

# PROGRAMMING GUIDE FOR ELECTRIC GLIDER FUTABA 8FG

These notes describe the programming of an electric glider with the following controls:-

Stick J1 - Ailerons

Stick J2 - Elevator

Stick J3 - Motor in START condition and Crow braking in LANDING condition

Stick J4 – Rudder

Switches SE and SA operate five flight CONDITIONS as follows :-

SE in centre and SA in centre – NORMAL CONDITION

SE in centre and SA up – SPEED CONDITION

SE in centre and SA down – DISTANCE CONDITION

SE forward – START CONDITION (Over-rides all conditions on SA)

SE back – LANDING CONDITION (Over-rides all conditions on SA)

Thus, during flight, only one switch (SA) has to be operated. SE is used only to select power and landing.

In each of the following conditions independent aileron, elevator and rudder control are always available. Different rate, exponential, differential and trim settings can be stored for each condition. (Additional mixes could easily be added to each condition or brought into play by the un-used switches if required). Where possible, delays are programmed to provide a smooth transition when conditions are switched.

**START** condition gives proportional motor control with flaps set at neutral. The Condition switch also effectively works as a safety switch as the motor cannot be operated until it is turned on. If it is in the ON position when the transmitter is switched on the condition alarm will sound.

**NORMAL** condition gives flaps set at neutral. The motor is disabled.

**SPEED** condition gives slightly raised flaps and ailerons to produce a reflex wing section with any necessary elevator compensation. The motor is disabled.

**DISTANCE** condition gives slightly lowered flaps and ailerons to increase the camber of the wing section with any necessary elevator compensation. Ailerons are mixed with the rudder. The motor is disabled.

**LANDING** condition gives proportional control of Crow Braking (Butterfly) with raised ailerons, lowered flaps and any necessary elevator compensation.

## INITIAL MODEL SET UP

LINKAGE MENU – MODEL SELECT – NEW (confirm) – MODEL TYPE MENU appears.

Set TYPE – GLIDER WING – NORMAL 2AIL + 2FLP TAIL – NORMAL. (Confirm)

LINKAGE MENU - FREQUENCY MENU Set MULTI for R6008HS Receiver.

LINKAGE MENU – MODEL SELECT – Select newly created model NEW1 (Return) – Select RENAME – fill in model’s name and ENTER.

N.B. If you have renamed an existing model go to LINKAGE MENU – DATA RESET and reset ALL MODEL SETTING.

## FUNCTION SET UP

LINKAGE MENU – FUNCTION MENU – On screen 1 of 4 change MOT control from SE to J3 to give proportional control. Do NOT assign a trim. It is not needed with an ESC and could affect the motor disable mix.

On screen 2 of 4 assign control LS to both FLAP and FLAP2. This is a temporary measure to help with setting up the flap servos and will be removed later.

On Screen 3 of 4 note that J3 is already programmed to BUTTERFLY.

LINKAGE MENU – T1–T4 SET Change the MODE for all four trims from COMBination to SEPARate. This allows you to trim out the model in each CONDITION and your settings will be saved when you switch to a new condition.



STEP	MODE	UNIT
T1	4 SEPAR	--
T2	4 SEPAR	T1-T4
T3	4 SEPAR	MEMORY
T4	4 SEPAR	INH

LINKAGE MENU Screen 2 - WARNING Change TRIM MIX to OFF. Trim mix is permanently active in this set-up. This will prevent the warning alarm going off each time the transmitter is turned on.

## SERVO SET UP

Note. I would suggest setting the receiver in Normal mode rather than High Speed mode. The latter makes no practical difference on a model of this type and requires the use of more expensive servos.

The FUNCTION menu shows to which channel each function has been assigned by the transmitter. Connect the servos to the receiver as follows:-

Channel 1 - Left Aileron	Channel 2 – Elevator
Channel 3 – ESC	Channel 4 – Rudder
Channel 5 – Spare	Channel 6 – Right Aileron
Channel 7 – Left Flap	Channel 8 – Right Flap

Mark the Aileron, Flap and any extension leads with coloured or numbered tape to ensure that left and right cannot be transposed when the model is assembled.

MODEL MENU – FLAP SET - Change both UP flap values to +25%, both DOWN flap values to +120% and both OFFSET values to -50%.



By default all servos move an equal amount in each direction from their neutral points. This aircraft requires only a small amount of up movement of the flaps (for reflex in SPEED condition) but a large amount of down (for crow-braking in LANDING condition). By setting an offset the resting position of the servos is changed. To check the effect of this go to the SERVO MONITOR. Position the Left Slider (LS) in the centre and you will see that Channels 7 and 8 are offset. Move LS and you will see much more movement one way than the other.

Check that LS is in its mid position and that all trims are central. Attach the servo arms making sure that they are exactly at right angles to their respective push rods when

the servo is at rest. This is particularly critical on the wing as you need flaps and ailerons to operate in perfect unison to give reflex and increased camber. Note that Futaba servo arms are slightly offset from 90 degrees (see small numbers moulded on them showing degrees). By rotating an arm on the servo you should be able to set it up perfectly.

LINKAGE MENU – REVERSE Move each control in turn (J1, J2, J3, J4 and LS) and check carefully that each servo and the ESC are working in the correct direction. Change any which is not from NORM to REV.

Connect all servos to their respective control surfaces and adjust the clevis connections to the control horns and servos until you achieve the recommended maximum throw for each surface. DO NOT use End Point adjustment. Ensure that each control surface is correctly centred and that the ailerons and flaps line up exactly along the trailing edge. The aim is to try to achieve a perfect set up mechanically. If necessary use VERY small amounts of SUB-TRIM (Linkage Menu) as a last resort. Too much sub-trim will produce differential movement of the control surface.

LINKAGE MENU – END POINT The outer columns of figures (135 by default) show the LIMIT POINTS in each direction for each servo and the two inner columns (100 by default) show the SERVO TRAVEL END POINTS.

The purpose of the LIMIT POINTS is to prevent the servos being driven too far. Their own controls only drive them up to their END POINTS but, because this set-up uses so many mixes, they can be driven beyond these by combined inputs. For example, if full Crow-Brakes are deployed the ailerons will be raised. If the aileron stick (J1) is then operated one of the ailerons will attempt to rise by its normal amount beyond this point.

Prior to adjusting the limit points make sure that control hinges are as free as possible. A suggested procedure for setting the Limit Points is as follows. For each channel in turn hold the appropriate control fully in one direction while increasing the value of the Servo Travel End Point until the servo just starts to buzz. Adjust the Limit Point to one less than this value and then reset the servo travel end point to its original value. Repeat with the control in the opposite direction. This will ensure that, no matter what mixes you set up, no servo will be able to stall.

Now return to LINKAGE MENU – FUNCTION MENU Page 2 of 4 and reset the controls for the FLAPS from the temporary LS to --. (See Function Set Up above)

# ASSIGNING CONDITION SWITCHES AND PRIORITIES

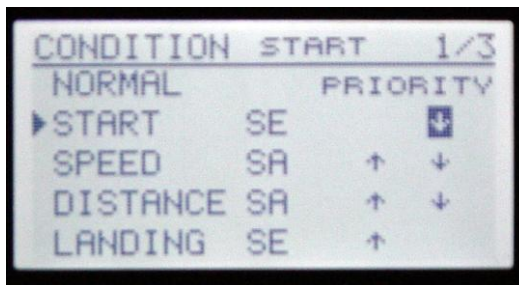
MODEL MENU – CONDITION Scroll to the -- next to START and tap return. The SWITCH screen appears. Leave SINGLE but scroll to -- and tap RETURN. The H/W select screen appears. Select SE and tap RETURN twice to go to the ON/OFF screen. Change the settings to ON, OFF, OFF reading from top to bottom.



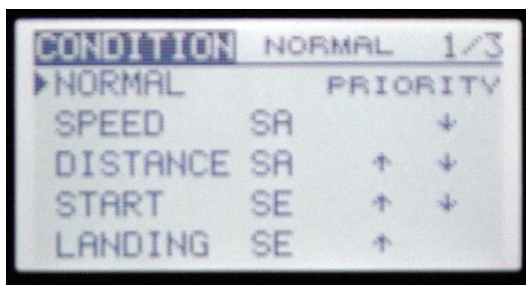
Return to MODEL MENU - CONDITION Following the instructions above set the remaining CONDITION switches in the same way as follows :-

SPEED	Switch SA	ON, OFF, OFF (reading from top)
DISTANCE	Switch SA	OFF, OFF, ON
LANDING	Switch SE	OFF, OFF, ON

Return to MODEL MENU - CONDITION Scroll to the DOWN arrow next to start.



Tap RETURN twice to move START down to just above landing. Your screen should now look like this.



This sets CONDITION priority. It is quite possible for two conditions to be turned on at the same time. Where this occurs the condition nearer the bottom of the screen will take priority. For example, if both switches are pulled towards the front of the

transmitter both LANDING and DISTANCE are selected on but only LANDING will be turned on as it has higher priority. Return switch SE to the mid-point (OFF) and DISTANCE will come on.

Set both switches SE and SA into their middle positions (OFF) and return to the HOME screen. NORMAL should appear at the bottom. Toggle switch SA back and forth and the condition will change to DISTANCE and SPEED as long as switch SE is in the middle (OFF) position. As soon as switch SE is moved it will over-ride switch SA to give either START or LANDING conditions.

All the complex mixes which we are about to programme will be selected by just these two switches and, apart from launch and landing, only one switch (SA) has to be operated.

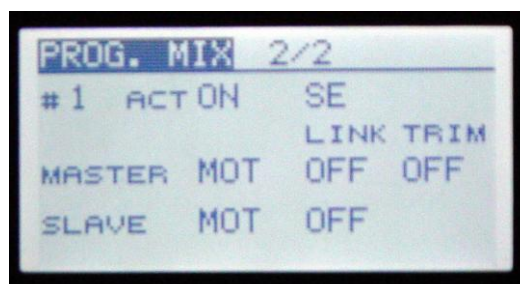
## SETTING THE MOTOR

J3 was assigned in the Function menu to give proportional control to the motor but we only want it to operate in START condition. This can be achieved by means of a PROGRAM MIX in which Motor is both the Master and the Slave. J3 fully back gives closed throttle and fully forward gives high throttle. The mix works in the opposite direction so, when it is switched on, J3 tries to generate an equal amount of movement in each direction regardless of its position. Effectively this disables it.

MODEL MENU - PROG MIX Scroll to the first mix and tap RETURN. Scroll to page 2 of 2. Change ACT from INH to ACT then roll the cursor to -- and tap RETURN to bring up the H/W SELECT screen.

Scroll to switch SE and tap RETURN twice to go to the ON/OFF screen. Set the switch to OFF, ON, ON (reading from top to bottom). Remember that when the mix is ON the throttle is disabled so it needs to be OFF when START condition is active but ON at all other times.

Return to PROG MIX screen 2 of 2 and set MASTER to MOT and SLAVE to MOT. Your screen should look like this if switch SE is in the middle position.



Return to PROG MIX screen 1 of 2 and change both values at the top of the screen to -100. The minus value sets the mix to operate in the opposite direction to the normal stick input. Set the Y OFFSET at the bottom of the screen to -100 to force the ESC to the OFF position when the mix is active. Your screen should look like this.

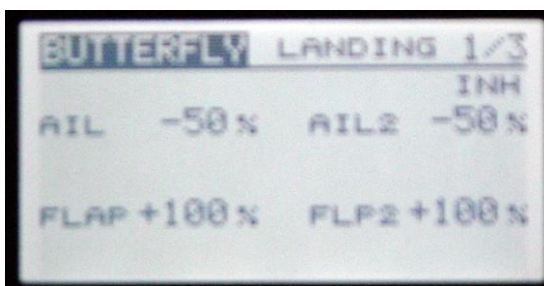


Check that the operation is correct in the servo monitor. In START condition (SE forwards) you should have full control of Channel 3 via J3. With SE in other positions Channel 3 should be locked in its fully closed position.

## SETTING THE CROW BRAKES

MODEL MENU Page 2 - BUTTERFLY

Pull switch SE towards you to select LANDING condition. This should show at the top of the screen 1 of 3. Adjust both AIL settings on this screen to -50% and both FLAP settings to +100% as shown here.



N.B. These are illustrative settings for the purpose of programming and you will need to alter the values as appropriate for your model.

On page 2 of 3 set ELE to +15%. There is scope on this screen to modify the way in which the elevator moves (see my 8FG Supplementary Notes) if needed later.

On page 3 of 3 change ACT from INH to ON. Leave the switch as -- because Butterfly will automatically be selected by the LANDING condition switch (SE).



The speed at which butterfly deploys can be adjusted later if needed but leave the settings at 0 for now.

By default the OFFSET is set at 15% on screen 3 of 3. This means that you have to pull J3 towards you by 15% of its travel before the Crow-brakes begin to deploy. This gives a margin for error as the brakes will be fully off even if you don't push J3 completely forward. To reduce the problems of the brakes suddenly deploying as you switch to LANDING condition you could re-set this so that they only start to deploy once J3 is pulled half-way back for example. To do this scroll to the 15% OFFSET value and move J3 to the point at which you want the crow brakes to begin to deploy. The % figure below changes with the stick position. DO NOT exceed 49% or you will reverse the action of the brakes. Hold RETURN until the transmitter beeps.

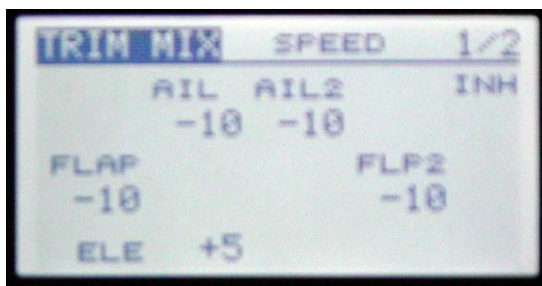
Now check the operation of the brakes by turning on LANDING condition and moving J3. Ensure that both ailerons rise, both flaps lower and the elevator lowers. If any operate in the wrong direction return to BUTTERFLY screens 1 and 2 and change the values for the appropriate control surfaces from minus to plus or vice versa.

## SETTING SPEED CONDITION

MODEL MENU Page 2 - TRIM MIX

Select SPEED condition (switch SE middle and SA up). SPEED should show at the top of screen 1 of 2. Set both AIL values and both FLAP values to -10 and the ELE value to +5.

N.B. These are illustrative settings for the purpose of programming and you will need to alter the values as appropriate for your model. A suggested means of finding the best values is given later.



On screen 2 of 2 change ACT from INH to ON. Leave the switch as -- because the TRIM MIX will automatically be selected by the SPEED condition switch. Set CONDITION DELAY to 20 to ensure a gentle transition to the reflex wing camber. Now



switch SA to give NORMAL condition and again set the condition delay to 20. Set condition delay to 20 in the same way for DISTANCE, START and LANDING so that all the transitions are gentle.

Now check the operation of the reflexed trailing edge by turning on SPEED condition. Ensure that both ailerons and both flaps rise slightly by exactly the same amount and the elevator lowers. If any operate in the wrong direction return to TRIM MIX screen 1 and change the values for the appropriate control surfaces from minus to plus or vice versa. If the mechanical set-up of your model is correct the whole trailing edge should move as one. If necessary, adjust the values on TRIM MIX screen 1 slightly for each individual control surface to achieve this.

## SETTING DISTANCE CONDITION

An aileron to rudder mix is included in this condition to aid circling in thermals at altitudes too high to judge co-ordinated turns. This is set as follows.

MODEL MENU - AIL to RUD

Select DISTANCE condition (switch SE middle and SA down). DISTANCE should show at the top of screen. Change both LEFT and RIGHT values to +50% and change ACT from INH to ON. Leave the switch setting at -- as the mix is selected when the condition is turned on.

The rest of the set-up for this condition is similar to that for SPEED condition except that the wing trailing edge is lowered to increase camber rather than reflexed.

MODEL MENU Page 2 - TRIM MIX

Select DISTANCE condition (switch SE middle and SA down). DISTANCE should show at the top of screen 1 of 2. Set both AIL values and both FLAP values to +20 and the ELE value to -10 as shown below.



N.B. These are illustrative settings for the purpose of programming and you will need to alter the values as appropriate for your model. A suggested means of finding the best values is given later.

Now check the operation of the lowered trailing edge by turning on DISTANCE condition. Ensure that both ailerons and both flaps lower slightly by exactly the same amount and the elevator rises. If any operate in the wrong direction return to TRIM MIX screen 1 and change the values for the appropriate control surfaces from minus to plus or vice versa. If the mechanical set-up of your model is correct the whole trailing edge should move as one. If necessary, adjust the values on TRIM MIX screen 1 slightly for each individual control surface to achieve this.

## **SETTING RATE SWITCHES**

MODEL MENU - DUAL RATE

Scroll to SW. Tap RETURN and change it to COND. You will now see the current condition displayed at the bottom of the screen and can alter this by means of SE and SA. Switch on each condition in turn and set your chosen RATE and EXPONENTIAL settings for each control surface in the normal way. For example you might choose low rate settings for START condition and high for LANDING where the low airspeed will reduce the authority of the controls. Exponential may help you fly smoothly in DISTANCE condition but elevator exponential may be unhelpful in landings as it can cause the elevator to 'bite' suddenly as you pull back to flare out. It is all a matter of personal choice but there is huge scope available and all at the flick just two switches.

## **SETTING AILERON DIFFERENTIAL**

This tends to be important on gliders where the ailerons on the high aspect ratio wings often cause adverse yaw.

MODEL MENU - AIL DIFF

Switch on each condition in turn with SE and SA and set your chosen differential settings.

## **SETTING THE FAILSAFE**

The fail safe should be set to turn off the motor. Other settings are a matter of personal choice but remember that the primary purpose is to minimise the risk to

people on the ground in the event of radio problems. Personally I would set a glider to deploy full crow brakes which would both reduce its speed to the minimum and, hopefully, the risk of losing it.

#### LINKAGE MENU - FAIL SAFE

For each control in turn change HOLD to F/S. Scroll to the position 0%. Hold the appropriate control stick to position the control surface where you wish it to move in the event of radio problems and hold RETURN. (You will need to be in START condition to set the MOTOR failsafe). The pictures below show the failsafe set for Crow-braking with no battery fail safe set.

	F/S	B.F/S	POS
1 AIL	F/S	OFF	-50%
2 ELE	F/S	OFF	-7%
3 MOT	F/S	OFF	+100%
4 RUD	F/S	OFF	+0%

	F/S	B.F/S	POS
5 AUX5 HOLD		OFF	
6 AIL2	F/S	OFF	+49%
7 FLAP	F/S	OFF	+24%
8 FLP2	F/S	OFF	-24%

I have no experience of using Battery Fail Safe with a BEC so have left it turned off in the above example.

## SUGGESTIONS FOR DETERMINING SETTINGS

Fly the model in NORMAL condition. Trim it out and adjust the C of G until you are happy. Adjust the clevises until you can achieve correct trim with all the transmitter trims at zero.

In **START** condition experiment with the elevator trim to achieve the best hands-off climb rate. Look at the servo monitor and note the value for the trim deflection (Channel 2) at the bottom of the screen. Reset the elevator trim to zero. Go to TRIM MIX. Make sure that you are still in START condition and change the +0 elevator setting to double the value you noted above. Check the servo monitor again and keep adjusting the elevator offset in TRIM MIX until the servo monitor is showing the same deflection you achieved with the trim.

One way of setting **SPEED** and **DISTANCE** offsets is to set up a temporary CAMBER MIX as follows.

LINKAGE MENU - FUNCTION MENU On screen 2 of 4 assign control LS to both FLAP and FLAP2.

MODEL MENU - CAMBER MIX Change ACT from INH to ON.

Check that NORMAL condition is switched on. Set all four rates for AIL and FLAP to +30%. With the model assembled, move LS and the flaps and ailerons should all rise and fall together. If necessary return to CAMBER MIX and change the values from plus to minus of any surfaces which operate in the wrong direction.

Now, make sure that LS is in its mid position and fly the model in NORMAL condition. Using LS gradually lower the trailing edge and adjust the elevator trim if necessary until you achieve the best low speed/low sink flight for use when thermalling. Leave LS where it is, switch to LANDING condition and land the model. Switch back to NORMAL condition and check the servo monitor. Take a note of the deflection values for both ailerons, both flaps and the elevator.

Reset LS and the elevator trim to their mid points. Go to TRIM MIX. Select DISTANCE condition. Keep adjusting the values for AIL, FLAP and ELE and checking the servo monitor until you achieve the same deflections that you achieved with LS and the elevator trim.

Now fly the model in NORMAL condition and this time gradually raise the trailing edge with LS and adjust the elevator trim if necessary to achieve fast flight with the minimum of height loss. When you are happy land and repeat the process above but this time store the values in SPEED condition.

Finally return to CAMBER MIX and make it INHibited. Go to FUNCTION MIX page 2 of 4 and reset the controls for FLAP and FLAP 2 from LS to -- .

Fine tuning **LANDING** condition is very much a matter of trial and error to get the best controlled descent by making adjustments to the settings in BUTTERFLY.

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