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STAR SEAT™

A Safety Standards Discussion

- Cycling Off-Road with Children
- Teaching Cycling Skills and Awareness

Product Safety Risk Information Report and Safety Discussion Toward Certification

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Product: Feva™ Star Seat™ – Bicycle Training Seat for Children
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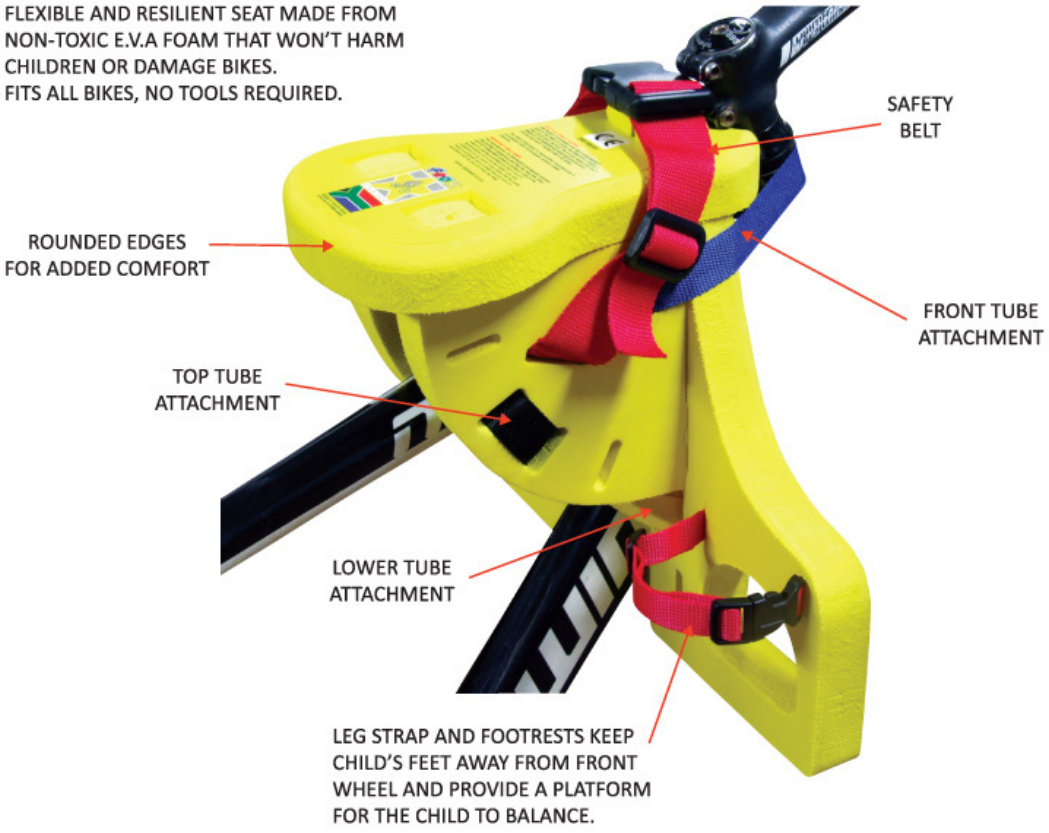
Contents:.



1. Introduction

The Feva Star Seat is an invention saddle-type seat that was designed to train young children in cycling and safely overcome specific dangers of cycling with children, especially to be used off-road using modern mountain bikes. All chair-type seats can be dangerous when used for this application. In the absence of a safety standard that adequately or properly caters for this application of a bicycle child carrier in accordance with the intended safety objective of the EU GPSD 95/2001, the most obvious available standard to test for safety is En 14344 and many of the requirements within this standard are not relevant to the Feva Star Seat for safety purposes. The objective of this report is to demonstrate that deviation from the recommended standard is required for safety and is in the best interests of society to reduce the risk of accidents and injuries while cycling with children. The product requires third-party certification from an accredited testing authority to permit placing the product on the consumer market for sale.

2. Supporting Safety Risk Report

The most up-to-date and comprehensive professional risk assessment currently available for use to verify safety in design application of the Feva Star Seat is detailed in a comprehensive University of Adelaide report from November 2016 entitled; TRANSPORTATION OF CHILDREN WITH BICYCLE SEATS, TRAILERS, AND OTHER CARRIERS: CONSIDERATIONS FOR SAFETY. This report deals with comprehensive available relevant safety facts and history. For the purposes of reference in this document, it has been abbreviated as SRR (Safety Research Report).

There is no elaboration referring to training seats for mountain bikes specifically that did not previously exist. This report is deemed appropriate to be used for design validation as fair and accurate reference for safety discussion relevant to standard design variations introduced to improve the safety of the Feva Star Seat as a child bicycle training seat use and for use on uneven terrain or off-road application (full 54 page report copy submitted with this document).

3. Problem/Challenge in obtaining certification - Application of Law:

Feva, the manufacturer is responsible for the safety of its product. According to DIN, it is not compulsory to use the recommended available standard EN 14344, but it can be used to conform with the safety directive 95/2001. The spirit of EU GPSD is to ensure safety for consumers. The directive allows for inventions and positive evolution. The design of the product may differ from the recommended standard if it improves safety or does not compromise safety. DIN states that it is more difficult to obtain certification if a product differs from the recommended standard, but nevertheless it is still possible. As manufacturers, we do not know how to solve this administration and certification problem.

Q: How can the manufacturer of a new kind of product prove that a design variation from the available recommended standard benefits safety for consumers to enable it to be sold on the market?

A: 1) Provide evidence to support the changes in the interest of consumer safety. 2) Provide evidence to show that the changes in the design will not negatively impact on safety.

Certification should be possible if the product conforms with the spirit of the EU GPSD.

4. Objective of this document

To sufficiently show that the design of the Feva Star Seat will improve safety for consumers with its intended application and also show that noticeable variations noted according to EN 14344 are not relevant for product safety.

To establish a viable strategy together with an accredited institution towards obtaining third party certification so that the product can be sold in Europe.

The chosen strategy toward certification could use a relevant available standard or not, as deemed appropriate on the advice of an accredited safety institute.

5. Design features of Feva Star Seat bicycle training seat compared with available standard bicycle child seats (chair-type seats)

- Feva Star Seat is a safe alternative to a chair-type seat (only for children from 18 months or self-supporting children)
- Mid-mounted position up to 22kg in front of cyclist is a safe alternative to rear mounted position with a similar standard weight restriction
- Limited restraint system permits managed active participation of the passenger as a safe alternative to a seat harness designed for passive restraint

6. Reasons for variations from available standards relevant to risk and safety report

- **A new kind of product for child training** - Education and awareness will benefit safety: Many countries prioritise the promotion of cycling as a safe, viable and enjoyable mode of transport and recreation. There is a need for continued development of safety and education to minimise the risks associated with cycling. It is important to target children to ensure generational change. (SRR p1 pp3) There are an increased number of reliable safety risk reports available for consideration and review. The selected most comprehensive recent relevant risk study shows a relative increase in the occurrence of accidents involving children aged 4-6 years compared with younger children 0-3 years and a further marked increase involving children aged 7-10 years reflecting the age that children begin cycling independently (SRRp5,pp6; p6pp2). **This important and valid researched safety statistic high-lights a safety benefit to increase cycling skills and awareness in children at a young age.** Feva offers a training seat to benefit society as a solution to improve safety by improving cycling skills and awareness in children that will prevent child bicycle accidents. As such, the Feva Star Seat is an invention that positively addresses an important safety issue as well as others associated with safe cycling that the standard EN14344 does not permit due to specific requirements. Placing a child in a rear positioned chair-type seat does not sufficiently promote cycling education and awareness in children, nor does it sufficiently develop valuable cycling skills required by children as they learn to cycle independently. The Feva Star Seat requires young children to participate and take an active role in operating a bicycle with parental guidance and supervision. This educates children in a managed way with valuable skills including confidence, safety-awareness, steering ability, braking ability and ability to balance. Being properly positioned in front of a cyclist contributes positively to a child's self esteem, core development and

spacial awareness. These combined factors contribute to a positive effect on the overall number of child bicycle accidents occurring and helps to minimise the risk of child bicycle accidents as children learn to cycle independently. A chair with a high back support may offer support to address certain valid risks, however it causes other safety risks and there are alternative options available to address the risk concerns including placing a child directly in front of a care-giving cyclist.

- **Cycling on uneven terrain.** The safety risk report (SRR. p20-21) indicates there is a measured preference for parents to avoid cycling with children in traffic. With evolution in cycling and recreational cycling and especially the popularity and capability of modern mountain bikes, more people are cycling with children off-road where the specific safety risks are less relevant to chair-type child seats used on paved surfaces. The concern of head injuries in children is largely and most effectively overcome by children wearing a suitable safety helmet. Accessory safety gear like gloves and elbow pads can also be used to protect children from sustaining minor injuries while not interfering with their natural ability to move in order to develop skills and assist balance and also develop physical ability to defend themselves towards safety while in a parent-supervised environment.

- Parents cycling with children change their cycling behaviour when carrying children and often change their cycling route to avoid traffic. (SRR p20 table3.6) There are no reports indicating high speed crashes of bicycles carrying children. Incidents are more likely to occur when a bicycle is stationary or moving slowly (RSS p14pp3). The most prominent risks associated with cycling off-road include loss of control, weight distribution/balance and child control as the most important for safety (SRR p19 Fig.3.5)

- The Feva Star Seat is used as a balanced push cycle carrier for safety when terrain becomes too dangerous to cycle. This application is unbalance with a chair seat.

- To reduce safety risks associated with child seats, the most relevant safety risk report (SRR) available to consider is based on factual accident history and public survey deemed most reliable. There are no safety accredited training seats on the market similar to the Feva Star Seat and most child bicycle seats are assumed to be either front or rear chair-type seats in accordance with available standards. The researched facts relate to these seats and indicate where improvements to safety are possible. The nature and occurrence of injuries and accidents involving child carriers do not necessarily support the need for a chair-type seat specifically, rather the need for a suitable safe carrier that properly addresses the valid risks as reported. Most reported accidents are due to loss of control and falls (SRR p2pp5,6; p5pp1) while reported injuries could be attributed to a child seat causing imbalance or improper support. The available EU standards raise safety concerns based on emerging factual evidence indicating that there are risks associated with the safety standard requirements (SRR p7 table 2.2; p8 table 2.3). There is always a need for improvement.

- Research indicates that a child seat (chair seat) contributes to imbalance and instability (SRR p2pp2; p3; p14pp2; p15pp2) and also that it can make it difficult for a cyclist to dismount easily. These are negative safety effects of child seats that are chair-type seats based on available products on the market. The most prominent number of child seat safety incidents occur while loading/unloading children, mounting/dismounting a bicycle and when losing control of a bicycle on uneven/slippery terrain. Risks concerns affecting design strategy of child seats relate to; other traffic, weight/balance, falls/tipping and child passenger interference.

- There is no conclusive evidence to support whether a high back chair possibly contributes to the number of back/spine/lumbar injuries in children due to vibrations or impact of the chair on the spine or lumbar region of children when cycling, however the relative frequency of occurrence of injuries to a child's back/spine/lumbar region suggests that it is possible that a chair seat contributes to this kind of injury. Cycling off-road on uneven or bumpy terrain exaggerates any negative effect of absorbing shock into the back and lumbar region of a child and a chair is therefore not ideal for safety reasons.

Off-road cycling also increases the importance of balance and the critical requirement for a cyclist to dismount easily (SRRp22 table 3.7).

- In the reported survey conducted to determine what measures could be suggested to reduce the risks associated with child bicycle carriers, the following extracted points for consideration relevant to design of the child carrier were raised: Choosing type of carrier suitable for application; Managing of passenger; Loading/unloading passengers; Use of accessory safety equipment. (SRR p24 table 3.8). The feva star seat addresses all of these concerns in a positive way.

7. Summary of reasons for design variations:

Current design standards for bicycle child carriers are based on European Standards. It is not yet known how the directive will adequately cater for valid alternative unconventional safety improvements in bicycle child seats for specific uses. This could be due to different interpretations of the law, or a previous lack of reliable research information affecting available standards and causing a perception of safety requirements that are not necessarily beneficial for bicycle child seats. The obvious available child seat bicycle standard shows limitations in predictable modern use application of child seats, not properly considering evolution in cycling off-road. Obvious available standards furthermore prevent a valuable opportunity for education and development of cycling skills for children to benefit increased awareness in children through managed active participation. The available requirements also potentially prohibit creating awareness and education that could be the most important alternative positive safety improvement in managing the risks of cycling related accidents involving child passengers. If children have training, then the significant number of child bicycle accidents between the ages of 4 and 10 years could be reduced (SRRp5p6pp2). The obvious available standards do not adequately cater for valid use possibilities and possible improvements in order to benefit safety. It is also evident based on research and reports that available standards can cause unnecessary safety risk by causing imbalance, difficult loading and difficult mounting. The standards do not fully consider the risk of causing injury to the back/spine and lumbar region of children as evidenced in accident reports. In terms of the law, including the EU General Product Safety Directive, improvement and evolution is possible.

8. Discussion of design features

- **Feva Star Seat is safer than chair-type seat for use on uneven and unpredictable cycling terrain**

  Research and risk assessment statistical facts are becoming more available creating awareness of risks that differ from common perception. Available accident facts do not support opinion to indicate that a Chair Seat is necessary for safety as it creates extra risks. It is possible based on reported facts and practical testing, that a chair contributes to safety risk with a significant number of reported injuries to abdomen, lower back and lumbar region of children. The frequency of occurrence of these injuries amongst other injuries related to cycling is of concern.

  It is also evident that most injuries to children are due to loss of control of a bicycle. Practical reasons for a chair back support could include providing child support for sleep and long distance transportation that are not relevant for an off-road training seat.

  The safety concern to prevent head injuries is valid and this important risk concern is overcome by using proper cycling helmets without introducing additional different safety risks associated with a chair design especially when there is no need for passive support for long distance transportation or sleeping passengers.

  The need for a chair back for supporting a child is negative if the position of the seat on a bicycle is in front of the cyclist and active participation is required. A chair-type seat can contribute to imbalance,

loss of control and cause a bicycle to fall that is factually the major cause of bicycle child seat accidents as reported.

A high back support does not protect a child's head in case of a likely lateral/sideways fall and does not conclusively improve safety against head injuries according to evidence.

A chair can restrict natural movement towards self-defence preventing injury. An adult care-giving parent body supporting a child from behind and in close proximity to a child is a more practical safe alternative replacement for a chair back support. A parent can monitor and manage the child and offer support.

The Feva Star Seat is a training seat not intended for long-distance transportation. The product requires children to be awake. Chair seat designs are not relevant for safety if used as a child bicycle training seat on uneven terrain.

Support

	Off-road	Training
Star Seat: Care-giving support of a cyclist body is flexible and accommodating that is necessary for balance, child control skills development and training.	✓	✓
Standard Seat: Support is a rigid obstruction for accessibility and movement. Additional risks include - imbalance, child interference and cyclist distraction.	✗	✗

The sitting position required for The Feva training seat is beneficial for safety because it allows shock impact from cycling to be absorbed into the seat and limbs of a child with reduced negative impact on the lumbar region and back/spine of a child. Uneven cycling terrain exaggerates the negative impact of a chair design on a child's spine/back/lumbar region casing safety risk.

Reports indicate that a chair-type seat can prevent easy mounting/dismounting of a bicycle and present a safety risk. The Feva training seat reduces the risk of losing balance significantly and makes it easier to quickly and safely mount/dismount a bicycle. This requirement is particularly important to reduce the reported occurrence of accidents on uneven/slippery terrain. Most relevant accidents include a bicycle falling. Losing control of a bicycle is a major risk concern for designing a bicycle child seat for off-road use. Being able to dismount a bicycle to recover balance or control before falling benefits safety and reduces the occurrence of accidents with children. It is possible that the chair-type standard compromises safety based on reported causes of injuries being loss of control due to imbalance or tipping over, loading and unloading children and mounting or dismounting a bicycle carrying a child. The risk of losing control of a bicycle and child passenger is significantly reduced using the Feva training seat that improves safety and stability.

Sitting Position

Off-road	Training
✓	✓

Star Seat: Jockey position and seat material permits impact and shocks to be absorbed into seat and limbs that is safe for bumpy terrain.

Standard Seat: Sitting position requires impact and shock to be absorbed into seat and spine / back / lumbar region of child that increases risk of injuries reported. Not suitable for off-road cycling.

Off-road	Training
✗	✗

Dismount

Off-road	Training
✓	✓

Star Seat: Easy dismount to recover loss of control with no obstructions that is critical for child safety off-road.

Standard Seat: Difficult dismount when in danger increased risk of falling.

Off-road	Training
✗	✗

Placing Children

Off-road	Training
✓	✓

Star Seat: Stable bicycle without the need for additional supporting devices deemed essential for safe off-road use.

Standard Seat: Unstable bicycle causes imbalance and risk of fall.

Off-road	Training
✗	✗

The chair seat standard causes a permanent operating obstruction for a cyclist. As a practical and safe alternative to a chair back, a parent cyclist provides a flexible natural care-giving support if positioned behind a child.

A chair prevents care-giving contact, obstructs movement and limits communication while relying on passive restraint of child that requires associated additional standard requirements and complicated regulation and control as proven. It creates additional safety risks as reported.

Communication

	Off-road	Training
Star Seat: Allows communication between cyclist and child with forward vision at all times that is important for training and safety.	✓	✓
Standard Seat: Limited communication requiring a cyclist to turn around to see or attend to the child is not preferred for safety or child training.	✗	✗

A passive extra weight can contribute negatively to balancing a bicycle. One of the most important safety considerations for cycling with a child is to maintain control of a bicycle and child. A chair-seat prevents a cyclist from reacting quickly to dismount and stabilize a bicycle and control a child to prevent a fall. A chair can also contribute to the risk of falling or tipping while loading/unloading a child or mounting/dismounting a bicycle as reported.

- **Mid-mounted position up to 22kg in front of cyclist is preferred to rear mounted position and weight restriction**

A mid-mounted saddle offers a parent control of a child creating close contact with a child passenger, allowing forward vision and improved communication with reduced risk of distraction and interference.

Reports indicate there is safety merit in developing awareness and skills in children as they learn to cycle. There is a need for a solution to improve skills development and awareness in children. Training seats benefit these objectives so that the occurrence of child bicycle accidents is reduced. The Feva Star Seat is positioned in front of the cyclist to promote interaction and education to properly address this valid safety problem as reported.

Weight carried behind a cyclist on a bicycle is not beneficial for safety compared to weight carried on the bicycle frame positioned between the wheels. A bicycle is more stable with improved centre of gravity. These are important reported safety risk considerations. The position of the Feva Star Seat is beneficial for carrying weight.

The compact size and versatile mounting system of the Feva Star Seat does not significantly compromise a cyclists ability to operate a bicycle while contributing overall to better balance and control of a bicycle and child being more important safety risk considerations as reported.

When cycling off-road, or pushing a bicycle over potentially dangerous terrain. There is a valid practical safety need to balance a bicycle carrying a child without the effect of the weight of a cyclist on a bicycle. A rear seat on a bicycle being pushed while carrying a child can become dangerously unbalanced over uneven or steep terrain causing the bicycle and child to fall.

Push Option

	Off-road	Training
Star Seat: Offers balanced push option when terrain is difficult for cycling off-road.	✓	✓
Standard Seat: Bicycle is not balanced when cyclist weight is removed with increased risk of tipping.	✗	✗

A rear seat does not sufficiently develop valuable cycling skills required by children as they learn to cycle independently. Encouraging young children to participate and take an active role in operating a bicycle with parental guidance and supervision educates children with valuable skills including confidence, safety-awareness, steering and balance. These skills contribute to a positive effect on the overall number of child bicycle accidents and help to minimise the risk of child accidents. If a child is in front of a cyclist, education and training of a child is possible in a managed way.

- **Limited restraint system permits managed active participation of the passenger as a safe alternative to a chair harness.**

A harness prevents movement of a child's upper body and is designed for passive restraint. Passive restraint of a child's upper torso has a negative effect on balance and training ability.

The Feva Star Seat is designed to provide limited support by safely securing the feet and upper limbs of a child so that a child cannot be thrown off a bicycle and ensuring limbs do not interfere with the working parts of a bicycle. These are requirements for safety.

A child is required to participate to support its own body with parent supervision. This requirement has positive and very important physical and social development benefits. A child learns how to balance and understand and operate brakes and steering in a managed environment.

Foot Hold

Off-road	Training
✓	✓

Star Seat: Cyclist can quickly and easily access and monitor secure use of safety restraints at all times while seated maintaining balance and ensuring safety and control of child off-road on bumpy terrain.

Standard Seat: Harnesses not accessible and cannot be adjusted while seated. Potential for child interference and harness to become loose especially on bumpy terrain. Child limbs can become entrapped with increased risk of injury. ✗ ✗

The most important safety benefits are evident as a child learns to cycle independently. Practical cases indicate that children adapt and transition much quicker and safer onto pedal bicycles. This contributes to reduce the high number of child bicycle accidents reported involving children between the ages of 4-10 years.

Seat Belt

Off-road	Training
✓	✓

Star Seat: Seat belt adds support to stabilize a child. Develops balance and confidence with supervision. Promotes training, allows movement of the torso to develop strength and balance Promotes learning cycling skills like braking and steering to reduce high number of cycling accidents involving young children. The restraint also prevents a child from being thrown in the event of a sudden an unexpected change in motion.

Standard Seat: Harness restricts movement that can be to the detriment of balance and does not allow child participation or skills development for safety or recreation. Safety relies on passive restraint that should be controlled while cycling. ✗ ✗

9. Consumer safety track record

- Feva has supplied 7000 of its training seats to customers in South Africa, Switzerland, Denmark, Norway, Australia, New Zealand and United Kingdom and the product has achieved 100% positive safety record with no reports of accidents or injuries.

- Feva has established an ongoing successful trade relationship over three years supplying the Feva Star Seat to main stream retailer Moresport group with approximately 40 Sportsman's Warehouse retail outlets. Feva also supplies approximately 30 independent retailers and 4 international distributors.

- Expert mountain bike cyclist parents that have positively tested and used the product with their own children include Stefan Sahm, Kristian Hynek and Nino Schurter. Feva works with cyclists and parents towards making improvements.

- As a father and the product inventor with two sons, the younger son had the benefit of using a training seat from 18 months old. The product was invented after an accident occurred while his mother was using a chair seat cycling off-road. The prototype training seat was immediately effective at improving control and immediately reduced the ongoing safety risk of falling while cycling off-road. Thereafter, the educational benefits of the prototype seat were obvious and the child later easily adapted and learned to cycle independently before 4 years of age without using training wheels. Today, the child has advanced cycling skills for his age, 6 years.

10. Conclusion

The Feva Star Seat safely achieves the following objectives by it's patented design:

- Improving cycling skills, creating awareness and promoting social and physical development in children.

- Enabling off-road bicycle adventure with children.

- Reducing the number of child bicycle accidents.

- Promoting cycling.

Feva is satisfied based on significant product testing, use and feedback relevant to the Feva Star Seat that the product is safe. The manufacturer takes responsibility for safety. It is willing to co-operate with any certification authority toward making the product available for sale in order to add value to society. Improvements in packaging, labelling, quality etc. as well as any valid safety risks that are not known can be addressed towards obtaining certification as required in specific countries.