

UHF RADIO CONTROL

It augurs well for the future of our hobby and indeed British industry as a whole that Messrs R.F. Technology were not put off by the voices of sceptics or the pronouncements of authors when they first decided to attempt to produce a commercial UHF system.

If they were less determined, the R/C model world as a whole would have lost the opportunity it so badly needs for more freedom of the airwaves.

Three years of hard and expensive development by this company have made UHF R/C a practical reality.

The UHF waveband has been available for our use ever since the G.P.O. allocated frequencies for model control purposes. Originally in the 465 MHz region; now in the 485.5-499 MHz band. The minor change in frequency allocation making no practical difference to the problems that had to be overcome. Oft repeated stories of low power, very directional signal transmission, reflection of signals etc. were all true of the first systems to be produced. There are several very real technical reasons for these limitations. Little by little the problems have been overcome but to further silence the sceptics some explanations of the whys and hows seems necessary.

Low Output Power

Firstly the G.P.O. regulations limit the UHF emission to 0.5W which is less than half the maximum allowable for 27 MHz. The UHF aerial is however far more efficient than that used for 27 MHz systems so transmission of the

Below left: Reftec's seven-function system. Position of the auxiliary control levers is unusual — they are sited to the outside of the stick bezels and can be identified by their silver finish.

Below right: the newer five-function system features Reftec's own designed stick units plus retract switch.

0.5 watt into the aerial is of a higher percentage. Having said this, it should be pointed out that half watt at 458.5 MHz was far more difficult to produce without excessively high power consumption by the Tx with the components and technology available in the early days of R/C. Output power of the transmitter should anyway never be confused with the range of the Tx/Rx combination for this is more a function of both Rx sensitivity and Tx output power.

Low output power was then a fact of life with early UHF systems which coupled with poor Rx sensitivity meant that recourse to a *Directional Aerial System* was necessary. The systems often employed a dipole aerial and reflector which beamed the signal in whatever direction the array was pointed. An obvious limitation! It was also often felt that even the interruption of the direct line of sight contact from Tx to Rx by a human body was undesirable and any building or trees would reflect the signal to such an extent that control would be lost. This was indeed so.

To sum up — lack of suitable components resulted in low power output transmitters of necessity fitted with directional aeriels transmitting signals that were easily reflected and therefore not responded to by insensitive receivers! Not a happy state of affairs and one which prompted most manufacturers to take the easy way out and pursue the development of systems to operate on the 27 MHz waveband.

Until the 27 MHz R/C airwaves looked like becoming choc-a-bloc the situation described remained static, that is until a long time modeller and industrial consultant in the electronics field, Geoff Smith, knowing of the rapid advances made in the radio frequency technology field over the last few years decided to change the status quo. The original system was designed by Geoff who then teamed up with John Speake, an RF design engineer to produce the final version.

RF Technology was founded and in order to finance the development of the UHF system

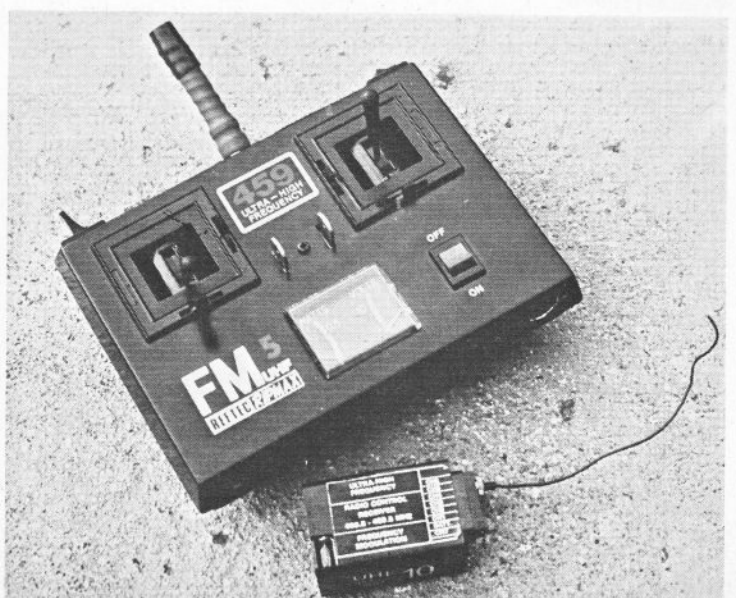
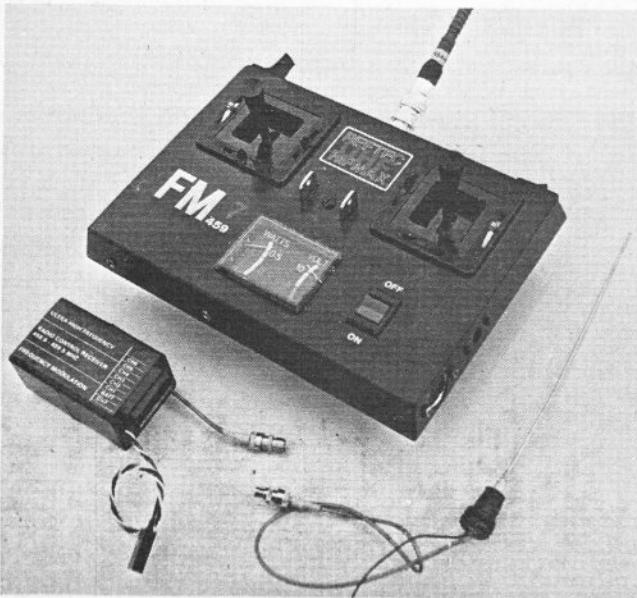
plunged into the competitive field of Support Systems such as chargers, cyclers meters etc. Two years of concentrated development starting with an Amplitude Modulated system and culminating in the production Frequency Modulated System (see R.C.M. & E. September '78 for comparison of the two types of modulation).

Geoff Smith would be one of the first to admit that the development of the UHF concept was not without snags — the fact that we can now purchase reliable UHF equipment testifies to the fact that his company was undeterred by the difficulties and were determined to seek and develop ways round the snags encountered.

Using the Reftec UHF/FM System

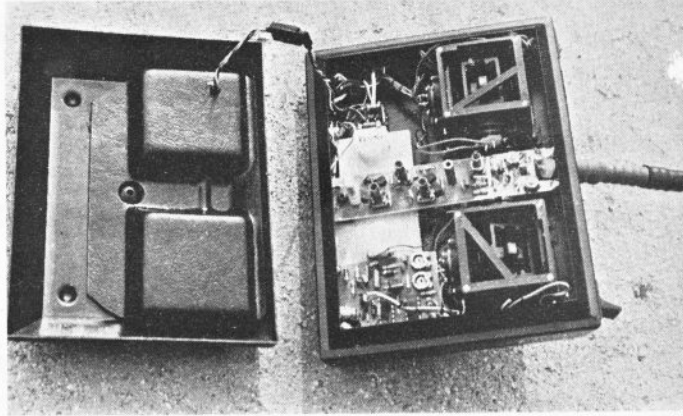
Geoff Smith of Reftec assured us that using UHF R/C equipment would be no different from using any other system that we had previously operated. Experience certainly supports this statement. Associate Editor, Jack Barnard and myself presented ourselves at the Reftec works on a recent breezy but bright day equipped with a well tried engine, model, servo combination ready for installations of the remainder of the UHF equipment. The first surprise was the size of the Rx. This is somewhat more bulky than the accepted norm for 27 MHz Rxs but even so was lost inside the shoulder wing sports model used for trials. The Rx aerial presented surprise number two as this is very much shorter than the norm, only four inches or so in length. Under the eyes of the design engineer John Speake, the Rx was duly connected up, suffice it to say that all the usual care that should be taken with 27 MHz equipment was taken — no more no less. The system was switched on and a check of control surface polarity was made, i.e. is up really up, etc.

Out on the field a stiff breeze was blowing curling over the trees lining both sides of the





Above left: the short aerial is a simple plug-in item — users should make certain that the plug and socket are not allowed to become dirty. **Above right:** transmitter back removed to reveal the split 500 mA/H battery pack in the case back, connected to the circuit board via a plug and socket. **Central board** is the RF section whilst **smaller board in lower left hand corner** (as seen in picture) is the encoder section.



battling along the straight final leg into wind. Landing over, and trims adjusted, a second flight was made but it was finally decided that turbulence was so strong that any relaxed appraisal of the system was impossible.

Returning to my own flying site after a rapid customising of the set had taken place, namely changing the stick knobs and 'mode' of the Tx plus fixing the neck-strap, I found myself far more at one with R/C and model. Reftec produce their own stick mechanisms which have a light and positive feel which coupled with the excellent resolution of the Futaba FD26 servos provide that 'tight' responsive feeling that characterises a good R/C system. At no time during my flight tests did I experience a glitch or any loss of control. My flying site has the usual complement of trees, parked cars, buildings (farm that is) and other modellers and other modellers' models. No untoward events of any kind were experienced, just ordinary uneventful flying. Still however that non-existent aerial gave me trouble! Too many hours of flying with the Tx balanced in my hands with the weight of the aerial to be forgotten easily I suppose. Reftec tell us that a minor modification to the neck strap mounting

is under way that will minimise this out of balance feeling. That minor fact aside there was literally no difference from flying with any other good quality R/C system. Apart from the obvious one that no way was anyone else on that site going to be able to shoot my model down that afternoon. Not for long alas as this equipment will ultimately reach all Model Clubs.

Conclusion

To summarise — the oft repeated stories about UHF/R/C were true. I stress *were* true. This new generation of equipment bypasses the shortcomings using a combination of modern solid-state electronic technology and thorough detailed design. The one area where RF Technology have still to make the breakthrough is in the area of operating time. The generation of a UHF signal consumes more current from the Tx batteries than would be expected from the average 27 MHz system. This means that operating time between re-charging is shorter, typically two hours. Rest assured RF Technology are working on it — they are that sort of company.

flying area creating obvious turbulence. But after a ground range check (this was a brand new off the shelf 'system') whilst the model was fuelled-up all was deemed satisfactory. The motor was started and after further checks the model was released for flight.

Slight nervousness over a strange and difficult site (we were later told that the local club had at first refused its use because of the tree induced turbulence) and the feeling of unfamiliarity caused by the apparent weightlessness of the Tx caused me to cut the first flight somewhat shorter than normal and several landing approaches were attempted from way out, turning fast into the final approach to combat the turbulence then