunction with your inspector, fill in the form on pages 4, 5 and 6 of this TIL, and return it to the BMAA. The BMAA will return this form to you, with the full modification approval number shown at the bottom of the page. This mod number must then be entered in the aircraft logbook.

It is acceptable to send in the form with your permit renewal form.

Aircraft must be wholly owned by BMAA members. A BMAA Ownership Trustee Grid should be submitted with this form for syndicate, group and company owned aircraft.

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BMAA – STANDARD MINOR MODIFICATION CHECKLIST: TIL 109

Reg: G-_ _ _ _	Aircraft type:	Serial No:
Owners name[1]:		Owners BMAA No:
[1] BMAA Aircraft Ownership Trustee Grid required for syndicate/group/company owned aircraft		

Installation Details

GPS Unit Make and Model**	
GPS Mount Make and Model *(If Separate to GPS Unit)*	

GPS Unit Weight	g
GPS Mount Weight *(If Separate to GPS Unit)*	g
Total Installation Weight *(Including Additional Wiring Required)*	g

Tick one box per section

1. GPS Unit Fitment	Removable	☐	2. GPS Location	Overhead	☐
	Fixed	☐		In Instrument Panel	☐
				On Instrument Panel	☐
				Keel Tube	☐
				Windscreen	☐
3. Power Supply	Integral Battery	☐	4. Antenna	Integral	☐
	Aircraft Power Supply	☐		Separate	☐
	Integral Battery with A.P.S Charging	☐			
5. GPS Mount	Non-Existent	☐	6. GPS Mount Fitment *(If Separate)*	Removable	☐
	Integrated with GPS	☐		Fixed	☐
	Separate	☐		N/A	☐

***It is common for syndicates to use a variety of devices, if so state MULTIPLE in this box and then supply details of the heaviest device in the other cells.*

Safety Checks

CHECK	ACTION	COMMENTS	INSPECTOR'S INITIALS
1 All GPS types			
1.1	No primary structure drilled or altered		
1.2	GPS inside cockpit & outside airflow		
1.3	Installation load tested		
1.4	Aircraft within weight & CG limits – amended weight & balance entry in aircraft logbook		
2 Removable GPS Unit & Mount			
2.1	Lanyard fitted - Ensure GPS is not a hazard if supported only by the lanyard.		
2.2	Primary flight instruments not hidden		
2.3	Aircraft controls not restricted		
2.4	Entry and exit of aircraft not impeded		
3 Fixed GPS Unit			
3.1	Mounted in instrument panel - not primary structure		
3.2	Instrument panel strength (see section 1.5 of Essential Safety Checks)		

(Further Safety Checks on the Following Page.)

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CHECK	ACTION	COMMENTS	INSPECTOR'S INITIALS
4 GPS powered or charged by aircraft power supply			
4.1	Circuit protected by appropriate fuse		
4.2	Fuse rating placarded		
4.3	Power to GPS can be switched off by pilot in flight (master switch acceptable)		
4.4	Switch function clearly placarded		
4.5	Switch down for off and placarded as such		
5 General installation checks			
5.1	Multi-strand cable used - adequate cable flexibility and current capacity		
5.2	All cable terminations properly made - no exposed conductor		
5.3	Cables and other components properly secured		
5.4	Quick-release fasteners used for de-riggable parts of airframe		
5.5	No holes or cuts made in airframe		
6 Antenna installation			
6.1	Secure and clear of propeller & exhaust		
7 Radio interference			
7.1	No excessive interference		

OWNER'S DECLARATION		
I declare that the foregoing information is correct to the best of my knowledge and I will not change the installation design once approved.		
Signed:	Name.	Date:

INSPECTOR'S DECLARATION		
I declare that the foregoing information is correct and the installation is fit to be flown.		
Signed:	BMAA Inspector #: BMAA Member #:	Date:

This form must be sent with payment as per BMAA Online Shop (www.bmaa.org), and BMAA Aircraft Ownership Trustee Grid (if applicable) to*:- technical.office@bmaa.org

BMAA Office Approval: **(signed)** **(Name)**

Mod No.: G-_ _ _ _ / TIL109 / 20 _ _ /_ _ _ _ _ **(Date)**

**Whilst waiting for this form to be returned by the BMAA the aircraft may be flown for up to one calendar month from the Inspection date above. Once this form is returned to you signed please enter the full modification approval number above in your aircraft logbook and retain this sheet with your aircraft records.*