



Australian Government

Australian Transport Safety Bureau

Examination of a Supair Strike Paraglider Harness Strap

Australia's national transport safety investigator

AVIATION | MARINE | RAIL

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Background

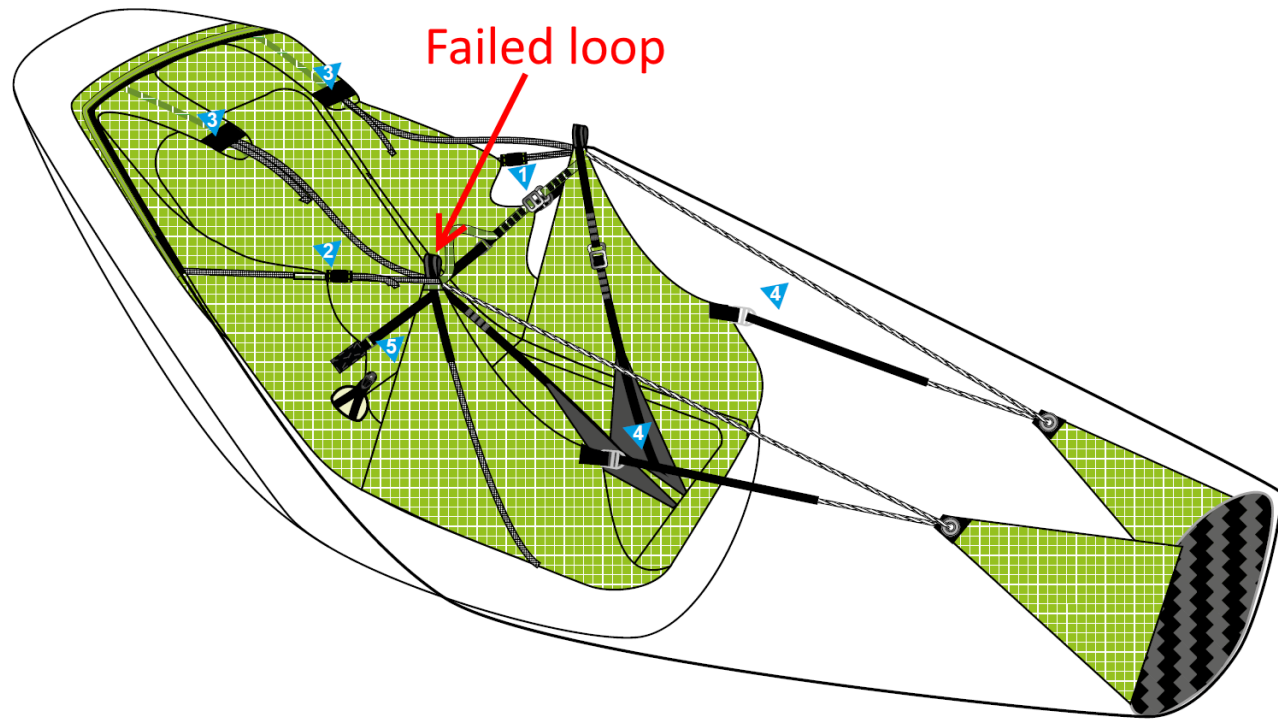
- During flight, the right-hand main hooking point (carabiner loop) of a Supair Strike paraglider harness failed.
- The wing disconnected from the right-hand side and the reserve parachute was deployed as a result. The paraglider landed in trees.
- Following the occurrence, a section of Dyneema strap was found to have failed.
 - This strap secured a carabiner that attached to the wing.

Purpose and Scope

- To examine the failed strap and determine the point of failure
- To determine, if possible, the mechanism of failure and any potential contributing factors.
 - The quality and suitability of the materials used will not be examined.

Failure Point

- The loop that failed was a Dyneema strap (ultra-high molecular weight polyethylene)
- A fabric sheath covered the strap to prevent wear



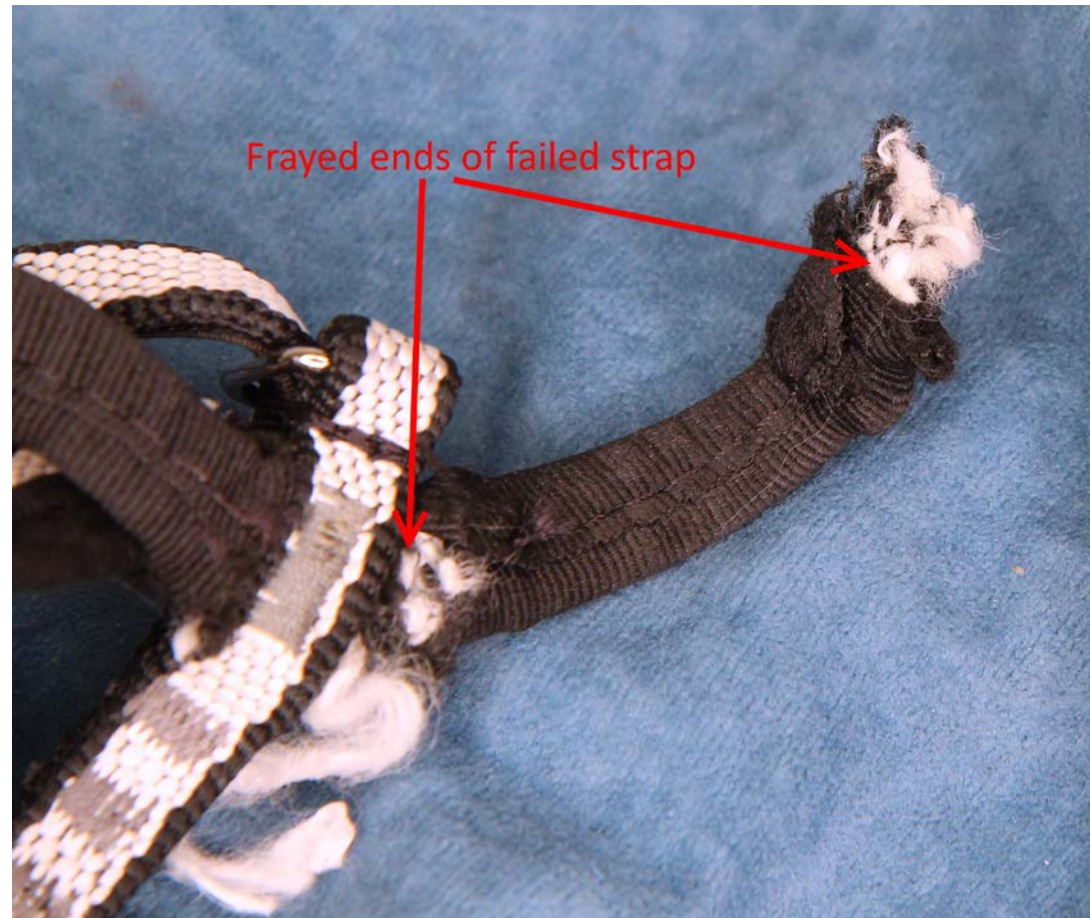
Left side comparison

- The left main hooking point had an identical construction to the failed right side.
- A secondary strap from the shoulder harness looped around the carabiner loop.
- Both loops, i.e. four layers of Dyneema from two different straps, were stitched together.



Failed strap examination (right side)

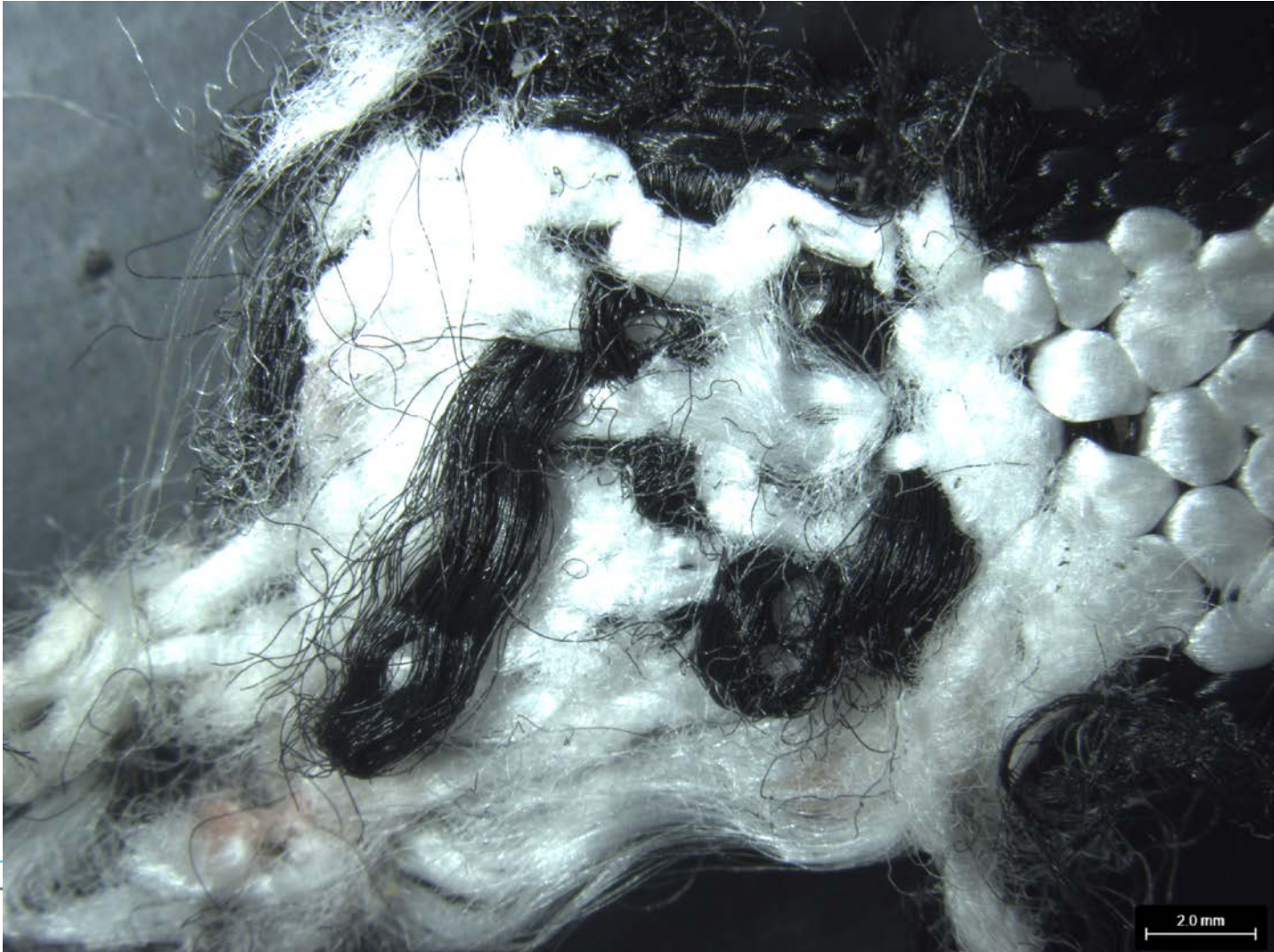
- The stitching was unpicked and the secondary strap removed, as well as the sheath around the carabiner loop
- The ruptured ends of the strap were examined under an optical microscope



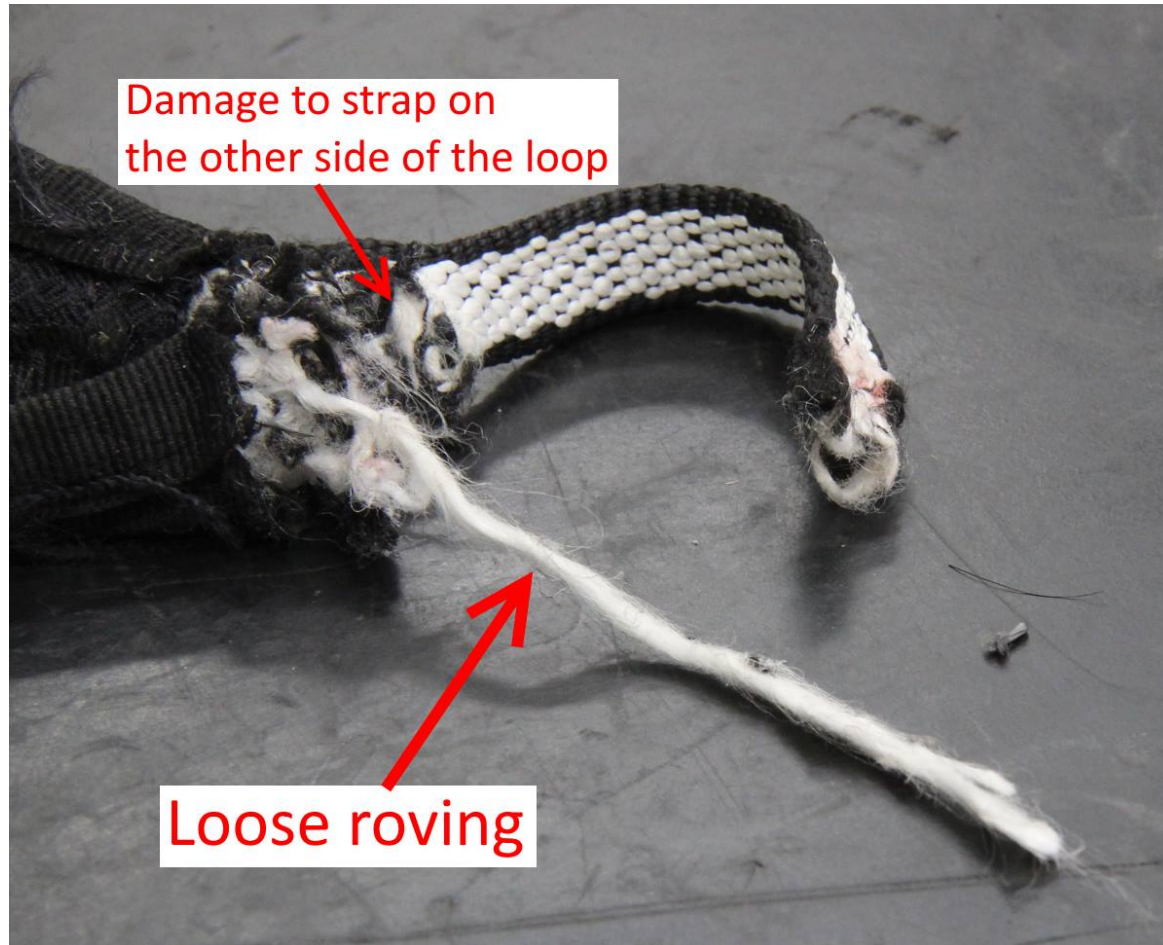
Failed strap examination (right side)



Failed strap examination (right side)



Failed strap examination (right side)



Observations

- Most of the strap filaments ruptured across a width of approximately 10-12 mm.
- The area of rupture coincides with the position of the secondary strap.
- Damage was present on the other end of the loop, where it also connected to the secondary strap. However, the strap had not entirely ruptured here.
- A single roving ruptured away from the primary point of failure. Its failure point was not identified .
 - Based on the length of the roving, it is likely on the other side of the loop; near the other point of contact with the secondary strap.
- Broomstraw effect is present at the point of rupture and the in the damage at the other end of the loop.

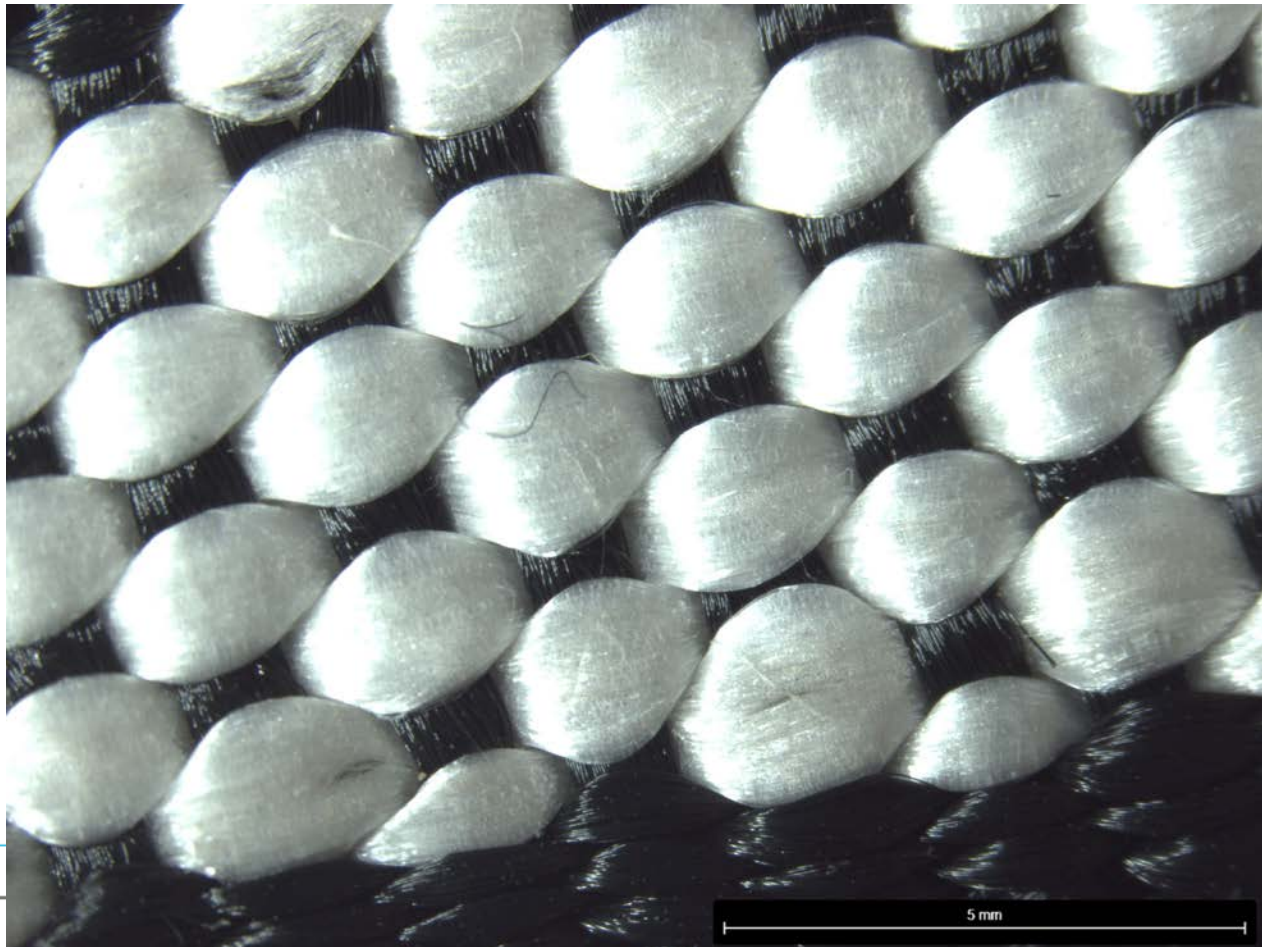
Left side examination

- The sheath and secondary strap had been removed from the main hooking point in a previous examination.
- The Dyneema strap that created the carabiner loop (which had failed on the right side) was examined using optical microscopy

Left side examination

Image shows a section of Dyneema strap from the left side of the harness, where no other straps or attachments have been stitched.

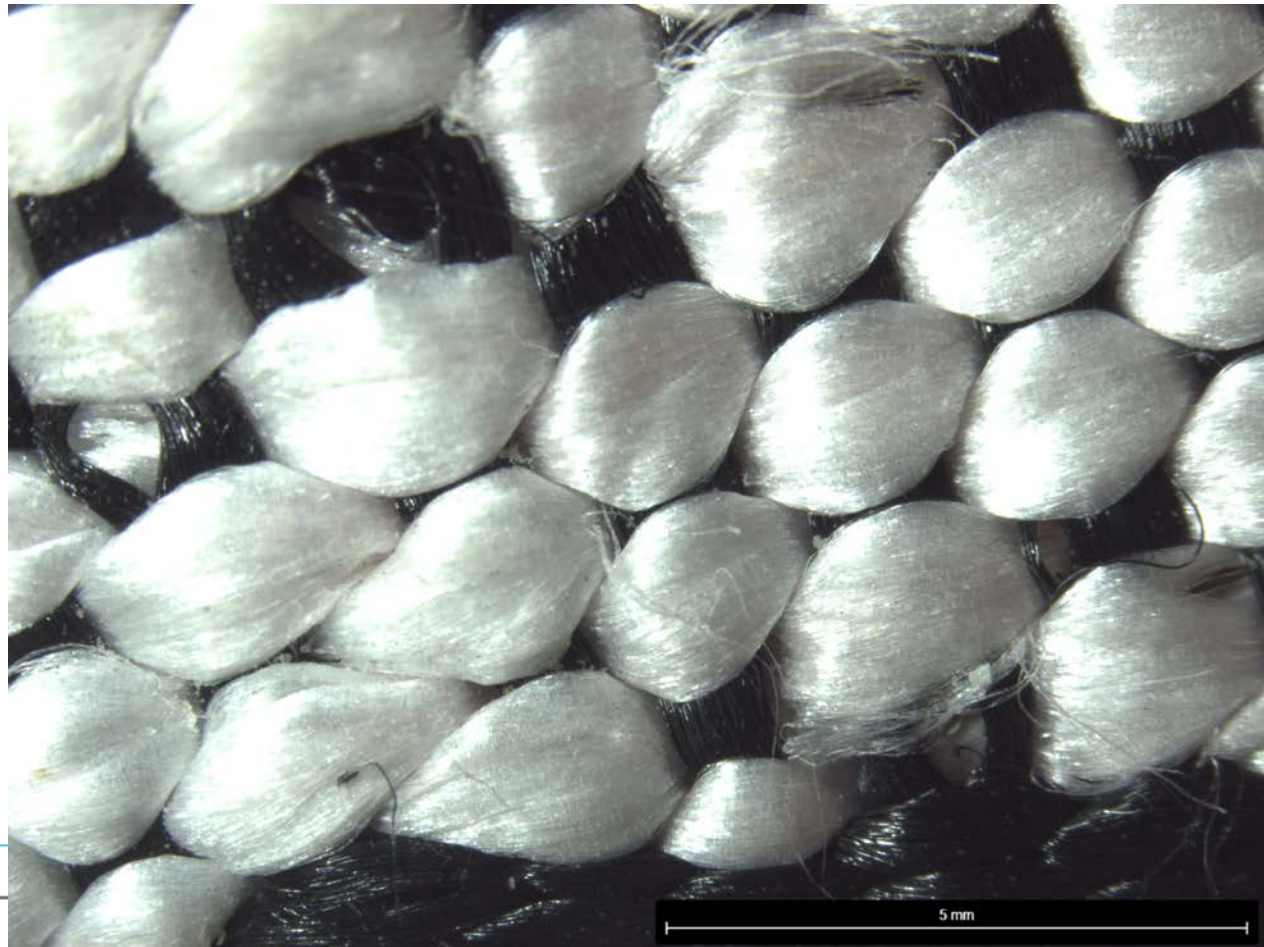
- Warp and weft are well aligned
- A few broken filaments visible



Left side examination

Image shows a section of Dyneema strap from the left side of the harness, where the secondary strap had been attached via stitching.

- Some deformation of warp and weft rovings
- More broken filaments than in the unstitched region



Findings

- The broomstraw effect at the point of failure and at the nearby damaged area indicate the strap failed in tensile overstress. The rupture and partial rupture occurred at points where a secondary strap was attached via stitching.
- Given that the areas of rupture coincided with the secondary strap, and given the damage from stitching observed on the unbroken left side of the harness, it is likely that the attachment of the secondary strap contributed to the strap failure.
 - Note: this does not mean that the stitching was inappropriate or done improperly. Stitching through a weave will invariably weaken it by restricting the movement of the rovings, adding stress concentrators. If a loop such as this was simply overloaded, it would be expected to fail at the stitching point.
- The fact that both sides of the loop had at least partially ruptured indicates that localised pre-existing external damage was unlikely (e.g. wear or nicking), unless the damage was equally present on both sides of the loop.
 - The exception to this is if the partial rupture on the unbroken side occurred as a result of the impact, or extraction from the tree.
- Without a greater understanding of the effects of stitching and load conditions on this Dyneema strap, the ATSB cannot determine to what extent stitching or loading contributed to the strap failure.