Keeping a weather

DO Englishmen really mean what they say when you hear 'It looks as if it is going to turn out fine again' or 'The weather should be better tomorrow'? We are frequently accused as a nation of talking about the weather for want of something better to say, and I would argue that we have very good reasons, apart from breaking the ice or diverting attention from awkward subjects. In fact, the British Isles are so placed geographically that you cannot forecast confidently what the weather is going to be like in twenty-four hours time and therefore tomorrow's weather is a very important topic of conversation, especially if you are planning a nice sunny afternoon watching the Australians at Trent Bridge.

Put yourself in the farmer's shoes and think for a moment how his livelihood depends upon how good the weather has been through the year. There is nothing you can do about improving the weather, but a lot is being done to improve the art of forecasting, and in fact a lot has been done already.

Working in this field the Radar Development Group have developed a new high power storm warning equipment based on the Radiolocator Mk. IV standard marine equipment. This is not a

Cumulo-nimbus cloud turning into rain. Although the cloud has not formed an anvil it is probable that the rate of precipitation has been very much increased by the presence of ice crystals. Rain has already started to fall and can be seen on the horizon in the centre of the picture. If precipitation occurs without the top of the cloud turning to ice the amount of water in it will be great so that a strong radar echo would be obtained. Aircraft would experience severe icing

eye open

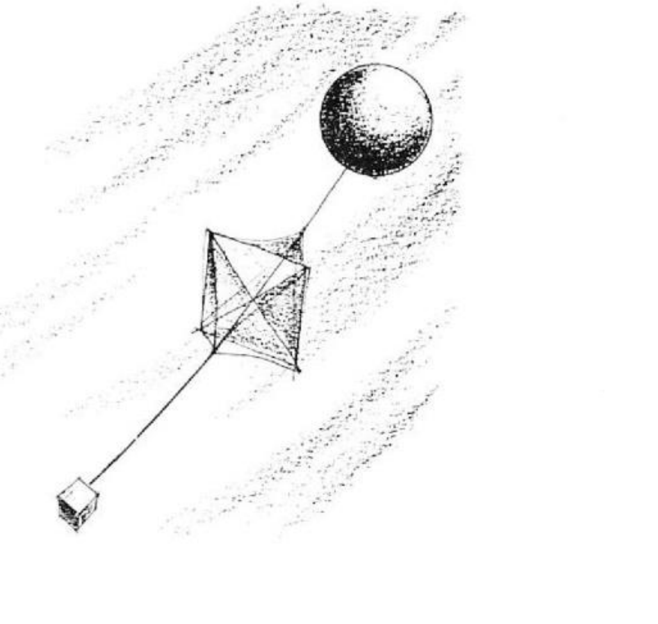
by **E. IRONSIDE**, *Radar Division*

A storm at its height. When raindrops disintegrate within a cloud, a charge is released. In time a difference of potential is built up large enough to cause a discharge between the cloud and earth or another cloud. [*A. C. E. Barnes*]

tracking radar but it will detect storm clouds at well over 100 miles distance and is primarily intended for large sparsely populated territories which have not the advantage of an even network of observation stations.

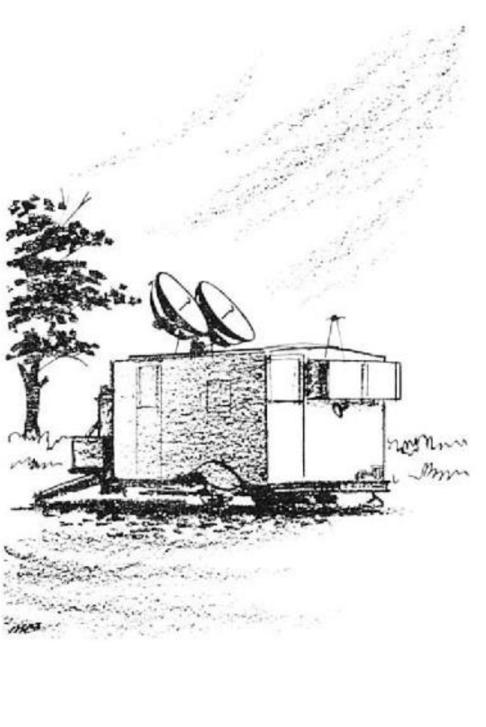
The need for better forecasting was shown during the war when the success or failure of a military operation might depend very much upon the weather, for instance, the North African landings and later the Normandy landings, both of which were critically affected by the weather and might well have been disastrous. The need for good meteorological information was also required by R.A.F. bomber crews, and now in peace time the commercial airlines of the world are perhaps the largest users of up-to-the-moment weather information which is essential to them for their efforts to provide the greatest degree of air comfort for their passengers.

Soon after the war, weather ships were stationed at various points along the Atlantic trade routes, and equipped with meteorological instruments and radar equipment they can provide accurate hourly reports on the weather, including upper air wind conditions. In fine weather it is possible to measure the upper winds by watching the movements of small hydrogen balloons. The amount of hydrogen in a balloon is adjusted so that it will rise at a known rate (say 500 ft. per minute) and its position is measured every minute by a theodolite. This method has been in use for many years. It is simple, but it suffers from the disadvantage that it only records the winds below the level at which the balloon disappears from sight in or beyond the clouds. By using a suitable tracking radar this difficulty has been overcome and it is now possible to track a balloon to 90,000 ft. using a reflector of metallised nylon mesh which is attached to the balloon itself.



Radar equipped stations are now working in the British Isles and many more overseas. Together with weather ships they form an efficient network providing accurate and up-to-date reports of upper air conditions in all weathers.

The upper air wind data is important to commercial airlines because it gives them information on the jet stream. This is a strong current of air which is found in certain latitudes, usually between 20,000 and 30,000 ft., and may reach a velocity of 200 knots. A strong following wind of this speed can help a pilot to clip hours off his planned flight times, sometimes even cutting them by half. As the jet stream is usually found in only a very thin layer, precise information is required and this can be provided simply and quickly by radar tracking devices.



Radar equipment is now also used in the study of rain-bearing clouds and storm formations. The ultra short waves used in certain types of radar are reflected by not only solid objects but also by rain drops. In fact, the echo return at a 3 cm. wavelength from heavy tropical rainfall is sufficient to obscure echoes from large aircraft flying through the same area. Raindrops vary in size from a tenth of a millimetre to several millimetres and the larger and more numerous the drops the stronger the radar echo. When the raindrops in a cloud are swept upwards by a current of rising air they increase in size. When they reach a $\frac{1}{4}$ in. in diameter they disintegrate and an electrical charge is liberated. In time this causes a difference in potential between the top and bottom of the cloud, which is large enough to cause a discharge. This is forked lightning and may take place between a cloud and earth or between two clouds. What we call sheet lightning is only a reflection of forked lightning which is perhaps hidden over the horizon or behind a layer of cloud. The atmosphere in a severe storm can thus become highly ionized and can also emit electromagnetic waves at random frequencies. These random emissions can be picked up on a directional receiver and used to supplement other weather reports. Equipment making use of this phenomenon is in regular use in the U.K. at present for detecting storms over the Atlantic.

In England we are lucky enough to have many meteorological stations dotted about the country, but there are many countries where it is impractical or too costly to set up reporting stations and radar equipment can thus be of the very greatest assistance in studying the weather over vast inaccessible areas, typical of which is the great South African continent. In many places there the conservation of water plays an important part in daily life. There are farmers who could save their precious supplies of water if radar could tell them that rainfall was expected within a few hours. Air routes in this part of the world pass over hundreds of miles of desert and jungle, where there are no meteorological reporting stations, thus making it difficult for pilots to avoid the severe storms which can occur.

The aerial of the SNW50 storm detection radar when on test at Rivenhall. This particular equipment has now been installed at the new Salisbury Airport in Rhodesia. With the aerial is Colin Downs who has been working with Eric Royle of Radar Division

The desk console of the storm detection radar type SNW50. On the left with his finger on the 12-in. PPI is Eric Royle, a systems engineer of Radar Division, talking over modifications with Edmund Ironside of Naval Sales Section, Radar Division

To increase the safety of air navigation the Meteorological Department of the Federation of Rhodesia and Nyasaland will be setting up, during the next few years, a chain of weather stations, the first of which is being established at the new Salisbury airfield. For this purpose they have bought the first two models of the storm warning equipment produced by this Company.

Now Radar Division is continuing its development work on the storm warning radar system—a further step in the task of providing a better weather forecasting service for everybody.