DHV investigation, entanglement of the deployment handle with the rescue parachute lines

Abstract

1. Long connections from the handle to the inner reserve parachute container pose a hazard. An entanglement with the reserve's lines is possible.

2. An entanglement with the lines of the reserve parachute is favoured if the deployment handle has hard, inflexible, and protruding components or complex, branched, and forked splint constructions.

3. Compatibility testing should pay more attention to points 1 and 2.

4. Manufacturers are called upon to rectify affected products.

After the publication of a report about a fatal accident due to the malfunction of the reserve parachute, the DHV has become aware of other cases* with similar problems. Specifically:

If the bridle (connecting line) between the deployment handle and the inner container is very long, it can tangle around the lines after deployment and prevent an opening of the inner container under unfavourable circumstances.

This problem is exacerbated if the deployment handle has protruding, inflexible components which favour an entanglement of the reserve parachute´s lines.

The DHV conducted an investigation where reserve parachutes with long bridles got tested in the G-Force trainer.

General results

Result 1

There is a risk of entanglement when the length of bridle allows the handle to come into the area of the reserve´s lines, which are unfastening from their packing rubbers after release. If that is the case, the handle/bridle and the lines of the reserve parachute may touch. Such contact may result in a looping of the bridle with the lines of the reserve parachute or an entanglement of the handle in the lines. In most cases this does not lead to a blockage of the inner container. However, it is possible to occur under unfavourable circumstances, namely if this blocks the release of the lines from their pack rubbers and thus prevents the inner container from being opened.

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Pictures 1 and 2 show handle-container-connections that are too long (clearly exceeding the area of the inner container), which, when thrown, may reach the area of the reserve´s lines that have come loose from their pack rubbers during the throw.

Picture 3 shows a short handle-container-connection, leading to a lower possibility of reaching the area of the reserve´s lines.

Result 2

The inner containers of reserve parachutes can be constructed in 2 fundamentally different ways regarding the way of releasing the lines and the cap of the reserve parachute:

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A) The inner container is closed with the first line bundle or line loop (counting from the cap). When throwing, the lines are released first. The container only opens after a longer throwing distance, when the lines are almost fully stretched, and the last bundle of lines has been pulled off.

Picture 4: An example of an inner container, construction type A

B) The inner container is closed with the last, or one of the last line bundles (counting from the cap). When throwing, the inner container opens after a short throwing distance, as soon as the lines are stretched to this last line bundle. The remaining lines and the reserve parachute are then released simultaneously.

Picture 5: An example of an inner container, construction type B

With type A, the closed inner container is exposed to the risk of an entanglement between a long bridle with handle and the lines much longer.

In the case of design B, this risk is considered lower because the inner container opens after a significantly shorter throwing distance.

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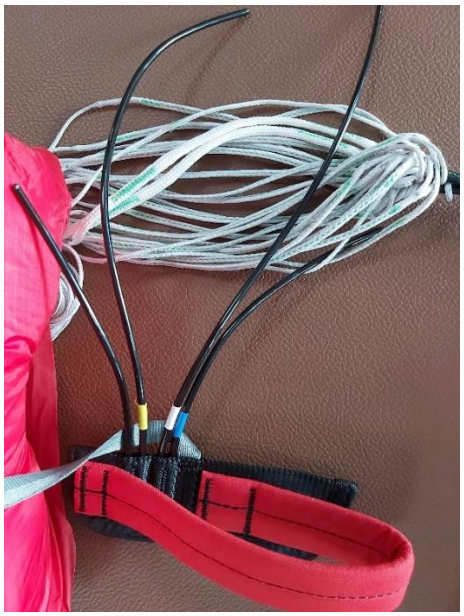
Result 3

The potential danger of the handle becoming entangled in the lines is increased if the design of the handle is conducive to entanglement. Hard, inflexible, protruding components, as seen in picture 6 or complex, branched, fork-like constructions, as seen in picture 7.



Bilder 6 und 7

Safety recommendation 1

A) For pilots: In principle, long handle-container-connections are disadvantageous. They require a long pulling distance to release from the harness container, making it very difficult to powerfully eject the inner container. State of the art are connector lengths of 30 cm and below. Regarding the researched points of compatibility, deploy ability, possible throwing energy and potential entanglement with the reserve's lines harness-associated inner-containers are less prone to error than most combinations of inner container and harness-associated deployment handle with a bridle.

B) For manufacturers: Manufacturers are encouraged to design their products (harness-associated deployment handle with a bridle to the inner container, and the deployment handle loop on the inner container) as short as technically feasible. Additionally, we are requesting that the harness manufacturers, who have so far refrained from producing harness-associated inner containers will develop such containers for their harnesses.

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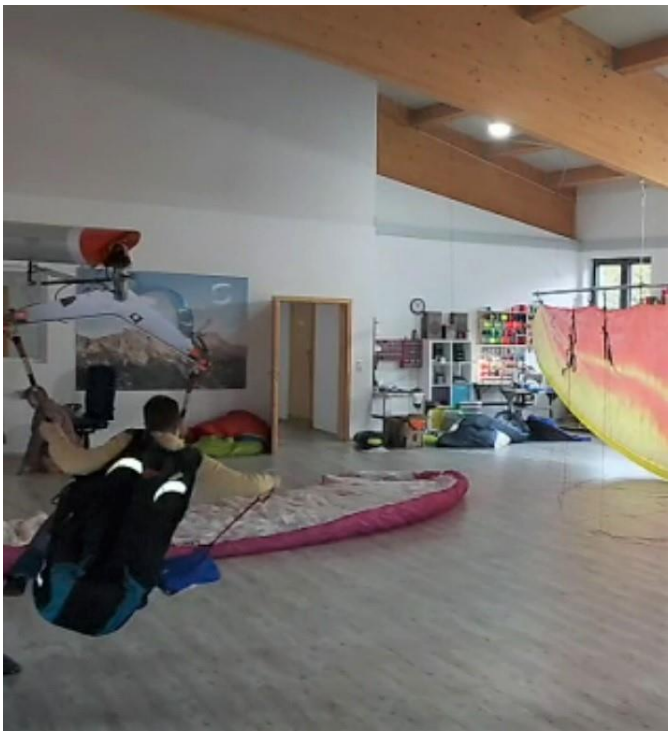

Pictures 8 and 9 show a very long handle-container-connection. This practically eliminates the chance of a powerful throw. These connections can still be seen today even though this problem has been known for over 20 years.

Safety recommendation 2

It is essential to ensure that the handle and bridle do not extend well beyond the surface of the container (see pictures 1-3). This applies particularly to the direction in which the lines are attached.

Safety recommendation 3

It is necessary to reiterate the importance of an individual compatibility check pilot-harness-reserve parachute. Its goal is to ensure that a completely problem-free release and a powerful ejection of the reserve is possible. Regarding the length of detachable connections (the release handle of the harness is looped to the inner container) the following applies: As short as possible - to allow an optimized throw, but as long as necessary - to allow a safe opening of the harness container (split pins). Release problems are observed more often with small pilots, therefore a particularly thorough K-test is required.

Another check point must be added to the K-check: Is there a risk of the deployment handle and bridle becoming entangled in the lines?

Safety recommendation 4

Hard, inflexible, protruding components on the reserves´ handles were proven to be problematic. The manufacturers are urged to discontinue the sale of handles with these characteristics and to offer more suitable replacements for handles already in circulation. The K-testers should pay particular attention to this point during the release test. The test centres and the committees responsible for standards should also strive for improvements here.

These video examples show that a long handle-inner container connection can come dangerously close to the area of the lines coming loose from the inner container.

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Videobeispiel1
Videobeispiel 2

*other documented cases 1

*other documented cases 2

"The reserve´s handle became entangled in the lines and blocked the second eyelet and thus the release of the canopy from the container. I was able to pull the reserve parachute to me by the lines and could untangle the handle (nylon pole) and the lines. When I threw it again, the reserve opened flawlessly. My Ava Cutaway harness has particularly many sticks on the handle and acts like a "throw anchor".