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F.M COMES TO MALAYSIA

BROADCASTING IN SABAH, the former British colony of North Borneo, was non-existent until late in the 1950's. Conceived by the Department of Information, which provided the programme material, the service was fostered by the Posts and Telegraphs Department which was responsible for operating the transmitters. An experienced chief engineer was recruited, and as local staff became more competent these also came under the control of the parent department.

The original two 250W medium-wave transmitters were situated in Jesselton to serve the town area with a single 5 kW short-wave transmitter to cover the rest of the country. As interest in broadcasting grew it became obvious that the service provided was becoming inadequate. It was planned to install medium-wave transmitters near all major towns to serve the main centres of population. The problem remained, however, of feeding these stations with programme material.

The Sabah countryside is rugged and densely jungled. Only recently were coastal towns linked by earth roads but little has yet been done to provide access to the interior. Difficulties with road transport and lack of power supplies ruled out the possibility of conventional land lines or point to point v.h.f links across the country so an alternative solution had to be found.

By way of compensation perhaps, nature has given Sabah the highest mountain in South East Asia, Mount Kinabalu, 13,445 ft of solid granite which towers above the whole country. From a point high on its slopes, quasi-optical paths over most of the country could be anticipated. It was considered that a high power v.h.f f.m transmitter, sited on the side of the mountain, would provide, not only the means of linking the distant transmitters with the studios but also a wide area of primary coverage over the interior and west coast regions.

The Marconi Company was commissioned to carry out a survey and extensive measurements of field strength were taken throughout Sabah and showed promising results. In view of this the Crown Agents were instructed to place an order for four 5 kW f.m Marconi transmitters. The station was planned for unattended operation on two channels with two transmitters operating in parallel on each frequency. It was also decided to use an eight-stack Marconi quadrant aerial with a gain of 10 dB to give an e.r.p of 100 kW on each channel.

It was realised that there would be many problems in establishing a station at such a remote site. Owing to acute shortage of experienced personnel in the Department the Crown Agents were asked to procure the services of an engineer, on contract, to assist the Chief Engineer with this project. Advertisements in the technical and national press failed to produce a suitable applicant. The author, an engineer on the Crown Agents' staff who had been responsible for the inspection of the actual transmitters at the Marconi works, was invited to join the Department on secondment, for the period of installation. Before leaving the U.K for Sabah some time was spent in familiarization at the Marconi works.

The transmitters and combining units were assembled and tested at Jesselton before being despatched to site to reduce the risk of trouble during the final installation. Access to site was by means of a rough track to the inland township of Ranau, some 70 miles from Jesselton. This road, open only to four wheel drive vehicles, winds along a high ridge up to 4,000-ft before reaching a junction with a 3 mile spur road constructed to give access to the power station

Fig. 1. Part of the 'jeep' track to Ranau along which all the equipment had to travel *en route* to the road-head.

site at an altitude of 5,800-ft. From here the mountain rises steeply and the remainder of the journey to the transmitter site at 8,200-ft must be made on foot.

Due to Indonesian confrontation the need for reliable radio communication over the country had become of strategic importance making the completion of the project of considerable urgency. The R.A.F. agreed to assist in lifting the more delicate and cumbersome equipment from the road-head to site. A helicopter arrived very quickly to survey the site and land at the road-head where work was proceeding on the power station building.

Considerable earth cutting was necessary to provide a site large enough to accommodate the transmitter building. As there was absolutely no other flat land in the area upon which a helicopter could touch down, it was decided to use the concrete base for the building as a helicopter landing pad and to store equipment under tarpaulin until the prefabricated building could be erected. As work on the site proceeded scores of local workers were employed as porters to undertake the gruelling task of transporting the many tons of building material from the road head up the steep jungle track to the site 2,400-ft higher up the mountain.

The R.A.F. carried out several training exercises on site using a Whirlwind Mk 10 helicopter which has a cargo-lifting capacity of 2,000 lb at sea level. Little was known of its performance at high altitudes, so it was decided that a safe maximum would be 1,000 lb inboard and that underslung loads should not exceed 500 lb. The eight transmitter cabinets, in their wooden cases, although within the weight limit, were too large to pass through the cargo hatch and were flown to site protected only by a cocoon of polythene. The delicate helical membrane r.f feeder cable, on an 8-ft drum, weighed 1,200 lb. Luckily it was supplied in two lengths and it was found possible to construct two new plywood drums in such a form that each weighed under 500 lb. It seemed therefore, that everything could be lifted except thirty drums of armoured three-core cable required to carry the electricity supply from the power station to the transmitters. Each weighed 2,200 lb and carried a 200 yard length which could not be cut. A serious effort was made to winch the drums up the mountain but this was abandoned after several weeks with only six drums at the halfway mark and the stiffest climb still ahead. The method finally adopted was to remove each cable from the drum and attach rope slings at six foot intervals along its length. Using a team of 103 porters, one at each sling and two at each end, the cable was snaked up the steep track to its final position.

On 31st July, 1964, the concrete base was complete, the prefabricated building piled neatly on site and the equipment, sorted and weighed, laid out at the road-head. At 5.45 a.m a helicopter, stripped of all non-essential equipment took off from Jesselton airport and 'Operation Eagle', as it became known, was under way. The mountain is usually clear of cloud until about 9 a.m, after which it is heavily shrouded for the rest of the day. Flying was therefore restricted to about three hours daily and with the operating cost

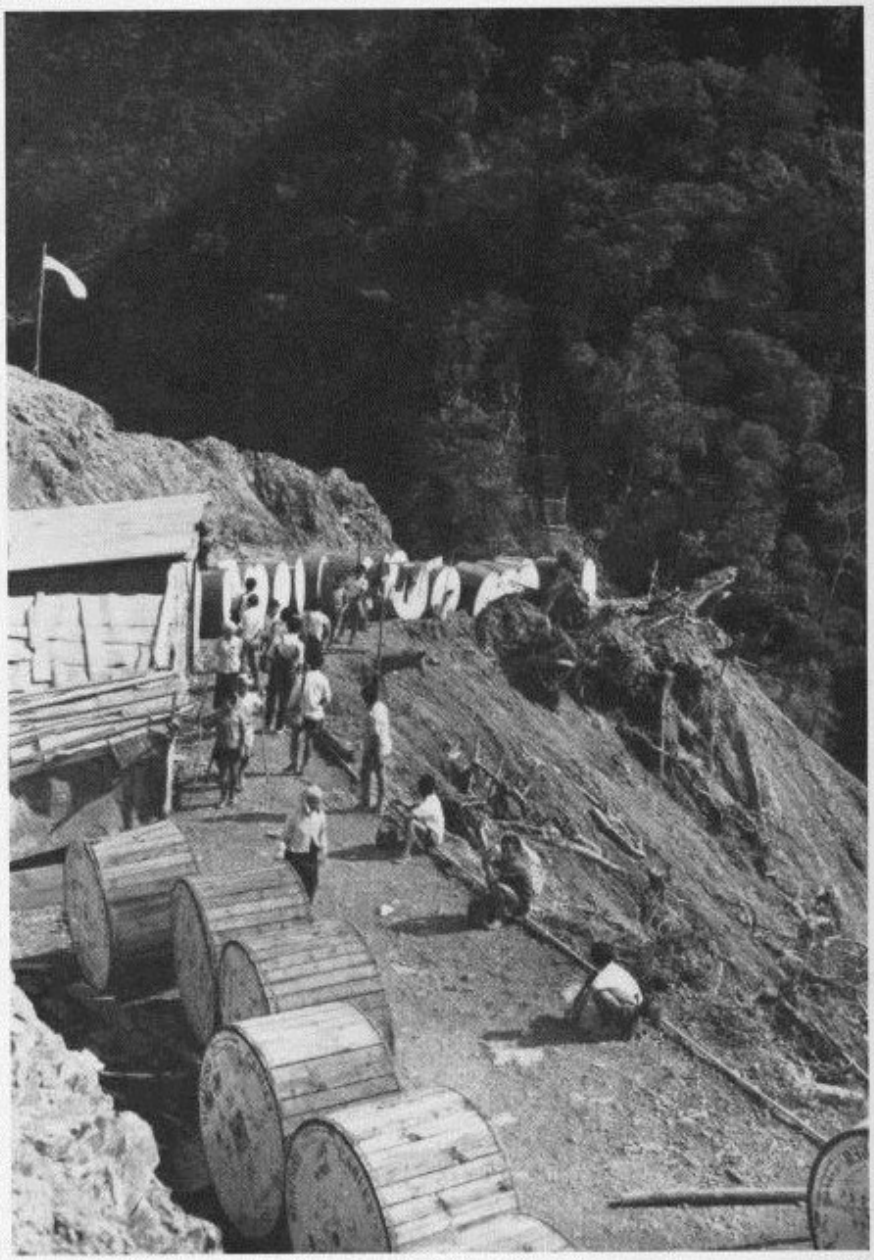

Fig. 2. Drums of armoured supply cable at the 5,800-ft road-head waiting transportation.

of a Whirlwind estimated at £300 an hour it was essential to reduce loading and unloading times to a minimum. To achieve this a trolley was constructed, the height of which coincided with that of the cargo-hold floor. This was pushed into position as the helicopter touched down, the cargo transferred and the trolley withdrawn so that the aircraft could get away for the next load, whilst the cargo was unloaded carefully, and in good time for the next trip. This worked so well that six trips an hour were achieved instead of the anticipated four.

All went well for five days and the stack of equipment on site steadily grew. On the sixth day however, the dawn spell of clear conditions did not materialize and the mountain lay under a thick blanket of cloud. This persisted for five nerve wracking days during which no flying was possible. Conditions then improved so that the lift could be completed—almost. All equipment was carefully reweighed before being loaded and it was found that there was a serious discrepancy between the scales in use and those employed for the first weighing at Jesselton. The six legs

Fig. 3. The transmitter building and aerial mast nearing completion.

comprising the lower sections of the aerial mast proved to be too heavy. An unsuccessful attempt was made to man-handle them up the mountain but it was found necessary to cut the legs into smaller sections. Additional flanges similar to those originally supplied were welded on in Jesselton so that the sections could be bolted together on site. The helicopter then returned and delivered the new lighter sections to site.

At this time some fifty technicians, craftsmen and labourers were living on site and all hands were turned to erecting the prefabricated transmitter building. The shell was completed in ten days and the equipment then moved into its final position. A thorough mechanical inspection revealed that apart from some superficial scratches and two damaged main h.t smoothing condensers, which had broken away from their support brackets, the transmitters had stood up well to the rigorous journey and period of exposure on the mountain.

Due to the difficulties of installing the armoured supply cable the provision of electricity was well behind schedule. In order to begin testing a portable 1 kVA petrol generator was acquired and all four f.m.q drive units were aligned and tested by this means.

The quadrant aerial was designed to be mounted on a 135-ft self supporting tower. The foundation drawings supplied assumed a flat level site affording adequate side support so the design was obviously not suitable for use on a narrow ridge, where winds could be expected to gust in excess of 100 miles per hour. New foundations were designed in conjunction with a local firm of consulting engineers and the foundation steelwork suitably modified. The installation team boasted only one trained rigger but with the help of fitters, technicians and local labour the tower was completed on schedule.

Fitting the two lengths of flexible feeder cable was a delicate operation being easily damaged if bent beyond the specified minimum radius. There was insufficient room on site to enable the cable to be laid in a straight line as recommended by the manufacturer so each piece had to be carefully manœuvred around the edge of the transmitter building as it was hauled into position on the tower. When voltage was available from the power station the aerial and feeder system were connected to the dehydrator and allowed to dry out while the four transmitters were tested into air cooled loads. Bridge readings indicated that all was well with the aerial and feeder and one by one the transmitters were brought on the air.

Test transmissions were carried out and field strength measurements at the proposed medium-wave sites confirmed the earlier survey results. At present the station is broadcasting on one channel only which is being relayed by medium-wave stations at Tenom and Tawau. Villagers in the interior have been supplied with portable transistor v.h.f sets so reliable radio reception is now available to them for the first time. Work is proceeding with the installation of further medium-wave stations.

Looking to the future, consideration is being given to the possibility of relaying a third and a fourth programme to cater more comprehensively for the diverse languages of the country by means of subcarriers on the two main v.h.f channels. F.M broadcasting in Malaysia has arrived.

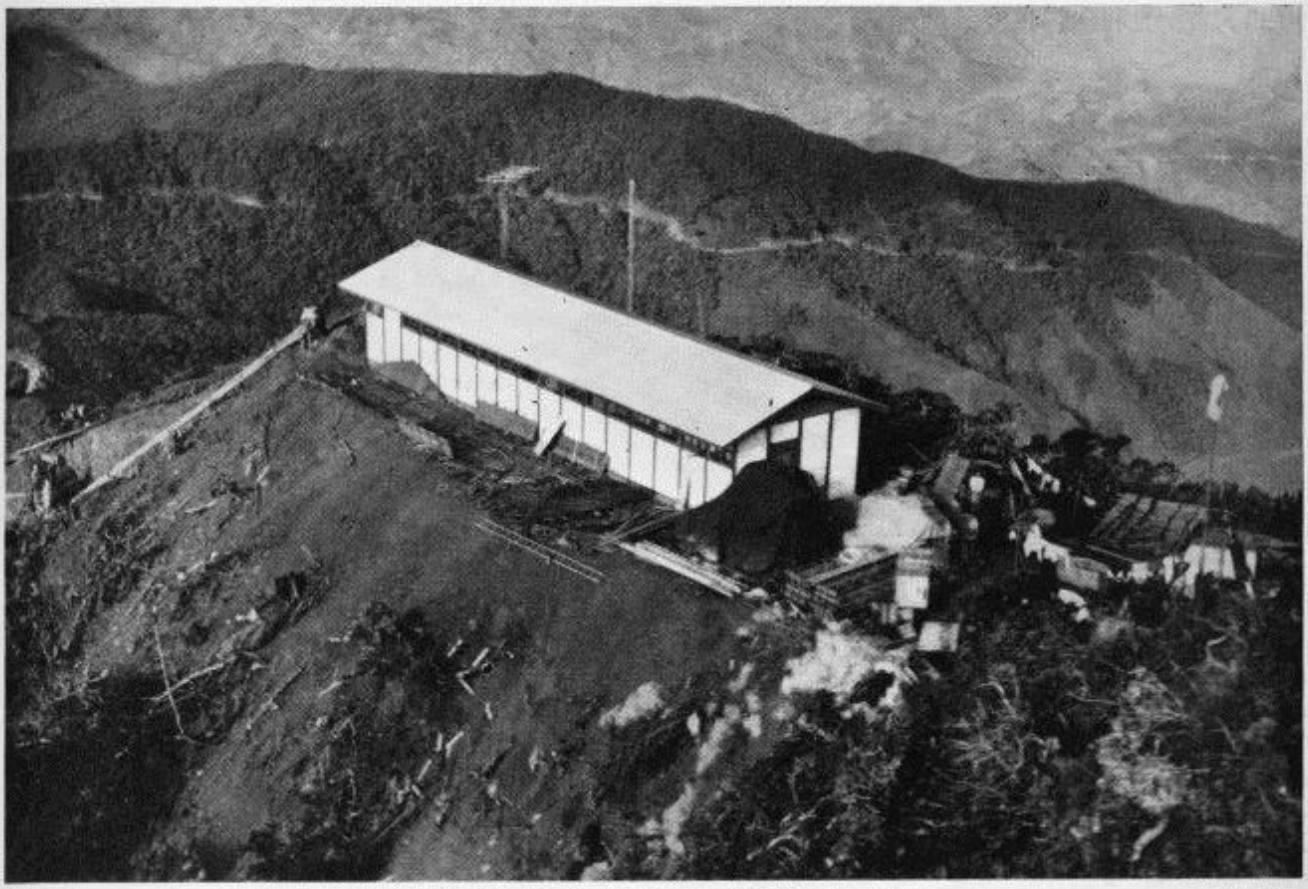

Fig. 4. The transmitter building soon after erection. The site of the aerial mast is on the left.

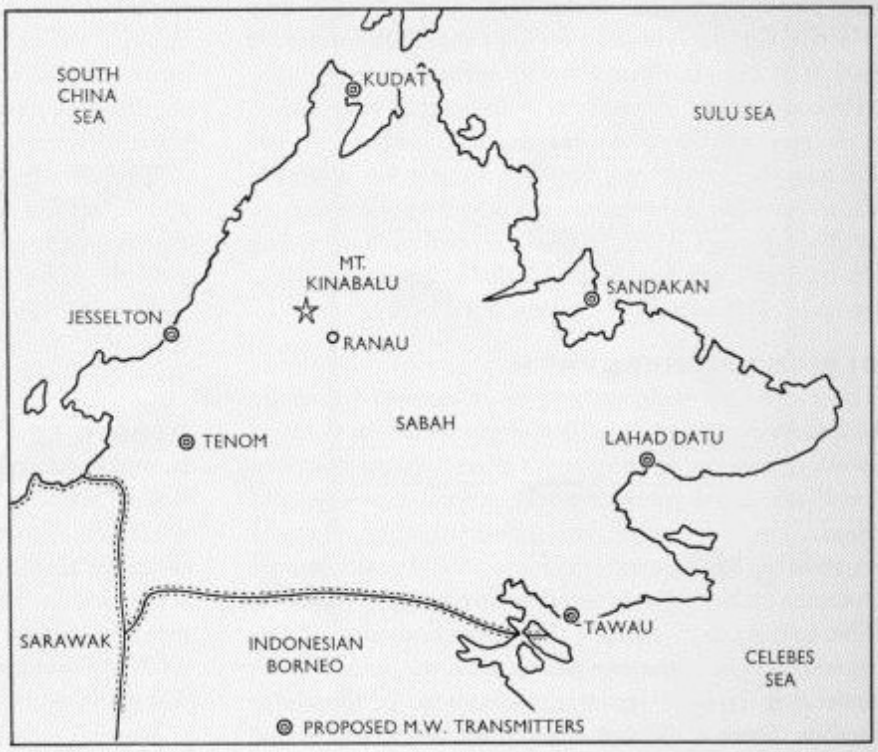

Fig. 5. The location of the f.m transmitter is shown, also the proposed new medium-wave stations.