THE NEW JR-9303/9503 COMPUTER RADIO
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Introduction

The evolution of JR's computerized radios continues with the introduction of the new XP9303/9503. This new radio adds some exciting features. The most interesting software upgrades are:

1. The multipoint programmable mixing has increased from 5 points to 7.
2. Many of the functions are now switch selectable.
3. The sailplane mode has 5 selectable flight modes that can be changed during flight.
4. The radio now has side slides on both sides of the radio.
5. Motor functions can be controlled from several different switches, buttons or the throttle stick.
6. Differential now includes plus or minus functions.
7. Ailerons are now plugged into location 1 and 2, making any four cannel receiver work with a two aileron setup.

The XP 8103 added ground breaking multi-point programmable mixing which completely eliminates that annoying bump the model takes when you first pull the flap stick down. Landing approaches become soooo smoooooth. The XP9303 increases the mix from 5 points to 7 making the approach even smoother. If you don't have this feature on your current radio, this feature alone is well worth the investment.

If you own either the JR347, the 388, or the XP 8103 you will find some similarity in the programming, but the layout and location are quite a bit different.. The switches are generally in the same place but the knobs have been replaced with digital trim switches and the Butterfly Switch replaced with a push button.

If you own a 10x you are going to feel rather comfortable with the programming. The XP9303 takes the flexibility of the 10x, adds a couple of new features and combines it with the more user friendly" template driven programming of the XP8103.

There are two versions of the XP 9303/9503 and both are now available in 2.4. Helicopter and airplane/sailplane. The switches are in the same place, but you only get one of the manuals, where you used to get all three. Fortunately, all three manuals are available on line at horizonhobby.com for you to download.

The XP9303/9503 also sports a new and much larger screen. The new screen is nearly three times larger than that found on the XP8103 and has been moved from the top to the bottom of the radio. The screen is nearly identical in size to the 10x, but without the push screen activation. The screen is pixilated, allowing the computer to place a significant amount of information on the screen at one time. The larger screen also contains an X\Y axis graph that is designed to visually represent dual rates, exponential rates, and the multi-point programmable mixing.

The new XP9303/9503 supports a case significantly different than prior radios. The new radio still fits my hands better than any radio I have ever held. Some of the additional changes to the case (when compared to the XP8103) include:

1. Only four buttons instead of eight. A new scroll wheel has been added to make scrolling through all the possible selections even easier. When you find the correct selection, just push to click the scroll wheel.
3. Side slides on both sides of the radio have been added.
4. Rubber grips on the sides and a much deeper recess on the back for your fingers for a much more relaxed fit in your hands.
5. The transmitter module is much easier to remove and prior transmitter modules are still usable.
6. The front knobs have been replaced with a digital trim switches,
7. The butterfly switch has been replaced with a push button toggle switch.
8. Newly molded stick ends that my fingers will not slip off of.

The XP9303/9503 transmitter modules are interchangeable with all other JR radio modules.

Flash memory is used for saving all the settings. No more internal battery to be replaced every few years or so.

Digital trims were introduced with the 8103 and when you have a radio with multiple model memory, it is the only way to go. You no longer have to save your trim settings before you switch to a different model in the radio. As you switch from model to model, the radio remembers the last location of each models trim settings. If you fly two classes in your local competitions, you no longer swear at yourself for forgetting to save your last trim locations. No more sub-par launches when you forget to reset the trim lever to neutral before launching a different model.

To change the trims, you simply bump the trim lever. Each time you bump the trim lever there is a corresponding change in the position of the control surface on the aircraft. A black dot moves along the graphic bar on the display screen and the radio makes a beep each time you bump the lever. If you bump the lever and hold it down, the trim will make rapid advancement in the direction the lever is held. As the trim is changed to the top or to the right, the beeps become come higher in pitch. As the trim is changed to the left or bottom, the beeps become lower in pitch. As the trim passes through the center position, a louder and easily recognizable beep occurs.

On the surface, digital trims do not sound like much of an improvement. Boy, what a surprise! The resolution of the digital trims is adjustable in the **TRIM STEP** mode. In its default mode, one click of the digital trim is approximately the same as the old style trims. The default can be changed so that it takes 3 or 4 clicks of the digital trim to equal one click with the old style trims. With the digital trims finer resolution, the elevator "sweet spot" was much easier to find. Whether the resolution is fine or course, the total amount of trim adjustment remains the same (approximately 15 degrees each way from center).

Over the last ten years or so, there has been a significant amount of discussion concerning elevator "dead band". "Dead band" may appear in several forms or any combination of forms. The most common is lack of pitch change with small stick changes near center. Another is a plane that cannot hunt. In other words, upon moving to level flight, the aircraft feels like its mushing along (nose high). The next time the aircraft moves to level flight, it feels like it will not slow down (nose down). It seems to occur most often on aircraft with full flying stabs.

There are many items that can contribute to "dead band". The ones most often discussed are sloppy linkages, poor choice of stabilizer airfoil cross section and worn out servo pots. Add a new "dead band" contributor to the discussion. Lack of trim resolution in the radio. With a trim step resolution of only 1 or 2, dead band has all but disappeared.

Another new feature to the XP9303/9503 is assignable switches, slides and sticks. JR has brought flexibility to a new level. For all you guys that have been demanding assignable switch locations, I hope we don't hear you complaining about the added complexity of radio programming.

Flight Modes are the newest wrinkle in computer radios. Another manufacture had a radio that allowed an alternative setup that can be changed in flight. The XP9303/9503 has five Flight Modes that can be changed in flight with the simple flip of a switch.

Cruise is the is the default flight mode. The other flight modes are inhibited when the radio is first turned on. The XP9303/9503 in this form has more power (side slides) than the XP 8103, but not much. It is the power of the Flight Modes that make this radio really something. The radio contains 5 flight modes. Launch, Cruise, Land, Speed and Thermal. Flight modes can be easily selected in flight. Each Flight Mode allows you to program separately the following mixes; Dual Rate and Expo, Elevator to Flap, Aileron to Flap, Differential, FM Delay, Flaprn Mx, Aileron to Rudder mix, Butterfly, Flap Rate, and each of the non-dedicated mixes.

In addition, you can set the radio so that each trim (Aileron, Elevator, Rudder, Flap and Flaperon) is the same for each Flight Mode or separate for each Flight Mode. As an example, elevator trim can be set so changing the trim in one Flight Mode will change it in all the remaining modes also. Alternatively, you can set the radio so that the trim settings for each flight mode have no effect on other flight modes.

A practical application would be for different elevator trims in different flight modes. Start by flying and trimming the plane in **COM** (common) mode. Now elevator trim for all five flight modes has a common starting point. Once accomplished, switch to **FM** (Flight Mode) mode. Cruise mode is your base line trim setting. You might need a couple click of up trim in launch and thermal mode, and a couple of clicks of down trim in speed and landing. When you switch from Flight Mode to Flight Mode the trims change automatically. Pretty cool.

In addition, the radio can be set to transition slowly from one mode to another to reduce the suddenness of changing from one flight mode to another if there are significant trim differences.

The trainer function instructions are now written right into the radio screen. The trainer function allows you to select the servos in the airplane that the trainee has control of. In other words, you can selectively allow them to learn elevator first, then add rudder second, etc.

The XP 9303/9503 allows you to transfer all the trim settings directly into another XP9303/9503 through a trainer cord. You may not transfer trim settings any radio other than another XP9303?9503. Several mix values changed in the radio making them incompatible for transfer through the trainer cord. A good description of how to make this function work can be found in the airplane manual.

Over the years, I have heard a lot of complaints about a lack of an "OFF" setting in computer radios. Most all computer radios do not contain a setting called "OFF". Why? Because every function is "ON" all the time. As long as the mix value is set to -0-, nothing will happen. In other words, "OFF" and "-0-" are the same thing.

The sailplane channel assignments with the 9303/9503 have changed from prior radios. These new assignments are for all receivers (prior JR and other brands). The new servo assignments are:

Channel Assignments

Channel #	Receiver (Most JR)	6 Servo TD (Dual flap active)	4 Servo w/ Motor (Dual flap inhibited)	V-Tail
1	Thro	Left Aileron	Left Aileron	
2	Aileron	Right Aileron	Right Aileron	
3	Elevator	Elevator	Elevator	Right Ruddervator
4	Rudder	Rudder	Rudder	Left Ruddervator
5	Gear	Right Flap	Motor	
6	Aux 1	Left Flap		
7	Aux 2	Motor		

JR claims this new channel assignment allows for better communication between the radio and the sailplane. What it really means is that a six channel receiver will now work with a six servo sailplane. All prior JR setups radios would have required a seven channel receiver.

The motor assignment for a four servo setup is defaulted to channel #5 and when dual flaps are activated, the motor assignment defaults to channel #7 (AUX2). However, these defaults are easily changed.

The battery may be plugged into **any** empty slot on the receiver or y-harnessed if necessary.

As indicated, do not use a amplified Y-harness with a 2.4 radio.

Programming Review

Flexibility is a wonderful thing. However, programming the JR is complicated by the fact that the radio's flexibility may provide more than one way in which to accomplish the same result. Although more than one means may be available, **it is important to select and use only one method to accomplish your objective.** Otherwise, programming functions may be in conflict and actually cancel themselves out. This article is only one of the many methods to accomplish the objectives below. If you disagree with my methods, or have found one that is better, please let me know what they are for use in a future article.

This article also assumes that you own an XP9303/9503, have the manual handy and are familiar with the four programming buttons across the face of the radio and the selector wheel. The page numbers referenced in the article are the page numbers found in the manual.

This manual provides the setup for several different types of sailplanes. The purpose is to show just how similar the programming is for each type of sailplane. You don't have to relearn the programming for a different model.

The transmitter has two separate programming modes. These are the **system setup mode** and the **function mode**. The system setup mode comes at the beginning of the instruction manual (Page S2) and <u>must be completed before you perform any of the function modes</u>. (Page S15) If you program the function settings first, and then revise the system setup settings second, it may result in wiping out your programming and returning to the system defaults.

Recommended Changes to the Manual

Page G9 contains the image of the front of the radio. Modify or make the following additions to this page and it will make your programming easier.

On image: Change to:

Lever (left side)   FLAP LV
Trainer Button   Time SW
Gear Switch   BTFL SW
Flap Switch   L3P SW
Flap Trim   FLAP TRIM
Aux Trim   FLAPERON TRIM
Aux 2   R3P SW
Lever (right side)   AUX3 LV

The following receiver channels can be assigned to any one of following switches, levers or sticks. This explains why the image of the radio seems to be missing some information:

Servo Slot   What switch, lever or stick will activate it.
Aux 2   Aux3 LV
                Flap LV
                Spoi ST

Aux 3   Ail D/R
                Ele D/R
                Rud D/R
                Aux4 SW
                R3P SW
                L3P SW
                BTFL SW
                Time SW
                Aux3 LV
                Flap LV

AUX4   Ail D/R
Ele D/R
Rud D/R
Aux4 SW
R3P SW
L3P SW
BTFL SW
Time SW

Switch Assignments

The following actions can be assigned to any one of the following switches, levers or sticks.

Timer can be assigned to any of the following:
Ail D/r
Ele D/R
Rud D/R
Aux4 SW
Time SW
BTFL SW
Tim Key

Launch, Cruise, and Land Flight Mode can be assigned to any of the following switches. To put Launch, Cruise and Land on one switch would require a three position switch. There are only two, three position switches and they are labeled R3P SW and L3P SW. (right and left three position switch). If you choose to assign a flight mode to a two position switch, the radio automatically selects the middle and upper positions and discards the lower position. As an example, if you choose the AIL D/R for you Launch, Cruise, Land Flight Mode, only Launch and Cruise are available as Flight Modes. The radio will automatically recognize this and whenever you come to a screen showing the available Flight Modes for mixing, Land will be missing.

INH
AIL D/R
ELE D/R
RUD D/R
AUX4 SW
R3P SW
L3P SW
BTFL SW

Speed, Thermal Flight Mode can be assigned to any of the following:

INH
R3P SW
L3P SW

The non-dedicated mixes can be turned on or off by selecting a flight mode or switch on the radio. Also, a non-dedicated mix can be activated by more than one switch or any combination of switches. This may look simple, but it can become complicated. AX4 and BTF are fixed switches. However, CRU, LAU, LAN, SPD and THM are Flight Modes that can be assigned to any switch identified above.

Non-dedicated mixes 3 through 6 are activated by the following switches.
CRU
LAU
LAN

SPD
THM
AX4
BTF

Non-dedicated mixes 1 and 2 are activated by the following switches.

ON
CRU
SPD
THM
LAU
LND
AX4
BTF

More Recommended Manual Changes.

Now that you have all the flexibility figured out, the following modifications to the manual are still recommended: (this is for the early paper manual. Some of these have been corrected in later manuals or on the CD)

1. Page S2. On the diagram for **[Device. SEL]** insert the following under **SPEED INH** "**TRIM:COM". TRIM:COM** only appears on the screen when either or both of the flight modes are activated. **COM** (Common) can be changed to **FM** (Flight Mode). This same change should be made on page S9, S11, S12, S13 and page S46. This allows trim to remain unchanged from Flight Mode to Flight Mode. Switching to FM means that each Flight Mode has its own trim settings. If **TRIM:** is set to **FM** mode be especially careful during the first flight and remember that the aircraft will need to be trimmed using the digital trims for Aileron, Elevator and Rudder **for each Flight Mode** selected during flight. If the aircraft is badly out of trim in one Flight Mode, it will probably be badly out of trim for each Flight Mode selected unless you change it. Leave this condition set to **COM** for the first flight so trims are set for each Flight Mode. Only after trimming the aircraft, then go back into **Device. SEL** and change **COM** to **FM**. Now you can change trims for each Flight Mode with each Flight Mode starting from the same base line.
2. Page S15. Delete **CAMBER ADJ** and replace it with **FM Delay.**(also page S55, S60 & S66) Delete **CAMBER MIX** and replace it with **FLAPRN MX.**(also page S55, S61 & S67) The function list also contains **MOTO.HOLD. MOTO.HOLD** is only visible on **FUNC. LIST** if **MOTO** is **ACT** on the **DeviceSEL** menu.
3. Page S17. There is a missing screen. On the **MONITOR** screen, scroll the curser over **MONI** and click the rolling selector. You will see the screen on page S39 and S51 entitled **CAMB.**
4. Page S18. There should be another screen here. If you continue to scroll the curser to the right the X-Y graph will disappear to be replaced with any flight modes that have been activated. You can change the D/R and EXP for each flight mode by assigning a flight mode to one of the three rates. These assignable values only appear if flight modes are activated.
5. Page S18. The **F.M.O** on the **D/R & EXP** should be replaced with **Pos-0**. The same with F.M.1 and F.M. 2.
6. Page S24. Change the title of the page and the screen name from **CAMBER ADJ** to **FM Delay.**
7. Page S25. Change the title of the page and screen name from **CAMBER MIX** to **Flaprn MX.**
8. Page S28. The phrase "camber mix" is used in the first sentence. Unfortunately, **DeviceSEL** in the service menu does not contain a "camber mix." The **DeviceSEL** screen uses the word "**FLAP**". Confusing, but they mean the same thing.
9. Page S29. This function is only available when **MOTO** is **ACT** on the **DeviceSEL** menu.

10. **Page** S31. On the far right of the screen image, the words **TIM KEY** appear. I still have not been able to identify what the **TIM KEY** is.
11. On several screens the instructions are discussing a setup in launch mode, but the screen fails to include a launch Flight Mode.

By now you are probably wondering what you have gotten yourself into. Don't worry you are gonna love it.

System Setup Mode.

You enter the system setup mode by pressing and holding down the **ENT** button on the face of the transmitter while turning the transmitter on. You will then be confronted with the screen entitled **System M**. (Page S2).

Model SEL

On the left hand side of the display you will see **Model SEL** surrounded in dark. This dark area will be referred to throughout the article as the cursor. The cursor can be moved around the screen by scrolling the ROLLING SELECTOR. After you have selected the area you wish to enter, press ROLLING SELECTOR until it clicks.

1. Start the programming by scrolling the cursor over **Model SEL.** (page S3) Press the ROLLING SELECTOR.
2. Move the cursor over **MODEL** and press the ROLLING SELECTOR.
3. Scroll through the 30 possible selections or find a blank location and press the ROLLING SELECTOR to start your programming.
4. When done, scroll the cursor to **LST** on the screen and press the ROLLING SELECTOR. Or, just press the **LIST** button. From here on out, this process of returning to the main menu will just be called Exit.

COPY

Although not discussed in the manual, if you place the cursor over **SELECT** and press the ROLLING SELECTOR, COPY will appear. This allows you to copy a model from one of the 30 possible selections to another. If you select an already full location, the original programming will be lost. Once you get the copy from and copy to models selected press the **CLR** button right next to where it says **COPY** on the screen. Pushing this button is what actual performs the copying. Exit.

MDL Reset

If you are setting up a plane in a template that has already been used YOU MUST DELETE ALL THE PROGRAMMING IN THAT TEMPLATE FIRST. Scroll the cursor over **MDL Reset** and press the ROLLING SELECTOR. Press the CLR button. Exit.

MDL Name

Scroll the cursor over **MDL Name** and press the ROLLING SELECTOR. (page S3) Scroll the ROLLING SELECTOR until an up-pointer appears under the <   > brackets. Press the ROLLING SELECTOR. A screen appears with all the possible letters and characters. Scroll the cursor over the selected letter and press the ROLLING SELECTOR. Just repeat until the name is filled in. Unfortunately, you only get eight characters. Exit.

Type SEL

Scroll to **Type SEL** and press the ROLLING SELECTOR. Scroll to **GLID** and press the ROLLING SELECTOR. Exit (Page S4)

MODULAT.

Scroll the cursor over **MODULAT.** and press the ROLLING SELECTOR (page S5). The cursor will be over Modulation. Press the ROLLING SELECTOR. Scroll the cursor over the type of receiver you have. The R770S receiver that comes with the radio is SPCM. Most of JR's older credit card receivers are SPCM. Some old JR ZPCM receivers will not work with this radio. If you have a plug in 2.4 module check

the 2.4 module instructions for which modulation to select. If it is a 2.4 radio only, you won't have a choice.

Exit.

TRIM STEP

1.   Scroll the cursor over **TRIM STEP** and press the ROLLING SELECTOR. (page S8)
2.   Scroll the cursor over **SPOI** and press the ROLLING SELECTOR. Reduce this trim setting to 0%. This effectively inhibits the throttle trim lever.
3.   Push the ROLLING SELECTOR again to return and then scroll over **AILE** and press the ROLLING SELECTOR again. Trim values are from 0 to 10. Setting the trim value to 0 inhibits the electronic trim switches. (inhibit is available for all six trims. (Motor, elevator, rudder, aileron, flap and Flareron) One is very little trim change per beep. Ten is quite a bit of trim change per beep. A setting of 4 or 5 just about equals one click on the old analog trims. I like to change the Aile, Elev and Rudd trims to one. The resolution, especially on the elevator is just fantastic. The total amount of trim change available is the same no matter what trim step you choose.
4.   The **FLAP** and **FPRN** trim steps are just 0, 4 and 8. A setting of 0 inhibits the two electronic trim switches just above the sticks labeled TRIM FLAP and TRIM FLAPERON. Leave these settings on 4.
5.   Exit.

Wing TYPE

Scroll the cursor over **Wing TYPE** and push the ROLLING SELECTOR. If you have a **V-tail** or **DUAL FLAP** scroll the cursor over **INH** and push the ROLLING SELECTOR to change it to **ACT.** If **DUAL FLAP** is **INH,** an ESC may be plugged into servo slot number 5 and the radio will default to the throttle stick working at this location. If **DUAL FLAP** is selected, an ESC may be plugged into servo slot number 7 and the radio will default to the throttle stick working at this location. Some RC Forum groups have alleged that "This means that no matter where you assign the MOTO function menu, the motor will be effected by the spoiler stick. For a 6 servo plane, this isn't workable." Fortunately, this belief is incorrect. In the **DeviceSEL** menu, if **AUX2** is inhibited, the spoiler stick no longer effects this channel and **AUX2** may become a slave to any Mix. This option is discussed in more detail in the chapter on a Six servo sailplane with a motor.

Device SEL

Scroll the cursor over **DeviceSEL** and push the ROLLING SELECTOR. This is the screen where magic happens. Below are setups for various types of sailplanes. For each of the sections identified below, go to the appropriate chapter. Each chapter picks up with **DeviceSEL** and then go from there.

The Types of Sailplanes Discussed in Detail in this Manual.

RUDDER, ELEVATOR AND SPOILER SETUP.
If you have a RES sailplane (rudder, elevator and spoiler):

FOUR SERVO AIRCRAFT
If you have a four servo sailplane (two ailerons, elevator and rudder):

FOUR SERVO AIRCRAFT WITH FULL SPAN AILERONS FOR CAMBER CHANGE.
1.   Scroll the cursor over **DeviceSEL** and push the ROLLING SELECTOR.
2.   Scroll the cursor over to **SPEED** and push the ROLLING SELECTOR. Select **INH** and push the ROLLING SELECTOR**.**

3. Scroll over to **LAUN** push the ROLLING SELECTOR. Select **INH** and push the ROLLING SELECTOR.
4. If your ailerons are full span and you want to adjust camber in flight scroll the cursor over **FLAP** and push the ROLLING SELECTOR.
5. Scroll the cursor over **FLAP LV** to activate the slide on the left of the transmitter case and press the ROLLING SELECTOR. In the alternative, choose **AUX3 LV** to activate the slide found on the right side of the transmitter case and press the ROLLING SELECTOR.
6. Scroll to the bottom of the **FLAP** column and press the ROLLING SELECTOR until you see **ACT**. Select **INH** for the rest.
7. Exit.
8. Go on to any of the sections concerning a six servo plane for Camber Adjustment.

FOUR SERVO AIRCRAFT WITH A MOTOR.
1. If you have a four servo sailplane with a motor, make sure that **DUAL FLAP** is **INH** in the system menu.
2. Scroll the cursor over **DeviceSEL** and push the ROLLING SELECTOR.
3. Scroll the cursor over to **SPEED** and push the ROLLING SELECTOR. Select **INH** and push the ROLLING SELECTOR**.**
4. Scroll over to **LAUN** push the ROLLING SELECTOR. Select **INH** and push the ROLLING SELECTOR.
5. Scroll over to **MOTO** and push the ROLLING SELECTOR. As you can see, there are a bunch of options to select from. Typically select **SPOI ST** and push the ROLLING SELECTOR. This places the motor control on the throttle stick.
6. Scroll down to the **OUT:** line under **MOTO** and push the ROLLING SELECTOR until it says **ACT.**
7. Plug the speed controller into slot #5 on the receiver.
8. Exit.

SIX SERVO AIRCRAFT WITH FULL TRAILAING EDGE CAMBER AND REFLEX ON THE SIDE SLIDE, ONLY ONE SWITCH TO FLIP AT THE TOP OF THE LAUNCH AND LAUNCH FLAPS ON ALL THE TIME EXCEPT WHEN IN THE LAUNCH MODE.

SIX SERVO AIRCRAFT WITH FULL TRAILING EDGE CAMBER, REFLEX ON A SWITCH WITH ALL FIVE FLIGHT MODES TURNED ON.

SIX SERVO AIRCRAFT WITH FULL TRAILING EDGE CAMBER, TURNING ON THE LAUNCH, CRUISE, CAMBER FLIGHT MODE AND A MOTOR.

RES (Rudder, Elevator, Spoiler)

The goal here is to put the elevator and rudder on the right stick and put the spoiler on the left stick. You don't need to worry about switch locations, because you are not going to use any of them. If you have a V-tail, perform the V-tail mixing found at the end of this article.

Plug the elevator in to slot 3, the rudder into slot 4 and the spoiler into slot 5.

This section assumes that you have read the beginning of the article concerning System Mode and have performed the setup described. The setup instructions below continue with **DeviceSEL** found in the System Mode.

Return to System Mode

1. Scroll the cursor over **DeviceSEL** and push the ROLLING SELECTOR.
2. Scroll the cursor over to **SPEED** and push the ROLLING SELECTOR. Select **INH** and push the ROLLING SELECTOR**.**
3. Scroll over to **LAUN** push the ROLLING SELECTOR. Select **INH** and push the ROLLING SELECTOR.
4. Scroll over to **MOTO** and push the ROLLING SELECTOR. As you can see, there are a bunch of options to select from. Typically select **SPOI ST** and push the ROLLING SELECTOR. This places the spoiler control on the throttle stick.
5. Scroll down to the **OUT:** line under **MOTO** and push the ROLLING SELECTOR until it says **ACT.**
6. Plug the spoiler servo into slot #5 on the receiver.
7. It does not matter what you select for **FLAP, AUX2, AUX3 and AUX4.** You are gong to turn them off, just scroll to the bottom line and **INH** each of the columns.
8. Exit.

After turning the radio on you will see the general information display. To enter the function mode simply touch the **LIST** button.

Servo Reversing.

Scroll the cursor over **REV.SW** and push the ROLLING SELECTOR. Slowly operate the rudder (left hand stick), the elevator (right hand stick) and the spoiler (identified on the **REV.SW** careen as **MOT**) Make sure that all of the control surfaces move in the correct direction. To reverse a servo, Scroll the cursor over the correct servo and push the ROLLING SELECTOR to change the servo from normal to reverse. Exit.

Sub Trim.

Sub trim allows you to electronically center all of your control surfaces. Now that the servo direction is correct, (the primary control surfaces all move in the right direction), it is time to align all of the control surfaces.

Start by mechanically aligning all the control surfaces as close to neutral as possible. It's important to perform this function with the transmitter and receiver turned on. Adjust the linkages and servo arms for the elevator and the rudder so that they are as close to neutral as possible. A computer radio will not make up for sloppy building.

Scroll the cursor over **Sub Trim** and push the ROLLING SELECTOR. All of your sub trim values should read 0%.

Scroll the cursor over the servo you need to align and push the ROLLING SELECTOR. Scroll the ROLLING SELECTOR left or right until the control surface centered. (elevator and rudder).

Dual Rates.

Dual Rate functions are available for elevator and rudder.
1.   Scroll the cursor over **D/R & EXP** and push the ROLLING SELECTOR.
2.   Scroll the cursor over **AILE or ELEV or RUDD** and push the ROLLING SELECTOR.
3.   Scroll the cursor down to **ELEV** and push the ROLLING SELECTOR.
4.   Select position 1 on the Elevator D/R switch.
5.   In this format, only D/R or EXP is available for Pos-0 or Pos-1. Ignore Pos-2. Scroll the cursor over the **Pos-1 D/R** column
6.   Move the elevator stick slowly, until it stops and hold it in that position. If the actual elevator throw is greater than that recommended in the plans, Roll the ROLLING SELECTOR while holding the elevator stick against the stop. The amount of elevator deflection will slowly increase or decrease depending on which way you are rolling the ROLLING SELECTOR. Stop when the amount of elevator throw is correct when the stick is fully deflected.

Now move the elevator stick in the other direction. As you can see, the dual rate function should have effected both the up and down elevator. (However, if your mechanical linkages are not symmetrical you still have more deflection in one direction than the other.)

Perform the same function for rudder throw by fully deflecting the rudder stick (left stick) and adjusting the rudder dual rate appropriately.

These instructions will only get you in the general area for the particular type, style and trim of your airplane. Use the dual rate function to modify the pitch (elevator) or roll (rudder) sensitivity of the aircraft to satisfy your personal taste. **I highly recommend, that once you have determined the optimum setting, that you program both switch positions for dual rate and exponential to be exactly the same.** This alleviates you from accidentally bumping a switch in flight and suddenly having an aircraft with different flying characteristics.

Exit.

Travel Adjustment.

Now that you have the two basic control surfaces (elevator and rudder) adjusted to appropriate amount of control throw, it is now time for the final control throw adjustments. (The final adjustment of these control surfaces should be done at home on your work bench and not in the field.) The goal is to obtain equal travel adjustment for each of the servos.

Unless you are an expert builder or awful darn lucky the control surfaces will not move equally. The elevator will move further up than it does down. The fine tuning of these control throws is now done using travel adjustment.

1.   Scroll the cursor over **TRVL ADJ.** and push down the ROLLING SELECTOR.
2.   On the next screen, all nine servo appear at one time.
3.   Scroll the cursor over to **ELEV** push the ROLLING SELECTOR.
4.   Measure the elevator deflection each way. Put in another 25% down throw to help push the plane over at the top of the zoom, right before the aircraft loses airspeed and the control surface becomes unusable. Sometimes the push over needs to be fairly abrupt and additional down elevator is helpful.

The same travel adjustments should be made to make sure that the rudder deflects the same both left and right.

Move the spoiler stick to the top. Connect the spoiler linkage so the spoiler is closed. Slowly pull the spoiler stick down. Change the TRVL ADJ of the **MOTO** section so that you obtain full open spoiler at full down spoiler stick.

Exit.

Mixing Rudder on the Left Stick.

The goal for this type of airplane setup is to place ALL the directional controls on one stick. Elevator (up and down) and rudder (left and right) on the right stick.

1. Scroll the cursor over **Ail to Rud M.**
2. Scroll over to **Left** and push the ROLLING SELECTOR.
3. Hold the aileron stick all the way over to the left.
4. Roll the ROLLING SELECTOR until the Rudder moves in the correct direction and the correct amount and then push the ROLLING SELECTOR.
5. Scroll the cursor over to **Right** and push the ROLLING SELECTOR.
6. Hold the aileron stick all the way over to the right.
7. Roll the ROLLING SELECTOR until the Rudder moves in the correct direction and the correct amount and then push the ROLLING SELECTOR.
8. Exit.

Yep, you are done.

FOUR SERVO AIRCRAFT

If you have a four servo sailplane (two ailerons, elevator and rudder).

The goal here is to put the aileron and elevator on the right stick and mix some rudder to the aileron stick also. Aircraft with roll controlled by ailerons may experience "adverse yaw." This occurs when there is insufficient differential in the ailerons. This adverse yaw is countered with rudder or differential in the ailerons. Some of that adverse yaw can be countered by mixing some aileron to the rudder. You don't need to worry about switch locations, because you are not going to use any of them. If you have a V-tail, perform the V-tail mixing found at the end of this article first.

Plug the left aileron in to slot 1, the right aileron into slot 2, the elevator in to slot 3, and the rudder into slot 4.

This section assumes that you have read the beginning of the article concerning System Mode and have performed the setup described. The setup instructions below continue with **DeviceSEL** found in the System Mode.

Return to System Mode

1. Scroll the cursor over **DeviceSEL** and push the ROLLING SELECTOR.
2. Scroll the cursor over to **SPEED** and push the ROLLING SELECTOR. Select **INH** and push the ROLLING SELECTOR**.**
3. Scroll over to **LAUN** push the ROLLING SELECTOR. Select **INH** and push the ROLLING SELECTOR.
4. It does not matter what you select for **MOTO, FLAP, AUX2, AUX3 and AUX4.** You are going to turn them all off by scrolling to the bottom and selecting **INH** for each of the columns.
5. Exit.

After turning the radio on you will see the general information display. To enter the function mode simply touch the **LIST** button.

Servo Reversing.

Slowly operate the rudder (left hand stick), the elevator (right hand stick) and the ailerons (right hand stick) Make sure that all of the control surfaces move in the correct direction.

1. Scroll the cursor over **REV.SW** and push the ROLLING SELECTOR.
2. To reverse a servo, Scroll the cursor over the correct servo and push the ROLLING SELECTOR to change the servo from normal to reverse.
3. Exit.

Sub Trim.

Sub trim allows you to electronically center all of your control surfaces. Now that the servos are all moving in the correct direction, it is time to align all of the control surfaces.

All of the control surfaces must be aligned mechanically first. It's important to perform this function with the transmitter and receiver turned on. Adjust the linkages and servo arms for the ailerons, elevator and the rudder so that they are as close to neutral as possible. A computer radio will not make up for sloppy building.

1. Scroll the cursor over **Sub Trim** and push the ROLLING SELECTOR. All of your sub trim values should read 0%.

2.	Scroll the cursor over the servo you need to align and push the ROLLING SELECTOR. Scroll the ROLLING SELECTOR left or right until the control surface centered. (aileron, elevator and rudder).
3.	Exit.

Dual Rates.

Dual Rate functions are available for ailerons, elevator and rudder.

1.	Scroll the cursor over **D/R & EXP** and push the ROLLING SELECTOR.
2.	Scroll the cursor over **AILE or ELEV or RUDD** and push the ROLLING SELECTOR.
3.	Scroll the cursor down to **AILE** and push the ROLLING SELECTOR.
4.	Select position 1 on the Aileron D/R switch.
5.	In this format, only D/R or EXP is available for Pos-0 or Pos-1. Ignore Pos-2. Scroll the cursor over the **Pos-1 D/R** column and press the ROLLING SELECTOR.
6.	Move the aileron stick slowly. The aileron may bind, especially on the bottom of the wing. DON'T MOVE THE AIELRON STICK ANY FURTHER! Roll the ROLLING SELECTOR while holding the aileron stick. The amount of aileron deflection will slowly increase or decrease depending on which way you are rolling the ROLLING SELECTOR. Your goal is to have the UP aileron move the recommended control throw for you aircraft at full stick deflection. Stop adjusting when the amount of aileron throw is correct when the stick is fully deflected.
7.	Now move the aileron stick in the other direction. As you can see, the dual rate function should have affected both the up and down aileron. (However, if your mechanical linkages are not symmetrical you still have more deflection in one direction than the other.)
8.	Perform the same function for rudder throw by fully deflecting the rudder stick (left stick) and adjusting the rudder dual rate appropriately. Don't be surprised if the deflection is different.
9.	Perform the same function for elevator throw by fully deflecting the elevator stick (right stick) and adjusting the elevator dual rate appropriately. Don't be surprised if the deflection is different.

These instructions will only get you in the general area for the particular type, style and trim of your airplane. Use the dual rate function to modify the pitch (elevator) or roll (aileron) sensitivity of the aircraft to satisfy your personal taste. **I highly recommend, that once you have determined the optimum setting, that you program both switch positions (Pos-0 and Pos-1) for dual rate and exponential to be exactly the same.** This alleviates you from accidentally bumping a switch in flight and suddenly having an aircraft with different flying characteristics.

Exponential rates are another way to adjust sensitivity of the sticks on your radio. The servos are a rotary output device. Although the line on the **EXP** screen may start out as what appears to be a linear output, it is rather misleading.   Because the servos are a rotary output device, there is a built in negative exponential rate in you servos to begin with. In other words, the stick is naturally more sensitive near the center than it is at the extremes. Obviously, if the D/R is reduced so that the servo arm deflection is less than full deflection, the amount of negative EXP is reduced.

This is a personal choice issue. There is no right or wrong amount of EXP.

Exit.

Travel Adjustment.

Now that you have four basic control surfaces (aileron, elevator and rudder) adjusted to appropriate amount of control throw, it is now time for the final control throw adjustments. (The final adjustment of these control surfaces should be done at home on your work bench and not in the field.) The goal is to obtain equal travel of each of the four servos.

Unless you are an expert builder or awful darn lucky the control surfaces will not move equally. As an example, the elevator will move further up than it does down. The fine tuning of these control throws is now done using travel adjustment.

1. Scroll the cursor over **TRVL ADJ.** and push down the ROLLING SELECTOR.
2. On the next screen, all nine servo appear at one time.
3. Scroll the cursor over to **ELEV** push the ROLLING SELECTOR.
4. Measure the elevator deflection each way. Put in another 25% down throw to help push the plane over at the top of the zoom, right before the aircraft loses airspeed and the control surface becomes unusable. Sometimes the push over needs to be fairly abrupt and additional down elevator is helpful.
5. The same travel adjustments should be made to make sure that the rudder deflects the same both left and right.
6. Ailerons are a different animal. Ailerons will always have more up than down. You don't want to make the up and down throw the same on ailerons. The idea is to make the two ailerons the same. Adjust the two ailerons until they both have the same amount of up. Then Adjust the ailerons until they have the same amount of down. Don't worry if the up and down on the <u>same</u> aileron is different.
7. Exit.

Aileron Differential.

Aileron Differential is a critical component of trimming a sailplane with ailerons. If the ailerons travel the same amount both up and down, the aircraft is likely to develop "adverse yaw." In other words, when you roll the aircraft left (with aileron) the nose of the aircraft wants to go right.

Lift creates drag so an aileron moving down creates more lift and more drag at the same time. An aileron moving up creates less lift and at the same time less drag. So, for a sailplane to roll to the left and have the nose of the aircraft go straight or left requires aileron differential. Less down than up.

An aileron that goes up ¾ inch and only ¼ inch down has a 3 to 1 ratio. Slow flying, under cambered airfoils may require a ratio as high as 5 to 1. A faster flying, symmetrical airfoil may require a 1 to 1 ratio. To get the correct amount of aileron differential depends on the aircraft, the type of flying you line to do, pilot preference and how much rudder you use to coordinate your turn.

1. Scroll the cursor over **DIFFEREN** and push the ROLLING SELECTOR.
2. Scroll the cursor over **0%** under **AILE** and push the ROLLING SELECTOR.
3. Hold the Aileron Stick all the way over to the stop.
4. Roll the ROLLING SELECTOR back and forth until the lower of the two ailerons starts to come up. Use this to set the amount of differential according to the aircrafts set up instructions. Move the aileron stick to the opposite stop and notice that the differential setting works for both ailerons.
5. Exit.

Mixing Rudder to the Right Stick.

Another way to combat "adverse yaw" is to "coordinate" the turn with rudder input. You can still fly the rudder with your left stick. You can also use the Aileron to Rudder Mix so that the rudder is input with your right stick.

1. Scroll the cursor over **Ail to Rud M.** and push the ROLLING SELECTOR.
2. Scroll over to **Left** and push the ROLLING SELECTOR.
3. Hold the aileron stick all the way over to the left.
4. Roll the ROLLING SELECTOR until the Rudder moves in the correct direction and the correct amount and then push the ROLLING SELECTOR.
5. Scroll the cursor over to **Right** and push the ROLLING SELECTOR.

6. Hold the aileron stick all the way over to the right.
7. Roll the ROLLING SELECTOR until the Rudder moves in the correct direction and the correct amount and then push the ROLLING SELECTOR.
8. Exit.

Yep, you are done

ADDITIONAL FOUR SERVO AIRCRAFT OPTIONS.

Camber Adjusting Full Span Ailerons

Please read the section on adding camber to a six servo sailplane. The programming is the same even if **DUAL FLAP** is inhibited in the System Menu. You must still adjust **FLAP RATE** even if there are no flaps. You may have to experiment, but start with a **FLAP RATE** setting of around **50% DN.**

Make the same offset changes in **Flaprn MX** and input a percentage under **FPRN DN** until you get the amount of camber you want when the Left Side Slide is full down.

Turning Full Span Ailerons into Spoilers or Flaps

Please read the section on adding landing flaps to a six servo sailplane. You use the same **Butterfly** programming. Instead of mixing SPOI to FLAP, you simply mix SPOI to FPRN instead.

Adding a Motor

Please read the section on adding a motor to a six servo sailplane. If you have a 7 channel receiver all the programming will work here also. If **SPOI ST** is selected in the **DeviceSEL/MOTO** menu, even the **MOTO HOLD** function is available. If you only have a six channel receiver, simply mix **MOTO** to any available channel (5 or 6).

The Right Side Slider is only available as a <u>direct</u> mix to channel 7 in the **DeviceSEL** menu under **AUX2.** If you want to put the motor on the Right Side Slider, you will have to mix **AUX2** to Channel 5 (gear) or Channel 6 (AUX1).

SIX SERVO AIRCRAFT SIMPLE SETUP. ONLY ONE SWITCH AT THE TOP OF LAUNCH.

The goal here is to:

1. Put the aileron and elevator on the right stick and mix some rudder to the aileron stick.
2. Flaps will be controlled with the spoiler stick, with some crow and elevator comp using the 7-point mix.
3. In flight camber will be controlled with the Left Side Slide.
4. Reflex will be controlled with the Left Side Slide.
5. In this simple version, only one switch needs to flipped in flight. At the top of the launch, just before the zoom. Landing flaps will remain on in all modes except launch.

Before you begin, make sure the servos in the wings are inserted so that the arm side of the servo faces the wing tip and closest to the leading edge of the wing. I further recommend, that during normal flight mode, you set up your radio so that all of the switches are in the same direction. I prefer starting at the top back of the radio and pulling my hand forward and down and move all the switches in that direction. This further simplifies flying and allows you to quickly check your radio without looking down at it by simply passing your hands over all the switches.

Plug the left aileron in to slot 1, the right aileron into slot 2, the elevator in to slot 3, and the rudder into slot 4, right flap into slot 5 and left flap into slot 6.

This section assumes that you have read the beginning of the article concerning System Mode and have performed the setup described. The setup instructions below continue with **DeviceSEL** found in the System Mode.

Return to System Mode

1. You enter the system setup mode by pressing and holding down the **ENT** button on the face of the transmitter while turning the transmitter on. You will then be confronted with the screen entitled **[System M]**. (Page S2).
2. Scroll the cursor over **Wing TYPE** and push the ROLLING SELECTOR.
3. Scroll the cursor over to **DUAL FLAP** push the ROLLING SELECTOR until **ACT** is selected.
4. Exit.
5. Scroll the cursor over **DeviceSEL** and push the ROLLING SELECTOR.
6. Scroll the cursor over to **SPEED** and push the ROLLING SELECTOR. Select **INH** and push the ROLLING SELECTOR**.**
7. Scroll over to **LAUN** push the ROLLING SELECTOR. Select **L3P SW** and push the ROLLING SELECTOR. (this turns on Flight Modes for Launch, Cruise and Land and assigns it to the Left Three Position Switch)
8. Scroll over to **FLAP** and push the ROLLING SELECTOR. Choose **FLAP LV** to activate the slide on the left of the transmitter case and press the ROLLING SELECTOR. In the alternative, choose **AUX3 LV** to activate the slide found on the right side of the transmitter case and press the ROLLING SELECTOR. All this does is identify the slider to be used for camber adjustment.
9. Scroll to the bottom of the **FLAP** column and press the ROLLING SELECTOR until you see **ACT**. If you move the side slide lever now, nothing will happen with the trialing edge. Both flaps and ailerons will be activated and adjusted later.
10. Exit.

Function Mode.

After turning the radio on you will see the general information display. To enter the function mode simply touch the **LIST** button.

If you have a V-tail, perform the V-tail mixing found at the end of this article first.

Servo Reversing.

Slowly operate the rudder (left hand stick), the elevator (right hand stick) and the ailerons (right hand stick) Make sure that all of the control surfaces move in the correct direction.

1.   Scroll the cursor over **REV.SW** and push the ROLLING SELECTOR.
2.   To reverse a servo, Scroll the cursor over the correct servo and push the ROLLING SELECTOR to change the servo from normal to reverse.
3.   Do not worry about flaps at this time.
4.   Exit.

Sub Trim.

Sub trim allows you to electronically center all of your control surfaces. Now that the servos are all moving in the correct direction, it is time to align all of the control surfaces.

All of the control surfaces must be aligned mechanically first. It's important to perform this function with the transmitter and receiver turned on. Adjust the linkages and servo arms for the ailerons, elevator and the rudder so that they are as close to neutral as possible. A computer radio will not make up for sloppy building.

1.   Scroll the cursor over **Sub Trim** and push the ROLLING SELECTOR. All of your sub trim values should read 0%.
2.   Scroll the cursor over the servo you need to align and push the ROLLING SELECTOR. Scroll the ROLLING SELECTOR left or right until the control surface centered. (aileron, elevator and rudder).
3.   Do not worry about the flaps at this time.
4.   Exit.

Dual Rates.

Dual Rate functions are available for ailerons, elevator and rudder.

1.   Scroll the cursor over **D/R & EXP** and push the ROLLING SELECTOR.
2.   Scroll the cursor over **AILE or ELEV or RUDD** and push the ROLLING SELECTOR.
3.   Scroll the cursor down to **AILE** and push the ROLLING SELECTOR.
4.   Select position 1 on the Aileron D/R switch.
5.   In this format, D/R or EXP is available for Pos-0, Pos-1 or Position 2. Scroll the cursor over the **Pos-1 D/R** column and press the ROLLING SELECTOR.
6.   Move the aileron stick slowly. The aileron may bind, especially on the bottom of the wing. DON'T MOVE THE AIELRON STICK ANY FURTHER! Roll the ROLLING SELECTOR while holding the aileron stick. The amount of aileron deflection will slowly increase or decrease depending on which way you are rolling the ROLLING SELECTOR. Your goal is to have the UP aileron move the recommended control throw for you aircraft at full stick deflection. Stop adjusting when the amount of aileron throw is correct when the stick is fully deflected.
7.   For now enter a dual rate in all three switch locations. We can discuss this more later
8.   Now move the aileron stick in the other direction. As you can see, the dual rate function should have affected both the up and down aileron. (However, if your mechanical linkages are not symmetrical you still have more deflection in one direction than the other.)
9.   Perform the same function for rudder throw by fully deflecting the rudder stick (left stick) and adjusting the rudder dual rate appropriately. Don't be surprised if the deflection is different.
10. Perform the same function for elevator throw by fully deflecting the elevator stick (right stick) and adjusting the elevator dual rate appropriately. Don't be surprised if the deflection is different.
11. Exit.

These instructions will only get you in the general area for the particular type, style and trim of your airplane. Use the dual rate function to modify the pitch or roll sensitivity of the aircraft to satisfy your personal taste. **I highly recommend, that once you have determined the optimum setting, that you program both switch positions (Pos-0 and Pos-1) for dual rate and exponential to be exactly the same.** This alleviates you from accidentally bumping a switch in flight and suddenly having an aircraft with different flying characteristics.

Exponential rates are another way to adjust sensitivity of the sticks on your radio. The servos are a rotary output device. Although the line on the **EXP** screen may start out as what appears to be a linear output, it is rather misleading. Because the servos are a rotary output device, there is a built in negative exponential rate in you servos to begin with. In other words, the stick is naturally more sensitive near the center than it is at the extremes. Obviously, if the D/R is reduced so that the servo arm deflection is less than full deflection, the amount of negative EXP is reduced.

This is a personal choice issue. There is no right or wrong amount of EXP.

Exit.

Travel Adjustment.

Now that you have four basic control surfaces (aileron, elevator and rudder) adjusted to appropriate amount of control throw, it is now time for the final adjustments. (The final adjustment of these control surfaces should be done at home on your work bench and not in the field.) The goal is to obtain travel adjustment as close to 100% as possible for the four servos.

Unless you are an expert builder or awful darn lucky the control surfaces will not move equally. As an example, the elevator will move further up than it does down. The fine tuning of these control throws is now done using travel adjustment.

1.   Scroll the cursor over **TRVL ADJ.** and push down the ROLLING SELECTOR.
2.   On the next screen, all nine servo appear at one time.
3.   Scroll the cursor over to **ELEV** push the ROLLING SELECTOR.
4.   Measure the elevator deflection each way. Put in another 25% down throw to help push the plane over at the top of the zoom, right before the aircraft loses airspeed and the control surface becomes unusable. Some times the push over needs to be fairly abrupt and additional down elevator is helpful.
5.   The same travel adjustments should be made to make sure that the rudder deflects the same both left and right.
6.   Ailerons are a different animal. Ailerons will always have more up than down. You don't want to make the up and down throw the same on ailerons. The idea is to make the two ailerons the same. Adjust the two ailerons until they both have the same amount of up. Then Adjust the ailerons until they have the same amount of down. Don't worry if the up and down on the same aileron is different.
7.   Exit.

Aileron Differential.

Aileron Differential is a critical component of trimming a sailplane with ailerons. If the ailerons travel the same amount both up and down, the aircraft is likely to develop "adverse yaw." In other words, when you roll the aircraft left (with aileron) the nose of the aircraft wants to go right.

Lift creates drag so an aileron moving down creates more lift and more drag at the same time. An aileron moving up creates less lift and at the same time less drag. So, for a sailplane to roll to the left and have the nose of the aircraft go straight or left requires aileron differential. Less down than up.

An aileron that goes up ¾ inch and only ¼ inch down has a 3 to 1 ratio. Slow flying, under cambered airfoils may require a ratio as high as 5 to 1. A faster flying, symmetrical airfoil may require a 1 to 1 ratio. To get the correct amount of aileron differential depends on the aircraft, the type of flying you line to do, pilot preference and how much rudder you use to coordinate your turn.

1. Scroll the cursor over **DIFFEREN** and push the ROLLING SELECTOR.
2. Scroll the cursor over **0%** under **AILE** and push the ROLLING SELECTOR.
3. Hold the Aileron Stick all the way over to the stop.
4. Roll the ROLLING SELECTOR back and forth until the lower of the two ailerons starts to come up. Use this to set the amount of differential according to the aircrafts set up instructions. Move the aileron stick to the opposite stop and notice that the differential setting works for both ailerons.
5. Exit.

Mixing the Rudder to the Right Stick.

Another way to combat "adverse yaw" is to "coordinate" the turn with rudder input. You can fly the rudder with your right stick. You can also use the Aileron to Rudder Mix so that the rudder is input with your right stick.

1. Scroll the cursor over **Ail to Rud M.** and push the ROLLING SELECTOR.
2. Scroll over to **Left** and push the ROLLING SELECTOR.
3. Hold the aileron stick all the way over to the left.
4. Roll the ROLLING SELECTOR until the Rudder moves in the correct direction and the correct amount and then push the ROLLING SELECTOR.
5. Scroll the cursor over to **Right** and push the ROLLING SELECTOR.
6. Hold the aileron stick all the way over to the right.
7. Roll the ROLLING SELECTOR until the Rudder moves in the correct direction and the correct amount and then push the ROLLING SELECTOR.
8. Exit.

You now have control sufficient for the flying of the aircraft. You just don't have any landing or lift control devises yet.

Flaps and Landing Mode.

Now that the basic control surfaces of the aircraft have been completed, the remainder of this section will focus on various flight modes which involve the use of flaps. These will include launch, cruise and land Flight Modes as will as full span camber changing.

Flaps and Their Connection.

View page S48 of the manual. The setting of the servo arm and the correct **Sub Trim** is critical to the operation of the flaps. Because the flap move through as much a 90 degrees, the Sub Trim of the flap servos requires a large offset.

1. Remove the Flap control rods from either the servo arm or the flap horn.
2. Move the **L3P SW** to the Cruise position. (center)
3. Scroll the cursor until it covers **Sub Trim** and push the ROLLING SELECTOR.
4. You will be confronted the Sub Trim page showing all the Sub Trims for all servos. Scroll the cursor over **RFLP** and push the ROLLING SELECTOR.
5. Scroll the ROLLING SELECTOR so that it moves in the direction that would raise the flap if it was connected. Keep rolling until the value reaches 200.
6. Remove the servo arm from the servo and reattach it so that it is at the angle shown on page S48. **Failure to perform this function will reduce flap movement in landing mode to less than 45°.**
7. Reattach the control linkage to the flap and adjust it so that the flap is in neutral. Push the ROLLING SELECTOR to Exit.
8. Scroll the cursor over **LFLP** and push the ROLLING SELECTOR.
9. Scroll the ROLLING SELECTOR so that it moves in the direction that would raise the flap if it was connected. Keep rolling until the value reaches 200.
10. Remove the servo arm from the servo and reattach it so that it matches the angle of the other servo arm. **Failure to perform this function will reduce flap movement in landing mode to less than 45°.**
11. Reattach the control linkage to the flap and adjust it so that the flap is in neutral. Push the ROLLING SELECTOR to Exit.
12. Fine tune both flaps using the **Sub Trim** so they are the same. A note of caution. Build a airfoil template of the top of the wing and use it to set the neutral point for the flap. Using the aileron or a fixed portion of the wing will almost always result in a flap position that is not neutral.
13. Exit.

Flap Control on the Left Stick

1. Scroll the cursor over **Butterfly** and push the ROLLING SELECTOR.
2. Scroll the cursor over **offset** and push the ROLLING SELECTOR.
3. I recommend changing the default from 170 to 160. A offset of 170 starts the flaps coming down with the first click of downward movement of the spoiler stick. With a offset of 160, the first three or four click have no impact on flap movement. That way, if you use the rudder stick, you are much less likely to pull the flaps down accidentally. Push the ROLLING SELECTOR.
4. Scroll the cursor over **SPOI to FLAP 1:** and push the ROLLING SELECTOR.
5. Pull the spoiler stick all the way to the bottom.
6. Scroll the ROLLING SELECTOR until the flaps move in the correct direction (down) and keep scrolling until the flaps reach the desired angle. You should be able to obtain 90° flaps quite easily. If you can't obtain 90 degrees of flap there is probably a mechanical linkage problem. Try shortening the flap control horn or lengthen the servo arm. Push the ROLLING SELECTOR.
7. Scroll the cursor over **SPOI to FPRN 1:** and push the ROLLING SELECTOR.
8. Pull the spoiler stick all the way to the bottom.
9. The flaps should be at the desired location. Scrolling the ROLLING SELECTOR will move the ailerons together. This is what is referred to as "CROW". With the spoiler stick all the way down, scroll the ROLLING SELECTOR until the ailerons stop in the desired location. Push the ROLLING SELECTOR.
10. Scroll the cursor over **SPOI to ELEV 1:** and push the ROLLING SELECTOR. With the spoiler stick all the way to the bottom, scroll the ROLLING SELECTOR until you achieve approximately 35% down elevator. When flaps are lowered, the airplane will pitch up altering the aircrafts flight path. Every airplane is different and the amount that you ultimately use will depend on your aircraft and your flying style. A recommended starting point is approximately 35%. Remember, the proper compensation is down elevator with full flaps. You must fly and experiment with the mix percentage, 35% is only a starting point.
11. Exit.

The XP9303/9503 also provides for a specialized mix function which will completely eliminate that annoying bump that the airplane makes when you first pull the flaps down. That specialized mixing function is discussed later under Multi-Point Programmable Mixing.

Launch Flap Preset.

This is the first time you will use flight modes. Earlier we activated the Launch, Cruise, Land mode and placed it on the **L3P SW.** There are three flight modes on this switch. Although they are labeled Launch, Cruise and Land, you can actually use them for anything you want.

1. Move the **L3P SW** to the launch position. (up on the radio.) This can be reversed so the launch position is down instead of up by making the change in Dev. Sel in the setup section. Next to launch or land you will see **nom** or **Rev.** Select rev to reverse the direction of this switch. (personally I prefer the launch switch to be in the down position so this is set to **Rev.**
2. On the top of the radio, click the **TRIM FLAP** until the flaps go in the correct direction and the appropriate amount for launch. The appropriate amount can only be determined by experimenting. Tow hook location, size of flaps, taper of the wing and several others all will affect the best flap setting.
3. On the top of the radio, click the **TRIM FLAPERON** the ailerons go in the correct direction and the appropriate amount for launch.
4. Move the **L3P SW** to Cruise (middle position) and the flaps and ailerons should move to neutral.
5. Some like to input up elevator trim in launch. With the **L3P SW** in the launch position, click the up elevator trim until you obtain the appropriate amount.
6. Move the **L3P SW** to cruise and the flaps, ailerons and elevators all return to neutral.
7. Exit.

Full Span Camber Adjustment.

Full span camber changing allows you to change the shape of the wing during flight. This function allows you to change the entire trailing edge of the wing. There is quite a current discussion concerning trailing edge camber and how it should be employed. Some argue that camber should be adjustable, from none to as much a ¼ inch. Others argue that there is only one setting for each airfoil that provides the greatest lift and that camber should just be on a switch. Simply on or off.

This section will show you how to put camber changing on the left side slide.

1. Scroll the cursor over **FLAP RATE** and push the ROLLING SELECTOR.
2. The next screen will show all the Flight Modes that have been activated.
3. Make sure the **L3P SW** is in Cruise mode.
4. Move the Left Side slide to the down position.
5. Scroll the cursor over **CRUISE DN.**
6. Scroll the ROLLING SELECTOR until you see the flap move in the correct direction and the appropriate amount.
7. Move the Left Side slide to the center position. The Flaps should return to neutral.
8. Exit.

So far we have flaps moving down from the center position of the Left Side Slide. Now we have to make a decision. That decision is about reflex.

Reflex is lowering the drag of the wing by raising the trailing edge. It does not take much. Put a straight edge across the bottom the wing. The straight edge should contact the bottom of the wing at the thickest portion and at the trailing edge. Start raising the trailing edge. As soon as the straight edge touches the wing in three locations, (at the hinge line) you have all the reflex you need. Reflex is for going fast.

The question is, do you want to deploy reflex or not? Recall, the goal of this version of the programming is to perform the entire flight mode and only flip one switch, at the top of the zoom. The only real option with this programming restriction is to use the upper half of the side slide for Reflex. In a later programming version, with more than one switch to be thrown in flight, we put reflex on a switch. You can do one or the other, YOU CANNOT DO BOTH.

Only Camber Adjustment on the Left Side Slide

1.   Scroll the cursor over **Flaprn MX** and push the ROLLING SELECTOR.
2.   Make sure the **L3P SW** is in Cruise mode.
3.   Scroll the cursor over **Offset** right under **FLAP LV** and push the ROLLING SELECTOR.
4.   Scroll the ROLLING SELECTOR until the offset value is +200. This operation makes the entire side slide move camber only in a down direction, no reflex.
5.   Exit.
6.   Scroll the cursor over **FLAP RATE** and push the ROLLING SELECTOR.
7.   Move the Left Side Slide all the way to the bottom.
8.   Scroll the cursor over **CRUI DN** and push the ROLLING SELECTOR. Scroll the ROLLING SELECTOR until the Ailerons droop to match the Flaps. Make sure to scroll the ROLLING SELECTOR all the way to the stops each way. Compare to the Flap adjustment, this one will take a lot of change. My sailplane took the full 125% that was available.
9.   If the Ailerons do not move, try the same under **CRUI UP**. If your flaps are installed differently than the servo output towards the wing tip and the leading edge, you may have to use **CRUI UP** to get **CRUI DN.**
10.   Move the Left Side Slide to the top position and the entire trailing edge should return to neutral.
11.   Exit.

Reflex on the Side Slide Using the Upper Half of the Side Slide Movement.

1.   Scroll the cursor over **FLAP RATE** and push the ROLLING SELECTOR.
2.   Make sure the **L3P SW** is in Cruise mode.
3.   Move the Left Side slide to the up position.
4.   Scroll the cursor over **CRUISE UP** and push the ROLLING SELECTOR.
5.   Scroll the ROLLING SELECTOR until the Aileron goes in the correct direction and the appropriate amount.
6.   Return the side slide to neutral and the flaps should return to neutral also.
7.   Exit.
8.   Scroll the cursor over **Flaprn MX** and push the ROLLING SELECTOR.
9.   Move the Left Side Slide all the way to the bottom.
10.   Scroll the cursor over **CRUI DN** and push the ROLLING SELECTOR. Scroll the ROLLING SELECTOR until the Ailerons droop to match the Flaps. Make sure to scroll the ROLLING SELECTOR all the way to the stops each way. Compare to the Flap adjustment, this one will take a lot of change. My sailplane took the full 125% that was available.
11.   If the Ailerons do not move, try the same under **CRUI UP**. If your flaps are installed differently than the servo output towards the wing tip and the leading edge, you may have to use **CRUI UP** to get **CRUI DN.**
12.   Move the Left Side Slide to the neutral position and the entire trailing edge should return to neutral.
13.   Exit.

So here are the things you do in a flight with this programming.

1.   If you have reflex on the Left Side Slide, move the slide all the way to the top.

2. Move the **L3P SW** to the Launch position. Your Flaps and Ailerons should drop into launch position. If you want to change the flap position, do it now by trimming with the **TRIM FLAP** and **TRIM FLAPERON** trim switches.
3. Input any elevator trim you may need.
4. Launch the aircraft, right before the dip and the zoom, move the **L3P SW** to Cruise mode (middle position)
5. At the top of the zoom, during the push over to level flight, move the Left Side Slide to the middle position.
6. As long as the **L3P SW** is in Cruise or Land mode, the landing flaps are always on.
7. This is the simplest programming mode for a six servo sailplane setup.

Multi-Point Programmable Mixing.
(or how to get rid of that annoying bump as you begin to pull the flaps down)

Traditionally, mixing functions in computer radios only allow a linear mix between the master and the slave channels. As an example, when the aileron to rudder mix is activated, and you push the aileron stick all the way to the stop, it mixes in a pre-programmed amount of rudder deflection. With multi-point programmable mixing, the XP9303/9503 radio allows you to insert up to seven different mix points anywhere on the curve. In other words, as you slowly push the aileron stick all the way to the stop, you could literally make the rudder waggle back and forth.

In the case of model sailplanes, this allows you to mix a larger percentage of elevator compensation during the initial part of flap movement and less elevator compensation as flaps approach 90°. This completely eliminates that bump your airplane takes on approach as you pull the flap stick down.

The XP9303/9503 radio provides six extra programming functions that allow you to assign any slave to any master channel. The first of these additional mix functions allow the multi-point programmable mixing and is defaulted to mix Flap to Elevator. The remaining four provide the ability to do things like add additional aileron/rudder mix during launch, and automatically eliminate the aileron/rudder mix in reflex mode.

To eliminate that annoying bump on approach when you pull down the flap stick, there is a very deliberate sequence of steps that you should follow. First, program the radio as indicated above for flap and elevator compensation on approach. Launch the airplane and adjust the elevator compensation until you achieve the proper glide path at full flap. Ignore the bump for now. Some individuals want the airplane, at full flap to continue on the same flight path before the flaps were lowered. Other individuals like the airplane to take a decidedly strong downward pitch when the flaps are lowered. This insures that you don't lose flying speed and stall your airplane. However, there is **no situation** where after pulling the flaps all the way down, the plane should pitch upward. This situation is unacceptable and should be avoided.

The steps below will be used to determine the amount of Elevator compensation at full flap using the **Butterfly** Mix. At mid Flap stick, the sailplane will want to float up. Full Elevator compensation at full flap needs to be determined and marked on the fin/Rudder. Once the fin is marked, the elevator compensation in the **Butterfly** mode is reduced to zero and **PROG. Mix1** will be used instead.

1. Scroll the curser over **Butterfly** in the program mode and push the ROLLING SELECTOR.
2. Scroll the cursor over **SPOI to ELEV 1:** and push the ROLLING SELECTOR. With the flap stick in the full down position, scroll the ROLLING SELECTOR until the Elevator moves approximately 35% in the correct direction. (down elevator)
3. Launch and fly the sailplane. When the flight path is perpendicular to you, several mistakes high pull the flap stick down. Add or subtract Elevator compensation until the flight path of the sailplane is the same at full flap as it is at no flap. At this time what happens at mid flap stick is not important.
4. Land the aircraft and mark on the fin or rudder, both neutral Elevator and Elevator compensation at full flap stick.
5. Return to **SPOI to ELEV 1:** in the Butterfly section like you did above.

6. Scroll **SPOI to ELEV 1:** to 0%.
7. Exit.
8. Scroll the cursor over **PROG.Mix1**and push the ROLLING SELECTOR.
9. As you can see, the master, slave is already set to **SPOI to ELEV.**
10. Scroll the cursor over **SW SELECT** and push the ROLLING SELECTOR.
11. You will be presented with all the possible switches that will turn this mix on and off.
12. The default is ON all the time for all mixes. This is OK, but I prefer to only turn on mixes when they are actually going to be used.
13. Scroll the cursor over **CRU** and push the ROLLING SELECTOR.
14. Scroll the cursor over **LND** and push the ROLLING SELECTOR. Landing flaps now work in Cruise and Land mode. The Flap stick will not move the flaps in Launch mode.
15. Scroll the cursor over **Point-0** and push the ROLLING SELECTOR.
16. Pull the Flap stick all the way down.
17. Scroll the ROLLING SELECTOR until the elevator moves to and matches the mark made on the fin/rudder earlier. Push the ROLLING SELECTOR.
18. Scroll the cursor over **Point-3** and push the ROLLING SELECTOR.
19. Scroll the cursor until the line is slightly high than a straight line between **Point-0** and **Point-6**.

After all of that work, you have now accomplished exactly what the elevator compensation section in the butterfly mixing was able to perform with a single button. Now, let the magic begin.

Launch your aircraft and verify, at least three or four mistakes high, that the elevator compensation is correct at full flap. If it is not, land and adjust **Point-0** until you have achieved the proper amount of elevator compensation with full flaps.

Launch the aircraft again. Three or four mistakes high pull the flap stick down to mid flap and add or subtract Elevator Compensation until the flight path at mid Flap stick (Point-3) is also neutral. It takes a while to get this right. You are not going to get it on your first try. You may have to increase or decrease the mixing at **POINT-3** until it is perfect. You may also need to adjust **Point-5** and **Point-4.** Variations in the size of flaps and effectiveness of different elevators will require experimentation. Two meter aircraft respond well to a single but strong bump on the curve at **POINT-4 and 5.** Unlimited aircraft respond to a more gentle curve by adding additional compensation at **POINT-2 and 1.** When it is perfect, its sweet. Worth the price of admission.

I recommend having a buddy pull the flap stick down while you are flying. By setting up the radio so that it is in **PROG.Mix1** before launch, your buddy can pull the stick down until the vertical line on the graph is right above point 1 through 5. Because the mixing only works on one of these points, your adjustments upon landing will be MUCH more appropriate and you will nail this portion of the programming just that much quicker.

Increasing Aileron to Rudder Mix During Launch.

I trim my models to fly with little aileron/rudder mixing during normal flight modes. However, this means at launch, I have little if any rudder to recover from a bad throw. (Recall aileron controls roll, making it virtually worthless in this situation. Rudder controls yaw, like a rudder in the back of a boat, and is MUCH more important on launch) It's easy to increase the aileron/rudder mix during launch with the Launch Mode Switch.

1. Scroll the cursor over **Ail to Rud M.** and push the ROLLING SELECTOR.
2. Scroll over to **Left** column and scroll down to Launch and push the ROLLING SELECTOR.
3. Scroll the ROLLING SELECTOR until the number after Launch is larger than the number after Cruise.
4. Do the same thing in the **Right** column.
5. The additional rudder mix is easily verified. Hold the aileron stick all the way to the stop. Move the **L3P SW** from Launch to Cruise Mode. The rudder should move back and forth as the switch is moved.

6. Exit

SIX SERVO AIRCRAFT WITH FULL TRAILING EDGE CAMBER, REFLEX ON A SWITCH WITH ALL FIVE FLIGHT MODES TURNED ON.

The goal here is to:

1.   Put the aileron and elevator on the right stick and mix some rudder to the aileron stick.
2.   Flaps will be controlled with the spoiler stick, with some crow and elevator comp using the 7 point mix.
3.   In flight camber will be controlled with the left side slide.
4.   All five flight modes will be activated. Landing flaps will remain on in all modes except launch.
5.   Launch on a switch.
6.   Reflex on a switch.

Before you begin, make sure the servos in the wings are inserted so that the arm side of the servo faces the wing tip and is closest to the leading edge of the wing. I further recommend, that during normal flight mode, you set up your radio so that most of the switches are in the same direction. I prefer starting at the top back of the radio and pulling my hand forward and down and move all the switches in that direction. This further simplifies flying and allows you to quickly check your radio without looking down at it by simply passing your hands over all the switches.

Plug the left aileron in to slot 1, the right aileron into slot 2, the elevator in to slot 3, and the rudder into slot 4, right flap into slot 5 and left flap into slot 6.

This section assumes that you have read the beginning of the article concerning System Mode and have performed the setup described. The setup instructions below continue with **DeviceSEL** found in the System Mode.

Return to System Mode

1.   You enter the system setup mode by pressing and holding down the **ENT** button on the face of the transmitter while turning the transmitter on. You will then be confronted with the screen entitled **System M**. (Page S2).
2.   Scroll the cursor over **Wing TYPE** and push the ROLLING SELECTOR.
3.   Scroll the cursor over to **DUAL FLAP** push the ROLLING SELECTOR until **ACT** is selected.
4.   Exit.
5.   While still in **System M,** scroll the cursor over **DeviceSEL** and push the ROLLING SELECTOR.
6.   Scroll the cursor over to **SPEED** and push the ROLLING SELECTOR. Select **R3P SW** and push the ROLLING SELECTOR**.** (this turns the Flight Modes for Speed and Thermal on the Right Three Position Switch)
7.   Scroll over to **LAUN** push the ROLLING SELECTOR. Select **L3P SW** and push the ROLLING SELECTOR. (this turns on Flight Modes for Launch, Cruise and Land and assigns it to the Left Three Position Switch)
8.   Scroll over to **FLAP** and push the ROLLING SELECTOR. Choose **FLAP LV** to activate the side slide on the left of the transmitter case and press the ROLLING SELECTOR. In the alternative, choose **AUX3 LV** to activate the slide found on the right side of the transmitter case and press the ROLLING SELECTOR. All this does is identify the slider to be used for camber adjustment.
9.   Scroll to the bottom of the **FLAP** column and press the ROLLING SELECTOR until you see **ACT**. If you move the side slide lever now, nothing will happen with the trialing edge. Both flaps and ailerons will be activated and adjusted later.
10.   All the remaining activities (**MOTO, AUX2, AUX3, AUX4**) should be inhibited. (**INH**)
11.   Scroll the ROLLING SELECTOR over **TRIM:COM.** This function can be switched from common (**COM**) to Flight Mode (**FM**). In **COM**, a trim changed in any flight mode, changes that trim setting in all flight modes. We recommend leaving this in **COM** for now. After the

trim flights are completed, change this back to **FM** and trim changes made in one Flight Mode DO NOT change trims in other Flight Modes.

12.   Exit.

The Flight Mode Switches have a series of default positions. If Launch or Land are selected, either will override Speed or Thermal. For Speed or Thermal to work, the Left Three Position Switch must be in the middle position. (Cruise)

Return to Function Mode.

After turning the radio on you will see the general information display. To enter the function mode simply touch the **LIST** button.

If you have a V-tail, perform the V-tail mixing found at the end of this article first.

Servo Reversing.

Slowly operate the rudder (left hand stick), the elevator (right hand stick) and the ailerons (right hand stick) Make sure that all of the control surfaces move in the correct direction.

1.   Scroll the cursor over **REV.SW** and push the ROLLING SELECTOR.
2.   To reverse a servo, Scroll the cursor over the correct servo and push the ROLLING SELECTOR to change the servo from normal to reverse.
3.   Do not worry about flaps at this time.
4.   Exit.

Sub Trim.

Sub trim allows you to electronically center all of your control surfaces. Now that the servos are all moving in the correct direction, it is time to align all of the control surfaces.

All of the control surfaces must be aligned mechanically first. It's important to perform this function with the transmitter and receiver turned on. Adjust the linkages and servo arms for the ailerons, elevator and the rudder so that they are as close to neutral as possible. A computer radio will not make up for sloppy building.

1.   Scroll the cursor over **Sub Trim** and push the ROLLING SELECTOR. All of your sub trim values should read 0%.
2.   Scroll the cursor over the servo you need to align and push the ROLLING SELECTOR. Scroll the ROLLING SELECTOR left or right until the control surface centered. (aileron, elevator and rudder).
3.   Do not worry about the flaps at this time.
4.   Exit.

Dual Rates.

You are about to experience the power of flight modes.

Dual Rate functions are available for ailerons, elevator and rudder. The first portion of this section is to obtain a D/R setting that is close to the rates specified for the particular aircraft. The second portion will then discuss how to assign particular D/R to a particular flight mode.

1.   Scroll the cursor over **D/R & EXP** and push the ROLLING SELECTOR.
2.   Scroll the cursor over **AILE or ELEV or RUDD** and push the ROLLING SELECTOR.
3.   Scroll the cursor down to **AILE** and push the ROLLING SELECTOR.
4.   Select position 1 on the Aileron D/R switch.

5.	In this format, D/R or EXP is available for Pos-0, Pos-1 or Position 2. Scroll the cursor over the **Pos-1 D/R** column and press the ROLLING SELECTOR.
6.	Move the aileron stick slowly. The aileron may bind, especially on the bottom of the wing. DON'T MOVE THE AIELRON STICK ANY FURTHER! Roll the ROLLING SELECTOR while holding the aileron stick. The amount of aileron deflection will slowly increase or decrease depending on which way you are rolling the ROLLING SELECTOR. Your goal is to have the UP aileron move the recommended control throw for you aircraft at full stick deflection. Stop adjusting when the amount of aileron throw is correct when the stick is fully deflected.
7.	For now enter a dual rate in all three switch locations. We can discuss this more later
8.	Now move the aileron stick in the other direction. As you can see, the dual rate function should have affected both the up and down aileron. (However, if your mechanical linkages are not symmetrical you still have more deflection in one direction than the other.)
9.	Perform the same function for rudder throw by fully deflecting the rudder stick (left stick) and adjusting the rudder dual rate appropriately. Don't be surprised if the deflection is different.
10.	Perform the same function for elevator throw by fully deflecting the elevator stick (right stick) and adjusting the elevator dual rate appropriately. Don't be surprised if the deflection is different.
11.	Exit.

Travel Adjustment.

Now that you have four basic control surfaces (aileron, elevator and rudder) adjusted to appropriate amount of control throw, it is now time for the final adjustments. (The final adjustment of these control surfaces should be done at home on your work bench and not in the field.) The goal is to obtain travel adjustment as close to 100% as possible for the four servos.

Unless you are an expert builder or awful darn lucky the control surfaces will not move equally. As an example, the elevator will move further up than it does down. The fine tuning of these control throws is now done using travel adjustment.

1.	Scroll the cursor over **TRVL ADJ.** and push down the ROLLING SELECTOR.
2.	On the next screen, all nine servo appear at one time.
3.	Scroll the cursor over to **ELEV** push the ROLLING SELECTOR.
4.	Measure the elevator deflection each way. Put in another 25% down throw to help push the plane over at the top of the zoom, right before the aircraft loses airspeed and the control surface becomes unusable. Some times the push over needs to be fairly abrupt and additional down elevator is helpful.
5.	The same travel adjustments should be made to make sure that the rudder deflects the same both left and right.
6.	Ailerons are a different animal. Ailerons will always have more up than down. You don't want to make the up and down throw the same on ailerons. The idea is to make the two ailerons the same. Adjust the two ailerons until they both have the same amount of up. Then Adjust the ailerons until they have the same amount of down. Don't worry if the up and down on the same aileron is different.
7.	Exit.

Back to Dual Rates

The power of flight modes is here!

1.	Scroll the cursor over **D/R & EXP** and push the ROLLING SELECTOR.
2.	The new screen contains a lot of information. There are really two screens here.
3.	The default screen uses the **D/R** switches to change between the two available rates.
4.	Scroll the curser over **ELEV, AILE or RUDD** and push the ROLLING SELECTOR.
5.	Select **ELEV** and push the ROLLING SELECTOR.

6. If you flip the **ELEV D/R switch** on the face of the radio, a 0 will change to a 1 just to the right **D/R & EXP** at the top of the screen. This means you are in the mode that uses the **D/R Switches.** In this setup, only the **Pos-0 and Pos-1** are available. **Pos-2** does nothing.

7. Scroll the curser over to the far right. If there is a graph there, it will be replaced with a column entitled **AUTO** at the top with the activated Flight Modes below. (This column only appears if one or both of the flight modes are activated) After each Flight Mode is the designation **:SW.**

8. As long as ALL the Flight Modes in the **AUTO** column are set to **:SW**, the two position switches around the radio are still functional.

9. The remainder of this section will show you how to assign **D/R's** to a Flight Mode.

10. Lets assume that you want to have less elevator during the "on tow" portions of launch and even less in Thermal mode.

11. You set **Pos-1** earlier. Scroll the cursor over to **D/R** next to **Pos-0** and push the ROLLING SELECTOR. Make the value less than **Pos-1**. Push the ROLLING SELECTOR.

12. Scroll the cursor over to **D/R** next to **Pos-2** and push the ROLLING SELECTOR. Make it even less than **Pos-1.**

13. Scroll the cursor over to the **AUTO** column, scroll down to **LAUN:SW** and push the ROLLING SELECTOR.

14. Select **Pos-0** and push the ROLLING SELECTOR.

15. Scroll the cursor over **THRM:SW** and push the ROLLING SELECTOR.

16. Select **Pos-2** and push the ROLLING SELECTOR.

17. You can actually watch the overrides working. Remember Launch and Land override Speed and Thermal. With the Left and Right Three Position Switch in the middle position (Cruise Mode), the number 1 appears just to the right of **D/R & EXP** on the screen. Flip the Right Three Position Switch down into Thermal Mode and the number changes to 2. Even with the Thermal Mode left on, If you flip the Left Three Position Switch to Launch the number still changes to 0.

18. Exit.

It is up to you and your airplane to determine how best to use Dual Rates. Some other areas where it might come in useful:

1. Rudder: Launch – more, Land – more, Speed – less
2. Aileron: Launch - ?, Land – more, Speed – less, Thermal – less.
3. Elevator: Launch – less, land - ?, Speed – less, Thermal – less.

Exponential rates are another way to adjust sensitivity of the sticks on your radio. The servos are a rotary output device. Although the line on the **EXP** screen may start out as what appears to be a linear output, it is rather misleading. Because the servos are a rotary output device, there is a built in negative exponential rate in you servos to begin with. In other words, the stick is naturally more sensitive near the center than it is at the extremes. A servo that uses full servo arm deflection each way from center has a negative exponential of a little more than 30 percent. Obviously, if the D/R is reduced so that the servo arm deflection is less than full deflection, the amount of negative EXP is reduced.

If this is your first chance to EXP, you might want to try a EXP rate of around positive 20 to 25 percent. This will give you a more linear output at the servo.

This is a personal choice issue. There is no right or wrong amount of EXP.

Exit.

Aileron Differential.

Aileron Differential is a critical component of trimming a sailplane with ailerons. If the ailerons travel the same amount both up and down, the aircraft is likely to develop "adverse yaw." In other words, when you roll the aircraft left (with aileron) the nose of the aircraft wants to go right.

Lift creates drag so an aileron moving down creates more lift and more drag at the same time. An aileron moving up creates less lift and at the same time less drag. So, for a sailplane to roll to the left and have the nose of the aircraft go the same way requires aileron differential. Less down than up.

An aileron that goes up ¾ inch and only ¼ inch down has a 3 to 1 ratio. Slow flying, under cambered airfoils may require a ratio as high as 6 to 1. A faster flying, symmetrical airfoil may require a 1 to 1 ratio. To get the correct amount of aileron differential depends on the aircraft, the type of flying you like to do, pilot preference and how much rudder you use to coordinate your turn.

1. Scroll the cursor over **DIFFEREN** and push the ROLLING SELECTOR.
2. Scroll the cursor over **0%** under **AILE** and push the ROLLING SELECTOR.
3. Hold the Aileron Stick all the way over to the stop.
4. Roll the ROLLING SELECTOR back and forth until the lower of the two ailerons starts to come up. Use this to set the amount of differential according to the aircrafts set up instructions. Move the aileron stick to the opposite stop and notice that the differential setting works for both ailerons.
5. Set the differential to that in the instructions for your aircraft. If unknown start with a 3 to 1 ratio.
6. Exit.

Mixing the Rudder to the Right Stick.

Another way to combat "adverse yaw" is to "coordinate" the turn with rudder input. You can fly the rudder with your right stick. You can also use the Aileron to Rudder Mix so that the rudder is input with your right stick.

1. Scroll the cursor over **Ail to Rud M.** and push the ROLLING SELECTOR.
2. Each of the activated Flight Modes will appear on the screen.
3. If you move the Aileron Stick now, the rudder remains motionless.
4. Scroll over to **Cruise** and just below **Left** and push the ROLLING SELECTOR.
5. Hold the aileron stick all the way over to the left.
6. Roll the ROLLING SELECTOR until the Rudder moves in the correct direction and the correct amount and then push the ROLLING SELECTOR.
7. Scroll the cursor over to **Right** and push the ROLLING SELECTOR.
8. Hold the aileron stick all the way over to the right.
9. Roll the ROLLING SELECTOR until the Rudder moves in the correct direction and the correct amount and then push the ROLLING SELECTOR. If you equalized rudder throw in both directions by using **TRVL ADJ.** discussed earlier, the left and right amount in **AIL to RUD M** should be the same.
10. Exit.

Now go back and mix Aileron to Rudder in the other Flight Modes you have activated. In general, Launch, Land and Thermal may require more mix. Speed usually takes less. Aileron to Rudder Mix is a personal thing and depends on your ability to fly the Rudder Stick on the radio.

So far, you have programmed the radio so that you can make the sailplane pitch up or down, yaw let or right and roll like a cork screw. Cool, but can you land on a dime?

Landing Flaps and Landing Mode.

Now that the basic control surfaces of the aircraft have been completed, the remainder of this section will focus on various flight modes which involve the use of flaps. These will include launch, cruise and land Flight Modes as will as full span camber changing.

Landing Flaps and Their Connection.

View page S48 of the manual. The setting of the servo arm and the correct **Sub Trim** is critical to the operation of the flaps. Because the flaps move through as much a 90 degrees, the Sub Trim of the flap servos requires a large offset.

1.   Remove the Flap control rods from either the servo arm or the flap horn.
2.   Move the **L3P SW** to the Cruise position. (center)
3.   Scroll the cursor until it covers **Sub Trim** and push the ROLLING SELECTOR.
4.   You will be confronted the Sub Trim page showing all the Sub Trims for all servos. Scroll the cursor over **RFLP** and push the ROLLING SELECTOR.
5.   Scroll the ROLLING SELECTOR so that it moves in the direction that would raise the flap if it was connected. Keep rolling until the value reaches 200.
6.   Remove the servo arm from the servo and reattach it so that it is at the angle shown on page S48. **Failure to perform this function will reduce flap movement in landing mode to less than 45°.**
7.   Reattach the control linkage to the flap and adjust it so that the flap is in neutral. Push the ROLLING SELECTOR to Exit.
8.   Scroll the cursor over **LFLP** and push the ROLLING SELECTOR.
9.   Scroll the ROLLING SELECTOR so that it moves in the direction that would raise the flap if it was connected. Keep rolling until the value reaches 200.
10.   Remove the servo arm from the servo and reattach it so that it matches the angle of the other servo arm. **Failure to perform this function will reduce flap movement in landing mode to less than 45°.**
11.   Reattach the control linkage to the flap and adjust it so that the flap is in neutral. Push the ROLLING SELECTOR to Exit.
12.   Fine tune both flaps using the **Sub Trim** so they are the same. A note of caution. Build a airfoil template of the top of the wing and use it to set the neutral point for the flap. Using the aileron or a fixed portion of the wing will almost always result in a flap position that is not neutral.
13.   Exit.

Landing Flaps on the Left Stick

1.   Scroll the cursor over **Butterfly** and push the ROLLING SELECTOR.
2.   Scroll the cursor over **offset** and push the ROLLING SELECTOR.
3.   I recommend changing the default from 170 to 160. A offset of 170 starts the flaps coming down with the first click of downward movement of the spoiler stick. With an offset of 160, the first three or four click have no impact on flap movement. That way, if you use the rudder stick, you are much less likely to pull the flaps down accidentally. Push the ROLLING SELECTOR.
4.   Scroll the cursor over **SPOI to FLAP 1:** and push the ROLLING SELECTOR.
5.   Pull the spoiler stick all the way to the bottom.
6.   Scroll the ROLLING SELECTOR until the flaps move in the correct direction (down) and keep scrolling until the flaps reach the desired angle. You should be able to obtain 90° flaps quite easily. If you can't obtain 90 degrees of flap there is probably a mechanical linkage problem. Try shortening the flap control horn or lengthen the servo arm. Push the ROLLING SELECTOR.
7.   Scroll the cursor over **SPOI to FPRN 1:** and push the ROLLING SELECTOR.
8.   Pull the spoiler stick all the way to the bottom.
9.   The flaps should be at the desired location. Scrolling the ROLLING SELECTOR will move the ailerons together. This is what is referred to as "CROW". With the spoiler stick all the way

down, scroll the ROLLING SELECTOR until the ailerons stop in the desired location. Push the ROLLING SELECTOR.

10. Scroll the cursor over **SPOI to ELEV 1:** and push the ROLLING SELECTOR. With the spoiler stick all the way to the bottom, scroll the ROLLING SELECTOR until you achieve approximately 35% down elevator. When flaps are lowered, the airplane will pitch up altering the aircrafts flight path. Every airplane is different and the amount that you ultimately use will depend on your aircraft and your flying style. A recommended starting point is approximately 35%. Remember, the proper compensation is down elevator with full flaps. You must fly and experiment with the mix percentage, 35% is only a starting point.

11. Exit.

The XP9303 also provides for a specialized mix function which will completely eliminate that annoying bump that the airplane makes when you first pull the flaps down. That specialized mixing function is discussed later under Multi-Point Programmable Mixing.

Launch Flap Preset.

Flight Modes, here we go again. Earlier we activated the Launch, Cruise, Land mode and placed it on the **L3P SW.** There are three flight modes on this switch. Although they are labeled Launch, Cruise and Land, you can actually use them for anything you want.

1. Move the **L3P SW** to the launch position. (up on the radio.)
2. On the top of the radio, click the **TRIM FLAP** until the flaps go in the correct direction and the appropriate amount for launch. The appropriate amount can only be determined by experimenting. Tow hook location, size of flaps, taper of the wing and several others all will effect the best flap setting.
3. On the top of the radio, click the **TRIM FLAPERON** the ailerons go in the correct direction and the appropriate amount for launch.
4. Move the **L3P SW** to Cruise (middle position) and the flaps and ailerons should move to neutral.
5. Some like to input up elevator trim in launch. With the **L3P SW** in the launch position, click the up elevator trim until you obtain the appropriate amount.
6. Move the **L3P SW** to cruise and the flaps, ailerons and elevators all return to neutral.
7. Exit.

Full Span Camber Adjustment.

Full span camber changing allows you to change the shape of the wing during flight. This function allows you to change the entire trailing edge of the wing. There is quite a current discussion concerning trailing edge camber and how it should be employed. Some argue that camber should be adjustable, from none to as much a ¼ inch. Others argue that there is only one setting for each airfoil that provides the greatest lift and that camber should just be on a switch. Simply on or off.

This section will show you how to put camber changing on the left side slide.

1. Scroll the cursor over **FLAP RATE** and push the ROLLING SELECTOR.
2. The next screen will show all the Flight Modes that have been activated.
3. Make sure the **L3P SW** is in Cruise mode.
4. Move the Left Side Slide to the down position.
5. Scroll the cursor over **CRUISE DN.**
6. Scroll the ROLLING SELECTOR until you see the flap move in the correct direction and the appropriate amount.
7. Move the Left Side slide to the center position. The Flaps should return to neutral.
8. Exit.

This section will mix the Ailerons to the Flap on the Left Side Slide and use the entire side slide (top to bottom) for Camber changing.

1. Move the Left Side Slide all the way to the top.
2. Scroll the cursor over **Flaprn MX** and push the ROLLING SELECTOR.
3. Make sure the **L3P SW** is in Cruise mode.
4. Scroll the cursor over **Offset** right under **FLAP LV** and push the ROLLING SELECTOR.
5. Scroll the ROLLING SELECTOR until the offset value is +200. This operation makes the entire side slide move camber only in a down direction.
6. Move the Left Side Slide all the way to the bottom.
7. Scroll the cursor over **CRUI DN** and push the ROLLING SELECTOR. Scroll the ROLLING SELECTOR until the Ailerons droop to match the Flaps. Make sure to scroll the ROLLING SELECTOR all the way to the stops each way. Compare to the Flap adjustment, this one will take a lot of change. My sailplane took the full 125% that was available.
8. If the Ailerons do not move, try the same under **CRUI UP**. If your flaps are installed differently than the servo output towards the wing tip and the leading edge, you may have to use **CRUI UP** to get the ailerons to droop and match the flap.
9. Move the Left Side Slide to the top position and the entire trailing edge should return to neutral.
10. You will probably want to perform the same mixing for the Thermal Mode. Whether or not you do something similar for **SPEE, LAUN and LAND** is up to you.
11. Exit.

Reflex

Reflex is Latin for "go fast, go very fast." And there is a way to help you sailplane move across the sky. Reflex is lowering the drag of the wing by raising the trailing edge. It does not take much. Put a straight edge across the bottom the wing. The straight edge should contact the bottom of the wing at the thickest portion and at the trailing edge. Start raising the trailing edge. As soon as the straight edge touches the wing in three locations, (at the hinge line) you have all the reflex you need. Reflex is for going fast.

1. Place the **L3P SW** in Cruise Mode (Middle position).
2. Place the **R3P SW** in Speed Mode (top position).
3. On the top of the radio, click the **TRIM FLAP** until the flaps go in the correct direction (up) and the appropriate amount (not much) for Speed.
4. On the top of the radio, click the **TRIM FLAPERON** the ailerons go in the correct direction (up) and the appropriate amount (not much) for launch.
5. Move the **R3P SW** to Cruise (middle position) and the flaps and ailerons should move to neutral.
6. Some like to input down elevator trim in launch. With the **R3P SW** in the Speed position, click the down elevator trim until you obtain the appropriate amount.
7. Move the **R3P SW** to cruise, the flaps, ailerons and elevators all return to neutral.
8. Exit.
9.

Multi-Point Programmable Mixing.
(or how to get rid of that annoying bump as you begin to pull the flaps down)

Traditionally, mixing functions in computer radios only allow a linear mix between the master and the slave channels. As an example, when the aileron to rudder mix is activated, and you push the aileron stick all the way to the stop, it mixes in a pre-programmed amount of rudder deflection. With multi-point programmable mixing, the XP8103 radio allows you to insert up to seven different mix points anywhere on the curve. In other words, as you slowly push the aileron stick all the way to the stop, you could literally make the rudder waggle back and forth.

In the case of model sailplanes, this allows you to mix a larger percentage of elevator compensation during the initial part of flap movement and less elevator compensation as flaps approach 90°. This completely eliminates that bump your airplane takes on approach as you pull the flap stick down.

The XP9303/9503 radio provides six extra programming functions that allow you to assign any slave to any master channel. The first of these additional mix functions allow the multi-point programmable mixing and is defaulted to mix Flap to Elevator. The remaining four provide the ability to do things like add additional aileron/rudder mix during launch, and automatically eliminate the aileron/rudder mix in reflex mode.

To eliminate that annoying bump on approach when you pull down the flap stick, there is a very deliberate sequence of steps that you should follow. First, program the radio as indicated above for flap and elevator compensation on approach. Launch the airplane and adjust the elevator compensation until you achieve the proper glide path at full flap. Ignore the bump for now. Some individuals want the airplane, at full flap to continue on the same flight path before the flaps were lowered. Other individuals like the airplane to take a decidedly strong downward pitch when the flaps are lowered. This insures that you don't lose flying speed and stall your airplane. However, there is **no situation** where after pulling the flaps all the way down, the plane should pitch upward. This situation is unacceptable and should be avoided.

The steps below will be used to determine the amount of Elevator compensation at full flap using the **Butterfly** Mix. At mid Flap stick, the sailplane will want to float up. Full Elevator compensation at full flap needs to be determined and marked on the fin/Rudder. Once the fin is marked, the elevator compensation in the **Butterfly** mode is reduced to zero and **PROG. Mix1** will be used instead.

1. Scroll the curser over **Butterfly** in the program mode and push the ROLLING SELECTOR.
2. Scroll the cursor over **SPOI to ELEV 1:** and push the ROLLING SELECTOR. With the flap stick in the full down position, scroll the ROLLING SELECTOR until the Elevator moves approximately 35% in the correct direction. (down elevator)
3. Launch and fly the sailplane. When the flight path is perpendicular to you, several mistakes high pull the flap stick down. Add or subtract Elevator compensation until the flight path of the sailplane is the same at full flap as it is at no flap. At this time what happens at mid flap stick is not important.
4. Land the aircraft and mark on the fin or rudder, both neutral Elevator and Elevator compensation at full flap stick.
5. Return to **SPOI to ELEV 1:** in the Butterfly section like you did above.
6. Scroll **SPOI to ELEV 1:** to 0%.
7. Exit.
8. Scroll the cursor over **PROG.Mix1**and push the ROLLING SELECTOR.
9. As you can see, the master, slave is already set to **SPOI to ELEV.**
10. Scroll the cursor over **SW SELECT** and push the ROLLING SELECTOR.
11. You will be presented with all the possible switches that will turn this mix on and off.
12. The default is ON all the time for all mixes. This is OK, but I prefer to only turn on mixes when they are actually going to be used.
13. Scroll the cursor over **CRU** and push the ROLLING SELECTOR.
14. Scroll the cursor over **LND** and push the ROLLING SELECTOR. Landing flaps now work in Cruise and Land mode. The Flap stick will not move the flaps in Launch mode.
15. Scroll the cursor over **Point-0** and push the ROLLING SELECTOR.
16. Pull the Flap stick all the way down.
17. Scroll the ROLLING SELECTOR until the elevator moves to and matches the mark made on the fin/rudder earlier. Push the ROLLING SELECTOR.
18. Scroll the cursor over **Point-3** and push the ROLLING SELECTOR.
19. Scroll the cursor until the line is slightly high than a straight line between **Point-0** and **Point-6**.

Launch your aircraft and verify, at least three or four mistakes high, that the elevator compensation is correct at full flap. If it is not, land and adjust **Point-0** until you have achieved the proper amount of elevator compensation with full flaps.

Launch the aircraft again. Three or four mistakes high pull the flap stick down to mid flap and add or subtract Elevator Compensation until the flight path at mid Flap stick (Point-3) is also neutral. It takes a while to get this right. You are not going to get it on your first try. You may have to increase or decrease the mixing at **POINT-3** until it is perfect. You may also need to adjust **Point-5** and **Point-4.** Variations in the size of flaps and effectiveness of different elevators will require experimentation. Two meter aircraft respond well to a single but strong bump on the curve at **POINT-4 and 5.** Unlimited aircraft respond to a more gentle curve by adding additional compensation at **POINT-2 and 1.** When it is perfect, its sweet. Worth the price of admission.

I recommend having a buddy pull the flap stick down while you are flying. By setting up the radio so that it is in **PROG.Mix1** before launch, your buddy can pull the stick down until the vertical line on the graph is right above point 1 through 5. Because the mixing only works on one of these points, your adjustments upon landing will be MUCH more appropriate and you will nail this portion of the programming just that much quicker.

Increasing Aileron to Rudder Mix During Different Flight Modes.

I trim my models to fly with little aileron/rudder mixing during normal flight modes. However, this means at launch, I have little if any rudder to recover from a bad throw. (Recall aileron controls roll, making it virtually worthless in this situation. Rudder controls yaw, like a rudder in the back of a boat, and is MUCH more important on launch) Its easy to increase the aileron/rudder mix during launch with the Launch Mode Switch. On the other hand, Aileron to Rudder Mix may need to be reduced in the Speed Mode.

1. Scroll the cursor over **Ail to Rud M.** and push the ROLLING SELECTOR.
2. Scroll over to **Left** column and scroll down to Launch and push the ROLLING SELECTOR.
3. Scroll the ROLLING SELECTOR until the number after Launch is larger than the number after Cruise.
4. Do the same thing in the **Right** column.
5. The additional rudder mix is easily verified. Hold the aileron stick all the way to the stop. Move the **L3P SW** from Launch to Cruise Mode. The rudder should move back and forth as the switch is moved.
6. Do the same for any other mode. Check you work using step 5.
7. Exit

How to Use This Programming.

1. Flip the **R3P SW** to SPEED. (switch up)
2. Move the **L3P SW** to the Launch position. Your Flaps and Ailerons should drop into launch position. If you want to change the flap position, do it now by trimming with the **TRIM FLAP** and **TRIM FLAPERON** trim switches.
3. Input any elevator trim you may need.
4. Launch the aircraft, right before the dip and the zoom, move the **L3P SW** to Cruise mode (middle position)
5. At the top of the zoom, during the push over to level flight, move the **R3P SW** to Cruise.
6. As long as the **L3P SW** is in Cruise, Land, Speed or Thermal mode, the landing flaps are always on.
7. This programming is more complex than before. It helps to figure out before hand what you want to use all the functions for.

Other Things You Might Want to Try With This Programming.

In Cruise Mode:
1. Set up you plane in this mode and use it as your baseline.

In Launch Mode:

1.   Launch Flaps.
2.   Less elevator throw.
3.   More rudder to Aileron mix.

In Speed Mode:
1.   Reflex the trailing edge.
2.   Much less Rudder to Aileron Mix.
3.   Either less elevator throw or more positive exponential.
4.   Less Aileron throw or more positive exponential.
5.   Possible less aileron differential.

In Thermal Mode:
1.   More Aileron to Rudder Mix.
2.   Less Aileron throw.
3.   Less Elevator throw.

In Landing Mode:
1.   More Aileron to Rudder Mix.
2.   Less Elevator Throw.
3.   Reverse Aileron Differential.

SIX SERVO AIRCRAFT WITH FULL TRAILING EDGE CAMBER, TURNING ON THE LAUNCH, CRUISE, CAMBER FLIGHT MODE AND A MOTOR.

We have reached the difficult one. So far, the Throttle Stick is used for landing flaps. The Left Slider is used for trailing edge camber. Where do we put the throttle control for the electric motor? Well, if you have soft start on you speed control, it can use any one of many switches. If you don't, you need something that is adjustable. You are limited to the throttle stick or the right side slider. The throttle stick is a problem. Motor control is usually off at the bottom and full power at the top. Flap control is usually up flap at the top and 90 degree flap at the bottom. The use of the throttle stick for both throttle and flap control is possible, but requires a switch to be flipped and the stick has to be in the correct place. As an example, you are on approach, half flap, and you decide to go around. If you raise the flaps first and when you switch the stick from flap to motor, the motor will instantly go to full throttle.

Flight modes again come to the rescue.

The goal here is to:

1.   Put the aileron and elevator on the right stick and mix some rudder to the aileron stick to help adverse yaw.
2.   Flaps, during landing will be controlled with the spoiler stick, with some crow and elevator compensation using the 7 point mix. Flaps will be inhibited in all other Flight Modes.
3.   Motor, during launch will be controlled with the spoiler stick, with some flap to help on climb and some down elevator and left rudder to compensate for an incorrectly mounted motor. The motor will be inhibited in all other Flight Modes
4.   In flight camber will be controlled with the left side slide and be available in all flight modes.
5.   All five flight modes will be activated.
6.   Speed Mode will reflex the trailing edge, reduce the aileron to rudder mix and input two clicks of down trim.

Before you begin, make sure the servos in the wings are inserted so that the arm side of the servo faces the wing tip and is closest to the leading edge of the wing. I further recommend, that during normal flight mode, you set up your radio so that most of the switches are in the same direction. I prefer starting at the top back of the radio and pulling my hand forward and down and move all the switches in that direction. This further simplifies flying and allows you to quickly check your radio without looking down at it by simply passing your hands over all the switches.

Plug the left aileron in to slot 1, the right aileron into slot 2, the elevator in to slot 3, and the rudder into slot 4, right flap into slot 5 and left flap into slot 6 and the ESC for the motor into slot 7.

This section assumes that you have read the beginning of the article concerning System Mode and have performed the setup described. The setup instructions below continue with **DeviceSEL** found in the System Mode.

Return to System Mode

1.   You enter the system setup mode by pressing and holding down the **ENT** button on the face of the transmitter while turning the transmitter on. You will then be confronted with the screen entitled **System M**. (Page S2).
2.   Scroll the cursor over **Wing TYPE** and push the ROLLING SELECTOR.
3.   Scroll the cursor over to **DUAL FLAP** push the ROLLING SELECTOR until **ACT** is selected.
4.   Exit.
5.   While still in **System M,** scroll the cursor over **DeviceSEL** and push the ROLLING SELECTOR.
6.   Scroll the cursor over to **SPEED** and push the ROLLING SELECTOR. Select **R3P SW** and push the ROLLING SELECTOR**.** (this turns the Flight Modes for Speed and Thermal on the Right Three Position Switch)

7. Scroll over to **LAUN** push the ROLLING SELECTOR. Select **L3P SW** and push the ROLLING SELECTOR. (this turns on Flight Modes for Launch, Cruise and Land and assigns it to the Left Three Position Switch)

8. Scroll over to **FLAP** and push the ROLLING SELECTOR. Choose **FLAP LV** to activate the side slide on the left of the transmitter case and press the ROLLING SELECTOR. In the alternative, choose **AUX3 LV** to activate the slide found on the right side of the transmitter case and press the ROLLING SELECTOR. (don't use the alternative here. Later this section will discuss placing the motor control here) All this does is identify the slider to be used for camber adjustment.

9. Scroll to the bottom of the **FLAP** column and press the ROLLING SELECTOR until you see **ACT**. If you move the side slide lever now, nothing will happen with the trialing edge. Both flaps and ailerons will be activated and adjusted later.

10. The remaining activities, **AUX2, AUX3, AUX4** should be inhibited. (**INH**)

11. Scroll the ROLLING SELECTOR over **TRIM:COM.** This function can be switched from common (**COM**) to Flight Mode (**FM**). In **COM**, a trim changed in any flight mode, changes that trim setting in all flight modes. We recommend leaving this in **COM** for now. After the trim flights are completed, change this back to **FM** and trim changes made in one Flight Mode DO NOT change trims in other Flight Modes.

12. Exit.

The Flight Mode Switches have a series of default positions. If Launch or Land are selected, either will override Speed or Thermal. For Speed or Thermal to work, the Left Three Position Switch must be in the middle position. (Cruise)

Return to Function Mode.

After turning the radio on you will see the general information display. To enter the function mode simply touch the **LIST** button.

If you have a V-tail, perform the V-tail mixing found at the end of this article first.

Servo Reversing.

Slowly operate the rudder (left hand stick), the elevator (right hand stick) and the ailerons (right hand stick) Make sure that all of the control surfaces move in the correct direction.

1. Scroll the cursor over **REV.SW** and push the ROLLING SELECTOR.
2. To reverse a servo, Scroll the cursor over the correct servo and push the ROLLING SELECTOR to change the servo from normal to reverse.
3. Do not worry about flaps at this time.
4. Exit.

Sub Trim.

Sub trim allows you to electronically center all of your control surfaces. Now that the servos are all moving in the correct direction, it is time to align all of the control surfaces.

All of the control surfaces must be aligned mechanically first. It's important to perform this function with the transmitter and receiver turned on. Adjust the linkages and servo arms for the ailerons, elevator and the rudder so that they are as close to neutral as possible. A computer radio will not make up for sloppy building.

1. Scroll the cursor over **Sub Trim** and push the ROLLING SELECTOR. All of your sub trim values should read 0%.

2. Scroll the cursor over the servo you need to align and push the ROLLING SELECTOR. Scroll the ROLLING SELECTOR left or right until the control surface centered. (aileron, elevator and rudder).
3. Do not worry about the flaps at this time.
4. Exit.

Dual Rates.

You are about to experience the power of flight modes.

Dual Rate functions are available for ailerons, elevator and rudder. The first portion of this section is to obtain a D/R setting that is close to the rates specified for the particular aircraft. The second portion will then discuss how to assign particular D/R to a particular flight mode.

1. Scroll the cursor over **D/R & EXP** and push the ROLLING SELECTOR.
2. Scroll the cursor over **AILE or ELEV or RUDD** and push the ROLLING SELECTOR.
3. Scroll the cursor down to **AILE** and push the ROLLING SELECTOR.
4. In this format, D/R or EXP is available for Pos-0, Pos-1 or Pos-2. Scroll the cursor over the **Pos-1 D/R** column and press the ROLLING SELECTOR.
5. Move the aileron stick slowly. The aileron may bind, especially on the bottom of the wing. DON'T MOVE THE AIELRON STICK ANY FURTHER! Roll the ROLLING SELECTOR while holding the aileron stick. The amount of aileron deflection will slowly increase or decrease depending on which way you are rolling the ROLLING SELECTOR. Your goal is to have the UP aileron move the recommended control throw for you aircraft at full stick deflection. Stop adjusting when the amount of aileron throw is correct when the stick is fully deflected.
6. For now enter the same dual rate in all three switch locations. We can discuss this more later
7. Now move the aileron stick in the other direction. As you can see, the dual rate function should have affected both the up and down aileron. (However, if your mechanical linkages are not symmetrical you still have more deflection in one direction than the other.)
8. Perform the same function for rudder throw by fully deflecting the rudder stick (left stick) and adjusting the rudder dual rate appropriately. Don't be surprised if the deflection is different.
9. Perform the same function for elevator throw by fully deflecting the elevator stick (right stick) and adjusting the elevator dual rate appropriately. Don't be surprised if the deflection is different.
10. Exit.

Travel Adjustment.

Now that you have four basic control surfaces (aileron, elevator and rudder) adjusted to appropriate amount of control throw, it is now time for the final adjustments. (The final adjustment of these control surfaces should be done at home on your work bench and not in the field.) The goal is to obtain travel each way from center that is as equal as possible.

Unless you are an expert builder or awful darn lucky the control surfaces will not move equally. As an example, the elevator will move further up than it does down. The fine tuning of these control throws is now done using travel adjustment.

1. Scroll the cursor over **TRVL ADJ.** and push down the ROLLING SELECTOR.
2. On the next screen, all nine servo appear at one time.
3. Scroll the cursor over to **ELEV** push the ROLLING SELECTOR.
4. Measure the elevator deflection each way. Measure the throw each way and reduce one of end points as necessary. Moving the cursor from one value to the other requires the movement of the stick. As an example, Scroll the cursor over **LAIL** and push the ROLLING SELECTOR.
5. Moving the cursor from left to right is done by moving the Aileron Stick.

6.   The same travel adjustments should be made to make sure that the rudder deflects the same both left and right.

7.   Ailerons are a different animal. Ailerons will always have more up than down. You don't want to make the up and down throw the same on ailerons. The idea is to make the two ailerons the same. Adjust the two ailerons until they both have the same amount of up. Then Adjust the ailerons until they have the same amount of down. Don't worry if the up and down on the same aileron is different.

8.   Exit.

Back to Dual Rates

The power of flight modes is here!

1.   Scroll the cursor over **D/R & EXP** and push the ROLLING SELECTOR.

2.   The new screen contains a lot of information. There are really two screens here.

3.   The default screen uses the **D/R** switches to change between the two available rates.

4.   Scroll the curser over **ELEV, AILE or RUDD** and push the ROLLING SELECTOR.

5.   Select **ELEV** and push the ROLLING SELECTOR.

6.   If you flip the **L3P SW** on the face of the radio, a 0 will change to a 1 or 2 just to the right **D/R & EXP** at the top of the screen. This means you are in the mode that uses the **Flight Mode Switches.** In this setup, **Pos-0, Pos-1 and Pos-2** are available.

7.   Scroll the curser over to the far right. If there is a graph there, it will be replaced with a column entitled **AUTO** at the top with the activated Flight Modes below. (This column only appears if one or both of the flight modes are activated) After each Flight Mode is the designation **:SW.**

8.   As long as ALL the Flight Modes in the **AUTO** column are set to **:SW**, the two position switches around the radio are still functional.

9.   The remainder of this section will show you how to assign **D/R's** to a Flight Mode.

10.   Lets assume that you want to have less elevator during the climb under power portions of launch and even less in Thermal mode.

11.   You set **Pos-1** earlier. Scroll the cursor over to **D/R** next to **Pos-0** and push the ROLLING SELECTOR. Make the value less than **Pos-1**. Push the ROLLING SELECTOR.

12.   Scroll the cursor over to **D/R** next to **Pos-2** and push the ROLLING SELECTOR. Make it even less than **Pos-1.**

13.   Scroll the cursor over to the **AUTO** column, scroll down to **LAUN:SW** and push the ROLLING SELECTOR.

14.   Select **Pos-0** and push the ROLLING SELECTOR.

15.   Scroll the cursor over **THRM:SW** and push the ROLLING SELECTOR.

16.   Select **Pos-2** and push the ROLLING SELECTOR.

17.   You can actually watch the overrides working. Remember Launch and Land override Speed and Thermal. With the Left and Right Three Position Switch in the middle position (Cruise Mode), the number 1 appears just to the right of **D/R & EXP** on the screen. Flip the Right Three Position Switch down into Thermal Mode and the number changes to 2. Even with the Thermal Mode left on, If you flip the Left Three Position Switch to Launch the number still changes to 0.

18.   Exit.

It is up to you and your airplane to determine how best to use Dual Rates. Some other areas where it might come in useful:

1.   Rudder: Launch – more, Land – more, Speed – less

2.   Aileron: Launch - ?, Land – more, Speed – less, Thermal – less.

3.   Elevator: Launch – less, land - ?, Speed – less, Thermal – less.

Exponential rates are another way to adjust sensitivity of the sticks on your radio. The servos are a rotary output device. Although the line on the **EXP** screen may start out as what appears to be a linear output, it is rather misleading. Because the servos are a rotary output device, there is a built in negative exponential rate in you servos to begin with. In other words, the stick is naturally more sensitive near the center than it is at the extremes. A servo that uses full servo arm deflection each way from center has a negative exponential of a little more than 30 percent. Obviously, if the D/R is reduced so that the servo arm deflection is less than full deflection, the amount of negative EXP is reduced.

If this is your first chance to EXP, you might want to try a EXP rate of around positive 20 to 25 percent. This will give you a more linear output at the servo.

This is a personal choice issue. There is no right or wrong amount of EXP.

Exit.

Aileron Differential.

Aileron Differential is a critical component of trimming a sailplane with ailerons. If the ailerons travel the same amount both up and down, the aircraft is likely to develop "adverse yaw." In other words, when you roll the aircraft left (with aileron) the nose of the aircraft wants to go right.

Lift creates drag so an aileron moving down creates more lift and more drag at the same time. An aileron moving up creates less lift and at the same time less drag. So, for a sailplane to roll to the left and have the nose of the aircraft go the same way requires aileron differential. Less down than up.

An aileron that goes up ¾ inch and only ¼ inch down has a 3 to 1 ratio. Slow flying, under cambered airfoils may require a ratio as high as 6 to 1. A faster flying, symmetrical airfoil may require a 1 to 1 ratio. To get the correct amount of aileron differential depends on the aircraft, the type of flying you like to do, pilot preference and how much rudder you use to coordinate your turn.

1. Scroll the cursor over **DIFFEREN** and push the ROLLING SELECTOR.
2. Scroll the cursor over **0%** under **AILE** and push the ROLLING SELECTOR.
3. Hold the Aileron Stick all the way over to the stop.
4. Roll the ROLLING SELECTOR back and forth until the lower of the two ailerons starts to come up. Use this to set the amount of differential according to the aircrafts set up instructions. Move the aileron stick to the opposite stop and notice that the differential setting works for both ailerons.
5. Set the differential to that in the instructions for your aircraft. If unknown start with a 3 to 1 ratio (three times as much up as down).
6. Exit.

Mixing the Rudder to the Right Stick.

Another way to combat "adverse yaw" is to "coordinate" the turn with rudder input. You can fly the rudder with your right stick. You can also use the Aileron to Rudder Mix so that the rudder is input with your right stick.

1. Scroll the cursor over **Ail to Rud M.** and push the ROLLING SELECTOR.
2. Each of the activated Flight Modes will appear on the screen.
3. If you move the Aileron Stick now, the rudder remains motionless.
4. Scroll over to **Cruise** and just below **Left** and push the ROLLING SELECTOR.
5. Hold the aileron stick all the way over to the left.
6. Roll the ROLLING SELECTOR until the Rudder moves in the correct direction and the correct amount and then push the ROLLING SELECTOR.
7. Scroll the cursor over to **Right** and push the ROLLING SELECTOR.
8. Hold the aileron stick all the way over to the right.

9. Roll the ROLLING SELECTOR until the Rudder moves in the correct direction and the correct amount and then push the ROLLING SELECTOR. If you equalized rudder throw in both directions by using **TRVL ADJ.** discussed earlier, the left and right amount in **AIL to RUD M** should be the same.

10. Exit.

Now go back and mix Aileron to Rudder in the other Flight Modes you have activated. In general, Launch, Land and Thermal may require more mix. Speed usually takes less. Aileron to Rudder Mix is a personal thing and depends on your ability to fly the Rudder Stick on the radio.

So far, you have programmed the radio so that you can make the sailplane pitch up or down, yaw let or right and roll like a cork screw. Cool, but can you land on a dime?

Landing Flaps and Landing Mode.

Now that the basic control surfaces of the aircraft have been completed, the remainder of this section will focus on various flight modes which involve the use of flaps. This will include all five Flight Modes as well as full span camber changing.

Landing Flaps and Their Connection.

View page S48 of the manual. The setting of the servo arm and the correct **Sub Trim** is critical to the operation of the flaps. Because the flaps move through as much a 90 degrees, the Sub Trim of the flap servos requires a large offset.

1. Remove the Flap control rods from either the servo arm or the flap horn.
2. Move the **L3P SW** to the Cruise position. (center)
3. Scroll the cursor until it covers **Sub Trim** and push the ROLLING SELECTOR.
4. You will be confronted the Sub Trim page showing all the Sub Trims for all servos. Scroll the cursor over **RFLP** and push the ROLLING SELECTOR.
5. Scroll the ROLLING SELECTOR so that the servo arm moves in the direction that would raise the flap if it was connected. (if you are doing this with the aircraft upside down, it is easy to get thing moving backwards) Keep rolling until the value reaches 200.
6. Remove the servo arm from the servo and reattach it so that it is at the angle shown on page S48. **Failure to perform this function will reduce flap movement in landing mode to less than 45°.**
7. Reattach the control linkage to the flap and adjust the control linkage so that the flap is neutral. Push the ROLLING SELECTOR to Exit.
8. Scroll the cursor over **LFLP** and push the ROLLING SELECTOR.
9. Scroll the ROLLING SELECTOR so that the servo arm moves in the direction that would raise the flap if it was connected. (if you are doing this with the aircraft upside down, it is easy to get thing moving backwards) Keep rolling until the value reaches 200.
10. Remove the servo arm from the servo and reattach it so that it matches the angle of the other servo arm. **Failure to perform this function will reduce flap movement in landing mode to less than 45°.**
11. Reattach the control linkage to the flap and adjust the linkage so that the flap is neutral. Push the ROLLING SELECTOR to Exit.
12. Fine tune both flaps using the **Sub Trim** so they are the same. A note of caution. Build a airfoil template of the top of the wing and use it to set the neutral point for the flap. Using the aileron or a fixed portion of the wing will almost always result in a flap position that is not neutral.
13. Exit.

Landing Flaps on the Left Stick

1. Scroll the cursor over **Butterfly** and push the ROLLING SELECTOR.

2.   Scroll the cursor over **offset** and push the ROLLING SELECTOR.
3.   I recommend changing the default from 170 to 160. A offset of 170 starts the flaps coming down with the first click of downward movement of the spoiler stick. With an offset of 160, the first three or four click have no impact on flap movement. That way, if you use the rudder stick, you are much less likely to pull the flaps down accidentally. (in this setup, landing flaps will only work in Landing Mode, so this is not a real problem)   Push the ROLLING SELECTOR.
4.   Scroll the cursor over **SPOI to FLAP 1:** and push the ROLLING SELECTOR.
5.   Pull the spoiler stick all the way to the bottom.
6.   Scroll the ROLLING SELECTOR until the flaps move in the correct direction (down) and keep scrolling until the flaps reach the desired angle. You should be able to obtain 90° flaps quite easily. If you can't obtain 90 degrees of flap there is probably a mechanical linkage problem. Try shortening the flap control horn or lengthen the servo arm.   Push the ROLLING SELECTOR.
7.   Scroll the cursor over **SPOI to FPRN 1:** and push the ROLLING SELECTOR.
8.   Pull the spoiler stick all the way to the bottom.
9.   The flaps should be at the desired location. Scrolling the ROLLING SELECTOR will move the ailerons together. This is what is referred to as "CROW". With the spoiler stick all the way down, scroll the ROLLING SELECTOR until the ailerons stop in the desired location. Push the ROLLING SELECTOR.
10. Scroll the cursor over **SPOI to ELEV 1:** and push the ROLLING SELECTOR. With the spoiler stick all the way to the bottom, scroll the ROLLING SELECTOR until you achieve approximately 35% **down** elevator. (don't forget, if the aircraft is upside down, you might get this backwards) When flaps are lowered, the airplane will pitch up altering the aircrafts flight path. Every airplane is different and the amount of elevator compensation that you ultimately use will depend on your aircraft and your flying style.   A recommended starting point is approximately 35% down elevator. Remember, the proper compensation is down elevator with full flaps. You must fly and experiment with the mix percentage, 35% is only a starting point.
11. Exit.

The XP9303 also provides for a specialized mix function which will completely eliminate that annoying bump that the airplane makes when you first pull the flaps down. That specialized mixing function is discussed later under Multi-Point Programmable Mixing.

Motor Active with a Launch Flap and Elevator Preset.

Flight Modes, here we go again. Earlier we activated the Launch, Cruise, Land mode and placed them on the **L3P SW.** There are three flight modes on this switch. Although they are labeled Launch, Cruise and Land, you can actually use them for anything you want.

1.   Move the Flap/Throttle stick to the bottom.
2.   Move the **L3P SW** to the launch position. (up on the radio.)
3.   On the top of the radio, click the **TRIM FLAP** until the flaps go in the correct direction and the appropriate amount for launch under power. The appropriate amount can only be determined by experimenting.
4.   On the top of the radio, click the **TRIM FLAPERON** the ailerons go in the correct direction and the appropriate amount for launch under power.
5.   Move the **L3P SW** to Cruise (middle position) and the flaps and ailerons should move to neutral.
6.   Some like to input down elevator trim in launch to counter act a motor without offset or a nose heavy aircraft. With the **L3P SW** in the launch position, click the down elevator trim until you obtain the appropriate amount.
7.   Move the **L3P SW** to cruise and the flaps, ailerons and elevators all return to neutral.
8.   Exit.

Full Span Camber Adjustment.

Full span camber changing allows you to change the shape of the wing during flight. This function allows you to change the entire trailing edge of the wing. There is quite a current discussion concerning trailing edge camber and how it should be employed. Some argue that camber should be adjustable, from none to as much a ¼ inch. Others argue that there is only one setting for each airfoil that provides the greatest lift and that camber should just be on a switch. Simply on or off.

This section will show you how to put camber changing on the left side slide.

1. Scroll the cursor over **FLAP RATE** and push the ROLLING SELECTOR.
2. The next screen will show all the Flight Modes that have been activated.
3. Make sure the **L3P SW** is in Cruise mode.
4. Move the Left Side Slide to the down position.
5. Scroll the cursor over **CRUISE DN.**
6. Scroll the ROLLING SELECTOR until you see the flap move in the correct direction and the appropriate amount. (if you want camber adjustment in any other Flight Modes, perform step 5 for all Flight Modes you want camber adjustment in the Left Side Slide.
7. Move the Left Side slide to the center position. The Flaps should return to neutral.
8. Exit.

This section will mix the Ailerons to the Flap on the Left Side Slide and use the entire side slide (top to bottom) for Camber changing.

1. Move the Left Side Slide all the way to the top.
2. Scroll the cursor over **Flaprn MX** and push the ROLLING SELECTOR.
3. Make sure the **L3P SW** is in Cruise mode.
4. Scroll the cursor over **Offset** right under **FLAP LV** and push the ROLLING SELECTOR.
5. Scroll the ROLLING SELECTOR until the offset value is **+200**. This operation makes the entire side slide move camber only in a down direction.
6. Move the Left Side Slide all the way to the bottom.
7. Scroll the cursor over **CRUI / ELEV DN** and push the ROLLING SELECTOR. Scroll the ROLLING SELECTOR until the Ailerons droop to match the Flaps. Make sure to scroll the ROLLING SELECTOR all the way to the stops each way. Compare to the Flap adjustment, this one will take a lot of change. My sailplane took the full 125% that was available.
8. If the Ailerons do not move, try the same under **CRUI UP**. If your flaps are installed differently than the servo output towards the wing tip and the leading edge, you may have to use **CRUI UP** to get the ailerons to droop and match the flap.
9. Move the Left Side Slide to the top position and the entire trailing edge should return to neutral.
10. You will probably want to perform the same mixing for the Thermal Mode. Whether or not you do something similar for **SPEE, LAUN and LAND** is up to you.
11. Exit.

Reflex

Reflex is Latin for "go fast, go very fast." Reflex is lowering the drag of the wing by raising the trailing edge. It does not take much. Put a straight edge across the bottom the wing. The straight edge should contact the bottom of the wing at the thickest portion and at the trailing edge. Start raising the trailing edge. As soon as the straight edge touches the wing in three locations, (at the hinge line) you have all the reflex you need. Reflex is for going fast.

Under cambered wings will benefit more from this than an airfoil with under camber.

1. Place the **L3P SW** in Cruise Mode (Middle position).
2. Place the **R3P SW** in Speed Mode (top position).

3.   On the top of the radio, click the **TRIM FLAP** until the flaps go in the correct direction (up) and the appropriate amount (not much) for Speed.
4.   On the top of the radio, click the **TRIM FLAPERON** the ailerons go in the correct direction (up) and the appropriate amount (not much) for launch.
5.   Move the **R3P SW** to Cruise (middle position) and the flaps and ailerons should move to neutral.
6.   Some like to input down elevator trim in Speed/Reflex Mode. With the **R3P SW** in the Speed position, click the down elevator trim until you obtain the appropriate amount.
7.   Move the **R3P SW** to cruise, the flaps, ailerons and elevators all return to neutral.
8.   Exit.

Multi-Point Programmable Mixing.
(or how to get rid of that annoying bump as you begin to pull the flaps down)

Traditionally, mixing functions in computer radios only allow a linear mix between the master and the slave channels. As an example, when the aileron to rudder mix is activated, and you push the aileron stick all the way to the stop, it mixes in a pre-programmed amount of rudder deflection. With multi-point programmable mixing, the XP8103 radio allows you to insert up to seven different mix points anywhere on the curve. In other words, as you slowly push the aileron stick all the way to the stop, you could literally make the rudder waggle back and forth.

In the case of model sailplanes, this allows you to mix a larger percentage of elevator compensation during the initial part of flap movement and less elevator compensation as flaps approach 90°. This completely eliminates that bump your airplane takes on approach as you pull the flap stick down.

The XP9303 radio provides six extra programming functions that allow you to assign any slave to any master channel. The first of these additional mix functions allow the multi-point programmable mixing and is defaulted to mix Flap to Elevator. The remaining four provide the ability to do things like add additional aileron/rudder mix during launch, and automatically eliminate the aileron/rudder mix in reflex mode.

To eliminate that annoying bump on approach when you pull down the flap stick, there is a very deliberate sequence of steps that you should follow. First, program the radio as indicated above for flap and elevator compensation on approach. Launch the airplane and adjust the elevator compensation until you achieve the proper glide path at full flap. Ignore the bump for now. Some individuals want the airplane, at full flap to continue on the same flight path before the flaps were lowered. Other individuals like the airplane to take a decidedly strong downward pitch when the flaps are lowered. This insures that you don't lose flying speed and stall your airplane. However, there is **no situation** where after pulling the flaps all the way down, the plane should pitch upward. This situation is unacceptable and should be avoided.

The steps below will be used to determine the amount of Elevator compensation at full flap using the **Butterfly** Mix. At mid Flap stick, the sailplane will want to float up. Full Elevator compensation at full flap needs to be determined and marked on the fin/Rudder.   Once the fin is marked, the elevator compensation in the **Butterfly** mode is reduced to zero and **PROG. Mix1** will be used instead.

1.   Scroll the curser over **Butterfly** in the program mode and push the ROLLING SELECTOR.
2.   Scroll the cursor over **SPOI to ELEV 1:** and push the ROLLING SELECTOR. With the flap stick in the full down position, scroll the ROLLING SELECTOR until the Elevator moves approximately 35% in the correct direction. (down elevator)
3.   Launch and fly the sailplane. When the flight path is perpendicular to you, several mistakes high pull the flap stick down. Add or subtract Elevator compensation until the flight path of the sailplane is the same at full flap as it is at no flap. At this time what happens at mid flap stick is not important.
4.   Land the aircraft and mark on the fin or rudder, both neutral Elevator and Elevator compensation at full flap stick.
5.   Return to **SPOI to ELEV 1:** in the Butterfly section like you did above.
6.   Scroll **SPOI to ELEV 1:** to 0%.

7.   Exit.
8.   Scroll the cursor over **PROG.Mix1**and push the ROLLING SELECTOR.
9.   As you can see, the master, slave is already set to **SPOI to ELEV.**
10.   Scroll the cursor over **SW SELECT** and push the ROLLING SELECTOR.
11.   You will be presented with all the possible switches that will turn this mix on and off.
12.   The default is ON all the time for all mixes. This is OK, but I prefer to only turn on mixes when they are actually going to be used.
13.   Scroll the cursor over **CRU** and push the ROLLING SELECTOR.
14.   Scroll the cursor over **LND** and push the ROLLING SELECTOR. Landing flaps now work in Cruise and Land mode. The Flap stick will not move the flaps in Launch mode.
15.   Scroll the cursor over **Point-0** and push the ROLLING SELECTOR.
16.   Pull the Flap stick all the way down.
17.   Scroll the ROLLING SELECTOR until the elevator moves to and matches the mark made on the fin/rudder earlier. Push the ROLLING SELECTOR.
18.   Scroll the cursor over **Point-3** and push the ROLLING SELECTOR.
19.   Scroll the cursor until the line is slightly high than a straight line between **Point-0** and **Point-6**.

Launch your aircraft and verify, at least three or four mistakes high, that the elevator compensation is correct at full flap. If it is not, land and adjust **Point-0** until you have achieved the proper amount of elevator compensation with full flaps.

Launch the aircraft again. Three or four mistakes high pull the flap stick down to mid flap and add or subtract Elevator Compensation until the flight path at mid Flap stick (Point-3) is also neutral. It takes a while to get this right. You are not going to get it on your first try. You may have to increase or decrease the mixing at **POINT-3** until it is perfect. You may also need to adjust **Point-5** and **Point-4.** Variations in the size of flaps and effectiveness of different elevators will require experimentation. Two meter aircraft respond well to a single but strong bump on the curve at **POINT-4 and 5.** Unlimited aircraft respond to a more gentle curve by adding additional compensation at **POINT-2 and 1.** When it is perfect, its sweet. Worth the price of admission.

I recommend having a buddy pull the flap stick down while you are flying. By setting up the radio so that it is in **PROG.Mix1** before launch, your buddy can pull the stick down until the vertical line on the graph is right above point 1 through 5. Because the mixing only works on one of these points, your adjustments upon landing will be MUCH more appropriate and you will nail this portion of the programming just that much quicker.

Increasing (or Decreasing) Aileron to Rudder Mix During Different Flight Modes.

I trim my models to fly with little aileron/rudder mixing during normal flight modes. However, this means at launch, I have little if any rudder to recover from a bad throw. (Recall aileron controls roll, making it virtually worthless in this situation. Rudder controls yaw, like a rudder in the back of a boat, and is MUCH more important on launch) Its easy to increase the aileron/rudder mix during launch with the Launch Mode Switch. On the other hand, Aileron to Rudder Mix may need to be reduced in the Speed Mode.

1.   Scroll the cursor over **Ail to Rud M.** and push the ROLLING SELECTOR.
2.   Scroll over to **Left** column and scroll down to Launch and push the ROLLING SELECTOR.
3.   Scroll the ROLLING SELECTOR until the number after Launch is larger than the number after Cruise.
4.   Do the same thing in the **Right** column.
5.   The additional rudder mix is easily verified. Hold the aileron stick all the way to the stop. Move the **L3P SW** from Launch to Cruise Mode. The rudder should move back and forth as the switch is moved.
6.   Do the same for any other mode. Check you work using step 5.
7.   Exit

Programming the Motor.

So far, you have programmed the flight control surfaces using the Flight Modes. This next section will add control of the motor. There are two types of control available. Adjustable speed control with the Spoiler stick or Right Side Slider and ON/OFF speed control with a switch.

If a switch is selected for speed control, the switch will control the motor an all flight modes. The same is true for the Right Side Slider.

On the other hand, the spoiler stick can be used to control different things in different flight modes. Besides showing you how to program motor control on a switch or the Right Side Slide, this next section will show you how to change the Throttle stick during launch to a Flap stick during landing.

Return to System Mode

1. Turn the radio off. Hold down the **ENT** button and switch the radio back down.
2. Scroll the cursor over **Device. SEL** and push the ROLLING SELECTOR.
3. You now have three options. 1. Place the motor on a on/off switch. 2. Place the motor on the Right Side Slider, or 3. Place the motor on the Spoiler Stick.

Placing the Motor Control on the Right Side Slider.

1. Turn the radio off. Hold down the **ENT** button and switch the radio back down.
2. Scroll the cursor over **Device. SEL** and push the ROLLING SELECTOR.
3. Scroll the cursor over **AUX2** and press the ROLLING SELECTOR.
4. Scroll the cursor over **AUX3 LV** and press the ROLLING SELECTOR. This places the motor control on the Right Side Slide.
5. Scroll the cursor to the bottom of the **AUX2** column and push the ROLLING SELECTOR until **ACT** appears.
6. Scroll the cursor to the bottom of the **MOTO** column and push the ROLLING SELECTOR until **INH** appears.
7. Exit.

Placing the Motor Control on a Switch. (In this example the Timer Button is used)

1. Turn the radio off. Hold down the **ENT** button and switch the radio back down.
2. Scroll the cursor over **Device. SEL** and push the ROLLING SELECTOR.
3. Scroll the cursor over **MOTO** and push the ROLLING SELECTOR.
4. Scroll the cursor over **TIME SW** and push the ROLLING SELECTOR. By selecting any switch other than **SPOI ST** will inhibit the **MOTO.HOLD** function.
5. Scroll to the bottom of the **MOTO** column and push the ROLLING SELECTOR until **ACT** appears.
6. Scroll to the bottom of the **AUX2** column and push the ROLLING SELECTOR until **INH** appears.
7. Press the **LIST** button to go to the **FUNC.LIST.**
8. Scroll the cursor over **PROG. Mix3** through **PROG. Mix6**. Any one of them will work. Press the ROLLING SELECTOR.
9. Scroll the cursor over **FPRN** (the first one) and press the ROLLING SELECTOR.
10. **FPRN** changes to **Mast** and a menu showing all the possible masters.
11. Scroll the cursor over **TIMT** and press the ROLLING SELECTOR.
12. Scroll the cursor over the second **FPRN** and push the ROLLING SELECTOR.
13. **FPRN** changes to **Slav** and a menu opens with all the possible slaves.
14. Scroll the cursor over **AUX2** and push the ROLLING SELECTOR.
15. Scroll the cursor over to **Pos1** and push the ROLLING SELECTOR.
16. There are two number's in the box. Move the cursor up and down by pushing and releasing the Timer Button. Increase both of these values to **+100.**

17. Scroll to the bottom of the screen and set **CRU, SPD, THM, LAU and LND** to **POS1**. Set **AX4, BTF and RUD** to **POS0.** This turns on the motor controlled by the Timer Button in all five Flight Modes and inhibits the three remaining switches.
18. Turn on the receiver. (you may want to remove the propeller from the motor) Some ESC's require a self setup each time you on the receiver. Push the Timer Button and push it again in less than a second. Next time, when you push the button the motor should run at full speed.
19. Scroll back to **Pos1** and push the ROLLING SELECTOR.
20. Push the Timer Button until the cursor is over the bottom number and may or may not be running. Scroll the ROLLING SELECTOR until the motor starts or stops running, then back off four clicks or so.
21. Push the Timer Button until the cursor is over the top number, scroll the ROLLING SELECTOR until the motor starts to slow down, then back it up four clicks or so. This sets the Spoiler Stick so that the entire movement of the stick will change the speed of the motor rather than a small fraction of the stick movement near center stick.
22. Although **MOTO.HOLD** is unavailable, the ability to turn the motor on/off with the Timer Switch can still be restricted to just one Flight Mode or any combination of Flight Modes.
23. Scroll the cursor over **CRU** and push the ROLLING SELECTOR until the switch changes to **POS0.** Scroll the cursor over **Pos0** and push the ROLLING SELECTOR. A box appears around **Pos0** and the two percentages next to it.
24. Move the **L3P SW** to Launch Mode and push the Timer Button until the motor runs.
25. Move the **L3P SW** to Cruise Mode (mid position) the motor should keep running.
26. Scroll the ROLLING SELECTOR until the motor stops running.
27. Push the Timer Button again, the cursor will move the next number and the motor should start running again.
28. Scroll the ROLLING SELECTOR again until the motor stops running.
29. Any Flight Mode or Switch across the bottom of the screen that has **POS0** selected will result in inhibiting the Timer Button from activating the motor from that Flight Mode or switch.
30. Exit.

Placing the Motor Control on the Spoiler Stick when in Launch and Still Using the Spoiler Stick for Landing Flaps in Landing Mode.

1. Turn the radio off. Hold down the **ENT** button and switch the radio back down.
2. Scroll the cursor over **Device. SEL** and push the ROLLING SELECTOR.
3. Scroll the cursor over **MOTO** and push the ROLLING SELECTOR.
4. Scroll the cursor over **SPOI ST** and push the ROLLING SELECTOR.
5. Scroll to the bottom of the **MOTO** column and push the ROLLING SELECTOR until **ACT** appears.
6. Scroll to the bottom of the **AUX2** column and push the ROLLING SELECTOR until **INH** appears.
7. Press the **ENT** button to go the main screen.
8. Press the **LIST** button to go to the **FUNC.LIST.**
9. Scroll the cursor over **PROG. Mix3** through **PROG. Mix6**. Any one of them will work. Press the ROLLING SELECTOR.
10. Scroll the cursor over **FPRN** (the first one) and press the ROLLING SELECTOR.
11. **FPRN** changes to **Mast** and a menu showing all the possible masters.
12. Scroll the cursor over **MOTO** and press the ROLLING SELECTOR.
13. Scroll the cursor over the second **FPRN** and push the ROLLING SELECTOR.
14. **FPRN** changes to **Slav** and a menu opens with all the possible slaves.
15. Scroll the cursor over **AUX2** and push the ROLLING SELECTOR.
16. Scroll the cursor over to **Pos1** and push the ROLLING SELECTOR.
17. There are two number's in the box. Move the cursor up and down by moving the Spoiler Stick up and down. Increase both of these values to **+100.** Pull the Spoiler Stick to the bottom. This is similar to **TRVL ADJ.** that was adjusted earlier for servo output.

18.	Scroll to the bottom of the screen and set **CRU, SPD, THM, LAU and LND** to **POS1**. Set **AX4, BTF and RUD** to **POS0.** This turns on the motor controlled by the Spoiler Stick in all five Flight Modes and inhibits the three remaining switches.
19.	Turn on the receiver. (you may want to remove the propeller from the motor) Some ESC's require a self setup each time you on the receiver. Advance the Spoiler Stick to the top and back down in less than a second. When you raise the stick again, the motor should start running.
20.	Scroll back to **Pos1** and push the ROLLING SELECTOR.
21.	With the stick all the way to the bottom, scroll the ROLLING SELECTOR until the motor starts running, then back off four clicks or so.
22.	With the stick all the way to the top, scroll the ROLLING SELECTOR until the motor starts to slow down, then back it up four clicks or so. This sets the Spoiler Stick so that the entire movement of the stick will change the speed of the motor rather than a small fraction of the stick movement near center stick.
23.	Exit to the **FUNC. LIST** by pressing the **LIST** button.
24.	Scroll over **MOTO.HOLD** ad press the ROLLING SELECTOR.
25.	Leave the **Motor HOLD Pos.** at 0.0%.
26.	Scroll to the bottom of the screen and set **CRU, SPD, THM and LND** to **ON**. This effectively inhibits the motor in all Flight Modes except for Launch Mode.
27.	Exit.

The Flap/Spoiler Stick works the motor in Launch Mode and the Flaps in Landing Mode. In all other modes, the Flap/Spoiler Stick is inhibited.

How to Use This Programming.

1.	Flip the **R3P SW** to Neutral. (middle position)
2.	Move the **L3P SW** to the Launch position. Your Flaps and Ailerons should drop into launch position. If you want to change the flap position, do it now by trimming with the **TRIM FLAP** and **TRIM FLAPERON** trim switches. You can also add additional launch flap by using the camber control on the Left Side Slide.
3.	Input any elevator trim you may need.
4.	Advance the throttle stick, Launch the aircraft, at altitude move the **L3P SW** to Cruise mode (middle position) The motor will go off and the stick will be in the up position. In this Flight Mode, the Spoiler Stick has no effect.
5.	In this setup, moving the **L3P SW** to Land activates the landing flaps and flaps and elevator compensation are active when you pull the Spoiler Stick down.

Other Things You Might Want to Try With This Programming.

In Cruise Mode:
1.	Set up you plane in this mode and use it as your baseline.
2.	Trailing edge camber is available.
3.	The Flap/Throttle stick is inactive

In Launch Mode (Motor available):
1.	Launch Flaps. Flaps and ailerons slightly down to help climb under thrust from the motor.
2.	Less elevator throw.
3.	Down elevator trim to make up for the lack of down thrust and to keep the sailplane to climb at a steady rate.
4.	More rudder to Aileron mix.
5.	Motor is activated with motor off in the down position and full throttle in the up position.
6.	The throttle stick has no effect on flaps.
7.	Trailing edge camber is available to increase the launch flaps.

In Speed Mode:

1. Reflex the trailing edge.
2. reduced Rudder to Aileron Mix.
3. Either less elevator throw or more positive exponential.
4. Less Aileron throw or more positive exponential.
5. Possible less aileron differential.
6. The Flap/Throttle stick is inactive.

In Thermal Mode:
1. More Aileron to Rudder Mix.
2. Less Aileron throw.
3. Less Elevator throw.
4. The Flap/Throttle stick is inactive.

In Landing Mode:
1. More Aileron to Rudder Mix.
2. Less Elevator Throw.
3. Reverse Aileron Differential.
4. The Flap/Throttle stick activates the flaps with Flaps neutral with the stick in the up position and flaps down, with elevator compensation, in the down position.

V-tail Mixing.

V-Tail Mixing is no more difficult that a standard tail setup as far as the radio is concerned. In both setup's, you have to program and mix two control systems. The Rudder stick on both setups is the same. The Elevator stick on both setups is the same. The mixing of Aileron to Rudder is accomplished the same way. There is no magic here, but it does help to think in terms of controls systems instead of left and right ruddervator.

What usually causes a poorly flying V-Tail is one that has been built out of square, a twist in the fuselage, or construction of control linkages that are not identical. The magic of a programmable radio is the ability to compensate for many of these type of construction deficiencies.

The two tail servos are connected to the receiver as follows: elevator servo to left ruddervator and the rudder servo to the right ruddervator. (Check to make sure that each servo is operating in the correct direction.)

1. Return to the System Setup Mode by turning the radio off, pressing the **ENT** button, while simultaneously turning the radio back on.
2. Scroll the cursor over **Wing TYPE** and press the ROLLING SELECTOR.
3. Scroll the cursor under **V-tail:** and press the ROLLING SELECTOR until it reads **ACT**.
4. Press the **ENT** button to get back to the main screen.
5. Press the **LIST** button

At this stage, the rudder stick (left) on your transmitter should move both ruddervators as rudders. The elevator stick (right) on your transmitter should move both rudder ruddervators as elevators.

Make sure both control surfaces are moving in the proper direction in relationship to the transmitter sticks. If they are not, scroll the cursor over **REV.SW** and push the ROLLING SELECTOR. Reverse whatever servos are necessary to make sure that they move in the proper direction. (that would be limited to Rudder on the right and Elevator on the left.

Control Throw Adjustments.

1. Scroll the cursor over **D/R & EXP** and push the ROLLING SELECTOR.
2. Scroll the cursor over **AILE or ELEV or RUDD** and push the ROLLING SELECTOR.
3. Scroll the cursor down to **ELEV** and push the ROLLING SELECTOR.
4. In this format, D/R or EXP is available for Pos-0, Pos-1 or Pos-2. Scroll the cursor over the **Pos-1 D/R** column and press the ROLLING SELECTOR.
5. Move the elevator stick up and down, both Ruddervators will move.
6. Slowly move the Elevator Stick all the way to a stop. If the Elevator stops moving or mechanically binds before the Elevator stick stops, DO NOT MOVE THE STICK ANY FURTHER. Scroll the ROLLING SELECTOR in a direction that causes 100% to become a smaller number. Continue to increase or decrease the percentage until the proper amount of elevator throw occurs at full Elevator stick. Don't be surprised if the two elevators move different amounts.
7. For now enter the same dual rate in all three switch locations.
8. Now move the Rudder stick similar to how you moved the Elevator stick above. Perform the same adjustment for the Rudder you did before with the Elevator. Again, don't be surprised if the two Ruddervators move in different amounts.
9. Exit.

Travel Adjustment.

Now that you have the V-Tail control surfaces adjusted to appropriate amount of control throw, it is now time for their final adjustments. (The final adjustment of these control surfaces should be done at home

on your work bench and not in the field.) The goal is to obtain travel each way from center that is as equal as possible.

Unless you are an expert builder or awful darn lucky the control surfaces will not move equally. As an example, the elevator will move further up than it does down. The fine tuning of these control throws is now done using travel adjustment. For V-Tails, this is a critical adjustment.

1. Scroll the cursor over **TRVL ADJ.** and push down the ROLLING SELECTOR.
2. On the next screen, all nine servos appear at one time.
3. Scroll the cursor over to **ELEV** push the ROLLING SELECTOR. This is where the system language is confusing. Before, Elevator described both Elevators. Under **TRVL ADJ.** however, **ELEV** only means the Elevator Servo or the Left Side Servo.
4. Measure the Left elevator's deflection each way. Reduce one of end points as necessary so that the deflection is EXACTLY the same in each direction. Moving the cursor from one value to the other on the screen requires the movement of the stick. As an example, move the elevator stick up and down and the Cursor on the screen will move back and forth. Push the ROLLING SELECTOR and scroll the cursor over **RUDD**.
5. The same travel adjustments should be made to make sure that the Rudder servo on the Right side servo deflects the same both left and right. USE THE RUDDER STICK, NOT THE ELEVATOR STICK TO MAKE THIS HAPPEN.

Accurate adjustment of control surface deflection in both directions is critical to a good flying V-Tail.

Adjust the amount of rudder to be mixed into the aileron stick (the right stick) by using aileron rudder mix described above.

These instructions will only get you in the general area for the particular type, style and trim of your airplane. Use the dual rate function to modify the pitch or roll sensitivity of the aircraft to satisfy your personal taste. **I highly recommend, that once you have determined the optimum setting, that you program both switch positions for dual rate and exponential to be exactly the same.** This alleviates you from accidentally bumping a switch in flight and suddenly having an aircraft with different flying characteristics.

Placing both the rudder and elevator controls in the right transmitter stick.

Perform the same mixing as discussed in any of the sections concerning Aileron to Rudder Mix. .

V-tail Differential.

To enhance the turning performance of your aircraft, you can now change the difference between the UP and DN deflection of the control servos on either side of the V-tail. This is performed by changing the end point adjustments That we just spent so much time trying to make identical.

To determine if your aircraft will benefit from differential, launch the aircraft and in slow level flight, level with the ground, move the left control stick (rudder only) on the transmitter. If the aircraft begins **pitch up or down**, you may wish to experiment with modifying the end point adjustments to compensate for that pitching motion. If the airplane pitches up with rudder only input both left and right, then you need to change the end point adjustments on both sides of the ruddervator to increase the amount of down movement of the control surface. (In the alternative, try less up movement.) The opposite is true if the aircraft pitches down.

The need for V-tail differential is a byproduct of not understanding the exact ducalage between the V-tail and the wing. Ducalage is the difference in angle between the tail control surfaces and the wings. Even if the ducalage perfect, changes in the CG, area and aspect ratio of the v-tail and the angle between the v-tails may result in an aircraft that requires differential in the tail. Rudder deflection will not only cause the aircraft to yaw, it may also cause the aircraft to pitch up or down. This same effect may occur if your

rudder or servo control horns are not perfectly placed over the center hinge line (creating a built in mechanical differential) or if you have other mechanical differences between the left and right ruddervator.

Dual Rates adjust elevator or rudder throws, and both left and right ruddervators act in unison. End point adjustments now adjust the left and right ruddervators separately. For example with a Rudder turn only, the nose of your aircraft may pitch up. By modifying the end point to increase the amount of down throw of each ruddervator, up pitch can be eliminated. Different from Dual Rates, adjusting end points requires that you adjust the throw of both the left (elevator servo) and right (rudder servo) ruddervators separately.

Re-enter the End Point adjustments discussed above. If the aircraft pitches up with a rudder turn, input more down deflection. The most likely result is that the aircraft will pitch differently with a rudder turn in each direction. It may pitch up in a left turn and pitch down in a right turn. If this is the case, it is relatively easy to fix. If the aircraft pitches down in a left Rudder turn, once on the ground input left rudder and increase the throw of the ruddervater that is in the up direction. If the aircraft pitches up in a left Rudder turn, once on the ground input left rudder and increase the throw of the ruddervater that is in the down direction.

When individuals complain about the flight character of their V-Tail, the majority of the time is a V-Tail that needs some differential and different amounts of differential when turning in different directions. An aircraft that pitches up in a rudder turn is a real handful for any pilot.

This manual is not the final say. It is just my way of giving something back to the hobby that has given me so much. It is just several ways to program the XP9303 for various types of sailplanes. There are other ways and I hope someone finds simpler means to accomplish the same results. If you have something different, please e-mail me or call me by phone. This document will be modified as something new comes up. If you provide a new concept, you will get credit for the idea in future versions.

If you have any questions, please don't be afraid to call

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