SAFETY THROUGH KNOWLEDGE

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I am honored to have been invited to give this address. My theme is 'Safety through Knowledge' but to consider this in context, I need to review the development of aviation in general and of gliding in particular.

Undoubtedly there would be dispute as to the beginnings of aviation; it is not my aim to be contentious. In general, the developments have been truly amazing. Apart from short powered flights in Russia, (1884), and France, (1890), the Wright brothers were the first to succeed with sustained powered flight, increasing their performance from 59 seconds duration and a distance of 852 feet in 1903 to 38 minutes and 24 miles by the end of 1905. In this year, they also carried the first passengers, the best flight covering a distance of 22 miles in 3 minutes 40 seconds. Contrast this with the airliners that nowadays span the world. Yet it was only in 1945-46 that regular transatlantic services were introduced.

In terms of sheer performance, there have been some remarkable developments. Think of a flight non-stop around the world, the Rutan aircraft; of man-powered flights, McCready's Gossamer Albatross crossing from England to France in June, 1979; think of the Space Shuttle and of moon landings.

Similarly the developments in one hundred years from Otto Lilienthal's first flights are equally remarkable; we can set aside the flight by Cayley's coachman in 1853. The first soaring flight of over one hour is credited to Martens on August 18, 1922, and of five hours to Floret (January 3, 1923).

The longest glider record flight is now over 1600 kilometers and 2000 kilometers has been exceeded. The list of pilots who have flown 1000 kilometers is increasing steadily and the mind may boggle at the current para-glider record of 281 kilometers and 499 kilometers for a hang glider! Only a further brief look at the development of soaring is necessary to set the scene for my theme, safety through knowledge.

Design development is, for the most part, driven by competition, and yet competitive soaring is only a small part of the sport as a whole. This driving force has stimulated designers the world over to produce better and better gliders. In this respect we owe much to the concept of the German Akafliegs and the designers that have emerged from this environment. Think of how many gliders were designed by Rudolph Kaiser; at one time over 20% of gliders in the UK were his designs; remember him for his contribution.

But development brings its own problems, of technology, glider performance and handling and, not least, of training and safety. Because glider design is competition driven, current designs become the club gliders of the future. At one time this was a problem because two-seaters did not keep pace with single-seaters, perhaps because of the period where there were few competitions for two-seaters. I can remember a conversation with Eugen Hanle about the lack of a high-performance two seater - " How many would I sell?" - he asked; now we know the answer.

Despite this, much basic training is still carried out on the ubiquitous ASK-13, something of a contrast to the glider that the student may be flying in a few year's time, an LS 22, or some such. He or she may still not get the training which permits the best use of such a sailplane. An aim, and surely a maxim, for our sport must be to "get the maximum satisfaction with an acceptable degree of safety".

Here there is a conflict. In my dictionary a sportsman is defined as - 'a person ready to play a bold game' - that is someone who is prepared to accept a degree of risk. In flying, training is provided to ensure a uniform and safe standard, to minimize the risk; inexperienced solo pilots are supervised with a view to avoiding the more obvious hazards. Safety is the aim.

There is no such thing as absolute safety. Training and supervision must strike the balance between allowing a 'voyage of discovery' and providing a comprehensive training regime which would stultify the nature of our sport. One can get a view on this balance from the freer airsports such as hang- and para-gliding. Young people like the freedom, the lack of control, to discover the joy of soaring. Nevertheless, in soaring we seem to have achieved a balance and the measure of that balance is the number of pilots killed each year.

The data on fatal accidents form the simple statistic which is used, arbitrarily, to determine what is, or is not, acceptable. I will return to this point later.

Let me now turn to my main theme, safety through knowledge. I propose to consider knowledge that might save our life or reduce the extent of injury. To finish, I will consider lack of knowledge sometimes shown by people who regulate aviation.

Let me ask the question - "what does one need to know to be a safe pilot?" - a rhetorical question. Consider these

examples:

1. A glider spins in, the pilot is killed.

2. Two gliders collide, neither pilot being injured in the initial impact, but they fail to bail out successfully.

3. In five years, 42 pilots were killed in the Southern Alps.

These seemingly unrelated examples all have something in common, a lack of knowledgeand/or training.

It is nearly 80 years since spinning was "discovered" and 75 since the spin recovery technique was understood. Today we have the knowledge, but the training policy and the glider design philosophy is not agreed. Consider the training. In some countries it is not the practice to teach the spin and recovery at all. The training emphasis will be on stall/spin awareness, in other words "prevention". And yet, if a pilot trained in this regime does actually spin, who can say how he or she will react? The pilot himself, his instructor? I think not! It is a matter for pure speculation as to whether the pilot will, or is even able to recover.

Such a training policy may well be based on the general handling of the aircraft in current use. It may be appropriate in American designed general aviation aircraft, Cessnas and the like. Is it appropriate for gliders? Some modern designs are very reluctant to spin at all, from my experience. It should be obvious that at 90 kg. I fly gliders at a forward center of gravity position. Are such gliders as reluctant to spin at the aft c.g. limit? Probably not.

Consider the two-seaters. Some spin very well indeed, notably the Polish designs. For training, especially instructor training, I would want a Puchacz available. At one time, there was the prospect of a two-seater, the Platypus, which, from all accounts, would have been ideal, with the advantage of side-by-side seating. Alas, it has not gone into series production. The ability to give this training is seriously limited if it requires either considerable skill or practice to make the two-seater spin at all.

The glider may be designed so that it will not spin, so making it as safe as possible. Gliders such as the ASK 21 are a delight to fly but are limited in their use for spin and recovery training. From conversations with Rudolph Kaiser his design philosophy was clear; he did not want his gliders to spin.

Better and better techniques and education are needed as well as more training. While the modern glider may be a delight to handle because of better aerodynamics it may also have less stall warning. Remember the competition for a stall-warning device? No prize was awarded because there is not one solution for all gliders and circumstances. So the basic problem of stall and spin remains, education and training only provides a partial solution.

So much for spinning. It continues to be a significant cause of accidents, usually fatal; the design philosophy and training policy should be obvious. Knowledge of how an aircraft spins and why the recovery is made in a particular way can obviously be no substitute for proper training. However, in the final analysis, it might just help the pilot to realize that if the ailerons will not raise the wing, nor the elevator the nose, then this does not mean that the controls were suddenly disconnected! Even the knowledge that attempting to raise the wing with aileron near to the point of stall might be critical in discouraging the instinctive use of this control.

My next example is a mid-air collision. Here we have a situation for which the training is limited; a briefing on how to use parachute and perhaps to jettison the canopy. It would not be appropriate to require every pilot to train to the standard to make his first parachute jump; how to put it on properly, to deploy it and the correct parachuting position should be sufficient. However, none of this is of much, or of any, use if you cannot get out of the cockpit.

Some pilots that I have talked to that have survived a mid-air collision have discovered the difficulty of jettisoning the canopy. The work of Professor Wolf Roeger at the Fachhochschule, Aachen, has established the nature of the problem and the solution.

From this work, a little knowledge may mean the difference between survival and death. A side-hinged canopy will best be jettisoned by first opening it in the normal way and then operating the jettison lever rather than the two levers simultaneously. Providing pilots with such basic knowledge is a fundamental training responsibility. Every glider that required it could have a simple modification. Although the risks of collision may not be great, the personal risks after the event are.

My next point is in regard to soaring training, specifically in the mountains. It has been 39 years since I first flew in a glider. This year, by invitation, I took a five-day mountain soaring course in the Southern Alps of France. It is not known how many pilots visit this region each year but up to 250 gliders is near the limit at any one time. I know of pilots who no longer fly there, they consider the risks to be too great.

The demands at any site in any country which attracts visitors suffers the same problem. Can the visiting pilot be trained and checked for every circumstance, every soaring opportunity? Of course not! And there is a price to pay, measured by the number of fatalities. Obviously this is accepted, but is it acceptable? I will deal with possible answers to this question later.

At a less critical level there a number of measures that can be taken to reduce the extent of injuries. Heavy landings may cause back injuries. The means of reducing injury is well known - energy absorbing material on the seat, and correct spinal curvature by using lumbar support which significantly increases the load-carrying capability, for example. But how many pilots put the recommendations into practice?

Other design improvements include the better location of the lap-strap at the hip- or H-point to reduce the risk of submarining - this from the work of TuV Rheinland. Improved crashworthiness is now exercising the minds of designers, perhaps stimulated by the SDP's Crashworthiness working group. And so on. You do not need to be paranoid to adopt such measures, just circumspect. Or do you think that accidents only happen to other people?

The final element of this address concerns the 'regulators' - the people, usually from the civil authorities, who write the rules ostensibly to "make it safer"! The key word here is 'objectivity'. Before considering knowledge, or lack of it I must consider the motivation of regulators. Consider this scenario. Your business might be designing controlled airspace. You may have noticed that the amount of such airspace is seldom reduced. Having just finished the latest 'improvement', what do you do? See what airspace can be done away with? No. More likely design some more! In the same way, there is seldom a reduction in the rules or the design criteria.

But, are such changes really introduced in an objective way. All too often, they may be introduced as a reaction to a single event. A number of examples come to mind.

- A general aviation department is formed because of one year's poor fatal accident record.

- A pilot crashes into a mountain while flying an airplane in cloud. The whole national training regime is reviewed because of this one accident.

In some cases the reaction is due to political pressure; in most cases it lacks objectivity. What is the extent of the risk that they, the regulators, seek to minimize? All too often, they do not know.

In this context, it is worth considering a definition of the word 'minimize'. A U.S. Advisory Circular gives this as: "to reduce, lessen or diminish a hazard to the least practical amount. The least practical amount is that point at which the effort to reduce a hazard significantly exceeds any benefit, in terms of safety, derived from that reduction."

It is a definition that should be engraved on the heart of every regulator.

So, where does knowledge come in? Sadly, the answer is "often not!" If the risk is not significant, why increase the amount or detail of the rules and regulations to reduce it? Not only do they not know proposals seek to go beyond 'minimizing' the risk, they aim to remove it altogether. Such a lack of objectivity is little short of appalling.

But this is emotive stuff, so consider these examples:

- In the UK no pilot's licence is required to fly a glider. Also, there is a 'declaration of health' rather than a medical examination and certificate. In 30 years, and over 10 million glider flights, there have been three accidents from medical causes; each involved pilots with an airplane license and only one student was killed as a result.

Compare this with the cost of medical examinations, an estimate in excess of Dm. 7,000,000 for Germany alone!

Regulators cannot prove the need for a medical examination but we can show that a declaration of health achieves as high a standard.

If the regulators argue that it is to protect third parties on the ground, then consider these figures for the UK:

- For the years 1983 to 1992, the number of airplanes (excluding gliders) has risen from 6,013 to 11,833; the total number of accidents in the same period was 2064, of which 190 were fatal. Nineteen accidents involved third parties, people or property on the ground, and there was only one fatality. Was there a medical cause? Of course not.

I could go on; there are numerous example of regulation for its own sake, but time does not permit. So I will close with a summary.

Glider pilots should recognize the need to understand their sport, the weather, technical aspects, the risks and the need for training.

- Meteorology continues to be increasingly well understood. Information from satellites and computers enables recognition of the weather patterns to realize the soaring opportunities. OSTIV has played its part here.

- OSTIV Airworthiness Standards, via German LFSM, formed the basis for Joint Air Worthiness Requirements (JARs), and continue to do so. The expertise of the Sailplane Development Panel (SDP) continues to refine these requirements.

- Finally, the Training and Safety Panel has, I would like to think, concentrated minds. The one thing that is lacking is an OSTIV Guide on good practice, and work has started on this project.

There is an urgent need for the gliding community to play a more active role in regulatory affairs at every level. It is no use complaining about regulatory changes or of not being consulted. Sometimes this involvement needs to be political.

In the final analysis, it is only the people who glide who can help themselves control their sport. Safety is not achieved through regulation but education - Safety through Knowledge.

IMPORTANT NOTE FROM THE EDITORS OF TECHNICAL SOARING MAGAZINE

"The period between the 1993 and 1995 OSTIV Congress is only 19 months instead of the usual two years.

There will thus be less space available for the Borlange papers than there has been for those of previous congresses, if publication is not to overrun the intervening period unduly, since the number of papers presented was slightly increased.

This means that, to avoid undue delay in completing the publication, all but the shortest papers will have to be condensed, sometimes considerably.

Only in a few cases will it be practical for the individual authors to be contacted; usually the shortening will be done by the editor. However, authors may rest assured that all important arguments and conclusions will be retained."