ORBIT

An exo-skeletal neck brace that works in-conjuction to the open faced helmet

Louis Farnsworth
BA Product Design

P - 07904 095821
E - louisfarnsworth98@gmail.com
W - louisfarnsworth_

Achievements -
DIIP 2019 (Shortlisted - TBA)
RSA 2019 (Shortlisted - TBA)

Statement -
A motivated, passionate and well-rounded product designer with a keen interest in the strategic process of a products development and finalisation.

As a Product Designer, I'm a problem solver at heart and strive to deliver the most effective solutions at the highest standards. I have gained a brilliant understanding of modern design language and the importance of end user
needs.

Introduction

Thousands of skiers enjoy snow sports every year. Although they can be safe, unexpected injuries may occur with improper preparation, varied snow conditions or poor judgment.

Protection and safety for skiers is very well established now helmets are an item required to wear on the head, and clothing is similarly improving. Every day accidents happen, and, in some cases, the neck becomes vulnerable where the skier could end up experiencing life-threatening injuries resulting in paralysis and death.

Opportuinities for innovation

Many individuals take part in skiing and snowboarding every year. 'The head and neck are involved in over 20% of all injuries

Wearing a helmet does not increase the risk of suffering an injury in the neck area

As younger individuals are taking part in sports and the ability of skiing and snowboarding advances rapidly, children are more at risk of a neck injury. The weight of the helmet on children aged 11 years and under can cause a more fatal neck injury. The weight behind this could end up causing an injury to the neck as well as the head.

Neck injuries, such as whiplash and concussion can take 3 months to recover from. For broken bones, surgery is required and is expensive.

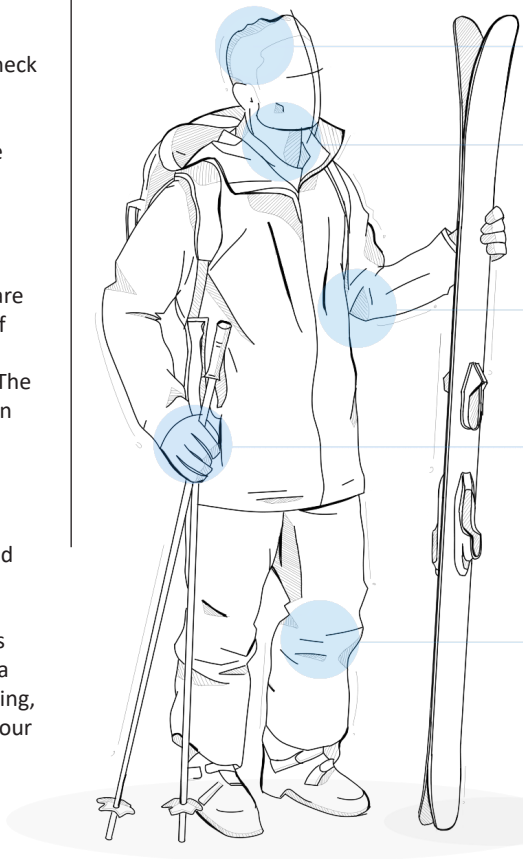
75% of skiers and snowboarders injuries occur from loss of control or falling down a slope, so the faster the skiing/ snowboarding, the more traumatic force is subjected to your head and neck.

Seeing a direction

01.
Casual skiing -
User is enjoying skiing at this moment in time. They are not expecting a incident to occur at any time period, therefore not preparing for a fall and all movements will be sudden.

02.
Incident -
Sudden incidents could be due to loss of control or collisions Via other riders on the slopes. Speed, weight, weather conditions and other riders are all potential factors towards a life changing incident.

03.
Impact -
Whether falling to the side or on their front, potential objects can restrict movement with a followed momentum, and at high speeds if the impact is to the head, the neck could be in a life threatening condition due to an extensive movement from impact.



Helmet & goggles -
The latest technology is included within the latest helmets and goggles on todays ski market.

Neck support -
No existing neck support for skiers wearing an open faced helmet.
Opens new product market and proposal outline

Elbow support -
Rarely used within skiing. Majority are strapped around the elbow area with velcro as a fastening feature. Normally worn when beginning to ski and with the less experienced riders

Gloves -
Used a lot of the time when skiing due to cold weather conditions. If there was an incident where the rider does fall over and are close to other riders, gloves also protect hands and fingers from impact and abrasion damage.

Knee support -
Rarely used within skiing but more so than elbow supports due to knees taking a lot of weight and pressure through changing of direction and time duration spent on lower body. Majority are strapped around the knee area with velcro as a fastening feature. Normally worn when beginning to ski and with the less experienced riders.

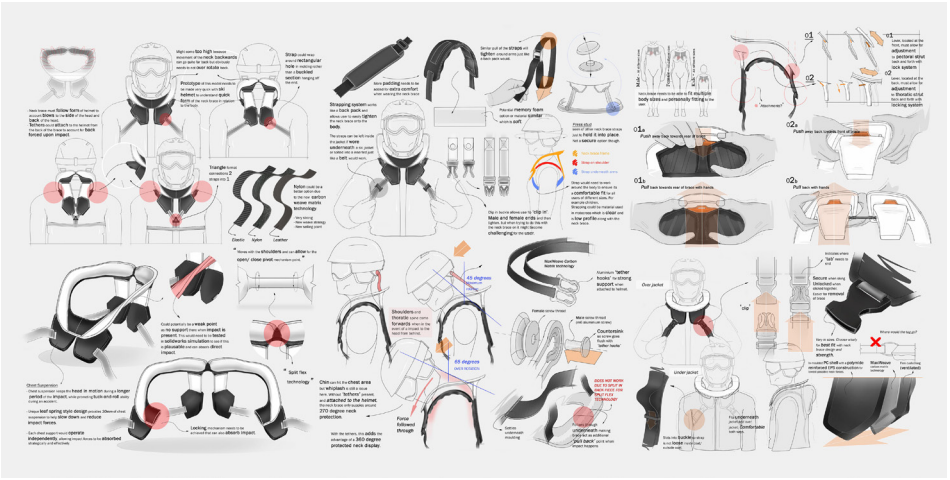
After undertaking valuable primary and secondary research, opportunities identified in the investigation justify the requirement for product development in neck safety for skiers. The lack of consideration for neck protection today is poor and not well established. As abilities of riders are getting heightened and younger people are getting involved, the best neck protection must be available for them to not result in a life-threatening injury.

How the neck brace would work is in conjunction with the open-faced helmet, where the neck brace would offer its protection by limiting the movement of the helmet in the event of a crash. Or, by fastening a brace to the neck.

Through the process of ideation, brainstorming using post-it notes was a great process to quickly develop a understanding of the project proposal and quickly overcome problems identified and raised early on, this process allowed me to be open minded and explore different paths and opportuinites that could resolve the issues upon neck protection.

High quality sketches were then generated which displayed detailed and accurate thinking. This allowed for a clear visualised product experience from a early stage which enabled crucial development to features and properties before taking a idea to CAD.

3D printing was a great service to allow a convertion from a CAD model into hands-on, full size prototypes. This allowed for successful user feedback and usability to a fully proposed design where the mechanisms were functional and mechanical.



In an event of an impact, even with the helmet on, The neck could over rotate as pressure on the helmet would cause the head to move the neck in an excessive position.

- **Extension and flexion forwards**

Extension backwards could be made to 45 degrees. Flexion forwards could be made up to 45 degrees.

- Left and right rotations

Left rotation and left rotation could be made to 80 degrees from central point.

- Right and left lateral flexion

Left lateral flexion and right lateral flexion made from central point can be made to 45 degrees.

These extreme movements of the neck that could result in a life threatening injury are as follows: **Hyper Extension**, **Lateral Extension**, **Coupled Axial Loading** and **Hyper Flexion**.

Orbit is an exo-skeletal neck brace that works in conjuction with the open faced helmet. It offers its protection by limiting the movement of the neck in the event of a impact countering its extreme movements. Orbit absorbs a head impact by spreading the force across the back, shoulders and tethers instead of over rotating the neck in all directions, ensuring a 360 degree protection.

Orbit offers functional and physical properties that are low profile, strong and adjustable for any b ody size. Orbit considers skiers by not restricting movement as it mimics natural ski positions of the body and is also comfortable and ensures a secure fitting to the body.

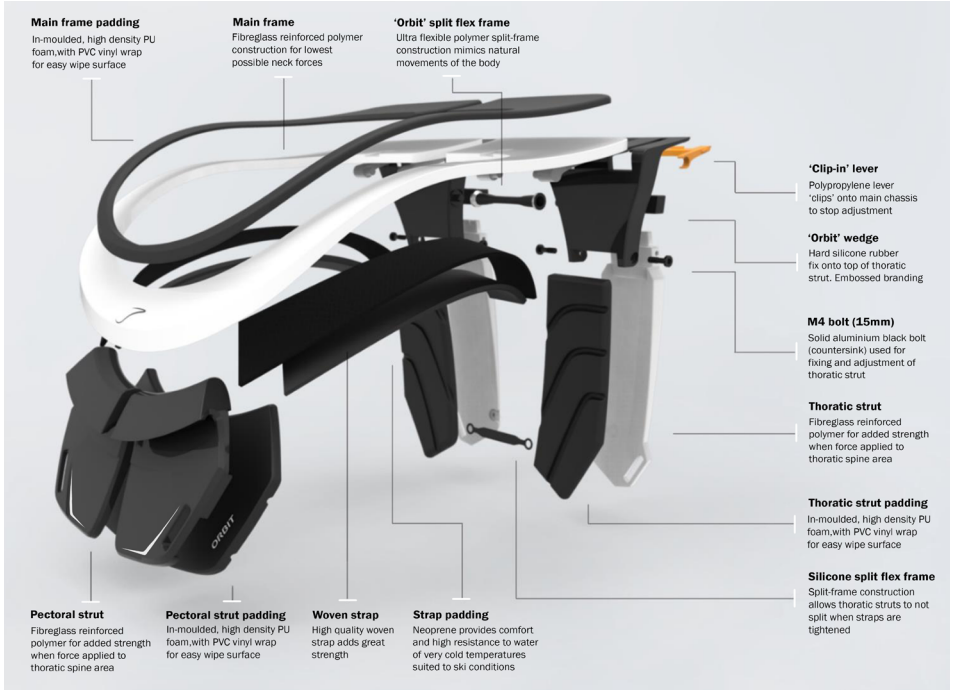
Further, as the design of the neck brace would be new to the snow sport, making sure the neck brace is comfortable, appealing and a restraint were the main aims of this endeavour. The chosen materials aid Orbits hard wearing and rigid functionality, whilst equipting the highest quality visual appearence and weight. For the main chassis (main frame), thoratic struts and pectoral struts, fibreglass reinforced polymide is the material used, which offers this functional strength ensuring great protection for riders.

The added comfort is obtained through the soft PU foam padding located on surfaces that make contact with the body and helmet. The padding is well ventilated to avoid the user resulting in being in a uncomfortable state or getting too hot. In addition, PU foam is present in the straps to gain comfort in the over shoulder straps where the brace sits.

Considering there are many ages that take part in skiing activities, Orbit is able to support all ages and sizes of riders. As it is a product to help reduce neck injuries in snow sports, different abilities in these sports, such as beginners, intermediate and advanced, can all be accommodated for.

Throughout the product, adjustable features are present which supports riders in ensuring the optimum and perfect fit for any body structure. For a secure fitting, a press stud and elastic strapping system is used to keep the brace in place, where it should be.

Orbit considers skiers by not restricting movement as it mimics natural ski positions of the body when taking part in the activity.



Component details:

1. **Main frame padding**

In-moulded, high density PU foam, with PVC vinyl wrap for easy wipe surface.

2. **Main frame**

Fibreglass reinforced polymer construction for lowest possible neck forces.

3. **'Orbit' split flex frame**

Ultra flexible polymer split-frame construction mimics natural movements of the body.

4. **'Clip-in' lever**

Polypropylene lever 'clips' onto chassis to stop adjustment.

5. **'Orbit' wedge**

Hard siliconerubber fix onto top of thoratic strut. Embossed branding.

6. **M4 bolt (15mm)**

Solid aluminium black bolt (counter-sink) used for fixing and adjustment of thoratic strut.

7. **Thoratic strut**

Fibreglass reinforced polymer construction for lowest possible neck forces.

8. **Thoratic strut padding**

In-moulded, high density PU foam, with PVC vinyl wrap for easy wipe surface.

9. **Silicone split flex frame**

Split-frame constructionallows thoratic struts to not split when straps are tightened.

10. **Strap padding**

Neoprene provides comofrt and high resistance to water or very cold tempertures suited to ski conditions

11. **Woven strap**

High quality woven strap adds great strength

12. **Pectoral strut padding**

In-moulded, high density PU foam, with PVC vinyl wrap for easy wipe surface.

13. **Pectoral strut**

Fibreglass reinforced polymer construction for lowest possible neck forces.

(Also included 'Orbit' strap pack, wedge pack, 2 nylon tethers W/ helmet attachment, 4mm allen key and spare bolt pack)