



Volvo Car Corporation

Press Information

Forty-year jubilee for Volvo's three-point safety belt

A CELEBRATION OF SELF-EVIDENT SAFETY

The motorised century's greatest life-saver in traffic - Volvo's three-point safety belt - celebrates its fortieth birthday in the final year of the millenium. No other single safety solution has made such a contribution to alleviating the consequences of millions of traffic accidents the world over.

The paradox is that the three-point belt as we know it was designed and patented by a man who had previously spent his time catapulting people as far and as fast as possible.

The human body travels at the same speed as the vehicle in which it is sitting. If the vehicle suddenly stops, the body carries on at the same speed. Forces of between 3,000 and 5,000 kg must be kept securely in place by a belt that must be both strong, supple and comfortable to wear. Today, the safety belt is a self-evident part of our everyday lives. The reason for using it is just as self-evident. Hundreds of thousands of people are the living proof of its effectiveness.

Self-preservation

The need to be securely restrained while travelling is nothing new. Four thousand years ago, Odysseus had himself bound to the rudder in order to stand securely through the storm on the voyage home from Troy. Several of the motoring pioneers at the turn of the century realised that a belt round the waist could keep them in the seat and stop them tumbling out of their horseless carriages on the roads of their day. A simple lap-belt was patented as long ago as 1907.

It was not until after the Second World war that people began to take safety belts seriously, and it was not in the automotive industry but the aviation industry that work on safety belts began. Two American former airmen, Hugh De Haven and Roger W. Griswold, designed a Y-shaped three-point belt in which the diagonal was anchored behind the seat - almost directly behind the occupant. This was joined to a buckle that was placed over the abdomen. The belt was called a combined shoulder and waist safety belt and a patent was applied for in 1951.

This can be regarded as a kind of three-point belt, but unfortunately the design was not as safe as intended. The anchorage points were placed so that the body could move under stress and the unsuitable position of the buckle injured body organs rather than protecting them.

Simple but ingenious

Nils Bohlin was working as an engineer in the Swedish aviation industry at the time - designing ejector seats which could catapult the pilot out of the cockpit as efficiently as possible in acute danger. Paradoxically, Bohlin turned his interest to quite the opposite, i.e. restraining the body as safely as possible under extreme retardation.

Bohlin was soon able to translate his ideas and experience into practice when he was recruited to Volvo in 1958 to work on safety solutions in Volvo cars. By 1957 Volvo already had provision in its cars for optional two-point belts at the front, but the so-called diagonal belt did not meet all the safety criteria Volvo was searching for.

"I realised that both the upper and lower body must be held securely in place with one strap across the chest and one across the hips, with an immovable anchorage point for the buckle as far down beside the occupant's hip that the belt could hold the body properly throughout the collision sequence. It was just a matter of finding a solution that was simple, effective and could be put on conveniently with one hand," says Nils Bohlin.

In 1958, Volvo's work on a truly effective safety belt resulted in a patent application for Nils Bohlin's three-point belt¹. Bohlin's prime criteria for the design of his car safety belt was based on four golden principles. The belt should consist of both a lap belt and a diagonal, worn in the correct position in physiological terms, i.e. across the pelvis and ribcage, and co-ordinated in a fixed low anchorage point alongside the seat. This meant that the belt geometry assumed the shape of a horizontal V and that it retained its position under stress.

Volvo's world first in 1959

In 1959, the patented three-point belt was introduced on the Nordic markets in the Volvo P120 (known in some countries as the Amazon) and the PV 544, making Volvo the first automotive manufacturer in the world to equip its cars with safety belts as standard.

The sled and crash tests with cars which were used to verify the basic concept became increasingly advanced at the same time, so when the three-point belt was launched in Volvo cars on all markets, crash test sequences were carried out on all belt solutions on the market. The result was quite clear. Volvo's three-point belt gave superior protection for the occupant.

On the basis of this and other findings, Volvo introduced the three-point belt in the USA in 1963, as well as on other markets where it was not yet available for various reasons. This meant that all Volvo cars were equipped with three-point belts in the front seat as standard when they left the factory.

Scepticism

Despite its life-saving properties, it proved necessary for Bohlin and Dr. Bertil Aldman, who was in charge of the Swedish belt testing and approval authority, to undertake a long lecture tour in the USA in conjunction with the introduction of the three-point belt in North America.

The purpose of this trip was to explain Volvo's safety philosophy and the advantages of the three-point belt, both to a negative auto industry and an equally negative car-buying public. Most people thought it was bad enough having a lap belt in the way in the car - so a three-point belt would be even worse. In many ways, Bohlin and Volvo were ahead of their time when it came to insight into the benefits of the three-point belt.

True acceptance of the three-point belt took a while longer, therefore, particularly in the USA. At the Stapp Conferenceⁱⁱ in the USA in 1967, however, Volvo and Nils Bohlin presented the pioneering "28,000-accident report" which was based on all collisions involving a Volvo in Sweden during one year. The report clearly indicated the effectiveness of the belt - it reduced injuries by about 50-60%.

Belt law

The Volvo report was just what many belt proponents had been waiting for. The NHTSA (now the NHTSA traffic safety authority) now had fuel for its fire and the following year, 1968, the USA passed its first three-point belt legislation, despite opposition in the industry. The Volvo report paved the way and resulted in the first compulsory belt law as long ago as 1971, in Victoria, Australia.

The report also provided the basis for Volvo's Traffic Accident Research Commissionⁱⁱⁱ since the work behind the accident report continued and was formalised in 1970. As Volvo's own accident research body, this provided a unique possibility to analyse and follow up the characteristics of the cars, with the substantial advantage of providing a complete grasp of them at all stages of their life cycle.

At the same time as the three-point belt has been developed in terms of effectiveness and comfort, the other occupants of the car have been given greater protection over the years. Volvo cars had attachment points for rear-seat belts as long ago as 1958, and in 1967 the three-point belt became standard on the outer rear seats.

As time went on, of course, inertia-reel belts were introduced on all seats, making them much more convenient to use and thereby ensuring their more frequent use.

In 1986, Volvo cars could be fitted with a three-point belt in the rear centre seat as well, significantly improving the safety of all occupants. A few years later, this solution was standard in all Volvo cars, including the estate - something which was unique in the industry.

It can be said that the real breakthrough for the safety belt came in the early 1960s and that since then about ten million kilometres of belt have been installed in over a billion cars world-wide. This means that the total length of belt would go round the world at the equator about 250 times - or thirteen return trips to the moon. Hundreds of thousands of lives have been saved by the belt over the years, and the three-point belt is certainly the single most effective safety solution in cars. And will continue to be so in the foreseeable future.

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ⁱ Patent 227 568, valid from 29 August 1958, AB Volvo "Safety harness in vehicle", inventor N I Bohlin.

ⁱⁱ Colonel John Stapp, born 1910, of the US Air Force, put himself through tough experiments in the late 1940s and thereby laid the foundations of our insight into what the human body can withstand in terms of retardation, for example. Stapp's findings are general in nature but have been extremely helpful in the development of safety in cars.

ⁱⁱⁱ Since 1970, the Volvo Traffic Accident Research Commission has studied about 27,000 accidents involving Volvo cars within a radius of 100 km of Göteborg, as well as a number of cases further away and abroad. The findings from these and other Volvo accidents reported by Volvo's insurance company Volvia are fed back to the product planning and design processes in order to constantly develop and improve the safety levels of Volvo cars.