



Óbuda University

Multifunctional child-friendly GPS product and packaging design

Többfunkciós, gyermekbarát GPS termék- és csomagolástervezés

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List of Contents

Abstract	5
1. Introduction.....	5
1.1 Introduction.....	5
1.2 Motivation.....	7
1.3 Research aim and relevance.....	8
2. Literature Review	9
2.1 Introduction.....	9
2.1 Competitors.....	11
2.2 Bands	12
2.3 Belt	13
2.4 Charm	14
3. Methodology	15
3.1 Methodology	15
4. Design	18
4.1 Moodboard.....	18
4.2 Mockup and Design Ideation Process	21
4.3 Product Development Process	27
4.4 Packaging Design.....	30
4.4 Material Research.....	32
4.4.1 GPS Product	32
4.4.2 Packaging	33
4.5 Cost Evaluation	33
4.6 Branding	34
4.7 Product Design, Technical Drawings and Assembly.....	35

4.8	Packaging design, technical drawing, and Assembly.....	44
4.9	User Interface Design	51
5.	3D Renders.....	52
6.	Conclusion	57
7.	Bibliography.....	58

List of Figures

Figure 1: Sample Air Tag	10
Figure 2: Air Tag internal structure.....	11
Figure 3: Comp.1 Product	12
Figure 4: Comp.1 Price	12
Figure 5: Comp.2 Product	13
Figure 6: Comp.2 Price	13
Figure 7: Comp.3 Product	14
Figure 8: Comp.3 Price	14
Figure 9: Comp.4 Product	15
Figure 10: Comp.4 Price	15
Figure 11: Moodboard.....	18
Figure 12: Storyboard	19
Figure 13: Sketch Belt.....	21
Figure 14: Sketch Charm.....	22
Figure 15: Sketch Band	23
Figure 16: Product Ideation	25
Figure 17: Packaging Ideation.....	26
Figure 18: Band Prod. Sketch.....	27
Figure 19: Belt Prod. Sketch	28
Figure 20: Charm Prod. Sketch	29
Figure 21: Bundle Package Sketch	31
Figure 22: Individual Packaging Sketch	32

Figure 23: Lolo Branding.....	34
Figure 24: GPS Tag Sample	35
Figure 25: GPS tag Cover Popper Technical Drawing	36
Figure 26: GPS tag Band Notch Technical Drawing	37
Figure 27: GPS tag Band Technical Drawing.....	38
Figure 28: GPS Band Product Assembly	39
Figure 29: GPS tag Belt Technical Drawing	40
Figure 30: GPS Belt Assembly	41
Figure 31: GPS Charm Technical Drawing	42
Figure 32: GPS Charm Assembly	43
Figure 33: Bundle Graphic Design	44
Figure 34: Individual Product die cut graphic design	45
Figure 35: Individual different popper die cut graphic design	46
Figure 36: Technical Drawing of the Bundle Box Product Container	47
Figure 37: The Technical drawing of the Bundle Box weight supporter	47
Figure 38: Bundle Packaging Assembly	48
Figure 39: Close up Bundle Packaging Assembly.....	49
Figure 40: The Bundle Box with Graphics.....	50
Figure 41: GPS Device Product and Box Bundle Assembly.....	50
Figure 42: User Interface.....	51
Figure 43: Render 1.....	52
Figure 44: Render 2.....	53
Figure 45: Render 3.....	53
Figure 46: GPS Band Live Render	54
Figure 47: Charm Live Render.....	55
Figure 48: Belt Live Render	56

Abstract

For every guardian or parent, ongoing concern for the safety and well-being of their children or those under their care is a universal and deep-rooted feeling. Unfortunately, the tech industry has largely focused on populations with higher purchasing power, inadvertently neglecting communities with limited resources to invest in gadgets. Given this disparity, my mission is to develop and offer highly affordable GPS products that seamlessly combine functionality, playfulness and security.

In the coming sections, I will delve into my careful design process and outline the development of a GPS bracelet, belt buckle, and pendant. Additionally, I will explore the dynamic and engaging packaging designs that embody the essence of the product. Additionally, I will detail the creation of a user-friendly interface for the associated application that allows guardians to effortlessly track and monitor the locations of their loved ones through their smartphones.

To ensure my design meets the specific needs and preferences of my target audience, I conduct a comprehensive survey over a two-week period. The data collected and its subsequent analysis will provide invaluable insights and guide the development of a product that is not only technologically adept but also deeply human-centered, functionally and aesthetically purposeful.

In the final section of this thesis, I will conduct a feasibility assessment, examining aspects such as product material research, cost estimation and market integration. Each evaluation is conducted with precision and lays the foundation for a comprehensive and successful implementation of the affordable GPS product in the market.

1.Introduction

1.1 Introduction

We all share a common thread—many of us have younger nieces and nephews, some have younger sisters or brothers, and as life progresses, some are blessed with the joy of having beautiful sons and daughters. In a world characterized by uncertain events, encounters with

unknown individuals, and the inevitable diversity of socioeconomic statuses, it is only natural for us to harbor concerns and deeply care for the well-being of our cherished loved ones.

Highlighting the urgency of this concern, a 2013 survey conducted by the Office of Juvenile Justice and Delinquency Prevention in the United States sheds light on a stark reality. By comparing and contrasting data from 1999 to 2013, the study reveals a distressing statistic—approximately 2,300 children go missing in the United States every day (*Sedlak et al., n.d.*) This alarming figure underscores the pressing need for heightened awareness and proactive measures to safeguard our children.

Further insight into the complexities of these missing cases is provided by the National Incidence Studies of Missing, Abducted, Runaway, and Thrownaway Children, as categorized by Finkelhor on November 21, 1996. The following five categories delineate the reasons behind these cases, providing a framework for understanding and addressing the multifaceted challenges associated with the safety and security of our children. (Finkelhor, 1996-11-21):

- Benign reasons (misunderstanding cases)
- Ran / Thrown away
- Lost, stranded, or injured
- Family abduction
- Stranger abduction.

According to data from the 1999 database, a disturbing discovery emerges: a staggering 58,200 children were victims of abductions by non-family members. When you look deeper into the details, it is notable that of these cases of extrafamilial abduction, a remarkable 81 percent involved children aged 12 or older. This trend is reflected in the broader context of kidnappings, where 58 percent of victims were 12 years old or older (*Sedlak et al., n.d.*). These statistics underscore the increased vulnerability of older children to extrafamilial abduction and shed light on a critical issue that requires a nuanced approach in developing policies and interventions to ensure the safety and well-being of our youth.

During the early 2000s, it was quite difficult to track and locate people when compared to the abundance of readily accessible Global Positioning System (GPS) equipped cellphones and smartphones we have today. As estimated by Ericsson & The Radicati Group, as of November

2023, there are 6.92 billion smartphone users in the world today. Nearly 86 percent of the world's population carry with them mobile phones (*Turner, 2018*).

Understanding that the topic of “missing children” covers a vast array of reasonings, stemming from social and economic disputes and differences, unwanted forceful abductions, and abuse cases (Pugh R. &, 2010), the paper shall highlight on the niche matter of locational based safety and alleviating tress and worries from caretakers regarding the safe location of their children.

However, in the case of children who are in their early developmental years, frequent usage of cellphones to communicate with their family could be rare. In addition, depending on the area of living, the family’s socioeconomic state, and possibilities, there could be instances where children cannot even have their own cellphones. A friendlier approach to solving the economic rift based safety concerns must to taken in to consideration when dealing with communities developing rural areas (Oliver, 2017). Hence, we must find alternative solutions for them.

1.2 Motivation

Before coming to Budapest, Hungary, to pursue my further education and enrich my experiences, I was living in Ulaanbaatar, Mongolia. From a young age I was taught by my mother to not pick up my phone nor fiddle it when I was walking home from school in the dark. She was worried that a little young girl with a “desirable” gadget might gain the unwanted attention from people with ill will and get herself harmed. Years later, what she feared came true.

I was walking home on a sunny afternoon from school and a group of boys asked for the time. Grabbing my phone from my pocket, I replied with the time and moved on. Later in the apartment building, I saw the same boys demanding me to give them my phone or else. After receiving a few punches and kicks I willingly gave them my phone and was left with a hefty bruise, which my mom was not happy with. That time I realized, it does not matter if it is dark or sunny, if you have something that others see that is valuable and you look vulnerable, you are at a risk of getting it taken from you.

I thought that these aggressive encounters happened in the rural areas where bullies could make a few bucks selling stolen items. Never thought that it would happen in the city center

where I lived. There had been much word and stories of children receiving new gadgets in the rural areas, later to have the item mysteriously vanish or brutally taken.

In the outskirts of Ulaanbaatar, families sell their land and possessions to move from the countryside to the city to reach better opportunities for their children, coming with little to none finances. Due to the lack of infrastructure, the rural outskirts of Ulaanbaatar are lacking in kindergartens, schools, and even streetlights. It is common for children in these areas to travel long distances just to gain education while the parents worry about their safety and whereabouts.

I wanted to make an affordable product for anyone and everyone, for families that are going through financial difficulties that would help them ease their nerves and worry about the location of their children. I wanted the product to have the whimsical toy like feeling so that young children would want to wear it every day and truly enjoy the product. Because at the end of the day, regardless of purchasing power, knowing the safety of your children and loved ones is not a luxury, it is a bare minimum, a life necessity that everyone should have.

1.3 Research aim and relevance

The existing market for GPS products aimed at children is saturated with offerings that are not only high in price but also overloaded with features. “Unfortunately, there is a noticeable gap in the options that give children creative freedom with their GPS accessories.” Ensuring affordability and providing parents with important information about their child’s whereabouts. In response to this gap, my product offers a refreshing perspective and offers three different design options that the child can use interchangeably. These designs include a versatile belt buckle, a stylish bracelet, and an adorable accessory.

Additionally, my product doesn't stop at the physical design; it extends to innovative and user-friendly packaging options for individual products and bundle sets. Additionally, I will delve into the painstaking process of creating a parent-tailored interface that allows them to effortlessly monitor the location of their children or loved ones. In this work, I will systematically break down my design process and explain the reasons behind each decision. “My aim is to provide a comprehensive understanding of how my product not only fills current gaps in the market, but also sets a new standard for creative, affordable and informative GPS accessories for children.

2.Literature Review

2.1 Introduction

The socioeconomic differences between financially stable and financially distressed populations are striking, particularly with regard to purchasing power for basic needs, health, security and opportunity. While these economic disparities have long been recognized, the advent of technology has ushered in a new phenomenon known as the “digital divide.” This term encapsulates the growing divide that arises from unequal access to technology, going beyond mere access to information and impacting broader aspects of lifestyles and societal structures.

The digital divide manifests itself in all countries, rural areas and even between genders, leading to different experiences and opportunities (Measuring Digital Development - Facts and Figures 2021, n.d.). A report on “Poverty and Shared Prosperity” published by the World Bank in 2022 reveals a harsh reality. In 2022, an estimated 682 million people lived in extreme poverty, underscoring the profound impact of economic inequality and the urgency of eliminating the digital divide to ensure equal access to the benefits of technological advances (*Poverty and Shared Prosperity 2022, WorldBank., 2022*).

By undertaking a comparative analysis of missing children data across Hungary, the United States of America, and the European Union, we can gain valuable insights into the scope of the problem. In Hungary, as reported by Portfolio in 2020, approximately 16,000 disappearance alerts were issued for minors. It is crucial to note that each alert corresponds to an instance where a child attempted to run away from home (*Így tűnik el több ezer gyerek Magyarországon 2020-ban, 2020*).

In the United States of America, the scale of the issue is even more pronounced. In 2020, around 400,000 youth were reported to be abducted, as indicated by data from Statistica (*Number of Missing Persons Files in the U.S. by Age and Gender 2022, Statistica, 2022*). Turning our attention to Europe, a report from Astra in 2023 reveals that almost 250,000 youth are reported missing annually, equating to an alarming estimation of one child disappearing every two minutes (*“Every 2 Minutes A Child Disappears in Europe,” 2023*).

These staggering numbers underscore the urgent need for proactive measures to address and mitigate this distressing trend. It is imperative that we collectively strive to find comprehensive solutions to combat the atrocity of missing children, ensuring the safety and well-being of our youth across the globe.

With the increased interest generated by the release of Apple's Airtag, there is a noticeable increase in people exploring the concept of tagging their everyday items such as bags, wallets and keys to improve tracking and security. However, the premium price associated with Airtag puts it in the realm of luxury and makes it an inaccessible option for the majority of people. To address this accessibility gap and bring the benefits of GPS tracking to a wider audience, my design approach involves using a basic model inspired by the Apple Airtag.

In order to make this design more inclusive and affordable, I took a sample model called "New Bluetooth Anti-lost Device Airtag" from Shenzhen Sykoo Technology Co. Ltd. be inspired. This choice serves as a starting point for my designs and allows for the creation of a product that captures the essence of high-quality tracking functionality while making it accessible and attainable to a broader demographic. By using this basic model, I want to democratize the benefits of GPS tracking and offer a solution that combines reliability with affordability. (*New Bluetooth Anti-Lost Device Airtag - Buy Apple Airtag Original Airtag Dog Airtag Itag Location Tracker Bluetooth Airtag,Airtag Gps Airtag Airtag Tracker Pet Airtag Bluetooth Anti-Lost Device Airtag,Airtag Apple Airtag Waterproof Pet Dog Real Time Tracking Product on Alibaba.Com, n.d.*).



Figure 1: Sample Air Tag

When the device is opened, its internal structure bears a striking resemblance to the make and model of Apple's Airtag product, as detailed in the teardown and test point mapping conducted by Colin O'Flynn in 2021 (*Apple AirTag Teardown & Test Point Mapping – Colin O'Flynn, 2021*). This conscious design choice not only ensures a familiar and proven internal architecture, but also gives us access to a wider range of connectivity options. By aligning with a widely recognized and established model, our product integrates seamlessly into existing technology ecosystems, improving accessibility and connectivity for a larger user base.

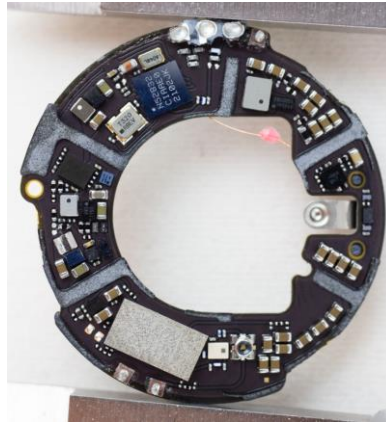


Figure 2: Air Tag internal structure

The packaging element and core principles were inspired from extensive research from various literatures. By making the production process uncomplicated, the cost effective value of my product will be in reasonable range of my target audience (Klimchuk, 2013).

2.1 Competitors

In the existing landscape, the predominant competitors in the children's GPS product market are predominantly individual manufacturers based in China that specialize in mass sales. Notably, there is a lack of established brands that specifically focus on and sell GPS products for children. Recognizing this gap, my goal is to introduce a product line that is not only characterized by its interchangeability and customization, but also a unique offering in the form of complete sets consisting of a band, belt and pendant or individual products - each equipped – offers with integrated GPS tag.

To underscore the prevailing market dynamics, I will now provide a list of individual product brands that currently populate this niche and highlight the limited selection available to consumers seeking innovative, interchangeable and customizable GPS accessories for children.

2.2 Bands

One competitor is Nogis currently retailing their products on the Walmart website (*NOGIS Waterproof AirTag Bracelet for Kids, Wristband for Apple Air Tag Hidden Silicone Holder for Toddler Child Elder GPS Tracking Tagging Watch Band (Black+Blue), n.d.*). They retail for over USD10 and arrive in two sets. Their product is IP53, splash proof and dust proof. Their silicone bracelet is anti-allergy, while being soft and durable.



Figure 3: Comp.1 Product

Figure 4: Comp.1 Price

Oria Kids, is also another competitor with similar designs selling their product on Walmart (*ORIA Kids Wristband Waterproof Compatible with Apple AirTag, 2 Pack Silicone Watch Bands, Black&white, n.d.*). Compared to Nogis, Oria is priced a little bit higher, perhaps due to their attention to detail in design. However, similar to Nogis, Oria has no personal branding on social media, nor has any active campaigns. They provide different colors such as blue, black, pink and white.



Figure 5: Comp.2 Product

ORIA

**ORIA Kids Wristband Waterproof Compatible
with Apple AirTag, 2 Pack Silicone Watch Bands,
black&white**

\$12.99

Figure 6: Comp.2 Price

2.3 Belt

Manufactured by the Shenzhen Yuxingda Technology Co., Ltd. Their silicone case for dog leashes is a fair competitor. It is retailing for USD0.72 for a minimum order of quantity of two. They provide the colors of black, pink, and white. Albeit mentioning they are waterproof, in the detailed product description there is a lacking of the face opening protection (*Factory Wholesale High Quality New Silicone Locator Pet Cats And Dogs Tracker Case For Apple Airtag Cases - Buy For Apple Airtag Cases Silicone Locator Pet, Cats And Dogs Tracker Case For Airtag Cases, Tracker Case For Pet Cats And Dogs For Apple Airtag Cases Product on Alibaba.Com, n.d.*).

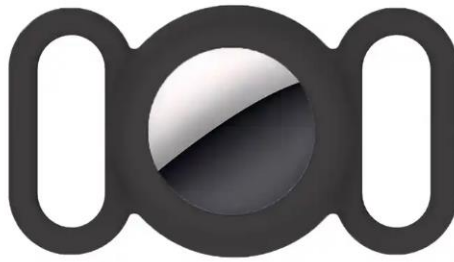


Figure 7: Comp.3 Product

Factory wholesale High quality new silicone locator pet cats and dogs tracker case for apple airtag cases Popular
7 buyers

2 - 999 pieces	1000 - 9999 pieces	>= 10000 pieces
\$0.72	\$0.70	\$0.68

Figure 8: Comp.3 Price

Since the loop perimeters are quite small, the majority of the competitive products are marketed towards animal companions' leashes. Despite the leash labeling, the designs are well researched and developed.

2.4 Charm

Conducting their business on Alibaba, the bulk production company of Fujian, China produces superhero, and cartoon inspired animal companion, key and even phone clickable tags. The designs are lively and charming. With a minimum order of quantity of two, selling for USD 1.20, the company produces their product in 15 different styles. Despite the mass production, the Fujian company lacks social media, marketing, and personal branding presence on platforms such as Instagram, Facebook, and Youtube (*Silicone Luxury Airtag Key Chain For Girls Protective Cover For Airtags Holder For Anti-Lost Dog Phone Bag - Buy Key Chain For Girls,Airtags Holder,Airtag Keychain Product on Alibaba.Com, n.d.*).



Figure 9: Comp.4 Product

Ready to Ship In Stock Fast Dispatch		
Silicone Luxury airtag key chain for girls Protective Cover for airtags holder for anti-lost dog phone bag 1 buyer		
2 - 49 pieces	50 - 499 pieces	>= 500 pieces
\$1.20	\$0.90	\$0.70

Figure 10: Comp.4 Price

3.Methodology

3.1 Methodology

To assess potential market interest and gather valuable insights, I carefully conducted a survey of colleagues and actively engaged in various social media forums. The collaborative effort received a strong response, with a total of 286 participants contributing their views. The following results, reflecting the feelings and preferences of this diverse sample, are methodically presented and analyzed in the table below. This data serves as a critical basis for understanding market dynamics and determining strategic direction for the development and launch of the proposed products.

Table of Survey		N	%
Age	18 - 25	86	30.07 %
	26 - 35	102	35.66%
	36 - 45	54	18.88%
	46 - 55	28	9.79%
	55+	16	5.59%
Gender	Female	198	69.23%
	Male	82	28.67%
	N/D	6	2.1%
Do you have any children?	Yes	197	68.88%
	No	89	31.12%
Do you have any siblings?	Yes	231	80.8%
	No	55	19.23%
What is the age range of your children or sibling?	2-6	51	17.83%
	7-11	185	64.69%
	12-18	19	6.64%
	19-25	27	9.44%
	26+	4	1.4%
What type of area do you live in?	Urban	251	87.76%
	Rural	35	12.23%
Do you feel safe in your neighborhood?	Always	109	38.11%
	Sometimes	73	25.52%
	Often	81	28.32%
	Never	23	8.04%
Do you buy colorful children's toys?	Yes	218	76.22%
	No	68	23.78%
Would you be happy if you could know the location of your loved one with said toy?	Yes	273	95.45%
	No	13	4.55%
Would you like it if the location toy was customizable and changeable?	Yes	276	96.5%
	No	10	3.5%
How much are you willing to pay for the toy like multi-functioning GPS location device?	<1000 HUF	81	28.32%
	1000 HUF – 5000 HUF	164	57.34%
	6000 HUF – 10000 HUF	32	11.19%
	10000 HUF >	1	0.35%
	None	8	2.8%

Analyzing the aggregated data reveals a clear demographic profile that highlights the key characteristics of our participants. A clear majority falls into the 26- to 35-year-old age group, with 69.23 percent of those surveyed being women. Notably, the majority of participants report having at least one child and sibling, and a remarkable 64.69 percent have children or siblings between the ages of 7 and 11 years of age.

Geographically, the majority of our respondents live in urban settlements and express a strong sense of joy and security in their neighborhoods. A remarkable 80 percent of participants have already purchased children's toys and an overwhelming 95.45 percent show great interest in knowing the whereabouts of that toy's owner. In addition, almost 97 percent of those surveyed expressed the desire for toys to be customizable and changeable.

Regarding the price expectations for our product, the majority of respondents consider a price range between HUF 1,000 and HUF 5,000 to be appropriate, which provides valuable insight into the acceptable price range for potential consumers of our customizable and interchangeable GPS toy.

4.Design

4.1 Moodboard



Figure 11: Moodboard

When creating the mood board, my goal was to give the GPS product an adorable, childlike essence. The vibrant splashes of color and individually hand-drawn illustrations have been carefully curated to breathe life and character into the device, giving it a unique charm. What was important to me was that the GPS device resembled a small toy that was discreet enough not to attract undue attention from potential wrongdoers.

Recognizing that children often get bored with their existing toys, I was inspired by the concept of adaptability. I envisioned a design that could transform and adopt different themes to suit a child's ever-changing interests. This idea was based on DIY backpack charms and bracelets that I saw on the mood board and thought would be well received by the target audience.

This creative process drove the development of a storyboard for the product. Building a backstory and connecting to the product strengthened my resolve to delve deeper into research and refine the planned GPS device for children. The narrative and design considerations became integral elements in developing a product that not only met practical safety needs, but also engaged children by offering a constantly evolving and personalized gaming experience.

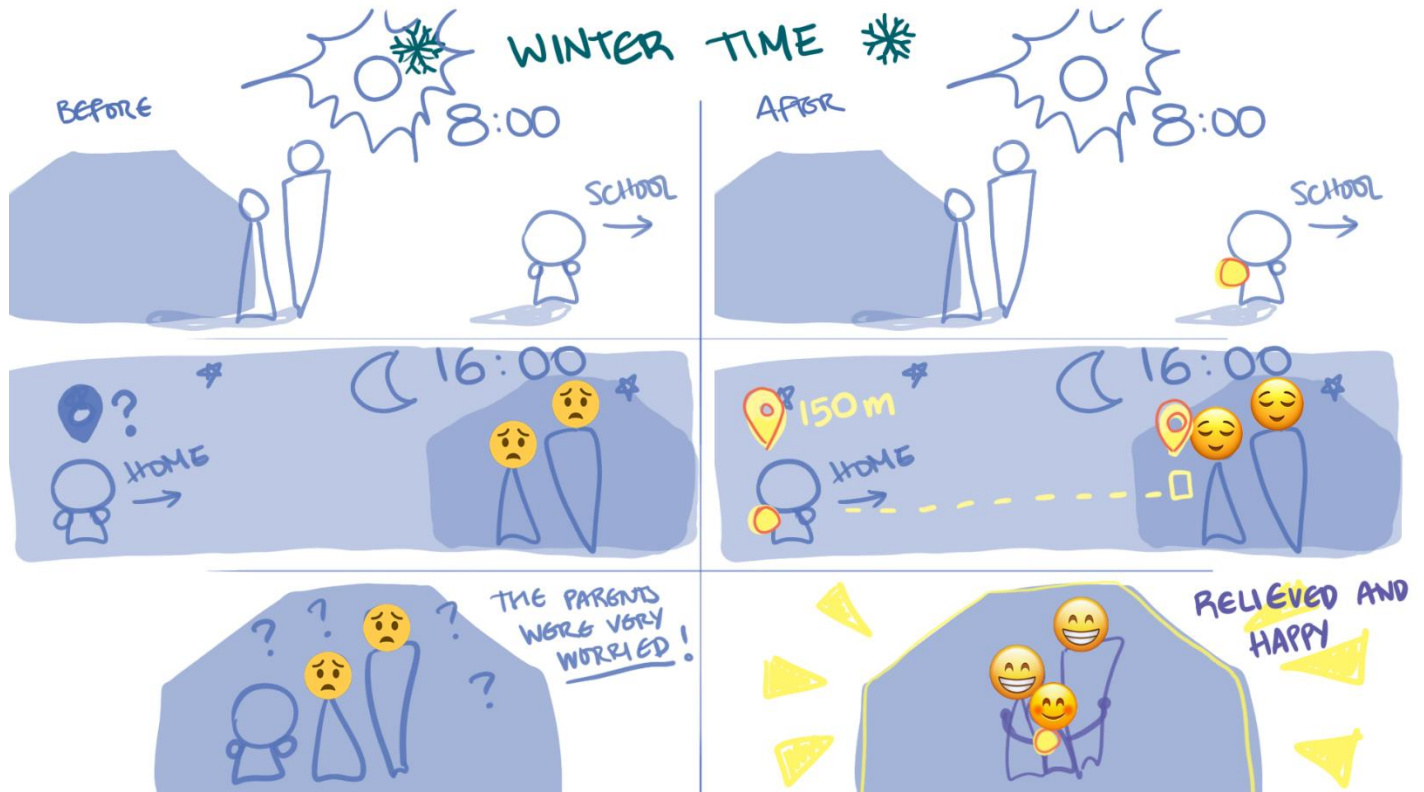


Figure 12: Storyboard

In the storyboard shown in *Figure 12*, we delve into the daily life of a little boy living in the rural outskirts of Mongolia during the winter season. The narrative unfolds in two parallel scenarios, offering a poignant contrast that highlights the impact of a simple yet innovative addition to his routine.

On the left we see the boy going to school and his day starting at 8:00 am. By the time school ends at 4 p.m., the surrounding area has already fallen into darkness, casting a shadow over his journey home. His parents' worried expressions reflect the concern they feel as their son travels the distance in the fading light.

Now turn your attention to the right side of the panel, where a similar action is taking place. The boy's school day follows the same schedule: it begins at 8:00 a.m. and ends at dusk at 4:00 p.m. However, one crucial difference emerges: the boy is wearing a toy GPS device on his backpack. This seemingly insignificant addition changes the entire narrative.

When the boy goes home, the GPS becomes a reassurance signal for his parents. Using their smartphones, they track his location in real time and find that he is only 150 meters away. This real-time connection eases their anxiety and replaces it with a feeling of relief. The emotional change in the parents is noticeable, moving from concern to joy.

The heartwarming climax occurs when the boy comes home and is greeted by his now relieved and happy parents. This narrative arc demonstrates the transformative power of technology, particularly the toy GPS product, in fostering a sense of security and family connection. The storyboard thus summarizes a story about how a seemingly small addition to daily routine can have a significant impact on a family's emotional well-being, highlighting the positive synergy between technology and human relationships.

4.2 Mockup and Design Ideation Process



Figure 13: Sketch Belt



Figure 14: Sketch Charm



Figure 15: Sketch Band

Creating the outline played a crucial role in sharpening my focus and defining the desired tone for the brand. This first step allowed for a clearer understanding of the brand identity. I then

delved into the creative process by outlining different product styles. Thinking about the possible forms of the GPS device – be it a band, belt or pendant – encouraged imaginative exploration. Each design iteration was a careful consideration of aesthetics, functionality and user experience. The sketches not only presented the external appearance, but also dealt intensively with the packaging aspect. The idea of how the GPS device could be presented in the form of a band, belt or pendant and the conception of the packaging became an integral part of the entire design process.

These imaginative depictions played a crucial role in creating a consistent and captivating brand image. It was crucial to ensure that both the product and its presentation seamlessly reflected the intended tone and struck a chord with the target audience. The designs highlighted in Figures 13, 14 and 15 have been carefully crafted to meet children's specific needs, creativity and, most importantly, vibrant lifestyles.

At the heart of the GPS products was the idea of giving children creative freedom. Whether it's a belt, buckle or pendant, the designs are designed to evoke playful accessories and offer a wealth of options. A primary concern throughout the design process was to give children a sense of control over their creative decisions. The aim was to offer them a range of options that would allow them to choose accessories that suit their individual tastes and preferences.

As shown in the images, the designs were tailored to children's dynamic interests. The GPS products are designed not only as security devices but also as interactive and evolving accessories. To maintain engagement, we explored the possibility of allowing children to swap out the snap design to ensure their GPS accessories can be updated and customized to suit their evolving interests and trends. The goal of this forward-thinking approach was to maintain the sense of novelty and ensure that each GPS accessory feels new and exciting to the children who use it.

GPS watch Ideation (4 Kids)

Inspiration / Ideation



petite size



Very ergonomic
+ child friendly
UI



+ multi-purpose
+ attachable
accessories

MAIN FUNCTIONS

- Real-time tracking
- SOS mode
- Minimum metal usage (for allergy)

PACKAGING IDEAS

- Age different packaging
- Coloring Book
- Board game
- Puzzle
- Maze
- Collectable figurine

Sketches

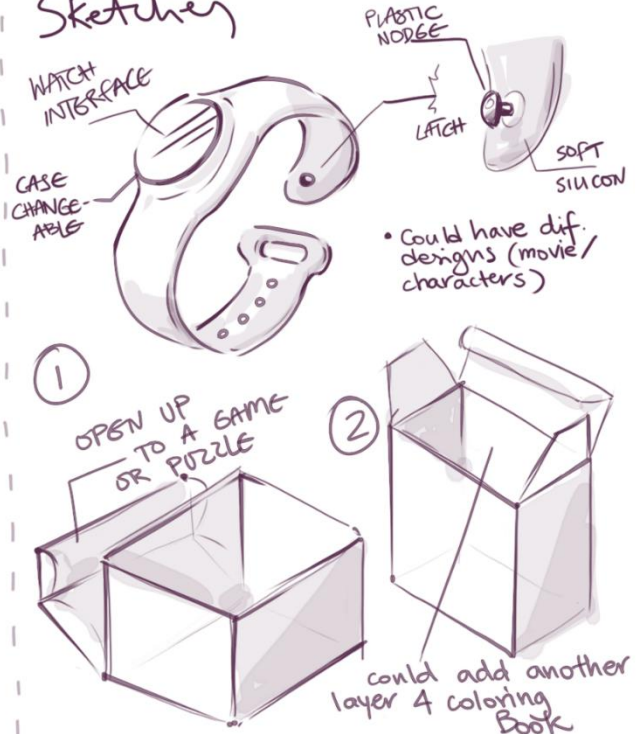


Figure 16: Product Ideation

As seen in Figure 16, initially, my vision for the device was expansive, envisioning a fusion of various functionalities such as a smart screen for timekeeping, an SOS mode for emergencies, and even a heart rate sensor for health monitoring. However, upon deeper contemplation, I recognized the inherent danger of deviating from the core purpose of the product and the specific community I aimed to cater to—those seeking emotional relief. The realization dawned that amid the plethora of sophisticated smart products saturating the market, the key to standing out lay in simplicity, necessity, enjoyment, and affordability. Consequently, I recalibrated my design approach to align with these principles. This strategic pivot seeks to safeguard the product's essence, ensuring it remains authentic to the targeted audience. By emphasizing simplicity and utility, the end result aims not merely for functionality but endeavors to be a meaningful and accessible solution, resonating profoundly with the intended users and providing a unique blend of emotional relief and practicality.

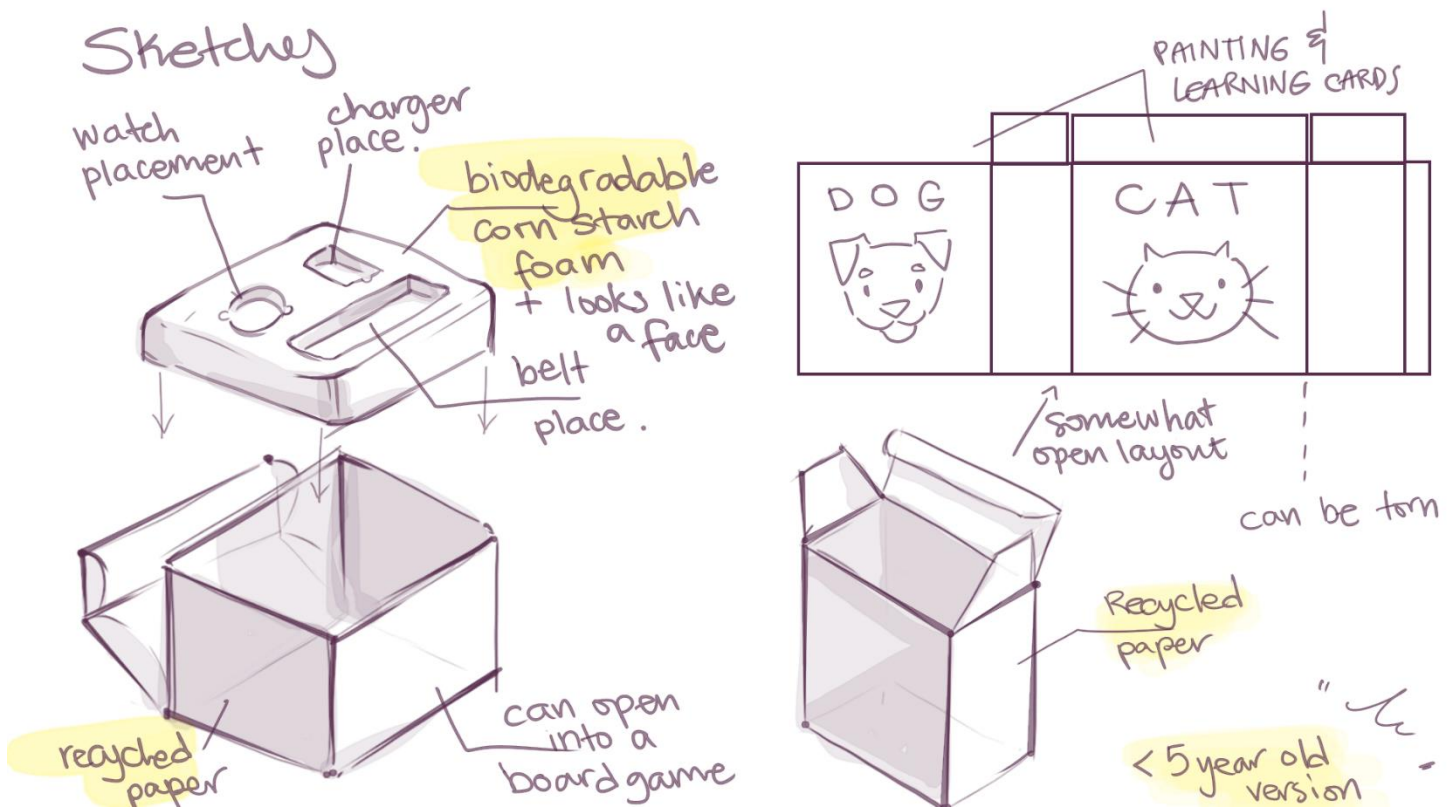


Figure 17: Packaging Ideation

During the research and ideation phase of the design process, I explored different approaches to packaging the products. The idea of creating multiple interactive packaging options for different age groups initially seemed promising. The concept not only aimed to be environmentally friendly through recycling, but also to bring joy to children when unpacking. Depending on the age group, the packaging could take the form of a color book-style die-cut box, an origami paper action figure with instructions, or paper car figures, as could be seen in Figure 17.

For bundle box sets, I envisioned using a biodegradable cornstarch foam holder combined with an interactive corrugated cardboard outer. However, upon reflection, I realized that introducing too many elements into the packaging could complicate the design process and go against my main goal of providing an affordable solution to financially disadvantaged communities who need the product for their children. It became clear that simplicity was the key to accessibility.

Furthermore, given the practicality of involving children, I realized that the initial excitement during the unboxing phase may not translate into sustained interest in interacting with

the packaging. To remain focused on the core mission and target audience, I decided to optimize the packaging design and ensure that it is consistent with the overall principles of simplicity, necessity and affordability of the product. The aim of this strategic decision was to maximize the positive impact on the target group while avoiding unnecessary complexity in packaging design.

4.3 Product Development Process

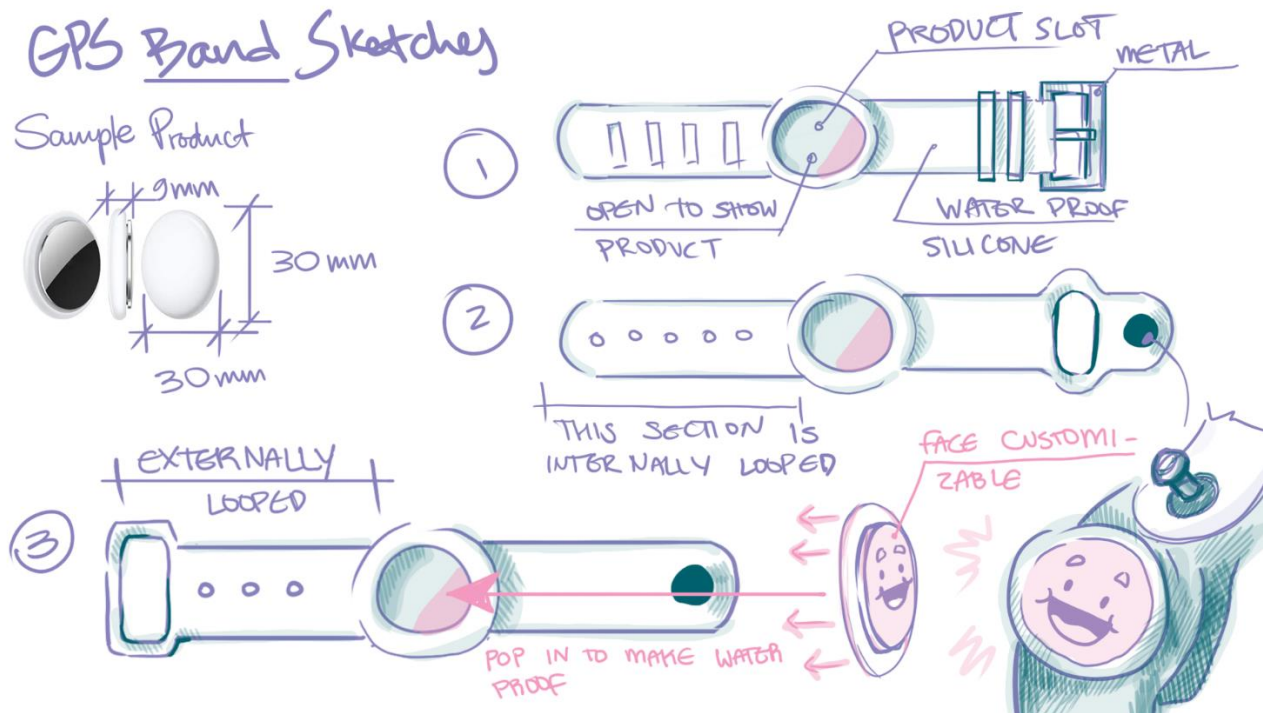


Figure 18: Band Prod. Sketch

When creating alternative cases for the products, I focused not only on aesthetics, but also on practical features that improve durability and user engagement. Introducing water-resistant features became a priority, and I envisioned a GPS device that was splash-proof and had a compact, water-resistant housing. Despite the emphasis on affordability, durability remains a primary consideration to ensure the product stands the test of time in the families it serves.

The concept of a changeable product topper proved to be a compelling idea, adding an element of personalization and sustained interest for the child. This feature allows them to customize the device with different cartoon characters or spontaneous designs, ensuring that the product remains visually appealing and meets the child's evolving preferences.

In Figures 18, 19, 20 I have developed multiple alternative designs per category of GPS product: band, buckle, and charm, to have creative range in which design concepts will be more plausible in product longevity and production.

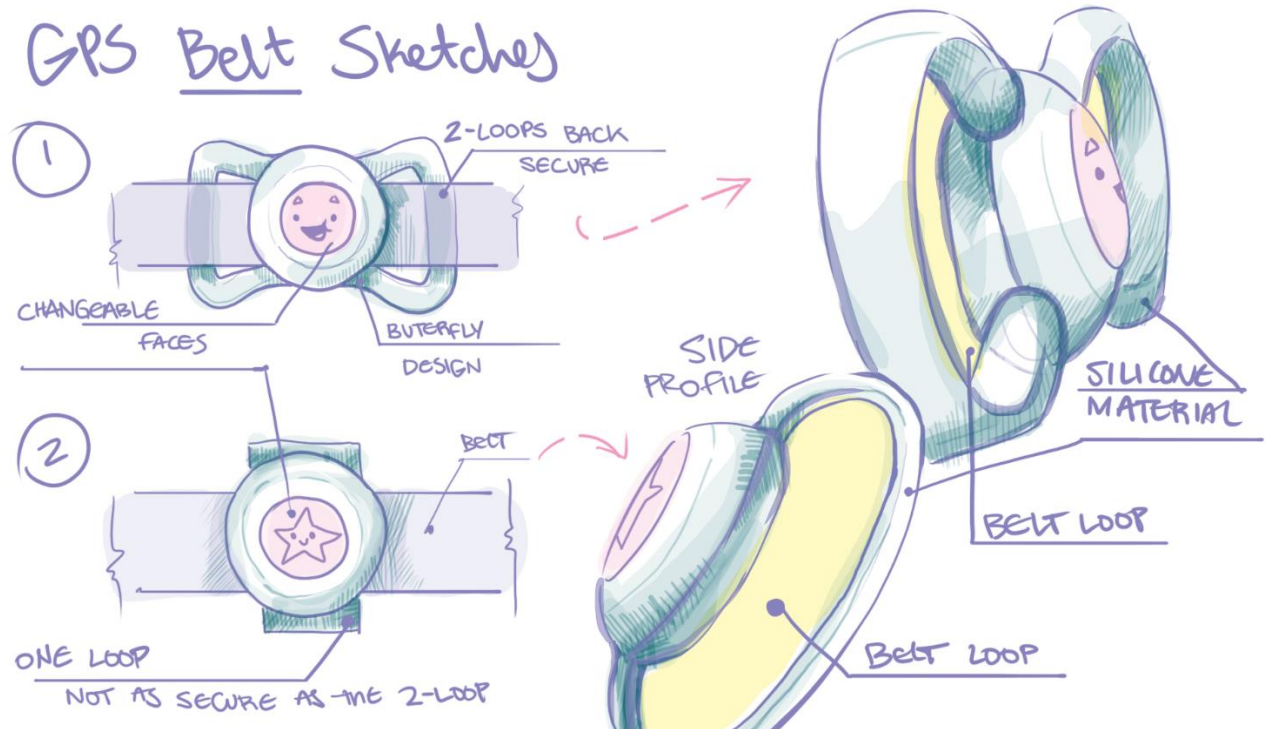


Figure 19: Belt Prod. Sketch

When designing the belt, conscious attention was paid to creating a playful and lively look in the walkie-talkie style. Not only does the design exude color and fun, but it is also structurally reinforced with three points of contact with the belt. This conscious design choice increases stability and ensures the belt stays securely in place during various activities. Essentially, the design approach integrates both practical and aesthetic elements to create a product that is not only functional but also attractive and visually appealing to its intended users.

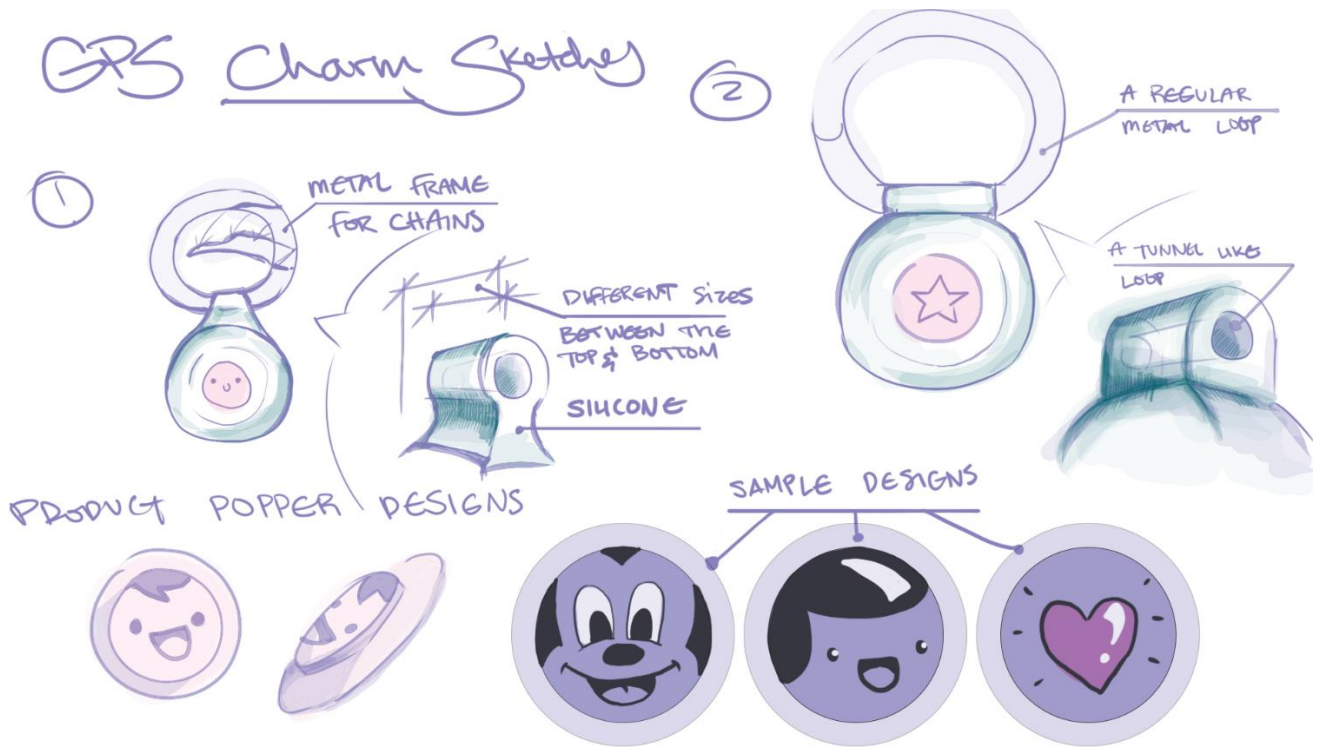


Figure 20: Charm Prod. Sketch

Figure 20, presents two different design options for consideration. The first design features a slim trapezoidal structure with a connecting metal frame and a housing that houses the GPS tag. Although aesthetically pleasing and ergonomic, I foresaw a potential challenge when this design is in the hands of an active child. Given the likelihood of playing outdoors, where the GPS device is frequently attached and reattached to various bags or items of clothing, the shorter top portion appeared prone to breakage after multiple uses. This vulnerability arose from the stress and pull exerted on the relatively small area.

To address this issue, the second design option was developed to improve durability through pressure displacement. This design ensures uniform contact area and thickness throughout the entire connection between the metal loop and the main body. The result is a structurally sound and robust construction that better withstands the rigors of a child's active lifestyle. This thoughtful customization ensures the longevity of the GPS device and allows it to withstand the various pressures it may be subjected to throughout its life cycle. The emphasis on

solid and durable design underlines the commitment to delivering a reliable and durable product that can withstand the wear and tear associated with a child's playful activities.

4.4 Packaging Design

The product is available in two variants: as a standalone item or as part of an enticing bundle set. The packaging strategy is designed to maximize affordability without compromising on visual appeal that captures the interest of children and parents.

In *Figure 21*, we look at the structural layout and assembly details of the bundle set. To keep costs under control, the main packaging adopts the simplicity of the widely used FEFCO 0427 standard layout, a choice attributed to cost-effective production values. Despite its straightforward design, the primary packaging is carefully decorated with eye-catching graphics that ensure it remains aesthetically pleasing and attractive to both young users and their parents.

To focus attention on the internal structure, a strategic layering method is used. The thickness and depth of each GPS device determines placement, with approximately half of each device subtly peeking through a carefully designed, larger leveling paper for placement. This not only serves to secure the products during transport, but also increases the visual experience when unpacking. The deliberate presentation aims to be visually appealing, add extra excitement to the unpacking process and increase the child's enjoyment.

This combination of a straightforward external packaging design and an attractive internal layout strikes a balance between cost-effectiveness and a pleasant user experience. The aim is to deliver a product that is not only accessible to a wider audience, but also provides the child with a visually appealing and entertaining experience, thereby increasing the overall appeal of the GPS device.

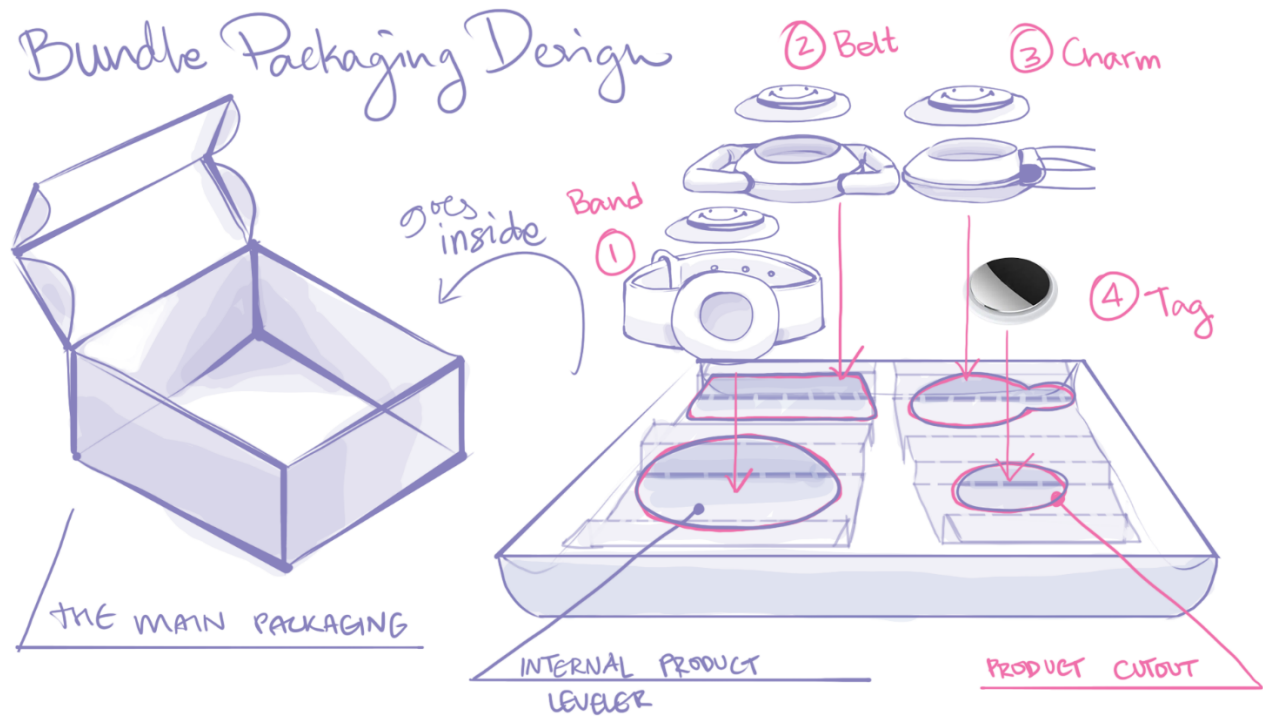


Figure 21: Bundle Package Sketch

In Figure 22, we provide a detailed overview of the assembly process of each product packaging. This illustration shows the careful arrangement of the band, buckle and charm designs within the packaging, ensuring a good fit and optimal space. In keeping with our commitment to affordability, minimal changes are made to the primary packaging.

The product's cost-effective approach is reflected in the optimized packaging layout, where certain components follow a consistent order. The order for each packaging layout is carefully coordinated: starting with the push button, followed by the selected GPS product, the GPS tag and finally with the manual. This standardized order not only simplifies the packaging process, but also contributes to overall production efficiency, allowing us to maintain an affordable price while delivering a well-organized and easily accessible product for our users.

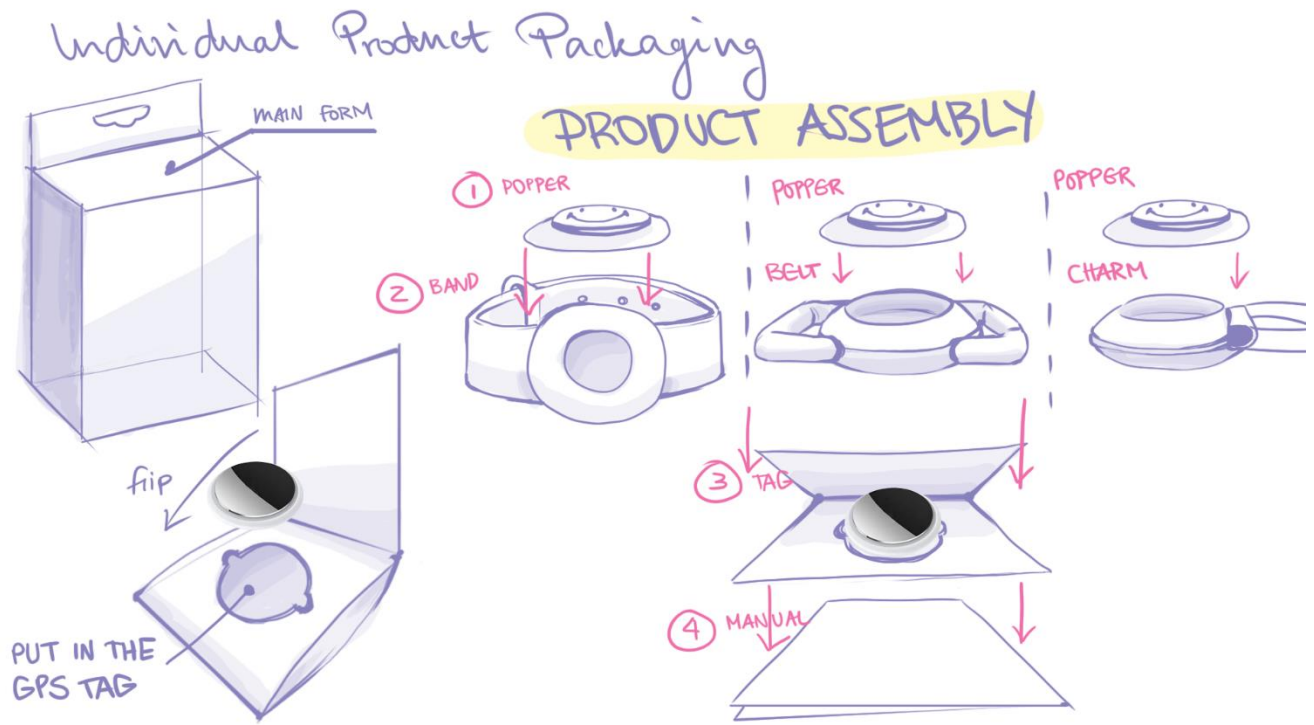


Figure 22: Individual Packaging Sketch

4.4 Material Research

4.4.1 GPS Product

For the material of the multi-functional GPS devices, I thought it would be best to incorporate silicone as the main material for production. Understanding that there might be children who have metal allergies or who are hypersensitive to material textures, the smoothness of the silicone and the availability and production ability of injection molding for mass manufacturing made silicone the most optimal material.

Silicone in society today is used in a myriad of fields, from cosmetics, aerospace manufacturing to electrical products; it's strong, malleable, synthetic, nontoxic, noncarcinogenic and non-hypoallergenic properties have made it a favorable compound to work with (Shit & Shah, 2013) (Surg, 2023). Since the material has natural elastic properties, producing the GPS tag holders—the products themselves, closely engulfing the tag would provide protection from dust and small amounts of water droplets, making it semi-waterproof. Such protection from the

environment, according to the Pacer group IP Code, will allow the product to be categorized as at an IP level code of IP54 (*Understanding IP Certification*, n.d.).

4.4.2 Packaging

In the pursuit of accessibility and financial affordability, thorough research has been carried out on the packaging materials. Double-sided coated corrugated cardboard with a thickness of 0.6 mm has proven to be the ideal choice for bundle packaging. This material strikes a balance between durability and cost-effectiveness, ensuring the integrity of the bundle set while meeting budget constraints (Jackson, 2012).

Likewise, for the individual product packaging and the internal materials in which the products are located, a thin gray corrugated cardboard with a thickness of 0.45 mm was considered sufficient. This choice optimizes both structural stability and economic considerations and is consistent with the overall goal of making the product accessible to a wide range of users.

By strategically selecting these materials, the packaging not only meets the required standards for strength and protection, but also contributes to the overall affordability of the product. This approach ensures that the packaging remains robust enough to protect the contents while remaining within the budget of the intended audience. (*550g 600g 750g 800g Corrugated Medium Paper Grey Board For Bible Covers*, n.d.).

4.5 Cost Evaluation

After conducting a comprehensive competitive analysis and examining each GPS tag price range, the estimated cost of production for a single GPS device is approximately \$5. This assessment takes into account the economies of scale for larger orders that arise from the competitive landscape. Taking into account the material costs for packaging and the pressure assembly process, the total production cost for a single GPS device is expected to be around \$10.

Taking into account the current USD-HUF exchange rate, the unit price for a single GPS product is likely to be between 3,500 and 4,500 HUF, depending on the variant. Extending this cost calculation approach to the product package, the estimated price for the package is expected to be between HUF 7,000 and HUF 7,500. These price forecasts are carefully calibrated to strike a balance between affordability and utility for consumers, ensuring that products remain accessible to a wide audience while adequately covering associated production and packaging

costs. The aim is to provide a cost-effective solution without compromising on the quality and functionality of the GPS device, making it a valuable and accessible tool for the target audience.

4.6 Branding



Figure 23: Lolo Branding

When formulating the brand strategy for my product, I wanted to create a name that would effortlessly capture the imagination of children, which led to the creation of the endearing nickname “Lolo, Your Location Buddy.” This choice was based on the goal of creating a product identity that was not only memorable but also easy for children to pronounce and remember. The goal was to create a brand that felt like a friendly companion (Wheeler, 2003).

When designing the visual identity, bright and lively colors were deliberately used. The chosen palette should evoke feelings of joy, fun and boundless energy, creating an aesthetic that is visually appealing and uplifting for the young users. The visual elements have been carefully curated to reflect the exuberance and playfulness of childhood (Wiedemann, 2017).

To further increase the brand's appeal to the younger audience, I introduced a charming mascot inspired by elements such as the well-known location pin icon. This lovable character, combined with playful circular typography and additional colorful graphic elements, helped

develop a brand identity that is cohesive, appealing and visually enticing. The intention was to go beyond mere functionality and give the brand personality, making it understandable and entertaining for children.

The comprehensive approach, which seamlessly combined a catchy name, vibrant colors and a quirky mascot, resulted in the creation of a complete and compelling brand identity. This identity is specifically designed to resonate with the children's target audience and to promote a positive and lasting connection to Lolo, Your Location Buddy. The brand sees itself not just as a product, but as a friendly companion that accompanies children on their adventures, offering both practicality and joy.

4.7 Product Design, Technical Drawings and Assembly

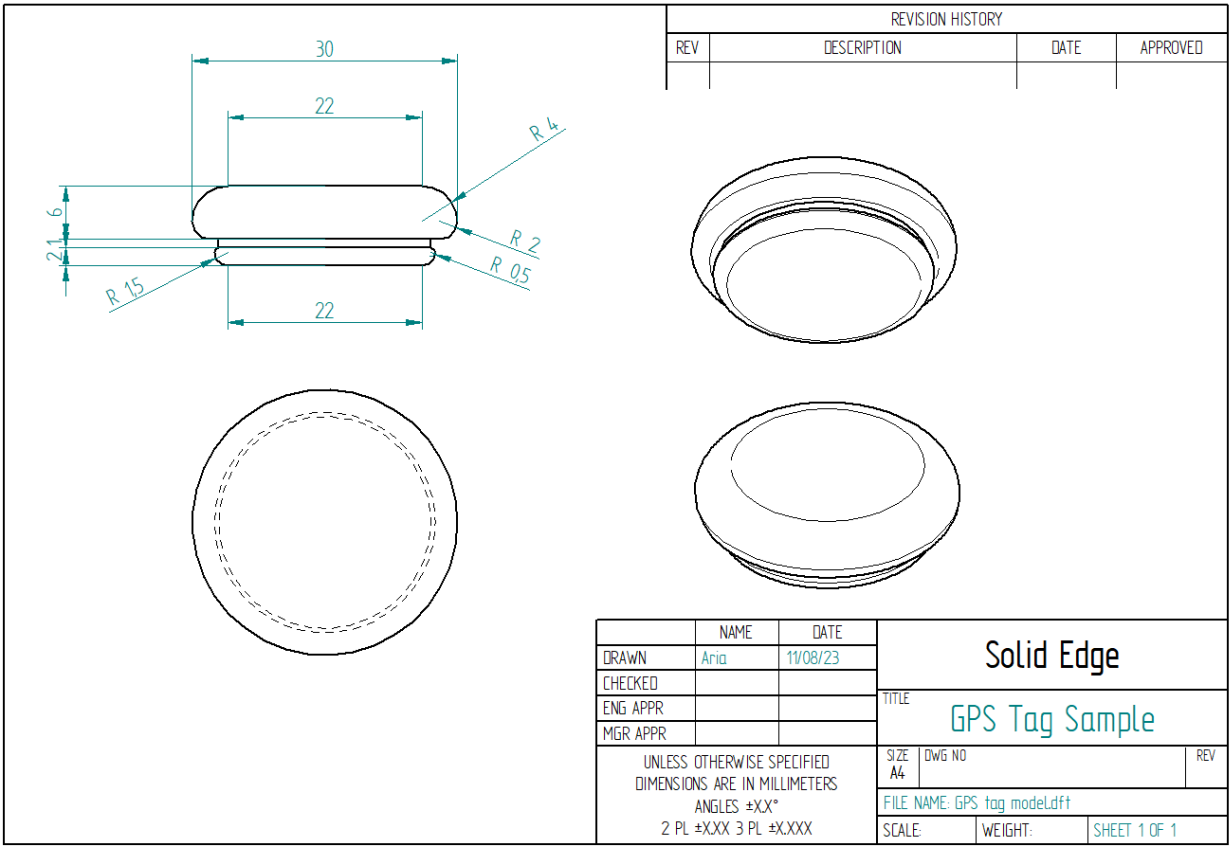


Figure 24: GPS Tag Sample

In order to streamline the product design process for other components, I took the initiative to create a sample GPS tag model. This proactive step was taken with the intention of facilitating

and speeding up the entire design workflow and providing a tangible and visual reference for the team. By developing this GPS example tag model, I wanted to provide a practical tool that contributes to the efficiency of the design phase and helps in conceptualization and decision-making throughout the development of the overall product.

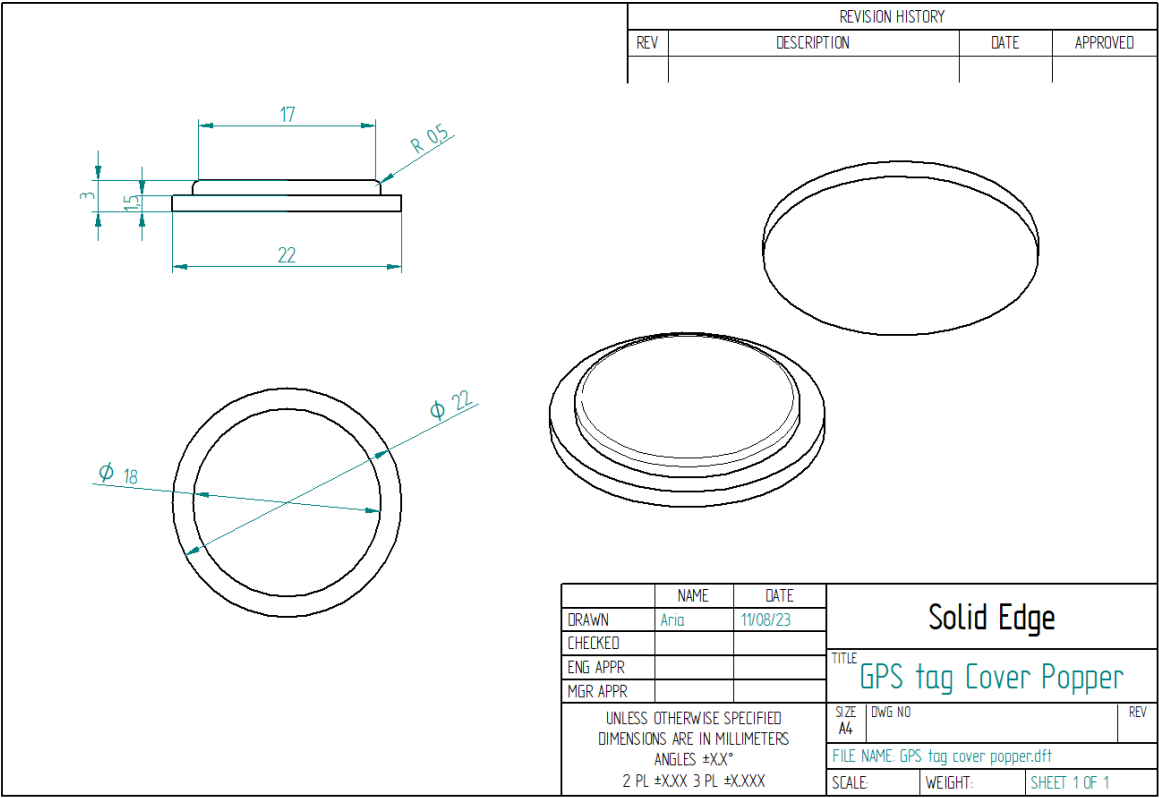


Figure 25: GPS tag Cover Popper Technical Drawing

To ensure the durability of all designs, the precise fit of the push button in the main body of the GPS product is the crucial element that makes them waterproof and dustproof. This good fit is achieved through the precise silicone-on-silicone contact, creating a secure seal that effectively protects the GPS tag from external influences. *Figure 25* shows the detailed dimensions for the popper. Notably, the center is intentionally thicker than the surrounding edges, a conscious design decision aimed at reinforcing stability. This increased thickness is critical to withstand frequent attachment and re-attachment of the snap to the main body, ensuring durability and long-term protection for the GPS device. Careful attention to these design details guarantees the reliability of the waterproof and dustproof properties and improves the overall robustness and effectiveness of the product in various environmental conditions.

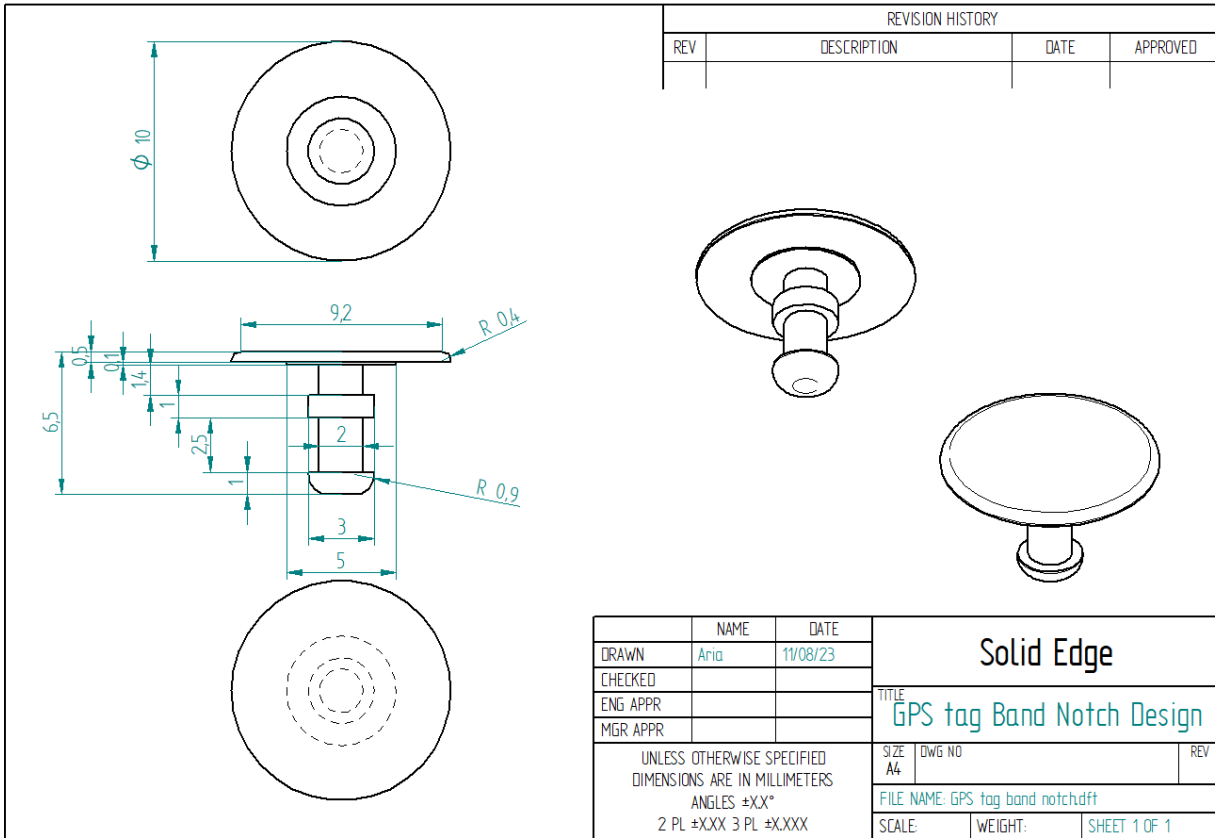


Figure 26: GPS tag Band Notch Technical Drawing

Made entirely of silicone, the band model takes advantage of the material's renowned flexibility and comfort. To increase durability and strength, a distinctive notch has been carefully designed as a separate component. This special notch is made from a more robust plastic material, selected with precision to ensure durability and strength, especially in the critical area around the wrist. The aim of this strategic design decision is to ensure a secure and reliable fit, significantly improving the overall stability and functionality of the band while ensuring the greatest possible comfort. Through careful consideration of materials and design elements, this approach ensures that the band model not only offers flexibility, but also emphasizes durability and comfort, providing a balanced and reliable solution for its intended users.

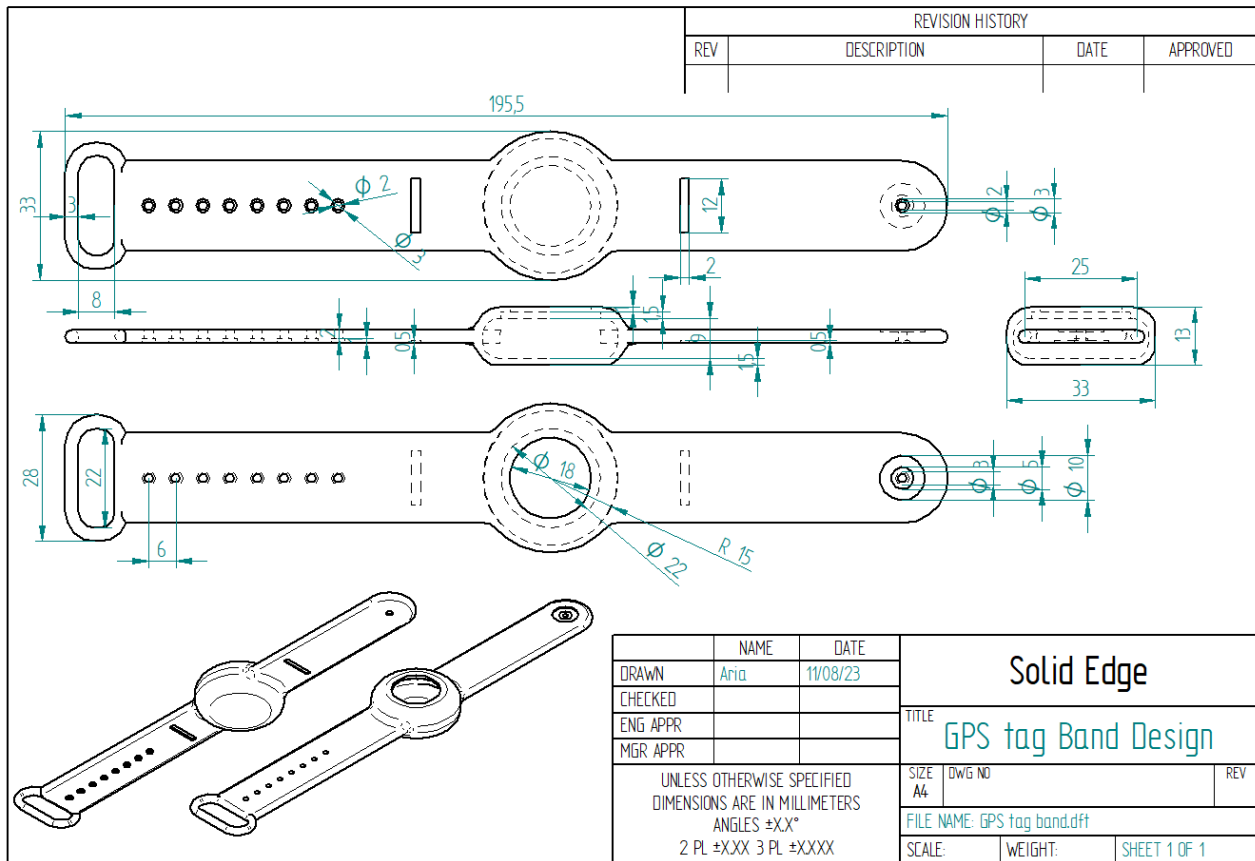


Figure 27: GPS tag Band Technical Drawing

Figure 27 clearly shows the dimensions of the tape and indicates the aspect ratio in which the product will be manufactured. A crucial aspect of the design is to ensure that the band remains child-friendly even on the shortest setting. With this setting, the circumference is 125 mm and is therefore tailored to the needs of small children aged 18 to 26 months (*Children's Jewellery Size Guide | Kids Jewellery Measuring, n.d.*).

The band is carefully tailored to the child's growth and has several adjustment options. This flexibility allows the band to adapt to the child's increasing size over the years. By adapting to further adjustments, the band remains a useful and comfortable accessory for the child, ensuring that it can serve them for a longer period of time as they continue to grow. This thoughtful design approach reflects a commitment to creating a product that not only meets the immediate needs of young children, but also provides long-term value to the child throughout their various developmental stages.

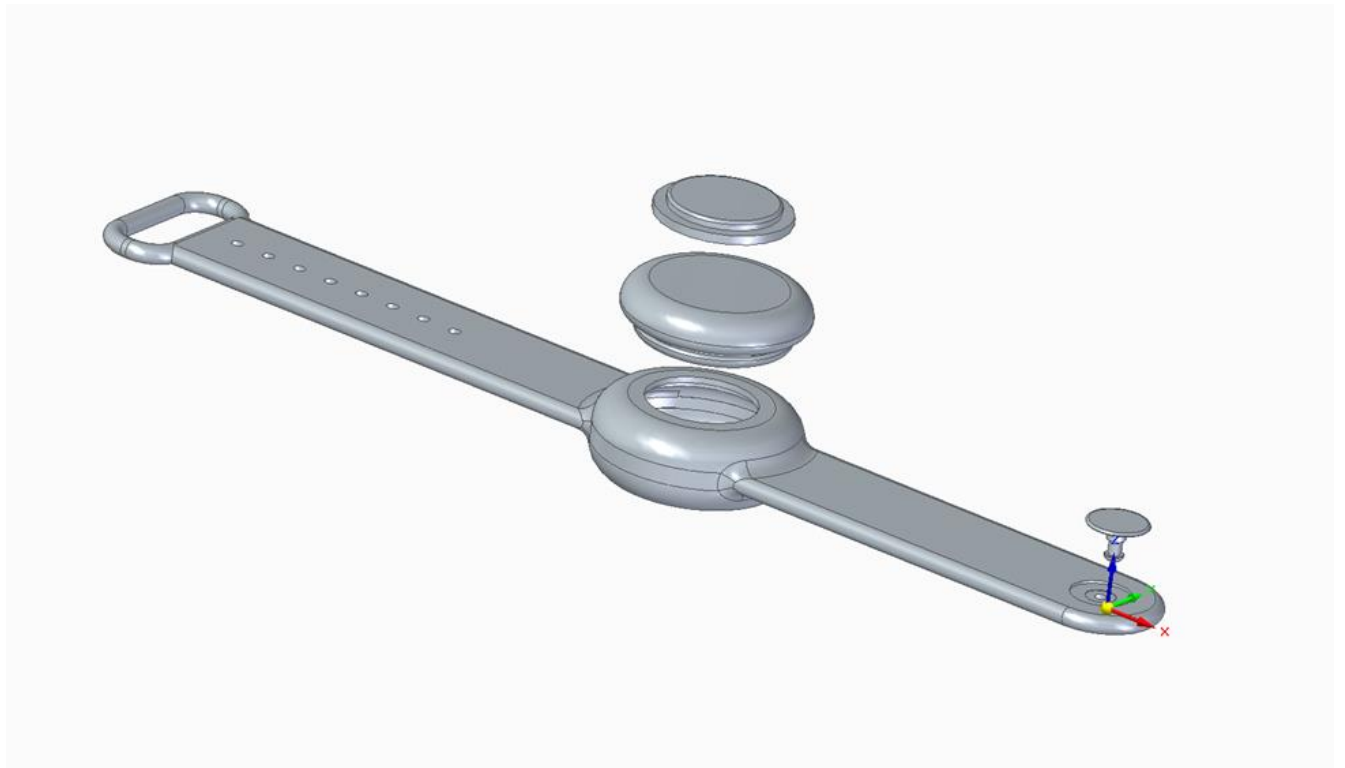


Figure 28: GPS Band Product Assembly

Figure 28 shows the GPS band assembly process. The sequence begins at the top with the topper, followed by the GPS tag, the main body and finally the band itself. This strategic arrangement ensures systematic and secure construction of the GPS band and allows each component to be seamlessly integrated into the next.

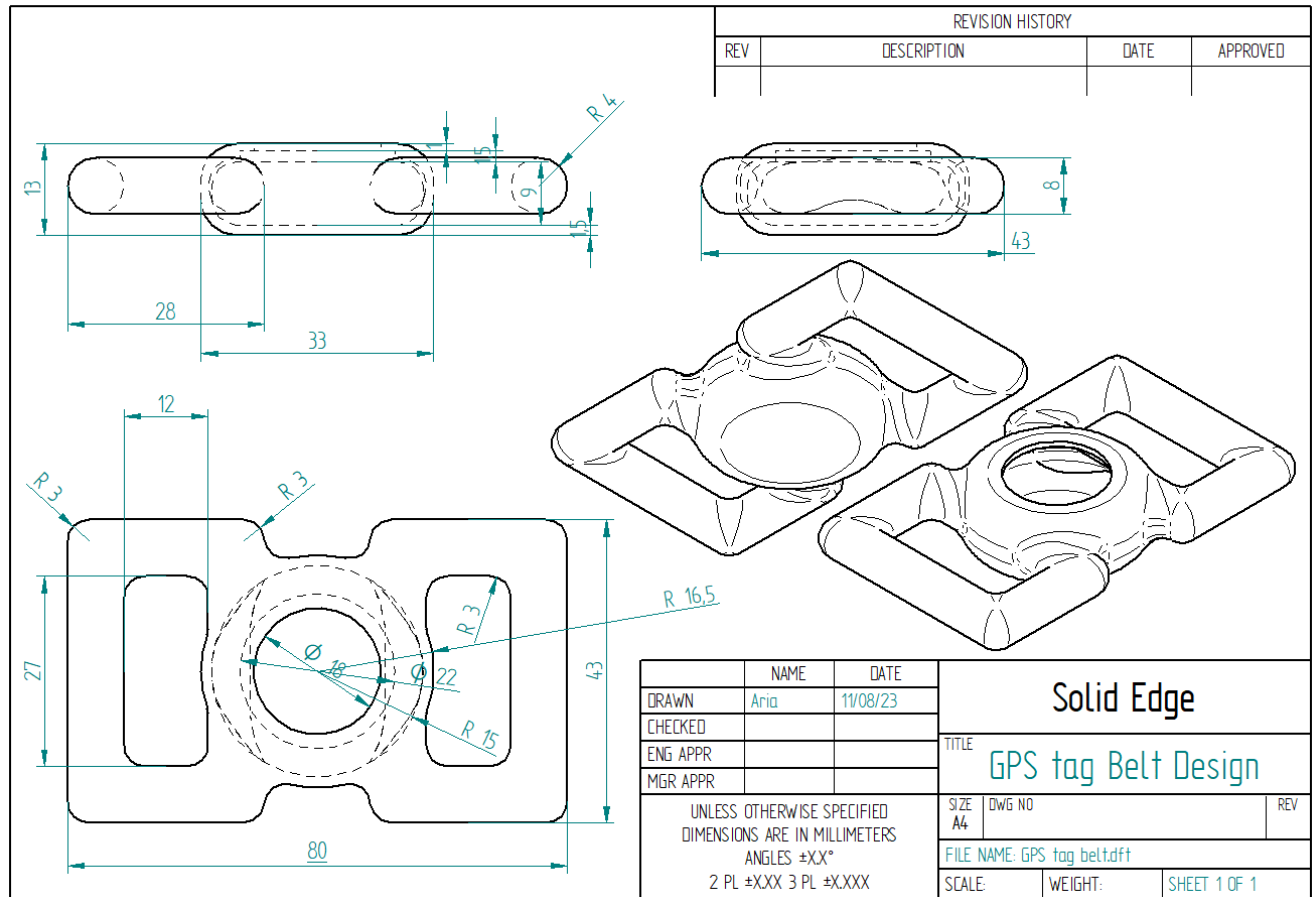


Figure 29: GPS tag Belt Technical Drawing

Figure 29 shows the construction of the belt design in detail. Since this design is in direct contact with the child's clothing, special attention was paid to the two sleeves on the sides. These arms feature a stable thickness to ensure that the product remains securely attached to the belt and minimizes the risk of detachment during various activities.

The belt design strategically includes three touch points along its length. These touch points are strategically positioned to ensure a stable and stationary position for the GPS device, providing safety and reliability while giving the child the freedom to engage in various activities. This careful design consideration aims to strike a balance between stability and freedom of movement, ensuring that the GPS device stays securely in place while the child goes about their daily adventures.

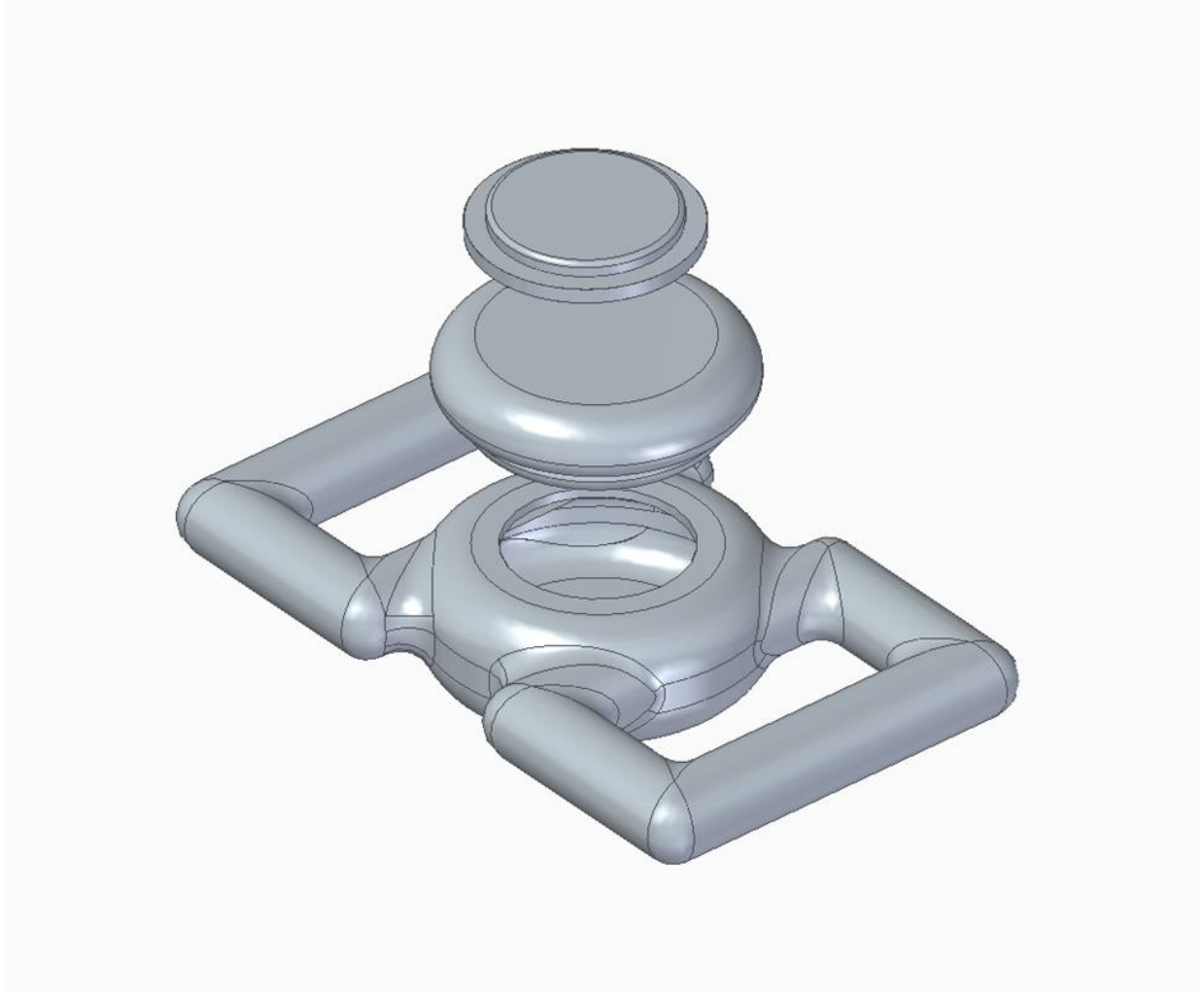


Figure 30: GPS Belt Assembly

In *Figure 30*, the assembly of the belt design is clear and visible. Again following the arrangement of the popper, GPS tag, and the main body of the belt design.

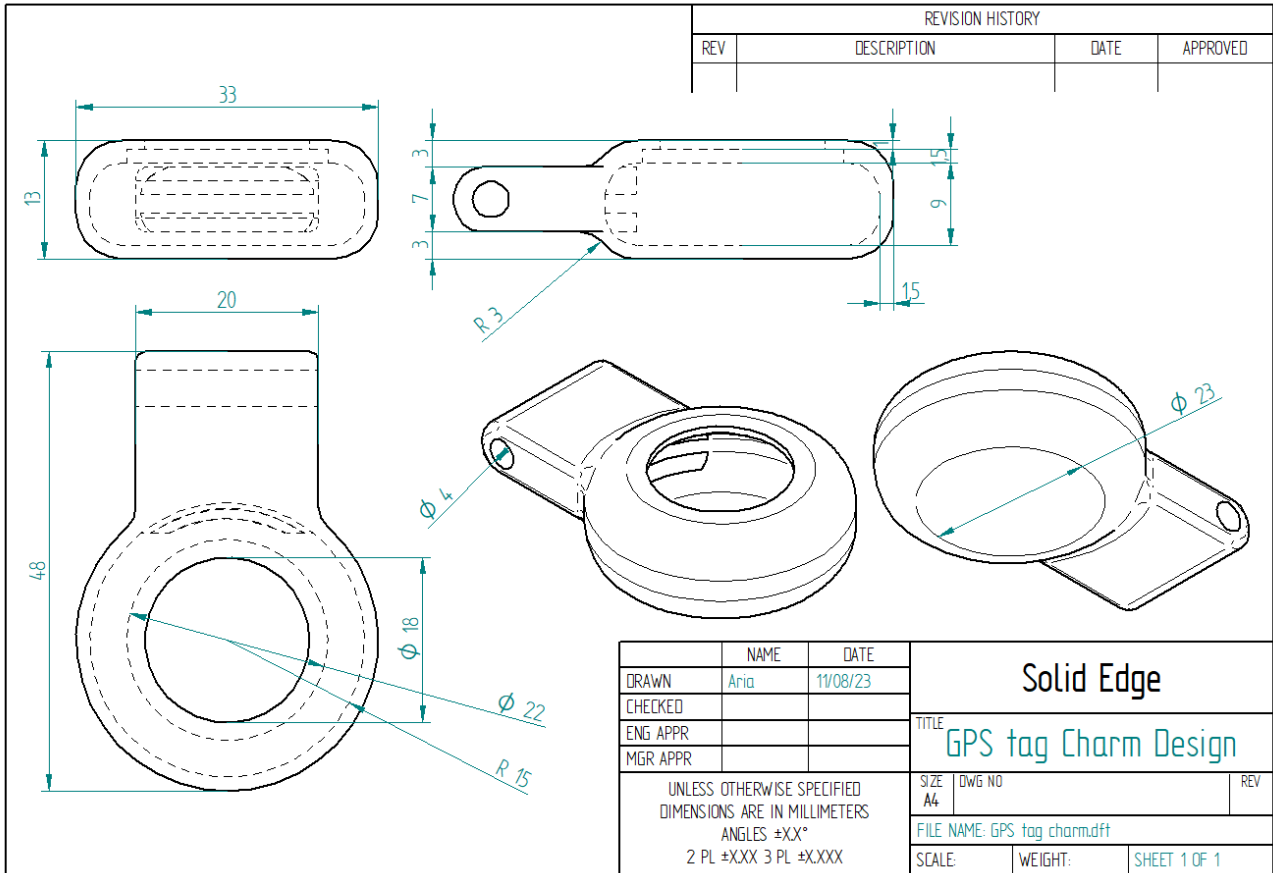


Figure 31: GPS Charm Technical Drawing

Figure 31 carefully shows the technical dimensions for the charm design. Notably, the extruded neck portion of the charm design maintains a consistent thickness. This conscious design choice ensures a consistent and secure structure and highlights the importance of stability in the overall design of the charm. The uniform thickness in the extruded neck area contributes to the robustness of the trailer and provides a reliable and durable basis for mounting the GPS device. This attention to technical details ensures that the charm design not only meets aesthetic considerations, but also focuses on practical aspects, ensuring the safety and longevity of the overall design.



Figure 32: GPS Charm Assembly

In *Figure 32*, the assembly of the charm design is clear and visible. Again, following the arrangement of the popper, GPS tag, and the main body of the charm design.

4.8 Packaging design, technical drawing, and Assembly



Figure 33: Bundle Graphic Design

Figure 33 shows the graphic design of the bundle set's FEFCO 0427 standard die cuts. Product images are clearly visible on the cover, clearly indicating that the belt, charm and band are safely contained within the packaging. This graphic representation on the cover serves a dual purpose: not only does it provide a visual preview of the included products, but it also enhances the overall aesthetic of the bundle set. This strategic design approach aims to capture the

consumer's attention, communicate the content effectively and create an attractive and visually appealing packaging design for the GPS products.

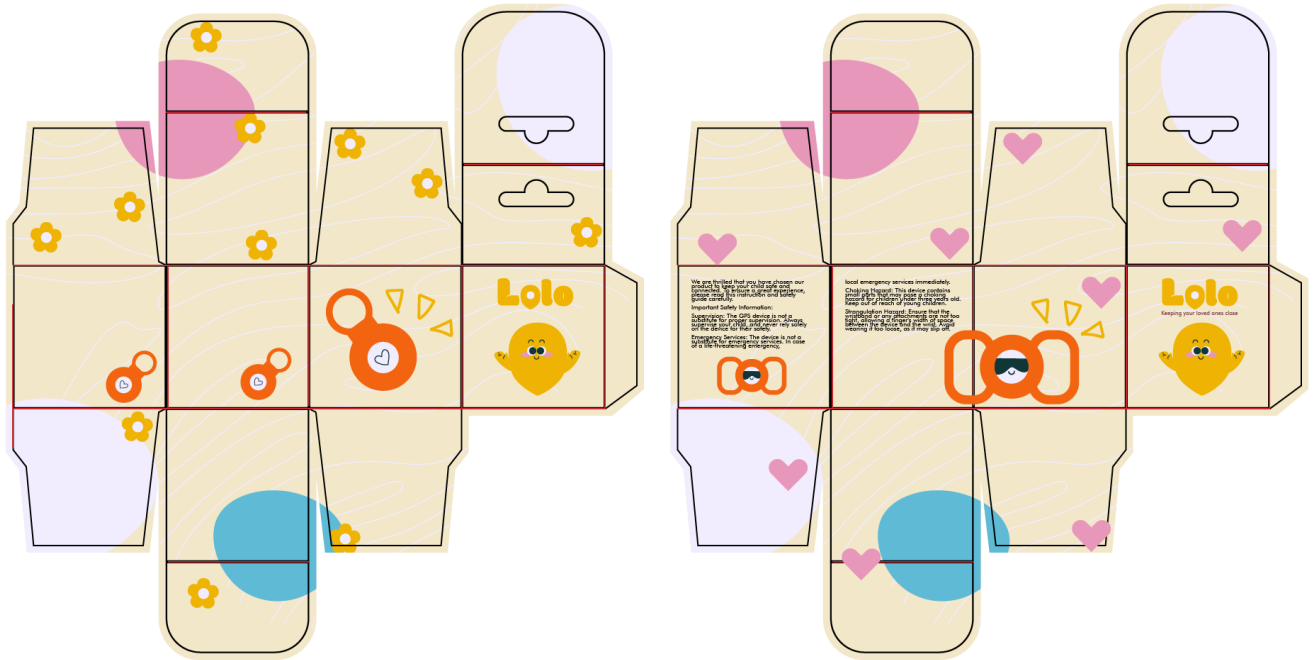


Figure 34: Individual Product die cut graphic design

In line with our commitment to a user-friendly experience, our packaging is designed to be intuitive and informative. Depending on the individual GPS product selected, our packaging will clearly show whether it contains the tag or the belt, as seen in *Figure 34*. This clear and visible distinction ensures that customers can easily identify and select the specific product variant that suits their preferences and needs. By providing transparent and straightforward information on-pack, we aim to improve the overall customer experience and enable users to make informed decisions with ease and confidence.

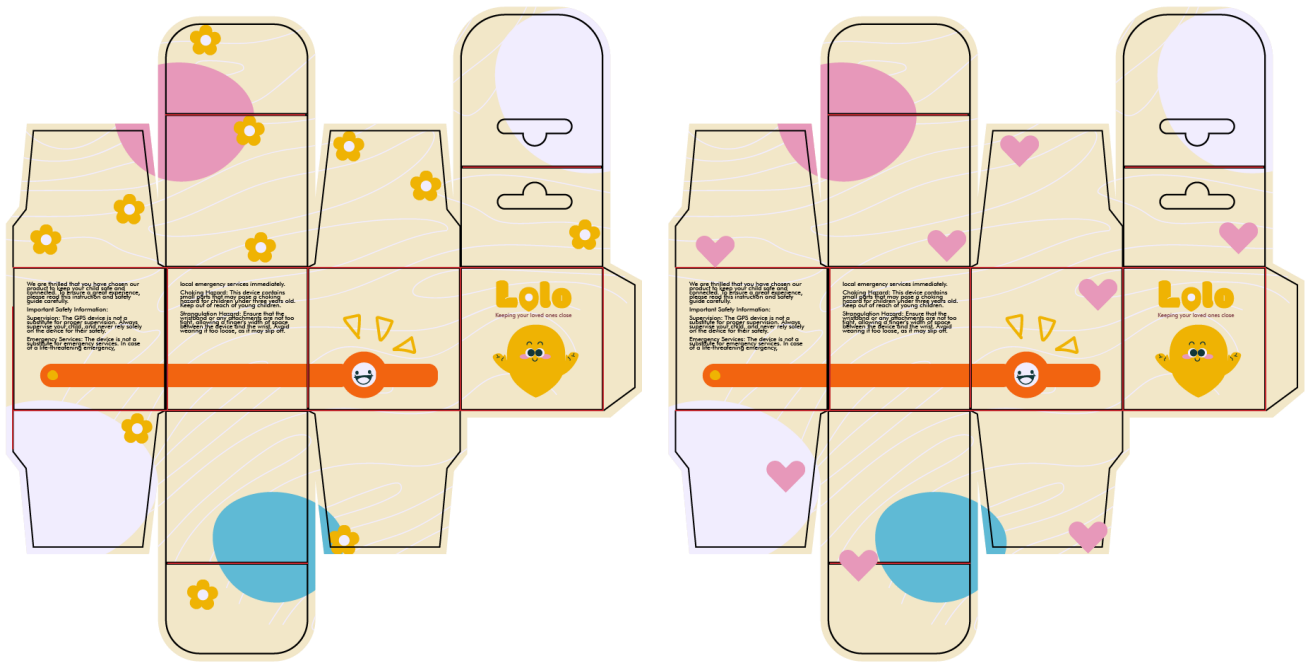


Figure 35: Individual different popper die cut graphic design

Furthermore, when we present the same product with a modified design of the popper, we have the opportunity to increase the attractiveness of the packaging by introducing charming embellishments. Examples of these improvements include an adorable flower-shaped popper and an adorable heart-shaped popper, as seen in *Figure 35*. These small, decorative details not only add visual interest to the packaging, but also serve as a delightful preview of the unique design elements incorporated into the product itself. This thoughtful approach enhances the overall aesthetics of the packaging, creates additional excitement for the customer and emphasizes the uniqueness of each product variant.

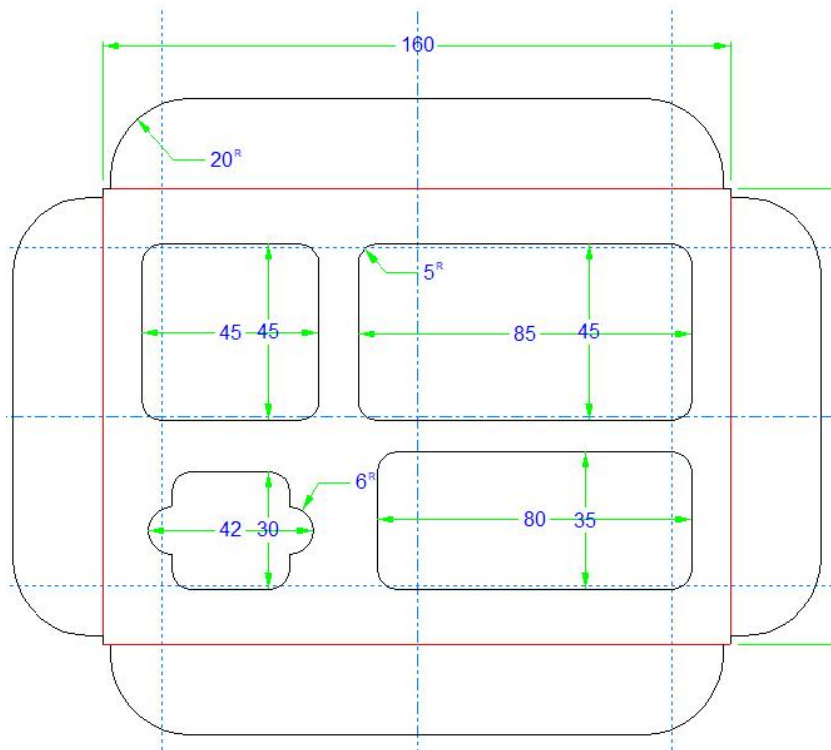


Figure 36: Technical Drawing of the Bundle Box Product Container

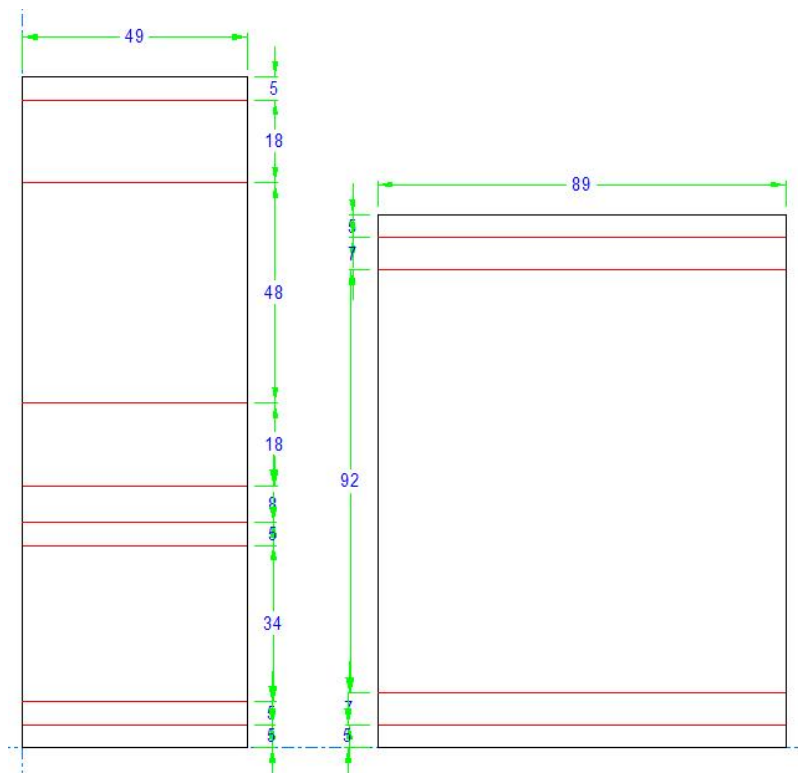


Figure 37: The Technical drawing of the Bundle Box weight supporter

Here you can see the technical drawings of the Lolo Bundle Box's internal product holding technical drawings. On the left side, in *Figure 36*, in between the cuts, the PGS devices will be placed to ensure that they are secure in place. In order of the arrangement, on the top left corner, the GPS Band, on the top right corner, the GPS Belt design, on the bottom left corner, the GPS tag, and on the bottom right corner, the GPS Charm designs will be placed. To ensure that the products are easily picked up, a weight support is placed at the bottom of the products, so that at all times nearly half of the product is peaking out of the container.

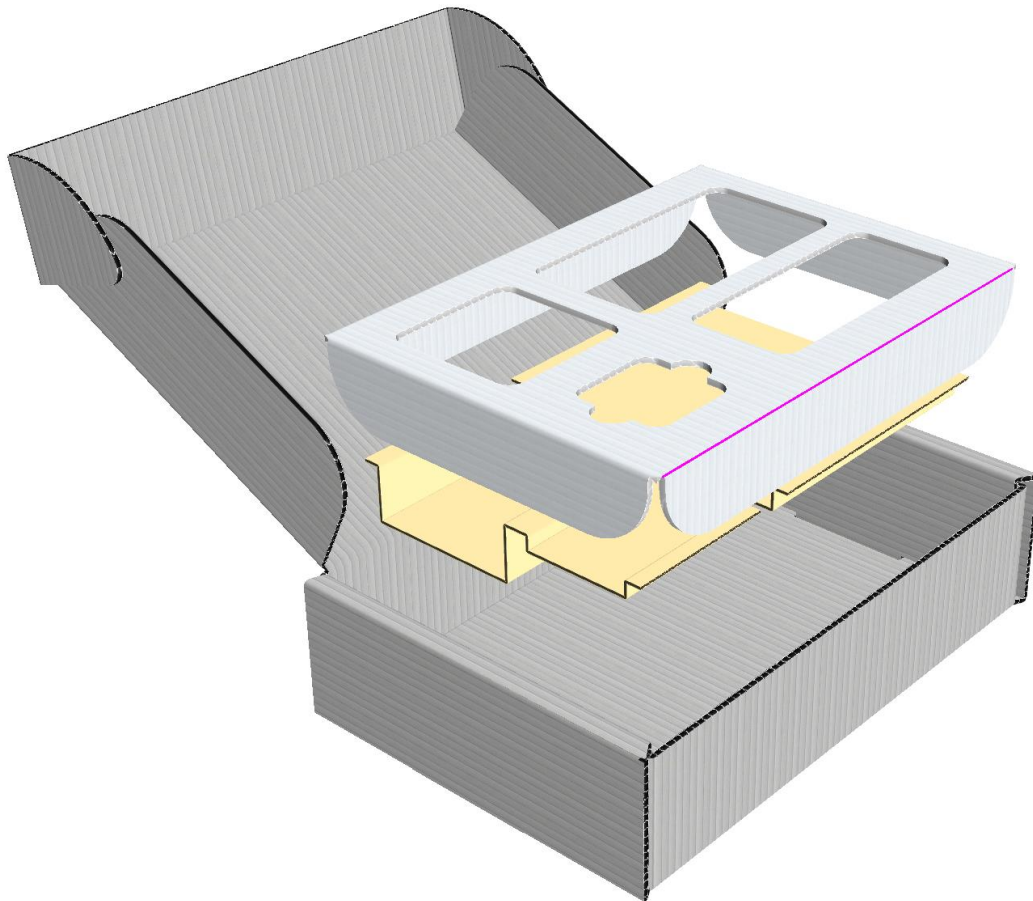


Figure 38: Bundle Packaging Assembly

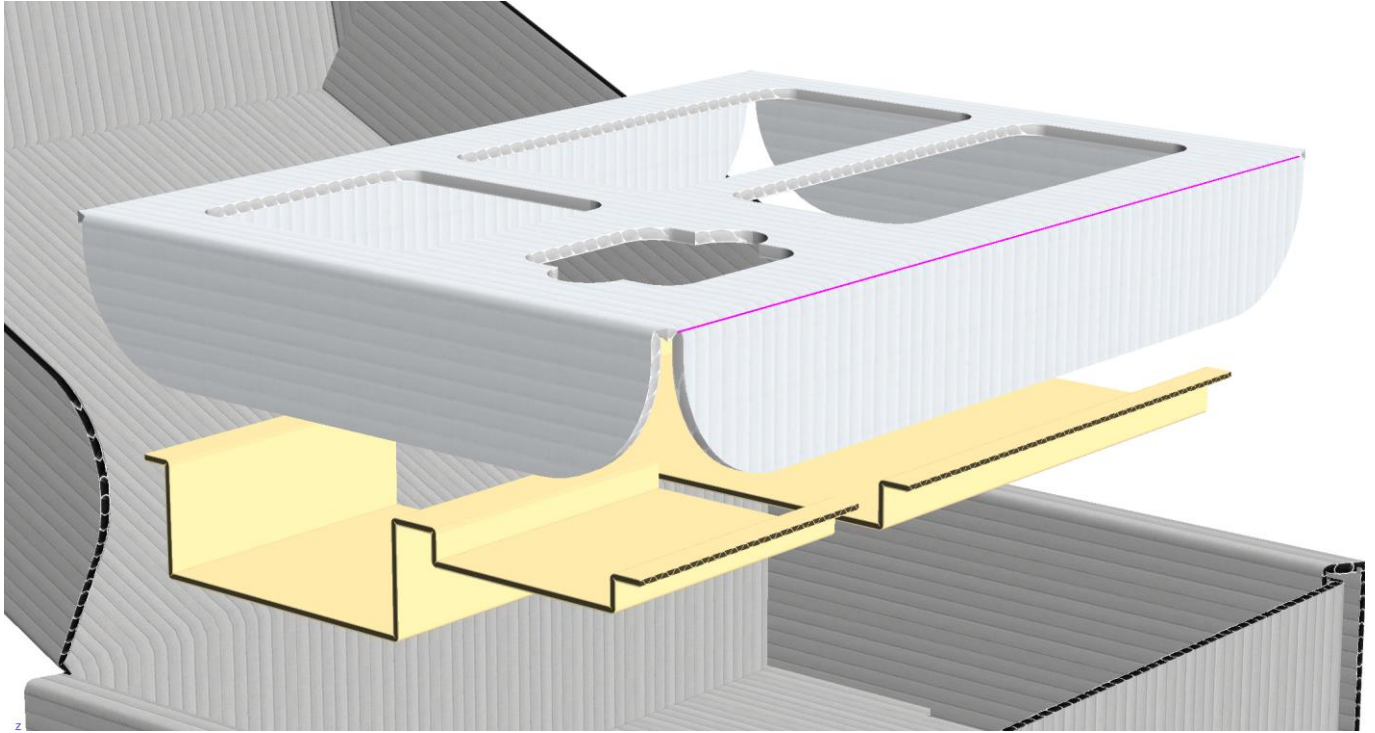


Figure 39: Close up Bundle Packaging Assembly

Figure 39 shows the assembly of the bundle box set in detail. The picture shows that the main plate of the product holder is firmly glued to the weight support part below. This strategic arrangement ensures structural integrity and stability of the products in the box set.

The weight carrying board is cleverly folded according to the depth and thickness of the respective product. This careful folding process ensures that each product is precisely positioned, allowing approximately half of each GPS device to gently peek out over the mount board. This conscious design choice not only ensures products stay in place during transport, but also improves the visual presentation when unpacking. The result is a carefully crafted and visually appealing assembly that holds the products in an organized and aesthetically pleasing arrangement within the bundle box set.



Figure 41: GPS Device Product and Box Bundle Assembly

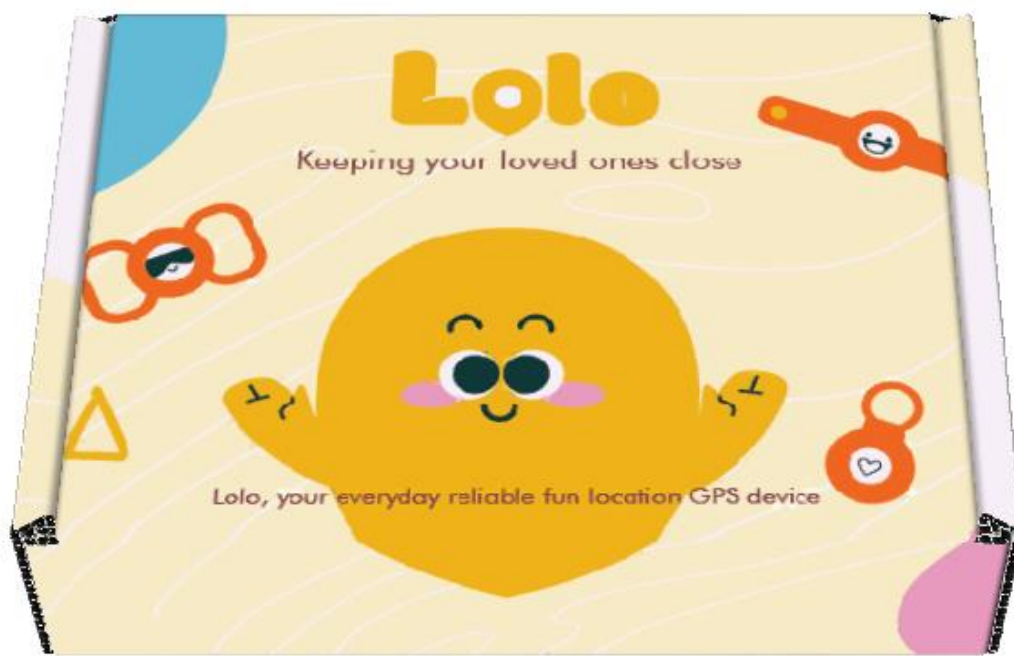


Figure 40: The Bundle Box with Graphics

4.9 User Interface Design



Figure 42: User Interface

The mobile application plays an important role for parents or caregivers in monitoring the whereabouts of their children. In *Figure 42*, the left side shows the Lolo application, staying true to the branding with consistent graphical elements. When users click on the application, they are seamlessly redirected to a map interface. This map allows parents and caregivers to securely view the location and distance of the GPS device in real time, providing a user-friendly and intuitive experience to keep track of their children. The application's graphical coherence and user-centered design aim to improve overall functionality and accessibility for parents, ensuring a sense of security and effective monitoring of their child's location.

5. 3D Renders

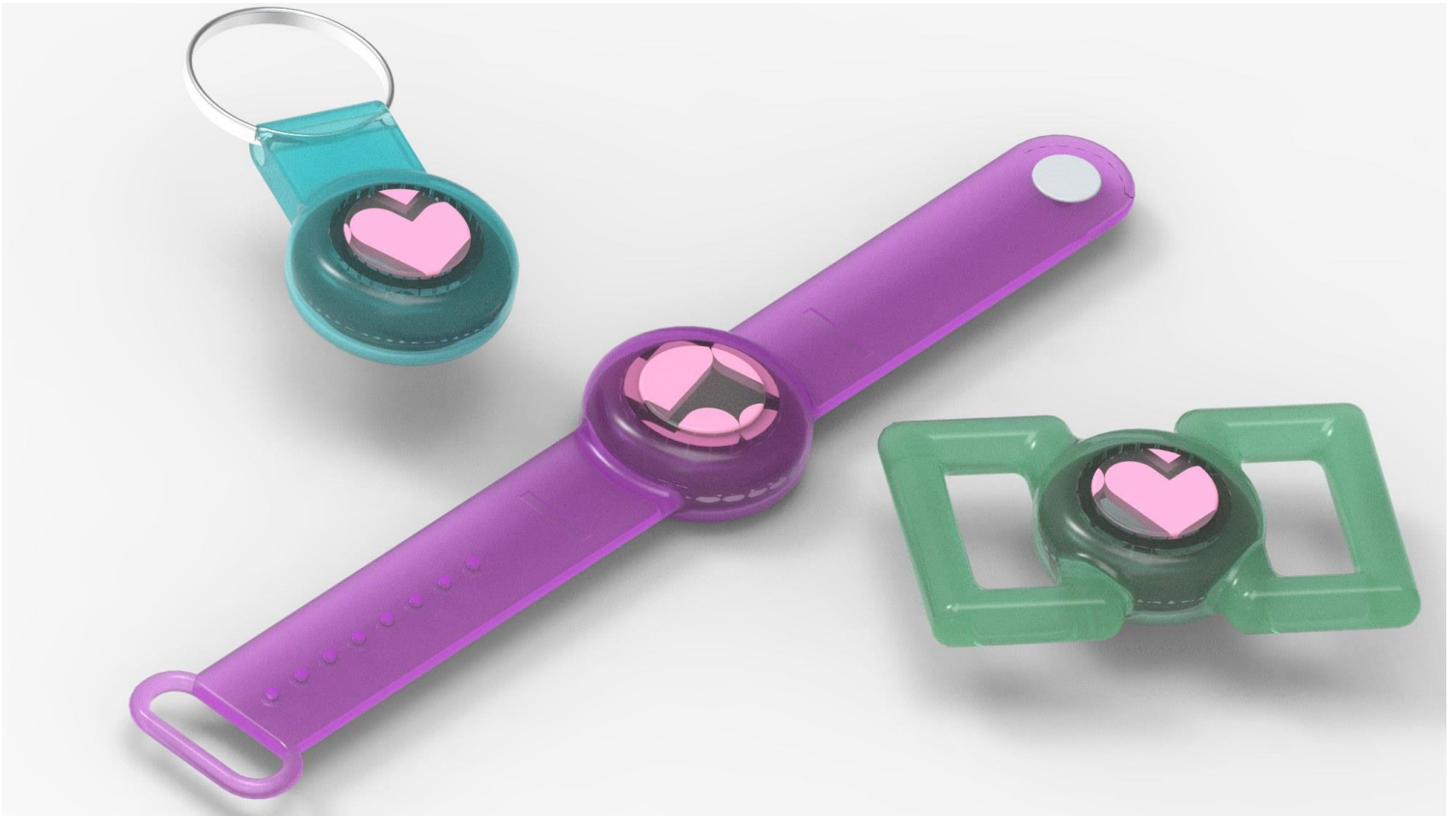


Figure 43: Render 1

The following *Figures 43, 44 and 45* present various renderings to present the products. These renderings include a range of colors and popper designs, showcasing the versatility and customization options available. The diverse color palette allows users to choose a GPS device that suits their preferences, while the popper designs add a touch of personalization and uniqueness to each product variant. These renderings provide a comprehensive visual representation of the product range and highlight the flexibility and aesthetics that users can expect from our GPS devices.

In *Figure 44*, the assembly process of all three products is visible.

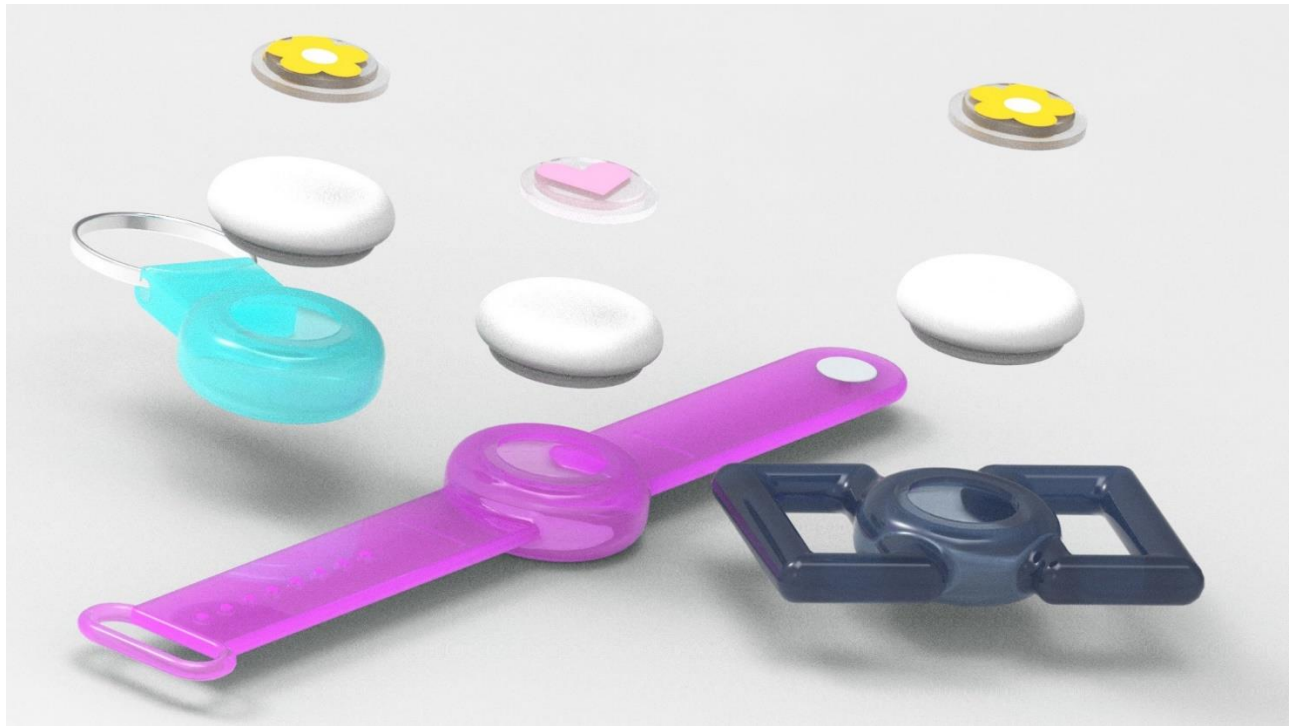


Figure 44: Render 2

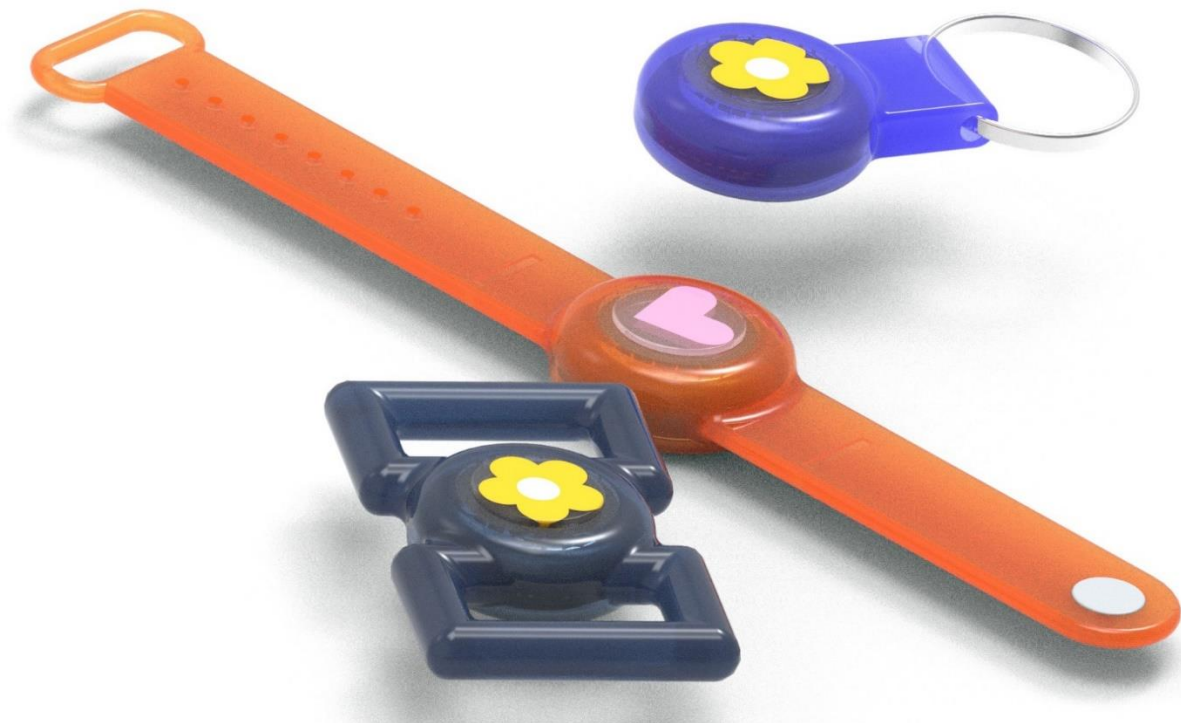


Figure 45: Render 3



Figure 46: GPS Band Live Render



Figure 47: Charm Live Render



Figure 48: Belt Live Render

6. Conclusion

Researching and developing these multifunctional, kid-friendly GPS devices took me on a journey through different phases of ideation and conceptualization. It all started with a childhood anecdote that sparked my curiosity to delve deeper into the unfortunate reality of missing children worldwide. This newfound awareness ignited a passion within me and fueled my creative efforts to develop a solution that was both functional and playful, bringing joy not only to the children but also to their parents.

As I reflect on this project, I feel inspired to continue its development beyond my academic years. The ultimate goal is to establish a product line that goes beyond the needs of many hopeful children. It is aimed at anyone looking for a cheerful and expressive tracking device. This aspiration drives me forward, motivated by the potential positive impact such a product line could have on individuals and families, bringing both practical functionality and a touch of joy into their lives.

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