I am a helicopter

Exploring the process of learning to fly

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Zurich University of the Arts
2014

Acknowledgments

First of all I would like to thank my mentors Gerhard Buurman and Max Rheiner for their support during this rather unique project.

Thanks to the Helipro team in San Luis Obispo for always keeping me safe up in the air.

A big thank you to Barb and Claude for being such lovely hosts.

A very special thank goes to Florian Jakober, Michael Zehnder and Vera Reifler for helping me with editing and designing the diary book.

And thanks to Cathrine Lutz for helping me with the english texts.

Further I would like to thank Adrian Guerrazzi, Barbara Hoffmann, Chiara Frei, Daniel Diethelm, Javier Aguayo Minguito, Jürgen Späth, Moriz Oberberger and Karmen Franinovic

12. May 2014

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Abstract

Our streets are becoming increasingly congested. Aerial vehicles, with the ability of taking off and landing vertically, present a promising alternative to this problem. But the challenging task of controlling these vehicles, the risk of fatal accidents, and many other factors make it hard to introduce these technologies to a broader public.

As my vehicle of interest, the helicopter brings us very close to this freedom of movement, thus making it an excellent subject for my research. In order to gain a deeper understanding of the process of learning to fly, I carried out a self-experiment. Within eighty days, I became a helicopter pilot myself and thoroughly documented every step I made. Using an interactive video installation, I am now sharing my personal experiences and thoughts as an interaction designer

Day 6 – Making myself comfortable with the helicopter controls

Introduction

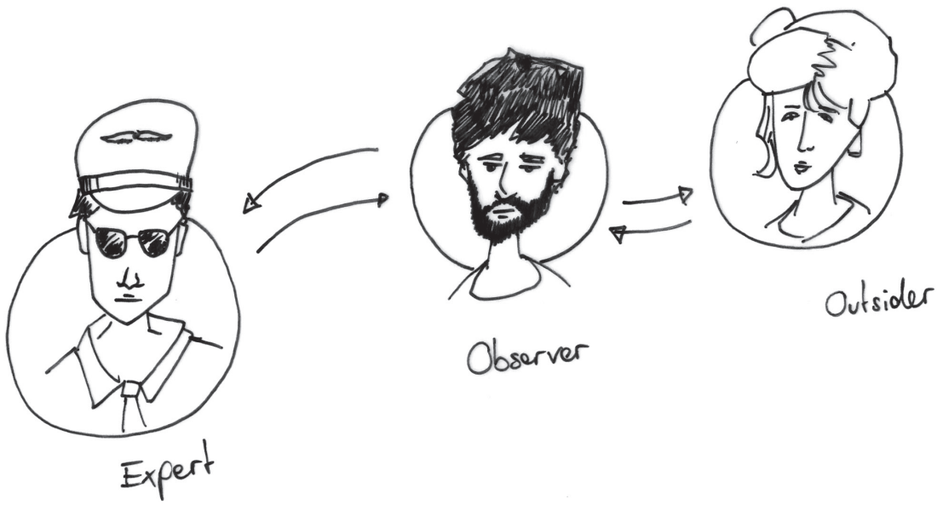
Over the last hundred years flying has become a part of our everyday life. It developed from a dangerous hobby to a deadly weapon in modern warfare and a powerful civil industry responsible for carrying thousands of passengers every day. Consciously and unconsciously we are faced with aviation on an almost daily basis. We use airplanes to go on holidays or business trips and when earthquakes make buildings collapse, helicopters are deployed immediately, evacuating people and delivering life saving goods. It was and still is a slow and gradual process though, especially compared to the rapid development of modern information technology in recent years. Conventional aviation seems to be immune to the current pace of technological developments. The human dream of flying like a bird is almost as old as humankind itself and becoming a pilot is as close as we can get to this dream today. But only a few take the step to go out there and learn to fly. So why are you no pilot? Maybe you can not afford the training, you think it is too dangerous, you do not want to pollute the air, you do not believe you are physically or mentally capable of doing so, you do not know where to begin or you just have different plans for your life. But what if there was a way to make flying affordable, easy, ecological and safe. Would you not like to take your flying car to a remote lake for a picnic with friends or enjoy the beautiful view onto the city by night?

In the last couple of years a new aviation discipline has emerged and become increasingly popular for civil and military use. Drones are unmanned aerial vehicles with autonomous flying capabilities. They have the advantage of being relatively inexpensive and not risking human lives with each test flight. Electronical systems help to stabilize the aircraft and assist in flying precise maneuvers. Some of them can even be programmed to fly routes and return automatically. Equipped with cameras and other devices they allow us to experience the feeling of flight, take pictures from unseen perspectives or develop new services. A recent video of Amazon (2013) showed how products could be delivered to the customer by drones. Since most of these technologies are reasonably priced and not strictly regulated yet, experts and hobbyists constantly experiment and explore new possibilities.

But often there is a need to be physically present and therefore we need to think of personal aerial vehicles too. The vision of the city that is ruled by flying cars has been illustrated in countless sci-fi books and movies. But how would this affect our daily life and what possibilities and risks does it draw? Nowadays traffic jams occur daily and are hard to avoid, flying offers a promising alternative. Not only does the three dimensional space provide more physical space but flying straight to your destination is also much more efficient. The project raises the question why being a pilot is still something exclusive and flying is not more accessible to all of us. With the help of modern computer technology and clever design of human machine interactions the demanding task of piloting an aircraft could be transformed into something safe and easy. As a matter of fact, according to Mary Cummings (2013) all necessary technology to achieve personal aerial vehicles is already here, the biggest hurdles we have are psychologically and culturally. But to better communicate and understand the psychological and sociological effects of aviation we need to rethink the emotional access to aviation. People need to understand what it means to be able to fly, what freedom it draws and what risks it involves. I want to stimulate a discussion about the meaning of flying, break-up traditional paradigms and promote more transparency.

By throwing myself into the process of learning to fly I am able to use my own experiences to highlight and discuss the unique aspects of the field, unfold reasons for the current situation. According to the research of Melander and Sahlström (2009), the concept of situation awareness is used to describe a pilots capability to correctly perceive and interpret a situation. This skill is fundamental to successfully control an aerial vehicle and respond to unexpected and untrained situations. The development and documentation of these cognitive skills are an important part of my journey into aviation. Along with the learning process and through exposing myself to the culture of flight my perception of the environment changed. Or as Nishizaka says in his paper about embodied structure of the environment: “[...] when one learns something, one learns a restructuring of the world.” (NISHIZAKA, 2006)

Compared to an airplane the helicopter has the big advantage of being able to take-off and land vertically. This draws an exceptional freedom of movement. The downside is, generally speaking, the lower airspeed and range. Attempts in combining freedom of movement with speed in a single aircraft have already been successfully made and are most likely the future of aviation (DILLOW, 2013). But in a first stage of personal aerial vehicles the freedom of movement will most likely be more important than airspeed. Nobody knows if and when personal aerial vehicles will replace our cars and become part of our everyday life. But since it would open up new possibilities and make many activities more efficient there is a general interest in turning this vision into reality. No matter what scenario will come true, we need to make ourselves comfortable with the thought of personal aerial vehicles and discuss its aspects



Background Research

Before diving into the field research I had to get some background knowledge on aviation and the process of learning to fly. I interviewed people working in the field and searched for scientific papers that deal with the subject. This revealed some interesting concepts, especially in development and educational psychology and sociology. In addition to the papers of Melander & Sahlström (2009) and Nishizaka (2006) I mentioned in the introduction, I want to highlight two more here. The book "Gendered Journeys, Mobile Emotions" (LETHERBY, 2009) talks about the emotional relationship people have with different means of transportation. In Chapter 15 "Learning to Fly", Andy Reynolds describes his experiences with learning to fly in an essayistic way. It is a good example for telling an emotional story in an engaging way. Andrew R. Dattel (2012) talks in his paper about methods to improve the learning of situation awareness in aviation. These strategies are strongly related to explicit and tacit knowledge. Whereas explicit knowledge is described as "how to work a system" and tacit knowledge as "how a system works". This background knowledge helped me to better understand my personal learning process.

Most of these research projects used observational methods to collect data, whereas an interaction designer I am interested in throwing myself into the experiment and document the experience from the inside. But the knowledge about the research helped me to better interpret the events I encountered in the field research. They also revealed the importance of human factors in aviation and that there has not been a comparable self-experiment focusing on the emotional experience.

Opinions of a pilot instructor

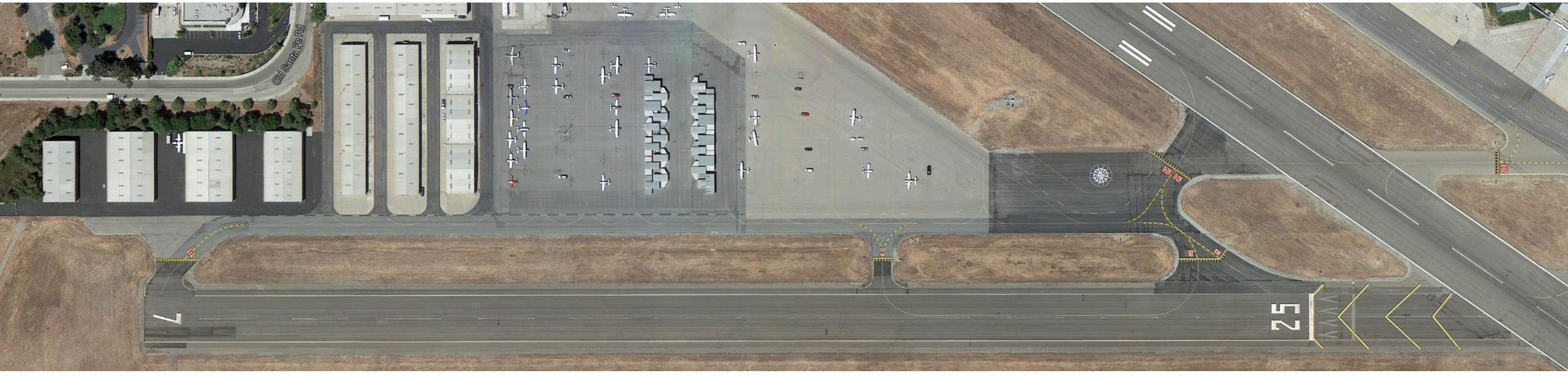
In order to get an opinion about my project idea from a pilot point of view, I went to talk to Daniel Diethelm. He is a Helicopter Pilot Instructor at "Heli Sitterdorf AG", a helicopter company in the north east of Switzerland. In his opinion such a documentation would definitely be helpful for future teaching of students or even students themselves. According to him the biggest challenge for an instructor is to learn about the individual strengths and weaknesses of the student. The more important part of the flight training is psychology and not the technical knowledge, he says. While talking further about the process of becoming a pilot, he highlights that it is very important for the student to learn a three dimensional thinking in order to be able to successfully navigate a helicopter. Students who have experience with remote controlled aerial vehicles often have a better understanding for navigation in three dimensional space, he mentions. When talking about the general learning curve during practical flight training, he says that it is very steep in the beginning and flattens-out to the end. Sometimes it happens that the student does not recognize his progress anymore, but there always is a progress, Daniel says. To plan my journey into the world of flight and since I have a limited time frame I needed to know more about the schedule and the approximate schedule of becoming a pilot. In average his students take about one year to finish the private pilot licence, but he also had students who did it in six months. My plan is to do it in four to five months. Daniel thinks this is definitely possible, if I am only working on this. It all depends on how efficient I can learn the theory, because this is the most challenging part for most students. I was surprised to see that the school already is a standardized way for the student to reflect on the events. It is a small sheet labeled with "Briefing" on the front and "Debriefing" on the backside. It is an integral part of each lesson, Daniel says. The briefing is more about technical preparation for the lesson and the debriefing is focusing on the emotional experience of the student.

Visit at Military Air Base

Adrian Guerrazzi is a young fighter jet pilot in the swiss military. As a former schoolmate I asked him for an interview, he agreed and even invited me to the air base in Meiringen. It was a beautiful sunny day and I was excited about the trip into the swiss mountains. I was mainly interested in his personal experiences, feelings and development in flying. Only a few people make it through the hard and strict procedures to become a military pilot. When I arrived Adrian took me to the airfield where one of his colleagues prepared a flight with a F/A-18 Hornet. I have never experienced a jet start before. You can truly feel the power of these roaring war machines. After inspecting two huge german helicopters from the seventies that just landed he showed me a Tiger jet and a Pilatus PC-7 which are mainly used for training purposes. During this walk on the airfield and hangar Adrian gave me a lot of technical details about the procedures, operations and daily routines of his job. Adrian makes a very calm and professional impression but still you can feel the passion for aviation between his words.

Around the age of ten started to fly with remote controlled airplanes and helicopters, his ability to control the big toys today, did not stop him from flying with remote aerial vehicles from time to time. He especially enjoys the so called "First Person View" (FPV) technology, where you control the airplane through video goggles and a camera mounted on top of the aerial vehicle. Adrian says that the experience is very exciting and real.

We talked a little about his career and his aviation studies. He pointed out that the concept of situation awareness is very essential to successfully handle a aerial vehicle, no matter if you sit in it or you control it remotely. You have to know the dimensions, the physical behaviour of the vehicle and your environment. In respect of my Interaction Design background we talked about the importance of Human Computer Interaction (HCI) and flight psychology. I further tried to find out more about the pilots relation amongst each other, especially the relation between helicopter and airplane pilots. Adrian says that even though there are certain prejudices and a sense of competition, in the end they are all friends and work for the same thing. But this sense of competition sometimes drives them in a positive way. Adrian mentioned that a helicopter pilots way of orienting himself in the air varies a lot from a jet pilot. Due to the different airspeed and altitude they often use different landmarks



San Luis Obispo Airfield (Source: Google Maps)

Field Research

To get a deeper understanding of the process of learning to fly, I became a helicopter pilot myself and documented the self-experiment with suitable methods to capturing my personal experiences. These methods are described in detail in the chapter Methodology and Practice. Due to the expensive training in Switzerland, I decided to get my licence in the United States of America. Immersing myself for eighty days into the process enabled me to identify and discuss the unique features of the adventure and communicate my story in a structured and essayistic way.

Context and Preparation

To better understand and judge the field research, this chapter talks about the context of the self-experiment in more detail. It also discusses different factors that could influence my performance in the process of learning to fly a helicopter.

The private pilot licence

With a private pilot licence (PPL) you are allowed to act as pilot in command for pleasure and personal means of transport. Any commercial flights are strictly prohibited. This means that owning a PPL licence is only useful for people who can afford the luxury of flying around for fun. Even if you own a commercial pilot licence, getting a job as a helicopter pilot can be extremely difficult. Companies do not even take you in account if you have less than 1000 or sometimes even 2000 hours of flying experience.

As preparation for the flight training, an authorized doctor had to examine my medical condition. This involves an eyesight test, hearing test, blood test, urine test and more. You do not have to be an extraordinary athlete, but in good health. To obtain the final helicopter pilot licence, I had to take a written, oral and practical flying exam. Usually the student learns both at the same time, this helps to connect the gained knowledge directly to practical flying. The theory is divided into general subjects such as air-traffic law, flight planning, operational procedures, navigation, human capability, helicopter knowledge, meteorology, aerodynamics and radio communication.

Choosing a school

It took quite some time to compare different schools and options before making a final decision. The school does play an important role in the learning process. Not only do you have to feel comfortable with the philosophy of the school but also the instructor himself. So it is not all about finding the cheapest place to fly, quality and comfort play an important role too. When checking on schools in Switzerland I had the impression that some felt offended when talking about cheaper alternatives abroad. They mentioned the lack of quality and the high cost for travelling and living abroad. But to me this just felt like plain sales conversation. I do not question the quality of a training here in Switzerland, but is it worth paying twice or even three times the price?

I looked at many different flight schools in different countries. Comparing them was not an easy task because you always have to take in account the expenses that come with the trip. Things like travelling, visas, accommodation and food can make a promising school suddenly very expensive. In neighbouring countries like Spain, Austria or Italy I can get my licence much cheaper, but when taking living and traveling costs into account, the difference is not that big anymore. With the low costs for gas and the good weather conditions in some regions, the United States are a popular alternative for the training. They also offer a wide range of compact training programs where you can get a licence in about three to six months. Considering my limited time for my studies, this was a big advantage. It also forced me to dive into the culture of flight more intensively. The downside is that the US licence of the Federal Aviation Administration (FAA) is not valid for European Aviation Safety Agency (EASA). There are ways to convert the licence but this again requires time and money. This did not affect the quality of my thesis but it leaves me with a pilot licence which is not valid in the country I live in.

After carefully evaluating the different options I chose to go to the United States for three months. The school named Helipro Inc. is based in San Luis Obispo, California and was founded by a Swiss in 1993. Although they are open for everyone interested, most of the students are from german speaking european countries, namely Germany, Switzerland or Austria. Most of the students want to work as a helicopter pilot back in Europe one day. The school uses the Robinson R-22 helicopter for the training. A small and lightweight helicopter that has been designed in 1973 by the Robinson Helicopter Company in California. Due to the relatively low operation costs, it is very popular all over the world for training purposes.

Relevant personal experiences

In order to correctly interpret my learning process it is important to look at past experiences and skills that could influence my performance. So this is a quick look at myself in relation to flying. It is known that using flight simulators can significantly improve the performance of a student, depending on the professional level of the simulator they can even count as official flying hours in education. I have never used one of those realistic simulators but I play video games and some of them include flying helicopters. Todays video games are incredibly realistic. I can not make a judgement on their realism according to flying physics but it requires quite some practice to fly properly. Most likely it helps to sensitize the brain in three dimensional thinking and improves the responsiveness (SPENCE, I., FENG, J., 2010). The in-game statistics say I have spent 7.3 hours with helicopter flying over the last two years.

After having been fascinated by helicopters for half of my life I finally decided to take an introductory flight in 2011. The flight only lasted 40 minutes, which was just enough to get a first impression on how it feels to be up in the air in a tiny little helicopter. I was thrilled to fly so close over fields and trees but I did not really manage to consciously control the helicopter because I was too tensed. The strong winds that day made it a very bumpy flight and because I started to feel sick I was more than happy when we touched the ground again.

Motivated by my master thesis I recently started with flying a remote controlled quadcopter. It took some practice until I managed to do even very simple tasks. Compared to the video games I was a much more careful this time, always worried about breaking my new toy in the next crash. It requires a fair amount of three dimensional thinking and hand-eye coordination because you are standing outside of the vehicle. If, for example, you turn the quadcopter by 180°, the controls become inverted, requiring you to adjust your inner navigation model. The progress so far was slow and step by step. It is very engaging and requires your full attention in the beginning. But I experienced it as a very satisfying and almost meditative activity.

While traveling to different places in the world I have collected quite some hours in ordinary passenger airplanes. Many of us will agree that this flying experience is not very exciting at all. It feels more like being on a bus or train. But we are used to the thought of traveling thousands of kilometers on a high altitude and are therefore more relaxed and comfortable.

Methodology and Practice

The participant observation method is used to collect intimate qualitative data of the learning process and the culture of aviation. Spending eighty days in the field and immerse into the process helped to capture ordinary activities and validate their meaning and relationships. Since the procedures, decisions and character of fellow students and myself play an important part in the process, ethnographic research methods like interviews and field notes were used for the documentation. Referring to the work of Gold (1958) I act as a complete participant in the observation. An combination of descriptive and focused observation (SPRADLEY, 1980) is used to gain an insight on the complexity of the field, develop questions and observe specific aspects in the process.

Diary Interview

To document my personal impressions and activities I answered the same six questions each day. They focus on the personal experience, thoughts and stories that affected the process and my performance. Sticking to this so called diary-interview method over an normal diary, enabled me to better compare the daily events. This combination of diary and interview has been introduced by Zimmermann and Wieder (1977) who used the method in their work on counter-culture.

Although the answers to the diary questions can not always be compared to one another directly, the method proved to be a valuable way of documenting the experiment. Answering the questions every day turned out to be a very time consuming task. It required a lot of endurance to keep doing it for the full eighty days. Sometimes I skipped certain questions because there was nothing noteworthy. In order to avoid repetition within the same question, I focused on different aspects if possible. Waiting for the next day to write the diary was a very bad idea because many days felt quite similar and it was hard to distinguish the different events after a while. In average a single diary entry took about one to two hours to complete. These are the six questions I selected for the diary interview.

A. How are you today?
This question helps to open up the discussion and gives a brief idea of my general motivation.

B. What did you do today?
The question aims to give a detailed overview on what happened during the day. It focuses not only on the flying process but also includes private experiences that are part of the journey and could influence my performance in the process of learning to fly.

C. Did anything interesting happen?
This question highlights events that should be looked into in more detail. It aims at personal experiences outside of the airport as well as aspects that are directly linked to helicopter flying

D. Did you learn anything new about yourself?
This question focuses on myself as an individual in the process and talks about habits, strategies, behaviour and my character.

E. What do you think about flying a helicopter?
The question aims to reflect on my motivation in flying helicopters and my situation at the airport.

F. How do you feel about this project right now?
This specific question forces myself to question the project itself every day and think about the general progress and goals I want to achieve.

Video- and Audio Recordings

The video and audio recordings are the main method used for an objective perspective onto the process. Every hour in flight training is video–recorded to be able to analyze and communicate my performance and progress. The recordings capture emotions and behaviour as they appear and can later be synchronized with location and emotional data streams. Goal of the was to not only capture the helicopter controls, but also myself and the outside scenery. Radio communication is an important aspect of aviation and an additional task a pilot has to accomplish. The radio conversations are recorded with a microphone and synchronized with the video material. Whenever I talked to people about my project I used these recordings to give an idea on how it feels to learn to fly.

Setting up the camera, making the microphone work and locating the best spot to shoot was not an easy task. It was trial and error until, after about two weeks, I decided on the final setup. It was a mixture of technical and setting problems I faced in the beginning. Once in a while technical problems ruined the recordings. For example if the microphone had a loose contact. Other problems I encountered were the camera being out of battery, shaky recordings or bad positioning of the camera. The camera I used was a GoPro Hero 3 with an external microphone that was mounted inside the headphones to avoid engine noise. Before the microphone adapter arrived, I used the iPhones audio recording function to record the radio communication and synchronized it later with the video. Each flight generated about 13GB of video data. To document and communicate the situations I encounter outside the flight training I used a photo camera and a sketchbook.

Emotional data

A sensor band measuring movement, skin temperature and skin conductance was used during the flight lessons to capture my stress level and emotional state during the flight. The product is called Smartband and is developed by the German company Bodymonitor. Synchronizing the measurements with the video, audio, location data gives a more objective understanding of the process. Although the project primarily focuses on the subjective perception of the process, comparing the data to measured data helps to strengthen argumentation. The collected data is encrypted and can only be decoded by Bodymonitor. Unfortunately I only received the smart band in the last weeks and don't have any recordings of the beginning of the process. Sadly I never received the decrypted data from the company in the end. They did not have enough interest and resources to completely evaluate the material.

Location data

The route of every flight is recorded via a Global Positioning System (GPS), providing the coordinates and detailed information about elevation and speed. The data can further be synchronized with the video material and sensorband data which gives a better picture of the situations I am exposed to.

I used the internal GPS of the Apple iPhone 5 and and the "Cyclometer" Application by Abvio Inc. to track and manage the routes. The device and application proved to be very useful and reliable even though the Application has been primarily developed for cycling.

Flight Training Protocol

Immediately after returning from a flying session I answered four questions regarding the lesson. They give additional insights into my personal perception of the training and would have enabled me to compare and contrast to the measurements of the Smartband. I introduced the flight protocol after I discovered that I need a tool to keep better track of the flight lessons itself. In comparison to the diary I kept the answers short.

A. How do you feel right now?
Gives a general idea of how I experienced the flight lesson. considering stress level, dizziness, anger and other emotions.

B. How exciting was the training?
Excitement can boost motivation and is an important parameter to better understand my performance.

C. How demanding was the training?
What was the balance between relaxation, enjoyment and challenge?

D. How effective was the training?
This question gives a personal opinion about how efficient the training was and how much progress I made.

Publishing and Social Media

Flight training website

I designed a custom website to document and share my experiences on a daily basis. Each day is documented with the diary interview and a number of visual and text posts, highlighting important events of the day.
http://www.iamahelicopter.com

Project Blog

A microblog is used during my entire project as a pool for collecting relevant web content and ideas including videos, statements, images and drawings.
http://iamahelicopter.tumblr.com/

Video Channel

I created a youtube channel to publish clips of the video recordings.
http://www.youtube.com/channel/UC5u-eUed3F-5G9rxBWXUcyDQ

Positioning and checking the camera before the next flight

Synchronizing the Armband with the video recording

Day 37 –First solo flight training

My First "Real" Solo Flight

How are you today?
Exhausted right now, but besides that I'm great.

What did you do today?
I had my first REAL solo flight, and by real I mean I flew higher than three meters off ground. I took off to a hover, requested a departure at the tower, took off the airport, circled the runway, landed again and repeated the whole procedure three times. This is called a traffic pattern. It was absolutely amazing haven't felt like this before. Being up there controlling the helicopter myself for the first time was thrilling! I did my best to stay professional doing all flight checks and radio calls every time, but at some point I had to laugh and tell myself how fucking great this is.

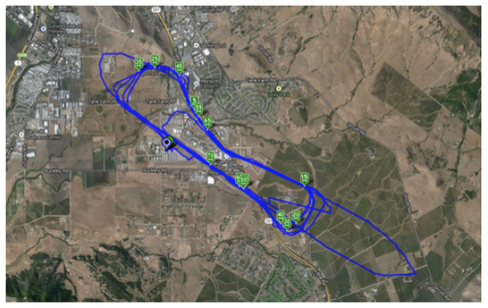
In addition I worked a lot in the theory book today, I'm trying to do the next exam tomorrow. That would be exam number 4 this week, phew.

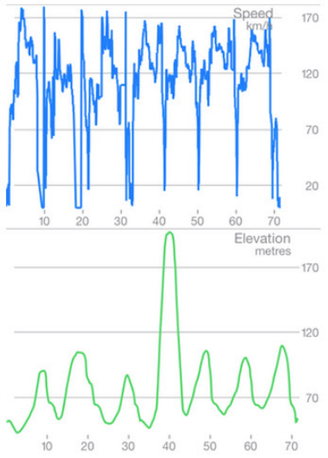
Did anything interesting happen?
Two of the students spent the week in LA to attend a safety course. I'm happy they got back today. I spent the last days alone in the student area of the hangar which was kind of depressing.

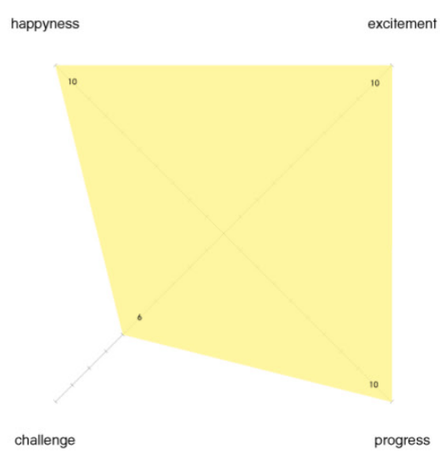
Did you learn anything new about yourself?
The flight today boosted my motivation extremely. It was totally worth the hard work so far.

What do you think about flying a helicopter?
I want to go up there again. Hopefully the wind will be calm and allow for another flight tomorrow.

How do you feel about this project right now?
While working and going through my theory notebooks today, I realized that there are only a few sketches. I wish there was more time to work on sketches but with the current schedule it's just impossible.







Flight Training Protocol

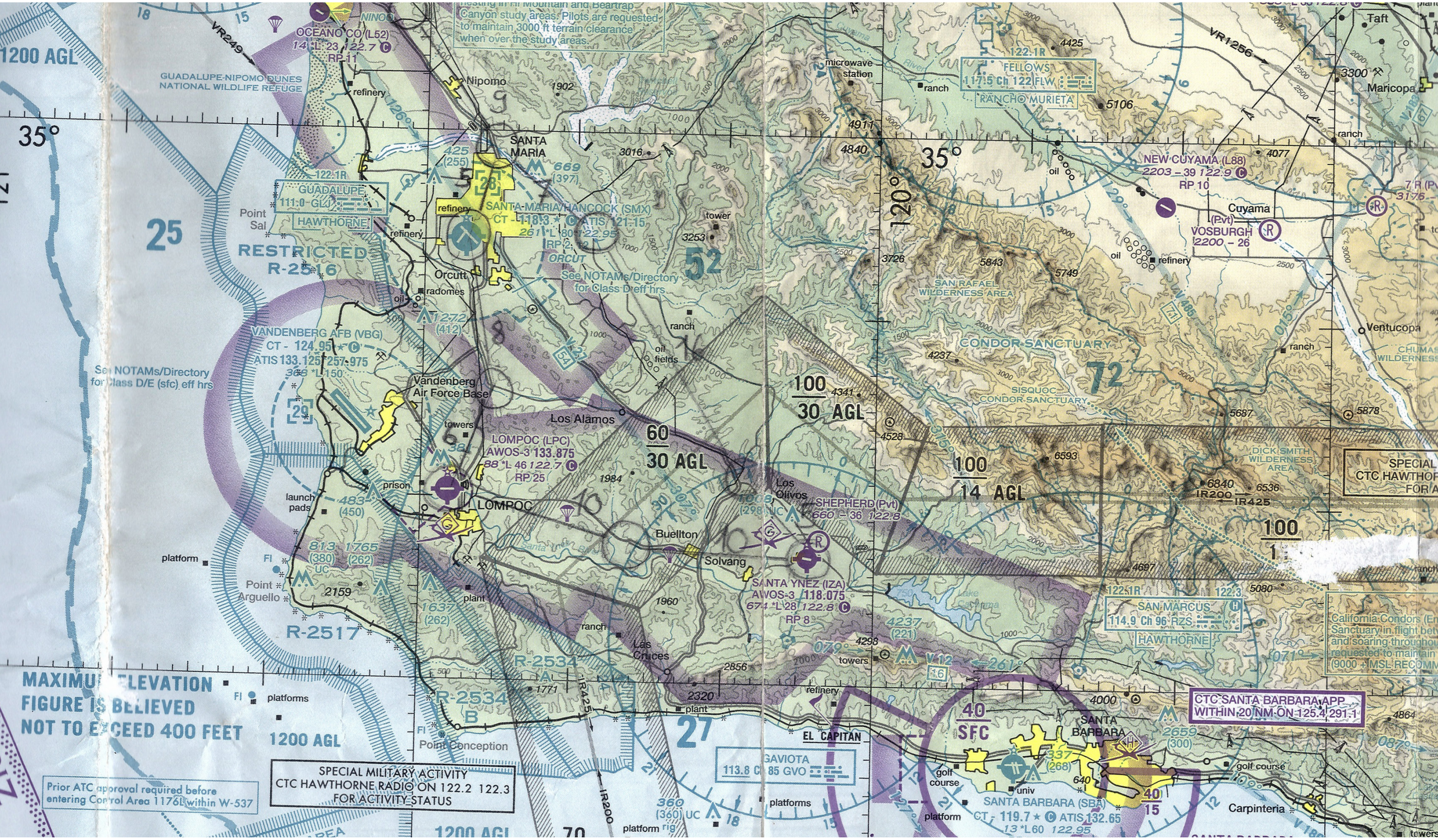
How do you feel right now?
This was the best thing ever! It was amazing to fly this thing by myself, I still can't believe I did it.

How exciting was the training?
I can't find words to describe it. I tried hard to stay calm and professional during the flight but sometimes I just had these laugh and tell myself how great this is.

How demanding was the training?
Well besides the fact that I was alone and the helicopter would respond a little different because of the weight it was all routine maneuvers in the traffic pattern.

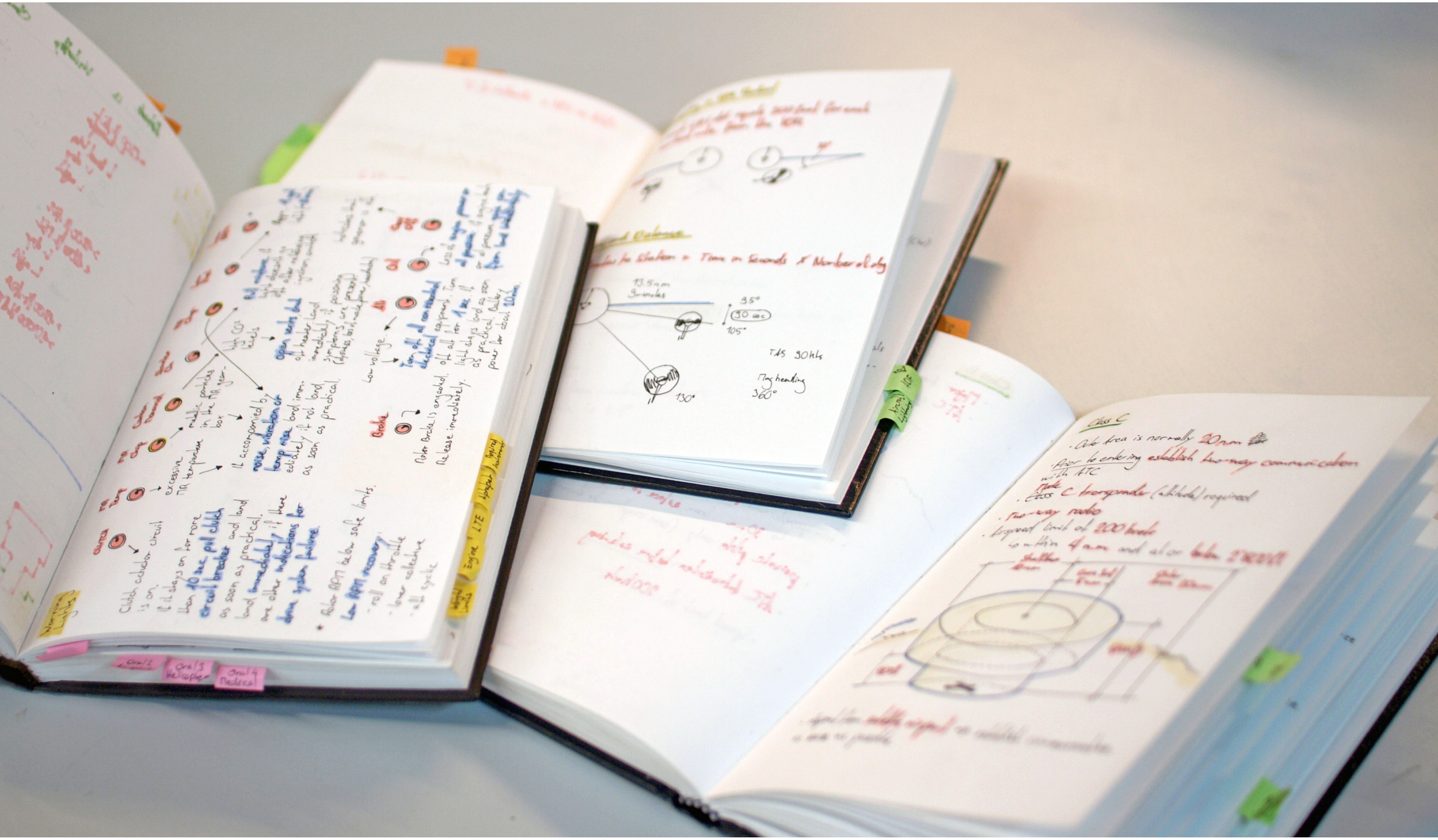
How effective was the training?
It would say it was mentally very effective. I wonder how the next flight with the instructor will feel.

Day 59 – First solo flight where I left the vicinity of the airport



Day 63 – Planing my cross–country flight on the sectional chart

The sky in San Luis Obispo is usually clear, but the winds can be tricky sometimes



Three personal notebooks filled with helicopter theory

Evaluation

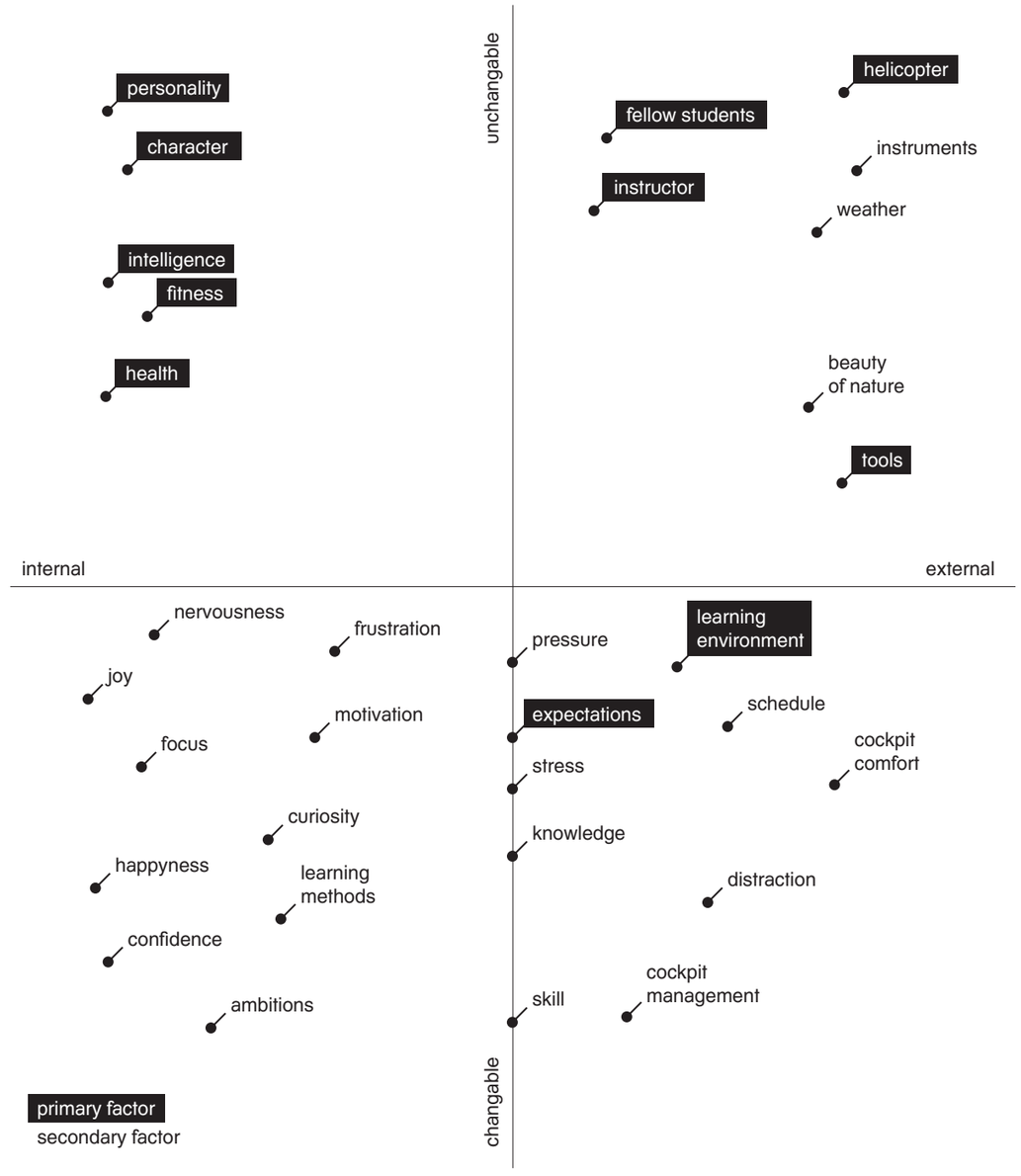
After having collected a lot of data over the period of eighty days, the challenge was now to get the bigger picture, uncover relations and extract knowledge out of the material. Drawing a timeline by using the diary, pictures and notes was the first step in trying to gain an overview of the process. The resulting map was the basis for further development and substantially helped in analyzing and navigating through the events. Not only did it enable me to highlight key stories but it also uncovered the development of the general motivation and other emotional states that significantly influenced the experience. The drawing is drawn on semi transparent paper and has a length of about two meters.

Extracting codes

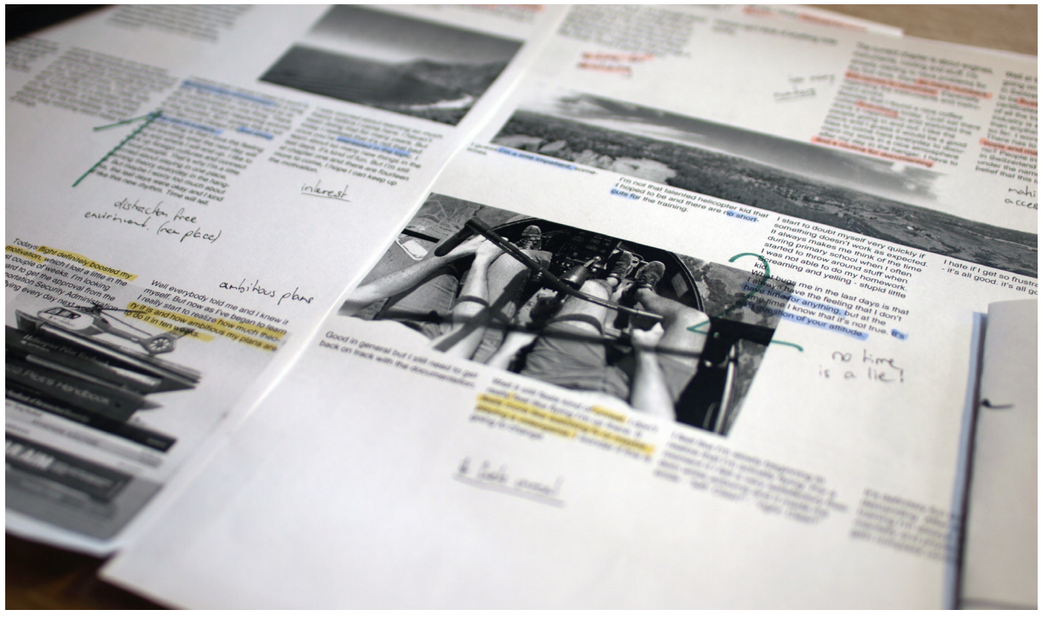
Based on the Grounded Theory method by Strauss (1991) I started to extract codes out of the collected material and grouped and connected events that are related to each other. This helped to further isolate categories and define the most important aspects of the learning process. Factors that influenced the performance have been extracted from the process protocols and timeline by reading and comparing diary entries. To better understand the factors origin, relations and effect they have been placed on a three dimensional diagram.

The x-axis describes the origin of the factor. They can be either Internal or External. An example for an internal factor is the my character. On the other end of the axis we have factors like the weather or the instructor. The y-axis shows how much influence I have onto a factor. A changeable factor for example is the schedule and difficult to change is the type of helicopter used for the training. And finally the z-axis gives an idea on how important a certain factor is relative to others.

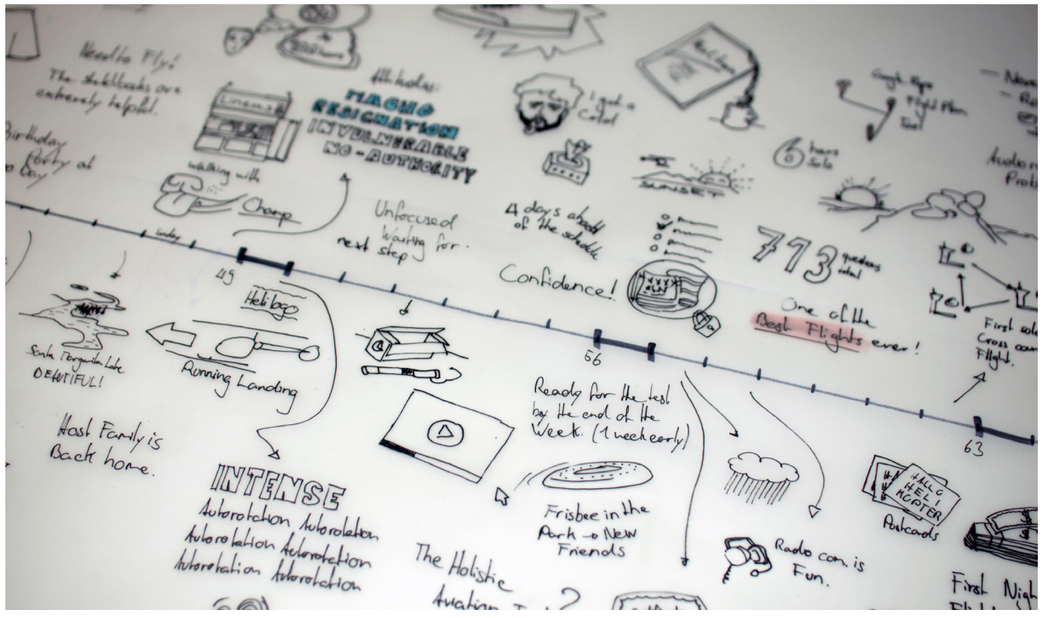
Building the diagram revealed that the factors are often highly dependant on each other. They can not always be completely separated because they only have a meaning in their relation to each other. The students motivation for example depends on multiple factors like the weather, personal health and pressure. To distinguish between the two types I put them into separate groups. Primary factors build the basis and can be looked at as independent aspects for the performance. Secondary factors depend on primary factors and influence each other as well.



Factors influencing my perfomance in the process

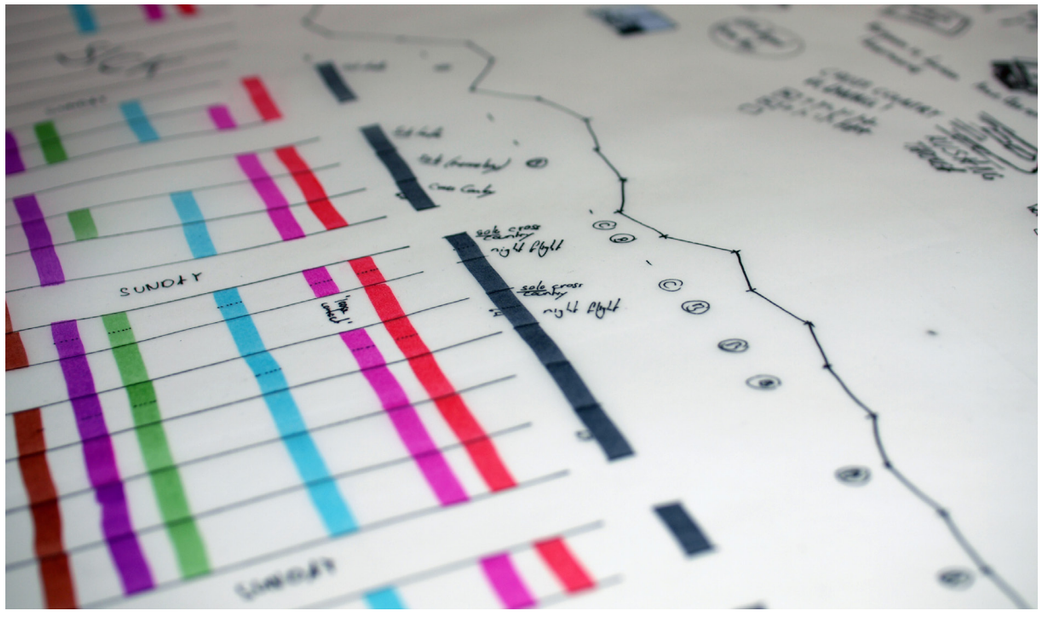


Extracing codes out of the diary interview material



Excerpt from the 2 meter overview drawing

Drawing, mapping, sorting and connecting the events



A motivationgraph was also part of the overview drawing

Relating important factors that influenced my performance

Mapping the factors onto a three dimensional system

Using pen and paper instead of computers to evaluate the data

Defining key stories

With the help of the drawing and the extracted codes I was now able to define the key stories of the process which influenced my performance and emotional state the most. The selection reflects important theory background, key moments in the practical flying and personal events that essentially affected the process.

day 1 – Hello California

After having prepared this project for many months it felt somewhat surreal to finally arrive in California. The weather was beautiful and I was excited about the time lying ahead of me. I was about to become a helicopter pilot now. After I arrived at the house where I would spend the next months, I had to organize some stuff first, get a bike, say hello at the airport , drop-off the car and grab some food.

day 3 – My very first flight

It was more the thought of finally being here and going through the process of becoming a pilot, than the feeling of the introductory flight itself that thrilled me that day. We went through all the basic procedures of flying and the instructor demonstrated what I need to be able to do by the end of my time here.

day 4 – Developing learning strategies

When the instructor handed over all the theory books, I started to get a little worried. The weight of them scared me. I knew that I need to work out a clever strategy to remember all this. I started to write personal notebooks, illustrating and highlighting important aspects. Only two days to go until I have to take my first exam on the first topic.

day 7 – Getting started

I finally received the approval from the federal aviation association to start the training, which means that I am now officially allowed to take flying lessons in the United States. In the following days the instructor introduced me step by step to the different controls. The flights were short but still very demanding and exhausting. Flying a helicopter required my full attention.

day 9 – Making a first radio call

I was a little nervous about making my first radio call. At that stage hovering on a spot still required my full attention. Pressing that little, red button and talking to the tower in a unusual way, was quite a challenge at first. As soon as I opened my mouth I was not able to hold the helicopter still anymore.

day 11 – A word about the cowboy attitude

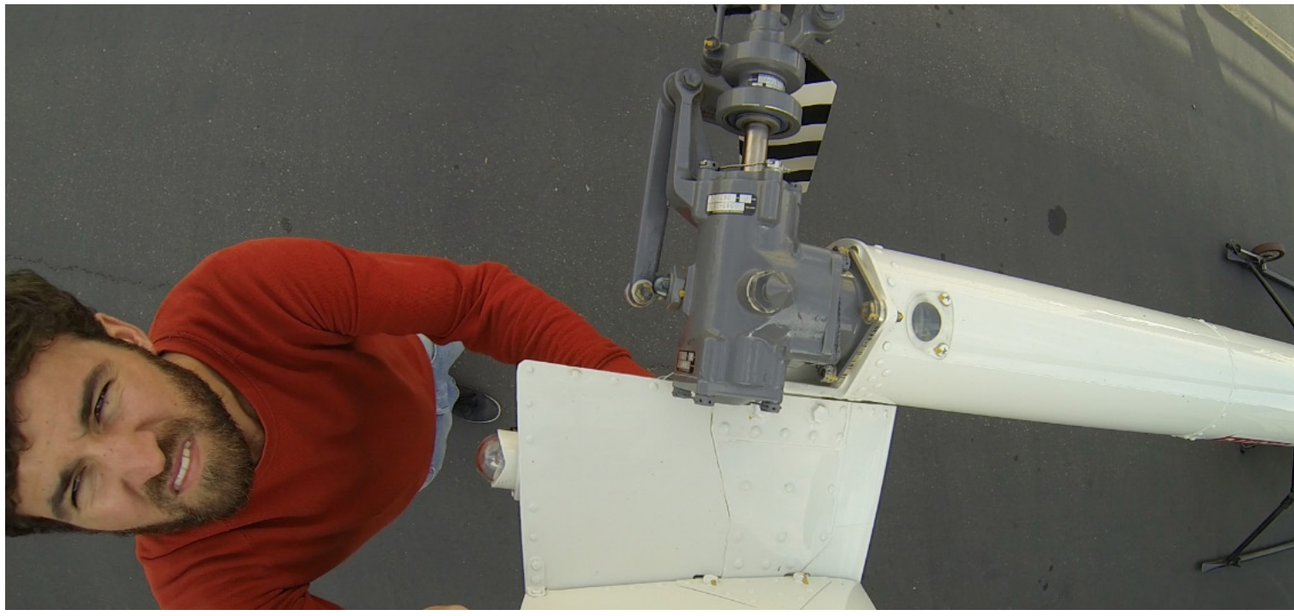
Flying a helicopter often reminded me of scenes from a cowboy movie. Saddling and preparing your horse, taking it out of the barn and riding out into the wilderness, being independent and very very manly. But I figured that pilots do not like to be compared with that, probably because they think it draws a slightly unprofessional and reckless image.

day 13 – Managing my ambitions

After the first weeks I started to struggle a little with some practical parts of flying. I got upset and frustrated because I was not able to perform a perfect landing. After this had continued for a couple of days my instructor had to remind me to relax and stay patient, it takes time to handle those kind of things.

day 17 – Mingling with the locals

Since I did not know how fast I would learn and if I can stick to the schedule, I wasted no time with anything that was not related to my goal of becoming a helicopter pilot. But after a while I realized that I was not able spend three months inside the hangar without getting to know the city and the people. Thats just not me and it would make me unhappy and probably inefficient. So I started to bring my books to cafes downtown and continued my reading there. After a while I started to meet new people and even make friends.



Pre-flight check of the tail rotor

Always using the checklist during the pre-flight check

day 18 – Stuck with my Nikes

I was not aware of the fact that clothes are important too, until I got stuck with my shoes in the helicopter pedals. No matter how much I disliked spending money on this, continuing with this ribbed shoe sole of mine was no option – who wants to fall from the sky because of wearing the wrong shoes. But another couple of weeks passed until I finally went to a shopping mall and bought new ones.

day 19 – I am so damn exhausted

After having spent so much time with reading books, writing notes, the flight training and the project documentation on top of all that, I started to get very exhausted. Because I did not know how I will perform I pushed it a little too much in the first weeks. I realized that I am not able to continue with this pace for another two months. So I slowed down a little and started to leave some space for breaks too.

day 22 – It feels like watching a movie

Today I had this weird feeling while airborne. It somehow still did not feel real yet to be up there. When looking down onto the hills, the coast or the city it felt more like watching a movie. But when I looked at the videos of the flights afterwards, I got very excited and could not believe that I just did that.

day 24 – Emergency maneuvers

After having learned about the basics of flying a helicopter we now moved on to more complex flying maneuvers, especially those related to emergencies. The so called autorotation is probably one of the most essential maneuvers when flying a helicopter. It is the only way to land safely after an engine failure occurs. It basically allows you to start gliding to the ground with the kinetic energy left in the rotor.

day 28 – Dealing with fear

While thinking about these emergency procedures and the risks everyone is exposed to when flying I started to question my project. Is it worth the risks? Part of the course is the so called safety awareness training where you look at videos of the manufacturer, explaining the dangers and how to deal with them. They also show related crash images which are sometimes very disturbing.

day 29 – Messing-up maneuvers

Everyday it felt like the instructor puts his live into my hands as a student. The small helicopter we are flying is very sensitive and has to be handled with great care. A single wrong movement could lead to a situation where even an experienced pilot will struggle to get back into control. With this thought in mind, I always felt very guilty when I did something wrong.

day 37 – My first solo flight

Today was my first solo flight. I was prepared thoroughly for this day, but when it finally was here I was still nervous. The sky was clear and the winds calm. After we went through the maneuvers again, the instructor left the helicopter and watched me from outside. It felt very different to fly by myself, not only because of the different weight balance of the helicopter, but also because I knew that I am now responsible for all actions and this made me much more aware of what I am doing. My senses seemed to be sharpened.

day 45 – Now I am all alone

The next big step was to not only hover close to the ground by myself but also go fly into the traffic pattern. This now truly felt like the real thing. I was thrilled by the feeling of being up there and carrying the full responsibility for all my actions. I sure was tensed too, but the positive feeling were just overwhelming.

day 46 – Landing in the wilderness

Although the flying part still thrilled me it sometimes seemed very repetitive, especially because I was mostly flying in the vicinity of the airport. Today this changed, we left the valley and flew over the hills to the north, to practice a first off-airport landing. This definitely boosted my motivation and reminded me of the original dream of flying I had. Flying to a remote place, passing lakes and landing into the soft grass was absolutely amazing.

day 48 – Becoming a part of the machine

As a pilot you are required to always stay professional and suppress certain hazardous behaviours and attitudes. Basically this means that you always have to make rational decisions. This is not always easy since we are emotional beings, but most accidents are related to wrong decisionmaking. Part of the learning process is getting to know yourself and your attitudes, this helps recognize and respond to dangerous situations in an early stage.

day 49 – Practice is everything

Right now it is all about repetition. I know all the different maneuvers, but it takes time and practice to perform them perfectly. This was the first time where I felt a little bored by it. Constantly circling the airport just wears out.

day 51 – How to get a cold in California

I could not believe it at first, but I got a cold. I do not know how exactly it happened. I mean I am in California. Anyway there was nothing I could do but wait until it would be over. Flying during this time was no option since I had to sneeze all the time and was under medication to make it go away.

day 56 – US Government shutdown

Today the US Government shut their doors. The political parties were unable to come to an agreement on a bill and so they just shut everything down, good job. No government related service was open anymore. It was not until I realized, that I could not take my theory exam until they reopen, that I started to get worried. Such a delay was not part of the plan of my trip. So all I could do was wait and hope that they will reopen by the time I am ready to take the exam.

day 58 – Radio calls can be fun

Since my childhood I have lived and worked in a very digital world. No wonder I was sceptical about the ancient radio communication system used in aviation. But after a while I started to like them. Not that I think it is very efficient nor user friendly, but it has charm and where else do you get the chance to listen to different people talking to each other? Unless of course you work for the United States National Security Agency.

day 59 – My best flight experience ever

When I arrived at the airport the instructor started to ask about my condition. I said, I am good. He smiled and said: "Good, you can take the helicopter and fly wherever you want, just make sure you are back in two hours." I was thrilled about the thought of leaving the vicinity of the airport by myself for the first time. It made me a little nervous too but again the positive feelings were much stronger. I flew towards the coast and was totally enjoying this unique experience.

day 62 – The beautiful silence of the night

Part of the flight experience I need to have before taking the final exam, is three hours of night flights together with an instructor. Today was my very first flight by night. I was asked to prepare the flight which basically means to get familiar with the route. I didn't really know what I have to expect. The feeling to be up in the sky by night was very surreal. Everything felt slow and silent even though the engine was rattling behind our backs. The hills were slightly glowing in the moonlight and the lights of cars and houses were the only way to navigate through the night. It was marvelous.

day 65 – All requirements fulfilled

Today I completed all my flight requirements. The last thing I had to do was a solo cross country flight, which means landing at different airports and come back. The flight took about three hours and I was sometimes a little bored by just flying straight and doing nothing. But I was happy that I came that far and was now looking forward to the final exam. Only twelve more days to go.

day 67 – Packed flying lessons

Now it was all about getting more proficient and confident in all the maneuvers. I also had to prepare for the oral exam which is part of the final test. The flights were packed with tricky maneuvers and questions about procedures and emergencies. The days were exciting but also very exhausting.

day 69 – Messing-up a last time

Just when I started to get very confident with everything I messed up a maneuver again. Even though we talk through the exact procedure just before I pushed the collective down, instead of leaving it as is, and we hit the ground. Luckily nothing serious happened, but I got pretty scared for a second and felt sorry for my instructor.

day 77– A motivating last flight

This very last flight boosted my motivation extremely. It was a wonderful evening. Me and my instructor were very relaxed, practicing all sorts of maneuvers and having fun flying. I got very confident during this flight and also a little sad since this adventure is about to come to an end now.

day 78 – The final exam

The day has finally arrived. But before I could show what I have learned during the last three months, we had to drive south for three hours. The instructor, who was responsible to prepare me for the final exam, was my driver so I could relax and mentally prepare for the test.

After a one and a half hour oral exam, I had to go fly with the examiner for one hour. It was not only about demonstrating different maneuvers but also answering questions about flying in general. Unfortunately I was not allowed to record the flight. The oral exam went very well and the flying part too. Although I got a little tired and nervous towards the end because I started to think about the consequences if I was going to fail the test. My flight back to Switzerland is in two days and there is no time for a second try. After these intensive weeks in the United States it was a huge relief when the examiner took off his headset, shook my hand and said: “Mr. Huggenberg, you are now a private pilot. Congratulations!”

day 80 – I’m done here, now let’s go home

I spent my last two days in San Francisco, I did not do any sightseeing or partying. Happy but tired I walked around the city, relaxed and slept in parks, staring at the sky and thinking about the last three months. What a trip.

Flying in an airplane feels somewhat different now. Goodbye California

Findings

The demanding task of flying

Flying an aircraft today is still a very challenging task for body and mind. You are much more exposed to weather phenomena compared to vehicles on the road. A pilot has to be able to recognize and respond to many aerodynamic laws. Neglecting these conditions can lead to very dangerous situations and make you fall from the sky very quickly. Even for experienced pilots it is sometimes difficult to correctly judge weather situations, such as wind strength and direction, without the help of visual references or weather instruments. If there are no obvious indications like flags or trees blowing in the wind or waves on the water or trees, the pilot has to use his experience and piloting skills to determine the approximate direction. One technique is to fly in circles with a constant speed and observe the helicopters behaviour, the terrain and changes on the airspeed indicator. Instruments giving live and detailed information about the current weather situation are often not available inside the aircraft.

Most civilian aircrafts today are still mainly controlled through cables, pulleys and cranks and only offer little or no electronical assistance. While it does take quite some time to get used these manual controls they start to feel much like extensions of your body. It changes from something external to something internal. This direct human machine interaction where no electrical system interferes, helps in building trust in the machine. There are many books that will tell you how a helicopter technically works and which controls affect what part of flying but you can only learn it by flying yourself. After my check-ride the examiner surprised me by saying that I should trust my feelings even more during flight and not work too mechanically.

Flying a helicopter requires you to independently move arms and legs. It took me quite some time to realize that I have to consciously focus on disconnecting these movements from each other. Like playing the drums for example. Redesigning the controls to better fit the humans physiology and make the interactions more natural could definitely help in eliminating this problem.

In the first weeks I was quite tensed during the flight training. The fact that I was up in the air and did not know how to control the helicopter made me nervous. A big part of learning to fly was to build confidence towards the helicopter and myself. On the other hand side there were times where I had to remember myself to stay professional and not get too sloppy and self-confident. When you get more experienced in the basics of flying a helicopter, you start to work on emergency procedures. This involves knowing the meaning of all the instruments, gauges and the meaning of every warning light. A quick and correct reaction to dangerous situations or a malfunction can mean the difference between life and death. Often you only have seconds to respond correctly before it is too late. Learning the procedures was pretty confusing at first. With a few exceptions the warning lights are all placed very close to each other, making it hard to see what the light relates to. Grouping the warning lights by the necessary actions the pilot has to take instead, could help in responding more quickly to dangerous situations. Another thing that irritated me was that they all look the same even though they represent very different levels of urgencies. The low fuel light does not look different from the one indicating a engine failure.

When driving a car the roads, signs, and lights are easy to understand since they are situated in our tangible world. In aviation the so called airspace classes, where certain rules apply, are three dimensional, layered on top of each other and invisible. The pilot has to carefully prepare the route in advance, already be familiar with the area or bring an aviation chart with him to observe the airspace while enroute. Reading these maps takes time and practice and making mistakes can lead to dangerous situations. My training took place on a small airport where mistakes are forgivable. But even if I have a pilot certificate now, I would still be nervous about flying in a highly congested area.

Human factors

Part of becoming a pilot was to learn more about my character and attitudes. Analyzing your personality helps to better recognize and respond to hazardous behaviour. You have to be aware of your mental and physical limits. You basically start to treat yourself like a mechanical part of the system, that needs to be analyzed and fixed when things are not working properly. Instead of a screwdriver you say sentences to yourself. For example if you are a macho type of person and realize that you are about to make a macho decision, you need to tell yourself that you are not invulnerable. Admitting that you are not in an airworthy condition can be very difficult. If a client is already waiting at the airport, it can be hard to make a responsible and honest decision. Not only are you responsible for your own safety but for the safety of your crew and passengers. Making them aware of the risks they are taking is very important. Just like a doctor who is giving information about dangers and side effects of a treatment or surgery. The truth can be hard and unpleasant and maybe even make your passenger cancel the trip.

Human failure is the number one cause for accidents in aviation (KEBABJIAN, 2014). A primary goal in the training of pilots is to educate awareness of hazardous human attitudes and teach ways to deal with them. A pilot has to suppress his emotions on a regular basis and always respond in a rational way. Suppressing your emotional responses over years can create physical and psychological stress symptoms (WASTELL, 2002). With state of the art technology, aircrafts could monitor the pilot and respond to his alertness or even take over the control if necessary. (CHUANG, 2013)

Human machine interaction

As an interaction designer I couldn't help myself to constantly analyze the systems and tools I had to work with. As someone whose job it is to work with new technologies, create efficient and friendly user experiences on a daily basis there were many procedures and parts of the helicopter system that I was unhappy with. The helicopter, as we know it today, has been developed in the early 20th century and is still much the same as it used to be. Many helicopters today are partially updated versions of old models that have been developed twenty or even thirty years ago. When designing the helicopter a hundred years ago the engineers focused on making it fly and when they found a way, they just pulled cables to the cockpit allowing a pilot to control it. Basically the opposite of what a user centered design approach looks like today.

During my training I experienced that it takes a lot of time and effort to get used to these mechanical and primitive controls. But they are comprehensible and you get a direct feedback about the aerodynamic load. This helps to prevent you from overstressing the helicopter. Replacing these controls with electrical interfaces, so called fly-by-wire control systems, has the advantage of reducing pilot error and workload but physically disconnects the pilot from the aircraft.

Another big topic that would significantly help in making aviation more accessible is the usage of metric measurement units. Aviation does not use the metric system but ancient units from the English history in a non–coherent way. Nautical Miles, Statute Miles, Inches of Mercury, Knots and other units are used, leading to confusion and unnecessary work-load especially for non US Pilots that are not used to these units. This is not only a matter of convenience but a safety issue. Or as Pilot Kent Jones (2002) explains in his letter to Bill Peacock former Federal Aviation Administration (FAA) director of air traffic services: " [...] Today world aviation remains hamstrung with the inches, nautical miles, statute miles, feet, inches, etc. There is no justification for prolonging non-metric units in aviation except for the comfort of doing nothing, clinging to the status quo. But that status quo keeps measurement confusion in the cockpits of the world. Metric units and American units

Pushing the helicopter on wheels out of the hangar

appear side by side on some instruments. Some countries, like Russia, rebel and altitudes are given in meters. [...]"

During my time in aviation I have encountered countless websites that look like they have been designed in 1991 and not changed since then. I was surprised that even government websites that are essential for everyday flight planning are so poorly designed. I do not want to complain about this situation at this point nor make suggestions on how to redesign and improve these websites. But it felt like these products reflect the prevailing mindset in aviation as I experienced it.

Culture and mindset

I experienced aviation as a very slow moving industry with an overall conservative mindset, helpful new technologies seem to take ages until they finally find their way into the cockpit. And while technology is progressing very quickly, aviation certification processes have not adapted the pace. Safety is top priority and approving every single part of the system is essential, no one disagrees with that, but it felt like this is often used as an excuse to keep the status quo. Sometimes it felt like pilots are scared of becoming obsolete once fully automated systems would become the normality. If everyone is able to fly, they could lose their prestige. I often missed a pioneering and open minded spirit which I was expecting from people working in aviation.

In the United States it is very common that fresh pilots work for little money or even free as instructors. This is often the only way to collect flying hours, which they need in order to get a real job in the aviation industry. Because of the big competition people are willing to accept this treatment in order to follow their dream of flying.

Discussion

Personal aerial vehicles

Flying has become a natural part of our everyday life and booking a plane ticket online to visit friends or do business is as common as never before. But for the majority, flying is still a black box and boarding an airplane does not feel much different from getting onto a train. If we consider that, according to early sci-fi books, we should already be flying around with our cars, it seems about time to take a closer look at the challenges of flying and the possible impacts of personal aerial vehicles to our society.

A project by the European Union called mycopter (JUMP, M., PADFIELD, G. D., WHITE, M. D., FLOREANO, D., FUA, P., ZUFFEREY, J. C., ... & BÜLTHOFF, H. H.,2011) is researching the field of personal aerial transport systems and is trying to bring aviation to the next level. With the anticipated growth of worldwide traffic they are looking into alternative solutions to overcome congestion problems. Such a system would probably be partially or even fully automated, they say, making flying even easier than driving a car. Intuitive human computer interactions are a crucial part to letting this vision become a reality. These attempts to make aviation more accessible and flying an aircraft safer and less demanding are very important. But we also need to think about an emotional approach to aviation. Communicating and understanding concepts of flying and talking about the possible impact it might have on our life is essential.

If looking at the aerial vehicle technologies, one of the few innovative companies which is going a step further is e-volo (2013). The german company has developed the socalled Volocopter, which is basically a scaled and translated multicopter to fit manned flights. Using these modern technologies for manned flight reduces the workload for the pilot significantly. The pilot does not have to care about blade stall, fuel mixture, minimum speed and other things that make traditional aviation so demanding. Thanks to the electrical system monitoring the position and attitude of the aircraft, maneuvers that usually require a lot of training, are now easy to accomplish.

Change of perception

Observing myself and my perception of the environment was one of the primary goals of the field research. There are many small personal aspects that have changed during the eighty days in the learning process. I also have slightly different opinions about being a pilot in general. So yes, my personality did change during the period of time, but this does not make me a different person. It even feels like I became more myself during the time. Going through the whole process and finally achieving the goal of becoming a helicopter pilot gave me strength and confidence. And after seeing how many people struggle in becoming a pilot and finding a way to make a living with it, I was happy that I have other priorities in my live as well. Aviation lost a little bit of its magic to me. The big competition in the industry seems to rob a lot of the joy of flying. Nevertheless does the thought of being able to fly and go wherever I want, whenever I want, still thrill me. I feel a strong urge to share this joy and let people take part in what I have experienced during that time. People should learn about the possibilities and excitement of being able to fly. More pilots means a bigger market, a bigger competition, more research, more innovation, lower prices and therefore easier access to aviation.

Knowledge Transfer

During the evaluation of the events the general question arose how and in what degree this experience can be communicated. This is probably a problem many of us have encountered when talking about something we are very excited about and suddenly realize that we can not find the words to describe it. Part of being a designer is the ability to tell stories and communicate ideas. But how much knowledge and awareness can I create within the eye of the beholder through telling my story? No matter what medium and method I choose it will always be an abstraction of the reality. The story I am telling is based on subjective feelings and experiences.

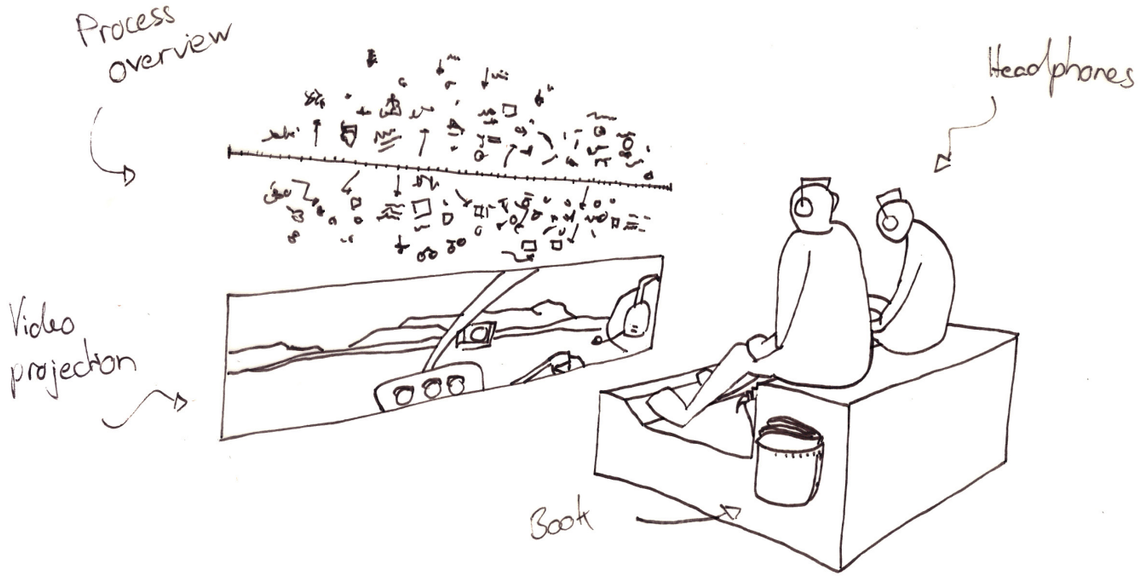
While talking to friends about my adventure into aviation, I learned that the video material I collected, is most suitable to share the experience of learning to fly. Adding my personal comments further helped to situate the videos into the context and draw a more complete image to the listener. People were excited to hear about the stories and started to ask questions. Especially the recordings of the radio communication triggers strong images, even more if I was hiding the related videos. People usually relate the clicks and beeps, the distorted, monotonous and hard to understand radio instructions immediately to aviation.

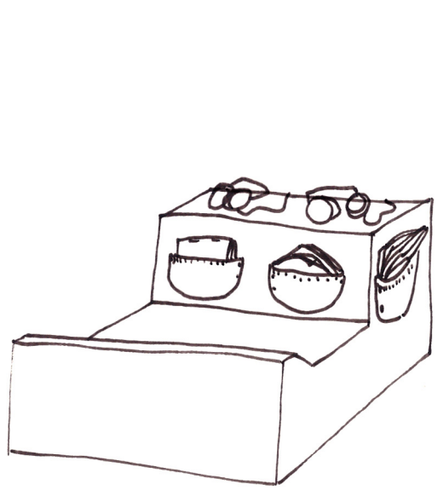
Design Product

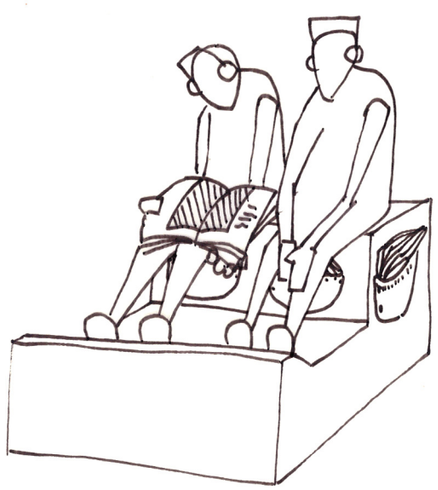
The final design product is an interactive video installation that lets the user browse through thirty selected key stories of my process of learning to fly. The stories not only focus on the practical and theoretical challenges, but also talks about personal insights and thoughts. Each story is presented through a video file. The visitor is seated in a slightly elevated, cockpit-like situation. With headphones, the diary book on his knees and hopefully a second visitor sitting closely next to him, he can explore the process. This context helps to immerse into a helicopter like situation of information overload and lack of physical space. It also requires the visitor to make conscious decisions about what he wants to focus on. The design of the seat is kept simple and abstract. It should not be mistaken for a new helicopter cockpit design.

When analyzing the process over the last couple of months, I often used the hand drawn overview map and the website to locate certain events. I was surprised how quickly I was able to point out the day of a specific event. I decided to transfer this navigation system into the installation. A slightly adjusted version of the original hand drawn map, with illustrations of important happenings, is drawn directly onto the wall and helps the user to navigate through the process. Since the installation takes place in a dark environment, the drawings are hidden until the projector reveals the drawings of the current story. The combination of handmade drawings and digital projections draws additional attention to the installation. Each seat is equipped with two foot pedals to jump back and forth in the process. As soon as a new key story is selected the drawings are revealed and the according video file starts to play.

In addition – with the help of Florian Jakober and Michael Zehnder of Studio Afrika – a diary book has been designed. The first part of the book is a pictorial access to the key stories of the process. A combination of photographs and images taken from the theory books. They are chronologically ordered and relate to the key stories. The second part of the book contains all diary interviews that I have written during the process. To clearly label the connection to the helicopter interior, the books are placed under the seat. One under each seat. The same place where the pilots handbook and checklists can be found in the real helicopter. The material of the book has been selected to further strengthen the connection to a technical handbook inside an aircraft. The book does not only act as an integral part of the installation but also works as a standalone product.





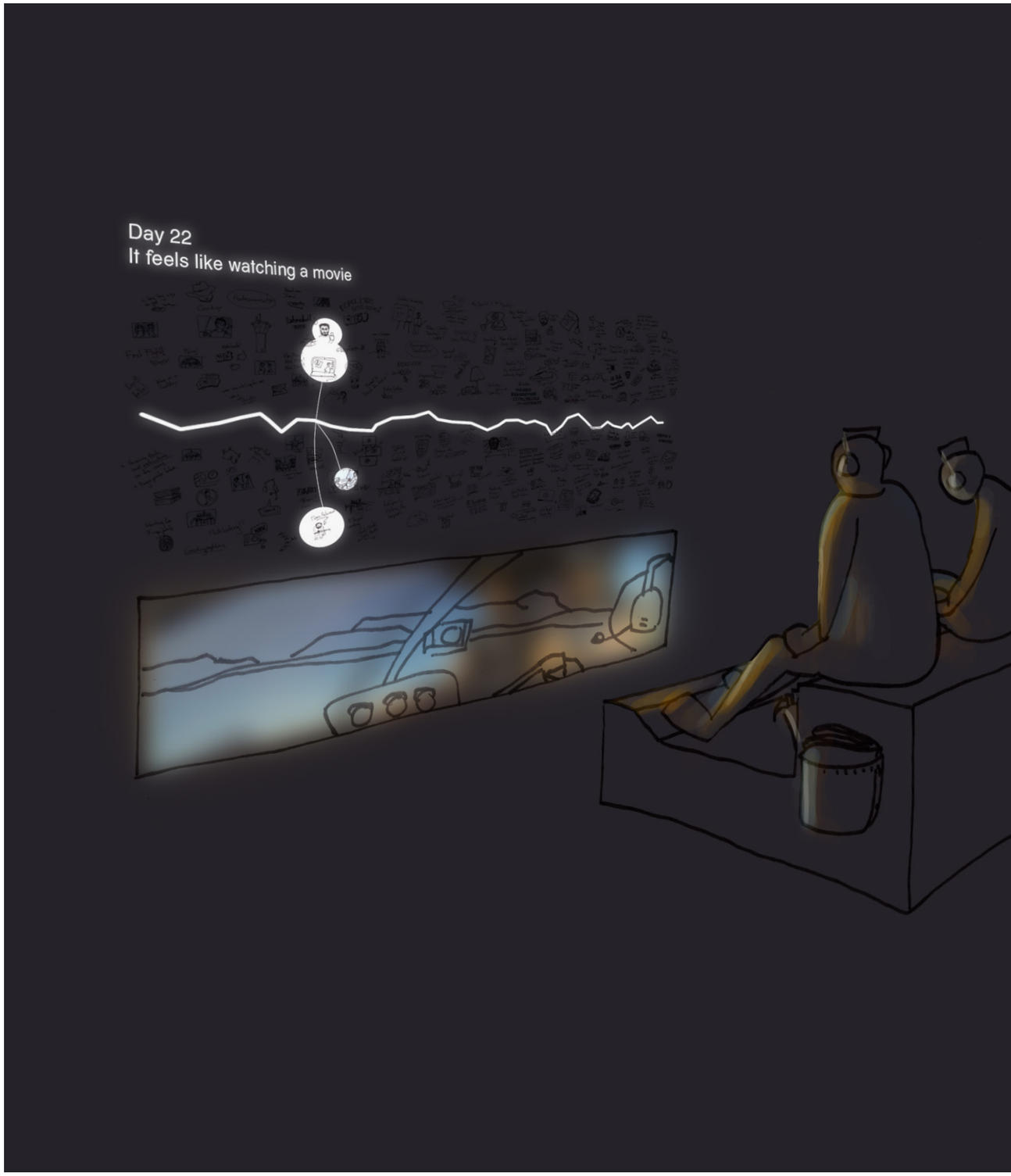


Final exhibition setup

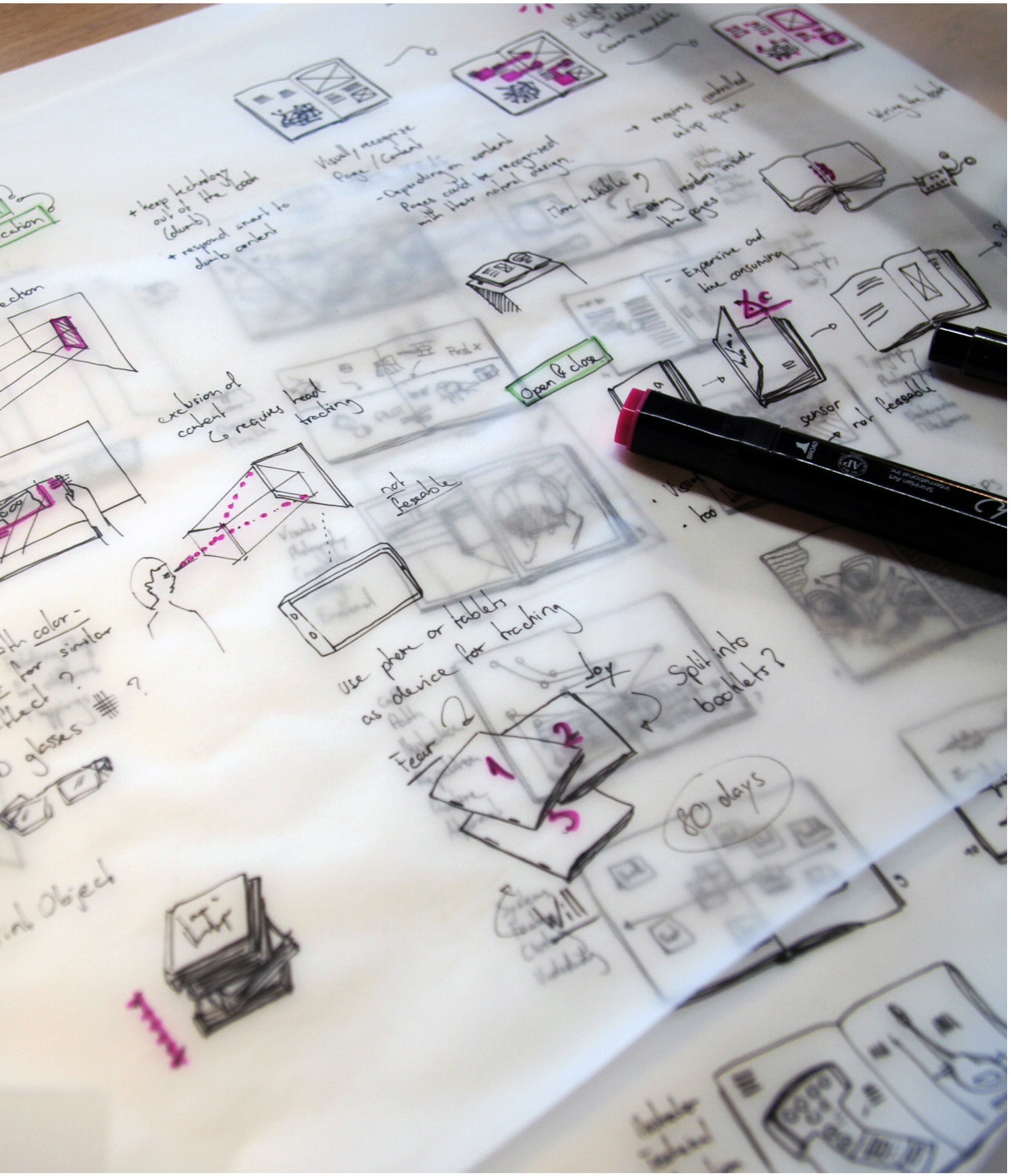
Setup and Technology

The installation takes up a space of two square meters and the projection also spreads over two square meters. This is mainly due to the limited space available for the exhibition. Two video projectors are used for the installation. The first one is mounted above the seat and projects the mask onto the wall drawing, highlighting important parts of the drawing. The second projector is placed inside the seat and projects the videos of the flight training, just below the drawing. Both are connected to the same computer.

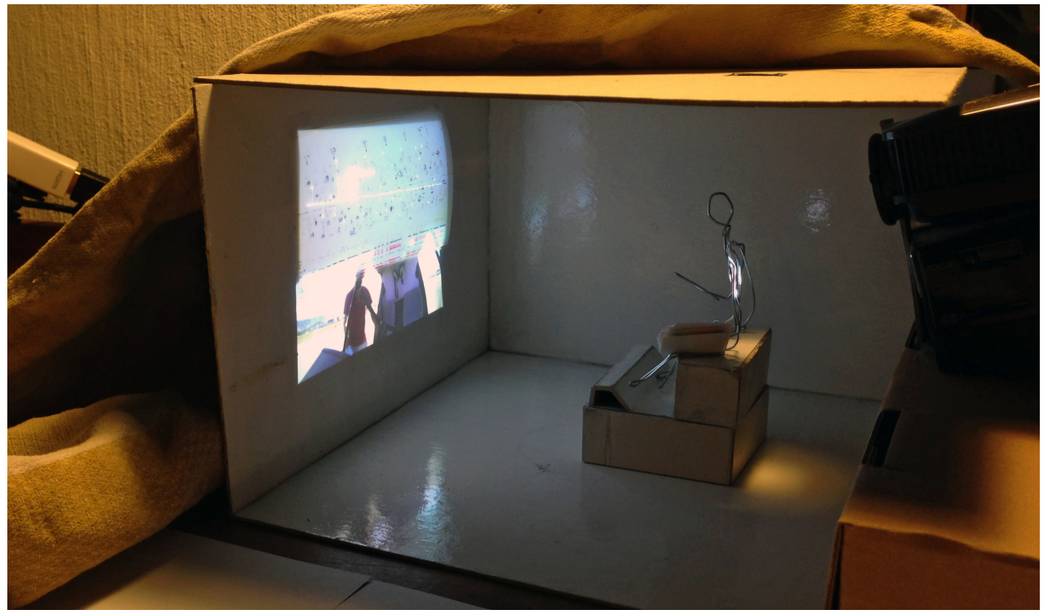
I used the java based programming language processing (www.processing.org) to develop an application that controls the visual appearance of the video mask. It reads the user inputs from the pedals, jumps to the according story, reveals the related drawings on the wall and forwards console commands to the video player. Since processing struggles with the playback of high definition videos, I decided to outsource this task to the powerful video player VLC (www.videolan.org) instead. The player can be remotely controlled via console commands and further allows to apply live video effects and cropping.



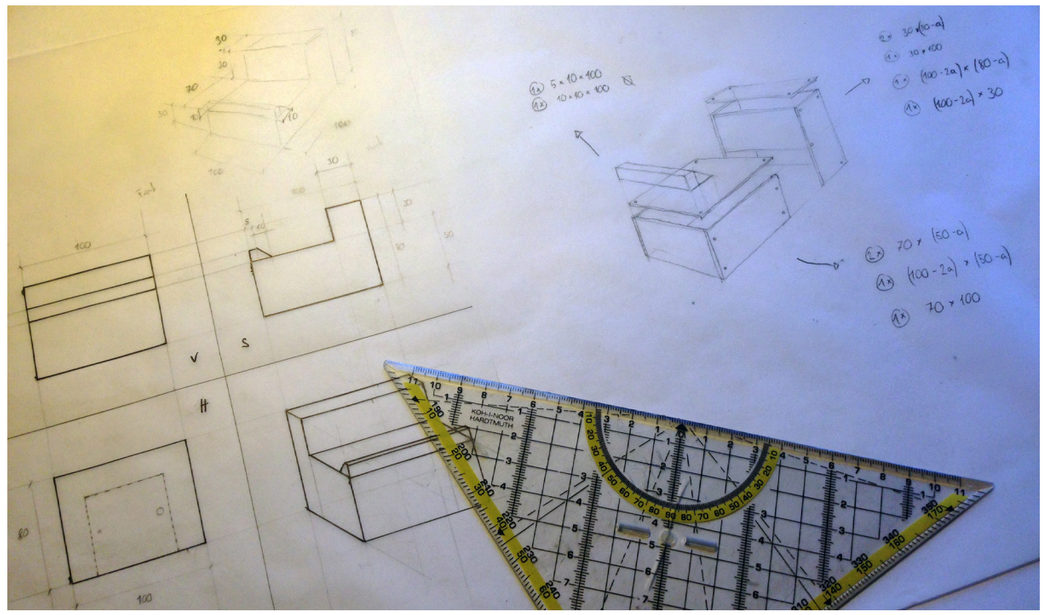
Mockup of the final installation setup



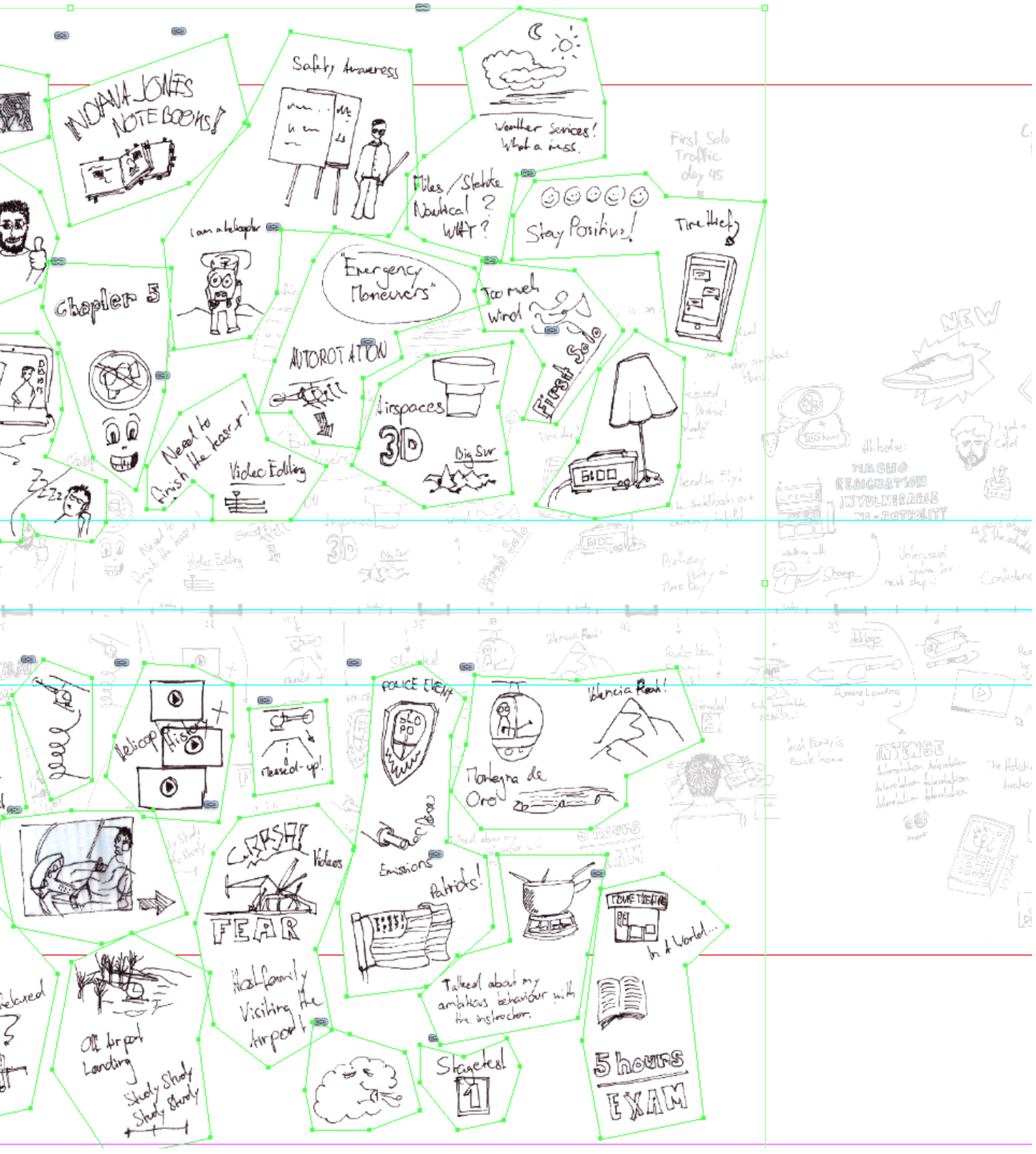
Working on design ideas to communicate the experience



Model (1:20) of the exhibition setup to test lighting situation



Technical drawing of the cockpit seat



Scanning and editing the original drawing to fit the exhibition setup

Overview of the visual material to decide on visuals for the diary book

Developing the application to control the video playback and projection mask

Conclusion

The self-experiment was the key to this project. Almost everything I learned, documented, analyzed and discussed is built upon the experiences I made during the process. I gained insights into the culture of aviation, into the challenges, the mindsets and the technology. Documenting this experience and my personal impressions was a demanding task. I learned a lot about myself and methods to documents, reflect and communicate such a subjective experience. The methods I used proved to be very suitable even though I underestimated the time they will consume. Documenting the process in such great detail was exhausting and often distracted me from the learning process itself. The documentation probably even distorted the results to a certain degree. I am still no aviation expert and it would be presumptuous to point at all the design problems I discovered and propose new solutions. The experiment is one dimensional. I did not look at other schools, other helicopters or students. But I can share my experience, communicate it as a piece in the bigger picture, highlighting features in the process. I touched many topics that are related to aviation and offer promising design problems to be investigated into. But picking one of these topics is not the goal of this project.

No other vehicle draws the kind of freedom a helicopter does and after being fascinated by this thought I am happy I made this self-experiment, not knowing where I would end up. We all have dreams, things that we want to do, but most likely will never find the time, the money or the courage to actually fulfill them. The daily routines have us trapped and it is often hard to step out and start something new and uncertain. But too often we look back and say: “I wish I had…”.

The project also shows how difficult it is to communicate personal experiences. You can never tell the complete story, it is always an abstraction of the reality. You never know how others will perceive and interpret your story. And even if someone went through the same process the results would probably look very different.

Where does the future of aviation lie and does the vision of the flying car ever come true for all of us? My answer definitely is yes, the question is when and how it will look like. A helicopter like the Robinson R22 can not be introduced to the broader public, it is too fragile and sensitive. If personal aerial vehicles should replace our cars one day it all has to be substantially simplified. Flying has to be at least as simple as driving a car. Probably flying will not be as exciting as science-fiction movies told us, but more like taking a taxi. A fully automated personal flying network is more realistic, than one where everyone is in control individually.

The Robinson R22 helicopter

References

AMAZON (2013)
Amazon Prime Air Project Website
Retrieved from: http://www.amazon.com/b?node=8037720011

CHUANG, L. (INTERVIEWEE) (2013, DECEMBER 5)
SRF Einstein [Television series episode], Mobilität neu definiert: Mal eben zur Arbeit fliegen, (5'45")
Retrieved from: http://www.srf.ch/player/tv/einstein/video/mobilitaet-neu-definiert-mal-eben-zur-arbeit-fliegen?id=406927c0-efcf-4424-9366-6d537d2374a1

CUMMINGS, M. (2013, OCTOBER 31)
BBC Future, World-Changing Ideas: Why everyone may have a personal air vehicle
Retrieved from: http://www.bbc.com/future/story/20131031-a-flying-car-for-everyone

DATTEL, A. R. (2012)
Improving Situation Awareness and Performance of Flight Students by Conceptual and Procedural Training
doi: http://hdl.handle.net/2346/9225

DILLOW, C. (2013)
The Future Of Flight: Helicopters Will Fly Like Airplanes
Popular Science Magazine (2013, July)

E-VOLO (2013)
Volocopter Project Website
http://www.e-volo.com/

GOLD, R. L. (1958)
Roles in sociological field observations
Social forces, 36(3), 217-223

JUMP, M., PADFIELD, G. D., WHITE, M. D., FLOREANO, D., FUA, P., ZUFFEREY, J. C., ... & BÜLTHOFF, H. H. (2011)
myCopter: Enabling Technologies for Personal Air Transport Systems
The Future Rotorcraft–Enabling Capability Through the Application of Technology

KEBABJIAN, R. (2014)
Plane Crash Info, Accident Statistics
Retrieved from: http://www.planecrashinfo.com/cause.htm

KENT, J. (2002)
Published Letter, Let's use only metric units of measure in aviation!
Retrieved from: http://www.esperanto-chicago.org/jones/metricaviation.htm

LETHERBY, G. (2009)
Gendered Journeys, Mobile Emotions
University of Plymouth, UK and Gillian Reynolds, Coventry University

MELANDER, H., & SAHLSTRÖM, F. (2009)
Learning to Fly—The Progressive Development of Situation Awareness
Scandinavian Journal of Educational Research, 53:2, 151-166
doi: http://dx.doi.org/10.1080/00313830902757576

NISHIZAKA, A. (2006)
What to Learn: The Embodied Structure of the Environment
Research on Language & Social Interaction, 39:2, p.119-154
doi: http://dx.doi.org/10.1207/s15327973rlsi3902_1

SPRADLEY, J. P. (1980)
Participant observation
Holt, Rinehart and Winston

SPENCE, IAN; FENG, JING (2010)
Video games and spatial cognition
Review of General Psychology, Vol 14(2), Jun 2010, 92-104
doi:10.1037/a0019491

STRAUSS, A., & CORBIN, J. (1994)
Grounded theory methodology
Handbook of qualitative research, 273-285

UK CIVIL AVIATION AUTHORITY (2013)
Global Fatal Accidents Review 2002-2011
Retrieved from: http://www.skybrary.aero/index.php/Aviation_Safety_Statistics

WIEDER, D., & ZIMMERMAN, D. (1977)
The diary: diary interview methods
Urban Life, 5(4), p.479-498

WASTELL, COLIN A. B.SC., PH.D (2002)
Exposure to Trauma: the Long-Term Effects of Suppressing Emotional Reactions
Journal of Nervous & Mental Disease (December 2002, Volume 190, Issue 12, pp 839-845)

Bibliography

Books

The Journey is the Destination: The Journals of Dan Eldon
Author: Kathy Eldon
Chronicle Books, February 2011
ISBN: 0-8118-1586-2

Nachtflug
Author: Antoine de Saint-Exupéry
Publisher: Fischer Taschenbuch Verlag; Edition: 21 (13. June 2012)
ISBN: 3596293162

Deutschboden: Eine teilnehmende Beobachtung
Author: Moritz von Uslar
Publisher: Kiepenheuer&Witsch; Edition: 6 (23. September 2010)
ISBN: 3462042564

Articles

Selbstkonstruierter Flugsimulator: Der Mann, der sich ein Cockpit baute
By Sandra Sperber und Matthias Kremp
Spiegel Online, 25.3.2013
http://www.spiegel.de/netzwelt/gadgets/selbstbau-cockpit-boeing-737-flug-simulator-in-der-garage-a-889932.html

Humans evolved to dream of flying
By Nora Schultz
New Scientist, Volume 209, Issue 2805, 26 March 2011, Pages 59
http://dx.doi.org/10.1016/S0262-4079(11)60693-3

Humans want to fly like birds, but their bodies make it all but impossible
By Brian Palmer
The Washington Post, June 27, 2011, Health & Science
http://articles.washingtonpost.com/2011-06-27/national/35235422_1_wings-humans-daedalus

Er weiss, was Drohnen anrichten
Christoph Amend
Zeit Magazin, 29. Mai 2013, Nr. 23

Motion Pictures

Chronicle; directed by Josh Tank (2012)
"Whilst attending a party, three high school friends gain superpowers after making an incredible discovery underground. Soon, though, they find their lives spinning out of control and their bond tested as they embrace their darker sides."
http://www.imdb.com/title/tt1706593/?ref_=sr_1

Sleep Dealer; directed by Alex Rivera (2008)
"Set in a near-future, militarized world marked by closed borders, virtual labor and a global digital network that joins minds and experiences, three strangers risk their lives to connect with each other and break the barriers of technology."
http://www.imdb.com/title/tt0804529/plotsummary?ref_=tt_ov_pl

Birdmen - The Original Dream of Flight; directed by Matt Sheridan (2012)
"The movie chronicles the history of man's ancient desire of bird-like flight and explains the how and why of arguably the world's most dangerous sport today."
http://www.birdmenthemovie.com/

Earthflight (BBC Documentary)
"Nature documentary that takes a breathtaking flight on the wings of birds across six continents and experiences some of the world's greatest natural spectacles from a bird's-eye view."
http://www.bbc.co.uk/programmes/b018xsc1