R/C Soaring

By Mike Stump

This month we are going to review some items concerning R/C systems. This should interest those of us who are just into, or thinking of acquiring a programmable or computer radio system. For those of you who have passed this way before, this may rehash some of the things you considered. Then again, maybe not, as when I purchased my first computer radio, an Airtronics ATRACS module upgrade, there were not a lot of choices.

Most of us as newcomers to R/C purchased a basic 4-channel or possibly a 6-channel radio as our first unit. Before the advent of computer or microprocessor driven radios only a few, if any, mixing functions were commonly available on the radios of the day. For the most part, early full-house (aileron and flapped) sailplanes functioned via mechanical linkages and mixers—thanks to innovative solutions by the likes of designer/kit manufacturer Bob Dodgeson and some others. We survived pretty well, then, and with those setups came the advent of the new radios with multi-model set-up memories, electronic mixing, plus the ability to electronically center and adjust servo throws as well. The market and the R/C industry has now brought radios to the consumer with up to ten model memories, multiple mixing capabilities with options, and the on-board programming for aerobatics, helicopter, and sailplane mixing processes.

All of this and probably more in complete systems that can be purchased in the U.S.A. for under $500! Now that's a lot of money but if you've been in the hobby for more than ten years you might remember that a 6-channel radio with dual rates, servo reversing, and maybe an aileron to rudder mix might have been $250. Not to mention we'd just begun to hear about computer radios and electronic mixing and programming in the transmitter. And, as these radios have evolved, the industry has worked to provide consumers with slightly trimmed down lower cost radios with some key programming features.

There are several radios such as this now and some questions have been cropping up as to the lower cost radio's suitability for sailplane use, in particular with aileron and flapped wings. We'll take some time this month to talk about the functions of a full house sailplane and how mixing some of these can help with your trimming and flying. Then we'll compare today's budget computer radios with the current standard sailplane radios as to how they can work in today's sailplanes.

Primary functions

In most cases, today's performance sailplanes use four functions, usually with six movable surfaces. A common "full-house" sailplane features flaps and ailerons on the wings along with the standard rudder and elevator controls most of us started with on our primary trainer. In the early days of full house planes, and still with some kits such as Dodgeson Design sailplanes you can operate such a system with as few as three or four servos and standard transmitters with no special mixing, by using mechanical mixers and linkages. These systems do work quite well, and often save weight. On the flip side, just the convenience and ease of adjusting surface alignment and trims with the push of a button—common with today's computer radios—as opposed to all of the mechanical manipulations required with older systems makes the newer radios something to look at. That goes even for those of us that will always fly 2–3 channel sailplanes.

The trade-off for this versatility is a bit more weight from the two or three extra servos and often a little more complicated servo wiring system with the wing servos. After a builder has been through a setup like this once or twice, it, like most any installation, is not difficult any more. Once everything mechanical is aligned, then the microprocessor in the computer radio can be told what values are to be given for each command and stick movement via electronic mixing, available pre-sets, and the ability to electronically limit or determine the amount of servo throw in each direction.

This is where it's important to compare the features of the different price groups of radios. Many times a huge amount of versatility and mixing power may not cost much more.

In the past couple years, computer radios have been introduced to the consumer at prices in the $225 to $280 range. The features on these radios generally will be: memory of two to four model set-ups, electronic sub-trims, electronic servo endpoint adjusting and reversing, dual rates, and basic mixes such as aileron-rudder or a flap-elevator mix. Some may be available with exponential and one or two other programmable mixes as well. Almost all of these offer programming for both fixed wing aircraft and helicopters.

While all of these radios are six channels, getting as much versatility from these more economical systems can be more of a challenge than with the higher priced "spreads". None of these "economy" radios address sailplane specific transmitter layout and mixing. Almost universally in this class of computer radios the flap function is placed on a pot or switch. While this is the standard and acceptable location for most powered functions, it makes setting up a system with variable flap settings across the flap range of travel a little more difficult.

In comparison, most sailplane specific transmitters will place the flap function on the left stick where a powered plane's throttle would be. We do the same thing in most 3-channel sailplanes when we put spoilers on that same stick.

Another related flap problem with the lower priced radios is in the flap/elevator mixing. While this mix is in some lower priced units, it again is based from the aforementioned pot or switch movement so if you can arrange a full-house set-up you can't take advantage of this mix when using the left stick for flaps.

What we are trying to achieve with all of this technology now is a sailplane that is more easily and accurately trimmed, with control settings and throws adjusted to suit the plane's design and individual pilot's flying styles. Beyond that, when the mixing is available we have the ability to droop (camber) or raise (reflex) the entire trailing edge of the wing to adjust speed and lift characteristics of certain wing sections.

For landing functions we either drop the flaps alone or with the ailerons rising (crow configuration) along with the lowered flaps, all with the elevator automatically compensating for changes in trim due to the changes in the wing's lift because of the flap deployment. All of this is programmed in the transmitter.

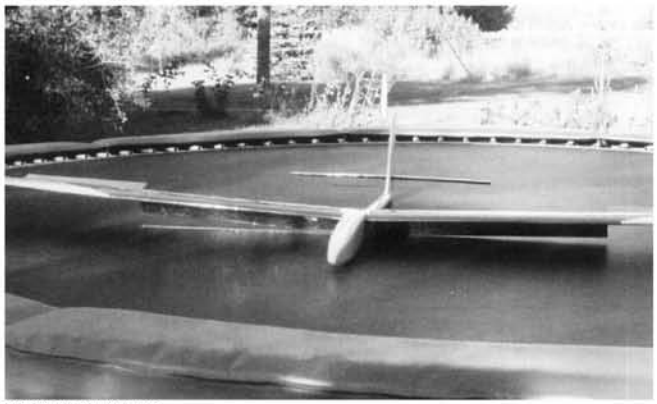
That's where technology has stepped in, improving the middle price range computer radios to a point where you may not need anything else, at least until technology totally changes everything again. When we look at the features of radios in the $400 to $550 range we find we might gain a whole lot for the money spent. While these radios cost from $120 to $200 more than their lower priced counterparts, they offer well over double the model memories and program capability in most every case.

Standard in these radios are the same features listed for the less expensive radios. Most all of these are seven or eight channels with exponential included in most, with memories from four to ten models. Other standard mixes include full trailing edge camber, V-tail, pre-sets for launch camber and reflex, ways to alter mixes or make the mixes themselves interact.

An example: some of these systems can alter aileron differential and/or increase the amount of rudder mixed to ailerons during launch and landing.

Keep in mind while you're researching and looking at these products that they don't all achieve these functions the same way. All of the different manufacturers' microprocessors use different menus and language, but all with time, and a little patience are relatively easy to figure out. I've been able to keep up with both Airtronics and JR's programming with little problem over the years.

You will also want to pay close attention to the physical features of the transmitter as you'll be holding it a lot. The feel in the hands is important. Equally important is the arrangement of the knobs and levers for any mix functions and pre-sets you may



PHOTOGRAPHY: MIKE STUMP

A *standard Duck* shows the various landing mix features **(above left)** in the surface positions. Flaps are at 90 degrees down, ailerons are up and the elevator is trimmed down. Hand launch greats and Nats Champs Brian Agnew (L) and Joe Wurts (R), **(above right)** return from their fly-off at the LSF Nats '92 Handlaunch Champs.

desire. This is where a good long visit to a hobby shop that stocks these radios will be valuable. This usually affords you the opportunity to feel how things are arranged on the radio, and look at the programming. To be able to spend time and look through the menus on most of these radios really shows you what they can do.

When you spend some time looking at the budget computer radios compared to the more full featured radios, it's usually easy to see that to step up, which many times is maybe just $100 to $140 more, will give you a lot more versatility now, and room to grow later. The full featured radios will give you much more for your dollar.

What do the mixes do?

That's a question asked by more than a few when they first get their computer radio home. Most of the mixes are self-explanatory but I'll talk about a few important functions. I've found when trying a new system that it's a good idea to put six servos on a table or a foam box laid out in similar configuration to a plane and spend some time with the processor functions. For me this has been the quickest way learn the sub-trim, servo reverse, and throw limit functions. From there you can move through the program's functions and get a feel for mixes and pre-sets before you install a system in a plane or drive a system in an old plane with the new radio.

When you upgrade or change transmitter's within a brand this generally isn't a large problem, but when switching brands of equipment the receiver and servo compatibility both should be checked out. Servos can be modified or fitted with plug adapters but some varying brands of transmitters and receivers will not work together. Keep in mind too that the order of individual functions on the receiver may change when integrating different brand receivers and transmitters too.

So we're ready to program. What first? I usually want to establish two primary functions: my landing mode, and camber. Landing mode "on", with a 6-channel sailplane, can take on a couple of configurations, depending on pilot taste, and the design. A pilot may prefer to land using flaps only as the braking function, or "crow"—raising the ailerons while the flaps are lowered. Landing is generally done using the left stick in the vertical (throttle) axis.

Auxiliary to the landing function should be a Flap-Elevator mix which will help in maintaining trim while landing. Generally when flaps are deployed the sailplanes nose pitches up in response to the increased lift and braking. Mixing down elevator to be added as the flaps are lowered helps keep the nose down during landings.

The other primary mixing function for the wing is trailing edge camber. In most cases, pilots will want to set this up as a variable function rather than a pre-set. The goal with using camber is to add to the trailing edge cusp, or under-camber a small amount which can sometimes assist in climbing. In setting up camber with your programming, don't over-do the travel. Make your maximum allowable throw a bit (1/16-inch) more than what the maximum amount you may use. This allows you to use the amount of camber you may be comfortable with for the present conditions you're flying in.

The penalty in using camber is that it will also increase drag, slowing the plane up. Moderation is usually the key in using camber. One of the goals you want to shoot for in setting up your camber mix is to keep the trailing edge surfaces together in a straight line throughout the entire travel range.

The opposite of camber on the trailing edge is "reflex" or raising the trailing edge. This is generally used in very small amounts of 3 to 5 degrees which is usually all that's needed to flatten the bottom of an under-cambered airfoil. This helps a sailplane speed up at the expense of a greater sink rate. It's a nice feature to have when you need to cover large amounts of sky or escape bad air.

Keep in mind with both camber and reflex not all airfoils react positively to the use of these functions. The key word is experiment with the functions in a variety of conditions and find what works best for you.

F3J Team Selection Finals

The Team Selection Finals for the first F3J World Championships will be held over Labor Day weekend in 1997. The event will be hosted by the Greater Lansing Area Soaring Society (GLASS) with assistance from the Michigan Soaring League. Contest dates are August 30, 31, and September 1 at the GLASS club field, a sod farm near Grand Ledge, Mich. The event director is Larry Storie.

At this time it appears that entry in the finals will be open, meaning that the only requirements to enter will be ownership of an FAI Stamp and paying the entry fee. Contact the Competition Department at AMA for more information. A few clubs around the country are hosting F3J events in preparation for this. The Nats F3J event which will be held about 30 days before the finals will be a good prep for this too.

Expectations for this first-ever F3J Team Selection Finals are to have between 40 and 50 entrants. Unfortunately, the committee chose the late date proposed, which is just ten days before our F3B Team and defending World champ Daryl Perkins head to Turkey for the F3B World Championships. There was a group of competitors that lobbied for the F3J finals to be held on an earlier proposed date so the F3B team members could have a little more time before leaving for the Worlds.

I hope that the proximity of this final to their departure does not stop them from attending. I think the U.S. is in a position to put a very strong team together for this first F3J World Championship. As a nation we've been somewhat removed from the early stages of international F3J as all of the early events took place in the UK and continental Europe.

In the six or so events I've flown or worked in the U.S. the near perfection required to be anywhere near the top or qualify for the fly-off is consistent with the larger thermal duration events we fly now. The launch is the only difference in most cases from our Nats man-on-man format. Aside from the FAI landing and option for one re-launch, F3J is not that "foreign" and our country has a great pool of thermal pilots to compete for this team.

The height of the soaring season is upon us, and by the time you read this I'll be well into rehabilitation for a ligament replacement in my right knee. Hopefully this procedure will allow me to continue to be a quality tow-person and chase my hand launch planes as before. This will allow a couple of weeks for building and trimming some Nats projects with some time to spare. We'll be talking about some of these in future columns.

Reader feedback

I appreciate your notes via regular and e-mail, and again ask you to let me know what subjects you the readers would like me to explore for you. You can mail me at: 607 Washington St., Cadillac, MI 49601. E-mail me at: Stumper@michweb.net.