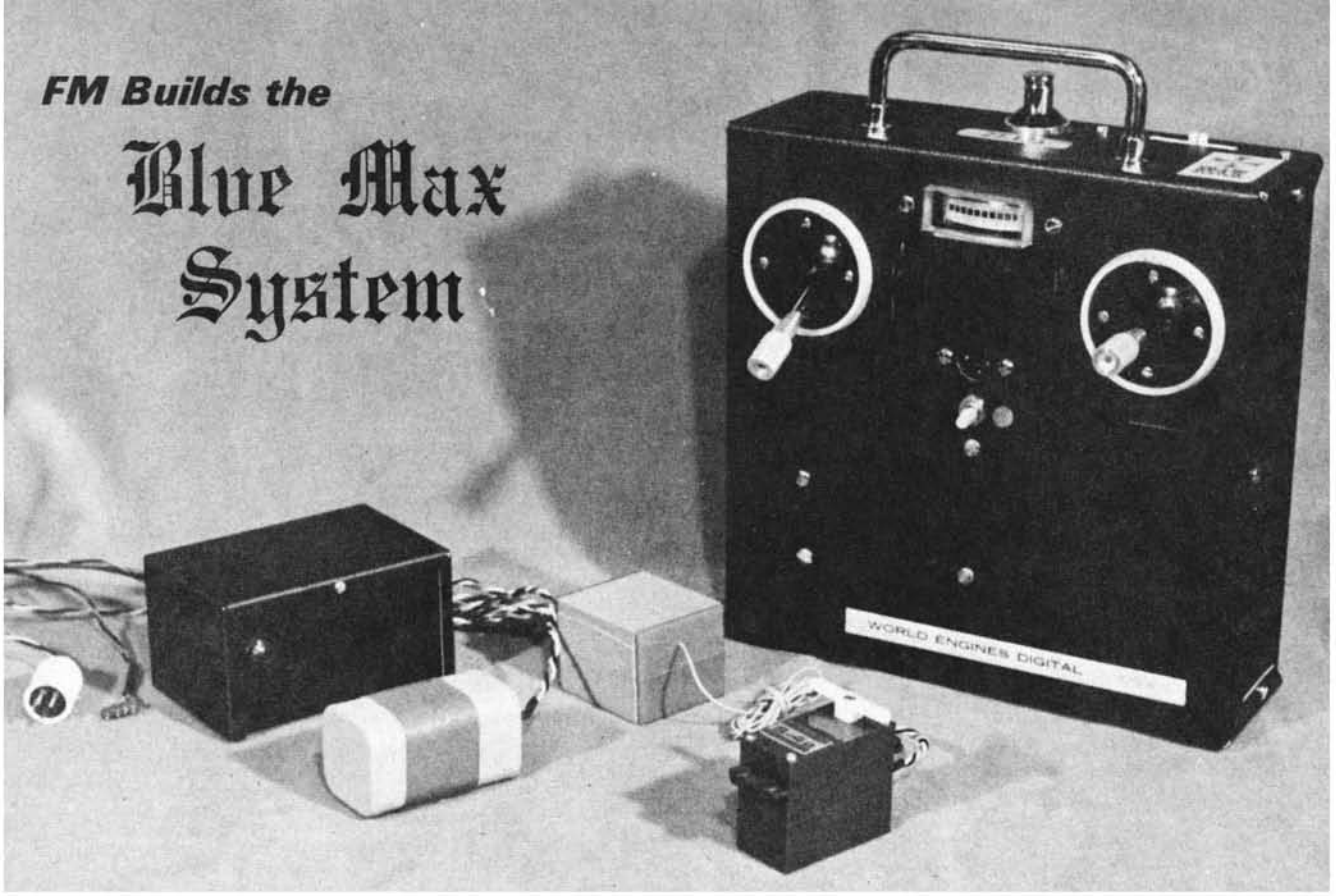
FM Builds the Blue Max System



Photos by the Author

The Blue Max System is the latest state of the art improvements from World Engines. Square battery pack fits in skinny glider noses easily. Small S-4b servos will fit just about anywhere.

If you've been hankering to build a kit R/C system, the Blue Max may just fit the bill.

by Gene Fuller

The Blue Max System developed by World Engines, is an upgrading of the earlier Controlaire System, using more integrated circuits, a base loaded antenna, 12 volt transmitter power, and a charger that is now external. The new system has factory assembled stick assemblies and incorporates a buddy box feature which permits modes and frequencies to be mixed for instructor-student use. The new transmitter has greater output because of the higher voltage.

We ordered a full kit, 5 channel system, so that we could evaluate the system fully. It came with the battery pack for the receiver wired to the plug, so that the pack can be checked at the factory. A servo is received completely assembled in order to align the transmitter correctly. This is so the transmitter will operate in conjunction with other transmitters when it is desired to use the buddy box hook-up. Do not open this servo until after the whole kit is finished and the transmitter has been aligned to it. Actually there isn't any reason to open it at all. World Engines states not to use it as a model as it could be different from a kit servo.

I used a 15 watt Wall soldering iron for almost the entire assembly. A few spots on the transmitter circuit board required more heat than this iron could generate, so I used a 100 watt iron for these. Solder connections on the antenna mounting bracket, switch and a few other larger, heat-sink materials will require the larger iron.

The transmitter is assembled first. Its large circuit board with spread out parts will present no problem and makes good practice for what will come later. Don't forget to solder the rivets, which hold the antenna bracket to the PC board, to the bracket and to the foil side of the board. Instead of the switch being wired to the PC board, in this system it is mounted directly on the foil side of the board, eliminating interconnecting wires. After assembling the seventy odd parts to the transmitter PC board, the wiring is installed on the board. The board is then set aside and the final assembly of the transmitter is begun. The rubber feet and handle are next installed into the Tx case. The charging plug, buddy box switch and socket are installed, and then the circuit board is mounted into the case. The stick assemblies are screwed into place and the final wiring is installed. The batteries must be charged for 24 hours before tuning the Tx so for that we'll need the charger.

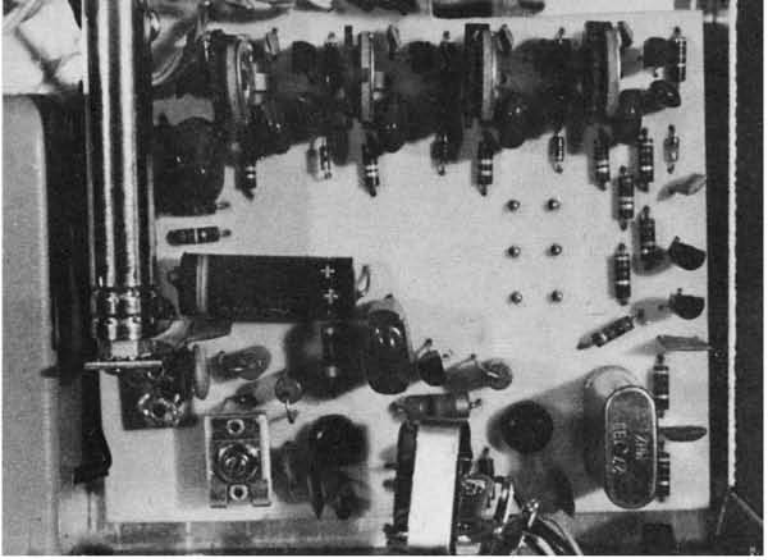
If you have ordered a 5 or 6 channel system, you'll have to build the add-a-channel section(s). These units (one for each additional channel) consist of a small circuit board and 11 components which is interwired to the main circuit board. These auxilliary PC boards are mounted just above the stick assemblies, to the right and left of the antenna. They are operated by a linear slide trim pot which protrudes through the top of the Tx case. These boards provide the extra pulse in the pulse train to operate the additional channels.

The external charger is rather easy to assemble. A unique feature with this system is the ability to charge either the Tx or Rx batteries separately should the occasion arise that you might want to do so. The batteries are normally charged together, though. After finishing the charger and putting the batteries on charge, my total time on the set was 11 hours. The charger may be easily wired for 220 Volt operation by simply connecting two wires together inside the charger—perhaps good news for our foreign friends.

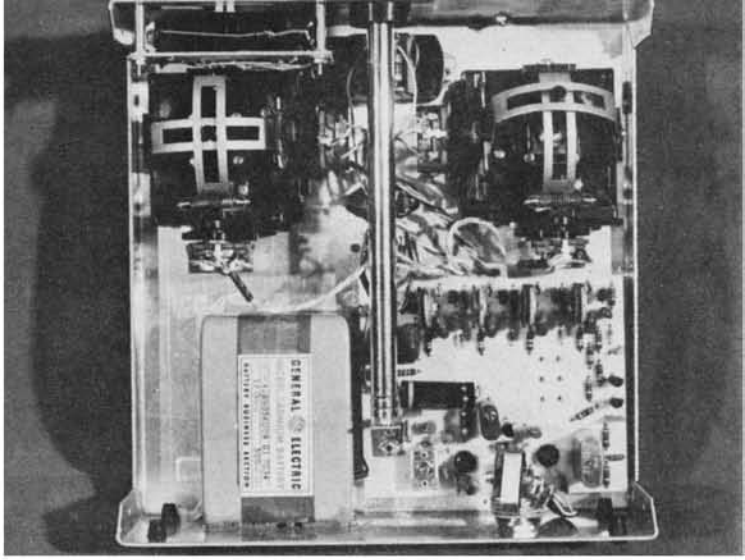
In the new receiver that the Blue Max System is using, a clipping circuit is used to get around the AGC requirement. The new receiver is using a single tuned front end with no problems having been experienced. Range is excellent on the ground and should be the same in the air. There is a slight tendency for the receiver to be swamped when its antenna is held in close proximity to the transmitter antenna. Sometimes it is, and sometimes it isn't. The tune-up resistors are left installed in the circuit board with about 1/8" length of lead left on top of them. Make sure they can't short out against one another. This way, they'll be there next time you want to tune up your receiver.

The decoder uses one integrated circuit for each channel, thus ours had 5 of them. A four channel receiver can be expanded at any time by simply adding the parts to the circuit board and the additional wires for the servo plug.

By the time the receiver and decoder are finished and ready to tune, the batteries will have been on charge long enough to get started on tuning up the system. A single capacitor, next to the antenna, is the only



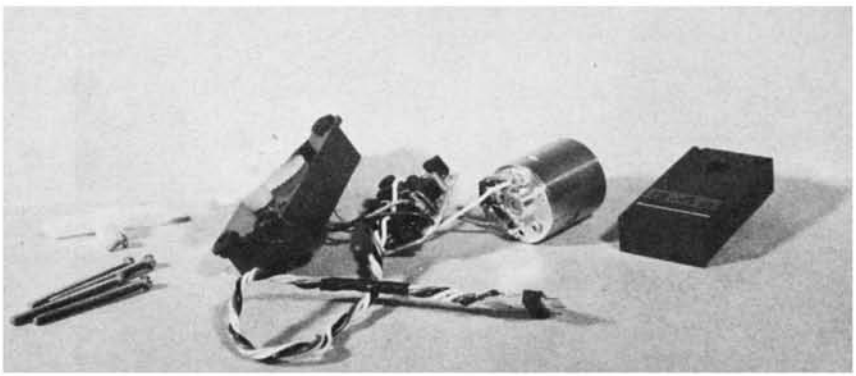
The transmitter circuit board is rather easy to assemble due to the well spaced out parts. The encoder section is above, while the RF section is below. Single tuning adjustment is below and to the right of the antenna.



Interior of the transmitter case shows the parts layout. The sticks come factory assembled. The 5th channel pot and PC board are visible at upper left.

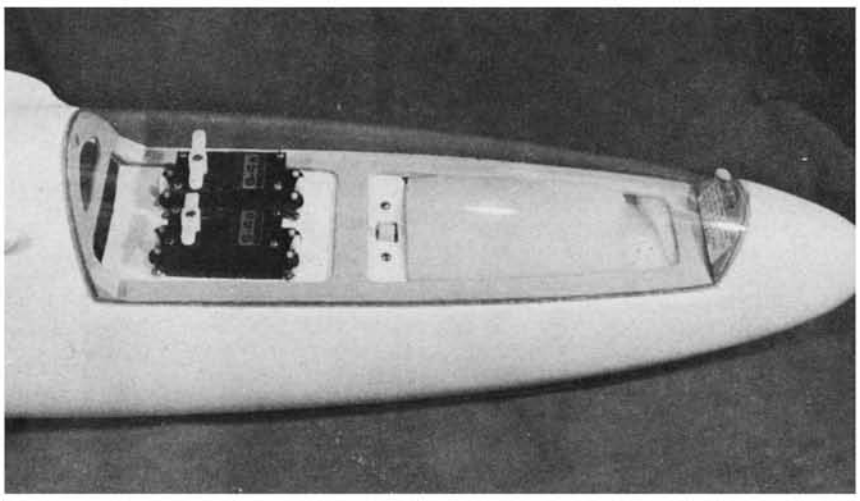
tuning adjustment there is in the transmitter. To get the most accurate reading it's best to tune this while the back cover is on, so I drilled a small hole right over its screw. In tuning, don't use a screwdriver; you *must* use a non-metalic tuning wand, such as one made of nylon, etc. The adjustment is tuned to get the highest possible meter reading—that's all there is to it. My set peaked out with the meter needle on the highest mark, not quite pegged. When the transmitter is held in the hands, the meter needle goes all the way to the right, pegged. The meter on the new system gives a relative indication of RF output. It also gives an indication when the transmitter battery is being charged.

The receiver is now tuned to the transmitter. A VTVM or good quality VOM is hooked up to the two tune-up resistors, with the meter set on a low voltage scale, say 1.5V D.C. The receiver is turned on, and with the transmitter also on, the mixer coil is tuned for a maximum meter reading. The transmitter is moved away to keep the voltage reading at .2V. Next, the yellow, white, and black IF cans are peaked (in that order) in the same way. The Tx antenna is then removed and the hole pointed at the receiver antenna at its mid point, and the coil and IF cans retuned again and again as the transmitter is moved further and further away. With the equipment installed in the airplane and the Tx antenna collapsed, range should be about 9 feet. It will vary from set to set and with different installations.



A disassembled servo showing various parts including the wired circuit board and motor. Not visible is the pot assembly under the case section containing the gears and rubber mounting grommets.

The installation of the system is shown in author's Foka sailplane. Servo clips are used to hold the S-4b servos. With these clips, it only takes 15 seconds to remove a servo.



At this point, the transmitter pots are adjusted for each channel to center the factory assembled servo. If you've fiddled with it prior to this—too bad. Don't forget to adjust the trimmer pots on the fifth and sixth channel circuit boards if you have them. At this point, all that remains is to assemble each of the kit servos and the switch harness, then you'll be ready to fly. It is possible to use this system without the switch, by simply plugging the battery into the receiver. Switches have been known to fail, and on some planes, I prefer to eliminate the switch—thereby eliminating a possible malfunction—especially on scale models where much time and effort has been spent. It's a lot of trouble to go inside and unplug after a flight, but if it helps to make that masterpiece last longer, it's worth it. The switch harness for this system provides an extra female connector for charging, so that the battery pack need not be disconnected for this operation.

The servo circuit boards are quite tiny and will necessitate some fine soldering work. If you have shakey hands you'd be better off ordering semi-kit servos. The servos do go together quite fast, though, I built one each evening until they were all finished. Each servo incorporates an integrated circuit which helps eliminate a lot of extra parts. Upon completion of each one, it's plugged into the receiver (I used the aileron plug), checked for proper operation, then centered by using a 1/16" hex Allen wrench. The wrench is inserted into the hole in the top of the rotary output shaft and turned in the opposite direction that you want the arm to move. The system is now completed but before flying with it, it might be a good idea to cycle through the

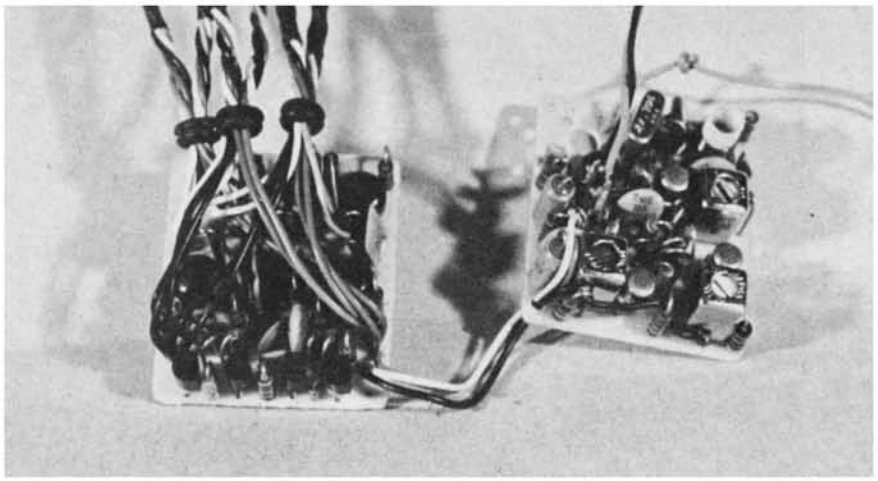
batteries a couple of times while operating the system. This will let you know that everything is working properly and also give you an idea how long the system will work before battery voltage gets too low.

Accessories included with the system are rotary output wheels for the servos in addition to the output arms, a servo tray that holds three side by side, a servo tray that holds two side by side and one across the front, an aileron servo mount, and S-4 servo clips for each servo. Servos are quickly installed and removed by using these clips, as the clips are left in the model while the servos simply snap into and out of them.

A few words are in order on the buddy box system's operation. The buddy box switch on each transmitter has no effect on transmitter operation when the buddy box cord is not plugged into the bottom of the Tx. Thus the Tx can be used normally with the switch in either position. The trainer plane should be already trimmed out with its own Tx. This Tx will become the instructor's Tx and the buddy box switch should be moved toward the blue dot position. The other transmitter will become the student's Tx and its switch should also be moved toward the blue dot position and *left there.* The buddy box cord's red plug is plugged into the instructor's transmitter and the black plug into the student's. The student Tx now has control and the controls should be checked for proper operation. The instructor now switches his Tx switch to the left, away from the blue dot and this transfers control to his own transmitter. The student must *never* move his buddy box switch or this will result in complete loss of control. If control of the model is ever in question, all the instructor need do is yank the switch from his transmitter and he will have control of the model. As long as the other end of the cord is plugged into the student's Tx it will be disabled, even though it may be on the same frequency.

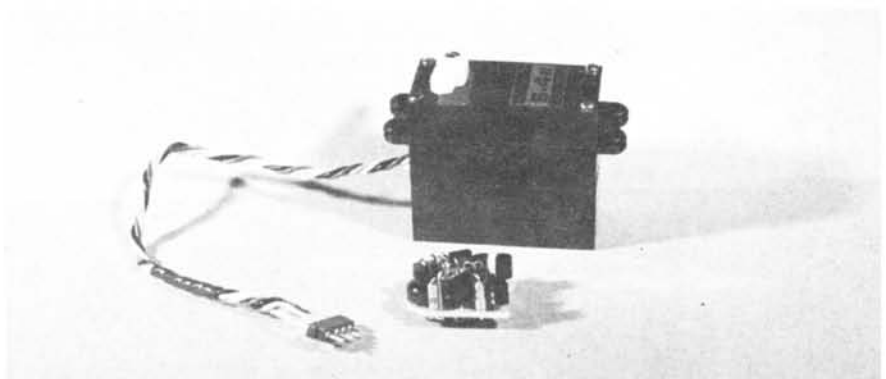
This buddy box system, as you can see, is rather fool proof. You can't accidently shut off your own Tx in flight by hitting the buddy box switch when the buddy box cord is not plugged in. All three frequencies can be mixed for buddy box operation but 72mHz can be mixed only if they have factory installed jacks and plugs. Modes I and II can be mixed too, so long as the system is being used as it came from the factory. During operation of the transmitters with the buddy box feature, the student's antenna can be left collapsed for safety reasons. Both transmitters must be switched to the "On" position. It's best to dry run the situation before actually trying it, to be sure each person knows just what he is to do.

The manual contains schematics and block diagrams of each circuit board and a trouble shooting section. We noticed there was no voltage chart for the transmitter in order to more easily check it out if it goes haywire. Follow the assembly instructions carefully and you won't make any mistakes. Become familiar with the manual before beginning assembly so you'll have a better understanding of what you are doing. For example: on page 43, step 56, tells you to use three pieces of wire which are of a heavier gauge than those used for wiring the servo plugs. If you did not know that this step was ahead, you might have accidently used one of the heavier gauge wires in the wrong place.



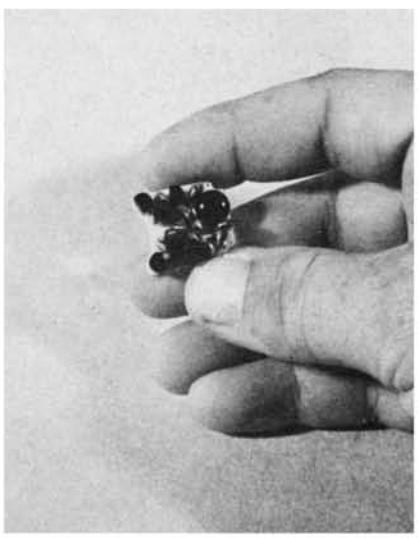
The receiver and decoder, completed and ready for tuning, then installation into their cubical type case.

Various components of the system, such as this servo, are packaged in plastic boxes. The new servos are powerful and have good resolution.



A servo amplifier next to a completed servo to show how small the board is in comparison to the finished object. The new S-4b servos have a red, nylon case.

The servo amplifier PC board is a little bigger than a thumbnail. Uses 6 transistors and 1 IC (integrated circuit).



All in all, the Blue Max system is quite a rig. It gives you a feeling of accomplishment and pride to build your own system. Besides, the person who builds his own system puts into it something no one else can—TLC (Tender, Loving Care). I am currently installing the system in a *Foka* sailplane which I plan to fly this winter as it is better suited for flying in windy weather than my *Cirrus.*

Those readers interested in further information on the Blue Max system without going for the whole package, can obtain the instruction manual separately for $2.95 from the manufacturer.