A NEW SEATBELT SYSTEM FOR SAILPLANES

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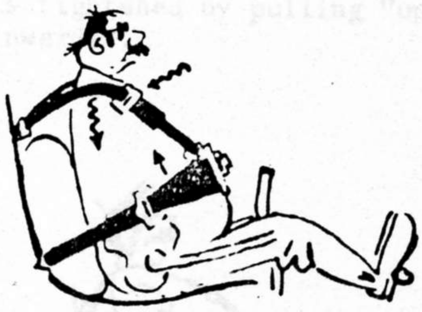
The method by which a sailplane pilot buckles himself in — a two-piece seat belt with two wide, stiff plates, two shoulder straps and a metal-tongued fastener — has remained essentially unchanged for decades. This method, however, due to the semi-reclining position of the pilot in most modern sailplanes, is no longer achieving a firm binding of the pilot to his airplane. The faults inherent in this system are the following:

1. The seatbelt rests against the lower abdominal wall, an elastic compliant surface, and therefore has no solid point of attachment or support.



2. The positioning of the seatbelt between the navel and the lower stomach is unable to prevent the pelvis from twisting during a collision, forcing the knees and lower legs up into the instrument panel and the feet into the foot pedals. Injuries to the lower limbs are often caused in this manner.

3. The forces occurring during a collision place the shoulder straps under tension, which then tend to pull the central clasp of the seatbelt upwards, and so in turn reducing the restraining effect of the shoulder harness. The fifth strap used during aerobatic flight does of course hold the clasp firmly in one position; however, it does not prevent the pelvis from slipping out underneath the seatbelt during a collision. Merely the use of a fifth strap does therefore not satisfactorily solve the problem.

4. The seatbelts are tightened by pulling outwards and downwards. However, the form of the seat and the narrowness of the cockpit in today's modern sailplanes often leave very little room and freedom of movement available, thereby making the tightening of the seatbelts extremely difficult.

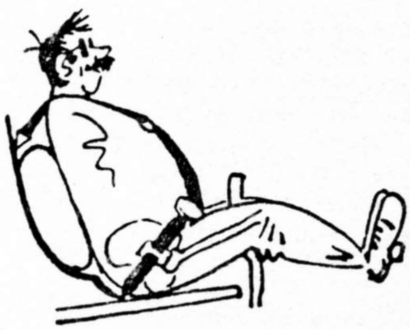
5. The buckles of the harness may have sufficiently held the older type textile straps, but the present-day synthetic straps tend to work themselves loose after only a few minutes in the air, and have to be constantly retightened.

6. The points of attachment of the shoulder straps to the airframe are too high in some glider types, thereby allowing the pilot to slip away from the foot pedals during a winch launch. To prevent this upwards slipping of the body the shoulder straps should be uniformily attached appreciably below shoulder level.

The above mentioned deficiencies, taken all together, were so serious, that we felt a better method of buckling oneself in could and should be attainable. Out of curiosity I installed a standard 3-point car seat belt into my ASW-15. Several trials showed that this new belt-arrangement lead to a much stronger and firmer seating. Together with the company "Autoflug GmbH" and consent of the German Federal Aviation Agency (Luftfahrtbundesamt - LBA) we have been able to work out and experimentally test a solution to this problem. Since our development and research work took place at the Hamburg-Boberg Gliderport, we have named our new buckling method the Boberg - Belt.

A 4-point buckling and strap system (which has since then been approved by the LBA) with asymmetrically positioned lock consists of the following parts:

A two-part hip strap passing around the pelvis and region of the groin and tightening directly onto the hip bones, holds the lower part of the body firmly in the seat. The strap is tightened by pulling "upwards and inwards".



A diagonal strap lies obliquely across the ribs and breastbone area and prevents the upper part of the body from being thrown forward during a collision. The upper point of attachment to the airframe should be positioned as far as possible to the outside.

A supplementary strap over the right shoulder hinders the upper part of the body from twisting around the vertical axis during lateral acceleration forces. The fastening point should be shifted 2-3 cm towards the middle of the aircraft in order to check a tendency of the strap to slip off the side of the shoulder. The lock, or fastener, in this arrangement is situated over the right hip bone. It is attached to a short, nonadjustable strap and can not slip upwards out of position in the case of a collision. The lock has three settings "Fasten - Safety - Release" and is additionally secured after having been placed in the "Safety" setting by means of a Velcro* fastener. All connections can be instantly released and set free by pulling on a red cord.

The materal of the straps is considerably softer and more conformable than that which has previously been

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* Velcro is the trademark name for a type of adhesive cloth.

used. The buckles are held in place by means of spring forces, so that the straps are no longer able to work themselves loose.

My ideas have not yet been fully realized with this version of the seatbelt system. Installation of an automatic belt for the right shoulder strap would give the pilot considerably more freedom of movement, thus making the instrument panel more easily accessible. Since an automatic belt is constantly under light tension it would also stay on the shoulder, and not tend to slip off. An automatic belt is, however, no longer reliable when the tension slowly increases. This is conceivable during aerobatic maneuvers and an objection from the LBA therefore seems possible.

My aim remains to show that a standard 3-point seatbelt-harness system is completely satisfactory for the requirements of normal flight operations, including the "elementary aerobatic maneuvers". I seem to be one of very few holding this opinion and will have to await future decisions of the powers that be. During all of my trial flights with just the hip and diagonal strap I felt thoroughly safe and found the available freedom of movement very pleasant.