PRODUCTION GUIDE
FOR SMALL PORT SAFETY VIDEOS

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INTRODUCTION:
A VIDEO PROJECT IN A NUTSHELL

PortMate will enhance safe access, suitable green services and joint marketing in small ports. It will also facilitate the delivery of improved services for port users in 19 Central Baltic small ports. The project's pilot ports are in Finland, Åland and Sweden.

The production of several aerial videos has started as part of the objective of improving safe access to the ports for seafarers. These videos will support the safe navigation into ports, while also presenting the available services in the small ports. Some of these videos have already been published and can be found on the PortMate webpage

In this document, practical guidance for the shooting of aerial videos about ports and its facilities is provided for port operators.

Just like a normal video, shooting with an aerial drone can be divided into three phases: preproduction, production and post-production. Each of these phases is a mixture of different steps and procedures that influence each other. For example, framing and camera movements are just as much as part of the pre-production as they are of the production. For the purpose of this guide, we have decided to divide the above-mentioned phases as follows, but it is always good to keep in mind the impact they have on each other.

Steps of preproduction:
1. Gathering knowledge of safety regulations and local legislation of shooting video with UAV (Unmanned aerial vehicle) from droneinfo.fi/en
2. Writing a synopsis and drawing a storyboard
3. Planning the production itself: what is needed for shooting your video?
4. Planning the action itself: what is your flying route and do you have an emergency landing site for changing batteries?

Steps of production
1. Selecting a place, equipment, light conditions and a time
2. Shooting the video

Steps of post-production
1. Editing including rough and fine cuts
2. Color corrections, selecting music, creating text titles and special effects (if needed)
3. Distribution and marketing

In the following chapters, we will focus mainly on the preproduction steps, without examining in depth topics so wide that would need specific and detailed instructions, such as the actual video editing process.

Finally, the last chapter will present the features of a modern drone and its equipment as well as provide a short guide on how to fly and become acquainted with the machine.

PREPRODUCTION: PLANNING A VIDEO

Good planning saves your time and effort.

SAFETY REGULATIONS

Before starting to film, it is vital to gather information concerning safety regulations and the local registration of shooting videos with an UAV (Unmanned aerial vehicle). The basic step is to contact your local aviation authorities or search information from local authorities' websites. As a pilot, you are always in full charge of any consequences in the case of an emergency. It is also important to remember to respect the privacy of other people. You can check your local legislation and rules here.

More information concerning how to safely fly a drone can be found in the last chapter.

SYNOPSIS

In preproduction, the planning of your video should be completed by writing a short and compact summary about the idea and content of your video.

The aim of the synopsis is to specify to yourself what you are doing and how. In addition, a clear synopsis helps to make your point clear for everyone else in your team, and it will result in a more enjoyable video for the audience.

The maximum length of a synopsis should be no more than one page and it should summarize the main idea in one sentence. A good synopsis is sufficiently informative to be helpful in the production planning. Since you are not making a full-length movie, a manuscript or film treatment is not needed.

FRAMING AND COMPOSITING

After completing the synopsis, it is time to plan your video visually. You should plan how you frame your shots and your camera angles.

The basic formula for an effective video is to use effective shots and good framing. Framing is the presentation of visual elements within an image, especially the location of the subject in relation to other objects. It makes an image more aesthetically pleasing and keeps the viewer's focus on the framed object (Wikipedia, 2018). Classical compositing often implements a golden ratio (see figure 1).
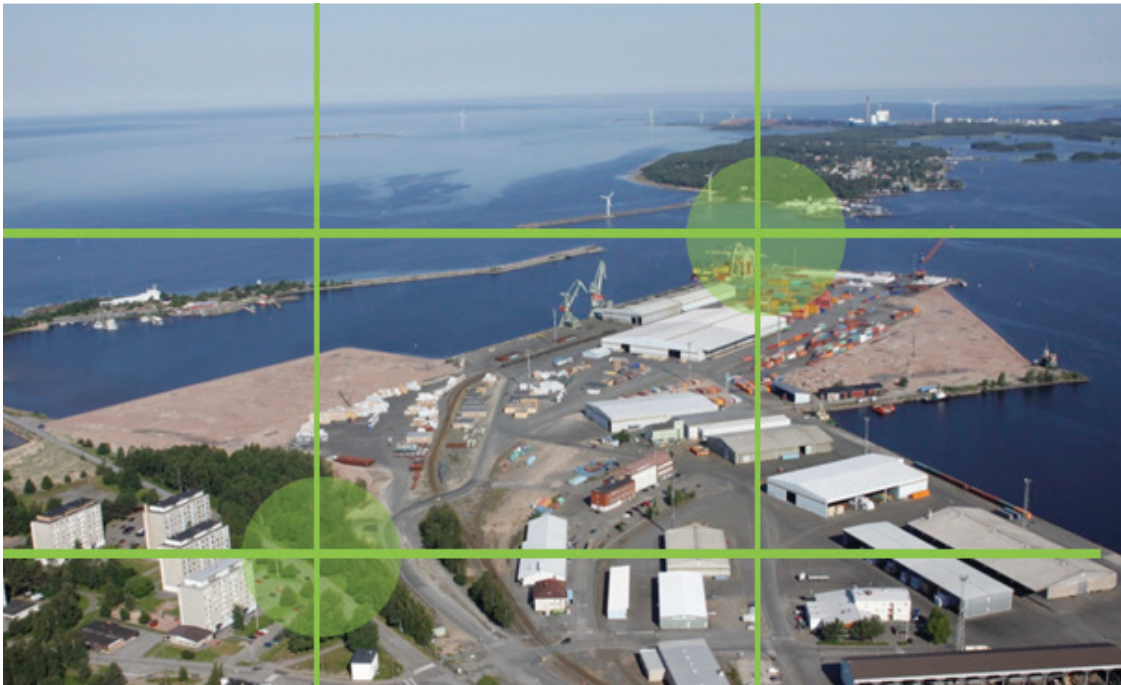

Figure 1. Golden ratio and framing in aerial videography.

Framing options

There should be variety in the framing to avoid certain dullness in your video. Therefore, writing a synopsis and visualizing it by drawing is important. The challenge of aerial videography is that shots are mostly Wide Shots or Very Wide Shots, due to a short focal length. Framing can be done only by flying closer, higher or by changing the angles of view. Below is a description of the most common framing options[1]:

Extreme Wide Shot (EWS). This view does not exactly show where the subject is, but it is often used as an establishing shot. Similar to the beginning of a story, EWS is intended to tell the audience where a particular scene is taking place.

Very Wide Shot (VWS). This is considered another establishing shot, except that the subject will be slightly visible in it. Although the focus is still on the environment, the viewers will get an idea of where the shot is leading to. Due to the small focal length of your camera (like with GoPro), aerial videography shots are mostly VWS.

Wide Shot (WS). This is the part where your subject takes up the full frame. Still, it is wide enough to capture the surroundings because it is probably the closest you can get without chopping off the top and bottom part of the subject. If your focus is a human, for example, getting too close could crop off either the feet or head, thus you need to maintain a wide shot.

Mid Shot (MS). Unlike the other shots, this is an approximation of how you view a person in real life or when having a casual conversation. That is, you would normally focus on the upper half of the body, making the lower part unnecessary.

Medium Close Up (MCU). This shot is neither too far nor too close to the subject and still provides a clear view. This is halfway between MS and CU.

Close Up (CU). This is where the subject takes up the whole frame—a close up shot of a person's face, for example.

Extremely Close Up (ECU). The camera focuses on a particular detail of the subject and is to be used to convey emotion and and only used sparingly.

Cutaway (CA). This is a shot of another action or a Close Up of a different part of a subject. It is used to increase interest or add information between shots.

1 The source for the framing description is: Guides to Effective Shots and Framing – Video Camera Tips 2018

STORYBOARD

A storyboard is a visual plan where all shots are drawn before the production. In a storyboard, you organize and visualize the sequence beforehand. A storyboard is based on framing and compositing, and it helps to visualize your production. It saves a lot of time, nerves and battery life.

The idea of a storyboard is simply to draw your sequence like a cartoon or a comic book (see figure 2). It also provides a visual layout of events as they are to be seen through the camera lens. A storyboard can also be done with post-it notes, which allows you to re-organize the sequence easily, for example.
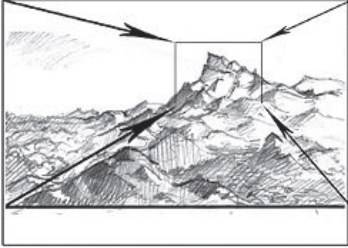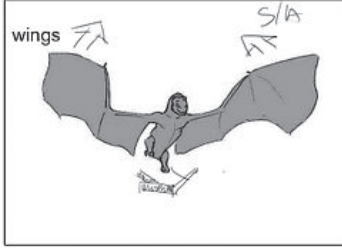

Figure 2. Storyboard (Source: Wikimedia Commons)

PRODUCTION:
CREATING A VIDEO

Practice is the key factor.

SHOOTING

Aerial videography is similar to any other video camera shooting described before, but it needs constant practice. While flying, you are a pilot and a photographer at the same time. Before you take off, make some mental notes of all electrical wires, trees and other possible obstacles. When flying, make sure to establish a direct line of sight. It is easier to fly directly towards or directly away from you. Any additional maneuver requires more advanced depth perception.

The main aspect to keep in mind is that you are shooting a video, therefore learning to slow down is vital: it takes time to fly slowly, steadily, and gently.

Planning a shot means framing a space and time. When you are filming, always think about the editing of the sequence. Editing is a crucial feature of creating a video, thus video editing software is needed. Most of the computers have some pre-installed software, but more professional applications can be obtained such as Pinnacle, like Pinnacle Studio or Premiere Pro. Nowadays, learning the basics of editing is quite easy.

Filming example

Let us imagine that you need a real long shot from the deck of a boat where the captain smiles and then you fly up to show a safe route to harbour with your drone. Shooting this kind of sequence takes about 30 seconds at least. You must fly steadily all the time making only very small adjustments. Even a professional videographer needs several attempts to get a good shot. When you are video shooting, think that you are telling a story with your drone.

Figure 3. Filming with a professional drone. Picture by Ari Ahlfors

CAMERA MOVEMENTS

The framing options are usually used alongside camera movements. By using different camera movements, you develop visual variety into your video.

The most well-known camera movements are tilt, panning, zooming, dolly, pedestal and trucking. These movements are usually tied together and used at the same time, creating a more appealing video. In this section, the different techniques will be presented briefly, except for the zooming: it is, in fact, quite rare that a drone is equipped with a zooming camera.

Tilting. The camera rotates on its vertical axis, up to down or vice versa. During tilting, the drone stays in one fixed position.

Panning. The camera rotates either left to right or right to left. During panning, the drone stays in one fixed position.

Pedestal. The entire camera (which means also the drone) moves vertically up or down, while keeping the horizontal axis fixed in one position.

Dolly. The entire camera (which means also the drone) moves forwards and backwards. When it is done well, it creates the illusion of flying, therefore it is a technique widely used in aerial videography.

180-DEGREE RULE

The 180-degree rule is a cinematography guideline that states that two characters in a scene should maintain the same left/right relationship to one another. When the camera passes over the invisible axis connecting the two subjects, it is called crossing the line and the shot becomes what is called a reverse angle. Reversing the angle is commonly thought to be disorienting and can distract the audience from the intent of the scene (Ferrari, 1927). This rule is also important in aerial shooting.
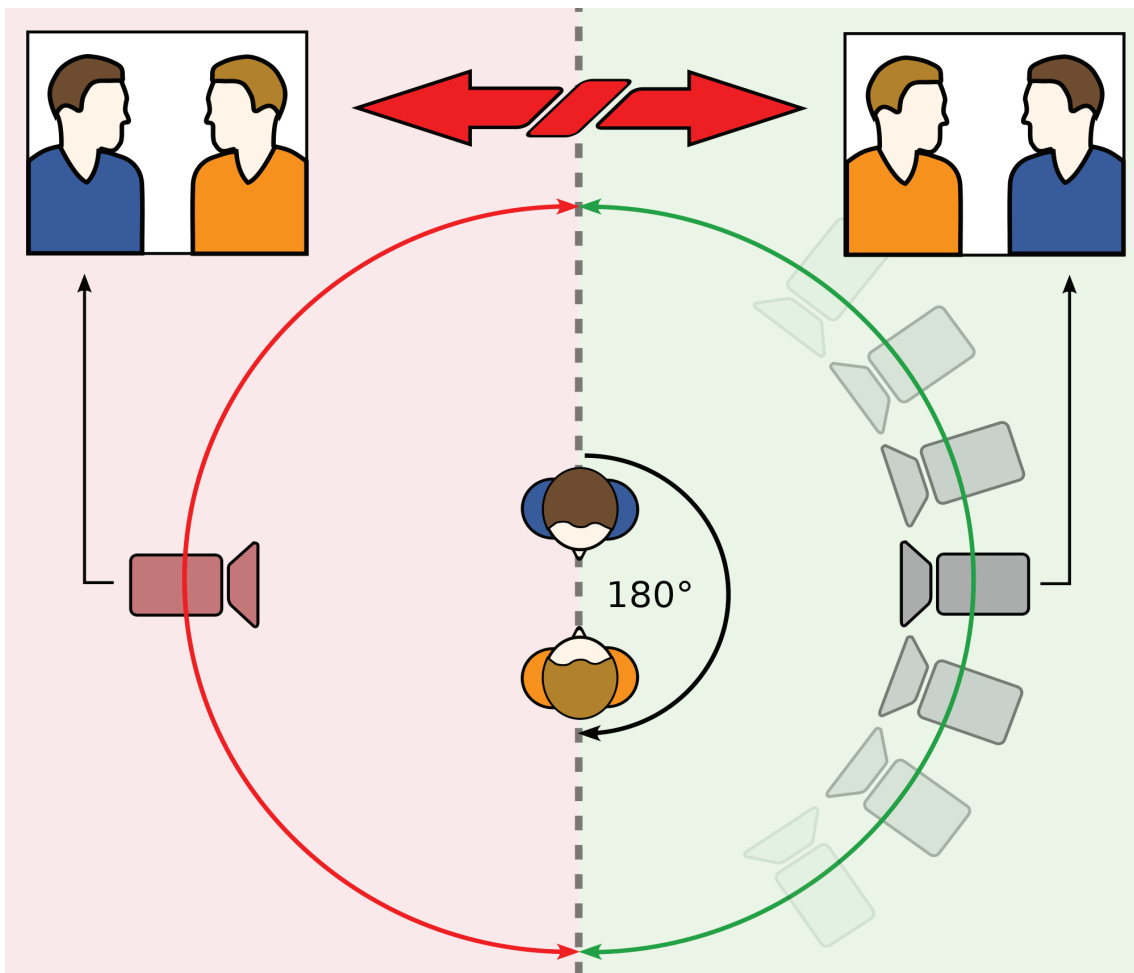

Figure 4. This schematic shows the axis between two characters and the 180-degree arc on which cameras may be positioned (green). When cutting from the green arc to the red arc, the character switch place on the screen (Wikipedia)

POST-PRODUCTION: PUBLISHING A VIDEO

Show the results of your work.

VIDEO EDITING

Editing is a crucial part of a video production. There are several good software packages created for this purpose. The professionals often use Adobe Premiere Pro, Final Cut Pro or Avid Media Composer. If you are an amateur, you may try Lightworks or Da Vinci Resolve. Remember that video editing requires a powerful computer.

A modern video camera can record very high (4K) resolution, but if your goal is to share your video via applications or Youtube, a FULL HD or HDV resolution will usually be sufficient.
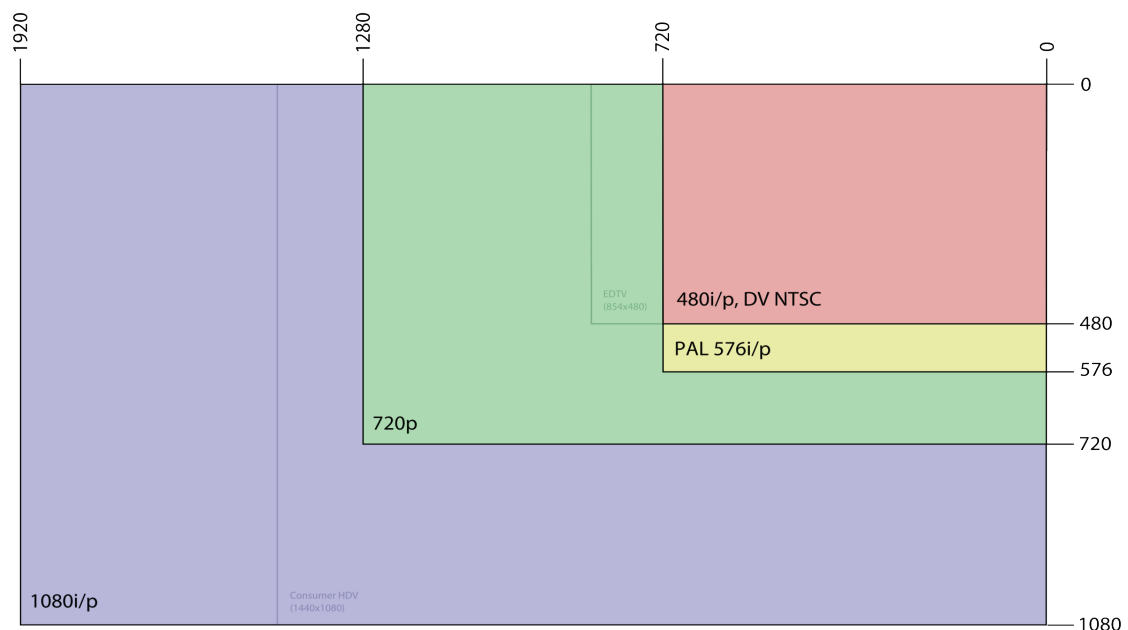

Figure 5. Video resolutions (by Tvauughan1 - originally from Wikipedia)

LEARNING TO FLY: ISSUES AND PRACTICE

There is no shortcut: it needs time and practice

PRELIMINARY ISSUES

Learning to fly a drone requires time and practice, even though each generation of drones is getting more and more user-friendly. A modern drone has several features, like sensors to avoid severe collisions, a multi-rotor one-power output fail protection, the RTH (return to home) setting, a built-in gimbal stabilization, hovering safe-function and many other properties.

Before starting your drone, keep in mind some preliminary issues concerning both safety and filming:
1. do not fly in rain or heavy wind
2. always have a lot of space around you
3. do not fly over crowded places
4. take note of electric wires, buildings and other obstacles
5. plan you maneuvers before in advance
6. check the battery level
7. check if the camera is on
8. if you have infrared sensors (for preventing collision), check that they are clean
9. check that propellers are not scratched and that they are fitted correctly
10. check that your smart device (tablet of phone) has a connection with the drone
11. check the selected flight mode – see below.
12. always switch on your transmitter unit first
13. when powering up the drone, do not move it.

LEARNING TO FLY: HOW TO PRACTICE

When you are ready, start your drone and practice as follows:

1. Let your drone hover in front of you at about 2 meters from the ground. Stay at the back (aft) of your drone: this position works logically as you do not need to think how controls work when the front of the drone is facing you.
2. When the throttle stick is in the mid-position, the drone hovers at the same altitude without moving. By pushing the throttle stick, the drone takes off.
3. To get familiar with these instructions, hover your drone and then land gently a few times.
4. When landing, you will notice that just as the drone approaches the ground, the ground effect might make it a bit unstable. If you are flying P-mode (position), the drone will automatically correct this effect.
5. Whenever you feel comfortable with these maneuvers, you can proceed further in your training.
6. Take off. Raise the drone up to 5 meters. Roll to left, stop gently and roll right, back to the original position. Do this slowly. Do it in opposite directions and then land.
7. Take off again. Fly forward and then backward. Stop and land.
8. Take off and make a full circle with yaw only. Fly it both clockwise and counterclockwise.
9. Fly a full square (both directions).
10. Fly a full circle (both directions)
11. Fly an X-form
12. Fly an 8-form
13. Take off and raise the drone up to 10 meters. Go forward, turn drone against you and fly over your head. Then turn left and fly over again. Turn right, fly your drone back and land
14. Fly backwards following steps 9-13.

EXAMPLE OF A TRANSMITTER

Every drone has its own instructions. Below is an example of the basic functions of the transmitter of a professional drone as well as the basic terminology for flying it.

Figure 6. Example of a transmitter

Left stick:

up= more throttle
middle= hover
down= land
left or right= yaw left or right

Right stick:

Forward= go forward
Backward= go backward
left or right= roll left or right

Basic Terminology:

Roll= banking to right or left
Yaw= rotate to right of left
Pitch= nose down or up
Throttle= go up or down. When throttle stick is in a middle position, the drone keeps the same altitude

A DRONE AND ITS EQUIPMENT

Drone technology has developed enormously during the last several years. Nowadays, drones are created either for professional or amateur use. Therefore, the price range can differ greatly, but a professional drone may have a starting cost of around 4,000 euros. Besides, more inexpensive drones might not be reliable and durable.

Selecting a drone for your purposes may be difficult, but the quality of the video should be one of the main priorities. In a suitable drone, the camera is automatically balanced and it is possible to tilt or pan with it. In smaller drones, a GoPro camera is very popular: due to the short focal length, GoPro produces steady videos easily.

The number of electric motors and the diameter of the propeller blades affects the drone's ability to carry load. Half of the propeller blades rotates clockwise, while the rest rotate counterclockwise.

Remember that there are some transport limitations concerning both lithium batteries in aircrafts and mail. See IATA's (International Air Transport Association) regulations here.

Figure 7. A professional-level drone (DJI Naza Inspire 2). On the right side is a 4K camera in the box. On the left side are batteries and the remote control (transmitter) unit. This quadcopter can lift its landing gears up and it may fly over 20 minutes. It is also possible to control the camera and drone with smart devices like tablets or smartphones.

FLIGHT MODES

In our example drone, there are three different flight modes:
- In P-mode, the drone maintains its current position and altitude when the transmitter sticks are released
- In A-mode (altitude), that drone stays at the same altitude, but it might drift around.
- In S-mode (sport), the drone is automatically balanced, but there is no altitude or position control: the drone is free to fly. The S-mode is also the fastest and the most challenging flight mode.

Some drones (like the one taken as an example) can also have an automatic return to home (RTH) function, and the pilot can define limits of maximum altitude.

Figure 8. Transmitter with flight mode P, S and A

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Although filming can still be divided into three phases (preproduction, production and post-production), shooting with an aerial drone presents different challenges and issues compared to a normal video. This publication provides practical guidance for the shooting of aerial videos, with particular attention towards ports and their facilities.

samk

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