

Flarm in US Contest Rules 2011

This is a report on the decisions taken by the US rules committee regarding Flarm in US contests during the Fall 2011 meeting.

1. Summary

We have decided to take the following actions for the 2011 season

1. Allow and encourage Flarm use. Flarm will be explicitly legal in the rules. The rules appendix will encourage Flarm adoption. Entry forms will have a checkbox for Flarm next to ELT. We strongly encourage a voluntary rental program.
2. Rules Mandates. Neither MIRA (Dale Kramer's "Mandatory if Rental Units Available") nor other mandates will be imposed for the 2011 season.
3. MIRA Waiver. Depending upon the development of the PowerFlarm unit, its installation requirements, the details of the MIRA rental-unit system, and the outcome of voluntary rental efforts, MIRA may be allowed by waiver in selected 2011 contests.
4. Stealth or other restrictions. We are not imposing stealth or other restrictions at this time. We may impose restrictions later, and may do so on a contest by contest basis.

In considering the contentious MIRA issue, it is important to distinguish a *voluntary* rental program, which we support enthusiastically, with a *mandate*, in which pilots face the threat of being sent home or facing penalties.

We will actively monitor Flarm adoption, use, pilot experience, and competitive side-effects, and revisit all these issues next year. Many pilots are encouraging us to take strong action on these issues – and we have heard opinions in both directions on each one. However, as a guiding principle, we do not want to take strong actions based on theory or opinion which are not based on experience. The only unit planned for sale in the US is PowerFlarm and this unit has not yet been put into production. At present, we have no experience with the US PowerFlarm unit and it is simply premature to impose or to write detailed regulations regarding its use.

The rest of this document provides detailed analysis, summary of our discussions, and describes our current long-run thinking on Flarm adoption. We hope that interested pilots will take the time to read this analysis carefully.

2. Background

Flarm is a collision warning system developed in Europe. It is based on two-way radio data exchange of GPS positions and velocity. It has been widely adopted in European contests and is very popular with pilots.

The Flarm system was developed by glider pilots for glider pilots and the specific needs of glider-glider and glider-towplane collision dangers. For example, it is tuned not to give excessive warnings in gaggles which would bedevil general-aviation products.

A new product, called PowerFlarm, is being developed for the US market. It will combine an upgraded version of the regular Flarm collision warning device, with slightly greater range, a new graphical display, the capability to detect and provide warnings about transponder-equipped traffic; and an IGC flight recorder suitable for contest use. Retail price is announced at \$1695, with substantial discounts for early purchasers and large volume orders.

The manufacturer has announced April 2011 availability, though this is conditional on FCC approval. We feel that any rules action should anticipate the usual snafus in bringing a new product to market, delivering it, installing it in gliders, and pilots becoming familiar with the equipment.

For (much) more information, please consult the US pilot's Flarm website, <http://www.gliderpilot.org/FLARM>, and the links it contains.

3. Allowing and Encouraging Flarm

The Flarm system might have been considered illegal equipment in the current rules. We propose (subject to SSA BOD approval) to explicitly allow and encourage Flarm with the following addition to rule 6.6.3 and the appendix. (Current text in black, proposed new text in italicized red.)

6.6.3 † Carrying any two-way communication device is prohibited, with the following exceptions.

- † A standard aircraft-band VHF radio
- † A wireless telephone (which is not to be used during flight)
- † A position reporting device
- † *An anti-collision device*

Appendix 6.6.3: SPOT is an example of a position reporting device. Examples of anti-collision devices include Flarm and PCAS such as the Zaon MRX unit. Though Flarm is not required, the Rules Committee recommends the use of Flarm by every competition pilot. The potential safety benefit is large. This could be a suitable topic for a safety briefing

We also will change the pilot application form to indicate whether the glider will be flarm equipped, as we now do for SPOT and ELT usage. This step will help us to track Flarm adoption. Knowing who has Flarm may also help pilots to see the individual benefit of adoption, and enhance social pressure for adoption.

We considered the view that allowing and encouraging Flarm might slow down pilot adoption of some future anti-collision system based entirely on ADS-B. We reviewed the progress of ADS-B, Mode S transponders, and their current certification and installation woes. We came to the conclusion that we should not delay or discourage voluntary adoption of the Flarm system in contests for this reason. Most of all, Flarm is designed for glider-glider collision avoidance in contest environments, which is our main concern. Better alternatives that are aimed at this issue are not even on the drawing boards. However, pilots buying Flarm, like any electronic device (or glider for that matter) bear some risk that at some point in the future a "better box" may emerge.

4. Rental program

Dale Kramer has spearheaded the “Flarm Fund,” a non-profit organization which will maintain a stock of portable power-Flarm units that can be rented by gliders and towplanes at contests for a reasonable charge. The Flarm manufacturer is supporting this program with a very good discount. A large number of pilots have agreed to donate to the Flarm fund. For more information see <http://www.flarmfund.org/>.

The rules committee commends Dale, Flarm, and the contributing pilots, and strongly supports this program. The rental program will allow new pilots to try Flarm, and it will allow contests to fill out the fleet of both gliders and towplanes, making Flarm more useful.

This program will of course have to figure out a host of operational details. Among these:

- How easy will it be to temporarily install PowerFlarm in a glider or towplane? The form factor of Power Flarm is different from the earlier Flarm, so it’s not obvious that velcroing it to the top of the glareshield will work. Additional mounting hardware may need to be developed. We will need to know if typical easy installation options give adequate radio performance.
- How much pilot training is required to use the Flarm acceptably?
- How will the mechanics of the rental program work? How will a large number of Power Flarm systems be delivered? Who helps with installation? How is battery management handled? How are they collected, maintained, updated, and any fees collected and accounted for?

We encourage Dale and other Flarm Fund supporters to run rental programs as soon as possible, understanding that there will be a learning curve as these and other details are worked out.

5. Mandates, MIRA

Many pilots have suggested that the rules committee mandate Flarm in some or all contests. Other pilots have expressed strongly contrary views. Dale Kramer has developed a thoughtful “MIRA” (“Mandatory if Rental is Available”) approach, in which contest organizers may declare Flarm mandatory provided rentals are available through the Flarm Fund.

The Rules Committee carefully considered the mandate suggestions and objections, and the MIRA proposal. We do not think it is appropriate to consider any rules mandates for the 2011 season. Among others, we have in mind the following considerations

- PowerFlarm is a new product, subject to FCC certification, and only promised for delivery in April 2011. We need to give pilots a reasonable time to purchase the devices, receive them, install them, and learn how to use them, before considering any mandate.

- The rental program is untried, and many of the operational details need to be worked out, as above. We encourage voluntary rentals as soon as possible. But if a contest operates under a mandate, then rental, installation or operational snafus (pilot pushes the wrong button) mean that pilots face the threat of being sent home, subject to penalties, etc. Before considering a mandated rental, we need some experience with the rental program, and assurance that it will work.
- A rules-based mandate, with the threat of being sent home or penalties for non-compliance, assumes that there is a significant pilot population who will refuse to install a Flarm when provided by a well-run, low-cost rental program, at a contest in which everyone else has a Flarm and there is significant informal social pressure to allow the installation. Are there really any such pilots? We need to see there is a problem; that a substantial number of pilots actually refuse rental units and so need the pressure of a mandate to comply.
- A mandate to use a new piece of equipment is a very major change, and should be done by the regular rules process. Pilots need to gain experience with the product, and the rules committee needs to monitor pilot opinion through SRA meetings, polls, and comment collection. This is a decision that should be taken collectively by the contest community, not “imposed from above” on short notice.
- Like all technology Flarm has finite (though large) benefits, and non-zero costs. Mandating that every new pilot at a small sports class regionals in uncrowded airspace must carry a Flarm imposes a \$1500 barrier to contest entry, which must be considered. (This is a consideration for pure mandate; we recognize that MIRA at organizer discretion addresses this issue.)
- Any mandate threatens a backlash. Many pilots who would adopt Flarm in one or two years after seeing the benefits, talking to their friends, listening to safety talks, and renting one for a contest or two will become converts under a voluntary system. The same pilots are likely to dig in their heels and say no to a sudden mandate. The RC *has* received feedback that some pilots say they will refuse to attend contests where a mandate is in place. These pilots need patient education by Flarm supporters.

The rules committee believes that mandates should come, if at all, as a last step. Our vision and our reasoning are as follows.

- A large fraction of active contest pilots have already ordered Flarm voluntarily. We are well over the hump that “there’s no point in me getting one because nobody else has one.” Flarm reports over 200 orders. As of November 15, 90 pilots have announced their intention to buy a Flarm at <http://www.gliderpilot.org/Flarm-PlanToPurchaseList>. 32 have announced a personal purchase along with donation to Flarm Fund at <http://www.flarmfund.org/>
- We anticipate that voluntary adoption, dissemination by word of mouth, and social pressure will bring a large fraction of regular contest pilots into the fold within a few years, especially at the

large and gaggly nationals (standard, 15, 18, open) and regionals which those pilots frequent. We anticipate that few pilots will refuse a voluntary rental program -- especially if the program operated smoothly enough that we could even consider it for a mandate. The question of a mandate for the 2011 season is this: How much more quickly will Flarm be adopted by a *mandated* rental program, with threats of penalties or expulsion, than it will by a *voluntary* rental program supported by the same infrastructure? On the other hand, how many pilots will be discouraged from participating in a contest by a mandate? This number is not zero – we have strongly worded emails to that effect.

As we ponder this question, we do not regard the small (if any) increase in adoption that a mandate would generate as worth our estimate of the costs in terms of lower participation that mandates might cause, at least for the 2011 season.

The major impediment to Flarm adoption for the 2011 season is the availability of units from the manufacturer, not pilot unwillingness to purchase, install or rent units. The point of a mandate is to address the opposite situation – units are easily available, but pilots are refusing to install them.

Our plan is to monitor Flarm adoption closely. We will reconsider mandates if the pilot community comes to the view that Flarm works very well, but voluntary adoption, social pressure, easy availability of proven units, and a smoothly-functioning voluntary rental program, are not sufficient to produce the desired amount of Flarm adoption.

In taking this step, we have considered but rejected the following motivations for immediate mandates:

- We do not agree that 100% must be equipped in order for the system to be of any use. More is better, of course, but Flarm is still useful even if a few gliders and towplanes at a contest are not equipped with Flarm¹.
- We are not in a crisis. Each midair is a tragedy, but overall midairs are not very high on the list of statistical causes of damage, injury or fatality. No change in the contest environment has made midairs more likely in the next year than they have been in the past. Flarm is an improvement on a system that has worked reasonably well for many years, not a response to a suddenly greater danger. The pilot community has not embraced similarly draconian steps to

¹ The number of glider-glider pairs covered by Flarm is proportional to the square of the number of Flarms. For example, if 90% of the pilots carry Flarm, then 81% of the glider-glider links are protected. 81% isn't 100%, but it's not zero either. Furthermore, for an individual pilot who has bought a Flarm, the number of links he is protected against is simply the fraction of other pilots who have installed Flarms. If 90% of the other pilots have installed Flarms, a given pilot who has done so is protected against 90% of the pilots who he might hit. This link analysis also assumes all gliders have an equal chance of hitting each other. In fact, gliders in the "fast gaggle" don't interact much with slower gliders, newcomers, or lone wolves.

address the statistically much larger dangers of landouts, crashes into terrain, and low energy final glides. Safety issues should be handled on a consistent and objective basis.

We also note that concerns over competitive side effects had no influence on our reluctance to endorse mandates for the 2011 season.

6. Sporting Considerations, Stealth Mode

a. Background

In addition to providing anti-collision warnings, Flarm gives information about where the other gliders are, which is potentially useful in competition.

To some extent, this side effect is unavoidable. Any device that can tell you “there is a glider thermaling ahead, don’t run in to it” must provide information useful for “there is a glider thermaling ahead, go join his thermal.” Transponder detectors with displays (such as Zaon XRX which gives distance, heading, and altitude) and eventual ADS-B traffic displays all provide information that is potentially useful in this regard as well.

However, the Power Flarm provides much more useful information than any of these future alternatives. The new Power Flarm display gives a graphical representation of targets within a few miles (distance depending on antenna location and user setting). PowerFlarm outputs data that flight computers and PDAs can use to provide additional information including relative altitude, climb rate, and even call sign.

Flarm can be set to a “stealth mode” which limits such information. In “stealth mode” other gliders will only be displayed in a cone ahead, with limited range, or if they pose an imminent collision threat. Climb rate and call sign information are not displayed, and noise is added to relative altitude so that computers cannot back out the climb rate. In turn the “stealth” glider does not show up on other displays, even those not set to “stealth mode,” in the same situations. The setting of “Stealth mode” can be verified by looking at the trace. (This information is approximate and preliminary. Since PowerFlarm is a new product, the exact nature of its “stealth mode,” including how much is displayed on the PowerFlarm display, and how much is sent out to the dataport for other displays, is still unsettled.)

One may think, “ok, let’s mandate stealth mode for contests,” but doing so opens a can of worms.

- If indeed Flarm is very useful competitively, then such a rule must be actively enforced. (If it’s not useful, then there’s no point to requiring stealth mode.) That means a cockpit check or other steps to guard against a second Flarm feeding the flight computer; daily submission and evaluation of the igc files to verify stealth mode setting during the entire flight; verification of igc file security to verify the file has not been tampered with (add stealth mode indication with

laptop); training of scorers to handle this task; programming scoring computers to recognize stealth settings. It also means penalties. Logger failures, log security failures, battery outages (the portable power flarm uses internal batteries) and pilot mis-steps must all generate penalties.

- Stealth mode lowers situational awareness and thus lowers the value of Flarm as an anti-collision device. If you learn of another glider's presence behind you while he is not a threat, this is better than waiting until you hear loud beeping when you crank over to enter a thermal. If gliders only show up when they are a threat, evasive action to avoid one can put you in the path of others. For this reason, Flarm recommends against the use of stealth mode.

Some countries have recently mandated stealth mode, but we have not yet collected their experience. Our WGC pilots reported that WGC mandated stealth mode, but this was completely unenforced so that the majority of pilots were flying with stealth mode off. This is the worst of both worlds.

Overall, European contests have left this to the pilots' decision – turn stealth on and they can't leech you, but you can't leech them. Given this choice, the vast majority of European pilots are flying with stealth mode off, and do not seem to be unhappy about the effect it has on contest soaring. U.S. attitudes may differ on this, as on so many other aspects of contest soaring, however.

Given these unpleasant choices, UH is working with the Flarm manufacturer to see if a "stealth mode lite" can be developed for the US Powerflarm. Some options include keeping all gliders displayed while suppressing climb and call sign information, and being able to set stealth mode irreversibly for the duration of a contest, so that only one trace must be verified and the pilot will not be subject to penalties for glitches. Needless to say, the availability, operation, debugging, and pilot familiarity with such modes is still in the future.

b. Rules committee discussion

The RC had a spirited discussion of these issues. As expected given that we have not yet seen the PowerFlarm and have limited experience with regular Flarm, many questions remain.

- Just how useful are Flarm displays for locating thermals anyway? Cochrane's experience from the WGC was that it was not particularly useful. Elliott reported that it was useful, and he liked the experience. Cochrane attempted to collect informed opinions via r.a.s. without much success.
- If it is useful, is this good or bad for the contest soaring experience? The possibility is that one can keep track of more gliders in a roughly 4 mile radius than one could do by naked eye. Will this make gagging and leeching easier? Or will knowing a wider range of gliders is around, and greater ability to pick up other gliders when alone, lead pilots to strike out more, rather than slavishly follow a small group? Most of all, will pilots like this ability, or bemoan its overall effects on the contest experience?

We know there are many strong opinions on both sides in the US contest community right now, reflected in the poll, r.a.s, and comments to us. Some feel that the ability to use Flarm to locate other gliders will be very bad for the sport. Others feel it will be pretty neat, and that this will be like GPS – after a hue and cry when everyone gets used to it, pilots will regard it as an improvement to the overall contest experience. (Some argued that we should encourage competitive advantages in order to give pilots incentives to buy Flarms, but we rejected this argument.)

We agreed that participation and the overall experience are the bottom line goals. If change makes pilots happier we should accept it. If change makes contests less enjoyable, we should pass rules to stop it.

We also know that nobody has any solid information, about PowerFlarm, about its actual usefulness for tactical questions, with the operation of stealth mode, with the limitations on collision avoidance that stealth mode imposes, or with the change in tactics and contest experience that PowerFlarm location of other gliders induces. After long discussion, we decided that making strong rules on theory is a bad idea.

c. Action and plan

Given this state of affairs, in the end, it seemed to us premature to impose stealth mode and associated procedures and penalties for the 2011 season.

We will actively solicit pilot experience and opinion (especially opinion informed by experience, and not armchair speculation!) throughout the 2011 season, and likely for following seasons as well. Expect questions on these issues in polls for many years to come. We must all decide together whether the potential competitive uses of Flarm displays are an enhancement, neutral, or damaging to enjoyment and participation of our sport.

If pilots dislike changes to the race experience brought on by Flarm displays, we will develop plans to require stealth mode, and work with the manufacturer to incorporate the optimal kind of stealth mode that balances collision avoidance, competitive issues, and complexity of verification.

We may also make any restrictions on a contest-by-contest basis and on a temporary basis. For example, it may make sense to impose stealth mode on nationals, where competitive issues are most important, while we continue to leave out such a requirement for regionals. This step would shield nationals from potential competitive side effects while we continue to assess whether stealth mode is a plus or a minus overall for our main goal, pilot satisfaction and participation.