Foreword

Safety Management System is a standard in civil aviation. From the US Federal Aviation Administration (FAA) https://www.faa.gov/about/initiatives/sms/ : "The International Civil Aviation Organization (ICAO) requires SMS for the management of safety risk in air operations, maintenance, air traffic services and aerodromes. These requirements have been expanded to include flight training and design and production of aircraft."

The SMS designed for professionals is heavy but fortunately, the Royal Dutch Aeronautical Association (KNVvL) has its own one. Henry Lemmen, paragliding safety officer, wrote a light version adapted to the paragliding and hang gliding sections, later shared by Andre Bizot, EHPU safety representative, and freely translated by Raymond Caux (2015). Thanks to the KNVvL and Henry Lemmen, this Safety Handbook is now available to the national hang gliding and paragliding federations.

Lastly, regulations applicable to air law, air traffic and control in the respective countries are reserved. They must be observed and, where applicable, take precedence over any sport regulations.

Safety Handbook

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1 Introduction

Paragliding (**PG**) and hang gliding (**HG**) are sports with lots of pleasure to experience. They are also sports with associated risks. The purpose of this handbook is to keep the risks within acceptable limits and to avoid accidents. It describes the structures, methods and measures used by the PG and HG sections to make their sports as safe as possible. It offers a guide showing how these structures, methods and measures function in practice and should be applied. The objective of this handbook is thus to foster a safety culture, where events are actively and systematically analysed and measures are taken to reduce the risk of recurrence.

For the function of these structures, methods and measures, it is important that everyone involved in PG and HG, like (help) instructors, winch men, launch marshals, school owners, board members and pilots, promote flight safety. Everyone must (want to) face the hazards and consequent risks, and be prepared to take appropriate measures to remove or at least reduce these hazards and risks.

Adverse events and particularly accidents can never be ruled out completely, not even with a handbook. But it is possible to learn from events to avoid recurrence. This requires openness of those directly involved and understanding of the others. It is not here about finding someone guilty or blaming those involved, but well about finding together the reasons and then the solutions to reduce the chance of recurrence. This handbook provides guidance for this purpose.

2 Definitions

Event:	Any situation that deviates from the normal course of actions
Hazardous situation:	A situation where the sum of the factors "chance" and "effect" is an unacceptable risk for persons and/or goods
Incident:	A hazardous situation or action that could have led to an accident
Near-accident:	An adverse event without damage nor injury, but where it could have occurred in slightly different circumstances
Accident:	An adverse event resulting in personal injury or property damage

3 Safety Management System

The Safety Management System (**SMS**) provides a proactive approach to managing safety within associations (shorter thereafter **clubs**) and instruction bodies (**schools**), including the necessary organizational structures, responsibilities, procedures and policies.

3.1 Objectives

The purpose of the sections is to:
– Reduce the risk of accidents
– Increase knowledge about safe operation for their customers and members
– Promote an environment where safety is paramount and a second nature

The aim is thus to create a culture not only made of reporting and analysis of events, but also where pilots can talk to each other about their behaviour regarding flight safety.

The SMS is therefore a tool to contribute to the previously mentioned objectives in a systematic way.

3.2 Contents

The components of the SMS are:
– Risk management (hazard identification + event management)
– Assessment of improvement measures
– Safety promotion and training

An important principle of the SMS is to pay attention to incidents. By doing so, risks can be better identified and serious accidents can be avoided. This is the preventive approach to safety. It means that not only accidents or near-accidents must be reported, but also events that could lead to a dangerous situation. In addition, the analysis of all events is necessary. This is the reactive approach to safety, that deviates from the normal course of actions.

4 Structure and Tasks

The PG and HG sections consist in boards and commissions, schools, clubs and individual members. The SMS of the section is therefore arranged as follows:
– Each school or club has its Safety Manager (**SM**), who is responsible for its SMS: establishing, performing and monitoring compliance of it.
– Certified pilots are responsible for their own safety, have rights and obligations concerning safety, based on the PG and HG rules, and must report the events.
– The section board supports and coordinates indirectly, through the Safety Commission or Committee (**SC**), the SMs of the clubs or schools.

Level	Tasks	Person
CIVL	Support safety policy of the federations	Board member
Federation	Coordinate safety policy for all sections	Board member
Section SC	Design, implement and monitor section safety for schools, clubs and individual members Coordinate and supervise SMs of schools and clubs	Options: • Safety representative of the section board • SC president • SC member • Combination of representative and president (representative becoming SC president, not board member anymore)
School/club SM	Ensure flight operations safety, establish and check compliance of safety policy within the school or club	

4.1 Safety Manager's Tasks

– Establish a safety culture where event reporting is normal and pilots can talk to each other
– Internally analyse events
– Implement improvement measures and ensure compliance
– Ensure that methods and material are used properly
– Ensure compliance of improvement proposals and assess them
– (Monitor) adjustment policies/rules where necessary
– Inform pilots/students/instructors about flight safety improvement measures and procedures
– Report events to the SC
– Produce an annual safety report

All events are handled within the school or club and collected in the annual report. Serious incidents, near-accidents and accidents, according to the rules of PG and HG, must be also reported immediately.

4.2 Safety Commission's Tasks

– Educational material for pilots/students/instructors (how to proceed)
– Events/hazards/risks registration material (as part of students' flight registration, for instance)
– Support and coordinate SMs of schools and clubs
– Supervise implementation of SMS
– Keep total record of events
– Coordinate research on serious events

4.3 Members' Tasks

Beside members are expected to respect laws and regulations, they are required to:
– Keep up-to-date knowledge about flying technique, meteorology, aviation regulations, aerodynamics, PG and HG rules, navigation if relevant, and other information affecting flight safety
– Apply that knowledge
– Take note of the safety notices, measures, and procedures
– Report events and issues that may increase the risk of incidents

5 SMS in Practice

The SMS is composed of hazard identification, risk recognition, safety training and promotion, and event management. Upon identification of hazards, an analysis of the biggest dangers and resultant risks in the sport is proactively made. The goal is to get insight into the frequency and impact of an incident. On that basis, areas of attention are determined for the upcoming season.

Safety promotion is aimed at increasing knowledge about safety, procedures and measures, but above all at stimulating a safety culture.

Event management is a reactive process where a continuous process is completed, from event reporting and analysis, implementation of measures to prevent the same event, to reviewing of the effectiveness of measures.

Hazard identification involves a number of operational experts. Therefore, at the initiative of the SC and before the beginning of the flight season, the section holds each year a meeting with the SMs of the clubs and schools and some of the most experienced members and/or (expert) instructors. In a brainstorming session during this meeting, the top three risks are identified, taking into account the probability that an incident may occur, and how serious its consequences are. In annex is a method by which this can be done in a systematic manner.

5.1 Safety Promotion and Training

Safety promotion and training are aimed at knowledge transfer regarding flight safety, both on a technical level and to create a safety culture. On a technical level, pilots should be aware of laws and regulations, flying technique, procedures and other flight technical matters. Aspects like talking to each other about behaviour and readiness to report are covered by the safety culture.

An important aspect here is that not only measures and procedures are applied, but it is also explained why and how they increase flight safety. People who know the reason of certain safety procedures will be more inclined to adhere to them. When people know that their reports result in measures, this leads them to report.

– Safety promotion and training's goal is that everybody (members, students, instructors and others)
   has current knowledge of flying technique, meteorology, aviation regulations, aerodynamics,
   PG and HG rules, navigation if relevant, and other information affecting flight safety.
– The above is applied consistently.
– Everyone knows what is expected of her or him regarding the safety policy.
– The improvement measures and other important decisions taken are known, like their follow-up.
– The reasons of certain measures taken are known, and everyone knows why certain safety
   procedures are introduced or changed.

5.1.1 Methods

Safety promotion and training takes place both at the clubs and schools level and at the section level. During the instruction period in the schools, through practice and theory among others, a detailed attention is paid to flying technique, legislation and procedures, with the objective that (future) pilots learn responsible use of airspace. However, the SMS is also aimed at keeping on refining flying technique after the licence is achieved, in the clubs.

To pay attention in a structured way to the promotion of flight safety among members and students, an annual day of instructors or schools is organized by the section board. This is to share knowledge and experiences and to create uniformity in the way safety is handled. Another aspect at the section level is the development of policy and instruction material for the theory examinations.

5.2 Event Management

Event management takes mainly place at the level of clubs and schools. Only in case of serious accidents, an investigation is made by the section board. Event management includes the following components:
– Event reporting
– Analysis and registration
– Implementation of improvement measures
– Assessment of improvement measures

5.2.1 Event Reporting

The members are encouraged to report events. The form to use can be found in annex. Some examples of events to report:
– (Near) collision with another aircraft
– Hitting obstacle upon take-off or landing
– Rescue throw due to non flying equipment
– Faintness of pilot during flight
– Damage to material
– Injuries (to oneself/others)
– Unsafe situations, like bystanders at launch, poor launch, landing and flying technique

All incidents are reported using the form on the section website. There are roughly two situations in which events take place:
1) In school/federation, whether accompanied by an instructor or not
2) All other incidents where individual pilots are involved

In the first case, the relevant SM presents a factual report on the incident. In addition, the SM interviews as many people involved and witnesses as possible. The factual report is submitted to the SC via the incident reporting system. The SM receives a copy, uses it for internal analysis and submits the possible feedback to the SC.

In the second case, the individual pilot presents a factual report and interviews also any persons involved and witnesses. The report is submitted to the SC via the incident reporting system on the section website.

In both cases, it is advisable to support the reports with available photo and video material, which can be presented separately to the SC.

5.3 Analysis and Registration

The research taking place after each report focuses on the causes of the event and the underlying hazards. The contribution of the organization, procedures, environmental and individual factors are included. Based on that study, the SM determines the findings, adds them to the factual report, and draws improvement measures/proposals.
The event reports are added by the SC in the register, where the files are kept for at least 5 years. The incident register, attached as an annex, makes a trend analysis possible.

5.4 Implementation of Improvement Measures

Working together with the club board or school owner, the SM establishes improvement measures and ensures that they are communicated to the members, students and instructors. Shortly after improvement measures have been implemented, it is necessary to check whether they have lowered the risk level.

5.5 Assessment of Measures

At least once a year are the occurred events discussed within the club or school. Here are also discussed the situations or outcomes of the researches, and which measures have been and/or are being taken to prevent recurrence. In the schools, it can take place during the annual refresher course which they provide for their (help) instructors. In the clubs, it can be an agenda item at their meeting. The central questions in the review of measures taken are the following:
– Are the measures working as they are supposed to?
– Do they still have the desired effect on the risk?
– Is the risk that these measures limit still at the same level?
– Have the measures introduced new hazards?

5.6 Communication Tools

Communication occurs among others by means of briefings on the flying day, via the website (of the club, school or section), club and members' magazine, and mailing lists/forums within the sections (e-line/chat...). Here can a distinction be made between two types of information, and the mode of communication depends on their type: critical information that must be known before the next flight or as soon as possible, and information where the time factor is less critical.

6 Annex 1 Risk Identification

Hazard identification is as follows:
The experts write, individually, their top three potential hazards and assign to them, in a comprehensive manner, their most serious and most likely effects.
All hazards with their effects are compiled and the corresponding hazards are merged.
The experts examine then all possible effects written down, and from there decide together which effects are actually the most serious, most probable ones.
Then is examined for each hazard how likely it is to happen and how big its effects are. This is again done separately by each of the experts, using the following tables:

Chance	Definition	Value
Often	Several times a season	5
Regularly	A few times per season/probable	4
Sometimes	Once a season or two seasons/possible	3
Rarely	Not known to have happened before, once in five years/small	2
Very rarely	Almost inconceivable that it will ever happen/unlikely	1

Effect	Definition	Value
Very big	Fatality/destroyed material	A
Big	Safety margins hugely affected, major injuries/material damage	B
Serious	Safety margins affected, serious injuries/incidents/material damage	C
Small	Emergency procedures used, aircraft limitations exceeded, incident caused minor issues in program	D
Very small	Few effects	E

Then the values of the results "Chance" and "Effect" are combined and it is examined in a discussion among the experts whether an agreement can be reached between the different results related to the outcome (risk). In case of agreement, this table is used:

Risk chance	Risk consequences				
	Very big	**Big**	**Serious**	**Small**	**Very small**
Often	5A	5B	5C	5D	5E
Regularly	4A	4B	4C	4D	4E
Sometimes	3A	3B	3C	3D	3E
Rarely	2A	2B	2C	2D	2E
Very rarely	1A	1B	1C	1D	1E

The outcome of the above table is used as input to the next table and it is examined whether measures are needed to reduce the risk:

Outcome combination	Criteria
5A, 5B, 5C, 4A, 4B, 3A	Unacceptable risk under current circumstances, measures needed to bring the risk down
5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C	Tolerable risk, the board may require measures still needed, risk growth monitored
3E, 2D, 2E, 1A, 1B, 1C, 1D, 1E	Acceptable risk, risk growth monitored

For the top three threats with the highest points numbers, measures are now formulated.

7 Annex 2 Event Reporting

The federation facilitates the recording of events. For this purpose, an event registration system is set up where anyone can report an event. Events can be reported via the website of the section. Event reports are treated strictly confidentially by the SC.