

A person wearing a dark, heavy winter coat and blue gloves is holding a brown drawstring bag. They are standing in a snowy environment with evergreen trees in the background. The scene is dimly lit, suggesting a cold, overcast day.

Term Project 1

Design Report

Protecting evidence in challenging weather conditions

A project by Nils Achenbach

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NEW TOOLS FOR CRIME SCENE INVESTIGATORS

“Protecting evidence on crime scenes in challenging weather conditions”

The project explores the process of protecting important evidence at crime scenes, taking into account environmental factors such as wind, rain, ice, snow, as well as missing daylight and low visibility in northern Scandinavia.



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„The master's program „Advanced Product Design“ at Umeå Institute of Design particularly stands out for its collaborations and user-oriented project work. Students have the opportunity to collaborate with working professionals to generate meaningful product experiences. In the course of the first term project, a highly complex topic was deciphered with the help of advanced design methods to generate meaningful product solutions.

During this process, aspects of people-centered design (PCD) were addressed. The following report will lay out my goals, the process of designing EVITENT as well as my personal learning outcomes.“

INTRODUCTION

PROJECT INTRODUCTION

The first-year term project „New Tools For Crime Scene Investigators“ applies a more theoretical approach to identifying potential product solutions. I set out to design a concept for a specific user group, using my skills to develop innovation with special emphasis on exploring the emotional responses of users as well as their professional and personal needs.

Within this process, I was able to get familiar with the four-pillar design approach of the Advanced Product Design program.

This project aimed to apply the philosophy of People-Centered Design (PCD) or Human Centred Design (HCD). In this approach, people are being seen in their social context rather than purely task-oriented „users.“ People-Centered Design shall be applied as an iterative process that focuses on understanding users and their context in all design and development phases. In the initial phase (week 44+45), user visits and interviews were conducted at Umeå University Police Training Department and Umeå Police Station.

I got to understand who will experience the product solution, how, when, and where. I further explored the user's values, desires, fears, dreams, expectations, and previous experiences in the following weeks. These insights were incorporated into the development of an emphatic product, allowing and supporting needs and wants to fit seamlessly into the everyday life of the target group.

The third phase of the project continued to build on my previously learned skills and newly acquired knowledge. In this process, the concept idea was visualized, documented, and shared at the final presentation on the 21st of January 2022.

Cooperation partners



The Crime Scene Investigation
department at Umeå Police Station

+



The Police Education Unit
at Umeå University

RESEARCH TRIP 1

RESEARCH TRIP 1

In the first phase of this term project, the whole semester had the opportunity to visit the police training center at Umeå University. Within two days, we got to know three teachers from the Swedish police and gained important insights into their everyday work.



QUOTES

After completing the first research visit, I took the time to revisit all of the audio recordings, videos, and notes. By listening carefully, I identified captivating and essential quotes that provide insights into the emotional dimension that police officers face every day.

„You have to be careful with the evidence. If you found only half of a shoe print, you just work with it. We teach them to take all the leads and be thorough without hurry. You always do your utmost you can to find any trace.”

- Patrol Officer C

“Sometimes we work in -30° and snowstorm. You have to deal with that, we can't bring the nice weather with us. If you have a dead body 3km away from any road, well then you have to walk! That's the way it is.”

- Patrol Officer C



**„How long it takes to write the report?
Depends on how tired you are!” (*laughs)**

- Patrol Officer A

“You have to adapt. Find a solution. Work with the situation and work in a team.”

- Patrol Officer A



**“Just don't touch anything.
Secure the place and don't run around searching for evidence.
Use the radio and talk to the people.”**

- Patrol Officer B

RESEARCH TRIP 2

RESEARCH TRIP 2

On our second visit to the Umeå Police station, we had the opportunity to talk to specialized crime scene investigators and capture their working procedures and experiences.

During this visit, all students had the chance to try out different methods for crime scene investigation, such as taking fingerprints, detecting footprints, and collecting DNA samples.



Photography by Nils Achenbach, Niels van Gils and Heinrich Zaunschirm, APD students, 03.11.2021



defining quote

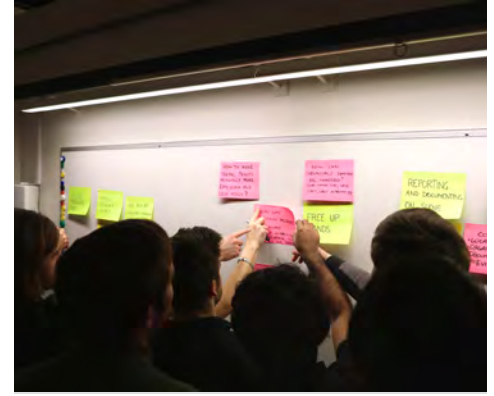
“Sometimes they (police officers) may use jackets to cover the most important evidence.”

Crime Scene Investigator J., on the question of how crime scene investigators react to environmental factors such as rain or snow.

RESEARCH ANALYSIS

The experiences and materials we brought back from three days of field visits were complemented by additional online research, organized, and visualized on research boards. Lectures and workshops by tutors Brendon Clark and Linda Bogren taught aspects of user research and methods for visualizing user journeys and timelines.

The results of the consumer observation were analyzed in smaller groups and later discussed with the entire semester. Initial findings from the field trips brought up relevant design opportunity areas, which have been enacted in experience prototyping roleplays.



Photography by Nils Achenbach, Oscar Olsson, Niels van Gils and Linda Bogren, APD students + tutor, 03.11.2021

RESEARCH CONCLUSIONS

Research conclusions and evolving opportunity areas

The research trips helped me understand the everyday lives of police officers as well as crime scene investigators and uncovered potential design opportunities. By analyzing film recordings, audiotapes, and numerous photographs, I matched my personal thoughts with our user observations. The findings helped me make my personal decision for the project topic at a later stage.

The most important findings of the research for my choice of topic:

- The everyday work of police officers consists of patrolling, assisting in lighter incidents like car crashes, traffic control, burglaries, and the de-escalation of conflict situations. Even though police officers are well-trained to investigate crime scenes, emotional levels of stress, tension, anxiety, and human error should be considered when designing new product solutions.
- In most cases, patrolling police officers (PPO) are the „first responders“ on a crime scene. First-aid measures are the first steps if the lives of victims are at risk. If a more severe crime happens, PPOs only secure the crime scene and contact the crime scene investigators (CSI).

- All police cars (VW Touran or Volvo V60) are equipped with many different tools. The two backseats have to stay empty at any time. Storing additional equipment can be a challenge.

- The police officers stated that every case is different. When working in new situations, they have to improvise and get creative. For example, when securing a crime scene in challenging weather conditions, police officers could use jackets or foil to cover essential traces since there are no professional tools to protect the evidence.

- Police officers currently use an iPhone 7 to document their process. Photos are taken straight into an application called „Filip“.

- Writing a crime scene report is a tiring and time-consuming process that requires concentration and focus.

Design opportunity: protecting evidence on crime scenes in challenging weather conditions.

After a detailed analysis of all the design possibilities, I decided on a concept solution that would simplify the workflow in challenging environmental factors. The interviews with experts surprisingly revealed that police officers often have to improvise during their work at a crime scene, as no tailored equipment can be carried in the vehicle due to the lack of space in the car trunk.

As a designer, I would like to use my knowledge and iterative methods to offer a more effortless and portable tool that police officers can rely on, when working in the challenging climate of northern Scandinavia.

DESIGN OPPORTUNITY

WHAT IF?



there would be a professional tool for police officers to secure evidence in challenging weather conditions?

AREA OF INTEREST

VALUE PROPOSITION

„My product helps all patrolling police officers who want to protect the evidence on crime scenes from bad weather conditions by avoiding the loss of valuable traces and offering investigators a more pleasant working environment. (Unlike improvising with unprofessional tools.)

OPPORTUNITIES

- + The product solution will solve a severe problem: up until now, there are no professional solutions for PPOs working with challenging weather conditions.
- + The product solution could combine photo capabilities and lighting equipment in one product

RISKS

- The product solution could require different sizes (product family). The limited storage space in the police car trunks should be considered if there should be an S/M/L version.
- The product solution needs to withstand heavy winds, experience prototyping sessions will be crucial.
- A handover procedure has to be considered in the service lifecycle if the product solution is left on the crime scene for the CSI team.

Photography by Wolfgang Hasselmann, unsplash, <https://unsplash.com/photos/aDN6MOIB-xg>, accessed 12.11.2021

GOALS + WISHES UPDATE

Goals

The primary objectives and intents of this project

- The product solution protects the evidence from being contaminated or destroyed by natural forces like rain, snow, ice, or wind.
- The product solution is easy and time-efficient to set up.
- The product solution is easy to store in a limited trunk space.
- The product solution is operatable by all patrolling police officers, respecting their gender, age, individual physique, and uniform.
- The product solution does not touch the evidence, even though it might be sterilely packed.

Wishes

The secondary objectives and intents of this project

- The product solution also considers the application for larger pieces of evidence.
- The product solution enables helpful documenting equipment (camera technology, lighting equipment, and scanning capabilities) through software.
- The product solution provides a more comfortable working experience, considering ergonomics in unpleasant weather conditions.
- The product solution considers an after-use scenario, where the product itself might be passed over to a different investigation team (CSI), and how to obtain it back.

RE-VISIT AT UMEÅ POLICE STATION

Polisen Traffic Tent



1



2



3



4



5



CONCEPT DIRECTIONS

Reinforcing structure

No structure

Blanket + Parachute



A foil is used to cover evidence on the ground. Additional weights are added on the corners to secure the scene from winds.

Soft structure

Inflatable + Popup



The evidence is protected by an inverted umbrella mechanism or inflatable tent, which is then set up above the evidence.

Hard structure

Exoskeleton + Tripod



A tripod-like architecture is replacing the traditional police tent, giving it more stability. While the solution is deployed over the evidence as well, an intelligent module with photo, light and scanning capabilities can be added.

NO STRUCTURE EXPLORATION - BLANKET



The first exploration was inspired by fire extinguishing blankets. A sterile foil is folded and packaged in a compact form factor.

Pro

- + cost efficiency
- + lightweight
- + scalability, easy to implement
- + easily disposable, sterile

Con

- requires additional weight solutions to protect from wind
- placement in wind can be challenging
- the blanket touches the evidence

NO STRUCTURE EXPLORATION - BLANKET



This sequence visualizes the unfolding process of the cover. The cover shown in this picture has the dimensions of 1,2 by 2 meters. A particular challenge in sewing the first prototype was to develop a folding method to prevent contact with the ground, which could result in contamination of the evidence.

NO STRUCTURE EXPLORATION - PARACHUTE



In a second experiment, a circular piece of fabric was sewn into a pyramid, reinforced by metal wire on eight spokes. Once the piece of fabric was released, it unfolded like a parachute, and was able to cover smaller pieces of evidence.

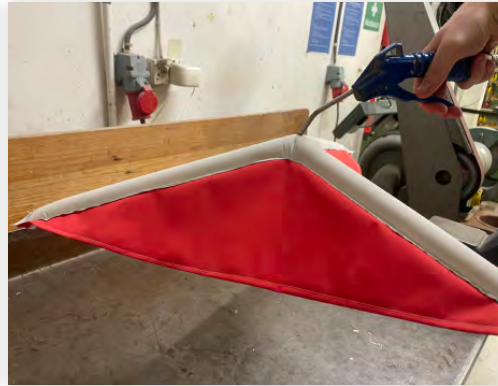
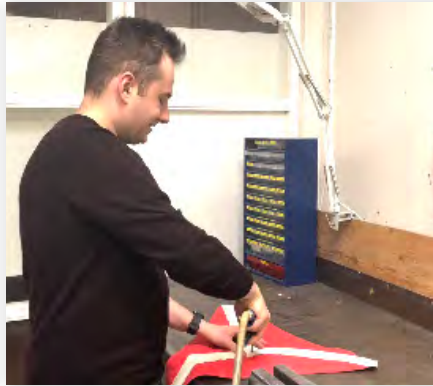
Pro

- + the mechanism worked surprisingly well in perfect conditions
- + easy to implement
- + low cost
- + lightweight

Con

- during the experience prototyping, I had to try two times for correct placement
- requires additional weight solutions to protect from wind
- placement in wind can be challenging

SOFT STRUCTURE EXPLORATION - 3LEG INFLATABLE



In a next attempt, I sewed a closed, 3-spoke channel onto a large triangle. On the top I cut a hole into which I could feed compressed air. This created the air cushions that formed a triangular pyramid.

Pro

- + The tent does not touch the evidence
- + Easy and quick to deploy
- + Super compact to store

Con

- correct placement was challenging
- requires additional weight solutions to protect from wind
- the placement in wind can be challenging
- (inflation with CO2 has not been tested!)
- what happens if the inflation fails?



SOFT STRUCTURE EXPLORATION - 4LEG INFLATABLE



I applied the same principle in another experiment. In this case, I decided to use a 4-spoke design to see if larger areas could be covered in a square footprint. In addition, I changed the angle of the pyramid.

Pro

- + The tent does not touch the evidence
- + Easy and quick to deploy
- + Super compact to store

Con

- correct placement was challenging
- requires additional weight solutions to protect from wind
- the placement in wind can be challenging
- (inflation with CO2 has not been tested!)
- what happens if the inflation fails?

SOFT STRUCTURE EXPLORATION - 4LEG POPUP



For my next experiment, I used 5mm wide spring metal strips for a diagonal 4-spoke design. These strips provided increased stability. However, due to the internal stability, the construct could only be folded to the form factor of a small umbrella.

Pro

- + metal legs can be used as tent pegs
- + The tent does not touch the evidence
- + Easy and quick to deploy
- + offers a solid amount of stability

Con

- The packaging size is much bigger in comparison to the other concepts
- Using the solution requires careful attention (sharp edges)
- + tension on metal band)

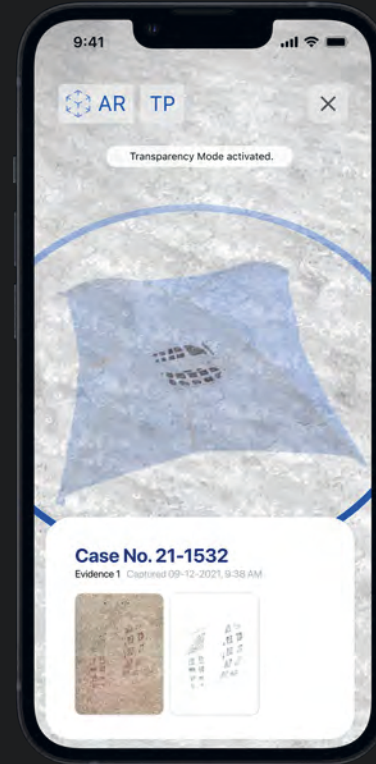
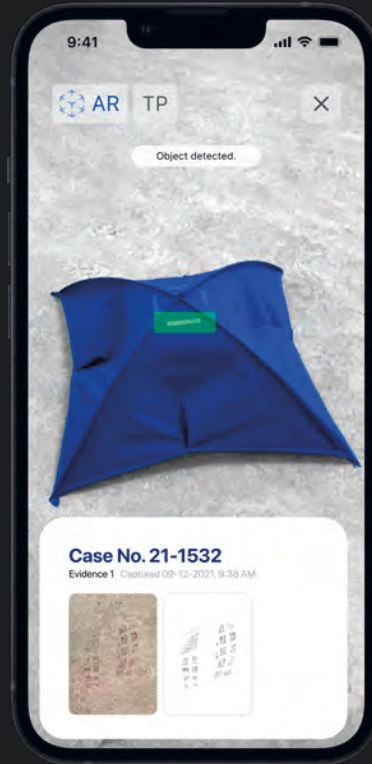


AUGMENTED FEATURES

From the beginning of the project, I intended that the physical product should be integrated into the existing police app called "FILIP". Every tent is supposed to have an individual barcode. The app should scan this identity number and link to the respective case number. In this way, previously taken photos in the app could be projected into the smartphone's viewfinder to have a look underneath the tent. This feature is intended to simplify handover processes between police officers and crime scene investigators.

OBJECT DETECTION

(QR code scan + allocated case)

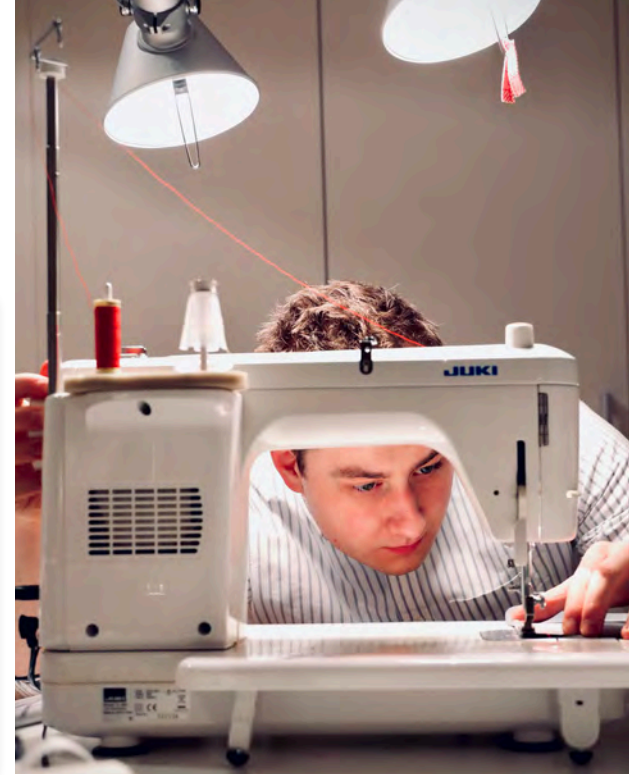


DIGITAL TRANSPARENCY

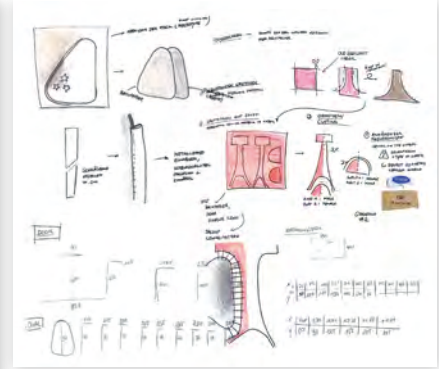
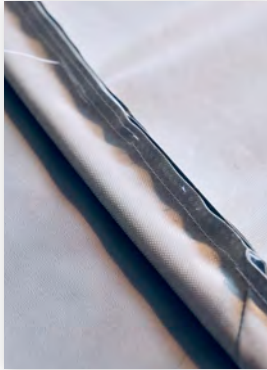
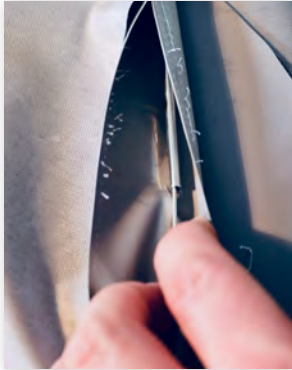
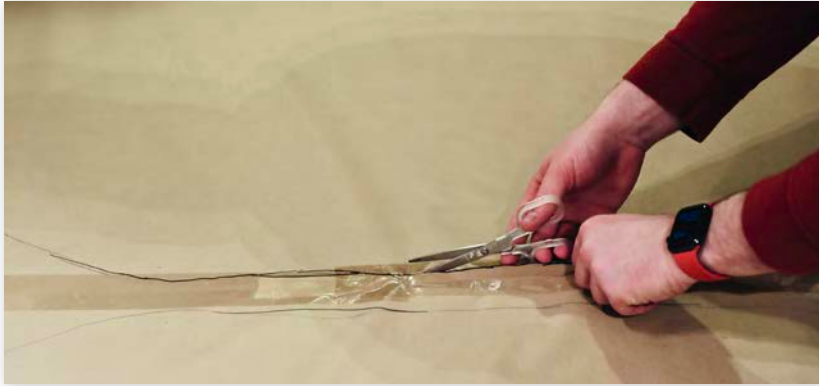
SEWING PROCESS

Before I decided on the subject of soft goods, I did not know about sewing or a professional design process with textiles. So in the first weeks, I familiarized myself with a smaller sewing machine.

During the creation of the first prototypes, I became more confident in handling the material. This experience helped me at a later stage when sewing the final prototype. Over the winter break, I had access to more professional and larger sewing machines that were designed for working with thicker polyester fabrics. After I completed the final prototype, it was an extraordinary feeling to hold a 1:1 model in my hands that had the quality of an industrially produced soft good.



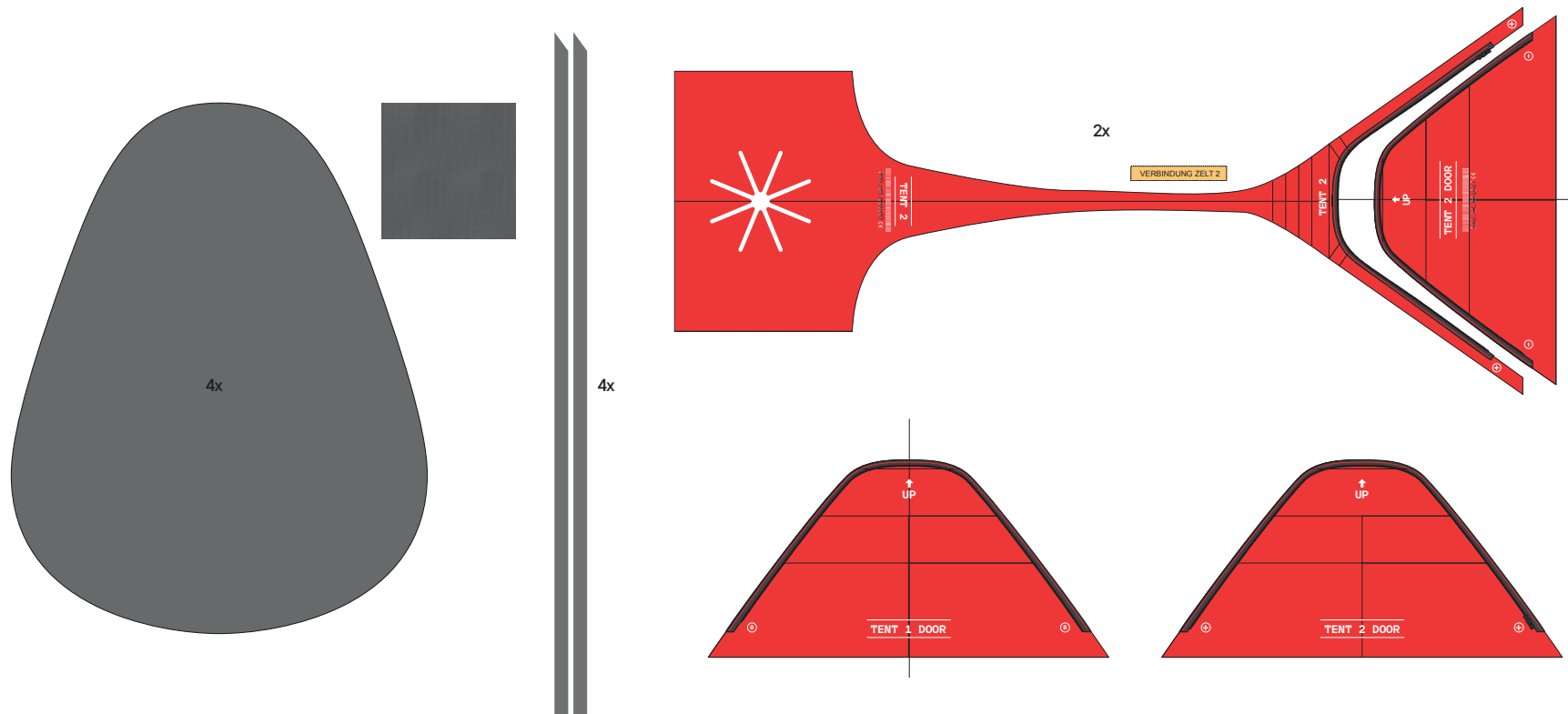
SEWING PROCESS



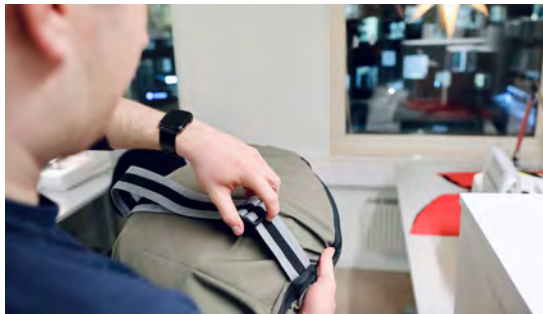
First, I sketched my sewing pattern on a large piece of baking paper and then transferred it onto my fabric. The large wings are made of a waterproof, thicker plastic plane, the connecting parts and accessories are created from a thinner, flexible polyester fabric.

In a first step, 5cm wide, 3 meter long strips were sewn to create a tunnel, into which the metal spring would be threaded in a later step. the four zippers were pinned on their correct position before connecting all elements with a single seam.

SEWING PATTERN



PACKAGING



PROTOTYPE EVALUATION

At the beginning of January 2022, I started trying out the finalized prototype and tested it under natural conditions. I set up the tent at several locations in Umeå while timing the duration of the setup process. On average, it took around 23 seconds to set up a single unit and 50 seconds for the assembled tent. In the photographs below, a moderately strong wind affected the setup but did not make it impossible. With the correct positioning of the tent pegs, the shelter was successfully protected from the wind.





FINAL PRESENTATION

On the 21st of January, the project was presented to our collaboration partners, including representatives of the Swedish police education unit.

In order to tell the story behind my product, especially all the effort to create a working prototype, I created a [process video](#) that introduced the audience to EVITENT.

After the presentation, all participating students invited all guests to have a look at the exhibition area, where prototypes and mockups were presented. I was pleased to hear that all three invited police officers took the opportunity to try out EVITENT. The feedback I received was encouraging:

„I could really imagine this in the police car. The tent is a solution that could come in handy in so many situations, and and also fun to use! A big thumbs up.“



REFLECTION

The first „term project“ addressed a specific target audience. Designing new tools for Crime Scene Investigators required appropriate and respectful handling of research material, visualizations, and graphic representations. Especially in the subsequent visualization of the project, it was essential to communicate the seriousness of the police work in a restrained way. Due to the tight time frame for the project, a forward-looking approach to deadlines and self-imposed, realistic goals were essential.

Working with so-called „softgoods“ was a completely new subject area for me. It was a challenge because I could not fall back on already known software applications and routine methods compared to the more classic industrial design. It was essential to get a feeling for the materials early in the design process. For example, to understand how polyether behaves when it is stretched, folded, unfolded, and stressed. Prototyping early on and being confident with the sewing machine helped me make quick changes to prototypes and uncover problem areas.

The project showed me that dealing with actual prototypes is essential for product designers, if not gained importance in recent years. With the constantly growing capabilities of CGI, AR, and VR Software, materialities and product details can be represented in a photorealistic way. However, essential aspects of user-friendliness are only perceived when holding an actual, functioning prototype in your hands. Additionally, having a 1-to-1 prototype can be more powerful when presenting to a client in a final presentation. When communicating and discussing Design details with colleagues and tutors, I found it extremely helpful to demonstrate concrete challenges on an actual prototype. This is often difficult to achieve on a screen or in a 3-dimensional space.



The realization that a „rapid prototyping“ process is essential in modern product design seems widespread and not surprising in itself. For me, however, it was striking how vital a physical engagement with the prototype was after a period when access to workshops was not possible for almost two years due to pandemic protective measures. For me, the decision not to create a 3D CAD model took a bit of courage. However, questioning known methods and choosing a purely analog process for this design project turned out to be a successful strategy in hindsight. In future projects, I will re-evaluate the use of virtual representation methods in the design process and where a physical product model offers more valuable opportunities for evaluation.

„Learning by doing“ - Applied to the project „New Tools for Crime Scene Investigators“, I used my listening skills and understanding of work processes to generate new product ideas. Having empathy for my target group had the highest priority at all times. The numerous opportunities to receive feedback from professional police officers, their trainers, and my tutors maintained an iterative, fact-based, and focused process. This process resulted in an „emphatic product“ that creates a new experience, communicates reliability through its pure functionality, considers redundant usage scenarios, and has a clear design language. The reliability adds an emotional dimension to the product and integrates seamlessly into the everyday work of police officers. It becomes part of daily routines and can bring joy with every use.

This is precisely the kind of relationship I was looking for to design a meaningful product.