

Development of a rooftop tent - designed for a younger user

Rebecka Marker Persson and Sofie Rouse

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Development of a rooftop tent – designed for a younger user

Rebecka Marker Persson and Sofie Rouse



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Abstract

This thesis aimed to develop a rooftop tent targeting the needs of younger users.

Using the Double Diamond design methodology the team was guided throughout the phases of the project. The research phase consisted of thorough market research, a questionnaire with over 50 participants and seven interviews. This data was then analyzed with the target user in mind by developing a methodology for mapping the participants based on age and experience with rooftop tents. These factors had an impact on how the data was analyzed and what conclusions were drawn, due to patterns being more easily distinguished. Concluding the discover and define phases was a redefined brief, focusing on what the product needed to accomplish.

An overarching concept was defined early in the develop-phase. The concept was to separate installation and set-up into two distinct states. By not compromising on the quick and easy set-up that is traditionally associated with rooftop tents but rather making the installation include more steps, the tent can be divided into two packages while off the car to ease the transportation and storage of the tent. Through brainstorming, sketching and prototyping a design concept was developed.

In the final full-scale prototype, these two packages were divided into the base and the canopy. They can be stored in a smaller apartment due to them only measuring 115 x 50 cm and weighing 18kg and 4kg respectively. When assembled and mounted on the car, they stay together, allowing for quick set-up and take down while traveling.

Keywords: Rooftop tent, Product Development, Thule, Concept Design, Double Diamond

Sammanfattning

Detta examensarbete hade som syfte att utveckla ett taktält riktat mot behoven av yngre användare.

Double Diamond-designmotodiken användes som vägledning genom projektets faser. Upptäcktsfasen bestod av grundliga marknadsundersökningar, ett frågeformulär med över 50 deltagare och sju intervjuer. Denna data analyserades sedan med den tänkta användaren i centrum genom att utveckla en metodik för att kartlägga deltagarna baserat på ålder och erfarenhet med taktält. Dessa aspekter påverkade hur datan analyserades och vilka slutsatser som drogs, eftersom mönster lättare kunde utskiljas. Upptäckts och analysfaserna avslutades med en omformulerad designbrief, med fokus på vad produkten skulle uppnå. Ett övergripande koncept definierades tidigt i utvecklingsfasen. Konceptet var att separera installation och uppsättning i två distinkta tillstånd. Genom att inte kompromissa med den snabba och enkla uppsättning som traditionellt förknippas med taktält, utan snarare låta installationen omfatta fler steg, kunde tältet delas upp i två paket utanför bilen för att underlätta transport och förvaring av tältet. Genom brainstorming, skissering och prototypframtagning utvecklades ett designkoncept.

I den slutliga fullskaliga prototypen delades dessa två paket upp i en bas och ett tak. De kan förvaras i en mindre lägenhet eftersom de bara mäter 115 x 50 cm och väger 18 kg respektive 4 kg. När de är monterade på bilen förblir de monterade, vilket möjliggör snabb uppsättning och nedtagning under resan.

Nyckelord: Taktält, Produktutveckling, Thule, Konceptdesign, Double Diamond

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1 Introduction

This chapter provides some background to the project and what rooftop tents are. A description of the mission as given by Thule is presented and the limitations of the project are discussed. The final part of the chapter outlines how one should navigate this report.

1.1 Background

1.1.1 Rooftop Tents

A rooftop tent (RTT) is a shelter which is mounted onto a car roof. Rooftop tents offer an alternative way to camp in nature, with the transportation ease of a car.

The RTTs history begins in the late 1920's and early 1930's in parallel, in both Europe and North America. These tents were made of canvas and mounted onto the roof of the car. The first patent for a "Tent accessory for automobiles" was granted in 1929, seen in Figure 1.1. During the 1960's, roof top camping rose in popularity as the first mass produced roof top tents were introduced a few years prior. This popularity created advancements in materials and design, introducing the first hardshell RTTs, a more durable and easier to use alternative. Today, RTTs are available in a plethora of sizes and configurations, catering to a variety of campers. They allow campers to connect to nature, comfortably and conveniently (d'Almeida, C.M, 2023).

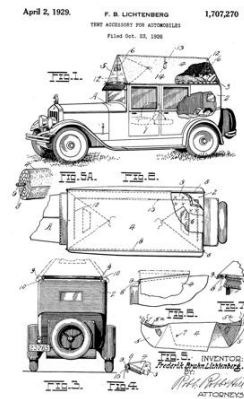


Figure 1.1 First patented roof top tent (Source: Lichtenberg, 1926)

1.1.2 Thule

This thesis assignment was given by Thule. Thule Group AB was founded in 1942 in Hillerstorp, Sweden by Erik Thulin. The first products were fishing gear, but their portfolio quickly expanded, adding other practical products. In the 1960's, Thule began focusing on car-related products to make it easier for users to transport their

gear. Today, Thule Group is a world leader, developing products “so that those who buy them can live an active life a little easier” (Thule Group, n.d.).

In 2018, Thule Group AB acquired Tepui Tents, a leading North American Roof Top Tent company, expanding Thule Group’s product portfolio to roof top tents. As of 2026, Thule continues to expand their range of RTTs, providing market leading products. (Thule Group, 2026)

1.2 Design brief

The mission statement, as given by Thule, was the following:

“Existing rooftop sleeping solutions are often expensive, heavy, and difficult to install. This thesis focuses on developing a lightweight, affordable rooftop option aimed at younger people with limited financial resources. The goal is to maintain the cozy, shed-like feeling, in a Thule way.”

This thesis aims to first discover and define the core problems and pain points, with a focus on a younger demographic, to redefine the brief accordingly. This redefined brief will then be the foundation to develop and deliver a concept for a roof top sleeping solution which addresses these problems and can be found in *4.5 Redefined designbrief*.

1.3 Delimitations

The project will aim to develop a concept which follows the design brief presented in *1.2 Design brief*. This concept will be accompanied by a works-like prototype as well as a design intent, focusing on showing the functionality and not a final product. Further development will be left out, such as manufacturing methods and detailed cost calculations.

When focusing on a younger audience, one assumption made was that many do not own a car with roof racks, therefore the possibility of developing a tent which can be installed directly on the car roof was briefly explored. However, in discussion with the team at Thule, the decision was made to assume that the car has a roof rack. This was decided to make the scope of the project more manageable, as creating an alternative installation method is a larger project in and of itself. Due to this, the current mounting system in Thule RTTs will be utilized.

Similar reasoning was used when deciding to use the same telescopic ladder that Thule ships with their products. Redesigning the ladder is outside of the scope for this project.

1.4 Outline of Thesis

Chapter 1 is the introduction to the thesis report. Here the design brief is established, Thule is introduced and the limitations are defined.

Chapter 2 introduces and explains the design methodology used throughout this project, the double diamond.

Chapters 3 to 6 each describe one step in the double diamond design process; discover, define, develop and deliver.

In Chapter 7, the project is discussed and further development is presented.

2 Design processes and methodology

Chapter 2 presents the design methodology used throughout the product development process, the double diamond framework. The methodology behind prototyping is also established.

2.1 The Double Diamond design process

The Double Diamond design process was developed by the British Design Council (2005). It is a process which is divided into four distinct phases, *Discover*, *Define*, *Develop* and *Deliver*. These phases are illustrated in Figure 2.1. Discover is a diverging phase which aims to research and inform the design team about the problem at hand. It is especially important to keep an open mind at this stage as to not influence or analyze the findings. This is where raw data is presented. Define aims to analyze and refine the data from the previous phase. For this thesis, a redefined brief and an overarching concept will be the transitional steps from the Define phase into the Develop phase. Throughout the Develop phase the design-led solutions are developed and iterated upon. The final stage, Deliver, aims to converge and scale off the design process in order to finalize the deliverable. This may include final testing of the concept to evaluate if it meets the established needs from the Define phase.

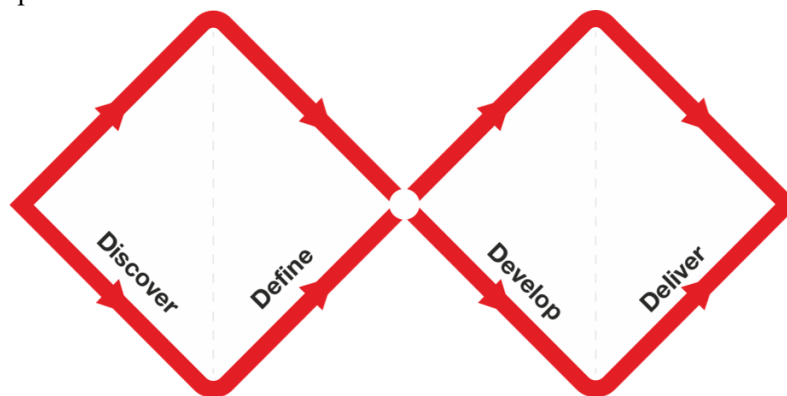


Figure 2.1 The Double Diamond design process (Source: Design Council, 2005)

The decision to follow the Double Diamond design framework was made as it allows the design process to diverge and converge when needed. It is a proven method that makes sure that sufficient understanding of the problem is gained, before moving on to problem solving and solutions.

2.2 Prototyping as a way of ideating

Physical prototyping is a widely used method throughout the entire product development process. Prototypes can have different purposes, depending on the state of the project and fidelity of the prototype, and are for example used for communicating, testing and allowing interaction with an idea. (Kent et al., 2021)

In discussion with the team at Thule, the importance of using prototyping as a way of ideating was established very early on. By prototyping with scale prototypes, the concept can be more easily understood and evaluated than through sketching, as mechanisms and the user experience can be immediately experienced. This allows the concepts to naturally develop through building scale prototypes, first on a 1:16 scale, then on a 1:4 scale, and then full-scale prototypes. Advanced materials can be easily replicated in early stages by using primitive materials like cardboard and wire without the craftsmanship that goes into the final product.

3 Discover

In this chapter, the Discover phase is presented, aiming to inform the design team about the problem at hand. In this report, this is done by extensive market research, conducting interviews and a questionnaire. This chapter will present the raw material and data collected by the team.

3.1 Exploration Methodology

The goal of the user research was to understand the underlying issues that people have with roof top tents as well as inform the design team about RTTs. To ensure that this research was thoroughly conducted, methodological triangulation was utilized. Methodological triangulation is the act of employing different research methods to ensure that the gathered data includes different perspectives which point to the same findings (Sharp, H., Rogers, Y., & Preece, J., 2019). Three main methods were chosen. The most encompassing of which was the market research, first looking into what RTTs are currently on the market and how these are divided, then benchmarking some direct competitors and finally, testing out different tents. To collect data from the community of RTT users, a questionnaire was sent out and interviews were conducted, both focusing primarily on qualitative data.

3.2 Market research

To gain understanding of the scope of the problem, extensive market research was conducted, both to gain general knowledge of RTTs, as well as to obtain insights into direct competitors.

3.2.1 Current types of RTTs

The project was initiated by collecting information on the current types of RTTs existing today, to understand the different types of tents with their pros and cons. As established, a rooftop tent is a tent, which is elevated from the ground, generally by being mounted on the roof racks on top of the car. There are currently some

exceptions on the market in the form of tents being placed directly on the roof of the car, this in turn puts higher requirements on the allowed load on the car roof. Further research showed that all RTTs can generally be divided into one of two categories, hardshell or softshell tents. Examples of which can be found in Figure 3.1 and Figure 3.2 respectively. It is worth noting that some tents fall between these, often called *hybrid* RTTs, combining elements of both tent types.



Figure 3.1 Thule Approach, softshell
(Source: Thule, 2026)



Figure 3.2 Thule Widesky, hardshell
(Source: Thule, 2026)

Softshell tents

Softshell tents are identified by the almost exclusive use of fabric, or soft goods, in their canopy construction. They are typically folded half lengthwise when stored, both on and off the car. When deployed they double in size, with one half extending outside of the vehicle, being supported by the ladder. The deployment is usually a little more complicated and time-consuming than for a hardshell tent, which is why they are recommended for trips with longer stays in one place. In return, the softshell tents are generally more spacious and create a more versatile and comfortable sleeping area (Thule Group, n.d.).

Hardshell tents

Hardshell tents are often constructed by using a rigid material as the roof of the tent. These types of tents are mostly easily deployed, by simply pushing the top plate upwards, making it suitable for shorter stays, where frequent set-up and take-down are required. The hard outer also has an advantage in handling elements and while closed, they usually create a slim profile with aerodynamic benefits. The sacrifices with a hardshell tent are a less spacious sleeping area and a bigger footprint of the package to store when taken off the car (Thule Group, n.d.).

When a fundamental understanding of different RTTs was established, the project was continued by looking at various forums, such as Reddit and YouTube, and

gathering quotes on RTTs. This was done to get a picture of what people think of the different types of tents, as well as advantages and disadvantages compared to ground tents and vans etc. This activity was important groundwork to formulate questions and focal points for the upcoming user research. Since the initial brief focused a lot on the solution being lightweight and accessible, RTTs in the field of “do it yourself” (DIY) were also investigated. It was a good way to get inspiration on how a scaled-back and simple rooftop tent could look, since DIY projects are usually not the most advanced designs.

3.2.2 Benchmarking

The next step was shifting the focus to look at and compare more direct competitors to our future solution. Benchmarking during market research is the act of systematically measuring established competitors to identify their strengths and weaknesses, as well as possible gaps in the market (Killip, 2023).

Seven different tents were compared, they were selected due to their weight and, or price, being on the lower side of the market average. To start, quantitative benchmarking was conducted, shown in Table 3.1, to get a general idea of the tents and their metrics. The values were collected through the websites selling the tents. (GentleTent North America, 2022; Inspired Overland, 2025; TentBox, 2026; Thule, 2026; 23ZERO Australia, 2024; Decathlon, 2026)

Table 3.1 Benchmarking competitors

<i>Metric</i>	<i>Gentle- tent Roof</i>	<i>Inspired overland</i>	<i>Tentbox GO</i>	<i>Thule Approach</i>	<i>23Zero Dakota Super lite</i>	<i>Thule Foothill</i>	<i>Quechua MH500</i>
Price (SEK)	23 544	8 935	8 899	27 199	10 200	21 199	15 355
Weight (Kg)	31	34,5	33	50	41	55,5	55,5
Size folded (cm)	W: 112 L: 142 H: 15	W: 127 L: 200 H: 15	W: 122 L: 225 H: 45	W: 123 L: 108 H: 28	W: 132 L: 118 H: 24,5	W: 61 L: 211 H: 24	W: 146 L: 123 H: 35
Size open (cm)	W: 150 L: 330 H: 140	W: 127 L: 200 H: 122	W: 122 L: 225 H: 114	W: 123 L: 213 H: 89	W: 132 L: 236 H: 118	W: 119 L: 213 H: 93	W: 140 L: 240 H: 106
Hard-/Soft shell	Soft shell	Hard shell	Soft shell	Soft shell	Soft shell	Soft shell	Soft shell
Material	drop-stitch, polycotton, PES, TPU	Aluminium, Vinyl	Aluminium, ripstop	Aluminium, ripstop	Aluminium honeycomb, oxford ripstop	Aluminium, ripstop	Aluminium, polyester



Figure 3.4 Trying Haven lay flat hammock



Figure 3.5 Trying Gentletent Roof

Table 3.2 Findings from trying tents

<i>Product</i>	<i>Positives</i>	<i>Negatives</i>
<i>Quechua MH500</i>	- Self-deploying awning - Very spacious inside - Attached shoe bag - Impressive construction	- Dark and shiny fabric inside – looks cheap - Some sloppy stitching - Takes some work to tuck in the fabric during take-down.
<i>Roofnest</i>	- Very easy and quick set-up - A bungee cord to help tuck in the fabric during take-down, which has a groove to rest in when the tent is opened.	- Difficult to tuck in all fabric and close the hasp during take-down. - The sticks for the awning were crooked and gave a bad visual impression.
<i>Thule Approach</i>	- Good mattress with two layers - Very spacious - Generally, many well thought out and user-friendly mechanisms. - Keeps sun out even without rain cover.	- Difficult take-down – a lot of fabric and the zipper for the travel cover was tight. - Rain cover was annoying to attach.
<i>Gentletent Roof</i>	- Very spacious - Dropstich – thick, rollable and foldable. - Small package and lightweight.	- Lack of internal pockets. - Comes with repair kit – affects the trustworthiness. - Zipper for travel cover – difficult to close. - Long set-up time to inflate.
<i>Haven Lay Flat Hammock</i>	- Very comfortable – more lay flat experience than expected. - The bag for the mattress can be used to inflate it. - Many smart features, e.g. a strap which lifts the head side of the hammock when tightened.	- The straps would not stay up on the trees – either they were bad or did not invite to be used correctly. - Finicky corners to get the mattress into. - Many features took a while to find or understand.

3.3 Questionnaire

A questionnaire was created to reach and collect opinions from a broader audience. The structured and standardized nature of a questionnaire makes it an advantageous tool when collecting big amounts of data from a broad and diverse population. In general, it is used to gather quantitative data, as a way of generating clear statistics

for further work to be based upon (Kuphanga, 2024). However, after discussion with the supervisors as well as internally, it was decided to add in more open-ended questions. The reasoning being that the scope was still too broad and complex to capture with strict questions. Also, the team did not want to unintentionally push the respondents in any direction, free text answers are generally a better way to make people express their actual opinions (Rosala, 2024). The aim of the questionnaire then became to gather unfiltered quotes from a broad audience, which would help to guide the project moving further. The focus when formulating the questions was on getting respondents to share general positives and downsides of RTTs, phrased in a way that allowed everyone to answer, regardless of prior experience. The questions can be found in Appendix B.

The questionnaire was sent and posted in different forums such as Facebook and Reddit, as well as to Thule employees who had previously lent and used a rooftop tent. In the end of the form, the respondents were asked if they would be willing to participate in a more in-depth interview, as a way of reaching people to talk to outside of the team's immediate vicinity. Different survey-links were posted in different forums, to allow traceability of answers and to see if some opinions were limited to a certain group. This was also done to prevent potential bots from ruining the complete data, a problem which was not encountered.

A visual representation of the responses from the open-ended questions can be seen in Figure 3.6, where the text has been blurred to retain anonymity, and answers to one quantitative question are visualized in a graph as seen in Figure 3.7.



Figure 3.6 Answers from the questionnaire

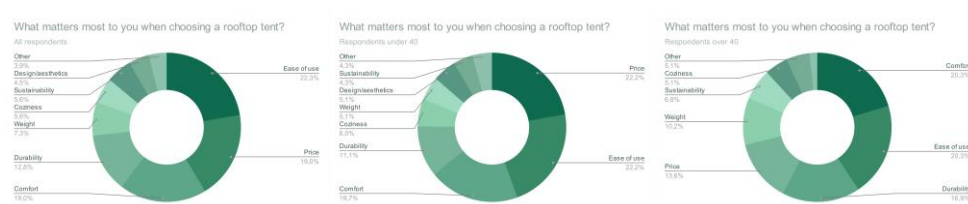


Figure 3.7 Answers from the questionnaire divided by age

3.4 Interviews

User interviews are used by researchers to get to know the users, learn about their experiences and understand their desires. Interviews can be either structured, semi-structured or unstructured, which is determined by to which extent the interviewer is following a fixed set of questions and in that way controlling the conversation. A structured approach is favorable when the researcher can predict possible answers from the user, whereas an unstructured interview is exploratory and therefore used when a new topic is to be investigated. A sample of structured interviews are more easily compared, since the same topics have been discussed by all, yet they run the risk of missing important themes by asking the wrong questions, themes which may come up in an unstructured interview with open questions (Sharp, H., Rogers, Y., & Preece, J., 2019).

In total, seven interviews were conducted. The point of this was for the team to gain insights into pain-points and opinions from RTT users as well as campers in general. The participants consisted of six people with RTT experience, of which four were Thule employees, and one compact camper without RTT familiarity. Some questions were predetermined by the team and asked in all interviews but since the level of experience varied a lot among the participants, the interviews were semi-structured and adapted according to the person and their expertise. Letting the conversation flow freely also allowed for new and previously, to the team, unknown topics to come up. In this way, the interviews acted as a valuable source of information, especially within areas which were not thought of being touched upon in the questionnaire. They also allowed for a more elaborate discussion on themes found through the answers in the questionnaire.

The guiding questions which acted as the foundation for all the interviews can be found in Table 3.3, along with a description of each section. Answers from the interviews are not listed here, since they touched on personal information, to better understand the participant and their habits, which would jeopardize the anonymity if shared.

Table 3.3 Interview guiding questions

Section	Discussion points
Background and camping experience	Discussing why and how the participant usually goes camping. Investigating motivation and relationship to the outdoors.
RTT awareness	Discussing familiarity with RTTs as well as their impression of them. To know how to continue the interview, as well as investigating the common view on RTTs.
Have used an RTT	For the participants with RTT familiarity. Discussing the experience, asking them to describe specific situations, identifying frustrations and positives.
Have not used an RTT	For the participants without RTT familiarity. Discussing alternative sleeping solutions and concerns regarding RTTs.

3.5 Discussion

All in all, the research felt extensive and diverse, using different data collection methods and triangulation. However, some things can be discussed. The questionnaire had a question related to age, the possible answers were the age-spans 18-25, 26-40, 41-60 and 60+. The question was included to allow for the rest of the answers to be analyzed based on age and try to find patterns among age groups. After the answers were collected, the team reflected on the set age-spans, early on the thought was that the target group would be defined by only the first age group, but after discussion, 25 seemed like too young of an age. Therefore, all respondents under 40 were considered as a part of the target audience. This break point felt a bit too high, and if the project was to be re-done, the age-spans would have been more thoroughly discussed before sending out the questionnaire, since it lays a lot of the groundwork for the rest of the project to be based on.

Furthermore, multiple channels were used to get in touch with different users and gather varied opinions. When looking at the assembled data, a lot of the respondents over 40 came from forums on Facebook and Reddit and were often not from Sweden. Respondents under 40 were often either Thule employees or acquaintances from Sweden. Then, when moving on to analyzing the data, there is a risk that opinions which are seemingly specific to a certain age group in reality are due to geographical differences. Still, the data contains deviations from this pattern, and the team agrees that the research and possible age-related conclusions should not be disregarded.

Lastly, when testing tents on our own, some of them were deployed on the ground instead of on a car, due to a lack of access to a car with roof racks. The mounting of

the tent on the car was already defined as being outside of the scope, so missing that part was not an issue. Lifting it on to the car would however have been of interest, investigating weight and form factors. Nonetheless, the testing was still rewarding and provided many good insights into features and how different materials behave.

4 Define

This chapter shows the analysis of the raw data presented in the previous chapter. It includes the findings and conclusions made by the design team, which helped move the design process forward.

4.1 Questionnaire analysis

4.1.1 Thematic analysis

The questionnaire, described in 3.3 *Questionnaire*, was conducted with 51 participants. To organize and draw conclusions from the results of the questionnaire, a thematic analysis was deemed the best method. Thematic analysis is a widely used method to structure qualitative data. The goal is to analyze and identify patterns within a data set. Braun and Clarke (2006) describe the six phases of a thematic analysis, shown in Table 4.1.

Table 4.1 Phases of thematic analysis (Braun, V. & Clarke, V., 2006)

Phase	Description of the process
1) Familiarizing yourself with your data:	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
2) Generating initial codes:	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3) Searching for themes:	Collating codes into potential themes, gathering all data relevant to each potential theme.
4) Reviewing themes:	Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic ‘map’ of the analysis.
5) Defining and naming themes:	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme.
6) Producing the report:	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

The goal was to define the user needs by seeing patterns in the opinions of different user groups. Therefore, a methodology was developed to represent the users through a questionnaire participant map, inspired by the research participant map method (Kumar, Vijay, 2013). The original method is used to map possible participants to identify key target audiences and who to reach out to while planning the research. This thesis’ thematic analysis utilized a participant map to lay out what group the participants fell into, succeeding the gathering of data. This was done by using different colors to visually represent two main groups, and subgroups in them. As seen in Figure 4.1 the two main groups were participants who had used, and had not used RTTs, represented by blue and yellow/orange respectively. Subsequently, these are divided into age groups of over and under 40 years old, defining our “younger” target audience.

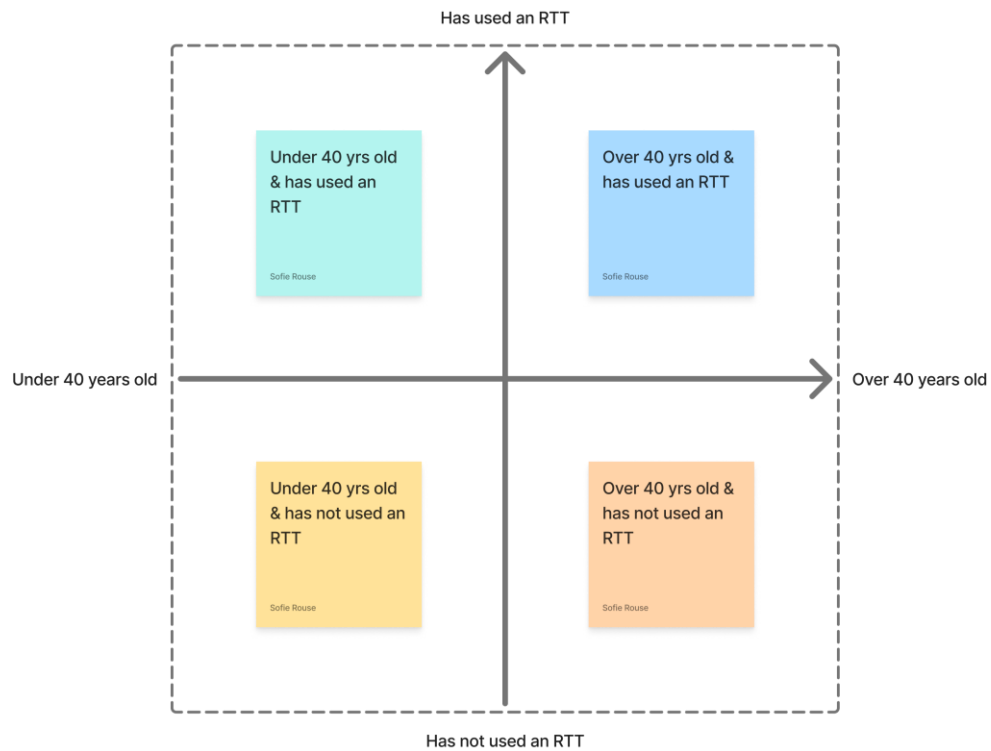


Figure 4.1 Questionnaire participant map (Source: Author's own work)

The thematic analysis was conducted by following the phases in Table 4.1. The result of which can be seen in Figure 4.2, where the answers have been blurred to maintain anonymity. After coding and iterating on themes, the team landed on 18 themes, as well two separate unconclusive categories. The findings within the different themes and what conclusions were drawn from these are explained below.

of a ground tent. There is one discussion about “you get what you pay for”, regarding the price being worth it.

Storage of RTT – Weight – Installation

Throughout the thematic analysis when coding and organizing, some definitions needed to be established, one of which was the distinction between *set-up* and *installation*. Continuing, installation would be defined as the act of installing the RTT on the car and the steps that that entails, whereas set-up and take-down would be the interaction with the RTT while out camping.

These three categories had less overlap than the team expected, thinking that installation and weight, as well as storage and weight, would be discussed interlinked. Worth noting, is that there are mentions of weight as a negative but undefined as to what is negative about the weight. This makes it difficult to put into context what problems that arise from the high weight are the pain points. Some possibilities are fuel consumption, installation and moving into storage. Here, the interviews fill in the gaps, as further discussion through follow up questions could be conducted, more about these discussions can be found in *Chapter 4.3*.

Set-up and Take-down

Set-up and take-down has 31 positive mentions and 7 negative mentions, the most mentions of any theme. The positives view the quick set-up and/or take-down time as a big advantage of RTTs. The conclusion can be drawn that quick and easy set-up is something users prioritize highly and should not be compromised on.

All the negatives, except one, mention take-down, indicating that take-down is generally seen as more complicated.

Internal size (Bedding/storage when closed)

There are an equal number of positives and negatives regarding internal size. Of the negative mentions, 4/6 participants are over the age of 40, whereas of the positive mentions, all participants are in the younger age category. Although as noted, there were few mentions of internal size compared to other themes, indicating that it is not a high priority for the general user. The conclusion was therefore drawn that for our target group, compromises can be made in regard to internal space.

Some themes were mainly considered a premise of the product but generally confirming that a sleeping solution on the car roof was the way to go. *Storage in/on car* had positive comments about an RTT opening up more storage in the car, compared to a ground tent. Whereas the negative comments were about losing

storage on top of the car. These two factors were not considered relevant to draw any conclusions from. The same reasoning was applied to the comments in *Camp spot requirements*, *Car variety* and *Car bound* when analyzing them; as in the fact that the user is car bound is simply a premise of the product. The *Elevation – Weather* theme was mostly positives considering safety, sturdiness and cleanliness.

The comments in *Threshold to camp* were only from younger participants, showing that they consider it as a positive when choosing to buy an RTT. This was tightly connected to *Convenience*, as ease of use is a valued aspect. *Perception (Image/novelty/coziness)* and *Quality* had comments about how RTTs make the user feel, ranging broadly from being exciting to use to them being a gimmick.

Generally, a lot of the negative comments seemed possible to solve, further acknowledging that there is a need for a rooftop tent targeted for younger people. Whereas the positive comments were quite closely intertwined with the fact that it is a tent. Therefore, the team decided to delimit the project to a rooftop tent and not an alternative sleeping solution, as there seemed to be a lot of potential for improvement.

4.1.2 Quantitative analysis

The results from one quantitative question in the questionnaire are presented in Figure 3.7. The point of the question was to identify driving factors and the appeal of an RTT. Unsurprisingly, price matters most to respondents under 40 and comfort matters most to respondents over 40. For both age groups, ease of use is also a top priority, while weight falls lower on the list. This insight was interesting, since low weight had been a focal point from the beginning of the project. However, the questionnaire showed that the weight might not be the core problem, rather that the weight contributes to the impracticability of the tent and that ease of use is the actual issue.

4.2 Benchmarking analysis and take-aways

The benchmarking was used to identify the market leaders regarding price and weight, as seen in Table 3.1. These would then be used to define metric goals for the design team to aim for.

Through the benchmarking, the team also noted that current lightweight tent companies usually make trade-offs on either comfort or set-up time. As previously stated, see 4.1.1 *Thematic analysis*, the installation and set-up of a tent had been

defined as two separate things. The group noticed that no tents on the market take advantage of the fact that these two phases of the user journey could be separated and handled in different ways. Comparing different tents helped to identify the established user journey for RTTs and inspired the team to challenge it. The current user journey focuses heavily on creating a pleasant and easy experience while out camping but makes storage and transportation of the tent while off the car very difficult.

Furthermore, the qualitative benchmarking showed that lightweight tents are usually deployed along the car, since the absence of overhang, outside of the car roof, decreases the structure needed for the base, minimizing the weight. As of now, all tents deployed along the car are a variant of a hardshell tent, however the qualitative benchmarking also showed that people often prefer the spacious inside of a softshell tent. A gap in the market was identified, a softshell tent deployed along the car.

4.3 Interview analysis

All the interviews were recorded, with consent from the participant, and later transcribed with an online tool. Both team members became familiar with the data by reading it multiple times while also taking notes to identify themes and opinions. It was decided not to include quotes from the interviews in the thematic analysis, partly because the interviewees would be overrepresented compared to the respondents of the questionnaire, but also because the interviews were less structured than the questionnaire, making the content difficult to compare to the rest. Instead, the notes and takeaways from the interviews were discussed and analyzed within the team, which then together wrote a summary of each interview, as well as extracted valuable quotes.

The interviews mainly acted as a way of educating the team on the nuances of having used a rooftop tent and on people's experiences with camping in general. They also increased the credibility of the thematic analysis, by sharing a lot of the same topics. Since the interviews were less structured, they acted as a supplement to the questionnaire, by touching on other undiscovered subjects.

One of the most important takeaways from the interviews was the insights into the storage of RTTs, which was not as prominent in the thematic analysis. One participant expressed the following:

First of all, you need to be able to store [the RTT] somewhere if you don't want to have it on the car all the time. And then you have to be able to park next to where you store it [...], because you don't want to carry it all the way (Participant 4).

A similar thought was expressed by another participant, the following quote has been translated by the team from Swedish to English:

I would like to buy a rooftop tent if we had somewhere to store it, but we do not since we live in an apartment. [What do you think would make the biggest difference regarding storage; weight or size?] For me, it is mostly the size, but that is difficult to get around with a rooftop tent (Participant 5).

The issue of storing the tent proved to be a concern to many, but especially to those living in a smaller space, potentially in an apartment complex with stairs. This living situation aligned with the target user of a younger demographic, making the subject very relevant to this specific project.

Another interesting takeaway was the discussions on what aspects the participants were willing to compromise on, to achieve a cheaper and more lightweight tent. As stated in 4.2 *Benchmarking analysis and take-aways*, current lightweight tents compromise on either set-up or comfort, rather than installation, as defined in 4.1.1 *Thematic analysis*. To explore this, the participants were asked which part they would prefer to compromise on, comfort, set-up or installation. The answers overwhelmingly pointed in the direction of installation, with the argument that for each trip, it must only be done once and when doing it, you are usually at home with the possibility to avoid bad weather and dirt. This opinion is reflected in the following quote, which has been translated from Swedish to English by the team:

[What would be the easiest for you to compromise on in return for easier storage, comfort, set-up or installation?] Definitely installation, because you want the comfort and once you're out, you want to be able to just crawl into the tent and sleep, or continue onto new adventures, so absolutely the installation (Participant 6).

Furthermore, the interviews highlighted the importance of comfort and quick set-up, as well as the issue of price, in alignment with the thematic analysis.

4.4 Define user needs and metrics

Combining the thematic analysis, benchmarking and interview analysis, the team came up with a set of user needs and metrics, see Table 4.2. The needs were differentiated on their importance, according to their presence in the research. They were divided into the categories *must have* (MH), *should have* (SH) and *could have* (CH).

Table 4.2 Needs and metrics

<i>Theme</i>	<i>Need</i>	<i>Metric</i>
<i>Physical comfort</i>	- The solution feels comfortable (MH). - The solution is perceived as comfortable (CH).	
<i>Price</i>	- The solution is inexpensive (MH).	- Cheaper than existing Thule tents.
<i>Storage of RTT</i>	- The solution is easily stored in a smaller living space (MH).	
<i>Installation</i>	- The solution is easy to install (SH). - The solution is quick to install (CH).	- Can be installed by two people.
<i>Weight</i>	- The solution is lightweight (SH).	- Weighs less than 30 kg.
<i>Set-up</i>	- The solution is easy to set up (MH). - The solution is quick to set up (MH).	
<i>Take-down</i>	- The solution is easy to take down (SH). - The solution is quick to take down (SH).	
<i>Internal Size</i>	- The inside of the solution is spacious (CH). - The solution can have bedding inside when closed, on the roof (CH).	- Sleeps two people. - Sleeping area: 200x110 (cm)
<i>Threshold to camp</i>	- The solution lowers the threshold to camp compared to a ground tent (MH).	
<i>Perception</i>	- The solution is aesthetically pleasing (CH). - The solution is cozy to use (CH).	
<i>Elevation</i>	- The solution keeps the user elevated from the ground (MH).	
<i>Quality</i>	- The solution is reliable (not flimsy) (SH).	
<i>Accessories</i>	- The solution can be attached to a ladder (SH).	

4.5 Redefined designbrief

Based on the research, the brief was redefined as the following:

The aim is to lower the threshold to camp for younger people by creating an affordable sleeping solution for two, on the car roof, which is easy to transport and install, and can be stored in a smaller living space without compromising on comfort or set-up/take-down time.

The redefined brief, paired with, an overarching concept, described in *5.1 Defining an overarching concept*, would be the transitional steps from the Define phase into the Develop phase.

4.6 Discussion

When writing the questions for the questionnaire and interviews, the field of rooftop tents were quite unexplored for the group. So even though they were both made so that people without experience could participate, there was a bigger interest in receiving answers from experts. After gaining knowledge and analyzing the data, it would have been interesting to hear from more people who are not yet convinced by the concept of RTTs, investigating their biggest concerns.

On the same topic, the interviews changed during the research phase. In the later interviews, the team had a better understanding of what questions to ask and what topics to discuss, whereas the early interviews acted as a way of identifying these topics and questions. This made the interviews a little difficult to compare to each other, however they all played an important role in the process, and after the last interviews, the research felt saturated, with no new topics coming up.

In general, when analyzing the data, it was apparent that keeping the questions in both the interviews and questionnaire was a good decision. Many of the findings would not have been predictable beforehand and would maybe not have come up if the questions were pre-defined. For example, in the few quantitative questions included in the questionnaire, some complementary answer possibilities would have been included if the team knew then what they know now.

5 Develop

Chapter 5 describes how the updated brief and the defined needs were used to develop a solution which fulfills the criteria of the users. The development process was divided into brainstorming and deciding the canopy and base separately.

5.1 Defining an overarching concept

Based on the realizations and findings made in *4 Define*, which are summarized as needs in Table 4.2, an optimized user journey was defined. By looking at the current user interaction, further described in *3.2 Market research*, and how it could be improved upon, the storage and transportation became the main concern. The team therefore looked into how these aspects could be made easier and decided to make the tent have differing form factors on the car and off the car. To visualize this, the new user journey was illustrated, seen in Figure 5.1.

Starting with storage, the user journey shows the tent being separated into multiple packages, making storage and transportation significantly easier. The installation then becomes the act of combining these two packages. As shown in the research, the target user is willing to compromise on installation time in return for easier handling and storage. This compromise would allow the tent to keep the same easy set-up while out camping that is traditionally associated with RTTs, as comfort and set-up are aspects of a RTT which users are not willing to compromise on.

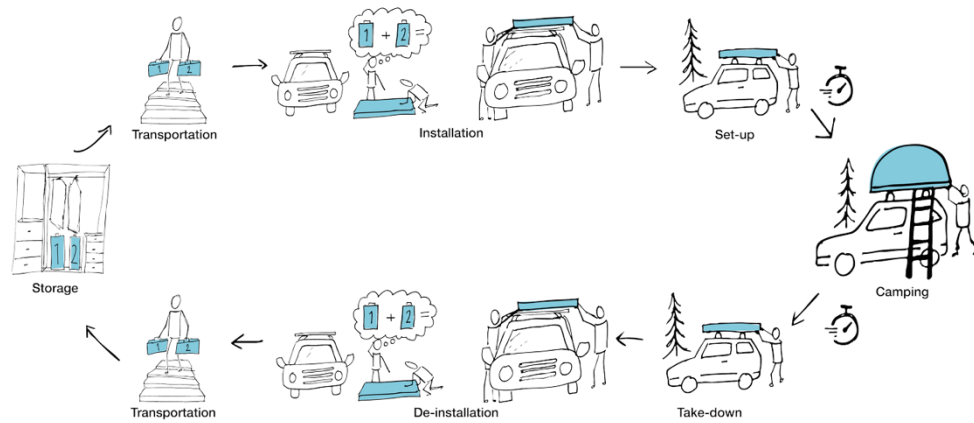


Figure 5.1 Optimized user journey

5.2 Developing a concept

As mentioned in 5.1 *Defining an overarching concept*, a decision was made to allow the tent to be in multiple packages while off the car. This separation was decided to be the tent and base in different packages. The decision was mainly based on the wish to separate hard goods and soft goods to prevent these from damaging each other. This choice also helped when starting the brainstorming, since the base and canopy could be investigated and developed as two separate things, rather than one entity already from the beginning.

5.2.1 Canopy

To start, a lot of inspiration was found online, searching for key phrases such as *foldable tent* and *simple DIY tent*. A collection of inspiration can be seen in Figure 5.2.

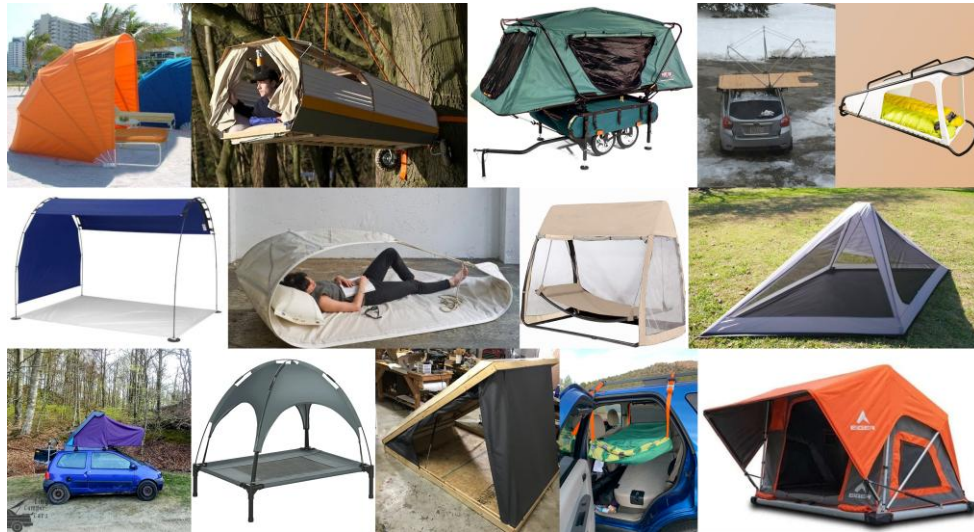


Figure 5.2 Canopy inspiration (Sources: Appendix C)

As mentioned in 4.2 *Benchmarking analysis and take-aways*, the team had identified an interesting, almost unexplored gap in the market, in the form of a soft-shell tent along the car, meaning that it does not extend outside of the car roof. With this idea in mind, combined with the gathered inspiration, the team started sketching on some ideas. Some of these sketches can be seen in Figure 5.3.

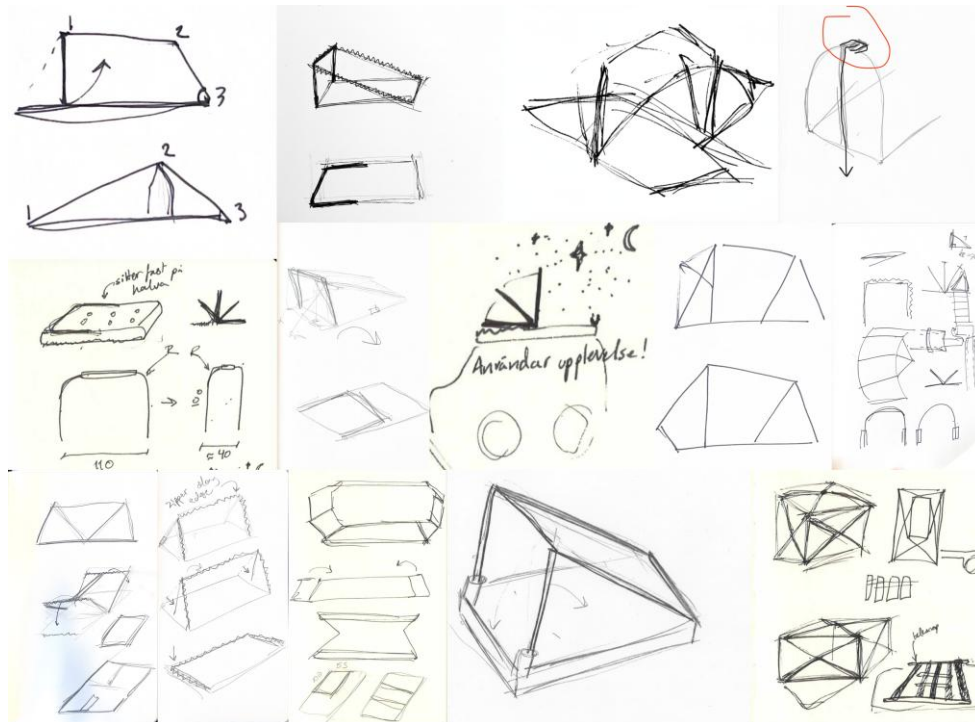


Figure 5.3 Canopy sketches

Since the canopy, in most cases, is dependent on moving fabric, the team moved quickly from sketching to building small prototypes in scale 1:16, to gain better understanding of whether a concept would work or not. The early prototypes are shown in Figure 5.4.



Figure 5.4 Initial canopy prototypes

When examining the prototypes and putting them against the established needs, one concept was chosen to move forward with, since it fulfilled the most criteria. Developing the concept was done through iteration and the evolution of the canopy can be followed in Figure 5.5.

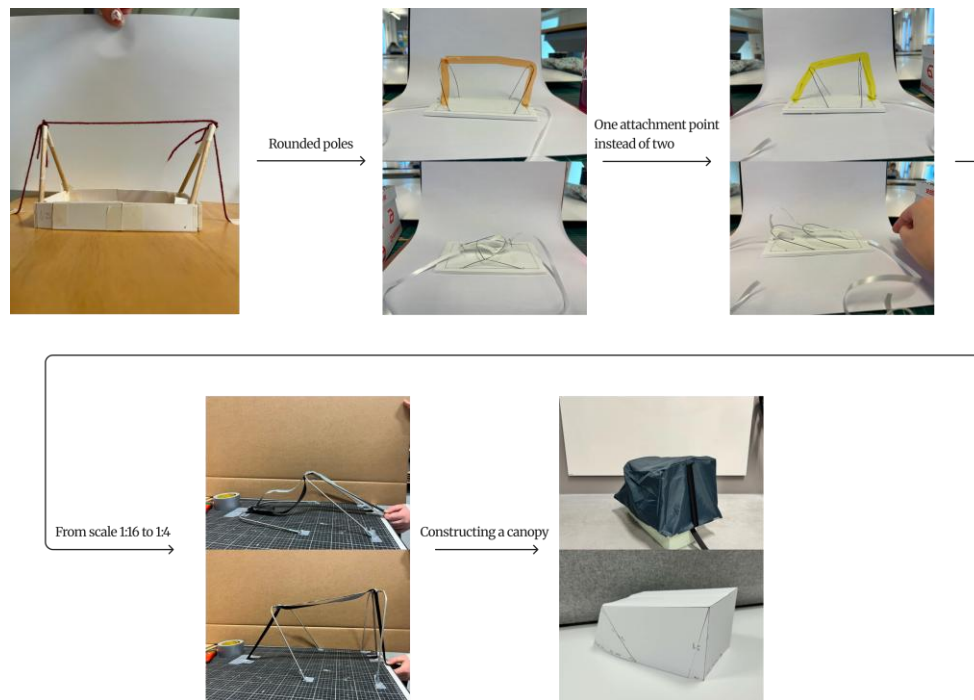
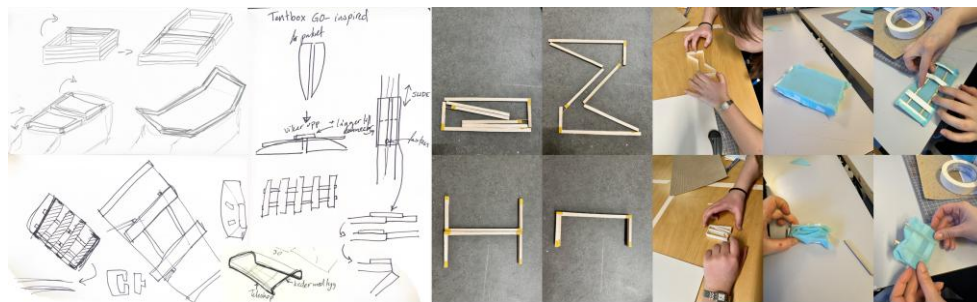


Figure 5.5 Development of final canopy concept

As mentioned, the development focused on a quick and easy set-up as well as a simple design, to minimize material usage. In the beginning, the concept relied on two strings, one on each side of the tent, being pulled when deploying the tent. This seemed too complicated, as well as ergonomically unfavorable because you would need to reach over the front of the car, which is why one pole was moved to the middle of the tent, so that both poles could fall in the same direction, allowing one end of the string to be secured all the time, leaving only one side of the string to be pulled. When the mechanism seemed to be working on a 1:16 scale, it was built and tested on a 1:4 scale, after which a canopy was sewn, to observe how the fabric would behave. This prototype gave insight into the optimal angles for the poles to achieve a stable, yet spacious, tent. After some alterations, the canopy concept seemed feasible, while fulfilling the established needs, therefore it was chosen to continue with for the final concept.

5.2.2 Base

Similar to the development of the canopy, initial inspiration for the base was found online. Examples of the search phrases were *foldable bed* and *foldable table*. The thought was to find principles used in other products and adapt them to a tent base,



chosen for the base, which made general brainstorming difficult to conduct. Therefore, the team decided on a material-based development of the base, to later adapt the folding method accordingly. Four materials were chosen to further investigate; these were chosen based on low weight and that they were already established in existing tents or in similar products such as foldable beds. Two of these materials, dropstitch and honeycomb, were previously unexplored by the team, and were therefore researched to understand their positives and negatives respectively.

Honeycomb

A honeycomb core material is defined by the use of a distinct hexagonal structure, resembling honeycomb, sandwiched between two plates offering a surface for the panels. The structural core can be made of various materials, such as aluminum and polypropylene, *PP*. Generally, honeycomb is a lightweight and durable material in the form of thin and large panels, no matter the core material. PP honeycomb was especially interesting due to its low weight, while still offering enough stiffness (Onebond Group, n.d.).

Dropstitch

Dropstitch is best known for its presence in stand-up paddle boards. It is an inflatable material built up by two polyester walls combined with thousands of fine threads. When inflated, the material becomes rock-hard, making it durable, while still being lightweight and compact when deflated (Staff, 2011).

The materials, as visualized in Figure 5.8 are listed in Table 5.1 together with some notes about each material.

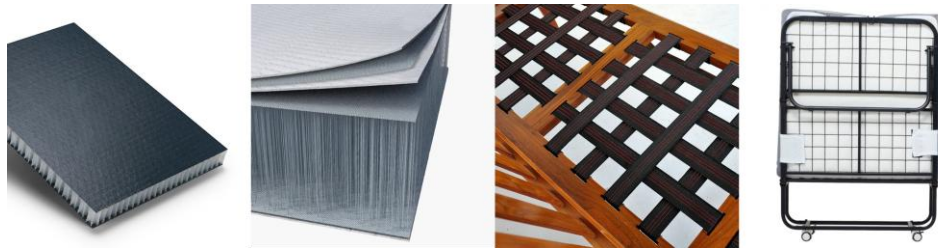


Figure 5.8 Possible base materials, from left to right: Honeycomb, dropstitch, tensioned fabric, wire mesh (Source: TOPOLO new materials, 2025. Shanghai MSD International Trade Co, n.d. Pinterest, n.d. amazon.se, n.d.)

Table 5.1 Possible base materials

<i>Material</i>	<i>Positives</i>	<i>Negatives</i>
<i>PP</i>	- Relatively lightweight	- Already well-explored
<i>Honeycomb</i>	- Lay flat experience	- Quite expensive
<i>Dropstitch</i>	- Rigid	- Production facilities
	- Small when deflated	- Puncture risk
	- Lightweight	- Aesthetic aspects
		- All small deviations on the base can be felt on top
<i>Tensioned fabric</i>	- Lightweight	- Hammock experience
	- Rare in RTTs	- Difficulty getting enough tension
	- Simple production methods	
<i>Wire mesh</i>	- Potentially lightweight	- Non-isolating
	- Rigid	- Would need to be made of steel for strength, difficult to combine with aluminum details
	- Rare in RTTs	- Aesthetic aspects

All materials had different positives and drawbacks. It was difficult to compare them by making prototypes, since they behave in different ways and it would be difficult to obtain a fair representation of them all on a smaller scale. To choose between them and decide for the final concept, the materials were ranked based on the established needs, in a scoring matrix, as seen in Table 5.2. The scores were estimated by the team, based on research on how they behave in other products, as well as trying and investigating the materials in person. The final score is presented in both a weighted and an unweighted form. The weighted score takes the hierarchy of the need into consideration, meaning that the points for a *must have* need is multiplied by 1,25 and points for a *could have* need is multiplied by 0,75. Some needs have been excluded from the matrix, since they were deemed unable to estimate or rank.

Table 5.2 Scoring matrix comparing the materials

<i>Need (The solution is...)</i>	<i>Honeycomb</i>	<i>Dropstitch</i>	<i>Tensioned fabric</i>	<i>Wire mesh</i>
<i>Comfortable</i>	3	4	1	2
<i>Perceived comfortable</i>	4	3	2	1
<i>Inexpensive</i>	2	1	4	3
<i>Easily stored in smaller living space</i>	2	4	3	2
<i>Easy to install</i>	3	4	2	3
<i>Quick to install</i>	4	2	3	4
<i>Lightweight</i>	2	3	4	1
<i>Aesthetically pleasing</i>	4	2	3	1
<i>Cozy to use</i>	3	4	2	1
<i>Reliable (Not flimsy)</i>	4	3	2	2
<i>Connectable to a ladder</i>	4	3	4	4
<i>Sum</i>	35	33	30	24
<i>Weighted sum</i>	31	34,25	28,25	21,75

As seen in the table above, honeycomb has the highest unweighted sum and dropstitch has the highest weighted score. Therefore, these were the two materials that were further explored. Dropstitch is an interesting material due to its very low weight and possibility to shrink significantly in size when deflated, However, after investigating it further, it seemed too big of a project to fully integrate a dropstitch base in the tent. It is not a material currently used by Thule, whereas they have much experience working with honeycomb and a lot of expertise which would come in handy when building the final prototype. As an unexplored material, dropstitch also had some concerns that felt limiting, such as puncture risk and the user experience of inflating the tent. Furthermore, the team was more interested in continuing with the honeycomb panels since they would be a better fit when combined with the chosen canopy solution. Therefore, dropstitch was dropped due to lack of time to figure out exactly how it could work and be produced, as well as a bigger interest in a foldable PP honeycomb base which then became the final decision.

5.3 Discussion

As stated in this chapter, the canopy and base were brainstormed separately, which gave the process more structure and made it a little easier to be creative and think outside of the box. However, a material like dropstitch might have been simpler to integrate if the tent was developed as a whole from the beginning, since an inflatable material seemed difficult to combine with a fabric canopy with tent poles, like our final concept.

The feasibility of the final solution was of importance, since from the beginning, the goal was to produce a full-scale prototype showing the concept. To have time for this, a lot of time had to be put aside to build, and even though our development stage did not feel rushed, it would have been interesting to have more time for iterating and exploring all materials more thoroughly.

In the process of developing the final concept, a lot of prototypes were made on the canopy, which gave important insights and helped a lot when building it in full scale. For the base, making smaller prototypes was more difficult, since material and parts such as honeycomb, screws and hinges were more difficult to represent on a smaller scale. Therefore, the process of building the full-scale base was more of a challenge and offered unexpected problems along the way. With that being said, no major issues arose, and even though untested, the plan for the base was well thought out.

6 Deliver

Chapter 6 describes how the team built the final prototype and the design decisions that were made throughout. The process is divided into how the soft goods, and the hard goods respectively were constructed. Finally, the final concept and prototype are described in detail and evaluated.

6.1 Refining concept and full-scale prototyping

After finalizing and choosing the concept for the canopy and base separately, the team began planning the building of the full-scale prototype. This construction entailed many design decisions, depending on tools and available materials.

6.1.1 Soft goods

Sewing the tent required a plan and a sewing pattern. To get this sewing pattern, the final design needed to be defined digitally. It was decided to re-use the tentpoles from another Thule RTT, the Approach S, as these fit the decided dimensions and were available to build the full-scale prototype with. This decision was also made as the final design would align with the rest of Thule's products. The CAD file for the tent poles was provided by Thule, the team then created the tent in Solidworks based off theses poles, using surface modelling. The surfaces could then be flattened and exported as a vector file. These pattern pieces were cleaned up, adding the windows and seam allowances to be used as a sewing pattern. A flatbed CNC cutter was used to cut out the pattern pieces. This process can be seen in Figure 6.1.

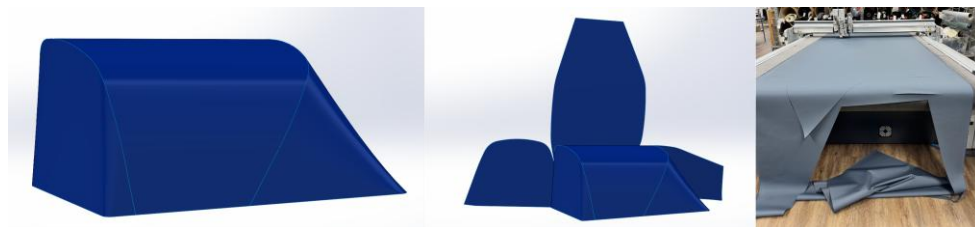


Figure 6.1 Canopy CAD model to flatbed CNC cutter

The final prototype was sewn in 300 denier ripstop fabric. This fabric is not commonly used in Thule tents, which normally use a 600 denier ripstop. That fabric was deemed to be over dimensioned for this prototype and a lighter fabric made prototyping easier and the tent weigh less. When sewing the soft goods, many decisions had to be made regarding placements of details. It was decided to add zippers along the windows, toggles to be able to roll up the windows, facing to strengthen the holes for the tent poles and strap, as well as other details. Figure 6.2 shows the process of sewing the canopy and the details that this impacted. A fabric flooring was added to the tent, to structurally help the tent keep its shape and to make the experience more comfortable, keeping dirt from the base out of the tent. Sandwiched between this flooring and the tent, was a fabric part with a zipper, the other half of which was attached to a keder. A keder is used to connect hard goods and soft goods, consisting of a core and a fabric covering which can be slotted into a keder rail. Figure 6.3 shows a graphic representation of this concept. The keder would attach the soft goods to the hard goods.

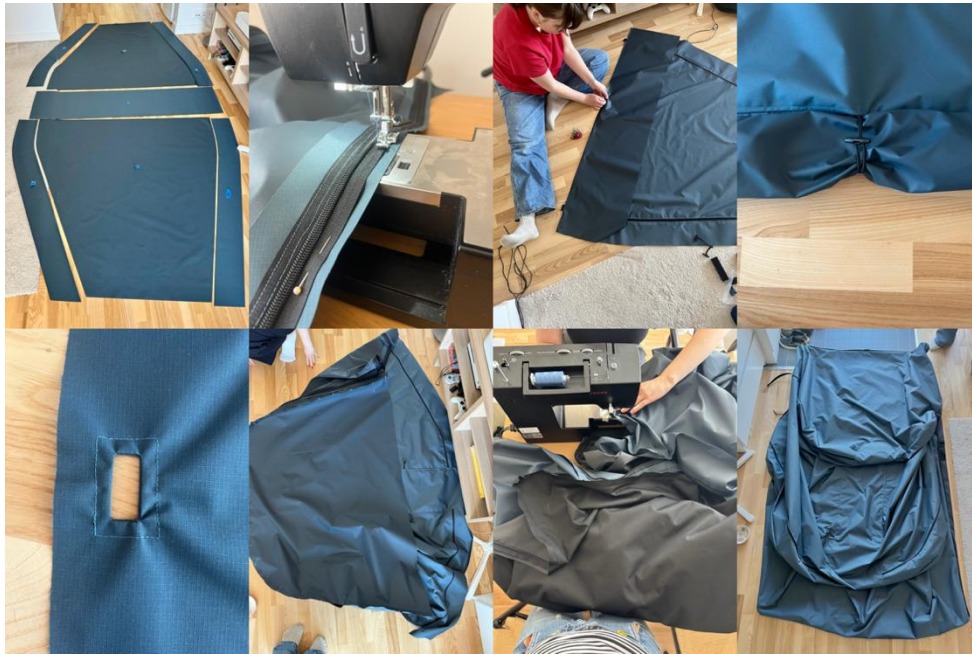


Figure 6.2 Process of sewing the canopy

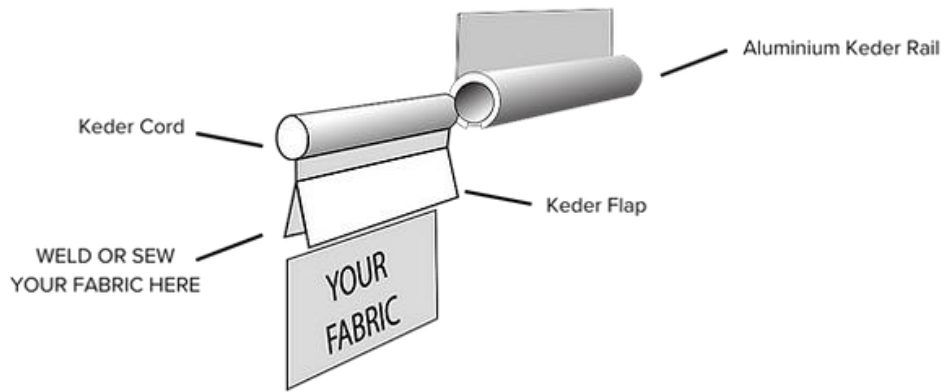


Figure 6.3 Keder and keder rail (Source: Keder Max, 2024)

6.1.2 Hard goods

Building the hard goods included the base and the tent poles. The base would consist of four sheets of the decided honeycomb material, each measuring 50x115cm. It was originally intended to use 15mm thick honeycomb material, as this was deemed structurally enough. This material was not readily available, which made the team choose a 20mm honeycomb instead, adding a small amount of extra weight to the final tent. A water jet cutting machine was used to cut the four sheets, using a vector file with the intended dimensions. At this stage, a radius was added to the tent. The entire process can be seen in Figure 6.4.



Figure 6.4 Cutting out the honeycomb plates

The honeycomb sheets were composed of a glass fiber reinforced thermoplastic material and had raw edges after cutting. These edges needed to be covered, as to not shed any of the glass fibers. This covering was to be done with plastic profiles, to also have additional functionalities. The plastic profiles would not only cover the base but also include a keder rail to hold the keder with a zipper, as previously mentioned. Two types of extrusions were needed, one straight and one curved, to fit around the circumference of the base. These were then 3d printed in segments. Parts of this process can be seen in Figure 6.5.

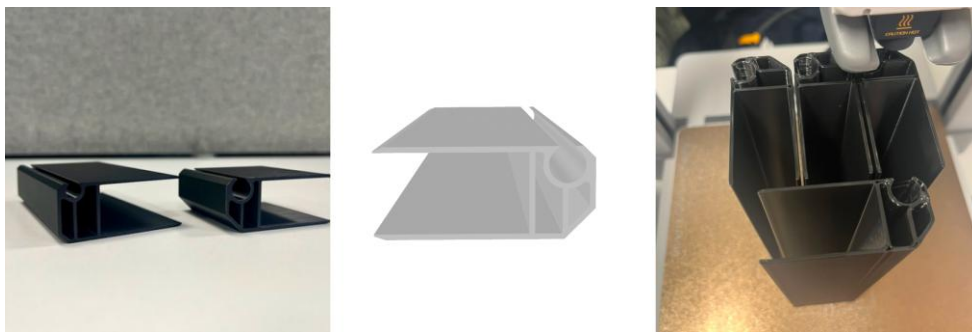


Figure 6.5 Keder profiles (Source: Author's own work)

Hinges were to be added in between each of the honeycomb plates to be able to fold the base. These hinges would be added so that the base could be folded into a W-shape, two on top of the base and the middle one on the bottom. To make the base sturdy, two continuous piano hinges were to be used at each folding edge, as each of these were 51 cm long. The raw edge of the honeycomb was still to be covered, so a profile was designed to encompass both the base and the piano hinges. These profiles were then 3d printed in segments and riveted onto the base with the piano hinges. Parts of this process can be seen in Figure 6.6.

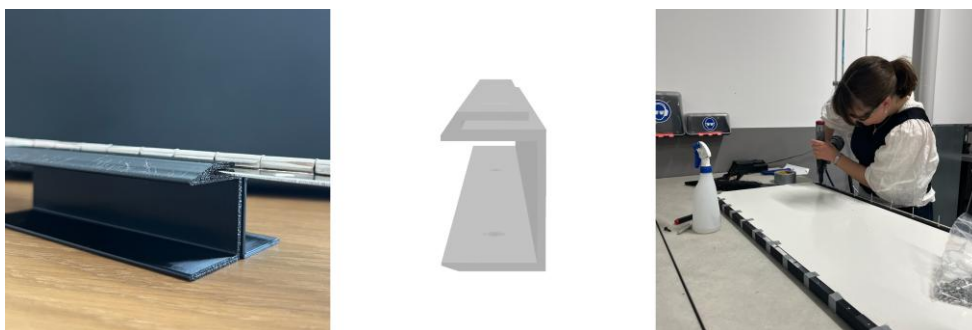


Figure 6.6 Plastic profiles for piano hinge

The tent poles were decided to be stored in the package with the soft goods, to remove the need of an additional step of the installation process. Therefore, the tent poles needed some way to attach to the base. Many different solutions were discussed but the way that was deemed most optimal was to have the bulky parts of the hardware on the poles. They were designed in this way to add minimal thickness to the base, so that it can be folded into a small package. The part that attaches to the base, consisting of two extruded trapezoids, is 5mm thick as this thickness could be accounted for in the piano hinges and their profiles. The hinges for the poles are therefore always attached to the tent poles. These parts can be seen in Figure 6.7.



Figure 6.7 Tent pole hinges (Source: Author's own work)

6.2 Final concept explanation

The concept is a roof top tent that can be divided into two packages, one for the base and one for the tent. These packages are therefore smaller than traditional RTTs and can be stored in a smaller storage space, such as in an apartment. The packages are the tent divided into the base and the canopy. The base package measures 115 x 50 cm and weighs 18kg. The canopy package weighs 4kg and is intended to have the same measurements as the base. Getting the canopy to fold that small would require the tent poles to fold in half, which is the intended concept, but has not been done in the prototype. To gain the advantage of easier storage and transportation off the car, the user must compromise on the installation time before their camping trip.

To install the tent onto the car roof, the user first unfolds the base. They locate the eight insert nuts and screw on the mounting rails. After flipping the base, the user places the tent package on top of the base and locates the bottom of the tent poles via the holes in the tent flooring. These hinges are slotted into their corresponding hardware on the base. When the tent poles are in their correct positions, the user closes the zipper, which connects the circumference of the tent to the base. Finally,

the tent is lifted into the car and attached in the same way as other Thule RTTs. This installation sequence is shown in Figure 6.8.



Figure 6.8 Installing the tent

The tent keeps the quick and easy set-up that is associated with RTTs. Once the user is out camping, the tent is set-up by simply pulling the strap at the back of the car and tightening it, this set-up sequence is shown in Figure 6.9. This strap is attached to the rear tent pole and is tightened using a tension strap to a piece that is riveted to the base. To take-down the tent, the user simply loosens this tension, and the tent poles collapse forward in the direction of the car. This collapsed mode is how the tent is when travelling from camp to camp, seen in Figure 6.10.



Figure 6.9 Set-up sequence



Figure 6.10 The tent in driving mode

When the tent is set up, it provides a lay-flat experience for the user to add their own camping mattress onto. This gives the user the opportunity to choose their own comfort level, while providing the stable base and elevated experience that is expected to come with an RTT. It also contributes to the affordability of the solution, excluding a mattress from the cost. The sleeping area measures 115 x 200cm. The following figures (Figure 6.11 to Figure 6.13) show the tent in its entirety, with more detailed descriptions under each picture.



Figure 6.11 The final tent packages on the ground, and the tent deployed on a car



Figure 6.12 The tent deployed, with the windows closed



Figure 6.13 The windows being rolled up and secured using the toggles

The final concept is compared to the previously set needs and metrics in Table 6.1 below. In the table, green symbolizes fulfilled, yellow unfulfilled and grey unable to, or not yet, measured.

Table 6.1 Final concept compared to needs

<i>Need</i>	<i>Metric</i>	<i>Prototype Status</i>
The solution feels comfortable (MH). The solution is perceived as comfortable (CH).		Lay-flat experience
The solution is inexpensive (MH).	Cheaper than existing Thule tents.	Scaled down compared to Thule tents but not calculated
The solution is easily stored in a smaller living space (MH).		2 packages, 50 x 115 (cm) each
The solution is easy to install (SH).	Can be installed by two people.	
The solution is quick to install (CH).		Approx. 10 minutes
The solution is lightweight (SH).	Weighs less than 30 kg.	22 kg
The solution is easy to set up (MH). The solution is quick to set up (MH).		Simple and quick
The solution is easy to take down (SH). The solution is quick to take down (SH).		
The inside of the solution is spacious (CH). The solution can have bedding inside when closed, on the roof (CH).	Sleeps two people. Sleeping area: 200x110 (cm)	Sleeps 2 people, Can leave bedding inside
The solution lowers the threshold to camp compared to a ground tent (MH).		Unmeasurable
The solution is aesthetically pleasing (CH). The solution is cozy to use (CH).		Unmeasurable
The solution keeps the user elevated from the ground (MH).		
The solution is reliable (not flimsy) (SH).		Yes, but more testing needed
The solution can be attached to a ladder (SH).		Further development

7 Discussion

7.1 The design process

The project followed the double diamond process closely. The brief was defined in such a way that the research needed to be done with a very open mind during discover. These findings could then be properly analyzed and defined during the define phase. As the redefined brief opened up new possibilities, the project was once again broadened and narrowed down into a final concept during the develop phase. Many prototypes were made during the early stages of development, which enabled the team to iteratively catch problem areas and enter the develop phase with a solid plan.

The expected deliverable was a prototype and a concept, which meant that the deliver phase became prototyping and making design choices. Had the goal been to create a final product, this project would have still been in the develop phase throughout the prototyping that has been done, as so many design decisions were made intertwined with the deliverable prototype. The scope of the project was defined clearly so that the final prototype was the goal of the project.

Double Diamond is a quite open framework, allowing for these deviations depending on the goal of the project. The design process was therefore very well fit for this project.

7.2 The final concept

According to Table 6.1, the final prototype performs well when held against the set needs. All the *must have* needs are fulfilled, and looking at the ones which are unfulfilled, one is a *could have* need, and the need about attaching a ladder would be an easy implementation in further development. Therefore, the final concept seems to meet the brief very well, and the team ended up being pleased with the outcome. The tent is not the lightest and most likely not the most affordable tent one could come up with, but it is a compromise between these aspects with a strong

focus on keeping the good features of a rooftop tent, such as quick and easy set-up as well as a comfortable sleeping surface.

The research showed that a compromise could be made regarding the time spent on the installation, which was taken advantage of. The prototype requires more steps to be mounted on the car compared to current Thule tents, yet it still became surprisingly easy in the end. Even though it contains multiple steps, it involves no heavy lifting or unmanageable shapes and can therefore be done in less than ten minutes by one person, apart from the one act of lifting it on to the car as seen in Figure 6.

7.3 Further development

The final concept fulfills the brief well, however, it is still only on an early prototype level, and a lot of further development could be done if continuing the project. Firstly, the next step would be to conduct user studies, evaluating how users interact with and respond to the prototype. These user studies should be conducted with RTT users and non-RTT users to evaluate the needs in Table 6.1. These user tests would preferably be made in a camping scenario, whether through observations or through letting users borrow the tent and report back their thoughts.

Some immediate improvements for the user experience have been identified. The installation process should possibly be modified to become more intuitive, and the handling of the windows could be changed to allow for easier handling, since now they are a little difficult to reach from the ladder. On the same topic, the required length and optimal placement of the “set-up strap” as well as the most ergonomic way of carrying the packages could be investigated.

Secondly, the material choices should be explored. The base of the tent is essentially just a foldable and thin base, there is no requirement on it being honeycomb, and there might exist an alternative offering lower weight or price. The material for the canopy is a 300D ripstop fabric, which is currently not used in Thule tents, since they have a 600D requirement. For these tents, the fabric makes up a surprisingly big portion of the weight. Continuing the project, it would be interesting to test the 300D ripstop properly to see if it could be a sufficient alternative in a scaled back tent. In any case, a rain-cover should be developed for the prototype, in the case of heavy rain, which would also lower the requirement on waterproofness of the material underneath. Alternatively, a completely different type of fabric might be the best choice for optimal balance between weight and durability and could therefore also be investigated.

Another essential next step is the development of a travel cover for the tent. Figure 6 shows what the tent looks like in driving mode, in other words when driving from camp to camp. This would not work for this specific prototype though, since the

fabric would be affected by the wind and consequently, a travel cover to put over the tent is a necessity.

8 Conclusion

The aim of the thesis was to develop an affordable rooftop tent solution for younger people. From the beginning of the project, the team had little experience and knowledge of rooftop tents and decided to nurture this naivety by changing the working title of the project to *affordable sleeping solution for younger people*, opening the possibility of making a tent alternative. A lot of time was spent on research and getting to know the target user and the data showed that there was a surprisingly big gap in the market in the form of a more manageable tent. The word *rooftop tent* was then included in the title again.

The result of the thesis is a rooftop tent which can easily be transported and stored in a smaller living space, with some compromises on sleeping area and installation time, while prioritizing keeping the quick set-up and comfort, both of which are strong selling points for rooftop tents.

Time has been a limiting factor throughout the project. It would have been interesting to spend even more time in the research phase, incorporating more research methods. While saturation was achieved in the interviews and questionnaire, getting to the bottom of the appeal of rooftop tents as well conducting user tests in the end would be desirable. Furthermore, the prototyping stage could have been longer. Building a full-scale mock-up before making the prototype with the right materials would have been educational and allowed for an even more iterative process. The compromise was between the given time and ending up with a convincing prototype, which could fit into the Thule catalogue.

In conclusion, the final concept is a nontraditional rooftop tent with a different user journey than current Thule tents. Still, the tent was made to mimic the design language and easy handling of current Thule products. Looking at the market for rooftop tents, there is a trend of moving away from the big and impractical versions, making this a highly relevant area for Thule to investigate if they want to keep their place as market leaders. The proposed solution, though needing additional work, would, according to the team, be a promising way to go.

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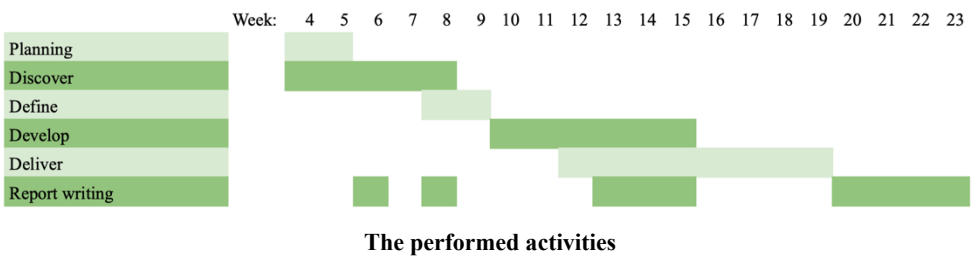
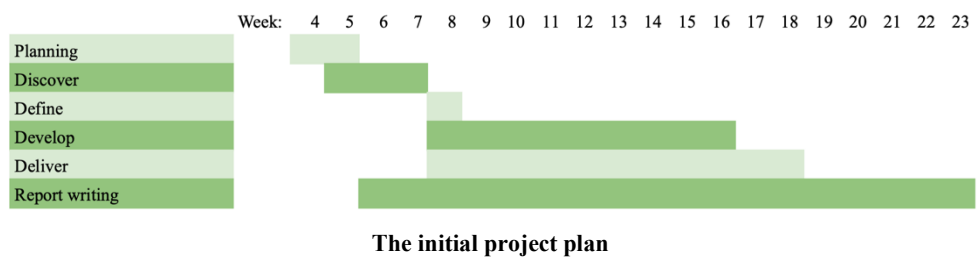
Appendix A Work distribution and time plan

A.1 Work distribution

The work distribution has been deemed to have been equal throughout the project, as both students have contributed equally through all phases.

Discover	Define	Develop	Deliver
50/50	50/50	50/50	50/50

A.2 Project plan and outcome



The figures above show the initial project plan and the performed activities. Worth noting is that the discover phase was initiated earlier than planned and continued on

longer than planned. The delay was mainly due to scheduling issues regarding interviews and wanting an extended period of which the questionnaire was open, to receive additional participants. This in turn delayed the start of the define and develop phases, but did not impact the conclusion significantly.

The report was also written more sporadically than expected, this was because the team preferred to take shorter, more effective, stretches of writing when each phase was wrapping up.

Appendix B Survey questions



Thesis research

Hi!

We are two students writing a master thesis regarding product development of roof top tents. Thank you for taking the time to fill out our research questionnaire!

You're welcome to answer in either Swedish or English.

Best regards,
Rebecka and Sofie

*** Anger obligatorisk fråga**

Have you used a car roof tent? *

- ☐ Yes, I own/used to own one
- ☐ Yes, but I didn't own it
- ☐ No

Briefly describe your experience with camping *

Ditt svar

How does/would a rooftop tent improve your camping experience? *

Ditt svar

What do you see as the biggest downsides or challenges of rooftop tents? *

Ditt svar

What matters most to you when choosing a rooftop tent? *

Select up to 3 alternatives

- ☐ Price
- ☐ Weight
- ☐ Comfort
- ☐ Coziness
- ☐ Durability
- ☐ Ease of use
- ☐ Design/aesthetics
- ☐ Sustainability
- ☐ Övrigt: _____

What do you think motivates someone to buy a rooftop tent compared to a normal tent? *

Ditt svar

If you could change one thing about the rooftop tents on the market, what would it be? *

Ditt svar

Demographics and general camping questions

Age Group *

- ☐ under 18
- ☐ 18-25
- ☐ 26-40
- ☐ 41-60
- ☐ 60+

How often do you go camping? *

- ☐ Monthly
- ☐ Couple times a year
- ☐ Once a year
- ☐ Less often
- ☐ Never

Who do you usually go camping with? *

☐ Solo

☐ Partner

☐ Friends

☐ Family

☐ Pets

☐ Övrigt: _____

Do you have access to a car? *

☐ Yes, I own one

☐ Yes, I can easily borrow one

☐ No

Thank you, please answer these concluding questions

Do you have anything else you would like to add?

Ditt svar _____

Could we contact you for a deeper interview? If yes, please write your email adress

Ditt svar _____

Appendix C

Forum quotes

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