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Degree Programme in Media Engineering

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**Essence of Life - Free Spirit 2006-2007 DVD
and
Usage of Multimedia Appliances in Sport Skydiving**

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<p>This paper presents a project that started in 2006 in the form of video footage taken with a video camcorder attached to a helmet while skydiving, which continued to become a study about the usage of different multimedia equipment in sport skydiving. The main objective was to create a DVD compilation of short films and one longer movie about different elements of ‘freely’ skydiving and the culture of sport skydiving as a modern pastime activity.</p> <p>The project was carried out by being involved in sport skydiving for years, discussing with other enthusiasts about the multimedia aspects of the sport, studying various internet and literary sources about the subject and most of all filming, visioning and creating the movies and the DVD package.</p> <p>The result is a compilation of one main movie and 11 additional short films on two separate DVD discs. Seven of the films have previously been edited and published in 2006 and 2007. Five films were made for this project alone. The duration of the main movie is 54 minutes 26 seconds. Other film clips range from 3 minutes to 25 minutes in length.</p> <p>From this study it can be concluded that using multimedia appliances in sport skydiving is very common today, because of the ever lowering prices and rising quality of the electronic equipment that is constantly getting smaller, lighter and more wearable. Only imagination is limiting the ways how athletes and their assistants can capture the sport action on different media. The main resource needed to create these sorts of productions is time and the second most important thing is vision. Everything else is available to anyone.</p>	
Keywords	skydiving, video, editing, multimedia, DVD, DVD-disc, Free Spirit 2006–2007 -DVD

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<p>Insinööriyöprojekti alkoi vuonna 2006. Kypäran kiinnitettyllä videokameralla kuvattua materiaalia urheilulaskuvarjohyppäämisestä alkoi kertyä ja myöhemmin projektista kehittyi insinööriyö multimedia-apuvälineiden käytöstä laskuvarjourheilussa yleensä. Päätaavoite oli luoda kokoelma lyhytfilmejä ja yksi pidempi elokuva DVD:lle. Filmien tarkoitus oli kertoa katsojalle 'freefly'-laskuvarjohyppäämisen eri puolista ja urheilulaskuvarjohyppäämisestä yleensä nykyaikaisena vapaa-ajanviettotapana.</p> <p>Projekti toteutettiin olemalla mukana urheilulaskuvarjohyppäämisessä vuosia, keskustelemalla lajin multimediapuolesta muiden harrastajien kanssa ja tutkimalla erinäisiä asiaan liittyviä internet- ja kirjallisia lähteitä. Mutta ennen kaikkea se toteutettiin kuvaamalla, visioimalla ja luomalla itse elokuvat ja DVD-paketti.</p> <p>Tulos on kokoelma, joka sisältää yhden pitkän elokuvan ja 11 lyhytfilmiä kahdesta DVD-levystä koostuvassa paketissa. Seitsemän filmiä on aiemmin tehtyjä ja vuosina 2006 ja 2007 julkaistuja, mutta viisi tehtiin vain tätä projektia varten. Pääelokuvan kesto on 54 minuuttia 26 sekuntia. Muiden filmien pituus vaihtelee kolmesta minuutista 25 minuuttiin. Projektin toteuttaminen vaati syvällistä perehtymistä erilaisiin kameroihin ja niiden kiinnitystapoihin sekä videoeditointi- ja kuvankäsittelyohjelmistoihin.</p> <p>Multimedia-apuvälineiden käyttö laskuvarjourheilussa on erittäin yleistä, koska elektroniikan hinnat laskevat ja laatu nousee. Myös laitteiden pieneneminen ja keveneminen sekä erilaisten puettavuustapojen kehittyminen on vaikuttanut paljon yleistymiseen. Vain mielikuvitus rajoittaa tapoja, joilla urheilijat ja heidän avustajansa voivat tallentaa toimintaa eri medioille. Tarvittava pääresurssi tällaisten tuotantojen tekoon on aika ja toiseksi tärkein on näkemys. Kaikki muu on kenen tahansa saatavilla.</p>	
Avainsanat	laskuvarjohyppääminen, video, editointi, multimedia, DVD, DVD-levy, Free Spirit 2006–2007 -DVD

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Abbreviations and Terms

- Canopy** The actual parachute attached to the skydiver's harness with dozens of durable lines.
- C-license** In skydiving there are internationally defined experience levels of A, B, C and D. In Finnish education program you are considered a student until you reach level C, when you are self-responsible skydiver being able to jump without supervision. All of these levels, except D, are achieved by passing certain skill level exercises in the sky and a written exam. Level D is achieved by 500 cumulative skydives proven with a logbook. In different countries some of these rules vary.
- Jumpmaster Assisted Deployment (JAD)**
The term refers to a traditional style of education for beginner skydivers. The jump is conducted so that the jumpmaster checks the students gear on ground and in airplane, opens the airplane door during jump run, spots the correct exit point, takes the student's pilot chute in hand, commands the student to jump and simultaneously throws the pilot chute in free air resulting in immediate deployment of students' main canopy. The student will steer his or her own canopy to a pre-designated landing area.
- Fédération Aéronautique Internationale (FAI)**
The international body which governs sport aviation competition and records. [1,95]
- Swoop** To make a controlled diving turn under parachute canopy (not in freefall) from 90 up to 720 degrees or more at low altitude to gain high velocity and then straighten the direction to fly a distance just above ground level before landing.
- Audible altimeter** An audible altimeter will give warning beeps at set altitudes, so the skydiver can act accordingly and break off from formation and open the parachute at a safe altitude. Does not completely remove the need for a visual altimeter.
- Automatic activation device (AAD)**
An AAD will deploy the reserve parachute at a set altitude, usually under 300 meters, if vertical velocity is higher than a certain limit. The purpose is to save life in case the skydiver is unable to self deploy due to unconsciousness, hand restraint or main parachute malfunction.

Skydiving disciplines Conventional disciplines began in the 1930s with one or two persons performing at the same time. These were *accuracy landing* and *freefall style*, where the jumper performed certain series of turns and flips as fast as possible.

Artistic disciplines are the new generation of skydiving sports created in 1980s and 1990s. These are judged also by camerawork and purity of the performance in addition to the actual success of the stunts. Cameraman is a part of the team. Artistic disciplines are very demanding to the skydiver because of advanced flying positions, such as head down and sit flying. *Freestyle* is a kind of aerial ballet or gymnastics. *Skysurfing* is basically freestyle with a snowboard-shaped board attached to the feet of the parachutist. *Freeflying* team consists of two persons performing aerial stunts and the cameraman filming them. Freeflying is also very popular amongst fun jumpers with varying amount of skydivers jumping together simultaneously.

Other freefall disciplines include *formation skydiving (FS)*, where teams of 4, 8 or 16 fly on their bellies and perform synchronously sets of figure formations that are randomly selected beforehand. *Vertical relative work (VRW)* is a mixture of FS and freefly, where four person teams perform set formations in freefly positions instead of just flying flat. *Tracking* means flying horizontally in a formation or in contact with varying amount of people, but it is not a competition discipline. *Wing suit jumping* requires a purpose built suit, which the jumper can use to lower the vertical speed down to 60-90 km/h instead of the usual 200-350 km/h while going at a horizontal speed of 150-200 km/h and possibly flying up to 8 km from normal jump altitude before opening the parachute. *Speed skydiving* also requires a special suit similar to one that speed skaters wear to achieve maximum vertical velocity, which can be even over 500 km/h measured with precision digital altimeters worn by the jumper.

Canopy disciplines include the older *canopy relative work (CRW)* and newer *canopy piloting (CP)*. In CRW the parachute is opened immediately after exit from the aircraft and different kind of formations are made while flying the canopies. Competition teams are 2, 4 or 8 persons. Canopy piloting, usually referred to as swooping, has been made possible with modern fast ram-air parachutes. The skydivers compete in longest distance and fastest speed just a few meters above the ground after accelerating. Longest swoop distances have been measured over 200 meters.

[4]

1 Introduction

This paper is a result of my personal enthusiasm for the skydiving sport and especially making of skydiving videos. I started the sport at Helsinki-Malmi airport in July 2001, when I participated in a JAD course with my friend. I got my C-license in June 2003 and currently have more than 500 skydives, of which approximately 250 performed with a camcorder installed to my helmet filming the entire event.

The second chapter of this study describes in detail the processes involved when conducting sport skydives with various kinds of camera equipment and related accessories attached to different parts of the body. Also, it goes through all the other aspects that must be taken into consideration before, during and after the actual skydive takes place with emphasis on this special subgenre of the sport. The post-processing of the filmed footage will be looked into as well.

As a practical example, the project that resulted in a DVD video compilation called “Free Spirit 2006-2007” is presented in chapter three. It will cover some team history and previous films and the process of constructing this latest set of movies. The fourth chapter discusses the results, testing and presentation of the product with some future plans and visions. Conclusions are given in chapter five.

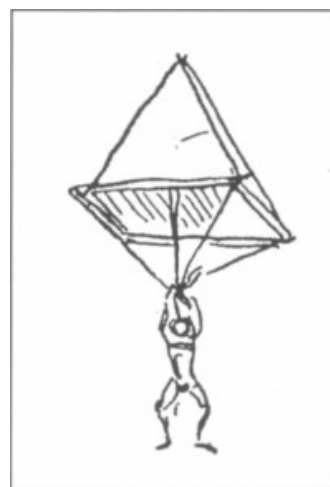
This document was written also for a non-skydiving audience. Hopefully it will arouse interest for skydiving and skydiving videos in the reader and be explanatory enough to understand the complexity of the sport and the usage of multimedia equipment in it.

A long term project like this has involved many people and I especially wish to thank all my Finnish and foreign Free Spirit team members, most of whom have either been displayed in the movie collection or helped to film and edit it. By team aliases, thank you Aivo, Ölli, Judge, Juicy, Perra, Liina, Karppa, Pexi, Jere, Jopi, Panda and especially Julho, who was the customer and instructor in this project.

2 Usage of Multimedia Appliances in Sport Skydiving

2.1 History of Skydiving and Skydiving Photography/Videography

First evidence of man-made parachutes and their usage have been found in China. In the 1100s the Chinese amused themselves by jumping from high places with rigid umbrella-like structures. Around 1495, Leonardo da Vinci designed a pyramid-shaped, wooden framed parachute presented in Picture 1. Fausto Veranzio, a Hungarian, jumped from the Bell Tower of Venice, Italy in either 1595 or 1617 (accounts vary). He dropped over 300 feet under a parachute with a rigid frame, a very similar design to drawings made by da Vinci a century earlier. British skydiver Adrian Nicholas jumped also a da Vinci parachute in June 26, 2000 to prove that the ancient design was good. Until late 18th century people around the world made their own parachute constructions and tested them with varying results. [1,85-87;2;21]



Picture 1. Early parachute design by Leonardo da Vinci. [3]



Picture 2. Adrian Nicholas jumping with da Vinci's parachute. [21]

In 1797 Andre Jacques Garnerin from France made several jumps from hot air balloons around Europe and is credited to be the first real parachutist. Garnerin jumped in a basket as did some others after him, but in 1887 Captain Tom Baldwin invented the parachuting harness in the United States and jumped with it. At that time Kathe Paulus from Germany became the first known female parachutist. [1,87-89;2]

Early 1900s brought several new inventions evolving the equipment towards modern parachutes. In 1914 Tiny Broadwick made the first freefall and manually operated skydive in San Diego, pulling the ripcord herself instead of a static line attached to the airplane. During World War I, parachutes as shown in picture 3 were introduced as rescue devices for observation balloon pilots, but airplane pilots were instructed to land with their aircraft. The first emergency bailout from an airplane did not occur until 1922. In 1925, early experiments with stable, extended freefall began. The first camera jump was made by James Clark in 1926. [1,90-93;2]



Picture 3. Cold war era Russian military parachute rigs with round canopies.

After World War II, an abundance of surplus parachutes, similar to those in picture 3, and former soldiers with the courage to jump them for sport resulted in the growth of parachuting as a hobby. In 1948 Fédération Aéronautique Internationale (FAI) was proposed to form the Commission Internationale de Parachutisme. The first meeting of the FAI Parachuting Commission was held in Paris in the year 1950 and parachuting became officially an aeronautical sport. Next year five European nations participated to the first World Parachuting Championships in Yugoslavia. Raymond Young coined the term skydiver in the mid-1950s and first commercial skydiving centers opened during those years. Suomen Laskuvarjokerho ry (SLK, Finnish Parachuting Club) was founded in May 1960 and first civilian jumps in Finland were made in 1962. Domina Jalbert patented the first rectangle shaped ram-air parachute in 1964, which eventually replaced round canopies. Visual comparison between traditional round and modern ram-air canopies is presented in picture 4. [1,91-98;2;4]



Picture 4. U.S. Army old round canopy (left) and Navy new ram-air canopy (right) [22]

Aerial photography has been there from the beginning of the sport and camcorders have been used since 1980s, when they became light enough and withstood pressure changes. Originally skydiving competitions were judged from videos that had been filmed from the ground with cameras on stable stands equipped with long focal length telephoto lenses. The development and miniaturization of cameras with other technical advances in skydiving gear has made it possible to film the freefall sports from the air. In 1994 formation skydiving discipline started using only aerial videos in Finland to judge the performance. Creation and development of artistic disciplines have further made the usage of cameras a common everyday thing for the regular skydiver. [5;6]

2.2 Equipment and Maintenance

2.2.1 Cameras and Camcorders

Cameras and camcorders that are applicable to filming sport skydiving have several special requisites to be able to produce good quality material in extreme conditions. As well as during the jump and landing, but also in the airplane, the machine has to withstand pressure changes, multiple G-forces, possible impacts, moisture and constant rapid changes in focusable objects to name a few. Many types of cameras are not durable enough to handle all this and at the same time be light and shaped to be attached easily by the preferred method to the skydiver, so some brands and models have become much more popular than others. Due to the scope of the project, older analog equipment will not be discussed here, as digital ones have almost completely replaced them.

The vast majority of video camcorders used in skydiving are Digital Video (DV) format and recording on MiniDV tapes, which tend to be small, lightweight and suffer much less from bumpy circumstances than hard drive recorders or DVD burning camcorders. DV/MiniDV has become the standard because of its good video quality, IEEE 1394 (FireWire) interface compatibility, intraframe compression of 25.146 Mbit/s, error detection and error correction. Other digital recording formats, such as Video8, Hi8 and MicroMV are practically obsolete. MiniDV tapes are also forward compatible with newer high definition HDV format using MPEG-2 compression. [7;8]

An important function in a camcorder for skydive use is focus hold, also known as manual focus or infinity focus. Without this function, the camera will continually try to refocus in freefall and the material caught on tape will be blurred. It is also important that this setting stays when the camera is turned off and on. Additional useful features in a camcorder are a LANC socket for attaching a remote control device or similar accessory, a DV In port for digitally copying from another camera for example and the possibility to add special lenses. A skydiver buying a camera should also consider the accessibility of power and record buttons, charging connector and tape slot when the camcorder is mounted to a helmet. [7;9,3-4]

Sony is unquestionably the most popular brand of camcorder that is used in sport skydiving today. Sony builds top-quality equipment that is small and light, yet packed with features, such as the one presented in picture 3. Most ready-made camcorder mounts and accessories sold in skydiving equipment shops are designed for Sony camcorders. Sony models also contain the required or recommended features mentioned previously. Other manufacturers offering skydive-capable camcorders include Canon, Panasonic and JVC. [7;10] In recent years new entrepreneurs have entered the market offering wearable camcorders specially designed for filming sports and other activities, but because these have not yet made a major impact on the skydiving market, they will not be discussed in this paper.



Picture 3. Sony DCR-PC350E digital camcorder with dock. [11]

Still cameras used in skydiving are mostly high-end amateur cameras or even professional level equipment, which have the possibility to change lenses, connect accessories and manually adjust varying properties. Basic consumer cameras are not suitable for skydive photography. Canon, Nikon, Olympus, Sony and such major manufacturers have several higher-end digital camera models good for skydiving photography. While many camcorders can also be used for taking decent still images on the ground, a person filming in the air will prefer to have a separate still camera for the purpose. Because in skydiving there is no second chance for taking a shot, you want the first one to be the perfect one. Viewing the images taken in the air is virtually impossible during the jump for obvious reasons.

2.2.2 Lenses and Accessories

For skydive camera work it is handy to have a polarizing ultraviolet (UV) filter lens attached. Usual summer conditions, when skydiving is practiced, include very bright sunlight and multiple large white clouds in the background of the camera target. Polarizing filter prevents the “bleach out” that can occur from direct sunlight and also gives better definition of clouds in the picture. Technically, ultraviolet filter allows visible light to pass through but filters out ultraviolet light at a specific range. In addition, it reduced the blue tinge in the image caused by solar UV energy which the human eye does not detect, but which will be visible in an image. Another type of filter sometimes used is a skylight or warming filter that has a slight yellow tinge that warms the image, but may not necessarily reduce the UV light. A filter lens also protects the inner camera lens from scratches. [9;12]

Even more important, practically mandatory, is to have a wide-angle lens, like the ones presented in picture 4 and 5. This special lens widens the picture by its factor, which is rather advisory. A more accurate measurement method is either in comparison to a cinema film camera regular lens or by the opening angle of the picture produced. Suitable factors are 0.5x to 0.6x for filming formation skydiving and 0.4x to 0.5x for general use in tandem jumps and many artistic disciplines. Ultra wide-angle lenses under 0.4x can be applied to some artistic disciplines and special situations. In other words, a 0.5x lens would have approximately 24mm cinema



*Picture 4. Raynox HD-4500PRO
0.45x wide-angle lens. [13]*

would have approximately 17mm cinema equivalency and about 95° horizontal opening angle. These measurements defined according to the widening factor might vary a lot depending on the lens manufacturer. [5]



*Picture 5. Century Optics 0,3x
"Baby Death" Mark II 37mm
ultra wide-angle lens. [13]*

Using a wide-angle lens makes it possible to fly close to the object, as shown in Picture 6, and still capture on film the other skydivers' bodies in total with much of the background scenery as well. Obviously, this is much easier, than flying far away from the target and trying to aim at it from there. It also enables maneuvering around the target to film from different angles with relatively little work in body flying. Sometimes a conversion ring is required to fit a wide-angle lens to a small camcorder.



Picture 6. World Cup and European Champion ladies' freestyle team HeKla (cameraman Klas Ramsay left, freestylist Heini Elo right) © Ahti Kangas. [14]

When using both a camcorder and a camera, it is recommended to try to match the focal length of the cameras and video with stills so that what one sees on video is duplicated by the stills. Digital single-lens reflex (SLR) sensors come in three sizes, full frame, APS-H and APS-C. The ones used for skydiving tend to use the smaller APS-C sensors which give the image an effective increase in the focal length of 1.6x. The larger and more expensive models use the larger APS-H sensors which give a focal length of 1.3x. Full frame sensors are used in cameras like the Canon EOS 5D, which are used by professional photographers and have a sensor identical in size to a 35mm film frame. [12]



Picture 7. Tokina AT-X 107 DX AF 10-17mm f/3.5-4.5 ultrawide fisheye zoom objective. [13]

It is essential to understand the relationship between sensor size and lens coverage, because a smaller sensor size is beneficial when the goal is to magnify a distant subject. In skydive photos, however, the subject has to be in frame and not cropped from the image. These facts in mind a skydive photographer can choose an applicable wide-angle lens component or use the objective supplied with most digital cameras, usually 18-55mm. It offers a degree of versatility that is suitable for general photography and with the focal length set at 18mm, the lens can be used for general skydiving imagery. [12]

Today, there are also different kinds of external lenses on the market, which can be connected to a camcorder in a jacket pocket of the skydiver with cables, for example. These systems have been tested in skydiving, but have not proven reliable enough. The connectors move in the sockets and cables can disconnect or at least give much disturbance in the picture when the skydiver has to perform acrobatic movements to control the body position in freefall.

Other accessories not completely necessary, but very helpful, are a sight and a remote control. A sight is needed to make sure the target is in the middle of the picture, because the cameraman can only aim the camera by facing the target if the camera is attached to the top or side of the helmet. Many skydivers use only a simple piece of tape on their skydiving goggles to form a sight into the field of vision, but there are also commercial sights, like Newton sight, where a motion sight aim compensates small movements of the helmet. In order to choose the eye to sight with, it is simple to just aim with your thumb to an object and notice which eye stays open, as it will be the better eye. [5]

Picture 8 represents a CamEye II LANC remote control, which is specially designed for skydivers and helmet mounted camcorder systems for controlling the camera and getting basic outputs from it via two LED lights. A short click on the red button toggles between recording and standby. The bright feedback indicator shows the camera status and notifies when it is time to replace the tape or recharge the battery. [13]



Picture 8. CamEye II LANC remote control. [15]

Also, useful items include lens cleaner and defogger liquids and cloths. After even one jump, the camera lens can be quite dirty depending on the circumstances and it is good to clean it as often as possible to prevent any dirt to be seen in the picture. Constant major temperature and humidity changes occurring on ascent and descent can also cause the lens to fog. In addition, many camera flyers like to keep extra batteries for their equipment ready and charged, because a long day of skydiving can absorb several batteries and there might not be enough time to recharge them between jumps. [9,4-6]

For still camera usage in skydiving, a remote control is usually required to control the shutter switch. Usually, this is a pressure or a vacuum switch held in mouth and activated by blowing in to or sucking air from it. Mouth tube is connected to a device attached to the camera, which handles the functionality. Many products also have a bite or a tongue operated similar switch, seen in appendix 1. There are also other types of remotes, like CamRL wireless LANC remote control that consists of a hand transmitter and a receiver module. It has three switches for video control and one for still camera control. An input socket allows for an external photo trigger switch to be used. [5;15]

2.2.3 Camera Helmets and Other Mounting Methods

Some kind of a mounting method for multimedia appliances is needed to use them in skydiving, unless the camera or such is held in hand.

Doing so is very rare, as hands are needed to control flying and for opening the parachute. By far the most common method is a camera helmet, but all kinds of devices have been connected to almost all body parts and also skysurf boards, hand held extension poles and such. Only imagination seems to limit these innovative ways to film others or oneself during a freefall. An example of a highly advanced and heavy multiple camera helmet configuration is presented in picture 9.



Picture 9. Ahti Kangas wearing a complex multiple camera helmet setup with a sight and a pressure switch. © Rauli Verkamo. [5]

There are several manufacturers that supply ready-made camera helmets for skydivers, but often also self-made ones are seen in use at dropzones. Helmets are usually made of composite plastic and carbon fiber materials with some metal bolts and such to attach different parts together, like the Optik Illusion helmet in picture 10. Typically a camera helmet has two flat surfaces for camera and camcorder mounting, one on top and one on the side of the helmet or on forehead. On these flat surfaces appropriate metal plates are attached and filming apparatus connected to those plates with screws and belts. With a side mounted camera the camera will be in line with the eyes. However, because of the extra bulk on one side, there is an increased chance of a riser strike on parachute opening and neck injuries caused by it. With a top mounted camera this is not as likely, because the weight of the camera set up will be symmetrical and in line with the rest of the body. However, a top mount will direct a bigger force to the neck, because the weight is further from the head. Also, more caution has to be taken when exiting the aircraft, as the risk of bumping the camera to it is more likely.



Picture 10. BoneHead Composites Optik Illusion camera helmet with top and left side mount. [16]

Most ready-made camera helmets today are supplied with an emergency release system, which the skydiver can use to rapidly get rid of the helmet in case it tangles on the parachute risers or lines, for example, causing problems on head movement, visibility or even parachute form and flying ability. Usually helmet connections can be opened rather quickly as it is, but in a skydiving emergency situation one might have only one hand in use and not too much time to act. These situations are very rare though, and the skydiver is very likely to already be dead if the power of the parachute opening is somehow transferred to the neck in a bad angle. To avoid this, it is good to make sure there are no unnecessary points in the helmet for anything to tangle to or get caught on. Other issues, like body position on opening also have a huge effect, but this will be discussed later on this paper. [5]

There are basically two types of emergency release systems. Some open face helmets use a fabric strap that has pop studs on it. This system works due to the force at the chin cup being at 90 degree angle to the studs. Therefore, a firm, direct pull on the fabric will remove the helmet. Another type of cut-away system uses Teflon cables and loops to disconnect the hinged part of the helmet. The cables pass through closing loops which replace bolts in the hinge or there can be a pin connected to the cable holding a single bolt in place, as the solution is in the Optik Illusion helmet displayed in picture 11. [7]



Picture 11. Red emergency cut-away cable seen on the right side of the Optik Illusion camera helmet. [16]

Some people also have tried to fix these cut-away systems with a small helmet parachute that would land the helmet and the camera intact to the ground when dropped, but these only cause too much excess items on the helmet, meaning more risks, and the size of the chute needed would be too big to be reasonable. A light, sleek, aerodynamic design is most preferable considering a camera helmet. [5]

Sometimes skydivers like to apply a casing to protect the camera or camcorder, but this is a remnant from the analog ages, when an attempt was made to remove the vibrations in the picture by a shell that would prevent the air flow into the camera components. A casing might in some situations protect the device, but will make the helmet more bulky and heavy, causing more strain to the neck. The advantage of a smooth box around the camera is less entanglement points, if the hole between the actual helmet and the camera box is protected so that no lines or such can get caught in between. A rubber fabric cover pouch is often used to avoid condensing cloud moisture damaging the fine electronics inside the camera over time. [5]

Accessories, like CamEye, are often taped with a gaffers tape inside or outside the helmet and ring sights connected with appropriate clamps. Usually a chin cup is used to fasten the helmet firmly around the head to avoid vibrations and dropping the helmet on parachute opening. The helmet must be the correct size and squeeze the head a bit, but not too much, to be comfortable and stable. [5]

One issue about helmet mounting is the angle of the camera lens in relation to where the parachutist looks at. The most common way is to set the angle at approximately the line of sight of the person filming. This is good for most situations, but when filming tandems it is justifiable to angle the camera a little bit upwards or with formation skydiving perhaps a little bit downwards from the center line of sight. This helps to keep the subject in the center of the picture with less effort in body flying and head movement. The attachment can also be made adjustable to cover all these positions, such as in Tonfly CC1 camera helmet presented in appendix 1. [5;17]

Other common body mounts for camcorders include torso and feet. Usually a torso mounted camera is pointed at the skydiver's own face and the parachute canopy above after freefall or a bit more forward to film something while freefalling in basic belly down position. This produces nice filming angles and gives the opportunity to show faces at the camera. Foot attached camcorders, as used to take picture 12, are also mostly directed at the wearing jumper for similar reasons. Hand attachments are not



common, because hands are used for maneuvering, and because pointing stably at anything during freefall is difficult, if not impossible. Other ways to carry media equipment on a jump are considered experimental.

Picture 12. A photo taken with a foot mounted camera. © Ahti Kangas. [14]

2.2.4 Skydiving Gear for Camera Flyers

The most important thing when doing camera jumps is to have a skydiving harness container system and main canopy that suit the discipline, which the cameraman is going to film. They must also be familiar for the skydiver to be able to use them on a routine level so, that concentrating on the filming task is not interfered by problems with the items that are supposed to save his or her life. The main canopy should be of easier type and not higher than mediocre wing load, instead of a very extreme sort, to minimize the possibility of hazardous situations on parachute opening. [5]

It is recommended to have an audible altimeter or even two, in case one malfunctions or battery runs out. A cameraman usually concentrates on the filming instead of constant glancing at the visual altimeter attached to hand or chest. An audible altimeter will give warning beeps at set altitudes, so the cameraman can act accordingly and break off from formation and open the parachute at a safe altitude. [5]

Sometimes a special camera jumpsuit will become handy, for example when filming tandem jumps or formation skydives. A skilled freeflyer can film formation skydiving without the use of a wing suit. However, it is not possible to achieve the steep angle above the formation that is possible using a specifically designed winged camera suit.



Winged suits give camera flyer the extra surface area required when flying steep and close to a formation, as picture 13 displays. Without the extra surface area created by the wings that enable flying in the turbulence, it is not possible to stay above and close to a formation. [12]

Picture 13. Flying above a formation with a winged jumpsuit. © Ahti Kangas. [14]

2.2.5 Post Processing Equipment

Post processing of the filmed footage requires basically four things: a computer, a cable to connect the digital camcorder or camera to a computer, software to process and edit the material and a DVD or other medium to export it to for viewing. With a still camera, the cable can be replaced by inserting the camera memory card into applicable slot in the computer, if there is one. Also on a video or a still slideshow some music is nice, because nobody wants to just listen to the static hiss of air flowing into the camcorder microphone in freefall, or plain silence.

For editing the material on location where it is filmed at, usually a laptop computer is required. Laptop computer display is usually not that large, compared to a desktop computer. When possible, it is recommendable to use even multiple displays. These are very handy in audiovisual production, where the user usually has several software applications open at the same time and needs to see the output of many of them at the same time to make the editing job easier and quicker. Real-time video editing, rendering and also the processing of several large pixel size pictures requires massive calculating power from the computer, so it is best done with the most advanced and powerful computer that is available.

Transferring of the footage from a camcorder or a camera is usually done with FireWire 400 (IEEE 1394), FireWire 800 (IEEE 1394b) or USB 2.0 cable. These are the ones mostly used in current digital cameras and computers, while being also fast enough for the transfer times to be reasonable. Raw digital video and still pictures require much storage space from the computer hard drive, so when working with a laptop computer an additional external hard drive is often required. There are plenty of software applications to choose from when selecting the preferred ones to post process filmed material. Most common video editing applications are Adobe Premiere, Avid Xpress, Apple Final Cut, Nero, Pinnacle Studio, Ulead VideoStudio and Sony Vegas. Also some operating systems have basic editing software built in, like Microsoft Windows Movie Maker or Apple iMovie. Some freeware applications also exist, for example Virtual Dub. [18;19]

The internet is full of free music and sound effects to choose from or the editor can try to get permission from some unknown composer, perhaps a friend, to use their music for the productions that might be presented to public audiences. If the edited material will stay private, any purchased music can be used, of course. For PC computers MP3 (Moving Picture Experts Group MPEG-1 Audio Layer 3), WAV (Waveform audio) and WMA (Windows Media Audio) as well as MP3 and AIFF (Audio Interchange File Format) for Apple computers are usual audio formats compatible with common editing software.

2.2.6 My Equipment

My skydive camera setup consists of a BoneHead Optik Illusion helmet, a Sony DCR-PC350E camcorder mounted with a BoneHead L-bracket to the left side of the helmet and a CamEye II LANC remote control. I use a polarizing UV filter lens, a Vitacon 0.45x wide-angle lens and a moisture protection cover. I have two audible altimeters: a Larsen & Brusgaard Pro-Track with an electronic jump logbook and a Larsen & Brusgaard Pro-Dytter. If I need a sight, which I normally do not use, I have extra goggles with a piece of black tape in front of the right eye to perform the task. I do not have a winged camera suit, because I mostly film freeflying.



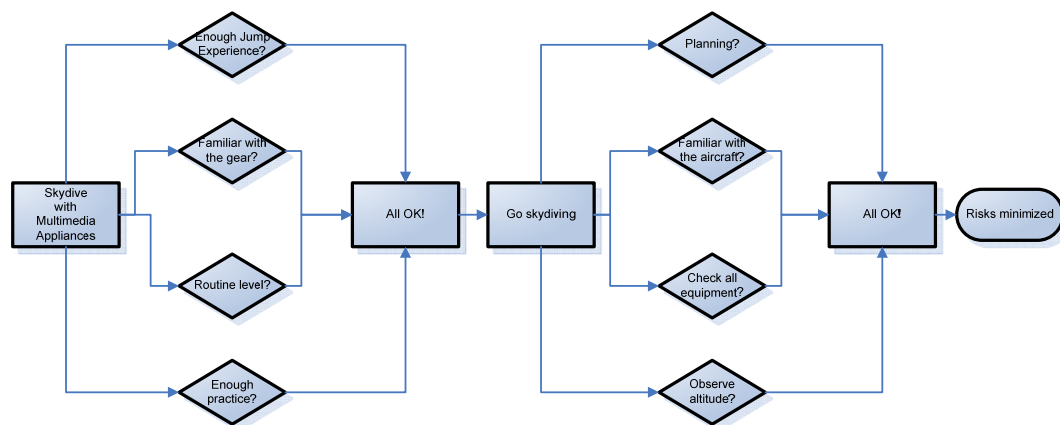
Picture 14. My camera helmet ready for use.

My edit setup consists of a PC equipped with AMD 3800+ dual core processor, 3 GB of RAM, about 1.2 TB of HDD, DVD recorder drive, FireWire 400 bus and two 19" TFT monitors. As editing software I use Adobe Premiere Pro. I also have a MacBook Pro laptop computer with Apple Final Cut Pro for on location use.

2.3 Preparing for the Skydive

2.3.1 General Considerations

There are many different reasons for bringing multimedia equipment along for a jump. It always brings more possibility for hazardous situations and requires additional considerations on safety precautions and all actions in general. A skydive is such an intimate and intensive situation every time, that it causes reduction of the field of observation, rise of stress level and different kinds of stress rituals in a person. For these reasons it is not recommended to wear or carry any special items during a skydive until 200-250 jumps experience. Flowchart 1 presents things that you have to take into consideration when using camera equipment. In some countries there are even more than just recommendations on this subject. This is always a very personal thing and for some it is quite justified to jump with a camcorder after 100 jumps and in some situations it would not be wise even after 500 jumps. [5;20]



Flowchart 1. General considerations for skydiving with camera.

As illustrated in flowchart 1, it is preferable you are very familiar with the camera equipment you are using. Switching or loaning specialty gear always adds to the risk. Practicing and learning to use the equipment well already on ground is helpful, of course. More experienced camera flyers can always give good tips and advice on several things and questions that come into mind. Practicing in the air is a must before trying to film something important, like a tandem jump or a competition jump. [5]

When jumping with special camera equipment, discussing with the other skydivers that you are going to film about their plans and your plans is vital. Surely, after the plans are set, sticking to the plan is also important. One must not forget about having a camera or a camcorder and then concentrate on filming the object. However, the most important thing to remember is checking the actual skydiving gear normally at all phases and observing altitude during the jump. [5]

2.3.2 Tandem Jumps and Formation Jumps

Tandem jumps are very different from any other skydive, because there are two people jumping with one parachute and they require a small drogue parachute, as displayed in picture 15, slowing the terminal velocity to similar of a single parachutist. This drogue is released usually a few seconds after exit from the aircraft and the camera flyer must be very careful not to hit it or get tangled with it. Of course, also crashing into the tandem pair must be avoided. Generally, the cameraman must not go straight under or above the tandem pair and always progress slowly when approaching them on same level. [5]

One thing to consider is that there is a paying customer involved. Tandem passenger will want such a video and photos that look like the passenger is excited, enjoying and being brave, instead of being choked to a tight harness and scared stiff. A cameraman should move to film from different angles to present height, tandem students' face and such variations. When planned, contact with student or tandem master can be taken, but not from any functional point of the harness, hands or feet of the tandem master. [5]



Picture 15. Tandem pair and the drogue above them. © Ahti Kangas. [5]

There are also different kinds of special situations in tandem jumps, like a side spin and a no drogue situation, which will not be discussed here further, but require actions or awareness from the cameraman. The cameraman usually climbs outside of the aircraft to film the exit and lets the grip loose usually a fraction of a second before the tandem pair exits. This gives just enough safe distance without drifting too far for filming with a wide-angle lens. Before opening their parachute, the tandem master shows a signal to the cameraman to take some distance, because the passenger's feet will swing forward on opening. [5]

When filming formation skydiving, the specialty considerations are different. There are three types of exits: leading, trailing and semi-peel. The most common is leading, when the cameraman takes a little advance on the exit. Trailing means going just a bit after the formation and catching them immediately. Semi-peel is somewhere in between the two previous. Each has its pros and cons and is suitable for different situations, but the scope of this thesis does not require examining them further. The basic principle is to have a stable starting pose with three contact points to the aircraft, getting in touch with the air flow as fast as possible after releasing the grips and keeping the formation in the middle of the picture at all times. [5]

The camera flyer must keep heading during freefall and handle sideways movement to keep the formation in picture frame and for the video to show the formation transformations. All grips the skydivers take in the formation during freefall must be seen in the video for the judges to give points for them in a competition. The cameraman must be close, but not too close to avoid the air turbulence immediately behind the other skydivers, which would result in a crash on the formation. In this discipline the camera flyer never goes vertically under the filmable objects. Losing visibility, for example due to clouds, is possible and then the cameraman should just remain still and not do anything that might jeopardize the other skydivers close by. Sometimes different things like shoes, goggles, visors, altimeters, sand and such will fly from the formation towards the cameraman. The camera flyer must always be aware of any unexpected situations and concentrate on the filming job. [5]

2.3.3 Artistic Jumps and Fun Jumps

Sometimes in artistic disciplines and fun jumps the camcorder or camera is just along for the ride to catch on tape or memory card whatever nice situation and filming angle happens to arise. On a freeflying skydive with six people it is not uncommon for half of the participants to have camcorders mounted on their helmets. This produces several camera angles from the same events and with good editing the final video can be magnificent. Usually there are one or more persons flying so called outside camera, meaning that they are filming the rest of the people from a bit further away to catch them all on screen at the same time. Others perform different acrobatics, take contact grips and make formations. The ones with camcorders get the close-up frames while participating in the act. The development of the freeflying discipline of skydiving has popularized camcorder usage in skydiving sport to a new level.

Freestyle is mostly a competitive form of skydiving, where the cameraman's job is to keep the performing freestylist in the center of the screen. This is difficult, because the freestylist constantly changes position and fall rate varies rapidly. The cameraman films from all different angles, circling 360° around the freestylist trying to present all the acrobatics to the judges in most favorable ways. Skysurfing is very similar to freestyle, difference being that the performer has a snowboard shaped skysurf board attached to both feet so, that toes point to the end of the board instead of the side. Freeflying competition team consists of two freeflyers performing acrobatics and one cameraman, such as the people

presented in picture 16. In all artistic disciplines the performance of the camera flyer is also evaluated by the competition judges as a part of the team total score. [9,71-75]

Picture 16. Freefly team:



cameraman (left) and two performers flying in contact grip (right). © Ahti Kangas. [14]

Camera flyers often participate on different fun jumps, like a hula-hoop jump where two persons hold a hula-hoop that other jumpers dive through in freefall. Many sorts of inflatable toys have been jumped with and even inflatable rafts with people sitting inside them in freefall. Large tracking ways, with 10-20 people gliding towards a sunset on the last load of a jump day can look amazing. All these memorable moments are filmed on video for the jumpers own digital scrapbooks and for presentations to friends and families.

Being a young and constantly developing sport, several new national and world records are made every year in sport skydiving. To be accepted into FAI official records, there must be some visual proof of the event happening. Again, camera flyers are needed for the job. While a group of highly skilled and experienced skydivers want to leave their mark on history, some or many must fly the outside camera. A great example is the current world record in formation skydiving, 400-way, presented in picture 18. From the picture, ten different camera flyers can be seen detached from the formation on the edges, flying close by, commemorating it all on digital cameras and camcorders. [21]



Picture 18. The 400-way formation in Udon Thani, Thailand, 2006. © Wendy Smith [21]



Picture 17. Canopy pilot swooping over a pond at sunset. © Ahti Kangas. [14]

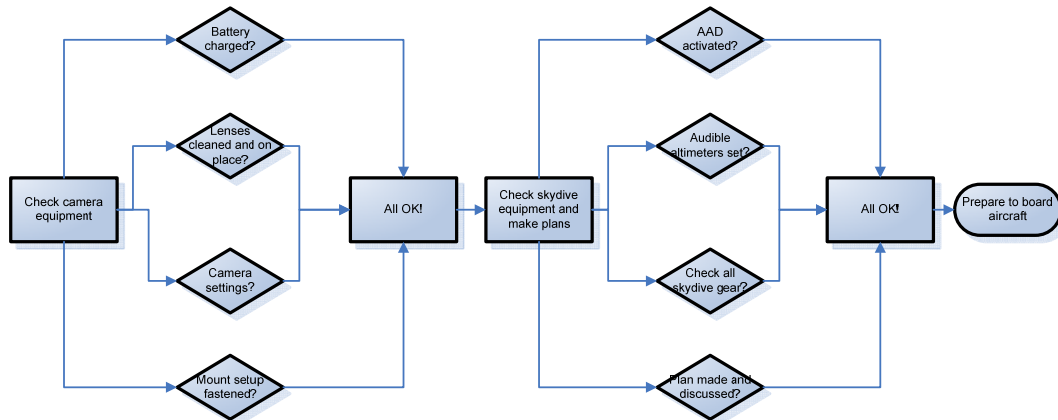
Cameraman's possibilities are not limited to filming in the air. Ground level action, such as canopy piloting, practicing, tandem student interviews and teaching, parties, aircraft take-offs and so on can surely be taken on video or photographed, too. As seen in picture 17, where a skilled canopy pilot swoops a small purpose-built water pond drawing a line on water with left foot, a ground cameraman can often commemorate breathtaking events.

2.4 In the Air and on the Ground

2.4.1 Before Jump

Preparing for a skydive, the camera flyer must do a thorough check on the camera equipment. First of all, the camera settings should be set correctly according to requirements of the jump, which usually means no zoom, no night shot, infinity focusing mode on, fast shutter speed et cetera. The battery must be charged enough, all lenses have to be cleaned and in correct places. Finally, the mounting setup is fastened and screwed tight to ensure nothing shakes or could be dropped in free fall.

As shown in flowchart 2, when camera equipment has been checked, also the skydiving gear must be checked and ensured that nothing is left behind. Automatic activation device is activated, audible altimeters activated and set to correct altitudes. Jump plan is made and discussed with others. After all this, the skydiver is ready to enter the aircraft and prepare for takeoff.



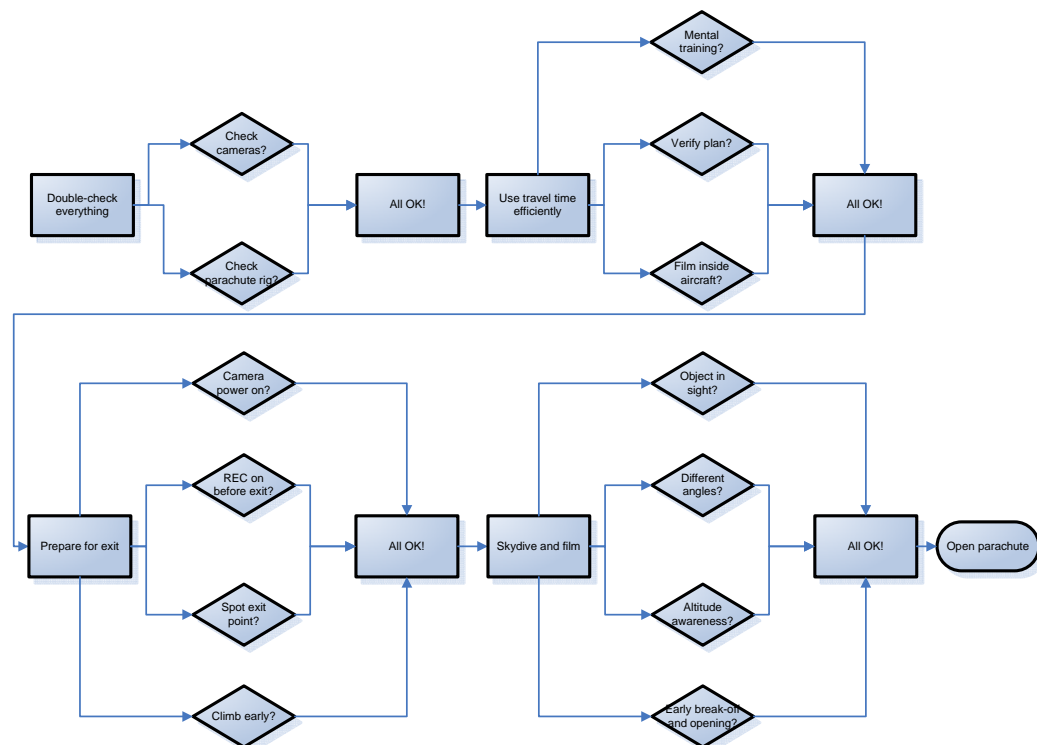
Flowchart 2. Preparations for a camera flyer before loading aircraft.

After performing the previously mentioned preparations when entering the aircraft (see flowchart 2), there usually is enough time to look at the grips and steps outside the aircraft, where the cameraman usually will hang on to, or even practice the climbing once or twice. If the cameraman is to spot the exit point for the whole load of skydivers, this is the latest time to be aware of it and discuss what would be a preferable point of exit.

2.4.2 In the Airplane and Freefall

Inside the aircraft, all perform a standard double-check of everything carried with them, both camera and skydiving equipment. During and after this, it is good to go through a verification of the plan with participants. Many do some mental training and concentration exercises while traveling upwards, have relaxing discussions or film some footage inside the aircraft.

Before exit, the camera flyer switches power on and record on. the first ones to go out from the aircraft will spot the exit point visually from the ground and often climb outside for a simultaneous group exit. During free fall, the cameraman sticks to the plan, takes different filming angles and concentrates on keeping the object in the middle of the sight, as presented in flowchart 3. All this time altitude awareness is crucial, as are early break-off from formation and opening to stay away from other jumpers. The cameraman usually is first to open parachute, unless otherwise planned.

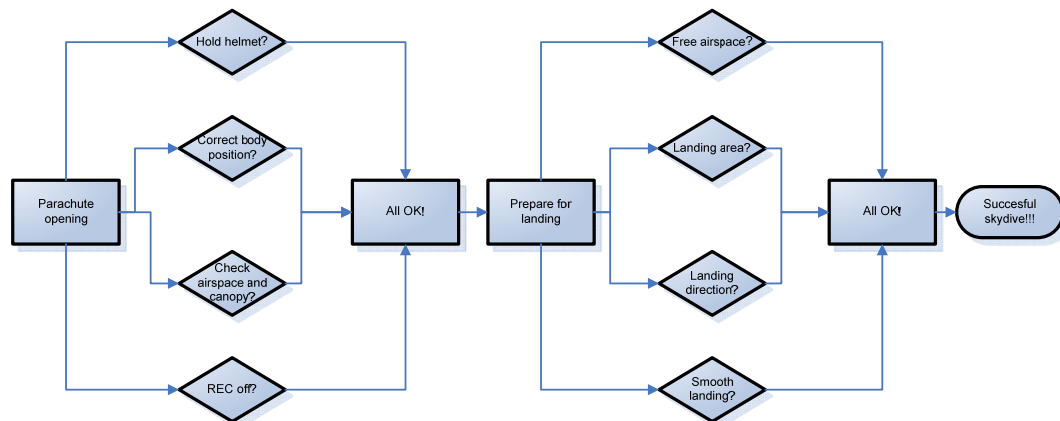


Flowchart 3. Pre-jump preparations and jump actions for a camera flyer.

2.4.3 Opening and Landing

When a cameraman opens the parachute, it is advisable to hold camera helmet with hands to assist the fragile neck muscles and bones to receive the powers caused by the opening. Opening in a stable and symmetric position is vital, especially for a cameraman, to avoid possible main canopy malfunction and to avoid extra forces influencing muscles supporting the camera gear. Immediately after opening, airspace and canopy is visually checked and possible steering maneuvers taken to avoid other nearby parachutists. If main canopy malfunctions, necessary action is taken to either correct the malfunction or disengage the main and deploy the reserve canopy. These actions are same with or without camera, but might involve additional trouble in case helmet is stuck for example. When all is fine and no immediate danger is in sight, the camcorder can be switched off to save tape and battery, unless some footage is filmed while flying the canopy. [5]

As pointed out in flowchart 4, the preparation for landing requires constant surveillance of airspace and flying systematically and predictably towards the landing area. Almost always there is a set direction for landing, according to the wind direction before take-off. On some occasions it is wise to adjust the landing direction with the changes of the wind direction, but then actions of other skydivers have to be considered as well. When landing, there is nothing special to consider for the cameraman, except to remember the camera's existence and beware not to break it during or after landing.



Flowchart 4. Parachute opening and landing operations for a camera flyer.

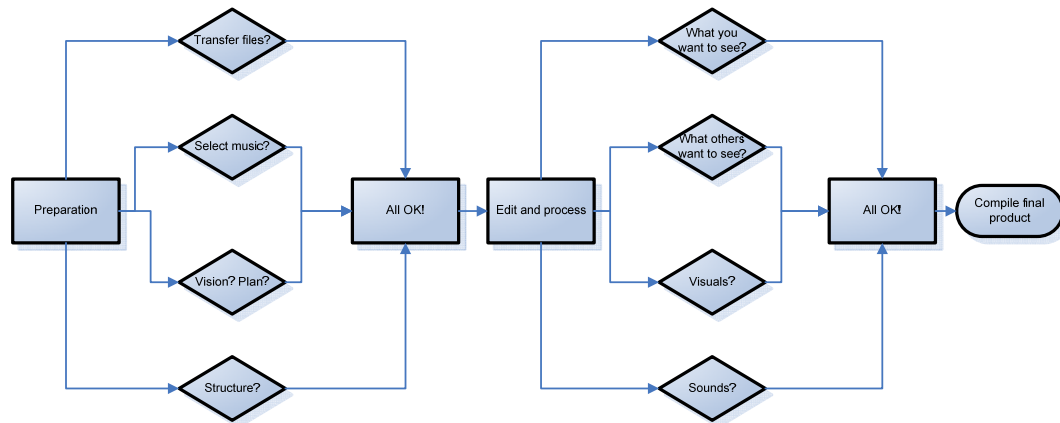
After landing, it is a good habit to check the condition of the lenses and the battery while quickly viewing the footage filmed from the small display of the camcorder or camera. Preservation of the recording media in a dry place with normal temperature keeps the footage usable for as long as required until post-processing.

2.5 From Footage to Product

After a tandem jump has taken place, often the post-processing is carried out immediately, with equipment dedicated for the purpose, so that the tandem student will get the video and photos to take away after the jump. For this reason the tandem videos are usually cut while filming, so that the cameraman only records the necessary clips and nothing extra. This way, it is easy and quick to just add some basic intro and music before compiling the DVD. Of course, some use even professional video mixers and such, but often the edit setup consists of a basic CD player, simple mixer and DVD recorder, where the camcorder can be connected to. [5]

Post-processing begins with transferring the footage to a computer. Still picture files are just copied, but a DV tape must be played into a file with applicable software, which is usually the video editing software. Music and sound effects might be partly figured out beforehand, but after viewing the materials when transferring to a computer, editor has a better understanding of the footage as a whole and can think of music styles and songs that would best suit the video. Planning and structuring the video is better than just putting the best clips on a row. Editor might want to look for similarities and group them, develop a storyline, show different locations or think of anything that would make the viewing experience more fun and interesting. [9,119-126]

In the actual video editing phase the editor must present questions, answer them and edit accordingly. Most important questions are: What do you want to see? What do others want to see? The common answers might be: skilled acrobatics, funny stuff, hazardous situations and anything out of the ordinary. Though, even ordinary can often be quite interesting when talking about skydiving. Flowchart 5 displays the main issues to be taken into consideration when making a good edit. It will include some, but not too many visual tricks, text titles, emphasizing sound effects and such in appropriate parts of the movie. The movie should be of viewable length, meaning not too long, and paced well with rapid cuts and slower stages to keep the viewers' eyes open and focused on screen and storyline. Finally, the end product must be exported to a media, usually into a DVD or online into internet. A DVD production might include digital menus and printed title covers as an additional task to make the product even more professional.



Flowchart 5. Post-production phase of skydive camera work.

For still pictures, sometimes a bit of enhancing is needed to make them more publishable. Cropping, color correction, color enhancing and similar basic methods can be used to fix the pictures a bit to make them look better. Often the best pictures will look great as they are and do not require post-processing. A slideshow can be constructed from a selected assortment of pictures from a certain skydive event, for example.

3 Planning and Making of "Free Spirit 2006-2007 DVD"

3.1 History of Free Spirit Freefly Team and Previous Videos

Free Spirit freefly team was founded at Parasummer 2005 skydive boogie in Pärnu, Estonia. A mixed group of beginner Finnish skydivers met a like-minded Swedish and German skydiver resulting in an idea to begin a new international group of freefly skydivers that would randomly meet and travel around to jump and have fun. The name Free Spirit was quite accidentally realized on one night in mid-July, but afterwards thought perfect as it represents both freedom of the mind and soul experienced when skydiving as well as free alcohol, which is often related to parties occurring after days or weeks of jumping from aircrafts.

First Free Spirit full-length movie was released the next summer, named unimaginatively "Free Spirit 2005", describing the events of that year when team members practiced the sport in Finland, USA and Estonia. Later the same year, Free Spirit entered a skydiving short film competition called Parafilm 2006 in Hanko, Finland, with two 3-4 minute films. The productions were called "Pociunai Chickens" and "Hanko Freefly X". The next year, Free Spirit won the same competition with the short film "Kolomna 2007", presenting skydiving at a dropzone near Moscow, Russia.

3.2 Planning and Filming the Footage

After the release of the first long movie it was clear to me that a sequel would follow at some point. At first I thought I could make one every year, but the process is so time-consuming that it took two more years until I could find time to begin processing the next one. During the years 2006 and 2007, I and our other team members filmed new footage around the world at different dropzones and skydiving events. The countries we filmed in included Finland, Estonia, Lithuania, Italy, USA, Russia and Spain.

I usually do the actual filming quite impulsively. I do not use video camera on all my jumps or all the time when present at skydiving events. Sometimes I plan to film some specific events or jumps. Sometimes I just grab my camera when something I want to film is going to happen or has already happened and the aftermath should be recorded. Often skydivers plan for some specific stunt to be performed or a larger group of people are going to do a jump together. These types of jumps are often good occasions to film good material. All kinds of competition events produce great footage, as well. It is very common among skydivers to come up with all sorts of crazy ideas when they can not or do not want to skydive. Always when something out of the ordinary happens, I try to keep my video camera on recording mode, if possible.

At first, my intention was to make one film every year. When I applied and was selected to student exchange for Spring 2007, I decided that I would take two years interval before making my second longer skydive movie. At times I pondered about different things about the length of the film, the structure, the focus and so on. After the first film I got some critique about it being too long and boring. It was about one and a half hours long and the cuts were very long at some points. So, the first decision was to make the film and the cuts shorter. In the main movie, I thought it would serve the purpose to put more focus to the actual skydiving action and leave almost all of the less related material for the short films.

I planned to make a double DVD with most of the skydiving clips on the first disc and the after-sky clips on the second, just as I did with previous *Free Spirit 2005*. Now, that our other team members had also taken up making these films, I thought it would be great to have all of those also on this same compilation and others agreed to this. On my first DVD release I had a few friends helping me with logos, DVD covers and such things, but this time I planned to do everything myself.

3.3 Editing Process

Editing of the movie began in April of 2008 with browsing the filmed material and making pre-qualifying editing while digitizing the tapes into AVI file format on my computer with Adobe Premiere Pro. At the same time I collected additional un-edited material on tapes and DVDs from other Free Spirit team members participating to the project. Also, at this time I collected all previously published films by our team members from the years 2006 and 2007 to be added into the DVD compilation.

After pre-qualifying most of the material, I finally decided that I would structure the movie into a timeline of one skydive. A skydive that happens simultaneously at different places around the world, from different aircrafts, by different people, doing different stunts, ending in different styles of landings, scenes and comments about the events. After the beginning titles and credits, this one jump begins with loading of aircrafts. Then the story proceeds to making the flight upwards describing the activities of people waiting to perform their jumps. At exit altitude I show the procedures how a skydive begins and then I present many disciplines of freefall skydiving. Finally, I present the opening, cruising under a canopy and landings as well as some comments of the jumps people made. My goal was to make the whole movie last less than one hour. I also wanted to keep most of the cuts short to keep up the viewers' interest and concentration.

The other four short films I edited for the bonus material DVD were mostly about one certain event and consisted of funny and exciting things happening at evenings after skydiving or during days on the ground while others skydive. I meticulously planned and created all the titles and other audiovisual additions for the edits to emphasize certain events or to add humor to the films. I could not find a way to realize some of the ideas I got, so sometimes it was necessary to think of another way to present my vision. I selected the music for the films just by listening short clips from a wide variety of songs and tunes. I collected the ones that I thought might suit a certain phase of the film and from those I picked the best ones while I did the editing. All sound effects were selected from a variety of websites that offer free sounds by using search engines.

3.4 DVD Cover, Labels and Menus [23]

As the basis for the DVD cover I used the previous “Free Spirit 2005” DVD cover made by Eero Rautsi and myself. The reason for this was to achieve consistency in the appearance. The cover edge and backside fonts are the same, as well as the general style of the backside with highlighted still photographs. The background sceneries are still frames extracted from the digital video footage. The title logo and font are the same as used in the movie itself as well as the labels printed on the DVD discs. I printed the cover sheets on Epson Matte heavyweight (167 g/m²) paper with Epson Stylus DX3850 inkjet printer with enhanced photo settings for the print quality. For packaging I used regular size Hama DVD double boxes.

I used Verbatim DVD+R Lightscribe 16x single layer discs as recording media. I created and printed the DVD disc labels with SureThing CD Labeler 4 SE software using LG Lightscribe DVD-writer with 16x speed. I used the same photograph of our team member Aivo looking through a window from outside an airplane at exit altitude as the background for the labels as well as the DVD menus. I created the menus, which contain animated video buttons for each of the edited titles and 10 seconds of looping background music, using Nero Vision software. Only the main movie is split into chapters with a separate menu presenting them. From the master copies made with Nero Vision, I captured ISO disc images with Nero Burning ROM software for copying purposes. Both the cover and the labels are presented in appendix 2.

Total time span to film and create the product was two years and nine months. I spent approximately 150 hours of working time to viewing, editing and re-editing over 15 hours of filmed footage, selecting music and sound effects, creating the menus, labels and cover.

4 Discussion and Future

4.1 Result

As a result of this project, a compilation of one main movie and 11 additional short films on two separate DVD discs were created. Seven of the films are previously edited and published by me or my team-mates in 2006 or 2007. Five films are edited by me for this project alone. The main movie duration is 54 minutes 26 seconds. Other film clips range from 3 minutes to 25 minutes in length.

The first DVD titled “The Movie” contains:

- Essence of Life, 54 minutes 26 seconds
 - o Title & Credits, 5 minutes 24 seconds
 - o Part 1 – Up & Go, 9 minutes 55 seconds
 - o Part 2 – Freedom, 24 minutes 36 seconds
 - o Part 3 – Down & Out, 14 minutes 25 seconds
- Judge – Movie, 24 minutes 36 seconds
- Judge – Trailer, 4 minutes 14 seconds
- Pexi – Freeflying Season 2007, 4 minutes 42 seconds
- Pexi – Free Spirit May 2007, 3 minutes 39 seconds
- Pexi – Kolomna June 2007, 3 minutes 11 seconds

The second DVD titled “Bonus Material” contains:

- After-Sky Flashback, 9 minutes 33 seconds
- Lithuanian Beer Drinking Competition, 8 minutes 22 seconds
- Raunoset Go America, 7 minutes 54 seconds
- Turku Shopping Masquerade, 11 minutes 17 seconds
- Pociunai Chickens, 3 minutes 7 seconds
- Hanko Freefly X, 4 minutes 6 seconds

4.2 Testing the DVD and First Presentation to Audience

I tested the movie first by myself a few times to see that it technically works on a basic Sony DVP-NS52P DVD-player. I also tested the menu structure and button navigation. In addition, I tried different display modes to see how the menus and the movie show when the picture is stretched and scaled and if the texts and functionalities would keep within the viewing perimeter.

I had two separate test viewings in end of August 2008 with different members of our skydiving team to get their comments about the movie and what should be changed. At this point I also viewed the whole movie with a critical touch and made notes. We found several editing bugs as well as invented some improvements, editing ideas and audiovisual improvements. A couple of story line enhancements I figured out from my friends' comments. We also spotted a few problems related to color, brightness, picture vibration and such quality properties. All of these I later fixed and implemented into new versions finally resulting in the ready version. At the very final stage I remembered to add two more short films from 2006 that I had forgotten from the compilation and had to remake the DVD menu and image of the second disc. The testing process involved six pre-ready versions.

First presentation to a major audience was at my 30th birthday party in a Helsinki nightclub mid-October 2008. More than a hundred people saw the movie at least partly at the event. The film was presented from four large video projector screens and the audio came through the professional public audio system installed in the nightclub. The reception of the audience was good. Most of the skydivers present, as well as other people I talked to about the movie, thought the main movie was very nice. Several people wanted to have a copy of the movie for themselves and some wanted many copies for gift purposes, also.

4.3 Future Plans

In the future my plan is obviously to make more films. Probably one major release every two years, because it is such a massive job. I might do some three minute short films in between the next major one, if I can find the time and inspiration. I will try to develop my skills as a skydiver, as a cameraman and as an editor. I will try to go deeper into the possibilities of Adobe Premiere Pro and learn Final Cut Pro better than now. I am also planning to buy my first professional still camera as an addition to my gear. Learning to use it well will take time, but eventually I can explore ways to integrate video and still pictures innovatively into my productions. The camera I am planning to get is Canon EOS 450D, which has won several reviews and considered the best camera in its class.

A few more of our team members have acquired video camcorders during the year 2008, so perhaps I will also act as a general editor and director of movies for our whole team later on as I have the most expertise on the subject. In the future I would enjoy to be able to make movies with footage from two to four different camera angles from a single jump, will make the editing process much more challenging while also adding to the possibilities of it.

5 Conclusions

Making of “Free Spirit – Essence of Life” was a great journey and a learning experience. I traveled to many countries, met and jumped with a lot of people from many nationalities to make the footage. Using multimedia appliances in sport skydiving is very common today, because of the ever lowering prices and rising quality of the electronic equipment that is always getting smaller, lighter and more wearable. Only imagination is limiting the ways how athletes and their assistants can capture the sport action on different media. Now and in the future more and more people have the means and will want to broadcast their activities and opinions to others, which will result in massive variance of entertainment and information available to everyone.


The main resource needed to film, view and edit a large amount of video footage is time and the second most important thing is vision. A lot of days and nights by the computer is the only thing that will make a product like this ready. Spending time creating something is always rewarding, but it can also be very strenuous and frustrating at times. During the creating process I have had to take several long breaks lasting weeks or months and then return to the material and review my creation to make it better and better again. It is the best way to distance yourself from your own mistakes and get new angles in assessing your own work. Despite the huge amount of work involved, I am sure to do it again.



References



- 1 Poynter D, Turoff M. The Skydiver's Handbook. 9th ed. Santa Barbara: Para Publishing; 2004.
- 2 The sport of skydiving [online]. 26 February 2008. Fredericksburg: United States Parachute Association; 2003.
URL: <http://www.uspa.org/about/sport.htm>. Accessed 8 April 2008.
- 3 Mahncke J. Military History Journal - Vol 11 No 6: Early Parachutes [online]. The South African Military History Society; 8 December 2007.
URL: <http://rapidftp.com/milhist/vol116jm.html>. Accessed 8 April 2008.
- 4 Lajiesittelyt [online]. Helsinki: Suomen Laskuvarjokerho ry; 2007.
URL: <http://www.laskuvarjokerho.fi/2007/>. Accessed 8 April 2008.
- 5 Kangas A. Ilmakuvaamisen neuvoja ja näkemyksiä [online]. 21 March 2007.
URL: <http://www.kusti.net/fi/ilmakuvaus.html>. Accessed 7 April 2008.
- 6 Kangas A. Ilmakuvaamisen perusteet [online]. 17 November 2007.
URL: http://www.kusti.net/fi/archive/ilmakuvaaminen_alkeet.ppt. Accessed 7 April 2008.
- 7 Harpin L. Camera Flying [online]. United Kingdom: Freefall Addicts; 2008.
URL: <http://www.freefalladdicts.com/cameraflying.shtml>. Accessed 8 April 2008.
- 8 DV [online]. San Francisco: Wikimedia Foundation, Inc.; 5 April 2008.
URL: <http://en.wikipedia.org/wiki/DV>. Accessed 8 April 2008.
- 9 Weldon P. Flying the camera. 5th ed. Shreveport: Creative Publishing Company; 2001.
- 10 Culver R. So you want to be a camera flyer, huh? [online]. Skydiving photography articles. Cape Town: D4DR Media CC; 3 September 2000.
URL: <http://www.dropzone.com/photography/articles/Soyouwanttobeacameraflye.shtml>. Accessed 9 April 2008.
- 11 Sony DCR-PC350E digital camcorder picture [online]. Espoo: Sony Nordic a/s; 31 March 2008.
URL: <http://sp.sony-europe.com/media/2/598>. Accessed 9 April 2008.
- 12 Williamson J. Skydive photos - Equipment [online].
URL: http://www.skydivephotos.co.uk/section120237_32737.html. Accessed 9 April 2008.
- 13 Digitarvike – Tuotteet [online]. Oulu: Fotohovi Oy; 2008.
URL: http://www.digitarvike.fi/product_search.php. Accessed 10 April 2008.

- 14 Kangas A. Galleria – Laskuvarjo ja ilmailu [online]. 2004-2008.
URL: <http://www.kusti.net/fi/galleria.html>. Accessed 11 April 2008.
- 15 SkyTools - Products [online]. Trelleborg: SkyTools AB; 14 February 2007.
URL: http://www.skytools.m.se/products_all.htm. Accessed 10 April 2008.
- 16 Optik Illusion [online]. Perris: BoneHead Composites; 4 January 2008.
URL: <http://www.boneheadcomposites.com/optikillusion.htm>. Accessed 11 April 2008.
- 17 Camera Converter One [online]. Partizanske: Skitec S.R.O.; 2008.
URL: http://www.tonfly.com/CC1_828527.html. Accessed 11 April 2008.
- 18 About video editing [online]. Singapore: Silver Media Singapore; 2005.
URL: <http://www.aboutvideoediting.com/>. Accessed 12 April 2008.
- 19 Video editing software [online]. San Francisco: Wikimedia Foundation, Inc.; 27 March 2008.
URL: http://en.wikipedia.org/wiki/Video_editing_software. Accessed 12 April 2008.
- 20 Kangas A. Hyppykamera [online]. 17 November 2007.
URL: <http://www.kusti.net/fi/archive/hyppykamera.txt>. Accessed 7 April 2008.
- 21 Team Spirit. History – how did it start? [online]. Ireland: 2008.
URL: http://www.teamspirit.ie/4-way_history.html. Accessed 29 April 2008.
- 22 Parachute [online]. San Francisco: Wikimedia Foundation, Inc.; 27 March 2008.
URL: <http://en.wikipedia.org/wiki/Parachute>. Accessed 29 April 2008.


Appendix 1: Tonfly CC1 Camera Helmet [17]


Camera Converter One

The **insert link** thanks to 3 coupling holes permits to adjust the camera angle according to own requirements.
 2 positions are typically for freefly shooting and 1 position is ideal for RW - Tandem videos and jumps with students





The **Converter** is equipped of PVC closing caps in order to safeguard the look when you don't use camcorder and still camera.

Appendix 2: The DVD cover and disc labels [23]



