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Training and Safety Panel

Pilot Safety in Gliding

Recommendations for Immediate and Long-term Safety Initiatives

by

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Synopsis

This paper is divided into two parts: The history and work of the Training and Safety Panel; and, a discussion of and recommendations for improving pilot safety in gliding, with emphasis on contest flying.

Part I

Beginning in 1973, national *coaches* or operations directors from several northern European countries met to discuss glider pilot training and safety. In the early 1980s, Bernald Smith of the Soaring Society of America, and Bill Scull of the British Gliding Association, invited many representatives to come to the 1983 Convention in Reno, Nevada. Fourteen representatives from ten countries met there for three days. The CIVV (renamed later IGC) was also invited.

At the CIVV meeting immediately following, Roger Wood, Australia, proposed that a subsidiary group be formed. The effort failed, however OSTIV offered to create a group, known today as the OSTIV Training and Safety Panel – TSP, alongside the other OSTIV Panels, Meteorology, and Sailplane Development – SDP.

The TSP has met approximately every two years since that time, to review accident trends and to make recommendations to mitigate problems, with an emphasis on training methods. In recent years, the panel has met jointly with the Sailplane Development Panel to discuss mutual concerns. Flying training seminars are held approximately every two to four years, at which flying training techniques and safety-related exercises used by the different countries are compared.

Part II

Pilot Safety in soaring is multi-facetted. This paper discusses the subject with a view to identifying areas where immediate and long-term improvements may be implemented, to make it safer for participants in competitions and in general gliding operations. Causal analysis of accident data is required of course, to pinpoint any problem areas and to prepare good safety initiatives.

Pilot safety can be improved in several areas such as cockpit design, clothing, and operating practices. The pilot, however, is influenced by factors that include Human Factors, his or her own training, experience, interactions with other people such as the gliding club or other flying organisation that trained him or her, and which provides flying services, the flying environment, including air traffic control and other pilots, and not least, by his or her personality. How can we influence people to improve pilot safety in these areas immediately?

This is the challenge, particularly when working with experienced (and competition) pilots. However, there are hazards to pilots that should be identified, not only for the competition pilot and contest organisations, but for all pilots. Measures that could be implemented or recommended to improve pilot safety are included in this paper. A major area that should be considered for implementation is to review and implement, where appropriate, safety programmes used at sanctioned competitions. Safety programmes may be examined more generally on a national level and at clubs, to implement suggested changes to improve safety.

For immediate improvements in contest safety we recommend that contest organisers implement a Safety Management Programme, or that current Safety Programmes be amended to include elements of Safety Management. The essential elements of such a programme are:

- Safety Policy statement (signed by the senior director / manager);
- Identification of hazards, risk levels, and development of risk mitigation strategies;
- System to recognise individuals/groups for improvements to flying safety; and
- Emergency Response Plan for the contest.

A Safety Management Programme based on the recommended format[1] will allow any national organisation and its gliding clubs, and commercial operators to manage safety hazards effectively, thus reducing costs and improving safety. Improvements should be realised quickly, particularly if a non-punitive reporting culture exists or is developed within the organisation or club.

Long-term improvements can be realised by involving pilots from the first days of training in programmes that include Human Factors, scenario-based training, and training in simulators. The TSP is actively discussing these types of training exercises, and following the August 2009 flying training seminar in the Netherlands, may make proposals to national and club organisations.

The three areas for improvements in safety that are recommended for consideration now are:

- Immediate safety initiatives for contests and contest pilots,
- Long-term goals for including Human Factors and Scenario-based Training of ab-initio pilots and for continuing training of pilots, and
- Improving incident and accident reporting generally.

PART I

FORMATION OF THE TRAINING AND SAFETY PANEL

Bill Scull, UK, Fred Weinholtz, Germany, and Ole Didriksen, Denmark founded a small group called the European Coaches' Conference in 1973. They met at Oerlinghausen, and thereafter approximately every second year. They exchanged information and ideas regarding training and safety. A few years later, coaches and chief flying instructors from more countries attended the meetings.

In the early 1980s, Bill Scull mentioned these northern European coaches' meetings to a group at the Soaring Society of America (SSA) annual convention in Arizona. Working with Scull, Bernald Smith (an SSA director) thought it would be good to expand the group worldwide. He planned to invite the CIVV (renamed later to IGC) to hold their meeting during the 1983 SSA Convention to be held in Reno, Nevada, and suggested that an expanded coaches' group meeting be held at that convention. This was accepted, and thus representatives from ten countries met at this convention to discuss and compare training and safety matters in their countries, and to find out what could be learned from one another.

The group consisted of fourteen senior national directors or coaches/chief instructors (flight instructors) from the United Kingdom, Canada, France, West Germany, Australia, Norway, Denmark, The Netherlands, South Africa, and the United States. At the CIVV meeting in Reno which immediately followed the above meeting, the Australian delegate Roger Wood proposed that, based upon the success of the coaches' group meeting, a subsidiary group of CIVV be formed to give international formality to the concept. However, there were some who opposed having such a group within CIVV and the effort failed. Dr. Manfred Reinhardt, President of OSTIV, offered to create a group under the OSTIV wing, which they did and that became what is still today the OSTIV TSP, alongside the other OSTIV Panels: the Sailplane Development, and Meteorology Panels.

THE WORK OF THE TRAINING AND SAFETY PANEL

The OSTIV TSP deals with training and safety in all respects. The delegates compare accident data from all countries, and analyse trends and measures that could be taken to reduce the risks. Training programmes and methods are evaluated. Standards (training, licensing, medical, etc.) have been compared, and the panel's European members have been and are involved with mutual recognition and other aspects of licensing, etc. Problems that have to be solved by the glider manufacturers are included, for example spin performance of two-seaters, or improvements in cockpit designs (safety and ergonomics).

At the present time, the following nations participate actively in the TSP: Belgium, Canada (current chairman of the panel is Ian Oldaker), Denmark, Germany, Netherlands, Sweden, Switzerland, UK, USA, with past participation by France, Norway, Finland, and Australia. South Africa and Greece have participated in one or two meetings only. In spite of numerous invitations to participate, other countries have not been represented.

The panel has been functioning for over 25 years. Typically, the panel meets every two years to review accident trends, to make recommendations to mitigate problems, reviews and proposes changes to training methods with an emphasis on flying exercises to improve safety and reduce typical accidents. In recent years, the panel has met jointly with the Sailplane Development Panel to discuss safety and training concerns. Flying Training Seminars, FTS, are held approximately every two to four years, at which the flying training programmes, training techniques, safety programmes, and safety-related exercises used by the different countries are compared. Early proposals for changes, or additional training methods are flown and discussed in detail, before a change is made part of a TSP recommendation. The next TSP meeting and FTS will be held in August 2009 at the Netherlands National Gliding Centre at Terlet.

Typical subjects, though not a complete listing, that are and have been discussed at TSP meetings, including the flying training seminars, FTS, are shown in Table 1 on the next page.

TSP INITIATIVES

The TSP has identified training problems and differences between countries that sometimes show omissions in training. These may have been specific to one or two countries, or they may have involved gliding in general..

The phenomenon of tug (towplane) upsets was identified early in the life of the TSP by Bill Scull and brought to TSP meetings. Methods to reduce the problem were suggested by delegates. Analyses and tests were performed by several countries and brought back to the next TSP meeting. For example, using less-strong, weak links was shown to be impractical and not necessarily the safest option for either the tug pilot or glider pilot. Subsequently, changes were suggested that included a number of training initiatives to show both tug pilots and the glider pilots how to prevent tug upsets.

Several years ago, TSP delegates identified spins as contributing to a higher than normal number of fatal accidents in several countries. At more than one flying training seminar, delegates investigated spin characteristics of different two-seat gliders to determine their suitability for ab-initio training, and to investigate the different situations from which spins can occur. Tail weights were included in the flying at the seminar. Delegates concluded that spin and spin-avoidance exercises must be part of normal training. In this way, pilots would learn to recognise the situations that can lead to inadvertent spins.

Winch launching and its hazards was a recent subject of discussion, headed by important work done by the British delegate, Hugh Browning, who made a very detailed investigation and worthwhile contribution. The delegates were able to apply the lessons learned when launching with both a conventional winch and a new electric winch.

Work that has occupied the panel recently is efforts to produce a standard set of recommended operating procedures for gliding sites. This is proving difficult because of the wide range of procedures in use in different countries. Many subjects have been and continue to be discussed at the TSP meetings and Flying Training Seminars.

TSP Meetings and Flying Training Seminars

- Accident Reports & Trends from each country
- Airbrakes for L/D of 5:1 vs. 7:1; Flying comparisons performed at FTS
- Collision Avoidance and Glider Conspicuity (how easy to see the glider)
- Human Factors, HF and Psychological Factors
- Mid-air collision problems; FLARM use investigated at FTS
- Scenario-based training (to be flown at FTS), Psychology of Training
- Safety Programmes / Improvements, and Risk Management
- Spin and Recovery Training; Also subject of FTS exercises; Tail weights
- Standard Operating Procedures
- Towing with a Motorglider / Micro-light; also flown at FTS
- Tug / Towplane upsets; mitigation techniques flown at FTS
- Training Programme Changes/Improvements; flown at FTS
- Winch launching and problems/dangers; FTS subject, etc.
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Joint Meetings with the Sailplane Development Panel

- Airbrakes, L/D 5:1 - Pros and Cons; Short field landings over high obstacles
- Anti-collision Equipment
- Cockpit Damage Reports - how to improve amount and quality of responses
- Cockpit Layouts and Ergonomics / Levers
- Crashworthiness - Lessons learned in other sports (motor boating / car racing)
- Glider Conspicuity
- Rescue Systems
- Micro-lights for Aerotowing
- Self-Launching Sailplanes
- Stall Warning Systems
- Tail Ballast
- Weak links for Aerotow and
- Winch Launching, etc.

Table 1. Typical Subjects discussed at TSP Meetings, Flying Training Seminars, and at Joint Meetings with the Sailplane Development Panel

PART II

PILOT SAFETY IN GLIDING

INTRODUCTION

There are many avenues to explore in Pilot Safety in gliding. This paper discusses the subject with a view to identifying areas where immediate and long-term improvements may be implemented, to make it safer for participants in competitions and n general gliding operations.

Obtaining immediate improvements in pilot safety is a challenging task, particularly for competition (experienced) pilots. However, there are hazards to pilots that can and should be identified, for all pilots. Detailed causal analysis of accidents is also required, to pinpoint problem areas and to prepare relevant safety initiatives.

The paucity of data from the few gliding accidents adds to the challenge. To provide more meaningful data for trend analysis, we require more reporting of accidents and incidents where, but for luck, the pilot did not come to grief. Only by analysing many incidents can we expect to obtain good causal data. In 1969, Frank E. Bird, Jr. of the Insurance Company of North America, analysed 1,753,498 occupational accidents[2]. He showed that for every serious or disabling injury, there were 9.8 minor injuries and 30.2 property damage accidents. 4,000 hours of interviews of workers added 600 no-loss incidents to the ratio that is known widely as the 1-10-30-600 ratio.

This suggests strongly that the gliding community should be doing its utmost to improve incident/accident reporting so that we can develop meaningful safety improvements and accident mitigation strategies.

The three areas for improvements in safety that are recommended in this paper are:

- Immediate safety initiatives for contests and contest pilots,
- Long-term goals for including Human Factors and Scenario-based Training of ab-initio pilots, and for continuing training of pilots, and
- Improving incident and accident reporting generally.

SAFETY MANAGEMENT SYSTEMS, SMS

Implementing SMS within a large aviation organisation such as an airline is increasingly the norm, and may be a national requirement by law. While some airlines initially showed some reluctance to the idea of safety being imposed on them, they have realised that SMS is a positive initiative for improving safety. Largely because the reporting of incidents may be anonymous, some organisations have received large numbers of reports from, for example, cabin crews and ramp personnel who were reluctant, in the past, to report anything. This may have been for fear of being reprimanded. Note, however, a basic principle of safety management requires that a person not be blamed or disciplined because of an incident or accident, unless that person shows willful negligence, disregard for rules or regulations, or has criminal intent!

A recognition system for contributions to flying safety improvement by an individual or group is part of the programme. Contributions to safety improvements should be publicized immediately: the contributor should be recognised and thanked for a job well done.

While an SMS is not necessarily the best type of programme for all national gliding federations or associations, particularly one in which there are many smaller and autonomous organisations (as in gliding), the least that can be recommended for contest organisations is a Safety Programme with some of the elements of an SMS. As a start, the current safety programme should be examined to determine what improvements may be made. If we allow the status quo to continue, we will go backwards in safety. By adding some new elements that are proving themselves in industry, we should be able to improve not only pilot safety, but safety all round.

Safety is not accomplished solely by the pilots, by team leadership, or by an individual. Safety involves everyone. A positive safety culture is invaluable for encouraging the kind of behaviour that will enhance safety. Positively reinforcing safety-conscious actions sends the message that the organisation's (contest) leadership cares about safety.

The best way to improve safety is to make it a core value, that is to make safety an integral part of contest management. Setting safety goals and holding leaders and others accountable for achieving those goals does this. To be effective, goal setting requires practical, achievable safety goals that can be verified. Goals should be set and deadlines established for meeting them. Leaders must follow through and hold those responsible to account for their progress toward the goals.

Many organisations hold safety meetings. This is a good idea, but if safety is a core value, safety implications should be raised and addressed at all meetings as a normal part of doing business. When flying operations and financial matters are discussed, associated safety issues should be considered. For example, the participation of tug pilots and aircraft from other organisations will probably involve evaluating factors such as pilot experience and currency, duty periods, rental and operating costs,, and maintenance. Safety aspects of the rentals should be considered. Requiring that safety be a part of every contest management decision underlines the importance of safety and ensures that safety is a normal part of the way all jobs are done.

Professor James Reason of the University of Manchester, a leading authority in the management of safety, compares managing safety to *fighting a guerrilla war in which there are no final victories.* It is a never-ending struggle to identify and eliminate or control hazards. We will never run out of ideas to make the system safer. Sound management requires that we identify the hazards, decide how to mitigate the risks and achieve safety goals, and hold ourselves accountable for achieving them. Risk management procedures can help leaders decide where the greatest risks are and help set priorities. Sound safety goal-setting concentrates on identifying systemic weaknesses and accident precursors, and either eliminating or mitigating them.

HOW DO ACCIDENTS HAPPEN?

A great deal of effort has been devoted recently to understanding how accidents happen in aviation and other industries. It is generally accepted that most accidents result from human error. It would be easy to conclude that these human errors indicate carelessness or lack of skill, but that would not be accurate. Investigators are finding that the pilot is only the last link in a chain that leads to an accident. We will not prevent accidents by changing people; we will only prevent accidents when we address the underlying causal factors.

In the 1990s, the term organisational accident was coined because most of the links in an accident chain were found to have been under the control of the organisation. Since the greatest threats to aviation safety generally originate from organisational issues, making flying in gliders even safer will require action by the organisation.

A comprehensive framework for guiding personnel when investigating and analysing human error in aviation has been developed[3] (Wiegmann and Shappell). It is called the Human Factors Analysis and Classification System (HFACS), and is based on James Reason's (1990) well-known Swiss cheese model of accident causation[4]. The authors describe human error and HFACS from an applied perspective. Another accident investigation tool was developed more recently, called the Integrated Safety Investigation Methodology, ISIM[5], which is used during the collection of data from an accident or incident. It helps investigators to identify risks, analyse underlying factors and to develop risk control options, with the ultimate purpose of preventing the same type of occurrence happening again. Both these systems assist safety personnel to effectively investigate and analyse the role of human error in accidents, and by extension, to help develop effective safety improvement programmes. What both do in a very effective way is to provide investigators with the tools to investigate the organisational factors that may have contributed to the event.

One area that we tend to forget is what goes on in the mind, the brain of the pilot. It is here that the competition pilot is driven to win, and he or she sometimes will forget about other matters, such as the safety consequence of the intended action. The decision is often sub-conscious, because the pilot has made this kind of decision many times before. Even though people are capable of making decisions in a thorough and methodical way, it appears that most of the time they do not. A growing body of research suggests that people unconsciously use simple rules of thumb, or heuristics, to navigate the routine complexities of modern life. Applying this to glider pilots, these individuals make decisions quickly and often. Pilots will be using heuristics more often than we may think. Heuristics give quick results because they rely on only one or two key pieces of evidence, and though they are not always correct, they work often enough to guide us through routine but complex tasks such as driving or shopping[6] (Gigerenzer, et al.1999). There are six heuristics recognised as being widely used in our daily decision-making: familiarity, consistency, acceptance, the expert halo, social facilitation, and scarcity[7] (Ian McCammon, 2004).

McCammon reviewed 715 recreational avalanche accidents and found good evidence that many victims fell prey to one or more of what are called heuristic traps. It is suggested that heuristic traps could apply also to any pilot flying with other gliders in the vicinity. Would knowledge of the heuristics phenomena help glider pilots avoid these traps and thus become safer pilots? See Annex A for a more complete discussion.

FLYING SAFETY AND SAFETY MANAGEMENT

The traditional flight safety approach in gliding depends on a safety officer or other interested person in the gliding organisation such as a club, to report to the chief flying instructor, CFI, or the club's president. The safety officer's effectiveness depends on his or her ability to persuade the club leaders, or management, to act. This approach works with varying degrees of success. However, we continue to have accidents that we describe often as preventable.

It is proposed that a safety programme philosophy should be adopted, in which the directors of the organisation take responsibility and accountability for safety. In the case of IGC sanctioned events, the organisers should be required to adopt and follow safety management practices, that is, to *manage* safety. The organisers (including the contest director, co-directors, and their assistants) are ultimately responsible for safety, because they must protect the assets that are the aircraft and the facilities that belong to them and the local organisation. The event managers also must be responsible for ensuring that the flying and ground operations, and the manner in which the contest is run (and how the contestants handle themselves) are as safe as is reasonably achievable. The safety of the tug pilots, local glider pilots, their passengers and the general public should be included.

Some countries have adopted a *National Safety Programme* within their soaring (gliding) association[8], with some success. The Swedish programme *Stop Crashing,* for example, has been very successful in significantly reducing the serious accident rate. For gliding events that are organized from time to time, often outside the direct control of the local organisation (airfield owner or operator), a full SMS may not be appropriate. However, some form of *Safety Management* is recommended. A safety management system typically is based on the fact that there will always be hazards and risks. Recognising this, proactive management is needed at the national level and at sanctioned gliding events (and within individual clubs for example) to identify and control these threats to pilot safety. By identifying these threats before the event, we hope to improve safety for our pilots and the public.

A good S*afety Management Programme* provides an organisation with the capacity to anticipate and address safety issues before they lead to an occurrence. It also provides the leaders/directors with the ability to deal effectively with accidents and incidents (near misses) that happen during the event so that the leaders may apply valuable lessons learned from these occurrences, to improve safety immediately. To develop a safety management programme, the organisation should first go through a basic safety process.

The Basic Safety Process

The basic safety process is accomplished in six steps, and is illustrated in the figure on the next page:

1. A hazard is identified (see first box in the figure), a safety issue or concern is raised, or there is an occurrence (an incident or accident); data from previous occurrences are included;

2. The concern or occurrence is reported or brought to the attention of the relevant leaders;

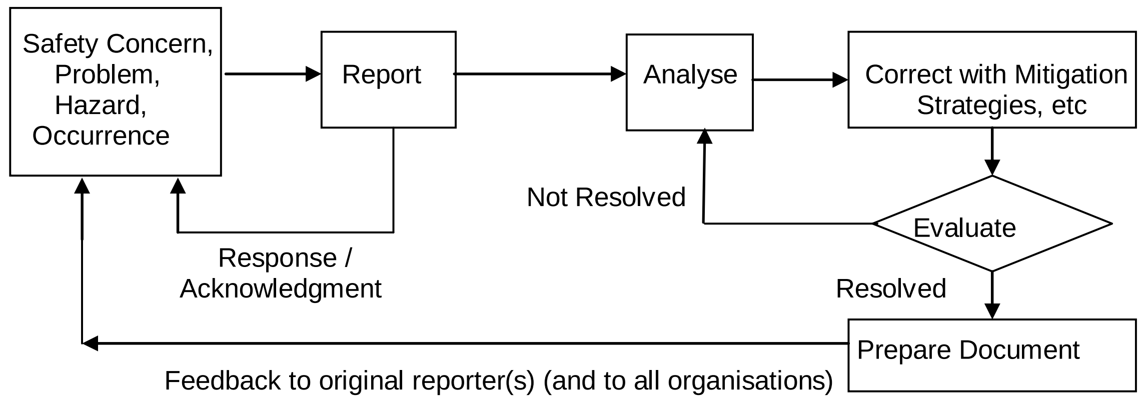
3. An acknowledgement that the report has been received is sent to the initial reporter(s), or an acknowledgement is published in a news bulletin, for example;

4. The event, hazard, or issue is analysed to determine its cause or source, and to assess the level of risk for each hazard (third box in the figure);

5. Corrective action, control or mitigation is developed and implemented;

6. The corrective action is evaluated to make sure it is effective. If the safety issue is resolved, the action can be documented and the safety enhancement maintained. If the problem or issue is not resolved, it should be re-analysed until it is resolved; and

7. Feedback and lessons learned are provided to the initial reporter(s), and to all pilots, operators (tug pilots, ground crews) and other organisations as appropriate.



The Basic Safety Process

In the case of a soaring contest, the first step would be performed well before the event is to take place. This step should include results from analysis of previous contest incidents and accidents, so that lessons learned from those events can be used to improve safety for the new contest. Step 1 should involve as many people as possible who are familiar with the site and with typical contest operations, and should include knowledgeable and experienced pilots. Most of these pilots would be able to list hazards that they know of or that they were exposed to in the past. Some pilots new to contest flying could provide useful insights that would be overlooked by the experienced pilot (see later under the *familiarity* heuristic trap). All participants would be tasked with identifying typical hazards in all aspects of the operation. HFACS[2] may be used for this work, for example, to examine the roles of all levels of the organisation: organisational influences, supervision, pre-conditions, and unsafe acts/unsafe conditions.

Once a list of hazards is compiled in Step 1, the level of risk is assessed in Step 4. (Steps 2 and 3 would be considered later, once operations begin). High-risk hazards should be given priority in Step 5 to develop corrective actions and mitigation strategies. Those involved in this work will be confronted with different kinds of pressure from stakeholders. Because the perception and management of risk cannot be mathematically calculated, they will have to make *subjective* judgements as a prerequisite for action. There will be differences of opinion between the experts and lay people, for example. They will encounter ethical questions related to procedures. Who is to be involved and in which way?[9] These may be resolved easily. The results from step 4 would be used to develop or amend the operational methods and rules to be used during the contest.

When flying is in progress, the flying rules and strategies, for example the finish-line procedures, will normally be followed by all pilots. If and when there is a flying or other operational occurrence that is or could be a safety concern steps 1 to 7 would be used as required.

Hazards with high Risk Levels

There are some hazards that can be identified now, and they include:

- Reciprocal tracks to be used by competing pilots in the contest
- Separation of high-speed finishing gliders from other traffic in the landing circuits
- Low-level, high-speed finishes towards the airfield and the finish line
- Mid-air collisions – use of FLARM or similar devices
- *Kamikaze* outlandings (last 100 – 200m height used to gain extra distance points)
- Obstruction of view from cockpit by contest instruments/devices
- High-speed starts across the start line.

Current contest rules and governing codes should be reviewed to determine the extent to which these hazards are now covered. In addition, the risk levels for each hazard should be assessed and action taken to lessen the risks to acceptable levels. Reciprocal tracks may pose particular risks in mountainous countries, while the risk of mid-air collisions is always present. In this case, the use of proximity warning devices, such as FLARM, should be made mandatory, and countries where they may not be used today because of licensing difficulties or frequency assignment problems, extra efforts should be made to permit their use. Particularly in single-seat gliders, the position of any auxiliary devices or display instruments must not obstruct the pilot’s sight lines used for lookout and scanning for other aircraft and gliders.

The so-called kamikaze outlanding refers to a pilot deciding it is worth the risk to use the last remaining height to gain extra distance, instead of taking the time needed to assess landing areas that are easily reached for a safe outlanding.

Flight following

All pilots should be required to give a regular radio call (at least hourly) to their team manager if they do not have a Spot tracker unit (or Spidertracks or Track Plus units) all of which would allow the flight followers to see glider progress via satellite and computer links. The radio call should identify the task leg that the glider is flying, to aid a search should this become necessary.

Emergency Response Plan

As stated previously, accidents are few. This is good news. The bad news is that a good safety record can lull us into complacency so that if something bad does happen, we may not be prepared to deal with it. Every contest organisation, and the airport from which the contest is to be flown, should have an emergency response plan. The Plan should:

- be relevant and useful to people on duty at the time of an accident;
- include checklists and emergency contact details;
- be updated when contact details change;
- be exercised to ensure its adequacy and the readiness of the people who must make it work; and
- copies should be delivered to and discussed with the emergency response centre, and police, ambulance and fire services, and helicopter operators who would respond to an emergency during the event.

HUMAN FACTORS AND SCENARIO-BASED TRAINING

We forget perhaps that advances in glider design and performance have improved markedly in recent years, to the point at which human performance and endurance are challenged more and more. Accidents from deficiencies in equipment design and maintenance have reached very low levels, and if we are to reduce gliding accident rates even more, we have to concentrate now on the pilot. Skills' training has reached high standards generally and we continue to make small advances all the time. However, to make real advances in lowering accident rates we should be looking more at the human and how he or she performs. Human Factors, HF, and how these affect pilot performance is an important aspect of piloting that should be included more in the training of glider pilots from the start.

Human Factors is the study of how a glider pilot's performance is influenced by the pilot's environment. It includes such effects as the cockpit design of the glider, its temperature and altitude on the pilot; the functioning of the organs of the body, the effects of emotions and attitude, and includes how well or poorly we interact and communicate with each other. HF will include the pilot's personality type, which determines his or her attitude, knowledge, and discipline in the role of effecting judgement and in making decisions.

Are Human Factors important? The majority of aviation accidents used to be attributed to pilot error! However, pilot error does not lend itself well to finding the root causes. Neither does pilot error easily permit analysis, nor allow management personnel to take proactive actions to mitigate the risks in soaring. Where does this leave us? We should be looking deeper into why the pilot made that decision, and what were the factors or influences that led to the decision. In gliding instruction, therefore, the role of HF on pilots' performance should be expanded.

Malcolm Gladwell points out that we use a process called *thin slicing* that is in our adaptive unconscious to make snap decisions accurately[10]. Thin slicing often delivers a better answer than more deliberate and exhaustive ways of thinking. We often function (most of the time for some of us) on some form of autopilot. We believe we are making rational decisions, but often we are using thin slicing and the previous associations we have made. In the training of new glider pilots to handle *difficult* or unusual situations, instructors should be asked to create scenarios as close to real life as possible that will safely allow the learner to experience what should be done. There is an optimal state of *arousal* - the range in which stress improves performance - and we all know about the so-called *tunnel vision* phenomenon that occurs when we become more highly stressed. Above some higher stress level, we become unable to make a decision or to take action. Sometimes we call it pilot error, but we are victims of our own biology.

S*cenario based training*, SBT, can help develop these useful criteria in our learners' unconscious, and prepare these new pilots for the higher stress situations that can and will occur in flying.

Typical gliding simulators cannot reproduce the 'g' loading on a pilot to produce typical falling and other sensations; however, simulators can be used to develop automatic and instinctive reactions in pilot trainees to typical situations that are only limited by the instructor's ingenuity. This is much safer than trying the same thing in the air! The Training and Safety Panel plans to investigate more fully the use of simulators for scenario-based training and to develop training methods at the upcoming flying training seminar, to be held in The Netherlands in August 2009.

CONCLUSIONS

Improving pilot safety at contests, as opposed to improving the safety of the vehicle and other equipment, is a real challenge. This is because these pilots are experienced and they have formed habits that, under the pressures and stresses of a contest, will determine how they fly and make contest decisions. *It is difficult to teach old dogs new tricks!*

Recent developments of Safety Management Systems allow us to plan our safety initiatives in a structured manner. HFACS guides us to examine organisational and other influences on pilots and their decision-making. Human Factors and Scenario-based training of new pilots will help develop safer pilots who will be well able to handle safely the advanced gliders and new technology.

Based on the 1, 10, 30, 600 ratio, we would expect to receive many *incident* reports for every one serious accident report. Our job is to persuade all glider pilots that we can learn from incident reports, in some cases even more than from a report following a serious accident. We need more data to be able to devise mitigation strategies.

RECOMMENDATIONS FOR PILOT SAFETY IMPROVEMENTS

1. Safety programmes used at sanctioned competitions should be reviewed and improvements implemented as needed. A typical safety programme would include, as a minimum, the identification of hazards and means to mitigate risks to pilots and others who may be involved in the operation or affected by it (e.g. third persons). Reference 1, *Implementing a Safety Management Programme for Gliding Organisations,* contains the requirements of a typical programme that could be implemented also for all sanctioned contests. An existing Contest Safety Programme should be examined to determine if additional elements could be added. Reference 1 includes some safety elements already used in competitions and suggests additional items for consideration.
2. We believe that long-term improvements can be realised by including Human Factors, Scenario-based training, and training in simulators for ab-initio, low-time pilots, and in the continuing (or advanced) training of pilots.
3. Better safety incident/accident reporting would provide us with more data to indicate trends and to show problem areas. Daily reporting (anonymously) of occurrences (incidents and accidents) to the organisers of a contest should be required. Reporting at international contests could serve as an example to the general glider pilot worldwide that reporting is encouraged, with the overall objective of improving gliding safety and thus reducing accident rates.

ANNEX A

How do Competition Pilots make Decisions?

Research into Avalanche Accidents in the USA

Even though people are capable of making decisions in a thorough and methodical way, it appears that most of the time they do not. A growing body of research suggests that people unconsciously use simple *rules of thumb*, or *heuristics*, to navigate the routine complexities of modern life. Applying this to glider pilots, these individuals make decisions quickly and often. They will be using heuristics more often than we may think. Heuristics give quick results because they rely on only one or two key pieces of evidence, and though they are not always right they work often enough to guide us through routine but complex tasks such as driving or shopping[5] (Gigerenzer, et al.1999). There are six heuristics recognised as being widely used in our daily decision-making: familiarity, consistency, acceptance, the expert halo, social facilitation, and scarcity[6].

McCammon reviewed 715 recreational avalanche accidents and found that there is good evidence that many avalanche victims fell prey to one or more of what are called heuristic traps. He further explains that because these heuristics work so well and because we use them for everyday decisions, we are misled by these unconscious heuristics. He cautioned that it is not possible to establish conclusively the causes of these accidents by heuristic traps. However, experimental results from other fields of human behaviour would support many of his findings.

In his study, McCammon showed that many avalanche victims appeared to ignore obvious signs of danger. Almost two thirds of the parties that were aware of the hazard still proceeded into the path of the hazard anyway. Why? In many cases, the people involved had received formal avalanche training, which included how to recognise the hazard and **how to mitigate it**. People at all four levels of training (none, awareness, basic and advanced) appeared equally susceptible to heuristic traps. His study gives us the basis perhaps of looking at how heuristics would apply to glider pilots, and what we might be able to do about improving safety through the pilots' actions.

The types of decision in gliding competitions that might lead to an incident or accident vary widely, but two come immediately to mind: how to enter a thermal already occupied by other pilots, and when to start a final glide and from what height. The heuristics that may be used, often unconsciously, are described as they might apply to a competition glider pilot. These heuristics could apply also to any pilot flying with other gliders in the vicinity. We hope that the pilots would be thinking how to make these decisions with safety in mind.

One of the missing factors in looking at glider pilots here, is that the hazards to the pilots and others are not discussed, though these would be fairly obvious in most cases. In other scenarios, the hazards would be less apparent, and these could be derived by group discussion, or brainstorming[9].

Heuristic Traps

Familiarity

Actions that do not require much thought are familiar and we base our decision on what we did last time in a similar situation. This works in most cases but when the situation changes this rule of thumb can become a trap. Pulling up sharply into a thermal works most of the time when no one else is around, and the habit is formed. However, when others are in the thermal an altered technique may be needed to avoid cutting off the tail of the glider above... this has happened.

There is an apparent tendency among skiers who are highly trained (in avalanche hazards) to make riskier decisions in familiar terrain. Remarkably, skiers with advanced training travelling in a group in familiar terrain exposed their parties to about the same hazards as parties with little or no such training. This observation would suggest that familiarity negates the benefits of training! This also suggests that high-time and competition glider pilots flying in familiar mountain and ridge terrain would make riskier decisions, even if they were trained in the hazards of such flying.

Consistency

Deciding when to leave for a final glide to the finish, or any long glide for that matter, is usually a decision not taken lightly. However, once the decision has been made, the pilot would find it easier to stay on the glide, it being easier to maintain consistency with the original decision. This heuristic saves time, because we stick to our original assumptions. Most of the time it is reliable but it can become a trap when our desire to be consistent overrides critical new information about an impending hazard (think increased sink → getting low).

Competition pilots are by nature, highly competitive and they want to win, sometimes whatever the consequences. They will be highly committed to achieving their goals, and this can expose them to greater risks compared to pilots with lower levels of commitment. This is consistent with the findings of McCammon.

Acceptance

This heuristic pushes us to do something or take part in an activity that we hope will get us accepted or liked by others. We are very vulnerable to this, even from an early age. Typically it shows up as competitive, aggressive or risk-taking behaviour, and is more prevalent with younger men when women are involved. This would suggest that pilots at a club would be more susceptible to this type of heuristic than competition pilots who compete in single-gender contests. A pilot new to the group (or the team) might, however, be susceptible to this heuristic when trying to validate his acceptance by the others on the team.

The Expert Halo

This heuristic refers to the leader of a group, often an informal leader, who makes critical decisions for the group. This could be based on local knowledge or experience, or simply on the person's age or assertiveness, situations that can lead people into the expert halo trap. In the case of gliding contests, it could be the assumed leader, the pilot who is followed by many because of his or her past successes or local knowledge. Another leader is the competitor who leaves first from the last thermal before the finish, whether or not he is an acknowledged *expert.*

Data in McCammon's study suggests that the expert halo heuristic may have played a role leading to avalanche accidents, particularly in large groups. Would a context gaggle in the last thermal constitute such a group, out of which the first pilot to leave might become the de-facto leader to others who follow, just to make sure they are not left behind?

Social Facilitation

When a group is involved in a decision, an individual's risk taking will be enhanced or diminished, depending on the skills of the group as a whole. In the avalanche study, it was found that when a person had received formal avalanche training, he or she would tend to take substantially more risks after meeting others. People with less training took less risk.

Competition flying will see pilots flying more often close to, or knowing the whereabouts of other pilots, that could be described as a group. We will normally expect less skilled pilots to take less risk than the more experienced in a group. In this context, by following the others (expert halo heuristic), will the less experienced take more risk than they can handle? Will this social facilitation heuristic, combined with the competitor's desire to win, mean that we will inevitably have competition pilots exposed to more risk than when they are flying at their home club? Like other heuristic traps, social facilitation lulls its victims into a sense of feeling safe, even when dangers are obvious[6].

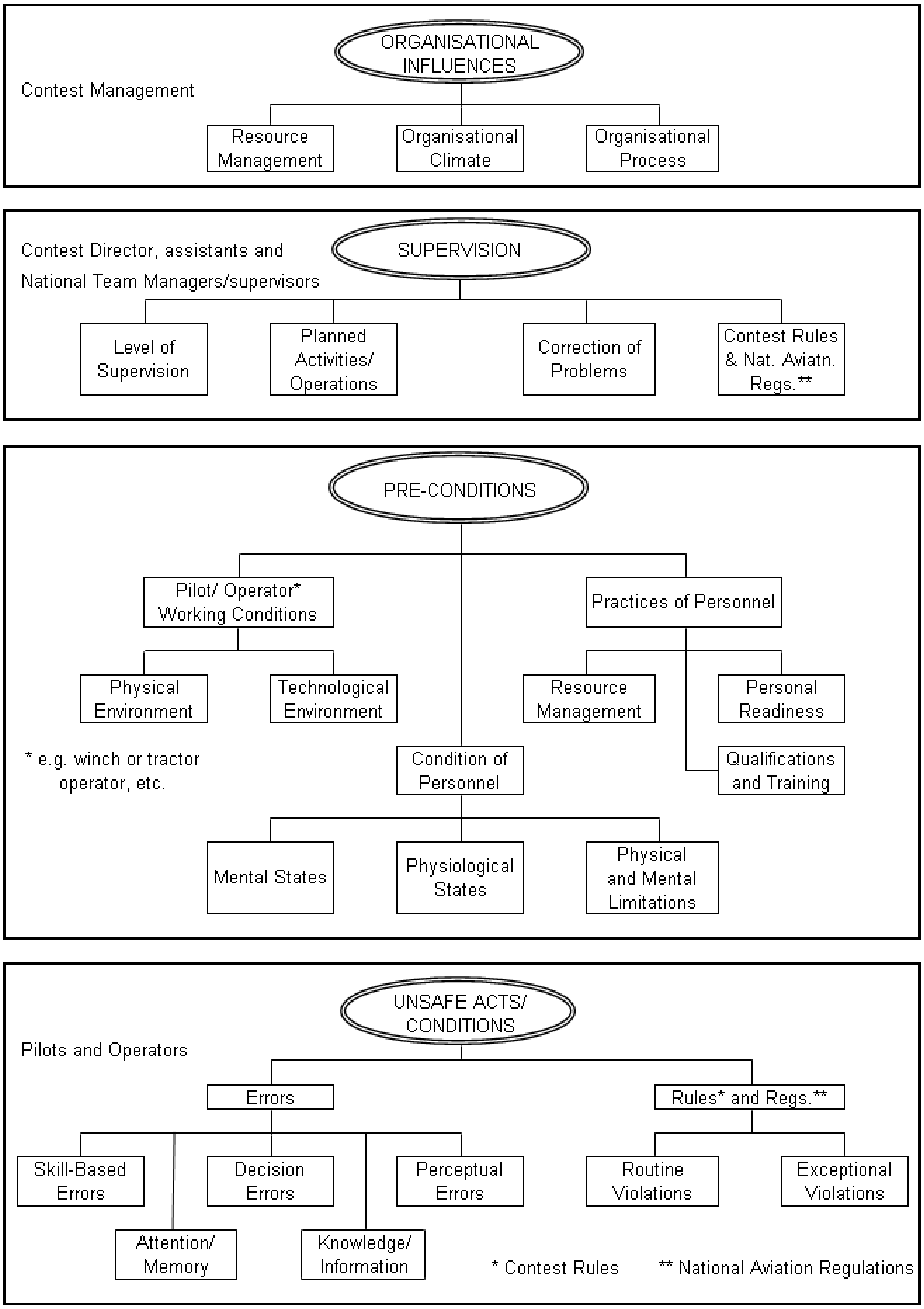
Scarcity

The scarcity heuristic is the tendency to value opportunities in proportion to the chance that the person may lose them, especially to a competitor. In skiing situations in avalanche territory, the scarcity heuristic works exactly contrary to personal safety; it appears to become a more tempting decision-making trap as the avalanche hazard rises. Whether this trap requires more analysis to determine how it could apply to glider pilots tempted to take a difficult route in the mountains on the chance that they will gain an advantage over their competitors.

CONCLUSIONS

Avalanche victims fall prey to heuristic traps because heuristics are simple to use and they have proven themselves in other areas of daily life. The challenge for avalanche educators continues to be developing and effectively teaching simple, effective tools that are viable alternatives to the heuristics traps described here. What would be needed to apply these lessons to the training of glider pilots? McCammon's work to analyse avalanche accidents suggests that we will not be able to influence individual pilots by more training, particularly in the subject of heuristics as they might apply to a contest pilot out on course.

ANNEX B



THE HUMAN FACTORS ANALYSIS AND CLASSIFICATION SYSTEM
(HFACS) MODIFIED FOR SOARING CONTESTS

After Weigmann and Shappell 2003

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