

The Future of Contest Soaring:

Classes and Rules

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I. Classes

Once upon a time, there was one class: the open class. Standard class came about as a very sensible idea to create a class with good performance, but simple operation and limited cost, in an era when open-class wingspans, costs and complexity were increasing, and their handling became more difficult.

Then, in the late 1970s, the IGC couldn't decide whether to allow flaps in standard class. Allowing flaps would disadvantage the Standard Cirrus owners. Disallowing them would ground the PIK 20's from racing. So they split standard class in two.

But within a few years, new gliders made the existing gliders more obsolete than any flap decision would have done. The result is two classes of nearly indistinguishable performance, cost, and handling qualities for 30 years.

Now we have open (really the 850 kg class), 20m two seat, 18m, 15m, standard, club, 13.5m (absorbing the world class), junior and feminine. This is a very strange trend. In the face of declining participation, why would we fragment the number of sailplane classes?

Perhaps the IGC is thinking only about world contests. It has, so far, been able to expand the number of "world" contests to all these classes. I put "world" in quotes because almost all the contests are held in Europe, and participation from out of Europe is thin for all but the big classes.

But this class structure makes little sense for soaring as a whole; for national or regional contests. The largest countries (US, Germany) still try to have separate nationals in many classes, but this won't last. The US open and PW5 nationals struggle to get the minimum 8 competitors. The last Standard class national was down to 10 gliders, and even 15m and 18m attract less than 30 pilots. We are unlikely to run a separate 20m two-seat national, and we never had enough pilots for separate junior and feminine contests.

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The vast majority of countries gave up long ago. They have one or two nationals, mixing gliders across classes with handicaps. No regional contest even thinks about having all these classes. Either many pilots simply cannot fly, or they fly together with handicaps.

Paradoxically, then, the result of too many classes is a big reduction in single-class non-handicapped racing!

Too many classes also means higher costs. Fixed design, certification, and production costs must be spread over much smaller production runs. With fewer classes, some bygone manufacturers might still be in business.

Too many classes also means less innovation in each class. A stated goal of FAI classes is to foster innovation. But, for example, the current standard and 15 meter gliders were designed 20 years ago, and no new ones are on the horizon.

Handicapped classes

By contrast, the club class is a great success, at least as measured by participation. The club classes are as big or bigger than FAI classes in many countries. And the use of handicaps is spreading.

The most obvious effect of handicaps is that racing is no longer restricted to the pilots who own the latest generation of gliders. Handicapping allows regional contests to exist for many gliders. This is great for participation.

A more subtle effect is that handicapped contests make racing more accessible to everyone. The most popular gliders in the US handicapped ("sports") nationals are the ASW27 and Ventus2. True "club" gliders are never more than a third of the entrants. Pilots prefer to fly in a handicapped race near home or in an exciting location than to drive across the country to "their" national.

Handicaps are controversial. As in other sports such as sailing, there's a lot of arguing about rules and handicaps. No handicapping system is completely fair. At best handicaps are fair on average, across a spectrum of weather, but different days will favor different gliders. Thus, handicaps unavoidably introduce more luck into a contest. It's harder to see how you're doing on course; you don't really know until the big black box churns out numbers at the end of the day. Handicaps also introduce another element of tactics: Go for a lower handicap glider, and try to just stick with the gaggle and beat them on handicap? Go for a better glider, and try to scrape off the gaggle?

For these reasons, many racers hate handicaps. However, despite all the complaining, handicapped contests are popular. It turns out that most pilots are not in the end all that concerned with small performance advantages and disadvantages, but they do like contests with reasonable numbers of glider, and they like being able to fly near home or in interesting locations. For the same reason, often a third or more of the gliders at any given US national are from the "wrong" FAI class; standards fly in 15, 15 in 18, 18 in open. These pilots are merging classes spontaneously even without the handicaps!

Races have to be popular. They have to attract the bottom 45 pilots who pay the bills, not just the top 5 racers. Given the profusion of FAI classes, it's clear that handicaps will continue to spread.

Future classes

The world class was a fiasco. It wasn't a bad idea in the abstract: Maybe pilots were really all hungry for simple, cheap one-design racing and didn't care that much about performance or sexy looks. The failure was in doing no serious market research to see if this idea was correct. It turned out that when it's time to buy, pilots choose €180,000 18 meter gliders, almost all with motors.

The IGC recognizes that world class was a mistake, but now they are faced with the question, what do we do with the PW5s? So, they are creating a 13.5 meter class. The idea is that this will allow not just PW5s, but also Russias and Silents and other similar gliders to participate.

Alas, it's easy to guess what will happen. First, pilots will quickly settle on the highest-performing glider in this group. It won't be the PW5. The PW5 is just as obsolete in a 13.5 meter class as if the IGC had abandoned the class entirely.

Then, the minute a new glider is designed to the 13.5 meter rules, all the current gliders will be obsolete, just as the PIK 20 and Standard Cirrus were obsolete the minute the Discus and ASW20 came out. And we'll be stuck with yet another class for 30 years.

What's the answer? If the purpose is to craft a racing venue for existing gliders, you merge them with handicaps.

This is the lesson of club class' brilliant success. To create a place for PW5s, Russias, and Silents, the IGC should instead create a second division of club class, for gliders with handicap below 1.0. This will allow many other gliders below the current club class list to participate.

The IGC need not decide from on high exactly where to draw handicap ranges. The right structure for racing gliders of widely different performance is to carve them up into ranges, set flexibly according to the number and character of gliders that show up at a given contest, and allowing the ranges to overlap. That's what most countries are doing anyway.

Maybe I misunderstand the point. The IGC did say they want to foster the development of new gliders in this class. Maybe the IGC does want to make all existing gliders quickly obsolete for racing, and hopes to see new 13.5 meter racers soon.

But why do we need to create of a whole new kind of glider? At least for 18 meter class, the IGC followed market demand, creating a racing class for gliders people already wanted to buy. And 18 meter gliders fit a natural aerodynamic and technical niche.

There is no 13.5 meter *racing* glider right now. 13.5 meter gliders have been developed for recreational and club use. They trade off lots of performance for light weight, cheap certification, and so forth.

A 13.5 meter racing glider will look like a scaled-down ASW27. It will get roughly 40:1, using modern technology to create ASW20 performance with 3 meters less span. If the class has no waterballast, it will have a high empty wingloading, making it unsuitable for early pilots. Judging from the price of standard, 15, and 18 meter gliders, it will save no more than 5% relative to a new 15 meter glider,

including instruments, trailer, etc. The design challenge may force the use of exotic materials, in which case it might cost more. Who wants a €100,000 ASW20?

Nobody. Nobody is building it now. Standard and 15 meter design, innovation, and production are already at a standstill. Nobody is thinking about producing a 13.5 meter racer.

If the purpose is to foster technical development of a new class for new gliders, do some market research. Adapt specifications to technical and market realities.

The Silent, etc. are neat little gliders, and they are in production and are selling. Successful innovation in this class would be useful. Soaring can't go on forever making only 18 meter motorgliders! However, a successful unhandicapped class for gliders such as these will need restrictions beyond wingspan, such as weight, wing loading, certificability as light sport or microlight, etc. Given those restrictions, it's not obvious that 13.5 meters is the right wingspan. Finding the right rules for a class that companies will build and people will buy will take a lot of serious market research.

At least the 20m double-seat class represents very popular gliders. But here too, the IGC faces crucial decisions. If they leave the class unlimited, all the duos and DG 500-1000 are obsolete. It becomes an Arcus class. Also, small convenience items like the non-retractable nosewheel must disappear. These make the gliders cheaper and much more useable in a club environment, but at a performance cost that is unacceptable for world-class racing.

Much of the motivation for the 20m class is, I think, to create a fun class in which to race existing gliders, not to foster the development of all-out racers with 20 meter wings and an extra seat. These gliders, though performing admirably, are also designed for club use and reasonable cost. Furthermore, though these gliders are popular, they are nowhere near popular enough to fill out 20-30 gliders at a national or regional level. So a separate class will again only apply to "world" championships, with countries left on their own again to merge classes with handicaps.

Why do these gliders need a separate class anyway? Two-seat gliders do not seem to be dominate the open class. Simply creating a high-performance handicapped class, which could include the older Nimbus 2/ASW17 type gliders as well (who currently have no place to race) might make more sense.

No new Standard and 15 meter gliders are being designed or produced. This is actually healthy in the short run. Though not fostering the development of anything, we have the essence of one-design racing, with no threat of something new coming along every few years. However, both classes are declining as pilots move away to 18m or other temptations.

The IGC should merge standard and 15 meter classes. They can allow any standard glider designed or produced before 2011 to have a 2% handicap advantage. Modern (ASW28, Discus 2) standard class gliders are not easier to fly than 15 meter, no more suitable as club gliders, and about the same cost. There is no reason to keep separate classes going.

But 15 meter, non-motorized gliders make a lot of technical and economic sense. Merging the standard and 15 meter classes is, I think, the best chance of restarting development and production of these wonderful gliders and keeping some semblance of single-class racing going with them.

Over the long run, the IGC should stick to only a few non-handicapped classes. These should be decided at least 10 years in advance, and thinking about what makes technical and financial sense, not thinking about how to group currently existing gliders. The class structure needs to think about all races, including national and regional races, not just the worlds!

II. Rules and incentives

To most pilots, rules are boring. But rules make the race! Wise rules can contribute greatly to the success of contest soaring. And vice versa.

Good rules balance two functions, *measurement* and *incentives*. The minute a rule says “this is how we measure your performance,” the pilot asks, “how do I change my strategy to take advantage of the rule?” In an ideal set of rules, you don’t; you just go fly as far and as fast as you can. Most rules, alas, lead to big changes in behavior.

The US team puzzled over the following question: Why is it that at worlds, pilots wait for hours before they start, and then go around the course in huge cautious gaggles? This doesn’t happen in the US. Some speculate that it’s a cautious European character, vs. “individualistic” Americans. But put those cautious Europeans in a Grand Prix, with different rules, and they suddenly stop gagging and leave us “individualistic” Americans in the dust.

The answer is in the scoring formulas. In IGC rules, the “lone wolf” who starts early, or leads out, and makes it home when the gaggle lands out gets little for his efforts. The lone duck who lands out when the gaggle makes it home, or gets caught by the gaggle, loses catastrophic amounts of points.

The table gives some numbers. Suppose the lone wolf leaves early and is the only finisher of 50 pilots. He gets 1000 points². Alas, with 1/50 finishers, the scoring formula gives only 13 speed points. A sheep in the gaggle who lands just short of the airport still gets 987 points. But if situation is reversed, the gaggle finishes, but the lone wolf finishes slowly or lands out just short of the airport, it’s a “speed” day and he only gets 347 points!

	Wolf	Sheep
Wolf finishes, sheep land out	1000	987 x distance/task
Sheep catch the wolf	347	1000
Wolf lands out , sheep finish	347 x distance/task	1000

And so we see contest pilots indulging in hours of start games, and then all landing out. The organizers decry the pilots’ timidity. But given the rules, the pilots would be fools to do otherwise.

² The scoring formulas are in the sporting code annex A, section 8.4 p. 91, <http://www.fai.org/gliding/system/files/sc3a.pdf>

US rules are not perfect in this regard either. But they do favor the lone wolf to a much greater degree, so there is much less start gaming and tactical gaggle flying. We also don't buy need to buy gliders with motors. Since we leave earlier and have more turn area tasks, we have far fewer landouts.

Do we want races that value the pilot, his reading of the weather, and his machine? Or do we want races that value start games, tactics, big gaggles, and clever use of the rules? We can achieve either once we understand that rules must balance measurement and incentives. The problem in this case is that how we measure each pilot depends so much on what everyone else does. Not changing the balance of speed and distance points according to landouts would make for many more lone wolves. Greater reliance on area tasks would also break up the gaggle.

Rules and safety

Once you realize that rules give incentives as well as measure performance, there is an obvious safety implication: if we remove temptations -- places in which pilots can earn hundreds of points by accepting a physical risk — we can lower the accident rate. Of course, such changes are most attractive if they do not reduce the “measurement” function, i.e. spoil the race.

A recent example occurred in a crash at the World Championships in Hungary. There were many good fields for the last few km before the airport, then a road, a fence and the airport. A pilot returned on a marginal final glide. Floating over several gliders in the field short of the airport who didn't quite make it, he still thought he could do it. Skimming in ground effect, he had just enough energy to pull up over the fence....except there was a truck going down the road. The truck driver was severely injured in the resulting crash.

Now, why did this pilot ignore the perfectly good field, and instead try to pull up from ground effect to just skim a fence, to say nothing of the road? Well, obviously, the rules offered him hundreds of points if he cleared the fence by 1 mm.

This is not an isolated accident. Year after year, around the world, there are regular crashes in the fields (or lack of fields) in the last few km before the finish, *on* the finish fence, or resulting from arriving at the airport with 10 meters, 60km/h, and no ideas.

And we glorify it. How many stories have you heard, or seen written in our magazines, telling the great story of the marginal final glide, the last minute pull up to make it over the trees, and the heroic landing just over the fence to win the day.

What should we do? We can deplore it, as we have for 50 years. “What a dummy.” “A good pilot like me would never do that.” That makes us feel better, but it is of little help to the truck driver, or the pilot's family. Wiser pilots know we are *not* immune to temptation.

We can spend another 50 years yelling at pilots not to do it. We should, and will. But this is hardly new wisdom, and I'm sure this pilot – like every other pilot at a world championship – could have given a great lecture on just this danger. Yelling makes us feel good, but it has not reduced the accident rate.

How do we actually reduce the accident rate? The answer is obvious. Don't give hundreds of points for finishing 1mm above the fence. Move the finish point upwards. If the minimum altitude is 200 meters,

you get only distance points for finishing at 199. It makes no difference to the quality of the race – measurement -- since the change is the same for everyone. Think of it as moving the ground down 200 meters.

The US is slowly moving to this system. Our crash rate involving low energy final glides and finishes has gone down substantially. The IGC is also slowly moving the finish out and up as well. The penalties are still insufficient. If you finish low, you get a warning the first time and 25 points the second time. But 500 points and a warning is much better than 500 fewer points and no warning, so pilots will still push the glide. The right answer is to give exactly the same points on either side of the fence, which the “high finish” achieves.

All of this is horrendously controversial, and proponents of these changes have been very unpopular in the US. I wrote an article explaining the high finish 10 years ago in our national magazine, and it still is not completely implemented.

That negative reaction is interestingly common in many sports. Bicycle racers fought helmets for years. They claimed “helmets will worsen safety, because they obstruct your vision.” (Sound familiar?)

A common complaint is that proponents want to “legislate safety,” or “remove the pilot’s responsibility.” That is not correct. This kind of rule change only removes temptation (bad incentives), where it costs little (measurement) to do so.

Safety decisions are always the pilot’s responsibility. But *we* get to decide what actions we want to reward with contest points. If we think the skill of judging whether you’ll be 1 cm above or 1cm below the fence is not the skill we want to use to select our champions, then it is entirely our job, and our duty, to change the rewards. By moving the finish up we are *removing* a strong incentive to try something stupid; we are *returning* the decision to the pilot; we are saying “yes, this is completely your responsibility. You’re in a tough spot, make the right safe decision. We won’t try to tempt you one way or another with hundreds of contest points.”

And there’s nothing new here. We have been removing temptations from the rules forever. Once, you could land out, return, assemble and try again. The result was a 200 kph retrieves, 5 minute assemblies, 10 second preflight inspections; not a great display of decision-making. The rules changed; now once you land out you’re done for the day. In the past, some some pilots filled the wings with huge water bags, flying way over certified gross weight. Now we have rules and weighing to remove this temptation.

The future

Are there further possibilities to remove incentives for unsafe flying?

Starts can be improved. The most common start geometry is an unlimited altitude gate. What’s the result? A big bunch of pilots flies up into the clouds at the upwind end of the gate. There is an option for a height limit, but it does not include a time or speed limit before the start. Pilots still climb in the clouds, then dive at VNE parallel to the line, turning quickly when they hit the start altitude.

The US uses a start cylinder with a top well below cloudbase. The cylinder removes the concentration of traffic at the most favorable, upwind edge of the line. Pilots must spend two minutes below the top of the cylinder before starting. This is more practical than enforcing a speed limit. While anything can be improved, this geometry gives much less incentive for unsafe flying.

The vast majority of contest crashes remain on off-field landings. I look at all the US accident reports, and I have looked at a lot of traces. Practically no contest off-field landing follows the book: examine fields from over 300 meters, commit by about 200 meters, fly a proper pattern. Thermaling at 50 meters, and roll out to final, or straight in at best L/D is much more common. No wonder there are lots of crashes.

These crashes could be addressed with a "hard deck." At an easy MSL altitude corresponding to roughly 300 meters, you are scored as if you landed out. This could be implemented tomorrow by simply making airspace below certain MSL altitudes forbidden in the airspace files. The altitude is over the valley, mountains and ridges stick out.

Again, such a rule does not remove any pilot's decision-making responsibility. We are doing exactly the opposite. We are simply saying at about 300 meters, "look, you need to make a good safety decision. Maybe you can thermal out. Maybe you should give up and land. Whatever you do, be a good pilot in command and make that good decision. And by the way, we don't want to bias that decision one way or another. So points are off the table, no matter what you do. See you when you get back."

"What about my 50 meter save?" the anguished pilot cries. Well, I answer, what about the guys who didn't make it? The gun clicked 5 times in a row. That doesn't mean Russian roulette is safe. If we want to reduce the accident rate, the 50 meter save will have to go, along with the 1-meter-above-the-fence finish.

I brought this idea up to a meeting of contests pilots a while ago. The vote was 39-1 against. I heard the usual complaints about legislating safety, pilot decision making, and my general wimpy attitude.

The US Airforce Top Gun flight school has a hard deck in simulated combat exercises. If you go lower than 10,000 feet you lose. I guess they're wimps compared to us contest pilots. Or perhaps they looked at a few too many crashes and decided to actually do something about it.

A related controversy is brewing in the US. Should the Competition Director have the explicit right to call off the day if the weather gets out of control? Many other sports (sailing) do this. Our tradition – not rule – is that once the start is open, the race is on for good, no matter if a tornado or squall line appears. We expect pilots to voluntarily give up when weather turns dangerous. But we give out points and world-team slots to those who thread the thunderstorms and survive. Shouldn't the CD have at least the right to get on the radio and say, "Listen up, pilots. We have a tornado out there. Use your pilot decision making to do the safest thing possible. It might be safe to come back, it might not. You make that decision. The race is canceled. Forget about points, I want you totally focused on making your own safety decisions."

And of course, as I emphasized above, gagging and leeching are only a function of rules, in particular task type (turn areas spread pilots out more), start procedures, and scoring formulas. If we dislike them for safety reason, that's an area of potential improvement.

Can we stop all accidents? No. Can we remove all temptations? No. Are rules changes the biggest route to lower accident rates? No. But if we remove from glider racing the remaining situations in which you can earn several hundred points from taking risks unacceptable in regular flying, will we reduce the accident rate? Yes. As we have done many times in the past.

Why not? Some say “gliding is a dangerous sport, accept it.” This is true, but it does not mean we need to make it artificially more dangerous than it already is.

Most of all, the answer is, participation. One accepts danger in extreme sports or in spectator sports. Motorcycle jumping or Formula 1 racing come to mind. One does not attract widespread participation with danger. When you tell people you soar, what do they always ask? “Isn’t that dangerous?” (Or “how nice, I’d never let my husband do that.”) When you tell a regular pilot you fly contests, what do they often say? “Sounds like fun, but I don’t want to break my glider.” If we could honestly refute that impression, we’d have a lot more participants.

A recent *Sailplane and Gliding* interviewed Hans Werner Grosse, and asked why he gave up flying competitions. He answered, “I still hate gaggles, tactical start-line games, and low approaches in close company with other pilots who have not been to enough funerals.” All of those come from the rules, and all can be changed.