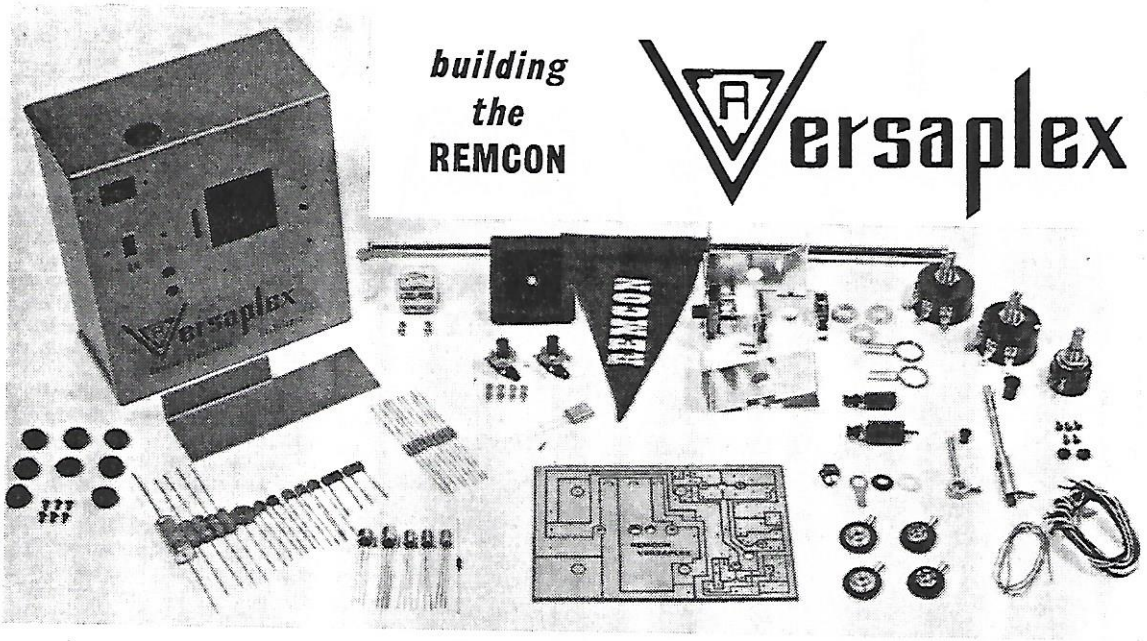
RM October 1967

building the REMCON Versaplex



built and photographed by Peter Freebrey

THE aim of the Remcon Versaplex has been to provide a proportional radio control system which can be constructed by a modeller of average ability, and without recourse to expensive test equipment—all that is necessary being a test meter, obtainable from most model or electrical shops, for a cost of about £3 12s. 6d. Basically the Versaplex gives proportional control on two servos simultaneously, whilst a third servo functions progressively. The progressive servo, normally used for engine control, incorporates a change-over switch system, which allows the proportional channel normally used for rudder control, to be routed via one or two servos, depending upon the position of the progressive servo, thus allowing the Versaplex equipment to be extended to what is known as a 3 + 1 system.

A further refinement, available as an optional extra, is a printed circuit junction board, which brings all power supplies, servo outputs, charging socket and model on/off switch, on to a common board, simplifying the none to easy task of wiring in the model. This same board has a printed circuit on it, which is a centring circuit for the system, when extended to 3 + 1, so that the proportional servo which is switched out, is held electrically on centre, or to a pre-set trim, by this centring circuit. It is, however recommended that the constructor builds the basic system first, and becomes familiar with its operation on the bench at least, before extending to the 3 + 1 system, since this may be added at any time.

Power supplies for the Versaplex are—Transmitter 12v., from two PP 1 dry batteries. Deacs are not recommended because, when freshly off charge, they will often exceed their nominal voltage by a high enough margin to cause damage. In any case, with a current consumption of only 30 mA., the PP 1's will give something like 100 hours use, so the additional cost of a Deac is not worthwhile. For the receiver and servos, however, a 7.2v. centre tapped 500DKZ Deac is essential.

Soldering

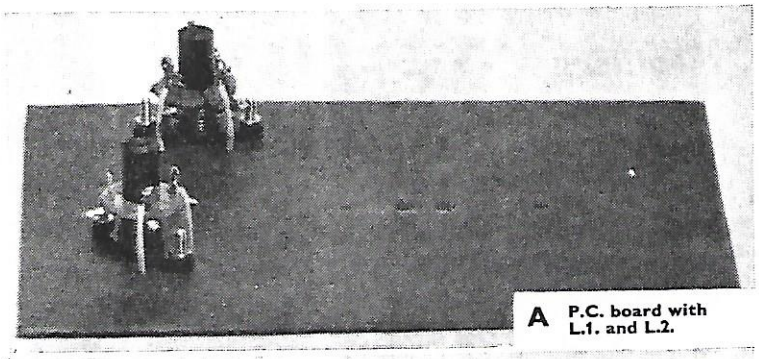
The most important feature of construction is soldering and, for the transmitter, a 15 watt or 25 watt electric soldering iron should be used. The bit must be carefully cleaned and tinned to ensure that a clean wet joint will be quickly made. Cored solder only should be used and NEVER use any other flux. Remcon printed circuits are coated with a lacquer which melts and fluxes the board, local to the joint, when heat is applied.

The soldering iron should be brought into contact with the copper land and the solder applied to the junction of the iron and land, the molten solder is slid over to the component wire, the iron remaining in this position for one or two seconds to ensure good wetting. Do not use heat shunts as the components will withstand a soldering bit at working temperature on their wire ends for up to 10 seconds without damage. Resistors and condensers should be placed firmly on the board body end, whereas transistors should be pushed through the board so that ¼in. of leg stands above the board, this also applies to the crystal.

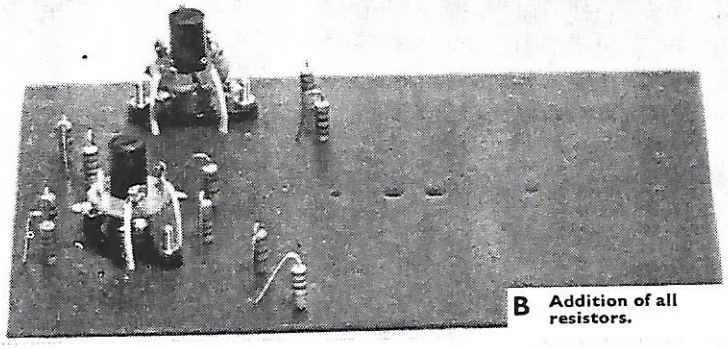
It will be noted that certain references in the text cannot be allied to a printed circuit drawing. This is to protect the copyright which Remcon hold and which would be lost if we published it ourselves.

However, the question of copyright is maintained by Remcon publishing the printed circuit layouts themselves, and for those interested, Remcon will supply these direct upon receipt of the coupon contained in their advertisement.

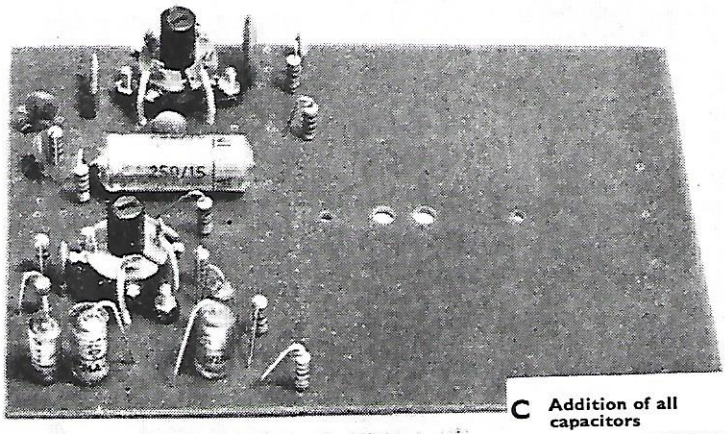
Naturally full details, and also lists of components etc. which are not included here for the above reason or considerations of space, are contained with each kit.



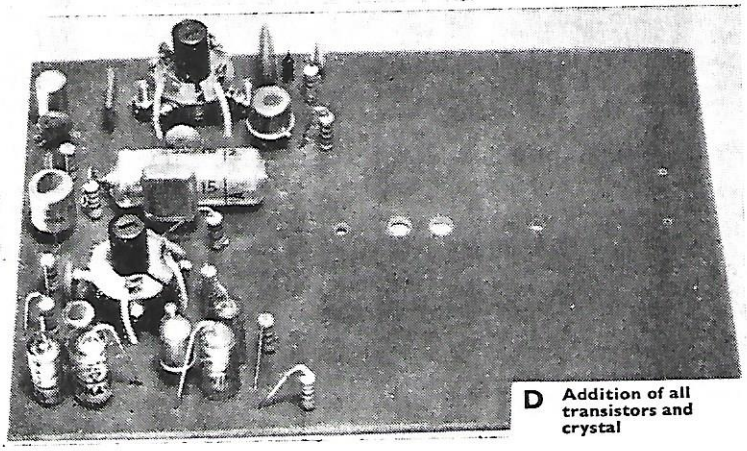
A P.C. board with L.1. and L.2.



B Addition of all resistors.



C Addition of all capacitors



D Addition of all transistors and crystal

Construction

The assembly of the electronic components on the printed circuit board can be carried out in almost any order since there is plenty of room for soldering. The sequence followed, and shown in the photographs is—(a) L.1. and L.2., (b) all resistors, (c) all capacitors, (d) all transistors and crystal. However, before commencing building, the constructor is recommended to identify each component against the parts list and familiarise himself with all the instructions appertaining to this section of the construction.

Extra care should be taken when inserting the following components:—

C.1. must be inserted with the positive end of the can in the position shown on the diagram. *(See note, page 327).*

D.1. has its positive end denoted by a red or grey band on the body and this end sits on the p.c.

L.1. and L.2. can only be inserted to give the start and finish (s and f) in the position shown. Note: 1. L.1. has three tags connected to the coil whereas L.2. has four. 2. The 8 BA fixing screws should have their heads on the copper side of the board.

The transistors must be correctly triangulated, ensuring that the base goes into the hole marked b. VT3. requires special attention since it has a fourth leg, which is soldered to the board to improve mechanical stability only.

All resistors condensers and the crystal, other than items mentioned above, can be inserted either way round, but should be positioned with the body of the component exactly as shown in the diagram to facilitate checking.

On completion of the insertion of the components, a number of holes will remain vacant, to receive the various switch and potentiometer wires from the stick assembly. Check at this stage that the components have been inserted correctly and that there are no solder bridges across the lands.

Wiring up

1. Two wires of the same colour are taken from positions sl on the printed circuit, to the two terminals on the lo engine switch marked sl on the stick assembly diagram.

2. Two wires of the same colour are taken from positions s2a on the p.c. to the two long tags on the hi engine switch, two wires of

a different colour are taken from positions s2b on the p.c. to the two short tags s2b on the switch.

3. Fit a red wire to position s4+ and a black wire to s4— and take to the two centre poles of the slide switch. A further pair of red and black wires, approximately 7in. long, are taken from the two poles of the slide switch nearest the engine control switches, noting that the polarity of these wires is retained and battery clips are fitted to their ends.

4. Two wires of different colours are taken from holes t1 and t2 to the trim pot tags labelled t1 and t2 respectively.

5. The elevator pot RV2 is connected directly to the p.c. by short pieces of wire (component off cuts), noting that d1 goes to the centre tag and the other tags connect to the holes immediately beneath them.

6. The rudder pot RV1 is connected in a rather more complicated fashion, since these wires move with the pot and, to avoid risk of fatigue, they should be routed as follows:

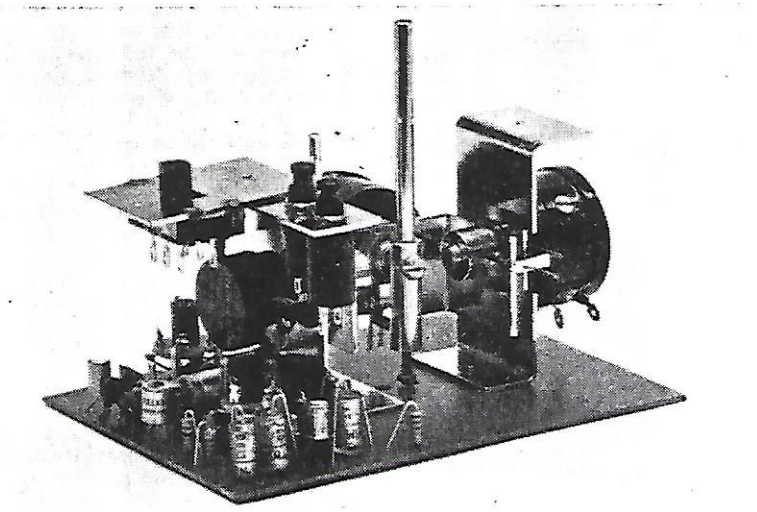
Three wires of different colours, approximately 8in. long, are soldered to the three tags on pot RV1 (note tags are shown in the forward position in the diagram for clarity only), the wires are then plaited, not twisted, throughout their length. A double conical grommet is fitted in the $\frac{5}{32}$in. hole in the rudder pot bracket, the plaited wires are brought from the pot around the outside of the bracket, through the grommet towards the control stick, close enough to be neat but not tight. The wires then make one helical turn of about $\frac{1}{2}$in. dia. and are then taken through a further double conical grommet fitted in the hole marked "G" on the p.c. diagram.

The wires are then connected to the three eyebrows printed towards the top edge of the p.c. board, noting that the centre tag of RV1 is fitted to eyebrow M1. The two remaining wires may be soldered to either of the two remaining eyebrows, since this determines the direction of servo travel, they may be reversed to change direction of travel, this does not apply to either the elevator or trim pots.

7. A wire (short as possible), is taken from the hole marked ae to the tag on the aerial socket.

8. A wire is taken from the hole marked m on the p.c. adjacent to ae, which goes to meter positive, a wire from meter negative goes to the positive side of the on/off switch. Note, these polarities are correct, again these wires should be kept as short as possible but, for bench testing, they may be say 2in. long, so that the meter can be laid well clear of the p.c. before fitting in the case.

9. All that remains is making a battery strap to connect the two PP1. 6v. batteries in series (pos. to neg.) to give 12v.



The stick assembly fitted to the P.C. board.

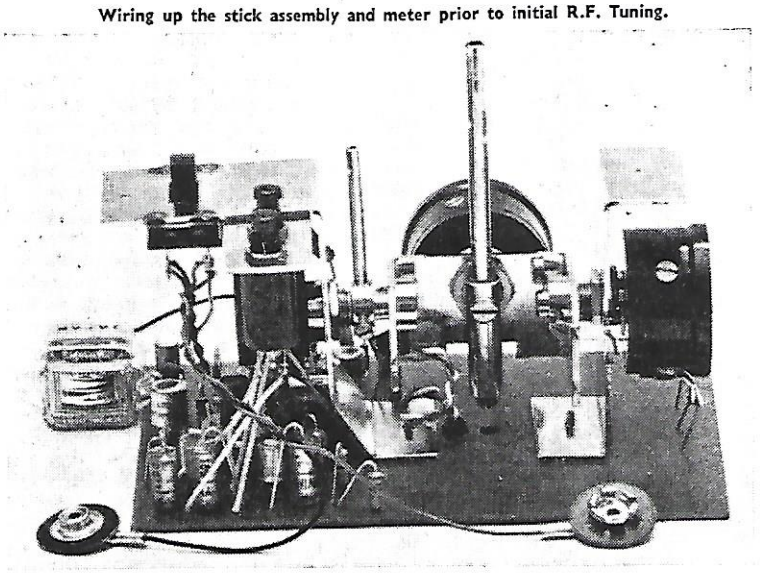
Stick assembly

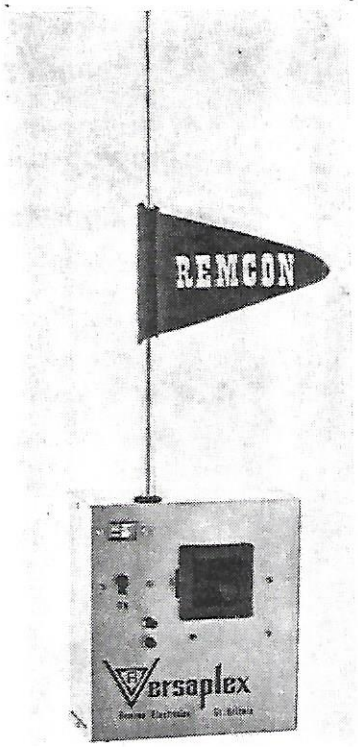
This unit is initially made up as a separate item. (An exploded diagram is supplied with the kit). It should be checked for mechanical operation before fixing to the printed circuit; again the constructor should familiarise himself with each component first.

The pot RV1. is marked 25,000 ohms. and is fitted to the "U" shaped bracket as shown, ensuring that the return spring sits over the distance piece and does not bind between pot and bracket when the nut is tightened. The elevator pot RV2. is marked 2,000 ohms. and is fitted to its bracket in a similar manner to RV1.

The aerial socket is mounted to the remaining bracket, which already has the on/off switch spot-welded to it, noting that the spigoted washer fits within the hole to insulate the threaded

Wiring up the stick assembly and meter prior to initial R.F. Tuning.





aerial bush and tag ring from the bracket, an OBA fibre washer insulates the nut from the bracket. This nut should be tightened carefully but strongly, using a spanner.

The elevator trim pot, marked 25,000 ohm., is assembled in the position shown. Note that a distance piece is inserted between the pot body and the bracket, ensuring the tag positions are approximately as shown, before tightening the nut. Before fitting the trim lever, the trim pot spindle should be turned fully clockwise, viewed from the spindle, and the lever is set so that it is approximately 10deg. towards the aerial socket when the set screw is tightened.

The "hi" and "lo" engine servo switches are now fitted, using one of the lock nuts provided, the other nuts are retained for assembly into the case. (Hi engine switch is a two-pole break switch, each pair of poles being defined by two long and two short tags respectively, lo engine switch is a single pole push to make switch). Whilst a position is shown for the engine control switches, their actual position can be reversed to suit individual requirements.

It is recommended that the five fixing holes, provided to take self tapping screws in the stick assembly, are pre-tapped, using a self tapping screw to minimise the risk of a screwdriver slipping on assembly and consequent damage.

After checking that the control sticks move freely about their axes, the whole assembly can be mounted on the printed circuit, checking that the trim pot and switches clear the electronic components. Again, stick movement should be checked to ensure that it is free, and any tightness caused by misalignment rectified. Do not fit knobs at this stage.

Setting up main control potentiometers

Rudder pot R.V.1. This control is set by using the resistance section of a multimeter. Due to transistors being inserted, the correct polarity of the probe must be observed, otherwise a false reading will be obtained. We have a 25,000 ohm. Pot. and, for central rudder position, require approximately equal resistance each side of the wiper.

Unlock the set screw from the lower end of the main control lever and, with the positive probe of the meter on the centre tag of the Pot., and the negative probe on one of the other tags, rotate spindle of RV.1. to give 12,500 ohms. (12.5K.) reading. Retighten set screw.

Elevator Pot R.V.2. Slacken set screw locking RV.2. and switch on transmitter with batteries connected. With voltmeter on 0-10v. range (or any value above) and negative probe to centre tag and positive probe to battery positive, adjust spindle of RV.2. to give 7.5v. Relock set screw.

These settings of the control pots. are approximate and final adjustment can only be made when the servos are connected to to receiver.

Radio frequency tuning

Working from the component side of the p.c. board, screw in the slugs of L.1 and L.2 until they are flush with the top of their coil formers, switch on and the meter should give a reading. Now carefully unscrew the slug in former L.1 until the meter drops to zero, wind in L.1 slug until meter rises to its peak, do this two or three times, so as to ensure that the meter has only just reached its peak and you are not tuning to the level reading which is beyond it. Depress the lo engine switch button holding it down, wind the slug of L.2 back and forth for a maximum reading on the meter; on releasing the button the meter should fall so that the needle sits in the red sector, indicating that your modulator is operational. Moving the stick from side to side should increase and decrease the meter reading (rudder operation), but moving the stick up and down should produce no meter movement. At this stage the output of your transmitter may be heard on a monitor, or a domestic VHF radio set tuned to 108 mcs., provided the transmitter is brought very close to the VHF set aerial.

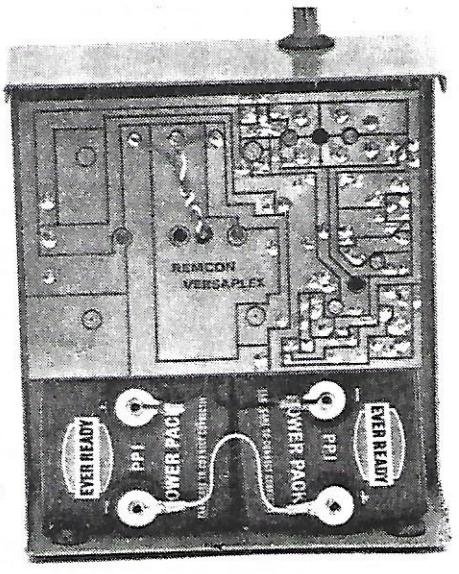
The setting of the control stick positions to give servo centre cannot be carried out at this stage, since these adjustments are finally made when the servos are connected to the receiver and decoder, the servos having been factory set to their correct centring voltage, thus making the use of an oscilloscope quite unnecessary.

Final assembly

It is appropriate to give assembly details at this juncture, although the setting of control stick positions is given in the section relating to receiver and decoder, and this must be carried out before transmitter case fitting commences.

The battery bracket is fitted to the case by two self tapping screws. The output meter which measures the current going into the aerial (ignore the tune and battery markings), is fitted to the case by two 8 BA screws and nuts, and the wires from the p.c. and on/off switch are soldered to the appropriate connections on the meter as described previously. These wires must be kept to an absolute minimum length.

(Continued on page 341)

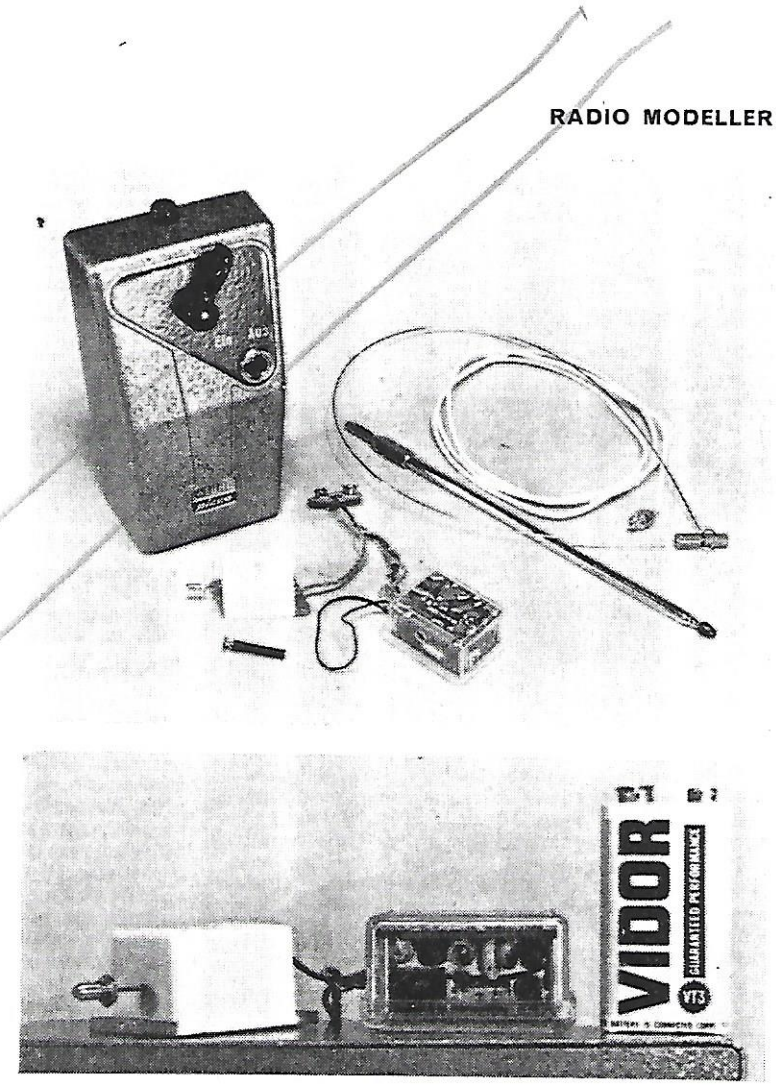


small brass pillars, which does make for a very compact arrangement. The receiver is housed in a clear polystyrene box and the diminutive magnetic actuator is entirely enclosed in a similar plastic container, but coloured grey and white.

Both the receiver and the actuator operate from a single 9 volt battery. The type of battery, a V.T.3 or similar, is not designed to deliver high currents and, as one would expect, the output torque from the magnetic actuator is quite small. But as we said, the system is intended for small models of around 24 to 30 inches span, so high torque is unnecessary, although it would enable the equipment to be fitted into larger models which are, at present, excluded by the output limitations. One other minor feature, also aimed at giving maximum range with the small R.F. power, is the provision of a whip aerial for the receiver, which has only a couple of inches of flex fitted.

All in all, we would rate this outfit as ideal for those radio conversions of suitable rubber-jobs or free-flight scale kits, which some modellers seem to do so well.

Importer: Model Aircraft (Bournemouth) Ltd.
Price: £38-0-9—plus 10% P.T. Surcharge.



VERSAPLEX

(*continued from page* 330)

The printed circuit and stick assembly are now offered up to the case, ensuring that the switches and control sticks centralise in their holes. The three self tapping screws are now carefully inserted into their previously tapped holes and the whole assembly screwed up tight, checking that the on/off switch and control sticks operate freely. The two remaining locknuts are screwed up finger tight on to the engine control switches and the conical grommet is inserted into the case, so that its apex sits on top of the larger diameter portion of the main control stick. The flanges of the grommet are carefully fitted around the square aperture of the case. The control knobs are now fitted to the sticks, being a push fit.

The tapered flange aerial bush is now slipped over the bottom of the aerial and the aerial screwed into its socket, leaving it approximately half a turn from tight. The spigot of this bush is coated sparingly with Araldite and pushed into the case. The squareness in both directions of the aerial should now be checked and the aerial held in this position whilst the assembly is left to cure. In this way, when the aerial is tightened, it will sit square to the case. The rubber buffer grommets are fitted to the two sections of the case and the frequency flag should be fitted snugly over the aerial loading coil, where it also serves as a cover.

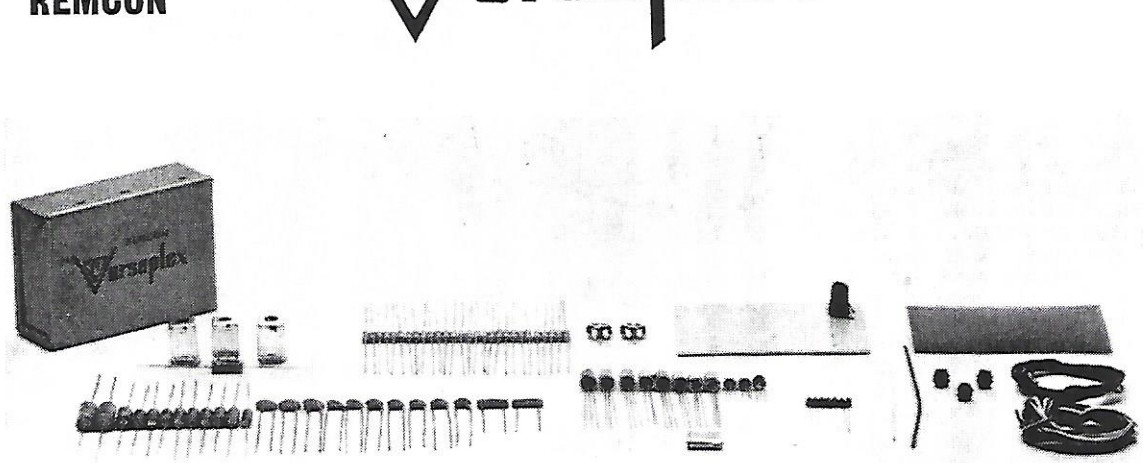
The transmitter should be finally tuned when it is fitted in the case. The instructions given for RF tuning should be followed, remembering that the aerial should be fully extended now and, with one hand on the case, L.1. and L.2. are tuned, using a non metallic tuning tool inserted into the formers from the copper side of the printed circuit, remembering that rotations are reversed from those mentioned earlier. Before finally screwing the case together, some insulating material should cover the inside of the back of the case to prevent the battery clips from shorting. Well doped cardboard (to prevent moisture absorption) will suffice.

Having followed the foregoing sequence, on completing our transmitter, we were delighted to find that it worked exactly as predicted. We came across no snags and can speak highly of the quality of the components supplied. Next month we will describe building the receiver, then conclude with the final setting up and adding the 3 + 1 facility.

RM November 1967

building the REMCON Versaplex

Part II — THE RECEIVER



built and photographed by
Peter Freebrey

IN common with the transmitter described last month, the Rx has also been designed with the average modeller in mind—i.e. a person with modelling ability, but no electronic experience. We again emphasise the necessity for a first class soldering job and hence strongly recommend building the transmitter first, as there is more room around the components and hence errors in soldering, or component placement, are more readily seen.

Essential tools for the construction of the receiver are a pair of good quality 4 or 5in. side cutters, round nosed pliers, and a soldering iron with a $\frac{3}{32}$ or $\frac{1}{8}$in. bit. Lining up is carried out without the use of an oscilloscope, because the ready built servos are factory set to the correct centre voltages, but, one must have a reliable test meter. Remcon recommend their EP.10K Universal meter. but any instrument of 10,000 ohms per volt sensitivity is suitable.

The Versaplex receiver p.c. board is of glass fibre and is only slightly larger than the Versatile reed receiver, while the R.F. section is virtually identical in layout, but the IF strip is followed by the squarer and decoder, which gives the following outputs. Mark space, normally used for rudder control or ailerons, and rate, normally used for elevator control. These two outputs are proportional to stick movement on the transmitter, and there are two further outputs, one commanded by the lo, engine button, the other commanded by the hi engine button. The circuit is so arranged that, in the complete absence of incoming signal from the transmitter, the receiver automatically gives centring voltages on both the mark space and rate channels, and energises the lo engine circuit, giving a complete fail safe. It will be seen that these centring voltages are adjustable via RV.1 potentiometer, which may be set to give either trim neutral to the flying surfaces, or a very small amount of turn, together with up elevator, thus eliminating even the risk of a fly away. For boat use, it is usual for the mark space channels to be used for rudder control and the progressive outputs for engine (hi and lo). Again, the fail safe circuit can be adjusted to give a slight turn to the rudder, together with lo engine. Alternatively, the rate channel can be used for engine control in a boat, thus making it proportional, but here fail safe would amount to half throttle setting, i.e. centre of servo travel.

Construction

Whilst several orders of construction may be adopted, the following sequence is shown in the photographs.

T1 Brown/red IF transformer.
T2 Mauve/white IFT.
T3 Black IFT.

The pins should be gently engaged in the holes in the board and the can pushed down so that it is flush with the board, and all 7 pins protruding through on the copper side should be soldered.

Fit all resistors noting comments on R12, 13 and 26.

VT.1 Red identification.

Ensure the base pin goes into the hole marked "B" on the diagram and that the can of the transistor sits $\frac{2}{16}$in. above the board, this comment applies to all transistors.

VT.2 Green. VT.3 Yellow.

RFC marked 1 amp. R.S. Sleeve wire to insulate from T1 can.

D.1 OA47. Positive end on p.c. denoted by red or grey band.

Continue construction in the following approximate order.

C.4. C.8. C.5. C.10. C.16. C.12. C.13. C.14. C.15. C.3. VT.4. C.6.

D.7 negative end on p.c. OA47. C.17. VT.5. C.1 negative end on board.

C.2 positive end on board. C.19 positive end on board. C.18 positive end on board.

VT.7. VT.6. D.3 positive end on board. D.4 positive end on board.

VT.9. D.5 negative end on board. VT.8.

Note. Timing capacitors C.20 and C.21 (.1 mfd. close tol.) are

sometimes manufactured with the lead out wires off centre to the body of the capacitor, this eccentricity can be used to advantage by inserting these two components and rotating them so they clear adjacent components.

D.6 laid horizontally positive end towards edge of board. C.22 negative end on board. C.23 negative end on board. C.24 positive end on board. VT.11. VT.10. C.7 positive end on board. C.9 negative end on board. C.11 positive end on board. D.2 negative end on board. R.12 sleeve wire end to insulate from T.1. R.13 leave extra long loop on top of resistor body ($\frac{1}{8}$ long) for testing. R.26 laying down. Fit RV.1 and RV.2. Crystal, the lower frequency one of the matched pair, supplied with the Tx. C.25.

This completes the component assembly and the board should be carefully inspected to ascertain there are no dry or doubtful joints, and that none of the lands are bridged with solder. It is now necessary to wire up the various points on the printed circuit as follows:—

A 22 swg. tinned copper wire is carefully positioned on the under side of the board, along the route shown as earth link, this wire must be insulated with sleeving throughout its length ensuring that the link does not pass over any solder joints, but sits in the valleys.

Approx. 8in. of red and black wire is fitted to the positive and negative positions respectively.

Approx. 36in. of any colour stranded wire is fitted to the point marked ae.

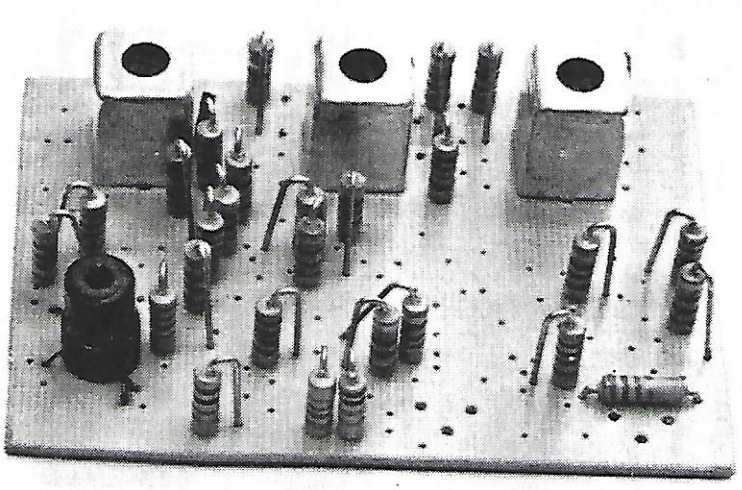
Approx. 8in. of yellow wire is fitted to the hole marked Rud.

Approx. 8in. of orange wire is fitted to the hole marked lo.

Approx. 8in. of blue wire is fitted to the hole marked Elev.

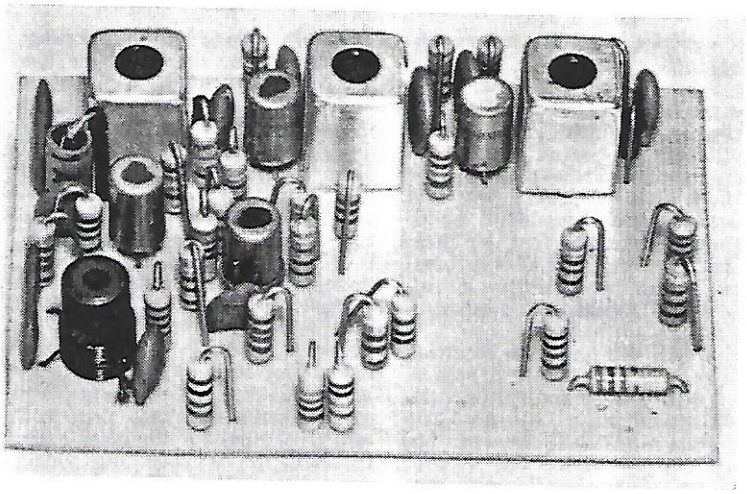
Approx. 8in. of green wire is fitted to the hole marked Hi.

It is noted that the drilling of the board has been kept "tight" to ensure good solid joints, also where component holes are quite close to a lead out wire hole, it is sometimes a good plan to leave the component wire unsoldered until the stranded wire is fitted, but a note should be made where this has been done as building progresses, so that these component wires are not forgotten and left unsoldered. In any case, all stranded wires should be tinned before inserting into the p.c. to keep the strands together and,

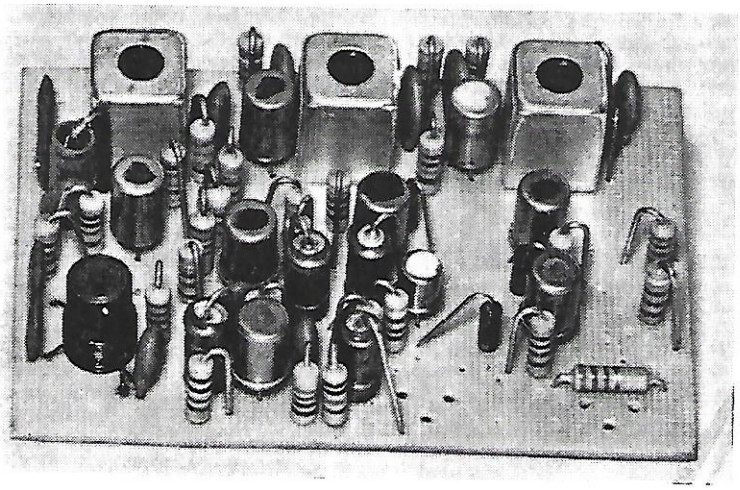


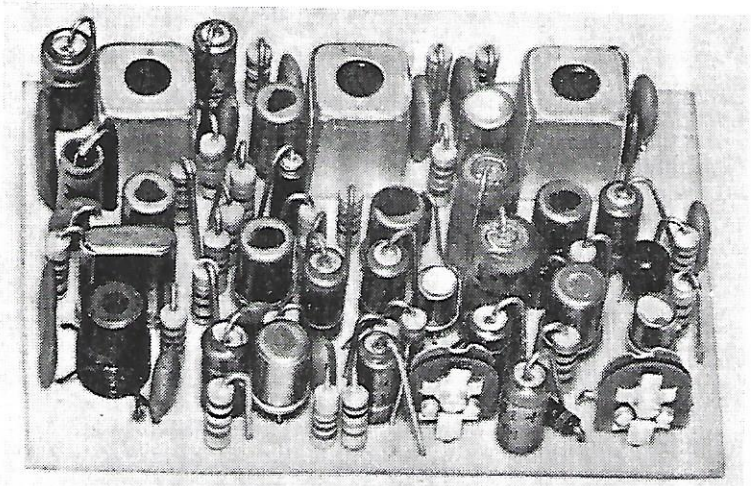
Above: I.F. Cans L.I. and all resistors in place.

Below: All components fitted up to installation of C.6.



Below: All components fitted up to installation of VT 8.





Above: all components fitted up to installation of crystal.

Below: Completed Rx and decoder fitted in case.

upon insertion, pushed up to the PVC sleeving to ensure a solid insulated joint.

Note also:

1. It is unnecessary to sleeve all component wires since this will make subsequent checking difficult, but do sleeve where called for above only.

2. The IF cans T.1, 2, and 3, are live and therefore component wires must not touch them. Also all transistors which have a small tag adjacent to their emitters have their collectors connected to the can and, again, the odd tweak may be required to make doubly sure that the component wires do not make unwanted connections with the cans.

3. To assist component checking try to keep resistor colour codes at the upper ends of their bodies i.e. gold band nearest the board.

Radio Frequency Tuning

After thoroughly checking that all components have been correctly inserted and the soldering is beyond reproach, connect a 7.2 volt 500 DKZ Deac to the positive and negative leads—red and black respectively.

1. With voltmeter set on 0-5v. range, connect meter to positive of battery and negative to wire loop formed on R.13. Voltage of approximately .5 v. should exist.

2. Now, with transmitter switched on, depress lo engine button and bring near to the receiver—under 2ft. the above voltage should fall to almost zero. With aerial removed and with engine button released, position transmitter so that the voltage on R13, is about .1 v. below transmitter off value—i.e. now .4 v. Tune the following to give the lowest reading on the voltmeter.

L.1 slug will be between $\frac{1}{16}$ and 5/32nd below the top of the former.

Adjust slugs of T.1, T.2 and T.3 to give the lowest reading. Note, if more than a quarter of a turn adjustment is required on any of these three transformers, then something is wrong, and further winding of the core into the transformer will only cause irreparable damage to this component.

This is all that is required to complete RF alignment of the receiver.

Output Tuning

With transmitter switched off and voltmeter again set to 0-5v. range, connect the voltmeter between Deac negative and the positive lead to the following points:

A. Yellow wire to meter positive 2.1 v. Blue wire to meter positive 2.1 v. In the likely event of these two voltages not being 2.1 v. adjust R.V.1 so that they are. Although these voltages may differ from 2.1 v. they should always be equal and RV.1 controls them equally.

B. Orange wire to meter positive greater than 2.4 v. Green wire to meter positive less than 7.5 v.

The receiver and decoder are now set up under fail safe condition—i.e. no signal from Tx.

With transmitter switched on without aerial connected and held close to Rx, repeat the above checks as follows:

C. Yellow wire to meter positive, adjust pot RV.1 *in transmitter* to give 2.1 v. with stick in central position.

Blue wire to meter positive and trim lever at centre, adjust RV.2 *in transmitter* to give 2.1 v. also with stick in central position.

D. Orange wire to meter positive approximately less than .5 v. Green wire to meter positive 7.2 v.

E. Depress lo engine button and all voltages should be as in "A" and "B" above.

F. Depress hi engine button and measure as follows: Yellow wire to meter positive 2.1 v. but swings plus and minus of this with stick movement (rudder direction).

Blue wire to meter positive 2.1

v. adjusted by pot RV.2 in receiver, no swing with stick movement (elevator direction).

Orange wire to meter positive to give less than .5 v.

Green wire to meter positive to give less than .5 v.

This completes the alignment and voltage checks of the receiver and decoder to the transmitter, and final adjustments are made to the transmitter only when the servos are connected to the receiver and decoder as will be described later when dealing with servos.

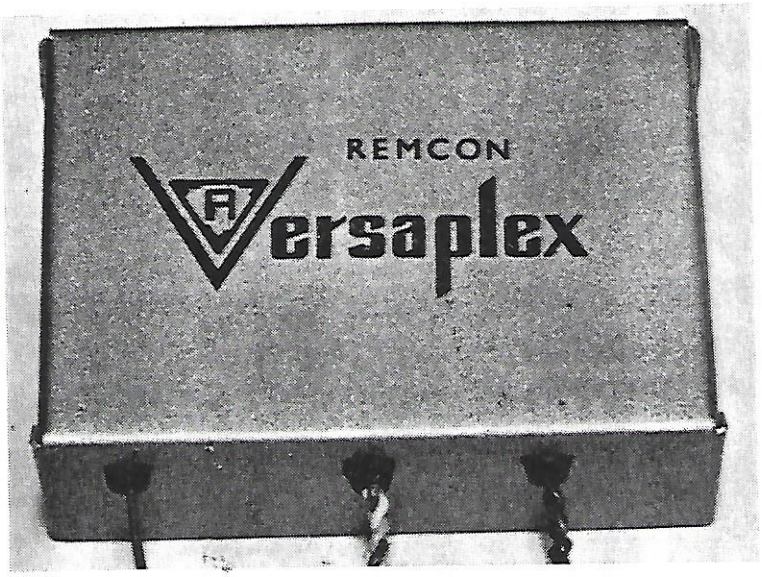
The receiver is fitted into the case but, firstly, it is recommended that the green, red and black wires are plaited together, as also are the orange, yellow and blue wires, and grommets slipped over them. We have found it unnecessary to screw the printed circuit into the case, it being sufficient to trap the insulating board under the printed circuit by laying a piece of sponge rubber over the components, giving slight pressure when the case lid is fitted.

Important. If you are unable to obtain the output voltages stated in A-F above do not connect servos because serious damage may result.

Comment

R.F. Tuning of the receiver needed only the slightest tuning to L.1, the I.F. cans being set by the manufacturer to the optimum position. No problems were encountered with output tuning, RV.1 and RV.2 both in the Tx and Rx, needing only slight alteration to obtain the voltages specified in the instructions.

This completes the construction of our transmitter and receiver



The completed receiver. Note substantial grommets to support wires.

and, to conclude, next month we will describe the final setting up and addition of the Plus 1 option. However, to put you out of suspense, we have now completed construction of our complete set and preliminary tests have been entirely satisfactory. We would, again, draw attention to the fact that, for reasons of copyright, certain references in the text cannot be allied to a printed circuit drawing. This is to protect the copyright which Remcon hold and which would be lost if we published these details ourselves. However, the question of copyright is maintained by Remcon publishing the printed circuit layouts themselves and, for those interested, Remcon will supply these direct, upon receipt of the coupon contained in their advertisement. Naturally, full details, and also lists of components etc., which are not included here for the above reason or considerations of space, are contained with each kit.

GOT YOUR LICENCE?

Don't forget you need a G.P.O. licence to operate radio control equipment. It only costs £1 for *five years* (4s. a year!) and all you have to do is fill up a form obtainable from: **Radio Branch, Radio and Accommodation Dept., G.P.O. Headquarters, London, E.C.1**

STRICTLY FOR SOARERS

continued from page 352

at the slope soon, Peter. (Thinks—would a *Minimoa* perform, sans fin/rudder, then?)

Room for all

One of the encouraging aspects of soaring contests, when you think about it, is the element of luck involved. Aerobatic soaring can never become boring, for the simple reason that one nearly always has to contend with changing conditions, so there's always a chance for the newcomer and it's unlikely that we'll get the expert-dominated situation one sees in other branches of model flying. And in any case, the thing that distinguishes soaring meets from others is the generally friendly, free-and-easy approach, and the absence of the "knifing" that seems to go on in the rough and tumble of cut-throat power contests.

We soarers, it seems, don't take ourselves so deadly seriously as those in other branches of the hobby—let's hope it stays that way!

Air-brakes, parachutes or spoilers?

Not a lot of work seems to have been done on any of these, but there is a growing need for them, with some of the larger models, which fairly whistle in, especially when there's not a lot of breeze to reduce the actual groundspeed.

That mystery site . . .

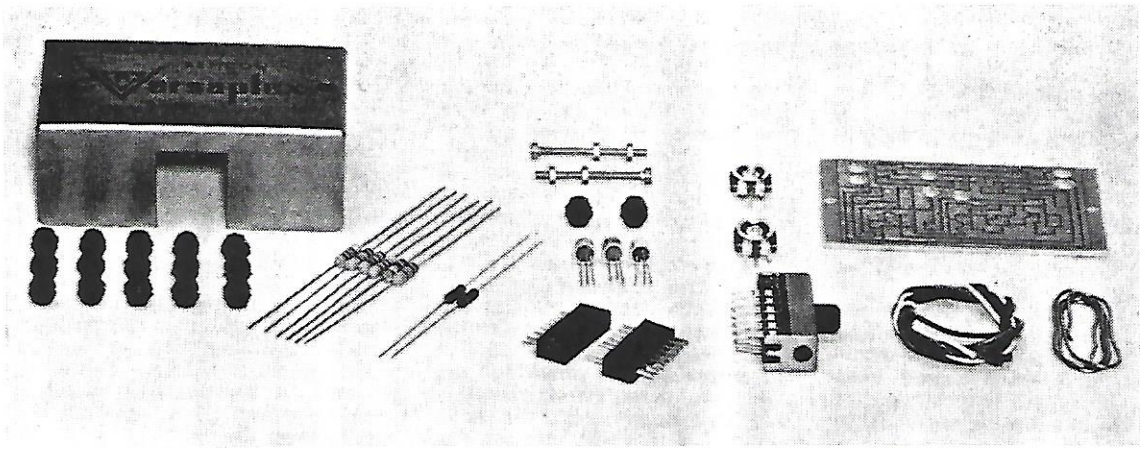
That "Hey Bluff" site, mentioned in the September issue, turned out to be actually *Hay* Bluff, Hay-on-Wye, Breconshire, some 21 miles from Hereford.

And another in the south-west . . .

This one is White Sheet Hill, on the Salisbury/Shaftesbury road, some five or six miles on the Salisbury side of Shaftesbury. For S.W. winds. (Not yet investigated personally).

No other news of sites, at present. With soaring becoming more and more popular, it's probably understandable that those with good, uncrowded sites, want to keep them to themselves . . . !

RM December 1967



building the **REMCON** **Versaplex** **Part III — THE SERVOS AND 3 + 1 OPTION**

built and photographed by Peter Freebrey

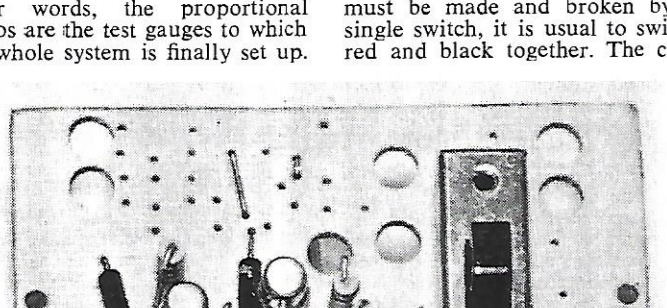
HAVING now completed the construction of the transmitter and receiver we are ready to connect the servos and check the working of the unit. After this we will describe the special hook-up printed circuit and case, which allows an extremely neat installation, and then the adding of the 3+1 option.

Proportional servo (4 wires)

This is a factory assembled unit, and is supplied tested and set up to the correct centre voltage. In other words, the proportional servos are the test gauges to which the whole system is finally set up. This does not mean that the setting up instructions for the transmitter and receiver can be ignored, since it would be possible to cause mechanical damage to the servos, if the respective output voltages on the yellow, blue, orange and green wires were not within 15 per cent of the stated figures. The rudder and elevator proportional servos are identical and therefore fully interchangeable.

The battery connections must be switched simultaneously and, therefore, a minimum of two poles must be made and broken by a single switch, it is usual to switch red and black together. The connections are made to the common 7.2v. DKZ500 Deac battery, as used for the receiver (common battery) as follows: Red to positive 7.2v. Yellow wire of servo to yellow of Rx—rudder. White to centre tap 3.6v. Yellow wire of servo to blue wire of Rx—elevator. Black to negative.

Without switching on the transmitter, but with servos connected as above, the receiver should be switched on and Pot RV1 in the receiver adjusted so that both servos are at centre, fail safe, condition. With the transmitter switched on and control stick and trim stick at centre, Pots RV1 and RV2 *in transmitter,* are adjusted to centre rudder and elevator servos respectively. It is possible that, if the alignment of the Rx as given under the heading "Output Tuning" has been carried out accurately, then little or no further tuning of the Pots will be required.



Progressive servo (9 wires)

This is identical mechanically with the proportional servo, but differs electronically. For normal purposes we need consider only the following five wires, which must be connected as follows:

The construction of Packs 'M' and 'N' shown (left) complete less wiring and (opposite) wired up and fitted in case.

Red to positive 7.2v. White to centre tap 3.6v. Orange wire to lo engine output on Rx. Black to negative. Green wire to hi engine output on Rx. The remaining 4 wires can be ignored until wiring up the 3+1, 4-servo system.

With the progressive servo connected as above, switch on transmitter and receiver and key hi and lo engine buttons to test. The servo should move in either direction and be halted at any position. Key hi engine, switch off transmitter, and servo should automatically run to lo position—fail safe. No adjustments are necessary or required.

Note

Upon keying lo engine button with control sticks at neutral, the rudder and elevator servos will produce a slight "sniff," whilst the centring circuit in the decoder is operating, similarly, the elevator servo will "sniff" on keying hi engine (control of rudder is maintained at this time). These "sniffs" can be virtually adjusted out by careful tuning on the receiver pots RV1 (lo engine) and RV2 (hi engine). In any case, when connected to the control surface in the model, this "sniff" is imperceptible.

An advantage of the adjustable centring available under conditions of fail safe, is that the elevator and rudder servos may be adjusted to give a small amount of rudder trim with elevator up trim, thus eliminating the risk of a fly away.

Hooking-up and the 3+1 system

An optional extra is a hook-up printed circuit and case, which serve two purposes.

1. As a junction board for the standard three servo system, whereby all connections are brought to a common printed circuit board. Mounted on this board are the on-off switch and a charging point for the Deac, in this way a trouble free, tidy, installation can be produced.

2. For those wishing to extend the system to 3+1 (i.e. where the position of the engine servo selects either rudder or aileron control), the printed circuit carries a centring amplifier, which takes control of the switched out servo, centres it, and holds it electrically on centre, while the switched-in servo is being commanded by the transmitter.

It may at first be thought that control of the engine servo will alter engine speed whilst changing from rudder to aileron control. This is not the case, since the majority of engines do not change speed for the small amounts of throttle movement created by the servo changing from rudder to aileron function. It is, of course, possible to make the engine control push rod from, say, 22 swg. piano wire and make a horseshoe bend about $\frac{3}{8}$in. dia. in its length, so that the throttle plug does not move at all, whilst the engine servo is switching from rudder to aileron servo, since this switching occurs with the servo pulling or pushing against the throttle stops.

It is not essential to purchase the hook-up board for either the standard or 3+1 systems, but if the board is not used then care must be taken in wiring up.

Construction

The junction board and 3+1 option is in two packs. Pack "M" containing the hardware, printed circuit board multi pole on-off switch, case, etc., and Pack "N" contains the electronic components and Deans plug required only for the 3+1 system.

The standard system can be converted to the 3+1 at any time simply by adding the electronic components to the printed circuit and wiring in the socket for the 4th servo. However, if one is making up for the 3+1 system only, then it is more convenient to add the electronic components before attaching the receiver and servos to the printed circuit. We will deal with the standard system first, and convert to 3+1 as a second stage.

1. Fit on-off switch in position shown on diagram, fit grommets into holes G1, 2, 3, 4, 5, and 6.

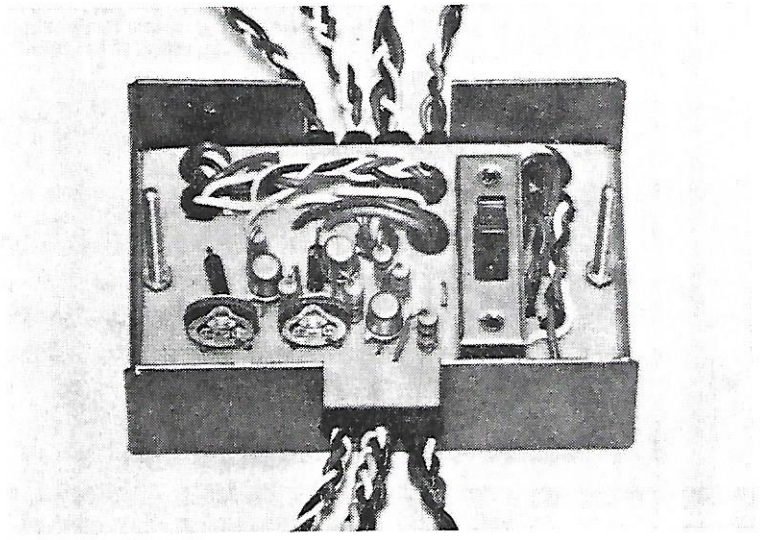
2. Plait 6in. of red, black and white wire, and twist a further 6in. of red and black wire together. Pass these 5 wires through G2 from the copper side of the board, the 3 go to the points marked "Deac," red to positive, black to negative, white to centre tap, the other two go to "charge" pos. and neg. red and black respectively. A further grommet is placed over the 5 wires to protect them where they pass through the case.

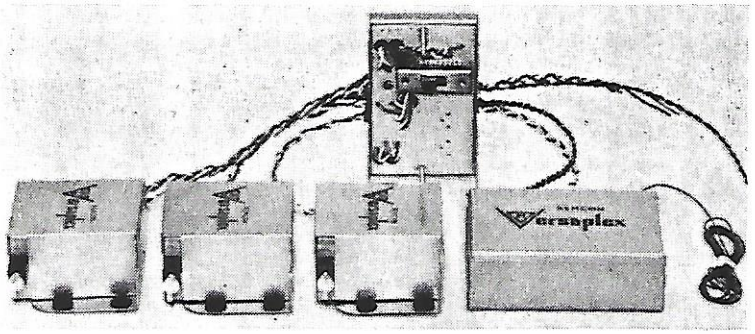
3. Plait the 6 wires from the receiver in two trios (excluding aerial), *and do not forget to fit a second grommet.* Pass through G1 from the copper side of board and wire as follows: Yellow to Ma. Green to Hi. Orange to Lo. Blue to Ra. Black to Neg. Red to Pos.

4. Engine Servo—9 wires. Plait or twist together as a 4 and 5 wire unit, slip a grommet over each unit, through G5 bring white. orange, red, green and black, and the remainder through G6. Wire as follows: Blue to m4, white to m3, yellow to m6, grey to m5, brown to m8, red to m1, black to m2, green to m7, and orange to m9.

5. Elevator Servo. Plait or twist 4 wires together, fit grommet, and bring through hole G3. Connect as follows: Red to e1, Yellow to e4, Black to e2, white to e3.

6. Rudder Servo. Connect as for Elevator servo but into the following holes: Red to r1, Yellow





The photographs on this page show—Left—Pack 'M' assembled and connected to servos and Rx. Below: Pack 'M' and 3+1 option completed with servos and Rx.

to r4, Black to r2, white to 3r.

This completes the wiring for the standard proportional system and the unit should be switched on and tested before inserting into the case. On fitting into the case, the grommets should be inserted into the slots and the whole unit pushed home so that the grommets are trapped under the copper side of the printed circuit. The two 8 BA screws are inserted into the case through the larger holes and the printed circuit retained by one nut at each end, the remaining length of 8 BA thread serves as two studs on which to fix the unit on to the side of the fuselage or box in the case of a boat, a slot having previously been cut through which the switch dolly passes.

Adding the 3+1 system

1. The printed circuit is cut at C-C.

2. Jumpers are inserted to connect ZZ, YY and XX.

3. The components may be added in any order and are as follows:

Resistors

VR1. and 2. 500 ohm. pots.
R3.—100K. Brown, Black, Yellow, Gold.
R4.—2.2K. Red, Red, Red, Gold.
R5.—10K. Brown, Black, Orange, Gold.
R6.—470 ohm. Yellow, Mauve, Brown, Gold.
R7.—10K.
R8.—470 ohm.

Semi-conductors

VT.1.—Orange spot.
VT.2.—Black spot.
VT.3.—White spot.
D.1. and 2.—OA.200 Grey Band denotes pos. end.

Note. Colour coded transistors may only be used in the device for which they are supplied.

4. The aileron servo may of course be wired direct to the printed circuit, but it is naturally more convenient to connect via a plug and socket, as supplied. Wire as follows: Red to a1, Black to a2, White to a3, Yellow to a4. These wires being brought through Grommet G7. and a further grommet fitted to protect from case. The Deans socket is fitted to the termination of these wires and a plug fitted to the servo, ensuring colour to colour connection.

Testing and aligning for 3+1

1. Remove Yellow wire from position r4, and White from position r3.

2. Switch on transmitter and receiver and blip engine control so that servo is approximately in centre of travel. With negative probe of meter to negative of battery and positive to a4, check that a voltage of approx. 2.1v. exists, and moves with control stick, rudder direction. Now take probe to r4 and adjust pot RV1 on amplifier board to give the same voltage as measured on a4.

3. Repeat the above process, having moved engine servo to one extreme of travel. Measure voltage on r4, and then adjust RV2 to bring this voltage equal on a4. Do not disturb transmitter or receiver pots during these operations.

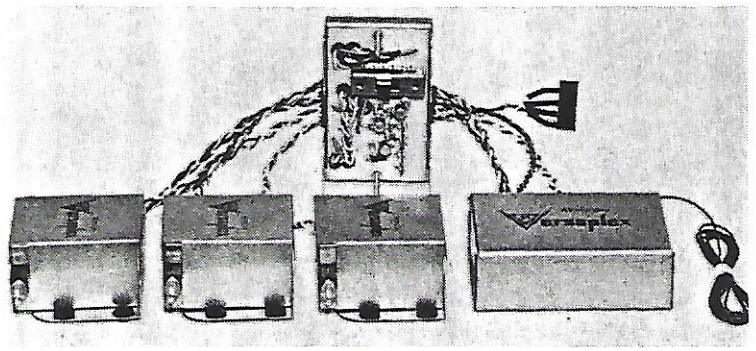
4. Switch off and reconnect rudder servo wires and plug aileron servo into its socket.

5. Test as follows. With engine servo at either extreme of travel, check that the rudder servo moves with control stick movement, and that the aileron servo is held on centre, if not, adjust RV2 on centring amplifier, to bring aileron servo to centre. Move engine servo to approx. central position, and check that aileron servo moves with control stick movement, and that rudder servo is on centre, if not adjust by RV1.

The printed circuit may now be fitted into its case as previously described, and is ready for use. We would, again, draw attention to the fact that, for reasons of copyright, certain references in the text cannot be allied to a printed circuit drawing. This is to protect the copyright which Remcon hold and which would be lost if we published these details ourselves. However, the question of copyright is maintained by Remcon publishing the printed circuit layouts themselves and, for those interested, Remcon will supply these direct, upon receipt of the coupon contained in their advertisement. Naturally, full details, and also lists of components etc., which are not included here for the above reason or considerations of space, are contained with each kit.

Next month . .

We had expected to complete our report this month, but through lack of space Mr. Freebrey's comments, also notes on various uses, installations, servo mounting etc., have had to be held over until the January issue.



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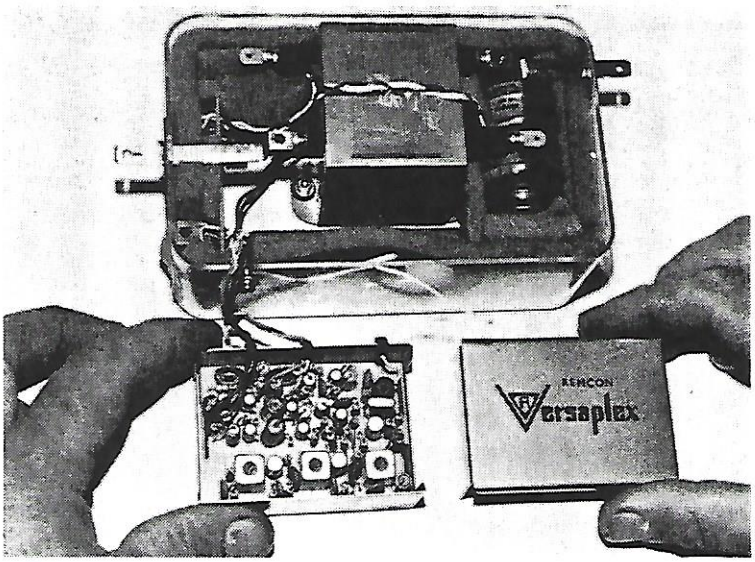


building the REMCON Versaplex

concluding the series by Peter Freebrey

Constructor's comments

The building of the transmitter and receiver is really quite straightforward, and should'nt give anyone who can handle a soldering iron any trouble at all. But, and it is a big *but*, please do be careful with the setting up of the servo voltages. This is not a difficult job, but it does require care. Take your time, make sure your meter is set to the right range, do make sure you have the same centring voltages, both in fail-safe, and with the transmitter on and the stick in its central position. If this is not so, you will find that the movement of the proportional servos can be quite excessive when the engine control buttons are operated. When properly set up, the "sniff" of the rudder and elevator servos should be only $\frac{1}{8}$ or $\frac{2}{16}$in. off load, so when installed in a model this should be hardly noticeable in flight.

The setting up of the servo voltages cannot be stressed too much, for, in their accuracy, lies the success of the whole equipment. It may be pointed out here, that the nominal centring voltage of 2.1 volts is true only if the Deac is 7.2 volts. So, if the Deac has just been fully charged, this voltage should be $\frac{2{\cdot}1}{7{\cdot}2}$ × Deac voltage. Final setting up should involve setting the actual servos to their central positions, so that if slight adjustment is required this is probably the reason.

Our engine servo had a tendency to stick in the hi position, if run from lo to hi unloaded. I understand from Messrs. Remcon that engine servos now have an extra spacer fitted, to inhibit this possible fault. Also, one proportional servo seemed to have a fit of the " jerks," moving in a succession of jerks instead of smoothly. This was found to be due to dust or fluff (or some such mysterious inanimate matter) on the wiper contacts, a silly fault and obviously very easily cured! The moral being: keep your equipment clean!

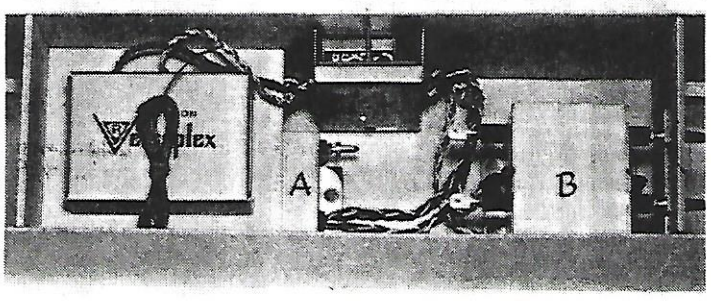
The hook-up board (Pack M), although not a necessity, certainly makes for a neat and reliable final assembly. Wiring this board up, either as standard or 3+1, should present no problems, although getting the wires, grommets and the case lined up at the last stage is a little frustrating and patience is called for! The only criticism of the hook-up board kit being that ours did not seem to have quite enough red and black wire.

The finished kit works well, the range being all that is claimed. In the event of a model flying out of range, it might be best to switch off the transmitter as, when on the borderline of "fail-safe" some peculiar things can happen. This, of course, applies to all systems of this type and not only the Versaplex.

As near as could be measured, the servos take less than $\frac{1}{2}$ second to move through their full travel. The 3+1 system works quite smoothly but, again, care must be taken to ensure that the correct centring voltages are applied to the servos.

Installing the servos, I would certainly recommend that they be (i) taped up with adhesive tape and then (ii) mounted on neoprene or sorbo rubber, this giving one a fairly crash resistant mounting.

The general impressions of the complete equipment are most favourable, the total cost of approximately £70, certainly making it the cheapest kit of its kind, offering one progressive and two proportional channels, plus the option of the 3+1 system.



Heading photograph shows the use of a plastic box for a boat installation. Left is a typical aircraft installation with the motor servo (A) in a recess under the rx, the elevator and rudder servos being taped together (B). The junction box and 3+1 components are in the case attached to the fuselage side. For clarity all the foam packing has been removed.

Time and weather conspiring full test flying has not been completed, but I will report more fully on this shortly.

Manufacturer's comment

We have read Peter Freebrey's comments and agree with them entirely, particularly his paragraph relating to setting up the servos under hi and lo engine conditions. We also note the comment regarding the quantity of wire supplied with Pack " M," this is an oversight on our part and will be rectified in all future packs.

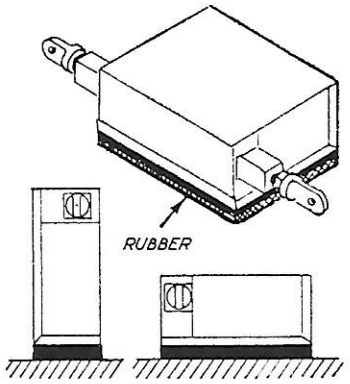
We would like to take this opportunity of stating that we feel that this review of building our Versaplex has been carried out fairly and accurately, the photography being particularly outstanding, and we look forward to reading about the equipment's performance after it has been used for some time.

Servo installation (aircraft)

The servos are provided with six positions for mounting grommets. For vertical mounting it is recommended that two servos are bolted together back to back, and for single mounting the four grommet mounting should be used, the servos may be fitted to the fuselage side, or laid flat on a servo board, so that they may be readily transferred.

With a total installation of weight of only some 12oz., the servos are obviously light in weight, the cases having been designed with rubber bond mounting in mind, although the grommets are supplied for those who insist on the nut and bolt method described above.

It is recommended that the servo cases are taped with one turn of Sellotape ½in. wide, and are bonded to $\frac{3}{16}$in. thick double skin neoprene with Evo-stik or similar. (Suitable neoprene ¾in. wide is available from Remcon at 2s. 6d. ft.). The servos may then be bonded to either the fuselage sides or mounting board but, in the case of the former, the wood should have been given two or three coats of dope, so that removal of the servo with thinners may be done without difficulty.

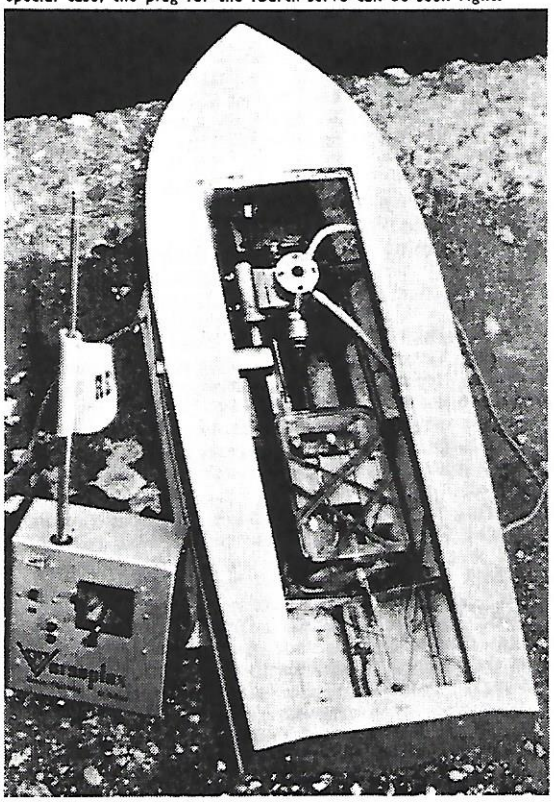


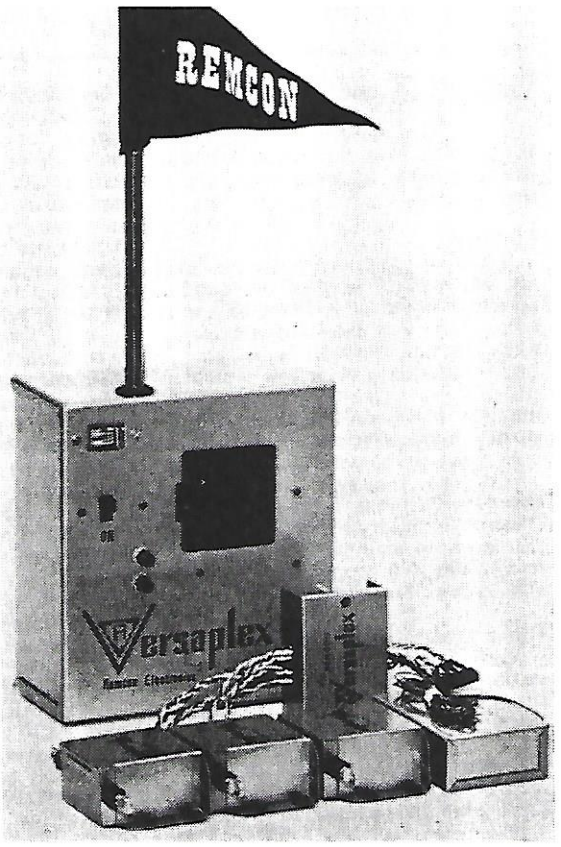
The method of servo mounting described in the text. This system is highly recommended.

This method of mounting gives the servo a real anti-vibration mount, as well as providing low stress on impact. To remove the servo, one simply takes a brush dipped in ether or similar solvent and applies it to the junction of the neoprene pad and bonding and, by gently pulling, the servo

continued on page 22

Below: the equipment shown in the heading photo installed in a boat belonging to Bill Young of the Cygnets club. Right: the complete outfit with hook-up circuit and 3 + 1 option in special case, the plug for the fourth servo can be seen right.





organised on a "league" basis. We hope that there are other clubs, whose members share with us the view that there may be added interest in ascertaining the "Championship" club, as opposed to the "individual" competition winner.

Our suggestion is that a "National League" be formed, divided geographically into four areas. Teams would meet each other on a "fixture" system, similar to that of the Football League; each team to have an organiser, who would be responsible for arrangement of "fixtures" on an elimination basis—producing eventually, an "Area Finalist Team". From the four finalists, the League Champion would then emerge.

Initially, we of the Bristol Club, are prepared to organise a "Wessex League" and we would like to hear from other clubs in the area who would be interested in discussing the plan further, and possibly agreeing a schedule, fixtures and judging, etc. We would also suggest that, ideally, each club should be prepared to field a team of a minimum of three flyers, using "propo" gear.

Yours faithfully,
N. G. Williams,
Hon. Sec., Bristol R/C M.A.C.

2 Banwell Close,
Bedminster Down,
Bristol, 3.

The commonsense approach

Sirs.—We frequently read and hear of flying sites being banned or restricted, in fact this would appear to be a very real problem for the model flyer of today. With more fliers graduating to the larger engined multi-aircraft, our present flying fields are attracting more activity and subsequently producing a lot more noise. Without doubt it is the noise which first produces complaints, add an accident, whether it be due to carelessness or just radio failure, and you can usually say goodbye to another good flying site.

It would seem senseless to ignore completely complaints by persons who live within earshot of engine noise. I realise some complaints are without justification, but, on the other hand, one does have some obligation to others. Perhaps it is time that we, the model flyers, should take steps towards more efficient silencing of engines and I would be interested to hear the views of others on this subject.

As sites attract more flyers and also more spectators, I am surprised at the lack of organisation and discipline when flying is taking place. One often sees carelessness in the launching of models, which sometimes results in a near accident. I have also witnessed the sort of attitude from flyers, when confronted by a complaining resident, which is almost certain to cause an immediate anti-model feeling—next time use a little discretion please!

Perhaps the future for flying sites rests with the model clubs, and may have to rely on the renting of suitable fields. If people are prepared to invest considerable sums of money in their models and equipment, then surely the cost of renting a field could be spread over the club's members.

I think this matter is one for deep thought by us all, so perhaps others would care to air their views and suggestions for finding and keeping our flying sites.

Yours faithfully,
M. J. Brown.

Chigwell,
Essex.

The Editors welcome letters on any subject related to R/C, but do not hold themselves responsible for views expressed by correspondents. The names and addresses of writers, not necessarily for publication, must in all cases accompany letters.

P.T.F.E. vapour lethal

Sirs.—Regarding P.T.F.E. tubing for control wires mentioned in Trade News, may I please point out to you that, as all users of P.T.F.E. cable know, a lethal vapour is given off when P.T.F.E. is heated as in the case of soldering. I think this should be pointed out to all users, as inhalation of only a small amount of vapour can be dangerous.

Thank you for an excellent magazine.

Yours faithfully,
G. F. Hewes.
Lee Bees M.A.C.

Our technical expert confirms Mr. Hewes' statement, but points out that the tubing must be raised to some 400 deg. C. before a vapour is given off. Few soldering irons will reach this temperature but be careful just the same.
—Eds.

VERSAPLEX continued from page 11

is removed in a few seconds and the pad may be used over and over again.

Linkages

Whilst the Versaplex system is not particularly affected by metal to metal noise, it is sense to use nylon links for push rod connections to the servos. It is also important that a high mechanical standard is maintained when making push rods and control surface horns, since any sloppiness will make the system feel woolly, whilst any tightness will cause excessive currents to be drawn by the servos, in trying to home on the position commanded by the transmitter. No proportional servo should ever be completely stalled.

Other applications—*Slope soaring*

Versaplex lends itself to giving virtually full house to slope soarers without the use of the three plus one system. In this case, the proportional channels are used for elevator and aileron control, but for rudder, the engine servo amplifier is used to drive a spring return actuator. The Graupner Bellamatic is a typical example, or the Mighty Midget motor, with a centring band fitted to its larger gear, would serve just as well. Either will give a selective direction, fast response, self neutralising, control on rudder, which is found particularly useful for model positioning near the ground.

Power boats

Reference to the photographs of the installation shows how Versaplex can be fitted into a transparent lunch box, approx. 6 x 4in., obtainable from most multiple stores, again, a tidy installation. Here it is recommended that the two proportional channels only are used, the centring spring being disconnected from the Pot RV.2., in the transmitter, and a rubber washer, approx. $\frac{3}{16}$in. thick, made from a pencil eraser, inserted between the "U" shaped gimble bracket and the bracket carrying RV.2. The thickness of the washer is adjusted to give the right "feel" on the control stick fore and aft for throttle control, leaving the normal self centring function of the stick for rudder control. If the two proportional channels only are used in a particularly high speed boat, then it may be desirable to adjust RV.1. in the receiver, so that fail-safe was to lo engine, together with a fairly tight turn on the rudder.

Yachts

For model yachts, it is desirable to have proportional control of rudder and an instantly reversible progressive control for the sheeting winch. Here we recommend the use of one proportional servo, and the amplifier from the progressive servo is used to operate two changeover pole relays, capable of carrying the high currents demanded by the sheeting winch motor.

A suitable relay is available from Remcon at 24s., two being required. In this case the control stick may be mechanically locked in a fore and aft direction, again leaving it free and sprung to centre for steering. Further detailed information is available to purchasers of Versaplex. The progressive servo amplifier, ready wired and tested for use as described, is available from Remcon at 4 gns.