



Safety at Paragliding, case Cumulus Clouds Nepal Paragliding

Milan Thapa Magar

2020 Laurea



Laurea University of Applied Sciences

**Safety at Paragliding, case Cumulus Clouds
Nepal Paragliding**

Milan Thapa Magar
Safety, Security and Risk Manage-
ment
Bachelor's Thesis
March, 2020

Milan Thapa Magar

Safety at Paragliding, case Cumulus Clouds Nepal Paragliding

Year	2020	Pages	49
------	------	-------	----

The Bachelor Thesis has been completed for the Cumulus Clouds Nepal Paragliding. The purpose of this thesis is to develop a correct safety practices in paragliding that can be practiced by commissioned company and their pilots to improve and strengthen its safety policy.

The thesis focus on suggesting the correct safety procedure for case company by conducting a research among pilots and participants passenger with regards to safety procedure practiced at present and their awareness level to potential risk in paragliding. Additionally, the thesis studied safety procedure that have been practiced by pilots of other company for statistical comparison of data between case company and other company. Finally, the recommendation has been made based on findings that have been mentioned by various source and experts. Since the research has been conducted to seek the answer, it is a research driven development project.

For research, quantitative research method has been applied and questionnaire survey as a tool of data collection was used. Questionnaire survey has been developed using Likert type scale response in order to make respondent understandable and easy to answer. 2 sets of questionnaires related to flight safety was prepared each for the pilot and the passenger participants.

In summary, the result among the pilots of the case company led to the conclusion that average remarks of safety procedure practiced was “Always practiced” and level of awareness to potential risk in paragliding was “Extremely aware”. On the contrary, the study found that the awareness level of participants passenger to the potential risk is not in adequate level. Accordingly, Cumulus Clouds Nepal and their pilots should focus more on emergency preparedness, incident reporting and put more effort to increase the awareness level of the passenger participants to potential risk by providing understandable safety briefing and publishing safety related information targeting passenger participants through its social media.

Keywords: Paragliding, Accident, Safety and Risk Management

Table of Contents

1	Introduction	6
1.1	Background of the Study	6
1.2	Objective and Problem Statement.....	7
1.3	Significance of the study	7
1.4	Limitation of Questionnaire Survey result	8
2	Theoretical Background	8
2.1	Paragliding	8
2.1.1	History of Paragliding	9
2.1.2	Paragliding Association in the world	10
2.1.3	Paragliding pilot statistics in the world	11
2.1.4	Paragliding in Nepal.....	12
2.1.5	Destination Pokhara for Paraglider	13
2.1.6	Paragliding participants in Pokhara, Nepal	13
2.2	Accident	14
2.2.1	Statistical comparison of the accident in the world concerning Paragliding.....	14
2.2.2	Paragliding accidents in Nepal.....	15
2.2.3	Accident in Cumulus Clouds Nepal Paragliding	16
2.3	Safety and Risk Management	16
2.3.1	Risk factor in paragliding and its possible consequences	17
2.3.2	Risk Mitigation in Paragliding	20
3	Methodology.....	24
3.1	Questionnaire Survey and its objective	25
3.2	Target group	26
3.3	Sampling Technique	26
3.4	Statistical treatment of data	26
4	Result and Discussion	28
5	Conclusion and Recommendations	34
	References.....	37
	Figures	42
	Tables	42
	Appendices	43

List of Abbreviations

APPI	ASSOCIATION OF PARAGLIDING PILOTS AND INSTRUCTORS
AOC	Air Operation Certificate
BHPA	BRITISH HANG GLIDING AND PARAGLIDING ASSOCIATION
CAAN	CIVIL AVIATION AUTHORITY OF NEPAL
FAI	FÉDÉRATION AÉRONAUTIQUE INTERNATIONALE (WORLD AIR SPORTS FEDERATION)
NAA	NEPAL AIRSPORTS ASSOCIATION
USHPA	US HANG GLIDING & PARAGLIDING ASSOCIATION

1 Introduction

Paragliding is a simple way for humans to fly openly in the sky. It is an activity with combination of adventure, thrill and fun along with high degree of risk, thus has been categorized as an extreme sport. The popularity of this sport is experiencing upward trend with the time and is attracting more and more attention day by day. There are many companies and organizations in the different corners of the world providing paragliding service. Most of them are actively involved in this sport considering it as a profession.

Cumulus Clouds Nepal Paragliding, founded in 2016 by Juddha Bahadur Gurung and Lakpa Tsheri Sherpa, is a private company established with the aim to provide commercial paragliding service to domestic and international tourists. The head office of the company is situated in lakeside, Pokhara-6, Nepal. Both the founders are renowned paragliding pilot of Nepal and thus have recruited highly qualified and trained pilots. (J. Gurung 2019. Personal communication.) Lakpa Tsheri Sherpa has won the award of “National Geographic 2012 Adventurer of the year” for successfully paragliding from the top of the world, Mount Everest. (National Geographic 2012.)

Cumulus Clouds Nepal Paragliding has been an active member of NAA since its establishment. There are currently 10 pilots actively involved with the company and has been operating its tandem paragliding service from Sarangkot, Pokhara Nepal. In a peak season, starting from September and prolonging till June, company operates about 20-30 take-off in a day. Juddha Bahadur Gurung also works as a command role for solo paraglider in cross country flying which starts from Mardi Himal and reaches to Pokhara. (J. Gurung 2019. Personal communication.)

1.1 Background of the Study

There are many books and articles published about paragliding and its safety. In the book ‘Paragliding: The Complete Guide’ written by Whittall (1995a, 137-152), the safety in paragliding has been classified into passive safety, active safety and defense safety, and discussed about it. Another example can be taken from the book “Touching Cloud Base”, where Curren and Cruickshank (1996a, 34-38) has mentioned about pre-flight inspections as canopy inspection, daily inspection and pre-launch inspection. Although Number of theories and procedure regarding the safety in Paragliding have been developed, but the pessimistic practices in adopting these procedures has led to the increase in the number of accidents in Nepal. This incident has raised question about safety issue among paragliders in national and international level. (S. Gurung 2019.)

- The issue has brought fear and challenge among paragliding participants, paragliding company and the whole community
- Rising concern about the safety procedure that have been practiced at present

- Along with the concern parties, case company cannot be separated with this issue

As saying “prevention is better than cure”, the necessity of in-depth study of existing safety practices, compiling data about the characteristics and risk factors relating to paragliding and suggest possible improvement in the company’s safety policy is needed to make Pokhara’s sky safe for paragliders.

1.2 Objective and Problem Statement

The objective of this study is to suggest correct safety procedure in paragliding for case company. To sought out the answer, researcher will conduct a research. Since the study will be guided by the research, it is research driven development project.

The research question directing this research is “What are the safety procedures that can be practiced by pilot of Cumulus Clouds Nepal Paragliding regarding safety in paragliding?”. The research is directed at finding the correct safety procedures for the case company by collecting the following information:

- Degree of compliance with regards to the safety procedures among pilot with series of checklist.
- Level of awareness among pilot and passenger regarding to the potential risk in paragliding.

After collecting information, it will be helpful to analyze the current safety situation and suggest additional safety methods to case company which can be helpful to make paragliding activity safer.

1.3 Significance of the study

The completed thesis can be beneficial for case company to strengthen, develop and upgrade its policies in terms of safety in paragliding. The study will assist to acknowledge strengths and weaknesses of safety practices that have been applied at present. Along with it, the case company will be benefited to realize and recognize the needs and importance of correct safety measures along with the growing trends of this sport. It will emphasize case company and the pilot to pay extra attention on possible risks and apply correct safety practices. It will also help to understand the level of awareness among passenger participants and develop the safety strategy taking them into consideration. lastly, the outcome of this study will contribute to the case company as a reference for correct safety practices.

1.4 Limitation of Questionnaire Survey result

As defined, “A limitation of a study design or instrument is the systematic bias that the researcher did not or could not control and which could inappropriately affect the results.” (Price & Murnan 2004). Based on the definition it can be said that researches tend to depend on the information from different sources and many a time, this information might not be quite accurate due to the limitations posed by the research. The research in the form of this thesis also poses certain limitations that might be listed as:

- Limited data size due to the limited number of pilots in the case company.
- Due to less knowledge about paragliding safety, paragliding participants could provide false information.
- Due to fear of reputation, possibility of providing false information from the pilot and case company.
- Language barrier between researcher and respondents.

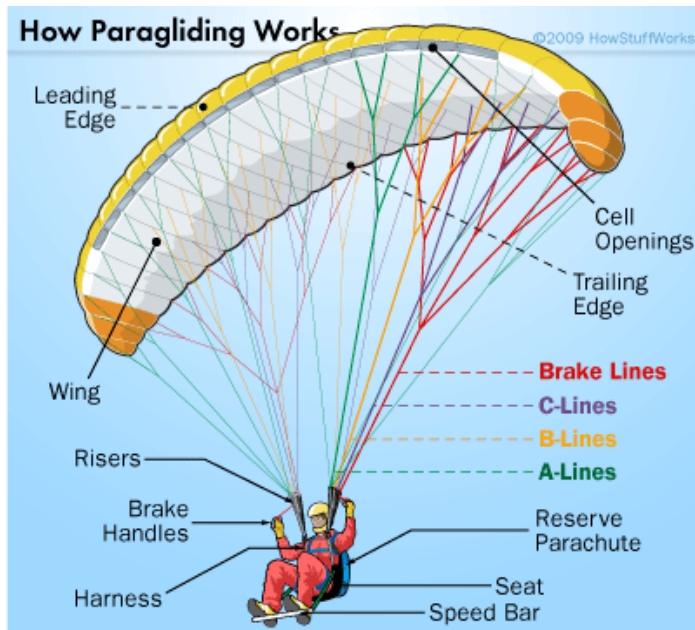
Since the research has been conducted using questionnaire survey, the respondents might not understand the question properly and choose irrelevant answer. There is also a possibility of inadequate reliability of data due to limited number of pilots in the case company.

2 Theoretical Background

The theoretical background is the concept that hold or support a theory of a research study based on existing theory. It is a blueprint that introduces and describes the theory which explains why the research problem under study exists. (Adom, Hussein & Joe 2018, 438-441.) This section presents the concepts which are relevant to the topic of this research by using existing theories.

2.1 Paragliding

Paragliding has been categorized as an adventurous air sport done with fully manually operated and completely non-motorized simple flying device. It is the simplest form of human flying with light - weight, free flying and foot launched glider and does not have any rigid primary structure. Although, it has some similarity to hang glider, they have some distinctive differences. It can also be termed an improved version of parachute. Paragliding can be done solo or tandem. Solo paragliding is done alone, and tandem is done with passenger and pilot paraglider. (Ronca 2009.)



The main Components of Paragliders are:

- Canopy (Wings)
- Lines and risers
- Harness
- Speed bar
- Reserve Parachute
- Helmet

Figure 1: Components of Paraglider (Ronca 2009.)

There are certain techniques required to launch the paraglider. It flies into sky with the help of rising air. To fly one needs to jump from the hill or cliff with the glider. It is operated and controlled manually and while landing, foot need to be used. The wings, also called canopy of paraglider, is made up of with two layers of fabric and are divided into row of cells. Each row of cells is open in the front edge to pass the air inside the wings and make the wings inflatable. Wings are attached with lines to the harness from its two ends. Lines and risers are used to control glider during flying. Harness are like backpack which is used to carry the paraglider wings and to support pilot to maintain standing and sitting positions during the take-off and landing. Harness also contains reserve parachute which is used during emergency. (Ronca 2009.)

2.1.1 History of Paragliding

There are different histories about invention of paragliding in different sources. The history of Paragliding that has been mentioned in USHPA states that it is said that in early 1960s, David Barish worked for NASA as a consultant in a project of developing parachute that help Nasa space capsule to safely return on earth. He named the parachute as Sailwing- a single surface, rectangular parachute. When the development and testing phase was going on in the different parts of the world, in 1964 a person named Domain Jalbert registered the patent of first parafoil- ram air double surfaced airfoil. The concept of this design was to enter flow of air into cell that gives shape to canopy and help to glide. Following year in 1965, David Barish tested his Sailwing by himself first time from Hunter Mountain, New York. Then from 1966, he started to promote it as a summer activity. Later in 1978 two skydivers from France named Jean-Claude Bétémps and André Bohn came up with more improved running and

launching technique during paragliding. They successfully launch their first paraglider from the slope of Mount Pertuiset in Mieussy, France. In 1979 the first paragliding school was established in Anemasse. The publicity and attention about paragliding among people get started from late 80s. (USHPA n.d.-a.)

2.1.2 Paragliding Association in the world

The popularity of paragliding is generally believed to have prospered from the decade of 80s. There are various organizations at present contributing for the further growth and development of paragliding in different parts of the globe since then. These organizations are responsible for monitoring and governing the safety practices practiced in their affiliate companies. Some of the major organizations are:

- World Air Sports Federation (FAI)-Switzerland

FAI is international organization founded in 1905 with an aim to establish rules and regulations, certification and further development worldwide in the field of air sports activities. It is private non-profit organization with more than 100 member countries and recognised by the International Olympic Committee (IOC). The head office of the organization is in Lausanne, Switzerland. (FAI n.d.)

- Association of Paragliding Pilots and Instructors (APPI)-Switzerland

The APPI is a Swiss non-profit and non-governmental independent organization which was founded on 2009 in Switzerland with a motive of providing worldwide united education system to paragliding pilot and instructor all around the world. By 2017, APPI has 180 schools in 50 countries and 7000 members in 122 countries. (APPI n.d.)

- United States Hang Gliding and Paragliding Association (USHPA)-United States

USHPA is non-profit independent organization established in 1971, working in the field of Hang gliding and Paragliding. The headquarters of the USHPA is in Colorado Spring, United States. The mission of USHPA is to provide pilot rating and instructor certification program, monthly magazine for flying, product and safety information and provide insurance coverage for its member and participant. There are over 100 local chapters and clubs as a member of USHPA. (USHPA n.d.-b.)

- British Hang Gliding and Paragliding Association (BHPA)-United Kingdom

BHPA is the governing body that has a network of recreational club and registered schools in UK established with a mission to oversee pilot and instructor training standards and to provide infrastructure for Hang Gliding and Paragliding. There are around

7,000 pilot as a member in BHPA. Its head office is in Leicester. BHPA is the member of “The Royal Aero Club of the United Kingdom” and “The European Hang Gliding and Paragliding Union”. (BHPA n.d.)

- Civil Aviation Authority of Nepal (CAAN)-Nepal

Civil Association Authority of Nepal was established in 1957 under the Ministry of Work, Communications and Transport of the Government of Nepal. It became the member of International Civil Aviation Organization (ICAO) in 1960. CAAN is the head of governing and preparing policy of all the civil aviation, air navigation service and aerodrome operation in Nepal. The mission of the CAAN is to ensure safety and security, maintaining efficient, standard and quality service in the areas of civil aviation and airport operations in Nepal. The head office of CAAN is in Babarmahal, Kathmandu Nepal. (CAAN n.d.)

- Nepal Airsports Association (NAA)-Nepal

The NAA was established in 2002 with the mission of development of air sports in Nepal. The primary engagement of the organization is in regular paragliding operation, assurance of safety and security, provision of rescue and emergency service. Further, the organization is involved in pilot licensing and monitoring as well as flying supervision and equipment registration. NAA is authorized association of Civil Aviation Authority of Nepal (CAAN) and works under supervision of the Ministry of Culture, Tourism and Civil Aviation. (NAA n.d.-a.)

For furthermore discussion in this study, the report, article and statistics about paragliding published through above mentioned organizations have been used. In addition, this study has also adopted the important safety procedure that has been discussed and suggested by these organizations in the conclusion and recommendation section of this thesis.

2.1.3 Paragliding pilot statistics in the world

Popularity corresponds to the number of participants; hence the increasing popularity of paragliding infers the increasing number of participants too. In order to paint the picture more vividly, graphs below represent the status of membership of pilot in some renowned paragliding associations like USHPA and BHPA. (BHPA 2018; USHPA 2019.)

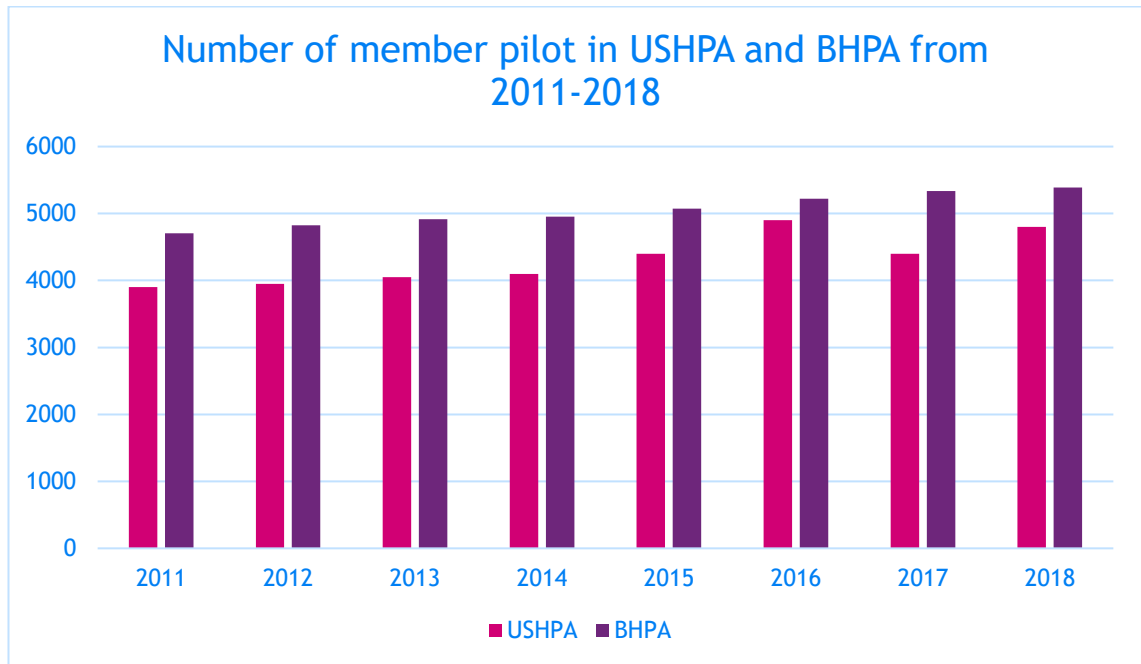


Figure 2: Number of paragliding pilots registered in BHPA and USHPA (BHPA 2018; USHPA 2019.)

The above graph shows the membership number of paraglider pilot in BHPA and USHPA from the year 2011-2018. As shown in the graph the number of memberships is in inclination in both BHPA and USHPA. BHPA have more membership number of paragliding pilots as compared to USHPA. The membership number in 2018 is approximately 5400 and 4800 in BHPA and USHPA respectively. (BHPA 2018; USHPA 2019.)

2.1.4 Paragliding in Nepal

According to Discover Nepal (no date), the official tourism website for Nepal, paragliding started in Nepal from 1995. There are over 60 tandem operator companies that have taken the membership of NAA by 2018. It has also stated that 294 tandem pilots and 50 solo pilots have taken the membership of NAA and involved in various tandem operating companies within Nepal. Although Nepal has several places for paragliding, Sarangkot, Pokhara is the most popular destination for paraglider lovers. (NAA n.d.-b.)

To fly in Nepal, the Civil Aviation Authority of Nepal (CAAN) has made the permit mandatory for all the paragliding pilots by authorizing NAA for issuing the permits. For eligibility of permit, pilots require to submit copies of their flying license and insurance coverage document along with copy of passport, visa and photograph of a person. The permits are issued at \$50 for 15 days and \$90 for 30 days plus 13% VAT with the additional NAA membership charge of \$16. (NAA n.d.-c.) The qualification and requirements to do paragliding in Nepal as stated by NAA (No date-c) are listed below:

- For solo flight, submission of valid flying license with minimum level of APPI Solo pilot Certification Para pro III and Insurance;
- For Tandem flight, submission of valid Tandem flying license along with insurance covering pilot, passenger and third-party liability;
- For Commercial Tandem, submission of Air Operation Certificate (AOC);
- For Organization and Group, authorization from NAA and CAAN under supervision of paragliding company.

2.1.5 Destination Pokhara for Paraglider

As information provided by NAA, Pokhara is one of the top destinations in the world for paragliding because of the stable thermal, suitable weather condition, beautiful mountain views and perfect launching and landing zone. Paragliding in Pokhara has been started from early 2000's. Paragliding in Pokhara take off from Sarangkot which takes about 20-minute drive from Pokhara city and lands on side of Fewa Lake. The total flight is about 20-30 minute. Paragliding in Pokhara is available all-round the year but the best time would be between mid of September till April. In Pokhara, there are many paragliding companies providing solo and tandem paragliding services with few schools approved by APPI, also providing paragliding course to learners. Beside this, there is also yearly paragliding competition. (NAA n.d.-d.)

2.1.6 Paragliding participants in Pokhara, Nepal

A report "Nepal Tourism Statistics 2018" was published by Ministry of Culture, Tourism and Civil Aviation, Nepal in year 2018. The following graph is inclusive in the report which depicts the total number of participants during 2015-2018. It allows the comparison of the involvement of domestic as well as foreign participants. (Ministry of Culture 2018, 91.)

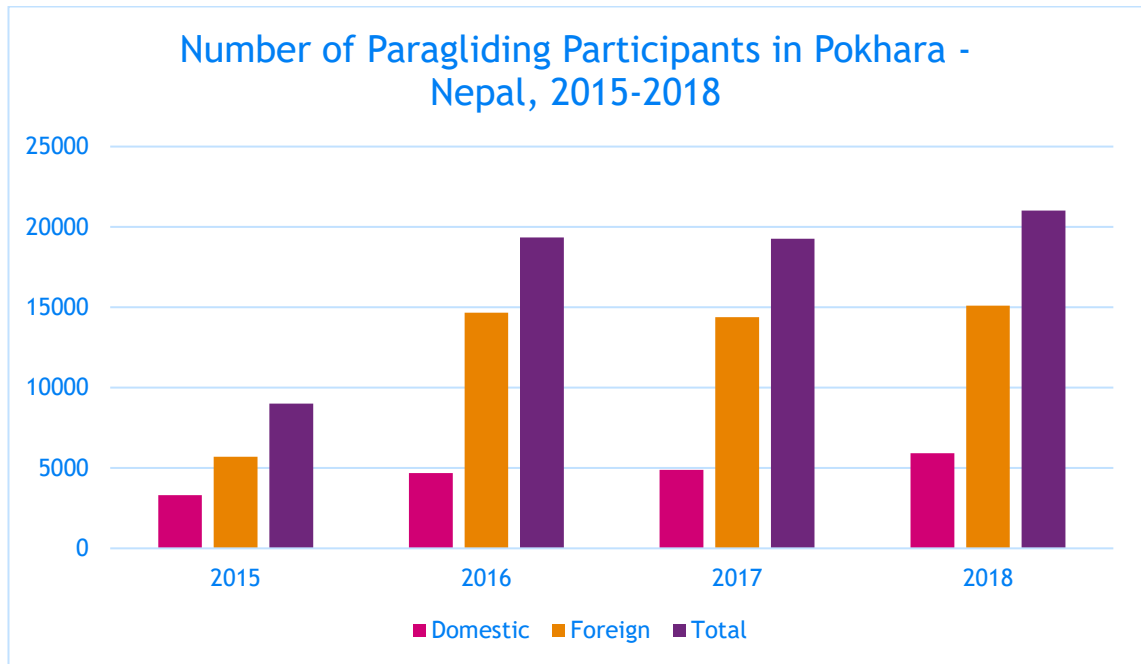


Figure 3: Number of domestic and foreign tourist paragliding participant in Pokhara, Nepal (Ministry of Culture 2018, 91.)

The above bar graph shows the number of domestic and foreign tourist who were participant in paragliding in Nepal from year 2015 till 2018. The number of foreign participants seems to be higher than domestic participant every year. 2018 has observed the highest number of participants among both tourists. On the contrary, the lowest number was seen in 2015. (Ministry of Culture 2018, 91.)

2.2 Accident

Lexico dictionary (2019a) defines an accident as ‘An unfortunate incident that happens unexpectedly and unintentionally, typically resulting in damage or injury’. Based on the definition it can be said that accident often brings about unwanted change to the status quo and the consequence is usually unpleasant. Accident can happen anywhere at any time.

2.2.1 Statistical comparison of the accident in the world concerning Paragliding

Along with the popularity of paragliding, number of participants has also increased by a huge number. Parallel to the number of participant and time, the number of accident and fatalities has also increased. (BHPA 2018; USHPA 2015; USHPA 2018.) Graphs in this section show statistical comparison of the fatalities and death that has been recorded in BHPA, USHPA and the country of the case company.

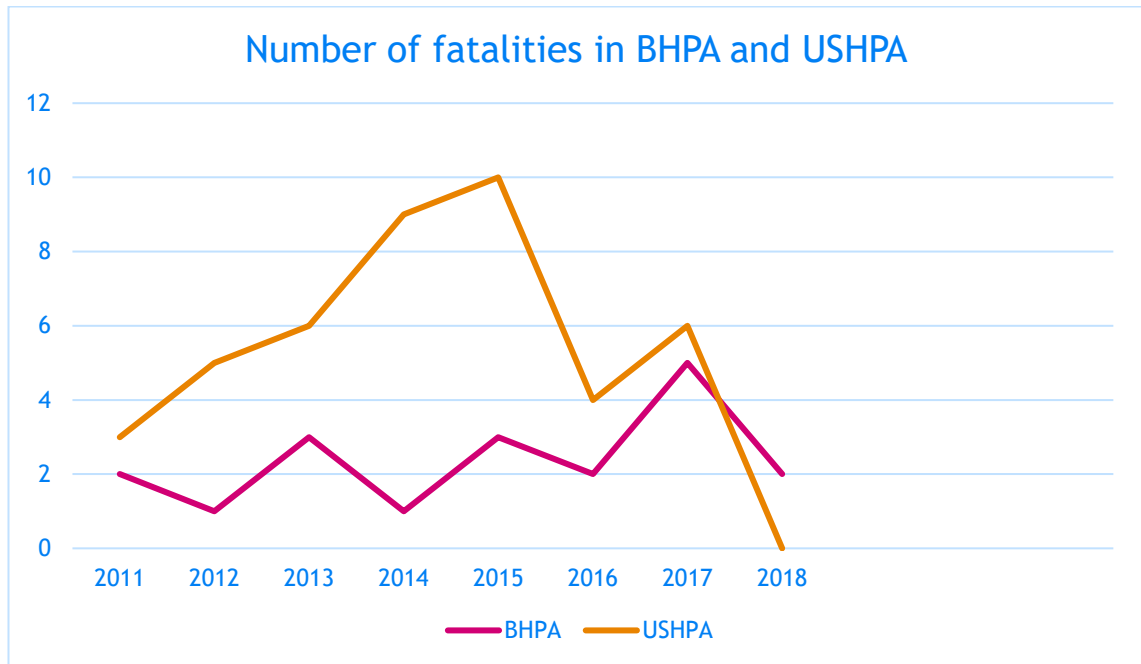


Figure 4: Number of fatalities in BHPA and USHPA (BHPA 2018; USHPA 2015; USHPA 2018.)

The above graph shows the number of fatalities provided by BHPA and USHPA from year 2011 till 2018. As compared, BHPA has comparatively lower fatalities than USHPA. Chart shows that BHPA has low fatality in year 2012 and 2014 equal to 1 where as in USHPA fatality was 0 in 2018. The highest fatalities were 5 in 2017 for BHPA and 10 for USHPA in the year 2015. (BHPA 2018; USHPA 2015; USHPA 2018.)

2.2.2 Paragliding accidents in Nepal

According to a study conducted in Manipal Teaching Hospital-Pokhara, Nepal, during the study period of 3 years from June 2012 till January 2015, 15 paragliding injuries has been recorded. All the injured people were admitted to Emergency Department of Manipal Teaching Hospital. Among them one person was brought dead to the hospital. 13 of them were foreigners. Most of the accidents were occurred in the month of November and December during landing phase. The injury related to spine and limbs were highest among them. (Atereya & Kanchan 2016.)

In the news penned by Suchitra Gurung (S. Gurung 2019) and published in English national daily newspaper of Nepal “The Kathmandu Post”, there were 20 serious accidents related to paragliding in Pokhara in 2018 only. According to “The Himalayan Times” daily English newspaper of Nepal, 14 paragliders have already died as per the record till the date of his article issuance (Dhakal 2019). Number of paragliding accidents are increasing with time. Thus, there is rising concerns about the safety in paragliding.

Amidst the thesis research, either no fatalities report has been made accessible to general public or there has been no systematic recording of these data. During the research, the number of paragliding fatalities in Nepal was not found contrary to the systematically recorded fatalities report of organizations like USHPA and BHPA. However, 'The Himalayan Times' has published the number of paragliding deaths between 2010 and mid - 2019 (Dhakal 2019).

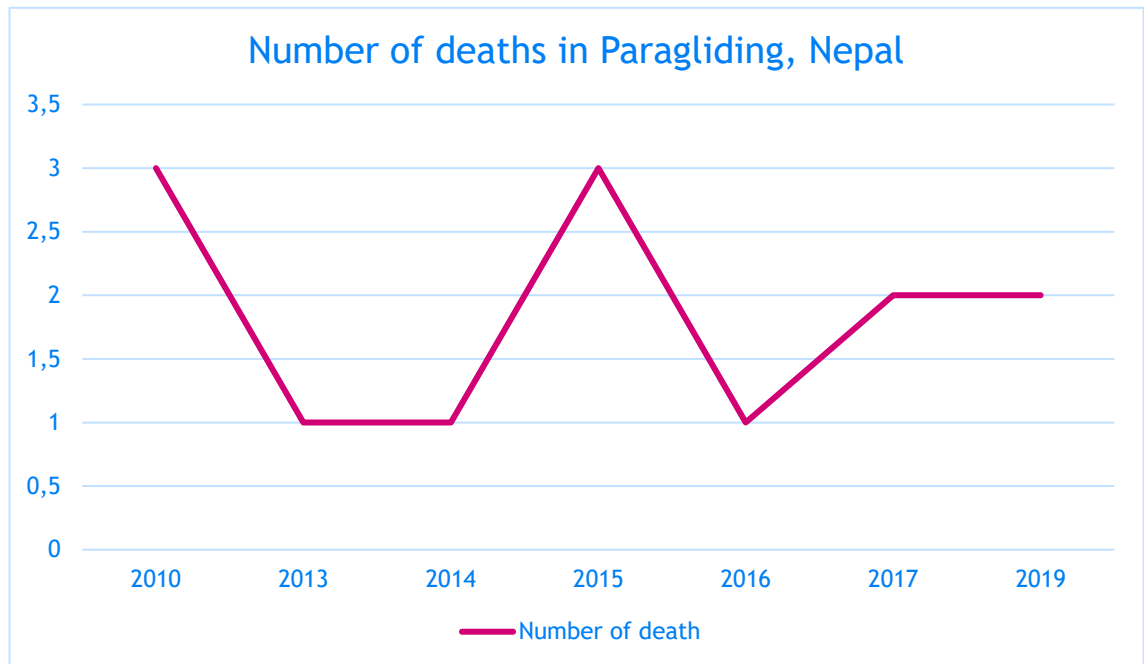


Figure 5: Paragliding deaths in Nepal (Dhakal 2019.)

The above graph shows the number of paragliding deaths in Nepal from year 2010 till mid - 2019. The graph above shows that the highest number of paragliding deaths occurred in 2010 and 2015 with the number rising to 3 deaths. There have been 14 recorded deaths in the history of paragliding till mid - 2019. (Dhakal 2019.)

2.2.3 Accident in Cumulus Clouds Nepal Paragliding

According to information provided by the owner of the company, Judhha Bahadur Gurung, there has not been any serious accidents or fatalities during paragliding until the time of writing this thesis. However, there has been few incidents resulting in minor injuries like sprains and scratches. Launching and landing process had the most recurring incidents mentioned earlier. (J. Gurung 2019. Personal communication.)

2.3 Safety and Risk Management

The statistics provided by National Safety Council (no date) of United States, it has estimated about 40000 deaths in vehicle related accidents in US in the year 2018. On the other hand, the statistics from US Hang gliding and Paragliding Association indicates no deaths in

paragliding accidents in the same year in US (USHPA 2018). Statistical comparison suggests that paragliding is much safer than driving. However, the statistical suggestion is not completely true. The article published in USHPA and written by Tim Pfeiffer ‘Risk Management for Paraglider Pilots’ has completely different perspective of the situation. The article establishes that pilots are three to six times more likely to die flying than driving (Pfeiffer n.d.). This statement concludes that there is certain degree of risk involved in paragliding, so risk and safety management is important topic that needs to be discussed.

According to Lexico dictionary (2019), the word risk is defined as “A situation involving exposure to danger” and safety is defined as “The condition of being protected from or unlikely to cause danger, risk, or injury”. Based on the definition, it can be said that safety is the state of riddance of any possible risk or unwanted disruption in the immediate status that might bring about undesirable change in the original form. Safety and Risk management is the systematic approach of assessing and mitigation of the identified hazards. It is important for physical, mental, economical as well as legal well-being. This section has been created to explain those factors that are relevant to the topic.

2.3.1 Risk factor in paragliding and its possible consequences

There are several factors that could be a threat for safe paragliding. USHPA has mentioned four major headings as risk factors in paragliding. They are weather, equipment, judgement and decision making. (USHPA n.d.-c.) Several other authors have also explained possible risk factor during paragliding under similar headings as USHPA. The following section explain more about the risk and its description under above mentioned specific headings.

Unfavorable Weather: There are various risk that might occur due to unfavorable weather condition. They are heavy rain, strong wind, cloud or fog, too sunny or too cold, poor visibility, sudden change in weather during flying. The following table displays risk and its consequences that poses threat to the safety in paragliding. (Curren and Cruickshank 1996b, 28-30.)

Table 1: Unfavourable Weather and its risk description (Curren and Cruickshank 1996b, 28-30.)

Risk Title		Risk Description
Unfavorable Weather	Rainy Day	wings not inflating due to flow of water into the cells instead of air
	Strong Wind	glider getting blown away, disbalance and difficulty in controlling
	Poor Visibility	difficulty in observing obstacle

Equipment failure: The possible risk of equipment failure are canopy damage, broken lines, entangled lines, riser and break, insufficient charge of electronic device, incorrect size of harness and helmet, undeployed parachute, improper clothing, unfastened buckle, unfastened leg and chest straps, broken or slotted carabiner, deflation of wings. The table below displays risk and its consequences that poses threat to the safety in paragliding due to equipment failure. (APPI 2014a, 93-96.)

Table 2: Equipment failure and its risk description (APPI 2014a, 93-96.)

Risk Title		Risk Description
Equipment Failure	Deflation of canopy	Instability and possibility of crash
	Stripped and buckled unfastened	Chances of getting separated, from canopy and harness due to unattachment and fall
	uncomfortable harness	difficulty in standing and sitting position during flying
	Entangled Lines, riser and break	not functioning properly and uncontrolled glider
	Not fully charged electronic safety device	Device getting switched off and difficulty in sharing information

Misjudgment: Possible risk of improper judgement are unable to assess and observe obstacle properly in the site prior to launching and landing phase, adjustment of speed, misjudging final height, misjudging position, misjudging glide point, misunderstand flow of air and inappropriate weather judgement, unable to control glider and act appropriately during different situation, unable to launch from and land in targeted area. The following table displays risk and its consequences that poses to the safety in paragliding. (Whittall 1995b, 142-151; APPI 2014b, 88-129.)

Table 3: Misjudgement and its risk description (Whittall 1995b, 142-151; APPI 2014b, 88-129.)

Risk Title		Risk Description
Misjudgment	Failure to land in targeted landing zone	Unable to understand the different situation and failure to take appropriate response
	Unable in maintaining speed and altitude	Difficulty in controlling, short emergency response time
	unable to judge obstacle in site	Possibility of colliding
	Misunderstanding flow of air	Difficulty in launching and landing, and possibility of getting blown away

Inappropriate decision making: In paragliding, the possible inappropriate decision making are flying during busy traffic, ignoring obstacle in launching and landing zone, flying alone, flying too close to terrain, feeling of competition with peers, time pressure, flying with new glider in new flying site, not following series of checklist, use of uncertified equipment, unfollowing schedule check-up of equipment and skipping repack of reserve parachute time to time, not preparing secondary plan, neglecting to use proper safety gears, deviation from standard procedure. The following table displays risk and its consequences that poses threat to the safety in paragliding. (Whittall 1995b, 142-151; Drews n.d.)

Table 4: Inappropriate decision making and its risk description (Whittall 1995b, 142-151; Drews n.d.)

Risk Title		Risk Description
Wrong decision	Flying alone	inability in tracing in case of emergency
	Flying in busy traffic	Possibility of colliding with another glider during flying and landing
	Flying with new glider in new site	Unfamiliar with the performance of equipment and location
	Skipping series of equipment check list	inability in detecting error of unfunctional equipment
	Unfollowing repack schedule for reserve parachute	Can cause reserve parachute undeployed during emergency

2.3.2 Risk Mitigation in Paragliding

Risk mitigation deals with preparing plans and policies that helps to overcome with the possible risk and reduce or eliminate its impact. It is the important part of risk and safety management after risk identification and assessment. Here, mitigation of the above-mentioned risk has been discussed.

Weather: Weather is the most important factor safety factor in Paragliding. Controlling weather is certainly not in human hands but taking right decision can help to eliminate or reduce possible risk and its impact. During typical day of flight, it will be wise to do systematic observation and check several reliable weathers forecast to come up with the decision to fly or not. Making a regular note of the forecast and actual weather condition might help in future in better prediction of the weather. Flying during unfavorable weather condition such as rainy day and unclear visibility should be avoided. If unsure, it will also be helpful to question the locals about specific weather condition of that area as they might be more familiar with it. It is recommended to be more careful and pay extra attention to sudden change in weather during flight. (APPI 2014c, 34.)

Equipment: In the book written by Whittall, use of proper equipment has been classified and explained under passive safety. It is highly recommended to buy and use only certified equipment and gear. In case of confusion, consulting expert might be helpful. Appropriate canopy

should be used corresponding to own skill and weight. Harness and helmet should be checked for their comfort and size. Professionally fitted reserve parachute, sunglasses, Shock absorbing boots, proper spinal protector, weather favourable gloves, preferably also whistle and webbing cutter should be used. (Whittall 1995c, 137-142.)

Judgement: Flying in overspeed must be prevented at any cost. The glider should not be flown to unnecessarily high or low altitude. During flight, the pilot should always maintain calmness even in case of possible incident. Situations like locations of launching and landing site as well as direction of wind flow should be assessed properly prior to flight. It should be noted that safety rules are not optional, so following safety rules comes as the top priority. (APPI 2014b, 88-129.)

Decision Making: It is wise not to fly alone and avoid flying with new glider in new site at the same time. Decision to flying should be avoided during busy traffic. Glider should be packed immediately after landing to create enough space for the next glider. Natural structures like terrain, hills or cliff should be cleared sensibly and flying close to these should be prevented as much as possible. Series of checklists provided namely, Pre-flight checklist, Pre-launch checklist and After-flight checklist should always be checked. Corrective actions for possible errors should be considered beforehand. Mental and physical health of both the passenger as well as pilot should be sound and fit for flight. Flying under the influence of any kinds of intoxicating substance should be strictly prohibited. (Whittall 1995d, 142-144.)

As it has been mentioned earlier, paragliding has been termed as extreme sport. This makes the sport more prone to the risks and the risks are stereotypically perceived to be the possible fault in the tools used. However, the safety in the sport is not limited to that but is more influenced by the attitude of the user of those tools. To aid in risk mitigation, the book "Touching Cloud Base", written by Currer and Cruickshank (1996a, 34-38) has mentioned about Pre-Flight checks as an important safety procedure in paragliding. Although the theory of these checks has been thoroughly described in the book by Whittall, the author of this book has placed this practice of inspection in the same priority as Whittall, but with minor updates. The author suggests categorising the inspections into three different classes:

- Canopy Inspection: Canopy inspection should be carried out carefully at least once a year or after any severe damage. There are certain things to take into consideration during canopy inspection such as fabric (for any possible tears), lines (stitches), attachment points (breaks) and so on. (Currer and Cruickshank 1996a, 34-38.)
- Daily inspection: Daily inspection should be carried out before every flight. It should be strictly followed since it is one of the major factors to determines safety of whole trip. It includes inspection of paragliding components such as Harness, Karabiners,

Risers, control lines and brake for their condition and functionality. (Curren and Cruickshank 1996a, 34-38.)

- Pre-launch inspection: Pre-launch inspection includes inspecting all the equipment and gears before typical day of flying. It includes several steps like checking the size of helmet, leg and chest straps, lines and riser (for possible entanglement), brakes, cells in canopy (cells inflation), visibility of pilot and so on. (Curren and Cruickshank 1996a, 34-38.)

Correct weather assessment, use of proper equipment and safety gears, right judgement and decision-making process plays vital role to establish safety in paragliding. Along with it, need of proper preparation, planning, practical knowledge and skills are also important to make this sport safer. To strengthen the safety practices in paragliding, an article called “The Three P’s” Preparation, Practice and Prevention by Roti (2009) has mentioned the following techniques.

- Preparation: The author of the mentioned article implies that physical and mental preparation as well as equipment preparation are the key factors for the reduction of the risks in paragliding. Physical preparation infers to the physical fitness of the paraglider as the sport can be very demanding especially during launching, landing and adverse weather conditions. Mental preparation refers to the mental fitness of the paraglider in taking rational decisions as well as organizing the whole flight plan carefully. Equipment preparation involves preparation of equipment by checking electronic device such as GPS, vario, radio, cell phone, camera and so on to make sure that the batteries are charged, and everything is working correctly. (Roti 2009.)
- Practice: As the saying goes ‘Practice makes a man perfect’, practice in fact helps in developing valuable experiences in paragliding. These experiences in turn helps in reducing the risks involved in paragliding. As there is a famous saying “In aviation launches are optional but landings are mandatory”, launching and landing needs to be practiced at the foremost. Another important thing is to practice the prediction of weather. (Roti 2009.)
- Prevention: Benjamin Franklin’s famous saying, “An ounce of prevention is worth a pound of cure” provides a very profound framework for safety in paragliding. Most of the flying accidents are predictable and preventable, and thus proper actions needs to be implemented for the prevention. Assessing the condition in flying site is the most important factor. The pre-flight checklist should be thoroughly inspected as it is the most part of preventive measure for safety. Proactive thinking which consists of making secondary plans, is another important preventive measure. (Roti 2009.)

Tandem as two persons flying in a single canopy, there is a participation of pilot and a passenger. Pilots are certified professional. They are experienced and gained knowledge about possible risk and safety practices from their schooling and training period. On the other hand, there is also an involvement of passenger who obvious might or might not have enough knowledge and ideas about safety in paragliding. In commercial Tandem paragliding, many of passenger participants are involved just for enjoy, fun and one-time experience. Thus, it is important to provide basic ideas and knowledge about safety procedure to them before the flight. To add up in the tandem paragliding safety, in the book called “Paragliding from Beginner to Cross-Country”, it has mentioned about the importance of safety briefing and Do’s and Don’ts in tandem flying. Safety briefing plays a vital role in the safety of both the pilot and passenger as per the author. The briefing should be precise, concise and easily understandable to the passengers. The inspections should be carried out thoroughly by experienced crew and in any case should not be handed over to the passenger. (Sollom, Cook and Rendry 1998, 104-106.)

Accidents are always unpredictable. Even though applying all the safety measures, accident might happen sometimes. Paragliding itself is an aircraft which does not have any rigid structure and does not provide any protection at all to the participants during crash. Thus, it is preferred to be prepared in advance for emergency response in case of accident. Emergency preparedness is the safety planning that not only help to save life but also protect the situation from being worse. Some of the steps that can be taken into consideration during paragliding emergencies are:

- The Parachute Landing Fall (PLF) rolling technique: It is categorized as Active Safety which deal with the actions and reactions that might keep the paraglider out of danger or minimize the effect. PLF is a rolling technique that helps to minimize the impact to the body during the crash in the ground. This rolling helps in the distribution of shock throughout the body instead of concentrating the shock to a point. (Whittall 1995e, 144-146.) The steps involved in PLF as described by Whittall (1995e, 144-146) are:
 - ❖ Make the first land contact with the legs and feet tightened, let your knees relaxed;
 - ❖ Keep the hand knuckles together in front of chest with elbows tightly against side and chin must be tucked in;
 - ❖ Tighten the arms along the body. Body should be relaxed but at the same time feet and knees should be kept tightly together;

- ❖ At the impact, look far away, not to the ground. Make back rounded then roll on the hip and shoulder;
 - ❖ Do not try to hold on the ground with the hands. It could possibly fell into high risk of injury.
- Paragliding Pharmacy: It is a first aid box which is very much useful for immediate medical treatment to injured person in case of accident. The first aid box should include Quick dressings, gauze bandages, elastic bandage, triangular sheet, adhesive tape, a pair of scissors, survival blanket, rescue cord and a whistle. (APPI 2014d, 132.)
 - Paraglider Emergency Response: In case of incident, responsible authorities such as police, local rescue team or universal SOS should be notified as soon as possible. The detailed status of the incident should be informed, and call should not be hung up till the emergency service provider permits. Protecting oneself should be of utmost priority and then other victim should be attended. While waiting for help, ABC's - Airway, Breathing, Circulation of victim need to be checked. After ABC's, victims' vitals should be monitored. The victim should be asked of his/her former injuries, if any, allergies as well as contact information of the next of kin. After the arrival of rescuers, all the information should be relayed properly and let them handle the situation further. (Kohoe n.d.)

The topic discussed above are based on the existing theories. This section has provided in-depth knowledge about various kinds of associated risk and the threat it poses in safe paragliding. On top of that, it has explained about various safety practices that contributes in risk mitigation process and safety establishment. Moreover, it has also explained emergency planning as a preparedness to minimize the effect of injury in case of accident. All this information will assist in the research section of this study by providing framework to develop questionnaire about the risk awareness level and the safety practices in paragliding. Ultimately, this section will serve as a foundation to suggest the correct safety procedure that can be applied in order to achieve the aim of this project.

3 Methodology

Quantitative research method is the method where data are collected in numerical form and result are interpreted using mathematical calculation. Since this method displays the result in numerical form, it is useful where sample size is large. Some example of quantitative research method is online survey, paper questionnaire, online polls and so on. In quantitative research method there are four types of research design. They are Descriptive, Correlational,

Causal-Comparative, and experimental research design. The use of these research design depends upon the need of researcher. (Bhat 2020.)

The most important part of any research is the method with which the data and information are collected and analysed. Since the sample size for this research was 80, quantitative research method was used in this research. For the data collection process, Descriptive research design has been used for the research due to its simplicity, reliability and suitable for independent variable. Under this method, Questionnaire as a tool of data collection has been used targeting the passenger and pilots. 2 sets of questionnaires related to flight safety was prepared each for the passenger and pilot of the case company as well as for the pilot of other companies from Sarangkot, Pokhara. The sample was 80, consisting 40 passengers, 10 pilots from the case company and 30 pilots from the other companies.

3.1 Questionnaire Survey and its objective

The questionnaire survey for research were developed using Likert type scale response anchors. The Likert scale approach was developed by American social scientist named Rensis Likert in 1932. Likert type scale as explained by Jamieson, is a psychometric rating system that has been designed to measure people's psychology such as their attitudes, opinions or perceptions to subject using specific question. The categories of response are defined for specific study with the numerical values. The size of the response available in different format such as 5-point, 7-point or 9-point. But the commonly used response size is 5-point. (Jamieson n.d.) In this research, 5-point Likert type response scale type has been used to conduct questionnaire survey.

The survey questionnaire aims to collect relevant information from the pilot and passenger regarding the paragliding safety practices in Nepal. It consists of two sets of questionnaires, each for pilots (pilots of Cumulus Clouds and pilots from other companies) and passenger participants with their own individual objectives. For statistical comparison of result, pilots from other companies within Nepal were approached for the survey. Pilot's questionnaire is further sub - divided into two subsets. The first subset, consisting of 15 questions, is related to the safety procedure that have been practiced by pilots during paragliding. The second subset, consisting of 12 questions, is related to the awareness level among pilots regarding the potential risk in paragliding. The questionnaire set for passenger participants consists of 15 questions and aim in finding the awareness level among passenger regarding potential risk in paragliding.

The questionnaire was printed in paper and handed to respondents. The survey was conducted in company premises and Sarangkot (Launching and landing) areas. The questionnaire was developed in such a way that the observations from it answered questions as to the regular inspection of the safety gears, safety briefing for the passengers beforehand the flight,

efficiency of rescue operation, emergency preparedness plan during the flight and so on. The survey questionnaire used for the research are attached to the end of this thesis as appendix 1, 2 and 3 respectively.

3.2 Target group

There were three target groups for the survey, pilots from the Cumulus Clouds Nepal Paragliding, pilots from other companies from Nepal and passengers from the Cumulus Clouds Nepal Paragliding. Pilots from the case company were 10 in number and were involved professionally in tandem flying, they were all part of the survey. For statistical comparison, 30 pilots from other companies within Nepal were approached for the survey. Among passenger participants, 40 passengers involved in the survey who had received the paragliding service from Cumulus Clouds Nepal Paragliding. These passengers were from different nationalities and background.

3.3 Sampling Technique

For the collection of data, all the targeted participants were chosen randomly in order to provide equal opportunities to participate in the survey. The survey was conducted during 27 to 30 November 2019 in company premises and the Sarangkot (launching and landing) area during the daytime. Total of 33 pilots responded to the survey, among these respondents all the pilots from Cumulus Clouds Nepal Paragliding responded. However, only 23 among 30 pilots from other companies responded. The participation of the passengers was overwhelming as all the passengers approached responded, however 3 of them were marked as void.

3.4 Statistical treatment of data

There are various methods available for quantitative data interpretation such as Mean, Standard deviation, median and so on. Among them, one way is using Mean. Salkind (2012, 86) defined Mean as one of the measures of central tendency which is “the arithmetic average of a set of score”. Based on the definition it can be said that it is the statistical way of obtaining the average of the gathered score. This can be calculated by adding all the score gathered and divide it by total number. Mean is the simple way of interpreting numerical value.

Formula to calculate Mean:

$$\text{Mean} = \frac{\sum x}{N}$$

Where, \sum = sum of

X = each individual score

N = total number of respondents

In this research, the response from questionnaire survey were analysed using Mean. Furthermore, the Mean score were divided into class interval. These class intervals were created to rank the Mean obtained from survey result.

The class interval is used to arrange data when the range of the values of variable is large. While determining the class interval, the classes must be equal in width. But the first and last classes are exceptions which can be value below a certain number at the low end or any value above a certain number at the high end. The class width is the distance between the higher and lower limits of successive classes. (Beck 2020.)

Formula to calculate class width:

$$= (\text{Highest limit} - \text{Lowest limit}) / \text{Number of class}$$

In this research, the 5 class intervals have been used to rank the Mean score. Here, the class width between each class interval is 0.80. The highest-class interval (4.20 - 5.00) is an exception where the class width is slightly greater by 0.01 than in other classes. Since, the Mean score were displayed in number, it will not provide complete information which creates confusion for reader to understand what these numeric values really means. In order to make it simple, easy and understandable to reader, the Mean score range were defined using text description from highest scale as Always Practised, Extremely Aware, Totally Agree to lowest scale as Never Practised, Not at all Aware and Totally Disagree.

Table 5: Information about the scale of response, Mean score range, and the remark of the Mean Score.

Scale	Mean Score Range	Remarks
5	4.20 - 5.00	Always Practised / Extremely Aware / Totally Agree
4	3.40 - 4.19	Often Practised / Moderately Aware / Partially Agree
3	2.60 - 3.39	Moderately Practised / Somewhat Aware / Neutral
2	1.80 - 2.59	Sometime Practised / Slightly Aware / Partially Disagree
1	1.00 - 1.79	Never Practised / Not at all Aware / Totally Disagree

4 Result and Discussion

The section below shows the result that has been collected through the questionnaire survey. The question was related with the safety procedure practiced by pilots at present and awareness level among pilot and passenger participants to potential risk. The respondent of first two set of questionnaire survey are pilot from case company and pilot from other company. The third set of survey respondents are the passenger participants who took service from the case company.

The results were analyzed using Mean value, classified according to Mean score range and interpreted using remarks as mentioned above. The Mean score in table 6 has been interpreted using remark “Always practiced” as highest to “Never Practiced” as lowest. Similarly, the Mean score of tables 7 and 8 has been interpreted respectively using the remark “Extremely Aware” as highest to “Not aware at all” as lowest and “Totally Agree” as highest to “Totally Disagree” as lowest.

Table 6: Safety procedure practiced by Paragliding pilots of case company and other company.

S. N	Safety practices	Mean (Case Company)	Mean (Other company)	Remarks
1.	Using proper safety equipment and gear in every flight (Correct size of canopy, Harness, Helmet, Spine Protector, Reserve Parachute, Gloves, Sunglasses).	4.80	4.60	Always Practiced
2.	Following the Preflight checklist: Canopy condition, lines, break and riser, buckle, Harness.	4.90	4.78	Always Practiced
3.	Following the Pre-launch checklist: leg and chest straps, control lines and break, wind strength and direction, visibility, obstacle clearance, landing zone.	4.70	4.60	Always Practiced
4.	Following the After-flight checklist: packing glider immediately, incident reporting, helping other.	4.20	4.43	Always Practiced
5.	Using only certified gliders for flying according to specific need.	4.70	4.69	Always Practiced
6.	Following schedule check for glider and repack reserve parachute.	4.50	4.21	Always Practiced

7.	Providing precise safety briefing, launching and landing technique to every passenger before flight.	4.30	4.26	Always Practiced
8.	Flying due to passenger's pressure despite unfavorable flying condition should be avoided.	4.80	4.78	Always Practiced
9.	Continuing education and revising safety training for pilot from time to time.	4.40	4.43	Always Practiced
10.	Reporting of paragliding incident immediately to: <ul style="list-style-type: none"> ▪ Company ▪ NAA ▪ CAAN 	4.10	3.91	Often Practiced
11.	Providing various emergency service available all the time such as: <ul style="list-style-type: none"> ▪ First Aid ▪ Rescue team ▪ Air and land Ambulance ▪ Hospital nearby 	4.60	4.47	Always Practiced
12.	Providing First aid training to every pilot and always carrying first aid box during flying.	4.30	4.26	Always Practiced
13.	Practicing Parachute Landing Fall (PFL) technique during collapse.	3.70	3.86	Often Practiced
14.	Using multiple weather forecast source, comparing and making prediction before flying.	3.40	3.43	Often Practiced
15.	Preparing secondary plan about launching and landing prior to flying.	4.10	4.0	Often Practiced
	Overall Score	4.36	4.31	Always Practiced

The result obtained from respondents are near identical to each other. The score of the case company is 4.36 and other company is 4.31 which means average remarks of the safety

procedure practiced during paragliding is “Always practiced” by the pilots irrespective to their company.

Regarding the case company, second question relating to pre-flight checklist got the highest score of 4.9 which implies that the Pre-flight checklist is given the utmost importance and is seldom missed. Similarly, the lowest score was 3.4 which reflected use of multiple forecast source implying that the practice of referring to multiple weather forecast is given lesser priority and possibility of missing is also higher.

Likewise, the questions regarding the safety practice procedures from 1 to 9 (excludes number 2) which concerns mainly with using proper equipment and its regular inspection, providing precise safety briefing, flying only in favorable weather condition, continuously educating and training pilots also appeared with remark “Always Practiced”. This result brings to the conclusion that pilots of case company has given importance on these safety practices and following them on a regular basis. Similarly, question number 10 which is about incident reporting scored 4.10 with remark of “Often Practiced”, meaning pilot practices this method but not on regular basis. In other words, there are chances of undermining minor factors that has hindered the smooth operation of the flight or safety concerns. The survey conducted derived the similar result in both case company and other company’s pilots survey.

Correspondingly, there were question regarding emergency preparedness. Question 11 and 12 recorded high Mean value with remarks “Always practiced”. This result mirrors that case company (also other company) is always prepared in case of emergency and able to response quickly if needed. Question number 13 and 15 with the remarks of “Often practiced” points out that the companies has given priority to these points but not in the top priority list.

Table 7: Level of awareness among pilot of case company and other company with regards to potential risk at Paragliding.

S. N	Potential risk in paragliding	Mean (Case Company)	Mean (Other Company)	Remarks
16.	There are chances of pilot getting distracted from passenger during Pre-Launch checking.	4.00	4.13	Moderately Aware
17.	There is high chance of accident during busy sky traffic.	4.10	4.04	Moderately Aware
18.	Use of drug, medicine and alcohol during flying can be risky.	4.60	4.43	Extremely Aware

19.	Poor visibility can cause accident during launching, flying and landing.	4.70	4.56	Extremely Aware
20.	Language barrier can create difficulty in safety briefing during launching and landing.	4.80	4.65	Extremely Aware
21.	Height of the passenger can hinder pilot's visibility during launching and landing.	3.90	3.78	Moderately Aware
22.	Physical and mental health of the passenger and pilot affects the safety.	4.20	4.34	Extremely Aware
23.	Over speed can be dangerous.	4.50	4.26	Extremely Aware
24.	Flying beyond skills, feeling of competition with peers and unnecessary showoff can cause accident during flying.	4.80	4.73	Extremely Aware
25.	Flying close to terrain, cliff or hill can result in accident.	4.50	4.65	Extremely Aware
26.	Flying with new glider in new site can create risk of crash.	4.80	4.78	Extremely Aware
27.	Flying in strong wind and rainy day can cause accident.	4.70	4.73	Extremely Aware
	Overall Score	4.46	4.42	Extremely Aware

The result obtained in the second set for pilot's awareness to potential risks is also closely similar with the case company pilot (4.46) and the pilot from other company (4.42) remarking 'Extremely Aware' as the result.

Regarding the case company, the highest score was 4.80 for question 20, 24, and 26. All these three questions were important topic in paragliding safety issues. These questions were basically related with judgement and decision-making risks associated factors of paragliding. They relate to language barrier, peer competition and new glider. The results display that pilots

are aware of risks created by them and they always take them into consideration with high priority in the course of flying. Meanwhile 3.90 score was the lowest score in this set that refers to visibility hinderance due to height of participant. The outcome concludes that the pilots of companies are aware of this issue, but it is not in the top priority list. It means the height of passenger does not have much effect in visibility to the pilot during the flight.

Similarly, the question about the possibility of distraction during Pre-launch check and accident during busy sky traffic has shown the average remark of “Moderately Aware”. The pilot of the case company is aware with these risks, but they put its importance below the top priority list.

The questions 19, 22, 23, 25 and 27 were related with judgement and decision-making risk factors in paragliding that are very likely to cause an accident. These questions relate with the issues of visibility, weather and location condition, state of passengers. Here, results draw the inference that pilots are “Extremely aware” with these risks and has given utmost priority and attention to these matters at the time of flying. In addition, question in relation to consumption of drug and alcohol has also been presented with the statement “Extremely aware”. It expresses that pilots are familiar with the possible consequences and dangers it might bring in the typical day of flying.

Table 8: Level of awareness among Paragliding participants to the potential risk in Paragliding.

S. N	Statement	Mean	Remarks
1.	I was aware and familiar with risk involved in paragliding.	3.75	Partially Agree
2.	Enough safety information was collected before participating in paragliding.	3.56	Partially Agree
3.	Safety instruction was checked in company’s web-site.	3.21	Neutral
4.	Precise Safety briefing was received from pilot before flight.	4.00	Partially Agree
5.	Safety briefing, launching and landing technique provided by pilot was clear enough to understand.	3.94	Partially Agree
6.	I was prepared mentally and physically before flying.	3.91	Partially Agree

7.	It was difficult to communicate with pilot because of language barrier.	4.08	Partially Agree
8.	Safety gears provided was comfortable, correct size and fitted properly.	4.54	Totally Agree
9.	Safety gear and Buckle were properly checked before flying.	4.67	Totally Agree
10.	No any drug, medicine and alcohol were consumed during flying.	4.48	Totally Agree
11.	Emergency number was known incase to contact.	4.21	Totally Agree
12.	Flight was in enough altitude from cliff, terrain and hills.	4.51	Totally Agree
13.	Launching and landing was smooth.	4.35	Totally Agree
14.	I was dressed properly favoring to weather condition during paragliding.	4.21	Totally Agree
15.	Overall paragliding experience was safe, fun and memorable.	4.67	Totally Agree
	Overall Score	4.13	Partially Agree

In relations of passenger participants survey result, the grand Mean is 4.13 with the remark “Partially Agree”. This result concludes awareness level among passenger about the potential risk is in satisfactory level. Off all the questions queried to passengers, the highest Mean score was for question 9 (4.67) regarding checklist of equipment for passenger and the lowest score was for question 3 (3.21) regarding the question safety information search in company’s website. These statement makes a conclusion that pilot pays extra attention for passenger’s equipment check and many of the passenger does not check the safety instructions before participating in Paragliding respectively. The later part shows that passengers are not aware about the possible risk and prepared for it (also relates to questions 1 and 2 that gauges the preparation level before going for paragliding). However, passengers have shown their awareness in terms of drug or alcohol consumption risks during the flights (question 10), types and ways of wearing weather favorable dress (question 14) and the emergency preparedness; whom to contact in case of emergency (question 11). In the light of theirs experience about

safety procedures directed by company and the pilot, the passengers have expressed their partial agreement. In simple terms, results from question 4-7 displays their slight disappointment regarding the safety terms provided by the case company though they have well agreed that it provides comfortable and correct size of safety equipment (question 8) and state their whole experience as satisfied.

5 Conclusion and Recommendations

The objective of this research was to find out the safety procedure that can be practiced by cumulus clouds regarding safety policy in paragliding where researcher conducted research based on the existing safety practices and level of awareness among pilots and passengers to the potential risk in paragliding.

There were questions concerning use of proper safety equipment and its regular inspection, following series of checklist and preparation for emergency where the survey concluded with remarks as "Always practiced". It reflects that pilot has given high importance on these factors and practiced it in adequate level which is highly appreciable. Pre-flight checklist is one of the important necessities for safe flight that every pilot must do in order to find out the condition of the equipment because once it is in the air it will be too late to adjust if any of the parts is not functioning properly. Equipment failure is one of the major factors in Paragliding that causes accident. Without proper equipment, safe flying cannot be imagined in paragliding.

The physical fitness and healthy mental state contribute to active safety, which must be taken into consideration at the time of flying. APPI manual also emphasize on the importance of physical fitness and mental stability in order to make the necessary correct decision in paragliding (APPI 2014e, 88-89). The average remark from the survey for the pilot of case company depicts that pilot has highly valued and given importance to the topic. However, the survey from passenger has responded as partially agreed for the same topic. During the flight, it is common for many people to feel nervous and anxious. In such situations, pilot should be mentally sound and prepared to assure passenger comfortableness during the whole trip. Also, author considers it very important to give pre-image about the whole flight which is often seen undermined amidst peer competition to take in more flights and passengers. So, before flying it will be good idea to give some theoretical knowledge about how the paragliding works, and explain about the planning of trip such as from where they are launching, in which direction and at what height they are going to fly, how long will be the trip, where they are going to land and so on.

As learning is an ongoing process. Paragliding is not an exception to it. In the article called 'Risk Management in Paragliding' the written by Revenko (2006) states "Knowledge, skills and attitude are key ingredients to make the sport safer. It is about you as an individual. Even

though this is a dangerous sport, if you exercise your new skills and avoid allowing your ego to stop you from making rational decisions, you can decrease the risks a lot". It is therefore deemed a major factor for successful paragliding. To which even Pilot accept as true that continuing education and revising safety training is one of the important factors to consider, since it contributes in safety in paragliding. However, the PFL technique is not being given much importance by pilot. This is one of the most important technique which should not be ignored and can be helpful to be saved during collapse. As stated by Whitthal (1995e, 144-146), practicing PFL technique can make the difference between life and death in a crash after a big deflation. PFL is very helpful technique which can save life from potential injuries during hard landing or crash. Thus, it should be mandatory for all the pilots. When emergency comes it will be too late to remember all the steps if it has not been practiced. So better if this technique is practiced time to time.

The information as received from the survey indicated safety briefing to passenger have been given importance but not taken as mandatory. This might pose a catastrophic threat in emergencies, so safety briefing must be made mandatory with easily understandable safety briefing. Use of multimedia as well as instructions in multiple language with pictures as mode of transmission might be quite useful in this process.

The safety equipment is an important part in the safety of the sport. Although, the safety gears and comfortable dresses were considered very important, many times it has been observed that passengers might not be aware of the equipment they receive from the company and equipment they need to bring themselves. Thus, one way to end the disparity might be publishing information on necessary safety equipment that the company does not provide in the company's social media.

Most of the passengers responded that being aware of the emergency contact number of the concerned authorities helps in alleviating the safety in paragliding. There is no objection about this, however, many international passengers might have difficulty in remembering all these number. So, there should be encouragement for passengers to store these numbers in their cellphones.

Incident reporting to the concerned parties has not been perceived as being very important as per the survey results and is often practiced but not always. However, incident reporting can be very helpful in understanding the nature of the incident and take preventive measure in the future. These incident reports can be published in the websites of the governing bodies, additionally, social media can be used extensively for circulating the report to other pilots.

In Tandem flying, there is an involvement of Pilot and a passenger. Meaning the weight is more than in solo paragliding. Thus, it is very important to remain under the range of Canopy's capacity. That is the reason why always measure the weight of pilot and passenger

should be mandatory and implemented fairly, and make sure that the combined weight should not exceed the limit. There might be different kinds of canopy available with different capacity. Therefore, always use the proper certified canopy that can hold the combined weight of pilot and passenger.

In general, the average level of compliance of the pilots with regards to safety procedure practiced and level of awareness among pilots regarding potential risk is in adequate level. Most of the pilots have been implementing necessary safety practices and consciousness about the risk associated with this sport which is contrary to outcome from passenger's survey. To sum up, the participants might not have enough knowledge about the risks involved in paragliding. Thus, it is important to put more effort into raising level of awareness to potential risks and safety practices during paragliding.

References

Printed sources

Currer, I. & Cruickshank, R. 1996a. Touching Cloudbase. 3 ed. Worcester: Ebenezer Baylis and Sons Ltd, 34-38.

Currer, I. & Cruickshank, R. 1996b. Touching Cloudbase. 3 ed. Worcester: Ebenezer Baylis and Sons Ltd, 28-30.

Salkind, N. J. 2012. 100 questions (and answer) about research methods. California, Thousand Oaks: SAGE, 86.

Sollom, D., Cook, M. & Pendry, J. 1998. Paragliding from Beignner To Cross-Country. Malborough: The Crowood Press Ltd, 104-106.

Whittall, N. 1995a. *Paragliding: The complete guide*. 1 ed. New York: The Lyons Press, 137-152.

Whittall, N. 1995b. *Paragliding: The complete guide*. 1 ed. New York: The Lyons Press, 142-151.

Whittall, N. 1995c. *Paragliding: The complete guide*. 1 ed. New York: The Lyons Press, 137-142.

Whittall, N. 1995d. *Paragliding: The complete guide*. 1 ed. New York: The Lyons Press, 142-144.

Whittall, N. 1995e. *Paragliding: The complete guide*. 1 ed. New York: The Lyons Press, 144-146.

Electronic sources

Adom, D. Hussein, E & Joe, A. 2018. Theoretical and Conceptual Framework: Mandatory Ingredients of a Quality Research. International Journal of Scientific Research, Volume 7, 438-441. Accessed 27 February 2020.

https://www.researchgate.net/publication/322204158_THEORETICAL_AND_CONCEPTUAL_FRAMEWORK_MANDATORY_INGREDIENTS_OF_A_QUALITY_RESEARCH/citation/download

Atreya, A. & Kanchan, T. 2016. Analysis of Paragliding Accidents - A Preliminary Investigation from Nepal. Nepal Medical College Journal. Accessed 15 September 2019.

https://www.researchgate.net/publication/316598685_Analysis_of_Paragliding_Accidents_-_A_Preliminary_Investigation_from_Nepal_Nepal_Medical_College_Journal

APPI. No date. What is APPI. Accessed 30 September 2019.

<https://appify.org/?What-is-APPI&lang=en>

APPI. 2014a. APPI Pilot Manual, 93-96. Accessed 2 March 2020.

<https://paraglajdingsavez.me/wp-content/uploads/2019/02/APPI-Pilot-Manual-1.2.pdf>

APPI. 2014b. APPI Pilot Manual, 88-129. Accessed 24 November 2019.

<https://paraglajdingsavez.me/wp-content/uploads/2019/02/APPI-Pilot-Manual-1.2.pdf>

APPI. 2014c. APPI Pilot Manual, 34. Accessed 29 February 2020.

<https://paraglajdingsavez.me/wp-content/uploads/2019/02/APPI-Pilot-Manual-1.2.pdf>

APPI. 2014d. APPI Pilot Manual, 132. Accessed 18 November 2019.

<https://paraglajdingsavez.me/wp-content/uploads/2019/02/APPI-Pilot-Manual-1.2.pdf>

APPI. 2014e. APPI Pilot Manual, 88-89. Accessed 26 November 2019.

<https://paraglajdingsavez.me/wp-content/uploads/2019/02/APPI-Pilot-Manual-1.2.pdf>

Beck, K. 2020. How do I calculate class width?. Accessed 13 March 2020.

<https://sciencing.com/do-calculate-class-width-8516043.html>

Bhat, A. 2020. Quantitative Research: Definition, Methods, Types and Examples. Accessed 04 March 2020.

<https://www.questionpro.com/blog/quantitative-research/>

BHPA. No date. About Us. Accessed 24 November 2019.

<https://www.bhpa.co.uk/sport/bhpa/>

BHPA. 2018. 2016-2018 Incident Analysis Report. Accessed 20 November 2019.

http://www.bhpa.co.uk/documents/safety/annual_analysis/index.php?doc=2016-2018_Incident_Analysis_Report.pdf

CAAN. No date. About us. Accessed 24 November 2019.

<http://caanepal.gov.np/about-caan/about-caan>

Dhakal, R. 2019. CAAN bans solo paragliding flights in Pokhara, tax evaders told to clear dues. Accessed 30 September 2019.

<https://thehimalayantimes.com/nepal/civil-aviation-authority-of-nepal-bans-solo-paragliding-flights-in-pokhara-tax-evaders-told-to-clear-dues/>

Discover Nepal. No date. Paragliding. Accessed 24 November 2019.
<https://www.welcomenepal.com/things-to-do/paragliding.html>

Drews, F. No date. Human Error: Violations in Paragliding and Hang Gliding. Accessed 09 March 2020.
<https://www.ushpa.org/page/download.aspx?DocKey=774>

FAI. No date. About. Accessed 24 November 2019.
<https://www.fai.org/federation>

J. Gurung. 2019. Founder. Cumulus Clouds Nepal Paragliding. Telephone conversation with the author. 18 October 2019. Personal Communication.

Jamieson, S. No date. Likert scale. Accessed 01 December 2019.
<https://www.britannica.com/topic/Likert-Scale>

Kehoe, J. No date. Hang Glider & Paraglider Emergency Response. Accessed 24 November 2019.
<https://www.ushpa.org/page/download.aspx?DocKey=773>

Lexico Dictionary. 2019a. Definition of accident in English. Accessed 21 September 2019.
<https://www.lexico.com/en/definition/accident>

Lexico Dictionary. 2019b. Definition of risk in English. Accessed 09 November 2019.
<https://www.lexico.com/en/definition/risk>

Lexico Dictionary. 2019c. Definition of safety in English. Accessed 25 October 2019.
<https://www.lexico.com/en/definition/safety>

Ministry of Culture, Tourism and Civil Aviation. 2018. Nepal Tourism Statistics 2018, 91. Accessed 30 September 2019.
http://tourism.gov.np//files/publication_files/287.pdf

NAA. No date-a. Who we are. Accessed 24 November 2019.
<http://nepalairsports.org/about.php>

NAA. No date-b. Members of Nepal Airsports Association. Accessed 24 November 2019.
<http://nepalairsports.org/about.php>

NAA. No date-c. Permits and Necessities. Accessed 24 November 2019.
<http://nepalairsports.org/guidelines.php>

NAA. No date-d. Paragliding in Pokhara. Accessed 05 November 2019.

<http://nepalairsports.org/guidelines.php>

National Geographic. 2012. 2012 Winners: Sano Babu Sunuwar and Lakpa Tsheri Sherpa. Accessed 26 September 2019.

<https://www.nationalgeographic.com/adventure/features/adventurers-of-the-year/2012/peoples-choice-lakpa-tsheri-sherpa-sano-babu-sunuwar/>

Pfeiffer, T. No date. Risk Management for Paraglider Pilots. Accessed 10 October 2019.

<https://www.uspha.org/page/risk-management-for-pg-pilots>

Price, J. & Murnan, J. 2004. Research Limitations and the Necessity of Reporting Them. American Journal of Health Education, 35 (2), 66-67. Accessed 26 February 2020.

<https://pdfslide.net/documents/research-limitations-and-the-necessity-of-reporting-them.html>

Revenko, I. 2006. Risk Management in Paragliding. Accessed 20 October 2019.

https://www.fai.org/sites/default/files/documents/risk_management_in_paragliding.pdf

Ronca, D. 2009. How Paragliding Works. Accessed 01 December 2019.

<https://adventure.howstuffworks.com/paragliding2.htm>

Roti, S. 2009. The Three P's: Preperation, Practice, Prevention. Accessed 10 October 2019.

<https://www.uspha.org/page/safety?hkey=094113f0-0092-47c0-8e76-f19f414fface>

S. Gurung. 2019. Paragliding has taken off in Pokhara, but the risks are numerous. Accessed 10 September 2019.

<https://kathmandupost.com/gandaki-province/2019/06/10/paragliding-has-taken-off-in-pokhara-but-the-risks-are-numerous>

United States. National Safety Council. No date. Vehicle Deaths Estimated at 40,000 for Third Straight Year. Accessed 24 November 2019.

<https://www.nsc.org/road-safety/safety-topics/fatality-estimates#:~:targetText=In%202018%2C%20an%20estimated%2040%2C000,a%201%25%20decrease%20over%202017>

USHPA. No date-a. History of Paragliding. Accessed 04 October 2019.

<https://www.uspha.org/page/history-of-paragliding.aspx>

USHPA. No date-b. Mission and History. Accessed 24 November 2019.

<https://www.uspha.org/page/mission-and-history?hkey=ba29fc7d-c06d-4acd-b52a-d68cc0dee49a>

USHPA. No date-c. What are the risks?. Accessed 31 October 2019.

<https://www.uspha.org/page/what-are-the-risks?hkey=8d48bccf-6b6c-4603-9288-84092ba41338>

USHPA. 2015. Safety Reminders. Accessed 08 November 2019.

<https://www.uspha.org/page/download.aspx?DocKey=775>

USHPA. 2018. Fatalities. Accessed 08 September 2019.

<https://www.uspha.org/page/fatalities>

USHPA, 2019. Organization Statistics. Accessed 24 November 2019.

<https://www.uspha.org/page/org-stats>

Figures

Figure 1: Components of Paraglider 9

Figure 2: Number of paraglider pilot registered in BHPA and USHPA 12

Figure 3: Number of domestic and foreign tourist participant in paragliding 14

Figure 4: Number of fatalities in BHPA and USHPA 15

Figure 5: Paragliding deaths in Nepal..... 16

Tables

Table 1: Unfavourable Weather and its risk description. 17

Table 2: Equipment failure and its risk description. 18

Table 3: Misjudgement and its risk description. 19

Table 4: Inappropriate decision making and its risk description. 20

Table 5: Information about the scale of response, Mean score range, and the remark of the Mean Score. 27

Table 6: Safety procedure practiced by Paragliding pilots of case company and other company. 28

Table 7: Level of awareness among pilot of case company and other company with regards to potential risk at Paragliding..... 30

Table 8: Level of awareness among Paragliding participants to the potential risk in Paragliding..... 32

Appendices

Appendix 1: Safety procedure practiced by pilot	44
Appendix 2: Level of awareness among pilots with regards to potential risk in Paragliding...	46
Appendix 3: Level of awareness among Participants with regards to potential risk in paragliding.....	48

Appendix 1: Safety procedure practiced by pilot

Survey Questionnaire for Pilot

This survey is a part of thesis work on “Safety at Paragliding in Sarangkot, Pokhara-Nepal” and contains general questions related to existing safety procedure practice in paragliding and level of awareness of potential risk among pilots. Kindly indicate your answer in the box below that accurately corresponds you. Your answer will be highly appreciated, and your information will be kept confidential. Thank you for your time!

5 - Always practiced

4 - Often practiced

3 - Moderately Practiced

2 - Sometime Practiced

1 - Never Practiced

S. N	Safety practices	5	4	3	2	1
1.	Using proper safety equipment and gear in every flight (Correct size of canopy, Harness, Helmet, Spine Protector, Reserve Parachute, Gloves, Sun-glasses).					
2.	Following the Pre-flight checklist: Canopy Condition, lines, break and riser, buckle, harness.					
3.	Following the Pre-launch checklist: leg and chest straps, control lines and break, wind strength and direction, visibility, obstacle clearance, landing zone.					
4.	Following the After-flight checklist: packing glider immediately, incident reporting, helping other.					
5.	Using only certified gliders for flying according to specific need.					
6.	Following schedule check for glider and repack reserve parachute.					
7.	Providing precise safety briefing, launching and landing technique to every passenger before flight.					

8.	Flying due to passenger's pressure despite unfavorable flying condition should be avoided.					
9.	Continuing education and revising safety training for pilot from time to time.					
10.	Reporting of paragliding incident immediately to: <ul style="list-style-type: none"> ▪ Company ▪ NAA ▪ CAAN 					
11.	Providing various emergency service available all the time such as: <ul style="list-style-type: none"> ▪ First Aid ▪ Rescue team ▪ Air and land Ambulance ▪ Hospital nearby 					
12.	Providing First aid training to every pilot and always carrying first aid box during flying.					
13.	Practicing Parachute Landing Fall (PFL) technique during collapse.					
14.	Using multiple weather forecast source, comparing and making prediction before flying.					
15.	Preparing secondary plan about launching and landing prior to flying.					

Appendix 2: Level of awareness among pilots with regards to potential risk in Paragliding

5- Extremely Aware

4- Moderately Aware

3- Somewhat aware

2- Slightly aware

1- Not at all Aware

S. N	Potential risk in paragliding	5	4	3	2	1
16.	There are chances of pilot getting distracted from passenger during Pre-launch checking.					
17.	There is high chance of accident during busy sky traffic.					
18.	Use of drug, medicine and alcohol during flying can be risky.					
19.	Poor visibility can cause accident during launching, flying and landing.					
20.	Language barrier can create difficulty in safety briefing during launching and landing.					
21.	Height of the passenger can hinder pilot's visibility during launching and landing.					
22.	Physical and mental health of the passenger and pilot affects the safety.					
23.	Over speed can be dangerous.					
24.	Flying beyond skills, feeling of competition with peers and unnecessary showoff can cause accident during flying.					
25.	Flying close to terrain, cliff or hill can result in accident.					
26.	Flying with new glider in new site can create risk of crash.					

27.	Flying in strong wind and rainy day can cause accident.					
-----	---	--	--	--	--	--

Appendix 3: Level of awareness among Participants with regards to potential risk in paragliding

Survey Questionnaire for Passenger

This survey is a part of thesis work on “Safety at Paragliding in Sarangkot, Pokhara-Nepal” and contains general questions related to level of awareness of potential risk among passenger. Kindly indicate your answer in the box below that accurately corresponds you. Your answer will be highly appreciated, and your information will be kept confidential. Thank you for your time!

5-Totally Agree

4-Partially Agree

3-Neutral

2-Partially Disagree

1-Totally Disagree

S. N	Statement	5	4	3	2	1
1.	I was aware and familiar with risk involved in paragliding.					
2.	Enough safety information was collected before participating in paragliding.					
3.	Safety instruction was checked in company’s website.					
4.	Precise Safety briefing was received from pilot before flight.					
5.	Safety briefing, launching and landing technique provided by pilot was clear enough to understand.					
6.	I was prepared mentally and physically before flying.					
7.	It was difficult to communicate with pilot because of language barrier.					
8.	Safety gears provided was comfortable, correct size and fitted properly.					

9.	Safety gear and Buckle were properly checked before flying.					
10.	No any drug, medicine and alcohol were consumed during flying.					
11.	Emergency number was known incase to contact.					
12.	Flight was in enough altitude from cliff, terrain and hills.					
13.	Launching and landing was smooth.					
14.	I was dressed properly favoring to weather condition during paragliding.					
15.	Overall paragliding experience was safe, fun and memorable.					