

down fast. Four clicks of up trim and I have managed to tame the demon somewhat. I flew three more flights using progressively heavier batter packs. The plane doesn't seem to care about the weight.

Originally I planned to test my new SR max ⁷ motor in the Wonder but my modest ferrite is plenty of power for now. I'll try the SR in a model that needs the extra power. I can offer a basis of performance for those who may be interested.

	Ease of Building	Ease of Flight	Flying Weight	Aerobatics
Psycho Max	3	1	3	3
'Wonder	1	2	1	2
Snapper	2	3	3	1

*In order of preference 3 is best.

This comparison may prove deceiving. The Psycho Max is most aerobatic but its way too sensitive. The Snapper maybe the least Aerobatic but it is the most stable and pleasant flyer. The Sig Wonder is a fine "Middle of the Road" aerobat. The original design was not intended for electric power. I'm at a loss to understand why.

Speed Controller Update

by Steve Neu

from Silents Please

Don Mott editor: 516-924-3385

We nearly all have switched from micro switches and relays to "speed controllers" of one type or another to control the motors of our electric powered models. The Hobby Industry advertisements of late are full of new models with associated features and claims. I think it is time again to review what the hobby industry is providing.

Let's start by looking at what a controller is and how it works. A controller works by switching the motor on and off at a high rate, the speed of the motor is changed by adjusting the ratio of on to off while switching. All of the modern speed controllers use special transistors called Field Effect Transistors(FET) these FETs are turned ON and OFF at rates from 40- 10,000 times per second. Current design speed controls fall into 2 types : the first is the frame rate type with a switching rate of 40-60/second, the newer designs are the of a high rate type with a switching rate of 2000-10,000/second. I think that most of you know my feelings about the cheap frame rate controllers by now (Keep them away from electric planes).

The high rate controllers in general are an improve-

ment over frame rate controllers, but there are features and problems with some of them. The high rate controllers are available with the control functions performed by "analog" circuits and more recently by "digital" methods using simple microprocessors. I have had the opportunity to look at some examples of the new crop of digital controllers and to see how they compare to their analog counter parts. This companson will be discussed in a future article but for now, let me

go over the features that I think are desirable in any model aircraft speed controller:

- 1) Optical isolation
- 2) High rate>2000hz
- 3) Soft start
- 4) Soft brake (if it has a brake)
- 5) No glitch on power up
- 6) Full FET drive voltage (8 volts or more)
- 7) Some sort of shut down on loss of correct drive signal from Rx
- 8) Small size
- 9) Low ON resistance FETs
- 10) No requirement for extra diodes to motor (internal to controller)

These are some of the more important features that I can think of. Let's look at some of the popular controllers that many SEFSD members have in their planes. **Astro Flight #215 & 217.** These controllers lack just about all the desirable features suitable for electric airplanes. Limit their use to demagnetizing old motors. This analog controller is cheap and built to stay that way!

Astro Flight #210 & 211 Digital Controllers: These units are a big improvement over the previous 2 units, however they still are missing several of the desirable features. They don't have optical isolation(motor noise can get into radio) and the FET drive is only 4.5 volts so the FETs are not operating at their lowest resistance.

Airtronics MA3 and Hitec Controllers: These controllers have the same concerns as the Space Brand 217 and 215 analog units.

A/i Robotics FX35 and FX 35D: These controllers have several good features but fall short in the area of low resistance FETs. Both units use a single FET instead of several smaller ones resulting in a resistance is 3-4 times higher than that of other units of the same size. The newer unit is digital.

Flight Tec Controllers: Newer units seem to have most of the desirable features, however the wire used on the units is a little small(#14) The newer units are digital.

Jomar Mini Max: Unit has many of the same concerns as the Space Brand 210 & 211 digital units.

Have I rated my own controllers yet? Here they are:
FAI V and LV controllers: They have all the features that I mentioned above. They are analog units and as such don't have the high frequency noise that is generated by the clock in the digital controllers. (This is the heart of the interference problem which will be discussed in the upcoming article -S. M.) Don't get me wrong: I like the idea of micro controllers for motor control, but many of the more popular units have had corners cut in their design and as a result, problems have shown up in some installations (ask Wayne Walker).

Summary: Use the list that I have provided as a guide to desirable features of a model aircraft speed control. You may not find all the items in all controllers, but the good ones will have the important features underlined in the list.