

Inadvertant opening of a paragliding automatic carabiner?

Recently the word got around that some automatic carabiners for paragliding harnesses opened inadvertently.

Here is some useful information, resulting from an accident investigation by the DHV/OeAeC technical Department, referring to a recent happening.

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What happened?

In July 2001 a German pilot was going to fly in Switzerland with his paraglider.

Taking off backwards was accomplished very organized, calm and in the usual chain of events, almost certainly excluding any chance of wrong carabiner attachment to the harness.

After climbing about 90m above the takeoff area the left riser of his paraglider separated from the main carabiner of the harness while performing a left turn. When the pilot tried to activate his rescue system he learned that it was impossible to do so (see compatibility-test page 7).

Fortunately the pilot suffered only minor injuries.

The equipment was confiscated on scene by the responsible district attorney and given back to the pilot after a couple of weeks without any known malfunction. That was the time when the DHV was able to start its own investigation with the material on hand.

It is essential to have the original gear for a correct investigation to get the appropriate results.

Results of the investigation:

After excluding almost certainly that a wrong attachment of the risers to the harness carabiner was the reason for the accident, it is possible that the inadvertant opening of the carabiner was caused by the riser during taking off backwards.

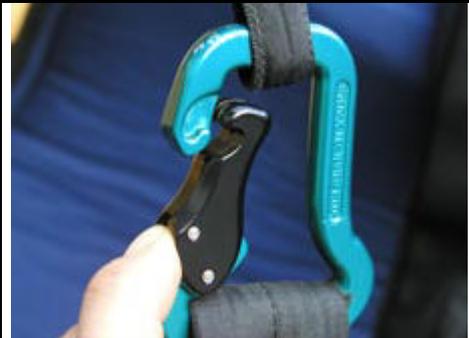
Multiple tests with the above mentioned equipment assembly resulted in inadvertant openings during taking off backwards when certain unfavourable conditions came together.

In this particular harness, the carabiners are arranged in a certain way that increases the risk that the main riser of the paraglider slips over the gate of the automatic carabiner, and in conjunction with a twisting motion (likely to happen when taking off backwards), actuates the locking nose.

In case the loop of the riser is big enough to slip over the gate, there are chances that the gate opens and you may finally lose the riser.



1. The affected carabiners are automatic carabiners that open the gate when actuating the locking nose (the nose of this carabiner is a pseudo-keylock design).



2. With the affected harness, the carabiners are not 90° off to the direction of flight, they are lined up into the direction of flight and stay fixated in this position during take off.



3. The riser loops of the affected paraglider fit easily over the gate of the carabiner and may, in conjunction with a twisting motion, unlock and open the gate.





4. When tension is applied to the riser during takeoff, the riser slips over the open gate and may separate from the carabiner during takeoff or later inflight.



With almost the same chain of events it is also possible that even a twistlock carabiner opens, with a 90° twist being sufficient to unlock the locking mechanism.

The tests did show that these cases are very remote but not impossible and its the nature of life, that in a certain unfavourable chain of events, accidents like above do happen. The important fact however is, that the latest results of accident investigations will be included into the development of new equipment and will be used to increase flight safety.

Common carabiners for comparison:

Type of carabiner		Safety features to open the system	Description of the safety features (when used correctly)	Handling characteristics
	automatic with nose	1	automatic closure and locking after hook in, safety against inadvertent opening by locking nose, unlocking of the safety opens gate simultaneously	+
	automatic with lowered nose	1	automatic closure and locking after hook in, increased safety against inadvertent opening by lowered locking nose, unlocking of the safety opens gate simultaneously	O
	Twistlock	2	automatic closure and locking after hook in, safety against inadvertent opening by springlock mechanism (90° twist and pushing the gate inwards)	+
	Twistlock+ push	3	automatic closure and locking after hook in, safety against inadvertent opening like a twistlock, but additional safety by pushing down of the springlock before twisting is possible	O
	Safe -in lock system	3	automatic closure and locking after hook in, safety against inadvertent opening by two finger actuated buckle, including a safety against falling out of the harness, attachment has to be mounted once on the riser	+
	Screwgate carabiner	Screwlock	automatic closure after hook in, safety against inadvertent opening only by a screwlock and a locking nose at the gate	-
	Screwshackle	Screwlock	closure and safety against inadvertent opening only by manually closing the gate and tightening the screwlock	-
<p>Note: This is a listing of different types of carabiners, which are likely to be used by paragliders in Germany, Austria, and Switzerland. This is not a complete listing of all available and suitable carabiners and it does not represent a product placement of carabiner manufacturers.</p> <p>The handling characteristics were judged by different test pilots with and without gloves.</p>				<p>+ = good O = satisfactory - = limited</p>

In the history of mountain sports and paragliding there have been accidents caused by not or not completely tightened screwlock carabiners. That and to compensate for unprofessional handling of screwlock carabiners and simultaneously increasing the handling characteristics were the reasons for the development of automatic/ twistlock carabiners.

This objective was achieved by the manufacturers and confirmed by the experiences made in daily use. It is a fact that unprofessional and careless handling can cause failure of these systems. Fairly new however is the experience that the combination of different equipment can cause serious problems which enforce the need of a mandatory **compatibility-check**.

Consequences and remedy:

- If using automatic/ twistlock carabiners with harnesses where the carabiners are lined up into takeoff direction and stay almost fixated in this position, make sure the gate is pointing towards the pilot. (Pic. 0)



Pic. 0

- In case there is an additional belt (webbing/strap) attached to the rear, long side of the carabiner, with these harnesses, a normal operation of the carabiner is not ensured any more, and the belt (webbing/strap) may actuate the locking nose or twistlock inadvertently. With harnesses like these it is highly recommended to use carabiners with a minimum of two safety features for opening, nevertheless if a automatic/ twistlock carabiner is used, the risers have to be secured in place to avoid slipping. (Pic. A)

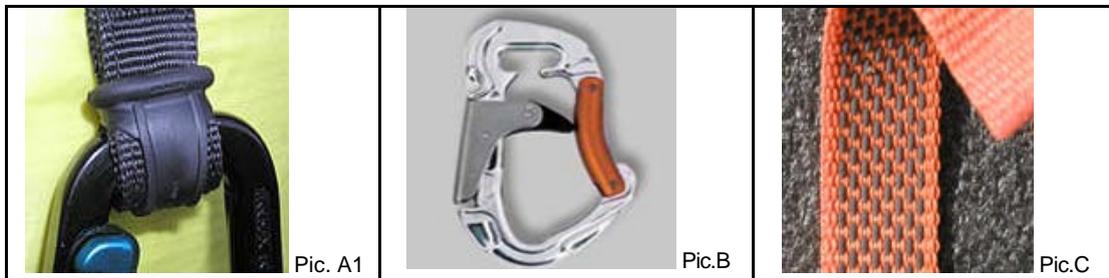
- Always use harness carabiners or other connecting devices with two or more safety features against inadvertent opening.

- Secure the risers in place to avoid slipping. (Pic. A and A1)



Pic. A

- Avoid the use of screwlock carabiners because inadequate handling or slipping/ moving risers, webbing or clothing could cause an inadvertent opening.
- Avoid the use of screwshackles (reason see above).
- Check your personal equipment, harness, carabiners, risers with speed system have to be compatible to minimize the risk of inadequate operation/handling. If there are any doubts or questions, contact the manufacturer, DHV, flight schools or other qualified personal.
- Put a special emphasis of your takeoff checks on the attachment of the risers.



Refitting of current systems :

- Anti-slip safety for the riser, e.g. fixating device „STRING“ by PETZL. (Pic. A and A1)
- Cover of the locking nose/ gate by Austrialpin



- Adjust the diameter of the riserloops to the according carabiners (ask the manufacturer to put an extra seam for downsizing in)

Food for thoughts concerning new developments :

- Multiple safety features on the gate
- Guiding for the risers on the carabiner, similar to the SALEWA climbing carabiner (Pic. B)
- Fitting of the riser loops to the carabiner diameter
- Risers with anti-slip feature in the loops (Pic. C)

Finally every pilot has to decide which connectinc systems,between paraglider and harness, he uses, on his own. The market offers a variety of carabiners, from screwlock to multiple safety and the safe-inlock system, which provide a high grade of safety if used appropriately.However the demand for fast operation and easy handling leads to reduction of safety features in the end. Hooking in has to be performed carefully,thoroughly, according to the book and without any pressure of time.

Climbers and mountaineers praise the redundancy of carabiners (mounted parallel and with opposite facing gates) as maximum security against inadvertant opening and material breakdown, however, due to the technical features of paragliding equipment this is not possible and because of difficult handling characteristics does not present a real alternative for paragliders.

Final comments to the accident investigation :

The greatest concern within the DHV/OeAeC technical Department was again the malfunction of the rescue system. Obviously there was no compatibility check performed and the rescue system was not correctly installed. With the different construction-, attachment-, and combinationvarieties of rescue systems and harnesses, the proper operation of the systems is not always guaranteed. For that

reason, the manufacturer or an authorized person has to check the compatibility of the harness and the rescue system and document it in the rescue system packing certificate, upon initial installation. Real life however proves over and over that a lot of pilots are lacking a great deal of knowledge and safety concern about the operation of their rescue and safety systems.