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THE HARSHTEST ENVIRONMENT

– Filming on a sailing boat



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My thesis tells in detail on preparation for documentary film making in difficult conditions and environment. I have planned this to be a field guide to filming preparations. The environment I have chosen is a sailing boat. The thesis starts with an introduction to the environment and how to create working safely where safety. Safety on a boat is mostly about your actions, how you have prepared to for situations and acting upon them.

After ensuring the safety in the environment comes preparing to the filming itself. My thesis goes to lengths explaining different tool options for filming and supporting processes. Gear options are explained on a level in which the reader is assumed to possess basic knowledge on film making. My thesis also makes assumptions for the sake of an argument, with the basic assumption is that the reader is making a professional level documentary rather than a home video.

Finally my thesis explains different shooting methods and alternative methods to common hardships when filming in a boat. Realizing that every project, or documentary, is a work of art – there will not be anything too specific when it comes to choosing angles and pictures to the reader's documentary.

The last chapter is about my further goals with my thesis. I am looking to broaden the text even further to create a publishable book on the subject.

Along with my thesis I will be using my own documentary as a case study, my documentary is an adventurous sailing documentary. Much of the knowledge I gathered during the production I has empowered me to write this thesis. When using the case study I will be explaining my decisions and what was my reasoning on each decision.

KEYWORDS:

Documentary, filming, tool choices, sailing, EBU,

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Opinnäytetyöni kertoo yksityiskohtaisesti valmistautumisesta dokumentaarisen elokuvan tekemiseen vaikeassa ympäristössä. Olen suunnitellut opinnäytetyöni olevan kenttäoppaaksi kuvauksiin valmistautumiseen ja itse kuvausten ajaksi. Valitsemani haastava ympäristö on purjevene. Opinnäytetyöni alkaa johdannolla ja esittelyllä ympäristöön; jatkaen siitä turvalliseen työskentely tapaan. Turvallisuus venessä on pitkälti kiinni tekijän omista valinnoista ja siitä kuinka hyvin tilanteisiin on valmistauduttu.

Kattavan turvallisuus esittelyn jälkeen aloitan valmistautumisella kuvaamiseen. Opinnäytetyöni kertoo yksityiskohtaisesti eri työkalujen valinnoista. Työkalujen valinnassa on tehty oletamus lukijan omaavan perustuntemuksen elokuvan kuvaamiseen. Opinnäytetyössäni teen myös yleistyksen lukijan tavoittelevan ammattimaista dokumenttia kotivideon sijaan.

Lopuksi pureudun erilaisiin kuvaamismetodeihin ja esitän ratkaisuja tavanomaisiin ongelmatilanteisiin, joita veneessä kuvaaminen aiheuttaa. Jokaisen projektin ja dokumentin ollessa omanlaisensa taideteos, en edes yritä kertoa liian tarkasti kuinka asiat tulisi tyylillisesti toteuttaa.

Viimeisessä kappaleessa pohdin tämän opinnäytetyön tulevaisuutta. Tavoitteenani on edelleen laajentaa tätä opinnäytetyötä, ja lopulta julkaista laajennettu kokonaisuus kirjana.

Opinnäytetyön lomassa kulkee esimerkkiprojektina oman dokumenttini kuvaukset. Kuvasin purjehdusdokumentin, josta saamaani kokemusta ja tietotaitoa olen avannut tähän opinnäytetyöhön.

ASIASANAT:

Dokumentti, elokuvaus, kameravalinnat, EBU, purjehdus

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LIST OF ABBREVIATIONS (OR) SYMBOLS

CO ₂	Carbon dioxide
HD	High-definition video, usually refers to 1920 x1080 resolution
EBU	European Broadcasting Union
DSLR	Digital single-lens reflex camera
XLR	Professional audio connector
Fps	Frames per second
Prosumer	Contraction of words professional and consumer
ENG	Electronic news-gathering, commonly refers to a camera form
ND	Neutral Density, filter type
Mb/s	Megabits per second, unit of data transfer rate
NLE	Non-linear editing, contemporary method of editing film in a computer environment
Gb - Tb	Gigabyte – Terabyte, unit of data measurement
RAM	Random-access memory, computer data storage
USB	Universal Serial Bus, standard data cable, contemporary usage includes charging electronic devices

1 INTRODUCTION

This thesis is written as a field guide for anyone planning to film a documentary on a sailing boat, or on any boat for that matter. The same principles also apply to many locations that are away from stable electricity, wet, cold and difficult locations for filming. This thesis will give guidance on choosing the right equipment for the job and will also give instructions on safety and how to get the right shots you need.

Filming is an artistic work, and therefore some of the things I will cover will not apply to every work. Each piece of art is its own entity with an individual style. Recognizing this I am not even trying to write a guide that would cover all the aspects of the work.

Along with the thesis I will use my own documentary project as a case study. During the summer of 2014 I filmed a documentary on a sailing boat. Planning of this documentary started during the winter 2013 – 2014 and went on to be a successful project. Our boat S/y Dijon sailed around the southern parts of the Baltic Sea, started from Turku and toured all the way to Germany and Poland. This trip included close proximity to shore and open water all the way to the horizon. We sailed overnight; our longest leg was 4 days. During the writing process of this thesis, in the autumn of 2014, we still haven't started editing the documentary. There are a few published clips, but the actual documentary hasn't been edited.

I attempt to write a guide that would allow anyone with a basic knowledge of filmmaking to choose the right tools, to work safely and get the idea how to get the shots one needs. Tools and requirements do change with time, therefore I will try to stay out from individual products and keep my focus on the bigger lines.

My ultimate goal is to keep broadening the guide later on and when I feel it to be ready I will try to publish this as a book.

2 ENVIRONMENT

Sailing boat, or any boat, is an incredibly difficult environment to film and work in. First there is the filming safety, which should never be ignored even for a moment. After safety comes the fact that it is always wet and if not on the boat then at least all around it. Other aspects of making filming difficult include things like lack of space, bad ergonomics, lack of stable electricity and continuous movement of your "stable" ground.

S/y Dijon is a 23 foot long yellow sailing boat. It has a set of sails, a "kitchen", a deck and a few places to sleep in. What Dijon is lacking is a stable source of electricity, a few safety equipment, a toilet and a cover from the water pouring down from sky and up from the sea. Dijon is also a rather small boat, a reasonable size for the archipelago, but for open water it is way too small.

On a boat, regardless of its size, there are always plenty of the issues named above. The smaller and lighter the boat is, the bigger and more plentiful the issues are. Safety for one, in a small 23 foot boat it is extremely difficult to stay strapped in all the time, and when you are moving around, keeping safe becomes incredibly hard.

When there is a need for you to attach yourself to the boat it's usually bad weather. Bad weather doesn't necessarily mean storm, it can just as well be large waves or hard wind. When the weather gets rough there is usually water everywhere on the deck, and it keeps spraying over the sides. Keeping your gear dry and working in the bad weather can turn out to be impossible.

In addition to big issues of filming on a boat, there is a long list of not that small issues. Lack of space in a boat is always an issue, it becomes concrete in two ways:

- 1) There is nowhere to store all your gear. This means you are forced to compromise even before when packing.
- 2) There is no space to film, you can't freely take the angle nor the distance to your subject that you'd like. Filming at sea brings a lot more challenges than on a stable ground. A boat is always moving up and down and side to side. It is practically impossible to get a steady shot on a boat where there would not be

any movement. Boats are also very curved, so putting up a tripod can be next to impossible, and if you do get one up, the next change in the boat's course will drop it over board.

During the planning of our documentary we hoped to get a cameraman who would just be filming. After a few visits to the boat we realized that there isn't enough space for a fourth person. The gear and our bags would take so much space that it would be impossible to fit anyone else in. Even with only the crew and the gear on the boat we sometimes found it hard to fit everything in. It became a daily struggle to move the gear from one place to another just to prepare food or to have a moment to sleep.

Issues also include such a thing as electricity; none of your gear will work without electricity. Boats usually do have some method of producing electricity whether it is with the motor or with the sun or wind. Nevertheless, these methods don't produce much electricity and it is in 12V. A good solar panel can produce 100W in an hour, when it is well positioned and it is sunny. This means roughly 50W in reality. Batteries store electricity but only for so long. Electricity from the batteries is in 12V currency, which you will have to take it in to consideration when choosing the gear and chargers.

Boats are also famously uncomfortable, small boats have neither enough height to stand straight nor to sit in a good position. The deck of a boat is usually curved with platforms at different heights. It can be very slippery and wet. All this means that you will be first filming in a weird stance and then editing lying on your back or in sitting in a bunk.

Dijon is famous for two things, namely for its bright yellow hull colour, but also for the small size of the boat. People talk about it as if it would be a bigger boat, the boat has been in conditions where larger boats seek cover, but it is still, after all - a really small boat. Dijon has no means to generate electricity while moving on sails, instead it uses the power stored in the battery. This much we knew, but then there were a few changes to be made for the electricity system, namely to rebuild it. During our journey we were able to use the battery a bit, but we were prepared to use external batteries designed to charge mobile phones. This meant we could charge some of our devices that were made to be charged with a USB.

Altogether, filming in a boat environment is extremely difficult and taxing on your muscles and overall stamina. Getting the shot you want is difficult, and the constant wind makes recording clean sound really hard. Keeping yourself and

your gear dry may become impossible, and one should never forget the imminent possibility of falling out and dying within minutes.

3 SAFETY ON THE BOAT

Working on a boat is famously difficult, every change that the boat's course takes moves everything. There are lots and lots of moving parts on the deck and in the rig. Even a slight change in wind can move the boom, and when the boom changes side it sways the boat. The boom also has a notorious tendency to wipe away everything on its way. It is attached to the main sail and has immense power with it: if a large boom with lots of wind in the sail hits you in the head, it can kill you.

Dijon is equipped with the bare essentials of safety gear. Normally Dijon sails around the calm inshore waters of Turku archipelago where extensive safety gear is unnecessary. For our trip we gathered a lot of new gear such as VHF-phone, more safety rockets, better life vests and harnesses. Some of the gear was used during our trip. Luckily the gear aimed for our distress didn't require real life testing. Before our departure we had a test sail where all the safety aspects were covered, and this was repeated every time a new sailor joined us on the boat.

We spent three weekends during May sailing, learning and testing new gear. Even though we spent all the free time we had on Dijon, our May 30th departure was pushing it a bit, because we managed to lay the boat back on water just before May. Part of our focus was on safety and how to apply everything we've learned before on Dijon. We didn't wish to overdo safety measures and make life on boat much more difficult. Slowly we learned how to apply the right amount of safety precautions to the situation at hand.

What you should do when you come to a boat you've never been to is to get to know all the moving parts on the deck. Have the captain walk you through all the things on the deck. You should also ask where the safe spots to film are and with experience you can move from these safety spots to much more daring positions.

3.1 Personal safety

The first thing about safety is: always wear a lifejacket. Having a lifejacket on can turn out to be literally vital. There are so many things on a boat that could harm you that you will want to take away the most imminent, drowning. If necessary, you should also strap yourself in with a lifeline. This is only needed in rough seas.

We agreed sailing during ideal weather conditions there was no need to constantly have life vests on. We did, however, notice later that when we were offshore the life vests made us feel so much more secure that we both ended up having them on anyway. Everytime we left a harbor we mounted our lifeline: a rope that travels around the boat. The lifeline's main function is to have a slideable attachment point when, in rough weather, you need to go on deck. Lifelines were used in every leg.

Assuming that the one filming isn't part of the crew with sailing responsibilities, they should know at least how to act in case one drops in the water. Your up to date automatic life vest will have a CO₂ cartridge in it. When the mechanism gets in contact with water it will fill the lifevest with gas that will float you. The crew on board might not see you falling or see you in the water, so you should wave and use the whistle in the life vest. Wave your arms up and down to create movement which is easier to see from the boat. Dropping out of the boat in rough sea at night can be a deadly experience, so be ready to make amends with yourself and prepare to die. To prevent this it is highly recommended that no one is never alone on the deck.

3.2 Gear safety

You should only take gear that can take a bit of moisture and pounding. Usually the amount of damage the gear can bear goes hand in hand with the level of professionalism it is intended for. Before you leave: check how rugged your gear is.

There aren't too many options to keep your gear from bumping into things. When you are working with any gear you should always be extra careful and mind all the corners. When you store them you should have a padded case or bag for them.

Most of our gear was reasonably well protected from water, but we opted in for a proper case for the more expensive gear. Our camera had a large Pelicase for it and the rest of the gear was neatly in 2 different camerabags. Our computer and harddrives were preserved in a waterproof backpack. Pelicases, and alike, are an industry standard to keep filming gear in safety.

Waterproofing your gear is easier than bumpproofing it. There are plenty of options for casings and sleeves that will keep your gear dry. Depending on the gear these can cost anything from 20€ up to 5000€. Cameras that don't have

the option for a waterproof case should at least be covered in a rain cover. Rain covers keep the rain and splashsing water away from your gear.

We had a "diving pouch" for our main camera. This limited working with the camera to an extend that we didn't use it in a heavy rain. Our action cameras were in manufacturer's waterproof cases. Waterproof cases meant that we could use them in all situations.

We planned the interior of the boat so that the gear, that probably wouldn't be needed during the leg was put further away in a place where they wouldn't move around when the boat sways. The gear that was used more often got a nice place close to the door where they would be safe from rain and steady when the boat sways. It is also good to keep the gear in a place where it doesn't harm the normal work and its constant movement doesn't harm the boat.

When the gear gets wet or moist one should try to dry it as soon as possible. Leaving you gear in a dry and warm place where air circulates is the best. If this is not possible, a case with silica gel is a good backup option. When the gear has dried you need to clean it from any dried water remnants. Regularly cleaning your equipment prolongs its usability.

3.3 Staying warm and dry

Staying warm and dry might not sound like part of general safety, alas it is imperative. Getting wet will eventually get you cold. When your body temperature gets too low it starts to show signs of hypothermia. These symptoms include:

- shivering
- confusion
- fatigue
- hampering in mental tasks

Keeping oneself warm is not directly a safety issue, but it causes so many symptoms that may cause one to act unsafe. It ought be considered important for safety.

Staying warm and dry isn't always easy, or even possible but every measure should be taken to ensure it. There are many options for a suit that would do the job. However, having one suit that would cover all necessities is possible, but a

compromise. You should invest a decent amount of money in a proper offshore suit and something for the lighter conditions.

I bought myself a brilliant sailing suit, from Musto, a year earlier. My suit is designed to be used offshore, with high collars and strong fabric it keeps me dry and warm all day long. Eero, however, was forced (by me) to buy a new sailing jacket, as he already got my old pants but was missing a jacket. Against my advice he bought himself a lighter jacket. It did a good job but didn't have the high collar to keep the wind out of his ears. However, his lighter jackets allowed him to move much more freely on the deck compared to me in my sailing suit.

A large and heavy offshore suit will keep you dry and warm in the harsh conditions, but it is a trade off. Heavy offshore suits makes one clumsy and they weigh a lot. Moving becomes harder and the weight of the suit means that you will need more muscular power to hold your camera up and steady.

Light suits are much more comfortable, but won't keep you as warm in a bad weather. Light suits are made for inshore sailing and are brilliant for that. These are also clothes that you can wear when you stop in a city.

Other clothing should consist of layers of clothes. A base layer that keeps you warm and transfers the moisture from your skin outwards is good to have. Merinowool is a fabric that is commonly used, and works really well in wet conditions. Merinowool has the ability to keep you warm even if it's wet.

On top of the base layer you can have a layer of fleece that would keep you warm, but doesn't keep the wind off your skin. You should avoid cotton based clothing as they tend to suck moisture from skin and air. Wet cotton is heavy and feels really cold, making you cold which again forces you to unsafe working practices.

3.4 Working safely

Working on a boat can be hard, everything moves and nothing is safe to lean on. Getting to know the boat as well as you can is important. Knowing how the wind and waves move the boat and how the change of sails affects everything will help your stay on the deck. Experience will bring you knowledge on how boats work, without experience you need to ask others and follow them doing

their tasks. If possible, ask to go on a shorter trip before you actually go for the larger project.

Working safely isn't just about the movement, it is also about knowing the boat. On the deck there are many ropes, some of them are tight and some loose. Knowing which ropes you can use to steady your stance might seem hard, but after a while you'll start to see the pattern. Mast and shrouds are also something you can lean on; these hardly ever move or are in an unstable state. The mast is always a good support for you and your camera.

4 CHOOSING THE EQUIPMENT

First it must be said that there is no such thing as the right equipment. All pieces of your kit will have flaws, and this part will help you to identify them and help you to find a workaround. Leaving with just one camera and a microphone wouldn't do if you want to film a proper documentary. Also considering budgetary reasons there is, and has to be, a limit.

Everything in the gear you choose is related to the intended use of the material. Taking a full feature movie camera to film a home video is as much an overkill as taking a consumer camcorder to shoot a full length documentary is an underkill. To rule all this out, I will take a middle road and wish to shoot a documentary that might be broadcasted on television or at least on the Internet. I'm looking to create professional level of material, but to cut cost where it is possible. In order to streamline my workflow I wish to shoot digitally on a memory card or a hard drive. I am looking to shoot in HD- format, 1080x1920 with at least 25 progressive pictures per second. 1080/25p is a simplification of the EBU- broadcast television standards. The cost of meeting the EBU- standards is a bit higher. My goal is to get as close as possible.

Our original plan was to film a full feature documentary film. However, when we worked on the plans and the idea we came to the conclusion that a TV- series would fit much better to our plans. Our trip was divided into legs, and the legs would be a natural stop for an episode rather than to an act. The TV- world is much more picky when it comes to technical details of the material. Our goal was to raise enough money to get a EBU- compatible camera to produce most of our material. More on our choices later.

4.1 Camera

To start off with the most obvious part of one's kit - the camera. In the current market there are plenty of cameras to choose from, some of them have advantages over others with downfalls in other areas. Camera technology is evolving so fast that the examples I write today may have become obsolete by the time this thesis is printed. I will try to keep away from designating models, but when doing so it will be to compare specific aspects.

Cameras fall in a few categories: professional videocameras, "prosumer" camcorders, DSLRs and action cameras. The line between professional and prosumer cameras is very thin; no precise definition exists. For the sake of argument I draw the line in a few details. Professional video camera has to have all the following details: interchangeable lens, XLR- audio connections and recording 4:2:2 color space internally. This distinction is harsh and some cameras might belong to both categories at the same time. For the sake of this thesis I'll be the judge of what falls into which category.

Later on I will talk about other gear that are closely related to cameras, such as mounts, memory cards and batteries.

4.1.1 Professional videocamera

Professional video cameras usually meet the EBU- standards for broadcast. Camera's form is such that it can be used to film handheld without any extra gear. The picture will be a bit shaky, but you have the possibility to secure the camera and hold it to your body. The prices of lower end professional videocameras have fallen dramatically in the last few years; now they cost around 10 000 €.

To compare two cameras and their specifications:

Canon C300



- Super 35mm-Size CMOS sensor
- EF lens mount
- Canon XF Codec - 4:2:2 50 Mb/s
- 1920 x 1080 / 25p
- HD-SDI output, XLR inputs
- Dual CF card slots

Sony NEX-FS700



- 4K Exmor Super 35mm CMOS sensor
- E-Mount lens mount
- AVCHD Codec – 4:2:0 35 Mb/s
- 1920 x 1080 / 25p
- HD-SDI output, XLR inputs
- Multiple memorycard formats

Choosing between these two models is incredibly difficult. They both have benefits and disadvantages and most of them are not listed above. Sony can record 4K- video, making it much more futureproof. Sony can also shoot superslowmotion at 120fps in full HD. Canon on the other hand has better codec and much nicer form, but also better compatibility with lenses. How should one choose? For one I can't, the best way is to try them both and see how they feel.

4.1.2 Prosumer camcorder

Prosumer camcorders come in many shapes and forms. Some of these would fit nicely in professional category with XLR- sound inputs and good enough codecs. We can compare them to ENG- cameras. There are also prosumer camcorders that are stripped down models of ENG- cameras. The prosumer category is a vivid category where the upper end is aimed for professionals and lower end to avid enthusiasts. The technical differences in these cameras are small, but form factors can create a huge difference in usability.

ENG- cameras are usually EBU- specification compatible handheld cameras that by form resemble the "old fashioned" cameras which are meant to be sitting on cameraman's shoulder. ENG- cameras have reasonably good fixed lenses and in-built ND- filters, good codecs and good video shooting ergonomics.

During the last few years the market has bloomed with good models that would suit extremely well for most documentary work. Cameras are getting smaller and more agile, sensors are getting better and image quality good enough to all major TV- broadcasters. When going this way there are major decisions to make when choosing the camera.

ENG- cameras are an investment that will influence your choices later on. Camera manufacturers have their own ecosystem where most of their products live: this consists of batteries, memory cards, codecs and plenty of smaller items and characteristics. When you choose manufacturer you are heavily invested in this ecosystem and therefore you will be "married" to it by your investment and workflow.

Just below the prosumer cameras come regular consumer cameras. Consumer cameras are worse in terms of ergonomics, sound recording, inputs and image quality. However, they use much cheaper memorycards, lighter codecs and are themselves a lot cheaper. The high end consumer cameras come with multiple possibilities to manually set the image settings and to use them in a professional way. They still lack the image quality and sound options of a professional cameras and for that reason probably are not a suitable option to any serious documentary work. Depending on your intentions and workflow, you might find the right camera from this category as well.

4.1.3 DSLR

Since the advent of Canon 5D Mark II independent film makers found that a normal DSLR camera can be used for video work as well as photographs. Canon 5Dmk2 has a full frame sensor, interchangeable lenses and reasonably good video quality, with only minor drawbacks. Full 35mm sensor gives better low light quality to image and smaller depth of field if wanted. These factors allow a good operator to create a filmlike image from a reasonably cheap camera. Since 5Dmk2 there have been many cameras with different advantages for filmmakers.

DSLRs come with a very interesting price tag, you can get a reasonable camera for 1000€, a used one for about 700€. The top of the line DSLRs are about 2000€ and cover most of your bases where filming is considered. DSLRs produce a beautiful image that can be used for more or less any documentary. Considering DSLRs there are a few pros that usually outweigh the cons: namely the price and interchangeable lenses.

Price I already mentioned, lenses are the next thing. As discussed earlier on the procameras, a wide variety of lenses allow you to use extremely powerful (low light wise) lenses that can be used in dark conditions. Interchangeable lenses allow you to use the right lens in the right scenario, and as DSLR is a photo camera, there is a huge backlog of lenses that can be used. There are "cine lenses" as well that are designed to be used in moving pictures, but the photolenses work almost as well.

DSLRs, as mentioned, also have drawbacks when it comes to shooting a video. The sensor is designed to take one picture with shutter speed up to 1/10000 of a second, filming a video you are trying to work with 1/25, 1/50 or max 1/100 of a second. This means that during the time of the image capture from the sensor, the subject has already moved producing an image where lines are not straight. DSLRs also suffer heavily on moire and aliasing, where tight patterns are shown incorrectly.

DSLRs are also ergonomically difficult to handle whilst shooting a video. Cameras have been designed with still photography in mind, and the ergonomics is brilliant for that - for video, not so much. One hand always holds up the body, while the other hand is left to handle all the controls. Bad ergonomics aside, there are also multiple settings to change according to ever changing light conditions. To resolve most of the issues on bad ergonomics, there are hundreds if not thousands of different rigs and handles you can use to manage your camera while shooting. E.g. anything from a simple shoulder rig to elaborate cages that allow you to attach handling equipment and extra devices to your system.

Photography in mind when designed, DSLRs are also missing a few needed features such as sound recording. DSLRs do have an internal microphone, and a possibility to attach an external one, but you are still better off with a proper external sound system. DSLRs record video in an inferior codec that can be changed when you attach an external recorder to your system. This doesn't work with all DSLRs.

All in all, DSLRs are good options, even though they do lack in some areas, but most of these can be solved with extra equipment. Some of the lacks in video quality can be solved by artistic compromises from acknowledging the downfalls and working around them.

Due to lack of funding we were forced to use DSLR as our main camera, I'm not sad about this, but I am a bit worried about how TV- broadcasters will look on it as there is not enough data in the image. I'm confident that content wins the specifications that they rule on the technical side. DSLR that we used was my Canon 5D Mark II, which I already owned, and I also had all the supporting gear to go with that.

4.1.4 Action cameras

Action cameras are small waterproof cameras and can take a hit or two. Cameras come with a wideangle lense and a microphone. The market has bloomed in the past few years after the introduction of GoPro- camera. Action cameras are commonly known as GoPros, but there are a few decent options to GoPro.

GoPro has created name for itself for a reason. Currently GoPros go in the 4th model with various different model options. GoPro is widely used by outdoor enthusiasts; its mounting possibilities are more or less endless. GoPros have a wide array of mounts and supporting gear designed for them. For a long while this was the only reasonable option to be used, and still today it is hard for some people to see beyond this option.

GoPro has a few competitors worth noting, mainly Sony's AS100. Sony has brought an action camera with 50mb/s recording. This is compatible with EBU-standars. Sony is currently lacking the vast mounting options of GoPro, but there are plenty of options to mount the camera. The Internet has also shown

an option to use most of GoPros mounts with the Sony. What makes Sony "better" than GoPro is the possibility to use a wrist-screen to remotely operate up to 5 cameras. BBC has been seen using AS100 in its productions (BBC, QI, Season 12).

There are new manufacturers of action cameras coming on the market. Among them Countour whose first model looks promising. Many cameras come from China, but naming any of the manufacturers is difficult. The Chinese models compete with the bigger names in price. Reasonably good picture for a much lower price is always tempting. Before taking any of these "white label" cameras to real action they need a much more thorough testing period than any of the bigger names.

A large portion of our budget was used during a single day: I bought some cameras, actually four of them. I got a nice discount from Sony and they made an arrangement for me to buy AS-100 action cameras for a reasonable price. The cameras worked wonderfully and I have used them in many projects since. Sony also provided me with a bunch of mounts that we used to attach the cameras to the boat. The only downside so far with the camera I've found is that it is hard to obtain an unattached charger to the batteries.

4.2 Sound

Some people say that sound is more than half of the movie and they are not wrong. Recording good sound is not easy even in a more controlled environment. The sea comes with a constant wind, sometimes more than enough. Recording sound needs many different devices, from microphone to recorders and cords.

Recording sound is a bit like filming pictures; every piece needs to work with each other. Below, I've collected a series of examples that would work well together. These are by no means the only options out there, but commonly known makers and models. All the devices are used by professionals and to bring you feature film quality to the recording or at least an indy feature quality.

My speciality isn't in sound recording so I called a friend to consult me on this one. He said a lot of things that made sense, and I acted on his advice. However, I did a lot of research on this, and finally I made a decision based on my financial situation and we borrowed a few mics and saved on the other parts. YOU

SHOULDN'T DO THIS, we did and now we are forced to do a lot of sound editing in post production.

4.2.1 Recorder

First we will look at recorders, as the name implies they record the sound. We are going for good quality sound with enough depth and information to help you in the mixing. Technical quality assures that all the sounds the microphone catches are recorded and therefore you can use the data in mixing.

There are two de facto manufacturers currently, Zoom and Tascam. Both manufacturers make similar devices in the same price range, with almost no difference in sound quality. There are more manufacturers and devices out there, but as before I have limited the options to two that will give you everything you need in one package. Comparing these two will give you the idea what you are looking for and therefore the possibility to compare other products to these.

Zoom H6 came out early this year taking the place from the earlier Zoom H4n. The most notable upgrade to the earlier model is an increase in the amount of XLR- ports. H6 also comes with interchangeable head to change the "internal" microphone. The Internet provides plenty of comparison between H6 and H4n. Tascam DR-44WL is similar to Zoom H6 with less XLR- ports and less recording channels but with wi-fi enabled control and file transfer. Tascam is also about \$100 cheaper.

Both models will work for any normal purposes. There are also "budget" models lacking some of the professional advantages of the above, notably Zoom H2 and Tascam DR-05. These devices function well, and are suited for many purposes, but they do lack some professional features such as XLR- inputs.

The ultimate budget option is to use your mobile phone as a recorder. Regardless of the serious drawbacks in this, it is possible. The biggest lack of a phone is poor connection: 3,5mm plug isn't what one might call a professional

connection due to its tendency to get interference from close-by electronics and metals. Another drawback of mobile recording is the inability to supervise and control the sound while recording.

We chose to use our mobiles as recorders after I found Røde Smartlav microphones that you use with your mobile. They worked reasonably well.

4.2.2 Microphones

Quality microphone transfers all the surrounding soundwaves into electronic pulses. The market for microphones is blooming with different options. Microphones come in many shapes and forms; most important types for your purposes are "shotgun mic" and personal microphone. Shotgun is a large mic with recording pattern straight ahead and recording from further away. Shotguns are very useful for many purposes.

Shotgun mics are usually long sticks that point to the direction of sound source. These are used both attached to a camera and to a pole held by the soundguy. Most ENG- cameras have a point where to attach a small shotgun mic. Camera sound is usually used to create a reference sound that helps later on in sound editing.

In our case the camera sound sometimes ended up being the only recorded sound.

Personal mics are small microphones that you attach close to a person's mouth. Small mic is either attached to a recorder or transfers the sound via a receiver wirelessly to a recorder. For making a good soundtrack for your movie you need both.

What you need to look for in a microphone is that it suits your environment, meets your needs and works well with your recorder.

4.3 Editing

Assuming that all the material filmed and photographed has to be published on the go and as soon as possible, every piece of material has to be edited on one level or another. For this a computer is needed. There are several options for

the computer to be equipped with. In this section I will look for the options but consider only a few common ones.

4.3.1 PC or Mac

There is an endless discussion whether Macs or PCs are better, both have their pros and cons. Where Macs are more stable due to the closed system, PCs are easier to connect to other devices. In editing Macs are preferred, and for the sake of this thesis I make the assumption that all the systems on the boat are Mac compatible. Therefore I chose Macs to be the operating system of choice. Another reason for choosing Macs is that PCs are lacking an option to use Final Cut as an NLE.

4.3.2 Laptop or minicomputer

Computers come in many shapes and forms, but on a boat there are a few limitations. First thing to take into account is the electricity consumption and voltage of the appliance we choose to use. The machine should be able to run with 12V electricity as it is available without an inverter. Secondly, processing power, available RAM and physical strength of the device.

After these we are limited to two categories of computers.

Laptop

A laptop excels in portability and it has a screen on itself. A laptop is also built to be carried with. That means better energy optimization and physical endurance. Where laptops lose is processing power and longevity.

After choosing Macs as our system there are a few options that Apple provides: MacBook Pro and MacBook Air. Editing requires a lot of processing power, and for that reason MBP is the better solution. MBP is not a native 12V machine, but there are 3rd party chargers with inbuilt

inverter to feed the MBP with 16,5V. Without this option there would be no chance to use an MBP.

Minicomputer

Mac Mini is a small "minicomputer" that basically is a laptop without a screen. Most of the components within are the same that are used in an MBP. The downside of a minicomputer is a need for an external monitor, and another lack of a minicomputer is the lack of internal battery to provide electricity.

I would choose to go with a laptop for several reasons: it comes as a package, there is everything you need in one box, and everything is designed to work as a package. Even if a laptop would lose it's processing power in time there are too many plusses on the transferrability. When you can take the laptop with you, you can sit down in a comfortable hotel bar, do your editing from there and use the hotel's internet connection to upload your videos. Laptops also have an internal battery allowing you to work without external power source.

4.3.3 NLE

While we are on Macs we have the choice of three major linear editing softwares: Final Cut, Adobe and Avid. All of these would do the job extremely well, and whichever were to be chosen is a close call and usually depends on a personal preference rather than on actual merits of the software.

Final Cut

Since the new version of Final Cut, the FinalCutX, there has been a lot of criticism if it is actually suitable for professional editing. Nevertheless, since the latest updates it seems to be working well and is suitable for professional editing.

Final Cut works best in a small project done by one person. It is easy to learn and easy to use. However, there is a lack of build-in tools that forces the user to use other softwares as well. Connectivity to other softwares is highly limited. Final Cut is a bit lighter and faster in our circumstances as there is a limited amount of material and only one editor.

Avid Media Composer

There is a new version of Avid coming out soon. After the updated version there are no good reasons to go back to the current version. Avid was one of the first computer based NLEs and has been developed ever since to fit contemporary needs.

The present version, version 8.1, being greatly improved. Avid has solved a lot of issues specially related to editing with a laptop. As a system, Avid does everything really well, and has a lot of inbuilt tools. The only downside of Avid seems to be a steep learning curve. For a user coming from another system Avid has its very own way of working.

Adobe

Adobe has a few tools to be used in the tasks at hand. There is not just one software that would be used, but rather a whole family of tools that do their separate jobs very well.

For editing there is Premiere, easy-to-use multifunction editing software. For color grading there is Speed Grade, a tool only to be used for making the colours look good. After that there is After Effects to create every effect one can imagine. And finally, there is Audition for sound editing and for sound effects.

All of the Adobe softwares work seamlessly together, and on top of that if the filming also requires photoediting Adobe Photoshop can be used for that.

My "weapon" of choice is Adobe, mainly because I like the workflow and how all the systems work nicely together. The pricing of this software package has also affected my choice. My full setup was a Macbook Pro, with unofficial upgrade to 16Gb of RAM, Adobe CS6 production premium, 3rd party 12V charger for the MBP, external mouse and a bunch of hard drives.

There are books and other resources to teach you how to edit your material. You need to establish your style and clarify your vision to yourself before you can actually produce good material. Finding your own style takes time, but in the long run it helps you to film and edit your material. Your style is something that people will, or rather should, recognize and wish to see more of.

4.4 Storing and backups

The amount of material that is filmed is vast. Saving, storing and backing it up is vital. There are options for "normal" hard drives, but there is a better option as well: rugged portable hard drives.

Portable hard drives do not require an external power source as they use the connected computer for power. Portable hard drives are usually a bit slower than "desktop external hard drives". The speed of the drive comes to question when using the material from the drive. When saving and backing up material in the field the speed is secondary to portability and reliability.

Currently there are only a few companies that make good rugged hard drives, but only one that makes them with thunderbolt connection. Thunderbolt is a connection system that allows faster transfer speed from computer to hard drive. This leaves us with no other choice, Lacie Rugged Thunderbolt 1Tb.

I already had a bunch of hard drives, one of which is Lacie Rugged, so this was our main hard drive. I also had a few non-rugged hard drives to make backups of our material.

4.5 Other gear

There is a "metric shit-ton" of gear that you will need. With so many options I will list a few that you will most definately need:

- memory card reader
- cords and wires to all devices
- external mouse
- headphones
- cleaning gear (for all devices)
- repair tool
- silica gel

I never listed all the gear I had with us, because there are just too many little pieces. Below there is a picture of my stuff lying around before packing.



4.6 Batteries

Most, if not all, your gear works with batteries of some sort. Cameras usually work with specific batteries to each camera, recorders with standard AA or 9V batteries.

You need to test that all the batteries work and how much working time they will give you. Usually camera battery gives you one to two hours of shooting time. You will need several batteries for each camera you have on board.

The option to go for 3rd party batteries is highly attractive when you consider the price. If you choose to opt in for not-so-original-vendors' batteries you need to test them thoroughly so that you know the quality. The quality of the batteries varies a lot.

Recorders can run for much longer with each set of batteries. Standard batteries have a huge quality range on durability. You should invest in good quality as they come cheaper in the long run. The best thing about having gear working on AA- batteries is that you can get them from every shop and gas station.

We had original batteries for each camera, but on top of those we had at least one more round of 3rd party batteries so that they would last a full leg. We also got 12V chargers that were suitable with the power we got from the boat. Our Sony actioncams were chargeable with USB so an external battery, intended for phones, was also an option.

4.7 Memory cards

Memory cards, or recording mediums, are probably one of the most undervalued items you need. Memory cards come in all large varieties. You need to choose the right one for you. You can have the best camera or recorder in the world but if your memory cards are not up to it then you will not have any material to show.

The first thing to mention is picking the right format of a memory card, as there are about ten widely used forms. This should be simple, just check the type, (e.g. microSD, SD, CF, SXS) from your device and buy the right kind. After this comes the difficult part: which one of the wide variety. Quality and speed are the key factors in choosing the recording format. Consumer class memory cards (SD and SD derivatives) come in a wide range of quality and speed, some are made cheap to appeal to the average customer, some for the highest professional quality.

Professional quality in memory cards consists of greater write/read speeds, weatherproofing, x-ray proofing and reliability. The downside of professional quality is the cost - about double. Everything in filmmaking is a compromise, this is the one place where you should not compromise: you would be better off with an inferior camera than bad memory cards.

The amount of gigabytes you need is the second thing you need to figure out. First you need to estimate how much you will be filming during each day and how often you can transfer your memory cards on to a hard drive. This is your estimate, now multiply that by two and you will know your realistic daily amount of material. Your camera is producing between 35Mb/s and 100mb/s of data. By combining this information, you can calculate how much you need space on your cards and hard drives. Getting a bit more than you think you need is a good idea, because hardly anything is worse than realizing that you have run out of space and you can not film anymore. There is also a tool to use for data calculations, see AJA in sources.

You should also consider buying smaller memory cards, because then you get more cards for about the same price. Forcing yourself to change the cards more often you eliminate a few factors that might end up ruining your documentary:

- 1) bad card – cards can corrupt and the data is lost for good. Having more cards you change them more often and have less material in one card.
- 2) sequencing – your cards hold less material ergo less events on the card. When you move the material to your hard drive you can have a file structure where one card holds just a few events, thereby helping you later on when you are looking through your material while editing.
- 3) more cards – while this is both good and bad, when you have more cards you are more likely to lose one of them on the boat, but you can change cards between devices and there is a better chance that you always have one empty card somewhere when you need it the most.

There is an old saying that your chain is as strong as its weakest link. This applies to the camera gear and the entity of the gear. There are places where you should save money when possible, but memory cards are not one of them.

I had many memory cards for four actioncams and one DSLR that we were forced to name the cards. I think we had 14 cards for five cameras, and this way we changed them a lot and the material was neatly saved in folders that hold one or two entire sequences.

When you end up with many memory cards you need to be really organised to prevent deleting any material. We unloaded all the cards before we left, and had two different boxes for them. This way cards from one box were always empty, and if a card showed that it had ANY material on it, then it was considered as used. We didn't lose a single file because of errors in memory card management.

5 GETTING THE SHOTS

Filming itself can turn out to be everything you've imagined, a nice day with sun and light wind, a smiling crew popping champagne. A day like no other, a day where nothing could go wrong. The polar opposite of that is the massive storm when it's raining upwards, and you need to strap yourself to the boat and fear for your life. Despite the weather you still need your shots, and for the drama you are trying to create the storm is even more important than the calms.

Boats offer limited space and distance from your subject, therefore you need a variety of lenses. Getting close or far enough from your subject to get the shot you desperately want and need can be problematic, but luckily with good gear and planning everything can be achieved. Your most important tool is your imagination, then come monopods, mounts and such.

Testing all kinds of angles before the actual shoot is important. To know beforehand whether the angle works or not helps you to improve your shots. Filming on a boat allows you to use unconventional angles to shoot a person. The boat itself offers plenty of possibilities to use as foreground and different backgrounds to create a picture with depth in it. Shooting from end to end of the boat gives shots plenty of depth, and from close range you can get gorgeous wide shots with only sky and/or sea behind your subject.

Monopods and tripods allow you to take more stable shots. Securing the camera to the boat gives an interesting movement to the shot where your subject moves along with the camera and horizon has its own movement. Securing the camera has its difficulties, as the smallest vibration of the boat is present in the image. There are a few things you can use to minimize this, but none too good. The best way I've found to get rid of minor vibration is to use rubber between the camera and the boat. This isn't the holy grail but it helps.

5.1 Inside

Filming inside the boat has limitations, difficulties and possibilities. The inside of a boat is usually dark and filled with walls and little spaces – all of which limit your options for a shot. In an ideal world you would install a led- panel to light your shot, but boats hardly ever are ideal. Solving issues with lights is the biggest invention you need to come up with. One option is to move your subject so that natural light from outside gives you a workable light, but might require the use of a reflector.

On a tight budget a flashlight or a headlamp might come in handy. I remember mounting a head lamp to a pole inside allowing me to film during the night. I also wore one on the subject to create the atmosphere I wanted. This depends on your style – if you accept noise in your picture you can use your camera much more freely to film in dark places.

The interior of a modern sail boat is usually wood: it has surfaces, boxes and sitting accommodations all over. The interior is therefore lacking wide open areas where you could freely choose your angle towards the subject. All this means that an ideal shot is difficult to compose. Mounting a smaller camera to one corner and shooting, handheld, from another angle gives you two directions to your subject and you can create an illusion of larger space.

5.2 Deck

Filming on deck gives you gorgeous action shots. The deck is hardly ever stable and someone should always do something. The deck is also filled with natural light - while this is good, it can as well be too much.

Reflectors are again useful tools to make your picture perfect. Modifying the light to your purposes is key to a good image. Using reflectors outside has a downside: they are large solid pieces of fabrication – they tend to catch the wind and never stay still. As there is no cure for this, a workaround is to have someone holding the reflector – and choosing a smaller reflector.

To limit the amount of light your camera catches you can use ND- filters. These filters dim the light without changing the colour dramatically. Some cameras have inbuilt ND- filters where some have thread on the lens for attaching the filter. In some cases you need to use a polarizing filter, as this filter allows only singular angled light to pass. Polarizing your light is good when the water reflects light from all angles. Studying and trying different kinds of filters can help you to create the image you want, reducing the need to modify your image in post-production.

The deck of a boat is usually wide open, excluding the ropes and the rig. The deck is a the place to get nice wide shots with sky on the background or tight portraits showing emotion and reactions. The deck is also the place where the action is, so you should be there as well.

5.3 Exterior

Showing the boat from outside can be tricky, if not impossible. Creating a shot showing the boat from a birdview or as seen from other boats requires either a bird, another boat or some equipment. Joking aside, given the limitations of reality you will need an extension to your arms.

Monopods have another use than stabilizing the shot: they can be used to hold the camera outside the boat. By mounting a camera to a monopod, sliding it outside the boat you can create images that give the viewer an idea of a bigger production value. Pictures outside the boat give you a possibility to show more than just the sailors and the deck. There is a limit yo how much you can use these images, but coming in a scene from the waterline raising the camera to show a sailor brings you an amazing movement and eases the viewer into a new scene.

The recent price development of flying apparatus such as RC- helicopters and quatopters gives you possibilities that didn't exist a few years ago. Mounting an action camera on a copter gives you many different options to film

the boat from outside. All kinds of flying devices are vulnerable to strong winds, so these won't allow filming your boat in a storm.

Ultimately, there is nothing I can say about how you should film your documentary, as every piece of art has its individual style -- the only piece of advice I can give is to test, try, practise and learn from your mistakes.

6 NEXT STEP

For you the next challenge is to find a boat and a crew, joining in the fun and film. Finding the best gear to try things out isn't the key. The key is to try, fail, recognize your shortcomings and try again. I have failed many times, I've checked my material and found out where I went wrong. From what I have gathered the hardest part for me is to keep my focus on filming rather than the sailing.

I will keep doing my documentaries, getting more material and broaden the content of this thesis into a book. Lately I have filmed a lot of smaller documentations of events. These are often filmed in bad light and restless environments. For the next edition there will be something about theses as well. I'm also looking into possibilities to travel the untraveled road and documenting this.

SOURCE MATERIAL

For sake of flowing reading I have left source references out from the actual text. I have merged information from multiple sources and from personal experience. Below is a list of sources and rough introduction to them.

Books

Jouko Aaltonen, 2011. Seikkailu todellisuuteen. Helsinki: Like.

This is a Finnish book that covers documentary making from multiple aspects; starting from idea development all the way to marketing and broadcasting. This is a complete opus providing a good basic knowledge of different styles and possibilities.

Suomen moottoriveneliitto, Lasse K Kivekäs, 1977. Veneenohjaajan käsikirja. Helsinki: Sanomapaino.

Regardless the age of the book this still has valid points on safety at sea. Book was written in time before GPS and such, therefore it explains how things are done manually rather than in a computer assisted world. This was the case in our journey.

Sailing videos

Volvo ocean race, <http://www.volvoceanrace.com/> .

Volvo ocean race is probably the only well documented sailing event where we actually get video material from the oceans. Volvo currently has two different YouTube- channels where videos are located. These videos are professionally produced and filmed hence a good point to look for ideas.

Wild Eyes: The Abby Sunderland story, 2011.

Girl in her midteens follows her brother's footsteps trying to be the youngest to alone circumnavigate the globe. Film has less sailing but more on preparing. Film shows how hardships can be achieved with a good and dedicated team.

Michael Perham around the globe, 2008, https://www.youtube.com/watch?v=TH88_b4aAHc

TV- documentary on Michael Perham's solo-circumnavigation around the world. Good source to see how work with "cold cameras" and how to edit the material.

Deep water, 2006.

Documentary on the first recorded single handed circumnavigation. A good source of ideas for editing archive material.

Gear

B&H Photo Video, <http://www.bhphotovideo.com/>

A large Internet store with broad catalog of different gear aimed for professionals and enthusiast. Gives good basic information on all gear and an idea on the price level. They have products from multiple manufacturers making comparing the field and features easier.

Philip Bloom, <http://philipbloom.net/category/reviews/camera-reviews/>

De facto professional video camera reviews on the Internet. Philip Bloom is a professional DOP whose reviews on the cameras are well constructed and extremely informational. If only he could do all the available cameras.

Manufacturer websites:

<http://store.sony.com/video-cameras/cat-27-catid-Video-Cameras> Sony video cameras

http://www.canon.co.uk/For_Home/Product_Finder/ Canon video cameras, ENG and cinema cameras in different categories

<https://www.blackmagicdesign.com/fi/products/cinamacameras> Black Magic cameras

<http://www.panasonic.com/business/provideo/> Panasonic video cameras

<http://www.zoom.co.jp/products/> Zoom recorders

http://tascam.com/applications/recording/handheld_recorder/ Tascam recorders

<http://www.avid.com/US/products/media-composer> Avid media Composer

<https://www.apple.com/fi/final-cut-pro/> Final Cut Pro X

<https://www.adobe.com/fi/products/premiere.html?promoid=KLXLV> Adobe Premiere Pro

Other

EBU, European Broadcast Union, <http://www3.ebu.ch/home>

Provides guidelines on technical data on the broadcast videos. These are recommendations that most of European TV- broadcasters apply on material.

Digital video, Wikipedia, http://en.wikipedia.org/wiki/Digital_video

Place where to start when you want to know technical information on digital video. Works as a point of reference and guides the reader to further information to each segment such as encoding, storage, bit rates and recording mediums.

NLE comparison list, Wikipedia,
http://en.wikipedia.org/wiki/Comparison_of_video_editing_software

Comparase and lists most if not all the available NLEs in the market today.

Comparing NLEs, <http://digitalfilms.wordpress.com/2014/02/07/comparing-final-cut-pro-x-media-composer-and-premiere-pro-cc/>

This article gives a good idea how close the systems are to each other.

AJA data calculator, <https://www.aja.com/en/family/software>

Calculates data amounts for different datastreams. Site also lists other usefull small tools for movie making.

Hypothermia, Wikipedia, <http://en.wikipedia.org/wiki/Hypothermia>

Basic and broad information on hypothermia.

These are just for start; my thesis is based on four years of education, personal experience on the matter and hundreds if not thousands of websites, articles, white papers and reviews. Searching the internet with your special need is highly recommended.