Civil Aviation Authority

SAFETY NOTICE

Number: SN–2021/006

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Non-Part 21 General Aviation Aircraft Safety Harness Integrity

This Safety Notice contains recommendations regarding operational safety.

Recipients must ensure that this Notice is copied to all members of their staff who need to take appropriate action or who may have an interest in the information (including any 'in-house' or contracted maintenance organisations and relevant outside contractors).

Applicability:	
Aerodromes:	Not primarily affected
Air Traffic:	Not primarily affected
Airspace:	Not primarily affected
Airworthiness:	All BCAR A8-23 / A8-24 / A8-25 / A8-26 Organisations
Flight Operations:	All Non-Part 21 General Aviation Pilots
Licensed/Unlicensed Personnel:	All Maintenance Engineers

1 Introduction

1.1 This Safety Notice applies to GA aircraft to which the Basic Regulation does not apply. This may include microlights, amateur built and historic aircraft, balloons, gliders, piston twins and singles up to 5,700 kg maximum take-off weight and single pilot helicopters up to 3,175 kg.

1.2 The CAA originally published Safety Notice SN-2018/005 to highlight this topic. In 2018/2019 the CAA consulted on this issue This was then superseded by SN-2019/003 at initial issue which was published to provide additional guidance. This SN supersedes SN-2019/003 and has now been reviewed and revised to change the terminology used as a result of the UK's withdrawal from the EU.

1.3 A review of a number of previous Non-Part 21 (previously Non-EASA) GA aircraft accidents identified that the ground impact had been survivable due, in part, to the good condition of safety harness systems used in each instance. However, the AAIB report of the accident involving Yak 52 G-YAKB in 2016 identified that the failure of the aircraft's lap and shoulder harnesses could have contributed to the severity of injuries incurred by both occupants during the unsuccessful forced landing. In this case, the lap and shoulder harnesses had been in service longer than originally intended by the aircraft manufacturer. The harnesses exhibited significant ultraviolet fading and discolouration, and the analysis showed that the harness strength had degraded by as much as 50%, and possibly more.

1.4 The evidence emphasises the importance of ensuring that aircraft safety harnesses are in good condition.

1.5 The aircraft safety harness system is subject to routine inspections that are usually prescribed by the aircraft manufacturer for inclusion within the aircraft maintenance schedule. The CAA also prescribes maintenance tasks to be undertaken, including:

(a) For aircraft maintained using the CAA publication Light Aircraft Maintenance Schedule (LAMS) (**CAP 411**) or **CAP 412** for light helicopters, inspections of seats, belts/harnesses, attachment, locking and their release is required every 50 hours or 6 months, whichever occurs soonest;

(b) Civil Aircraft Information and Procedures (**CAP 562**) leaflet B-180 Appendix 25-5 Seat Belts in Light Aircraft – Orientation of Stitched Joints, prescribes verification during routine maintenance;

(c) Civil Aircraft Information and Procedures (**CAP 562**) leaflet 25-40 Maintenance and Inspection of Crew Harnesses and Passenger Seat Belts (metal to metal attachment).

1.6 The assessment and inspection of harnesses is carried out in an environment involving personnel authorised for the task. The decision as to serviceability ultimately rests with these authorised personnel in combination with suitable guidance/criteria. Where no explicit criteria are given in maintenance instructions, the situation should be dealt with following appropriate best practice, including that presented in this Safety Notice.

1.7 Whilst several manufacturers provide some guidance to support the safety harness maintenance tasks, this is generally only applicable to their products. This Safety Notice provides generic advice regarding safety harness inspection and maintenance practice for Non-Part 21 GA aircraft, identifying points to consider when establishing the ongoing integrity of the aircraft lap and shoulder harnesses.

2 Action to be Taken

2.1 The scheduled maintenance inspection of safety harnesses in Non-Part 21 GA aircraft should be conducted in accordance with the procedure appropriate to the aircraft, which should preferably refer to the original manufacturer's instructions and/or specified retirement lives, or to other appropriate generic maintenance information such as that published by the CAA in LAMS (**CAP 411**).

2.2 When undertaking scheduled maintenance, the expectation is that consideration is given to the utilization of the aircraft and therefore wear to the harness, visible or not:

(a) An aircraft that is used for training or is regularly operated by different pilots will see considerably higher 'working' of the harness through adjustment. This will have an adverse effect on the degradation rate.

(b) The age of the harness should be considered, regardless of the environment. Anecdotal evidence has shown that even in good storage conditions without even being installed on an aircraft, there can be a degradation in strength over time:

(b)(1) A set of good quality Nylon harnesses that had been stored in good conditions (dry and appropriately packaged and not exposed to sunlight) showed an approximate 12% reduction in total breaking strength over 12 years, despite not ever having been installed.

(b)(2) A harness of the same construction and material installed on an aircraft with low annual hours, very limited UV exposure and stored in a hangar had degraded in strength by 30% over 14.5 years. The external condition appeared to be 'as new'.

The percentage of strength deterioration that is acceptable has generally not been defined, partly because strength data is not available, and partly because the decision depends to an extent on the magnitude of the reserves of strength of the harness, particularly when compared to the strength of the attachments.

(c) Evidence suggests that while harnesses with straps made from natural fibres are likely to be worst affected, harness strap fibres constructed of any material can degrade with exposure to temperature and light (particularly UV light). With Nylon for example, continued exposure to temperatures exceeding 20 degrees Celsius will result in a degradation in strength over the long term. Above 40 degrees, this can be accelerated considerably further. Thus, a harness in a type with a bubble canopy consistently left uncovered on an apron in the summer will likely be notably affected.

2.3 When undertaking scheduled maintenance, it is recommended that the following advice is considered as an aid to the inspection process. Gain access to the aircraft seat harness (shoulder harness, lap belt etc.) attachments and using a suitable light source, mirrors, magnifying glasses or other visual aids, examine:

(a) each attachment bracket, its securing means and where appropriate, whether it's free to swivel;

(b) each harness adjuster and buckle for evidence of cracking, corrosion, wear or deterioration of the surface finish, and for correct operation, freedom from jamming, slippage and broken springs, ability to release under tension etc.;

(c) the related aircraft structure in the vicinity for evidence of cracking, corrosion, distortion, wear or deterioration of the surface finish;

(d) the webbing, ensuring it is looped through buckles and other hardware in the correct sense, has not been pulled significantly to one side of any adjustment/attachment device and is not twisted.

2.4 Any faults identified should be rectified in accordance with the requirements of the appropriate maintenance manual.

2.5 Gain access to the full length of each safety harness (in some cases, this may involve removing the harness from the aircraft). Each individual strap of each cockpit safety harness should be examined in detail, including assessing for signs of:

(a) broken or frayed stitches and threads;

(b) nicks, cuts and tears;

(c) chafing (e.g. scratching and scuffs on webbing exterior);

(d) warping (usually apparent by curvature in the webbing pattern)

(e) contamination due to mould growth or from exposure to contaminants such as acid, oil, grease, water, grit/dirt etc. (Dirt or grit contamination could lead to chafing/fraying of stitches/webbing as the harness is in normal use, and may be partially or fully hidden from view unless care is taken);

(f) deterioration due to exposure to sunlight (UV degradation, often evident by discoloration 'bleaching');

(g) lack of security of end fittings;

(h) elongation or wear of the attachment holes.

2.6 Where an unacceptable level of deterioration is found, the safety harness should be replaced.

(a) The determination of what constitutes an acceptable, or unacceptable, level of deterioration is the responsibility of the authorised person performing the maintenance task.

(b) Reference should be made to original equipment manufacturer's maintenance data for the harness if this identifies acceptable conditions, but this may only be applied to the safety harness specified, and generally this should not be used to determine acceptable levels of deterioration for other manufacturers' harnesses. Some manufacturers declare a maximum safe design life within the maintenance instructions for specific harnesses which should be considered when deciding whether a harness should be replaced. Justification for exceeding such a life should be recorded in the aircraft records.

2.7 Care should be taken when cleaning safety harnesses to ensure that the cleaning agent used does not itself degrade the harness strength or any protective finishes.

(a) Nylon materials respond adversely to any acidic substances, whereas for polyester, alkalis have an adverse effect. The original equipment manufacturer's maintenance practices should be followed where possible.

(b) Generally, clean luke-warm or cold water with a mild (non-detergent, pH neutral) soap may be used, but even soap residue remaining present can accelerate degradation, so after rinsing, the harness should be allowed to dry naturally. Accelerated drying by heating could induce temperature-related degradation.

(c) When cleaning, care should be taken to keep foreign matter and any cleaning media (water/soap) away from the hardware components i.e. buckles, adjusters etc.

3 Further Information

3.1 It is important to note that degradation is not always visible. Harnesses may appear 'as new' but have had their strength reduced considerably due simply to elapsed time or factors that are not immediately apparent. If in doubt, it is wisest to err on the side of caution, particularly when the function of the harnesses is considered. The replacement of degraded harnesses with up to date (FIA specification) automotive racing assemblies can prove cost effective, but the modification procedures of the relevant oversight body (i.e. LAA, BMAA or CAA) must be followed if such non-original equipment is substituted.

3.2 **CS-STAN** Standard Change CS-SC153b for the exchange of Safety belts/Torso-restraint systems can be utilized in accordance with the procedures outlined in **CAP 1419** Chapter 7 provided that the criteria specified in CS-SC153b are adhered to.

3.3 Care should be taken by those involved in re-webbing harnesses, for example with respect to thickness of the webbing. Failure to obtain the correct thickness can lead to slippage at the adjustment devices at considerably lower than specified loading conditions.

3.4 Inspecting engineers should also consider that the harness itself is just one part of the restraint system. Particularly in the case of lightweight structures, when inspecting the system, it is essential to check for degradation in the attaching structure/load paths.

4 Queries

4.1 Any queries or requests for further guidance as a result of this communication should be addressed to;

GA Unit, Safety Airspace Regulation Group,
Civil Aviation Authority, Aviation House,
Gatwick Airport South, West Sussex, RH6 0YR
Tel: +44 (0)1293 573988
E-mail: **GA@caa.co.uk**

5 Cancellation

5.1 This Safety Notice will remain in force until further notice.