

» Manfred Kinnast and the team of Air Zermatt prepare our test person for the flight in the new rescue bag.



New helicopter rescue bag from Air Zermatt

More safety in air rescue

For two and a half years specialists working under the guidance of Manfred Kinnast (MK-Med Medizintechnik AG), Dr. Axel Mann (Medical Director of Air Zermatt) and Andreas Harms (Managing Director of PAX) tinkered with the new helicopter rescue bag for Air Zermatt. Now, with all the certification work completed, we took this bag through a series of tests, including a practical test.

» Placing the "victim" in the bag is fast and easy thanks to the large opening. The innovative vacuum mattress with the foldable headpiece is clearly visible.

both pictures: Jörg Rothweiler

"More safety of use, more comfort for the patients, more speed in air rescue – and no more Velcros". This is how Manfred Kinnast, owner of MK-Med Medizintechnik AG in Raron, summarized the functional specifications of the new rescue bag from Air Zermatt. Kinnast, who joined the "Air rescuers of Matterhorn" in 1986 as a freelancer and played an active role in it for two decades, knows that a rescue bag is first and foremost "only" a temporary aid for air rescue, but it is also a product which must satisfy continually increasing medical and technical expectations, especially in terms of certification. "Because of that, and because the rescue bags that were on the market always required compromises with regard to detail, we decided in 2016 we had to develop a rescue bag", Kinnast explains.

Highest certification level attained

Today we have the new rescue bag before us, having gone through countless hours of work, test flights and trials with ten prototypes. Its cover is made of disinfectant and gastric-acid resistant Cordura, it has an interior patient belt system, is 200 centimeters long, 70 centimeters wide, and weighs about 8.7 kilograms including the newly-designed vacuum mattress and loops for attaching it to the helicopter stretcher.

"Every part, that is to say each of the ten lifting cables which carry the bag, every belt and connection and finally the entire product was checked and certified", Kinnast explains. "According to the norms for PPE (Personal Protective Equipment), aeronautical products and human external cargo". This means the "Helicopter Rescue Bag - HBRS" is explicitly licensed for rescuing people.



» During the test flight the rescue bag hung without rotating on the winch, although we had drawn it provocatively (too) close to the hovering helicopter.

Developed by rescuers for rescuers

The detailed solutions of the HBRS are as numerous as the certificates. They are all based on real needs of air rescuers. "I have 20 years of experience in air rescue, and the focus of my company since 1998 has been on medical equipment for rescue operations", explains Manfred Kinnast, who found two other very competent development partners in Dr. Axel Mann, Director of Air Zermatt, and Andreas Harms, Managing Director of PAX. "Besides", he emphasized, "the specialists of Air Zermatt oversaw all the practical tests. Their expertise and suggestions were also part of the process."

Zippers and an adjustable head piece

One of the wishes was: No Velcro! Although Velcro is quick and easy to close, and also holds reliably, the grinding noise when opening is "a stress factor for many accident victims", Kinnast asserts. Moreover, Velcro gets dirty and wears out rather quickly, and Velcro fasteners cannot always be closed properly by one person alone and they stick in places where they are not supposed to.

"Hooked Velcro pulls fine threads from the fabric of the bag and also from the lifting cables – thus weakening them in the long run", Kinnast observes.

The new rescue bag has strong and smooth-sliding zippers. These are partly waterproof and are secured with hooks to prevent unintentional opening, with the colors of the zipper and the accompanying safety hook matching. "There are also safeguards with color combinations for the individual lashing and adjusting ropes", says Kinnast. He then demonstrates how, with two or three hand movements, the head piece can be closely nestled against the head of the dummy lying in the bag without cramping it. "Even more important than this is the fact that we can shorten the space meant for the head", he explains while pulling at a yellow rope. Therefore even very small adults and children can lie centered, with the rescue bag always hanging horizontally."

Perfect balance

The lifting cables hand-crafted to a tolerance of five millimeters in length also contribute significantly to perfect balance. They also have individual color markings which correspond with the attachment loops, thus helping to avoid wrong positioning. When not in use, each cable is bundled with its hook and stored in well-protected compartments, from which it can be quickly pulled out with one hand – without being twisted or tangled.



Jörg Rothweiler

Logical operation even for laymen

The four fixing belts are also marked with colors. "Try to close the bag correctly, yourself", Kinnast challenges. This works out well at the first go and with astonishing ease. The doll dummy lying in the bag is tightly fixed, all belts are closed and the zipper pulls are secured. Kinnast says: "The colors are helpful in case laymen decide to lend a helping hand. The colors can be seen clearly, they are easy to label, and they cannot be confused even if you're highly stressed."

Patented gathering system

The optional gathering system is registered for a patent. By a simple tug at a rope system the fabric contracts at the top. This has three advantages: a smaller target for the wind, the person in the bag is better secured of and has more protection from cold, thanks to the air cushions produced by the folded gathers. "During the winter tests with up to minus 20 degrees Celsius, the effect was impressive", Kinnast assures us.



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» Dry run in the hangar: The ten accurately measured lifting cables and the adjustable head rest provide good balance and ensure that the bag does not fold into a shape of a banana.

Manfred Kinnast



» This (early) prototype with gathers clearly shows how the material on the upper part contracts. Noticeable: the carrying loops still lying on the outside.

Jörg Rothweiler



» An interior belt system with stable cobra fasteners provides additional safety in the new rescue bag.

Jörg Rothweiler



» The heart-massage device Corpuls CPR can be quickly attached thanks to the zippers. The crossed safety straps can remain fastened.

Innovative vacuum mattress

The rescue bag gets its dimensional stability from the innovative vacuum mattress. The covering of the mattress consists of a special glued membrane, which is lighter, more tear-resistant and more durable than previous materials. A fabric liner, laminated into the leg area of the bag, offers protection against the sharp edges of the skiing or mountain boots of accident victims. Convenient: The suction tube is fed through an opening in the leg area into the bag with the vacuum pump. "This brings together, what belongs together, and we can still adjust the vacuum pump, after the person to be rescued has been completely wrapped in the bag", Kinnast explains. The valve lies protected inside the rescue bag and is connected via a freely rotatable port. "Unintentional opening is not possible", says Kinnast

The two-ply head section of the mattress is also cleverly designed. It makes it possible to have a physiologically correct head posture, and when it is opened up it also allows the head to be overstretched backwards, if necessary. Furthermore, the head can be stabilized with the help of the side flaps that are foldable upwards, and the head can additionally be secured with Velcro straps. "This works so well that we can often do without the stiff and unpleasant neck brace.", says Kinnast cheerfully.

Quick access to the thorax area

Unlike the conventional rescue bags equipped with Velcro overlapping straps, access to the thorax area is swift: open two zippers a bit, push the fabric back and the chest is exposed. In the process, the injured person remains secured, thanks to the crossed fixing straps, which remain closed. Therefore, the "Corpuls CPR" mechanical resuscitation device can also be very easily positioned and the cardiac massage that was started on the ground can be continued in the air.

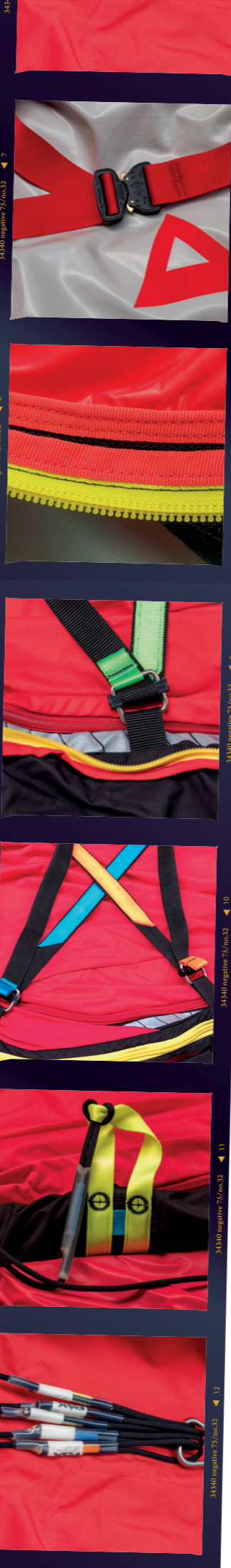
All pockets are inside and accessible any time

All accessories, e.g. the neck braces, are stowed in inside pockets. The "sail" which helps to prevent the rescue bag from rotating in the downdraft of the helicopter lies under the vacuum mattress. Thanks to a zipper, it can still be reached at any time. Kinnast says: "The smooth outer surface without pockets, fluttering straps, or loops helps to improve the aerodynamics considerably. Besides, it helps prevent the bag from getting entangled in bushes or trees."

Manfred Kinnast



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» Color markings on the straps, components from approved suppliers, spotlessly clean seams, safety hooks for stable zippers, reflective stripes. Each of the ten lifting cables was checked and certified individually. Everything was given attention

Practical test at high altitude

Whether and to what extent all of this works well, was subsequently tested; first on a crane in the hangar of Air Zermatt, and then on a simulated rescue flight overlooking the Matterhorn. Within a few minutes our test person finds himself neatly secured and in the stiff vacuum mattress lying in the rescue bag. He actually hangs horizontally on the hook and tilts only slightly when the body position moves excessively towards the head or foot end. It is virtually impossible for him to turn his head, thanks to the "ear flaps." Setting up of the "Corpuls CPR" proceeds effortlessly. Ideal: At no one time does the bag sag, thanks to the precisely made lifting cables.

Even on the mountain, it takes hardly five minutes for the test person to be neatly positioned and secured, for the vacuum mattress to be stiffened, and for the pairs of lifting cables as well as the belt of the emergency doctor to be hung onto the central hook. The body of the «injured person» is well protected against the wind rushing down from the helicopter and dust from the ground as the bag and rescuer are lifted gently up into the air. Bag and doctor hang rotation-free on the hook high above Zermatt. And thanks to the use of the sail, there is no rotation even as the rescue bag is hauled provocatively to the particularly critical distance of "one and a half times the diameter of the rotor" from the helicopter. The rotation the emergency doctor deliberately triggered by taking down the sail quickly stops again. The test person later reported: "It was loud and very windy especially on my face, but I felt safe. Apart from the deliberately caused rotation, which was a little terrifying, I didn't feel any unpleasant physical strain. Besides, my hood cushioned the contact to the quite stiff 'ear flaps' of the vacuum mattress. Take-off and flight were as smooth as silk, the landing not too hard."

Conclusion: an extremely ingenious bag

What the two days at Air Zermatt showed: If experienced rescuers, competent specialists and specialized manufacturers strive together for solutions to everyday challenges of real operations, pioneering inventions can arise. This does not call for the re-invention of the world. All it takes is for basically tried and tested products to be modernized in great detail. Of course you might say "luxurious comfort" for the injured person is superfluous during rescue. But if this comfort stems from better safety features, more modern materials and eradication of troublesome details, then it becomes something more than just a bonus. After all, accident victims travel in a well-upholstered rescue transport vehicle (RTW) with a modern couch as well as less stress and less physical strain than in the small car that just "fulfills its purpose".

Info

The history of the helicopter rescue bag

Air Zermatt was founded in the 1968. At that time the "horizontal net", which accident victims were tied into, was still the method of choice for rescuing accident victims by rope from a steep slope or an inaccessible ravine. In these nets the victim hung completely unprotected on the hook - without cover, without stabilization of limbs, back or neck area, and above all without a doctor by his side. It was only in the 1980s that closed rescue bags came into use, later combined with a stiffening and stabilizing vacuum mattress. Manfred Kinnast and Dr. Axel Mann, Medical Director of Air Zermatt, were involved in the development of these bags from the very beginning.



» The chronicle to the 50th Anniversary of Air Zermatt shows how what rescue bags looked like in those days.