Website of the Month

This month's website of the month is called **FRCFoamies**. The slogan on their homepage states "The home of scale looking and flying score and fold park jet plans!" The link given below from the FRCFoamies website has a video on Foam-Tac glue that I found very interesting. Here is the link:

http://www.frcfoamies.com/Foam-Tac_Glue.php

Do you have a favorite website? If so, let me know and I will put it in the newsletter. Favorite online store, how to build, how to fly, etc- send me the link! My email address:

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LiPo Battery Charging & Storage Dangers and Solutions

We are very fortunate to be able to start off the new year with a training article written by our very own Steve Klute. Steve has recently done exhaustive research on LiPo battery storage and charging. I asked Steve if he would write an article based on his research and he agreed to do so. Here is part 1 of Steve's article:

As a comparative "newby" to the electric scene, I have already seen significant advantages associated with electric flying in terms of convenience and cleanliness. I still love engines, but other than the sound, electrics can be pretty equal and in fact preferable in some ways. What concerned me most when I first started looking, though, were the stories of major fires with destroyed planes, equipment and even homes due to LiPo battery failure. So I started to do a little research and have now probably learned just enough to be dangerous. With that in mind…read on if you care to. It will be an easy read 'cause we will look at some Interesting videos to help get a little educated. The goal will be to minimize or eliminate the fire danger associated with LiPo batteries undergoing charge or in storage by our CVA members.

There is already a wealth of information written and waiting to be read on every aspect of the use of, and care for LiPo batteries. In addition there seems to be an endless supply of videos to help us learn. Percentage wise the problem is quite small. Many users never have a problem at all. Also, in most cases fires result from the mistreatment of the LiPo packs, but there are reported cases of LiPo batteries causing fires for no apparent reason. So is there really a problem? How bad is it really? Do you want to take a chance? Let's take a look at some descriptions, pictures and videos. We have to caution that some of these posts may not be legitimate but… we have sorted through a lot more and kept only the ones which *appear* valid to us. Also please note that we will not focus much on the causes of failure this time…only how to prevent damage if failure does occur during charging or storage. Much is

already written on causes, which, since we have already started to study, we may plan to review in the future. Let's start by looking at some mishaps:

Examples of carnage:

A garage damaged by fire:

http://www.rcgroups.com/forums/showpost.php?p=23342976&postcount=2093

Pictures of a home totally lost:

http://www.flyinggiants.com/forums/showthread.php?t=51563

Car totally lost at field:

http://rc.runryder.com/helicopter/t519305p1/

Mercedes, planes, etc. damaged badly:

http://www.youtube.com/watch?feature=player_detailpage&v=e3qGfocIOgM#t=16

There are many more examples of what can happen, but these few should be enough to wake us up to the dangers and potential ugly results.

The nature of the event:

So what are the *characteristics of failure* for our LiPo batteries? If we know how they behave when they fail, that may help in learning how to prevent the resulting damage. The following 3 videos from the ***Utah Flyers*** are very educational and we can learn quite a number of characteristics of LiPo failure. Read my impressions on each of the videos after you watch it and see if you agree or have other thoughts.

http://www.utahflyers.org/video-mainmenu-28/16-lipo-safety/21-lipo-fires-1

These videos (scroll down a ways) show us a lot about what really happens and what does not. Let me mention a few of the things I saw. I am sure most of you saw things I did not or perhaps interpreted things differently. That's great, we can continue discussion over time and all learn more.

In the first part of the **first video** you see a good example of how a LiPo behaves in failure if it is out in the open. It flares up rather quickly burns with a lot of flame, can throw numerous sparks and burns afterward for some time. It is clearly capable of starting a fire. In the second part of the first video we see that as they ignite, LiPos can imitate a rocket. If not contained or restrained they can shoot a fair distance! In the third part of the first video we see how the event looks when partially contained by the walls of a cinderblock bunker. The

force of expansion pushes upward with some urgency but is not truly a strong explosive force (in one video I saw earlier an ammo box was blown up and open as if it had a grenade in it…I now think that may have been a bogus post). It is important to know what does not happen as well as what does.

In the first part of the **second video** we can see how the event looks in the confines of an aquarium. Again there is significant flame but again also the inflation is significant but not what you would term a huge "explosion". It is clearly something that we can handle with the proper equipment. In the second part of the second video we see how putting a cardboard lid (yes cardboard) on the aquarium changes things. We notice that there still can be flame but it seems to last a shorter period of time and it is not allowed to spread beyond the containment confines. Notice too that the cardboard did not burn nor was it blown off the aquarium. It did flex some to allow venting. So from that I think we have validated our above thought that the force of expansion is manageable. In the next part of that video they put only one piece of block on top of the cardboard and it was in fact lifted for an instant by the expansion. Further, while one of the glass panels was cracked either by the force or the heat, it was not shattered as you might expect from a strong explosion nor were the other glass panels damaged. That really gives us a further feel to judge what the force is or is not. As you have seen by now, when enclosed, there may or may not be a fire.

In the first part of the **third video** we can see that in some cases the cells become a real torch or "flamethrower". In the second sequence in that video they used a really clever trick. A plastic bag was filled with sand and used as the cover. The containment was a cinderblock bunker. When heat and or flame commenced the plastic bag melted and the sand was automatically dumped on the LiPo putting out any flames or at least minimizing any outward evidence. In the next part of the third video they ran the same test but with a block on top instead of the sandbag. Again any fire was contained but of course smoke was still a big factor. Note also that the expansive force did not lift the blocks nor crack them. The rough surfaces and the gap caused by the wire left enough vent space to preclude any damage to the bunker from the expansion of the gases. The last test in video three is actually our favorite. They tested an ammo box with only one modification. They drilled a hole through the lid big enough to let the charging wire enter. We would like to know the size of the hole and may try to find out from the Utah Flyers. Looking at the hole when the box was turned on its side later in the video it would appear to be smaller than ½ inch (we guess 7/16ths). The ammo box appears to still have its seal as no smoke came out around the lid. All smoke exited through the small hole for the wire. After watching and listening to the video several times (yes it really hisses!) we believe that the pressure in the box was significant at its peak (perhaps 5 to 10 PSI). That appeared to be the highest of any of the tests we have seen. But, one reason for that is the volume of the ammo box enclosure is much smaller than the aquarium. Also, the

true venting space in the ammo box was only that space in the hole which was not occupied by the wire so the true vent area was quite small. That said then it is no surprise that the peak pressure is somewhat higher. In fact that is exactly what you expect. A second, properly sized vent might be desirable. Notice though that it still bled down or dissipated rather rapidly thus indicating again that these are not major explosive events.

This article will be continued in next month's newsletter.

Steve Klute

See you at the field.

Alan Fry
Training Coordinator