MODIFYING THE SAMPEY 404 PROPORTIONAL SYSTEM

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Woody, Smog Hog, and modified '404'.

Less than $35, plus a few hours work, will make your Sampey '404' Superhet Proportional System one of the most reliable rigs around.

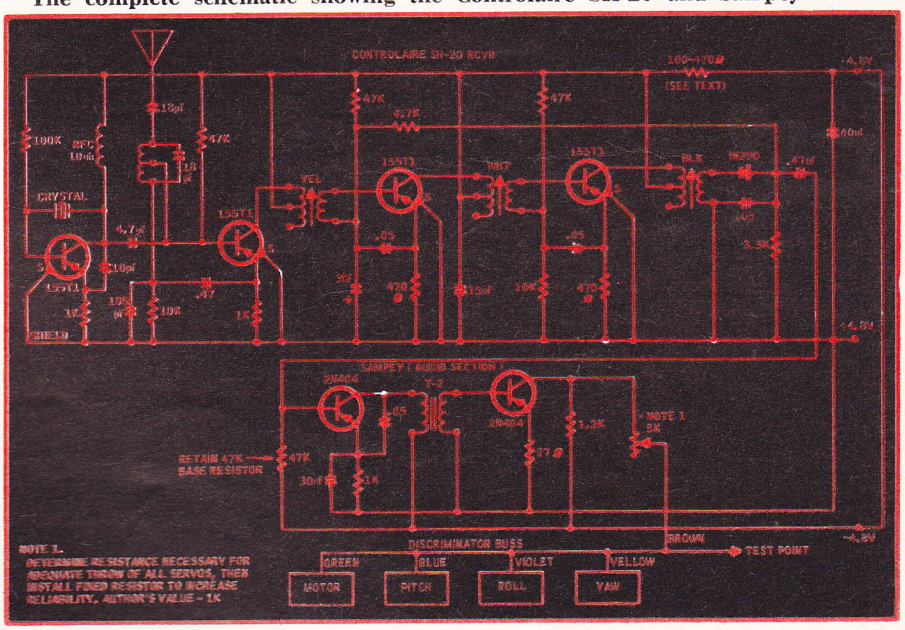
The following data and experience is being offered by the writer in an attempt to help those who have been having difficulty with the older Sampey '404' proportional equipment. In the author's case, the set is about a year and a half old and never worked quite properly. A few months ago we developed several modifications to this system, and if your trouble corresponds with our symptoms, then a few hours of shop work, plus an investment of under $35 will have you airborne once again.

The information contained in this article will be concerned with those sets utilizing the Sampey superhet receiver — the author has had no experience with the superregen version and, therefore, has no data concerning its operation. To get into the general symptoms, we had the 404 version which contained the airborne power pack converter. It had fair range, but we had a difficult time keeping zener diodes in it. When one of these went bad, all power supply regulation went to pot and the servos would jiggle around intermittently. We could, in fact, wave the transmitter back and forth and the elevator of the plane would wave back at us! Incidentally, ground range wasn't too good with this version, but was apparently just enough once the plane was airborne. It was also noted that elevator trim varied with the distance between the plane and the transmitter.

At this point, conversion to an all-battery model for the airborne portion became available, and it was decided to have this modification performed. This didn't help the situation at all, as now the equipment had even less range than it had before! We could walk away from the receiver, and at about 50-100 feet — nothing! Complete loss of control occurred, with the actual range varying intermittently for no apparent reason. If these are your symtoms, read on — there's a good chance of vastly improving your '404' system.

Your main problem is with the receiver. To borrow a good old field phrase, the 404 superhet "just ain't got it." When it is peaked up, the IF cans go into oscillation and you lose control of all the functions. You can prove this to yourself simply by connecting earphones to the audio tie-point and listening to **motor** tone only. In most cases the tone will suddenly jump **one octave,** or you will hear two tones instead of the one. This can also be observed on a scope, if one is available. The IF cans can be detuned to stop oscillation and make for more stable operation, but then you lose your range! If you are familiar with transistorized receiver circuits, a second glance at the 404's circuit configuration will tell you that this is a very unstable circuit from a

The complete schematic showing the Controlaire SH-20 and Sampey '404'.

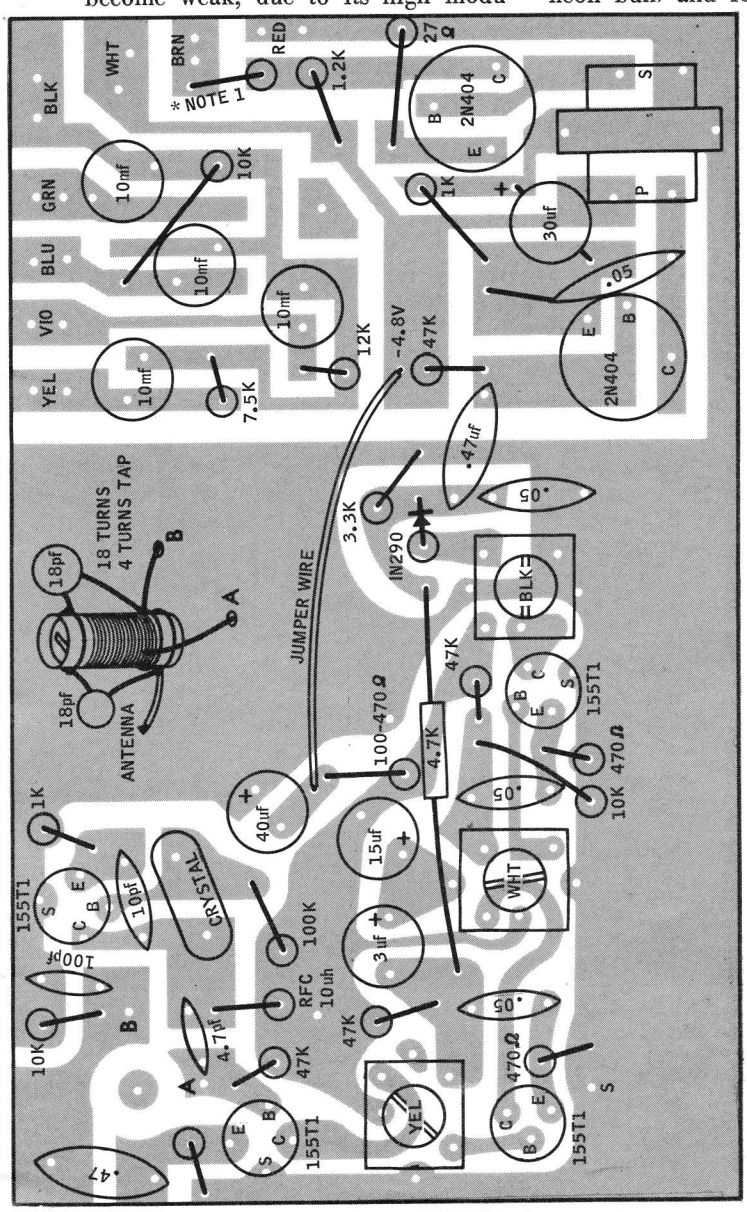


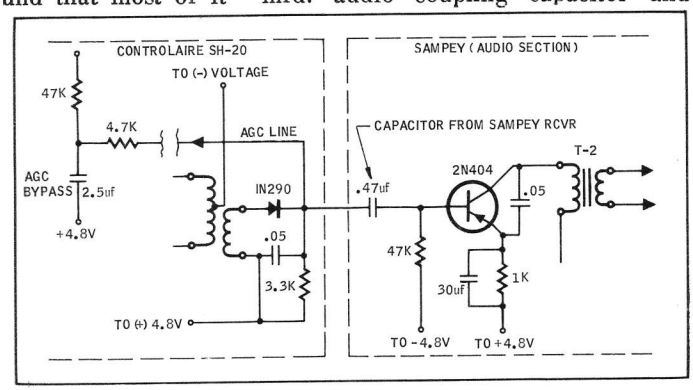
temperature standpoint. For instance, the transistor bases are not divided off so that there is a good steady voltage at these points — there are no emitter swamping resistors in the IF circuitry. So what to do? Get a receiver with better stability and plenty of pep — sensitivity-wise, that is.

In our case, the World Engines SH-20 Superhet kit filled the bill perfectly. This is available, sans reed bank and case, for about $32.95. It uses the same voltage as the 404 and you can actually vary the sensitivity by changing the common IF collector dropping resistor as specified in the instructions with the kit. We jumped right into the fire and installed a 100 ohm resistor here and were able to peak up the receiver in a matter of a few minutes **without** the IF's going into oscillation. Ground range was now **in excess** of 1,000 feet and those servos were as steady as a rock when no command was being sent. Normal rudder control was still available at this range, a fact that amazed us, since this is usually the first function to go out on the 404 system when signals become weak, due to its high modulation frequency. We felt that 1,000 feet was plenty of ground range, so we went ahead and flew at this point. What a difference! Although we have only been flying the modified 404 for two months, not one "glitch", or loss of any function has been experienced. So now, if you're interested in giving it a try, let's get into the technical aspect of the modification and go through the procedure we used with success.

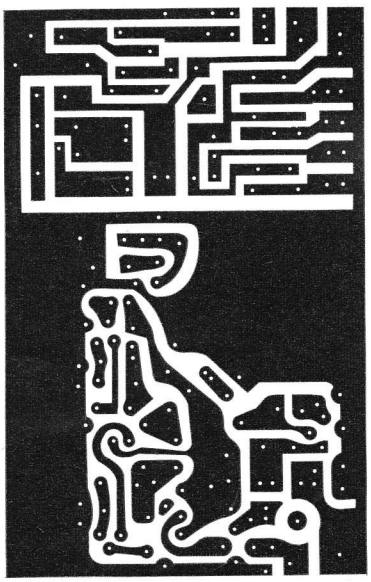
Let's start with the transmitter, as this is the easiest modification to accomplish and doesn't take much time. We inserted a milliammeter into the final RF amplifier (in series with the RCF-2 and +160 volts) plate circuit and found that the final was only loaded up to 4 milliamperes, as the transmitter came from the factory. We were able to load it up to 8 ma. and higher with the pi-network capacitors at which time the reading on our field strength meter actually doubled. This might be worth a check on your transmitter as we are interested in getting as much RF out as possible. We then checked the RF out with a neon bulb and found that most of it was still in the transmitter case around the pi-network coil. At this point we decided to make the antenna with a loading coil by following Dale Springstead's article to the letter. (Grid Leaks, Sept-Oct 1963). It was possible to load up the final to 7 ma without making any changes to the pi-network, and the field strength meter **had to be de-sensitized** by about three times to keep from pinning the needle! We were certainly getting more efficient radiation now! The author's transmitter power supply puts out 150 volts, the final draws 7 ma which gives 1.05 watts into the final. With an efficiency of umpty-ump percent — well, you figure it from there. We tuned the oscillator plate tank also, setting it just below the peak on the "stable" side to ensure good stability and maximum drive to the final. This should do it for the transmitter.

You can use the receiver board that comes in the Controlaire SH-20 kit and mount it just above your present Sampey board after you have removed all of the I.F. and oscillator parts from the board. You will retain the .47 mfd. audio coupling capacitor and

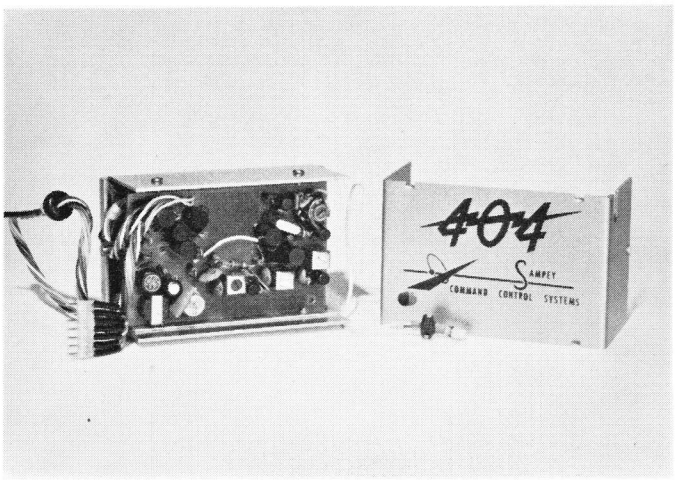




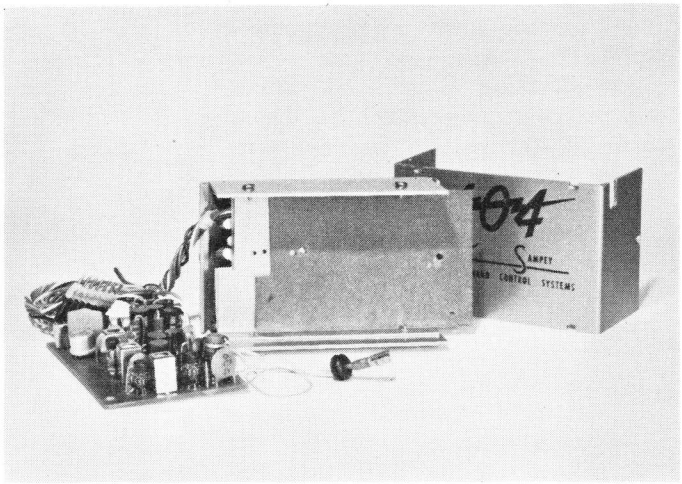
LEFT: Twice actual size P.C. board with component layout. ABOVE: Detail schematic illustrating the introduction of the Controlaire SH-20 superhet to the Sampey 404 audio section.



LEFT: Full size P.C. board for Sampey modification.



'404' receiver with new top deck, consisting of modifications in this article. Plenty of room for "ham-fisted" technicians.



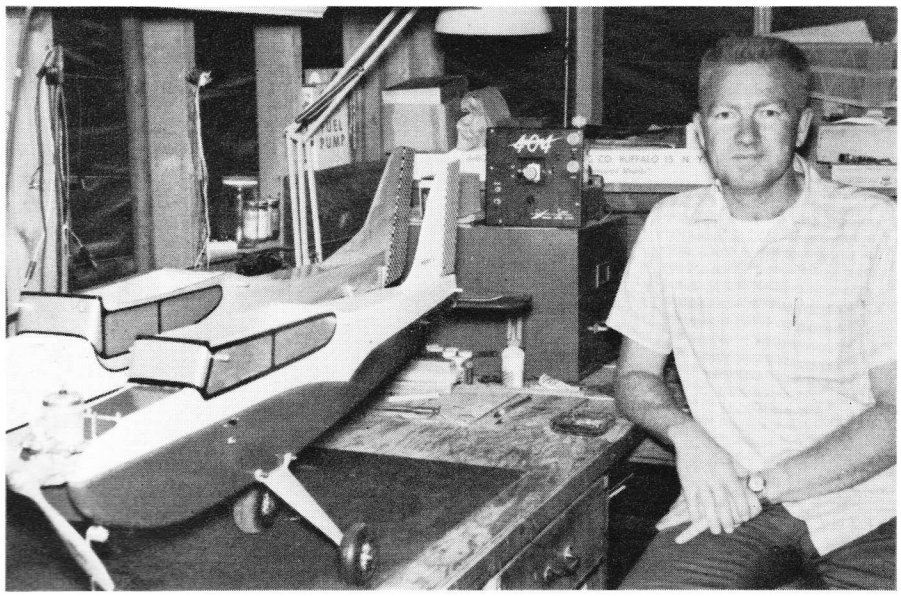
New top deck removed — Note sheet of insulation over metal deck support. Two small sheet metal screws hold P.C. board in place.

everything thereafter on the board. We did things up brown by fabricating a new printed circuit which combined the SH-20 receiver and the Sampey audio section. This circuit board is shown, here. Everything is used in the SH-20 circuit **up to the audio coupling capacitor.** Instead of using the 15 mfd coupler as supplied in the SH-20, use the .47 mfd out of the Sampey board. We found that it was unnecessary to go beyond the .47 mfd here. However, **don't** use the 15 mfd AGC capacitor in the SH-20. — we found that 2.5 mfd was ample and still gave us plenty of speed on AGC action time. The detector load resistance used will be the 3.3K as supplied in the SH-20 kit. A modification came out on the Sampey which changed the 47K resistor on the base of the 1st Audio stage to a 10K. We tried this and found that the gain through the stage was lowered quite considerably while it was supposed to improve the frequency response of the receiver. This we changed back to the 47K to retain our gain, and our frequency We would recommend installation of response is still more than adequate. a 47K at this point if one is not already installed.

The best method in tuning the receiver is to use a scope connected to the audio test point using +4.8 volts as common. Turn on the transmitter, and with the **motor** tone only on, peak up the I.F.'s and antenna coil as much as possible while using the weakest signal from the transmitter. (We had to place the transmitter on the floor-board of the car and close the doors in order to get a very weak signal!) This should do the trick and you should be ready to install the 404 in your plane and **GO!** With just the airborne equipment **on,** you will notice intermittent wavering of your control surfaces. This is normal due to inherent receiver noise, and is really a good check to see if the receiver is operating properly. Turning on the transmitter and depressing the **start** button should bring all control surfaces to neutral and be rock-steady.

So get with it and get your 404 off the shelf! Considering that you have at least a $500 investment there, is $35 more worth it to get many hours of completely reliable air time? Sure it is, so give it a try. We think you'll be surprised at the results, and much happier, too!

(Ed's note: Sharp eyed readers may note that Woody has a 10 mmf across the Controlaire antenna coil instead of the 18 mmf as supplied with the SH-20 kit. This was necessary in the author's case since the coil happened to "peak out" with the slug all the way out of the form when using the 18 mmf. Installation of the 10 mmf gave Woody the peak where the slug is presently located.)



The author in his workshop. Smog Hog in background, newly completed Mark I (RCM plan) in foreground. Woody's Sampey system has performed to perfection since these modifications were completed.