F2D News - January 2009

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Change is here! No, I'm not talking about the US government. I'm referring to the F2D rules. January 1, 2009 has passed, and the last time I checked the world has not imploded yet. That can mean only one thing – from now on you better keep it strapped up with a shutoff every time you fly.

What's that you say? You don't have any shutoffs? Don't know how to use one? Don't have any idea how a shutoff works? I won't say "not to worry," but instead I will try to provide you with some (old and new) references and information to hopefully help ease the transition.

Let's start with the official wording from the CIAM website:

> From the 1st of January 2009 it will be mandatory that an engine shut-off be used in F2D. In the event of a fly-away the shut-off must activate and stop the engine. Failure to do so will result in disqualification.
>
> The shut-off can either be armed by the mechanics prior to launch or by automatic arming of the shut-off on take off. When the model is prepared the shut-off may also be armed.
>
> A damaged shut-off on a landed or crashed model (for instance as a result of a mid-air collision) must be repaired or replaced before the model is launched again.
>
> Both mechanical and electronic shut-offs will be allowed, providing they do activate and shut down the engine in a fly-away. The fly-away activation can be of any type, mechanical or electronic.
>
> The shut-off rules are intentionally of a basic nature to allow the development of good working systems but it should be noted that flagrant breach of the rules or "ungentlemanly conduct" will result in disqualification.
>
> 8th of December 2008
>
> Bengt-Olof Samuelsson C/L Subcommittee Chairman

So that's what we have to work with. Now, what to do about it. The best and most comprehensive reference for information on shutoffs to my knowledge is still Henning Forbech's webpage `http://www.modelflyvning.dk/linestyring/combat/shutoff/shutoff.htm`. If you haven't looked at it before, or even if just not recently, I strongly suggest looking over what he has posted. He has amassed a wealth of information about his own tests and designs, as well as those of other people, and is sharing it freely with the public. We should all thank him for helping spread this information around and facilitate rapid development.

Another great resource is on Preston Briggs' control line combat information page: `http://www.clcombat.info/shutoffs.html`. In addition to the shutoffs you see on the page when you enter the address mentioned in the previous sentence, there is a menu bar along the left side that will allow you to navigate to detailed pictures of a wide variety of shutoffs used in Fast combat. Although some adaptation is needed to meet the specific challenges of F2D, this site can be a great resource for ideas.

In terms of readily available products, the Aerolux factory in Ukraine is now producing centrifugal force activated swing-arm shutoffs for $35 each. I saw an early prototype when I was in Novomoskovsk last year, and my sources tell me that there has been considerable development and testing since that time. A nice feature of swing-arm shutoffs as that they easily bolt on to the mounts of existing models without the need for any modification (in contrast to shutoffs based on moving bellcranks, etc). Although those who flew Fast combat in the late 90s and early 21st century are undoubtedly familiar with some of the controversies and arguments surrounding swing-arm shutoffs, I think it would be a big mistake to overlook the swing-arm at least as a temporary solution for the 2009 F2D season. While I was back in CA over the holidays, I flew several matches with a swing-arm shutoff (prepared by my dad) and found it to be working reasonably well.

FIG. 1: Pete Athans' F2D shutoff. The other end of the string is attached to the leadouts, and opens the spring when line tension pulls the leadouts straight.

Keep in mind that no shutoff will ever be 100% effective. Every design has its flaws and particular set of conditions that can lead to failure. We've been flying without any shutoffs for a very long time; a shutoff that works even 60% of the time is already a good step in the right direction.

Over time we can continue to refine our equipment, but for the immediate future the best strategy is to find something that is simple, cheap, and relatively reliable/effective. In this vein, Pete Athans has been working on an extremely simple solution that requires nothing more than a simple spring and a piece of string – only $0.08 USD in parts, and perhaps 5 minutes to set up! One end of the spring is attached to the engine/mount, and the other end is attached to a piece of string ("spider wire") that connects to the model's leadouts. The fuel line (soft latex stuff) runs between coils of the spring. When there is line tension and the leadouts are fully extended, the spring opens up and lets fuel flow. When line tension is lost, the spring pulls closed and pinches the fuel line between coils. It's dead simple and can be adjusted by changing the length of the string or the tension/strength of the spring. Don Jensen has adopted this design and made some of his own modifications. Although the design still needs an effective arming mechanism, it looks very promising. According to Pete, he used this same design in Fast combat and had 6 successful shut-downs in flyaway situations.

At perhaps the opposite extreme, Alex Prokofiev is working on a technologically advanced shutoff. He and Mike Willcox created a very cool webpage (`http://www.unteh.com/shutoff/`) to describe the guts of the shutoff and to report on its progress. The basic idea is to place a small transmitter in the handle that sends an electrical signal through the lines to the model. On-board the model, there is a receiver that checks for the signal from the handle. If the signal is absent, indicating a break in the lines, the receiver trips the shutoff mechanism.

What I like most about Alex's shutoff is that to my knowledge it is the only design that operates on the "correct" principle. By this I mean that swing-arms or accelerometer-based electronic shutoffs operate by detecting the centrifugal acceleration of the model that is present when the lines provide a force to keep the model flying in a circle. However, there are many reasons why a model may fly in a circular arc once its lines are cut, and thus "fool" a centrifugal shutoff. Line-tension shutoffs suffer from a similar problem: if enough junk is caught on the line remnants attached to a model as it flies away, or if the leadouts get jammed into the wing tip due to a collision, the shutoff may fail to engage. The Prokofiev electronic shutoff, however, attempts to detect whether or not there is a direct connection between the model and the pilot. Let me reiterate, however, that I am not writing in opposition to any of the other designs. We should continue to explore all options, and until/unless an electronic shutoff like Alex's is widely available, cheap, and reliable, the best bet is to go for something simple and keep up the R&D.