

THE LAUNCHING OF ARIEL

The launching of Ariel affected the Radio Research Station in a number of ways.

Firstly, the new satellite observing stations at Singapore and Port Stanley, which had originally been expected to be used first on signals from the topside sounders, had to be established. Much preparatory work had been done at Datchet in the laboratory, workshops and in accounts section (ordering and dispatching) but the actual installation was the responsibility of the Singapore and Port Stanley staff, assisted in the case of Singapore by Ashwell. Extra observers, seconded from the R.A.F. by the Royal Society, also played their part at both stations.

Secondly, Winkfield had to be prepared to act as a communication centre (of which more later) in addition to its normal functions.

Thirdly, R.R.S. was to be the British centre for publicity connected with the launching. It was this responsibility, the scale of which was quite beyond our previous experience at R.R.S., which meant that the whole of the D.S.I.R. team - Singapore, Port Stanley, Winkfield, Datchet and, last but not least, the press and broadcasting/film sections from Headquarters - had to be very much on their toes, (awake or asleep!) while public interest lasted.

Communications were organised in the following way. Winkfield was put on to Telex - a public communication system using teleprinters. This established our contact with the Singapore site through Admiralty, London, who kindly relay outgoing and incoming messages; and with Port Stanley through Post Office London where our messages become overseas telegrams. On launch day the circuit between London and Port Stanley was kept open continuously for more than eleven hours instead of the normal three one-hourly periods. Winkfield and Datchet were connected to Goddard Space Flight Center by teleprinter in the usual manner. Post Office teleprinter operators helped at Winkfield for a week before and after launch.

An additional communication link through Winkfield was set up about half an hour before launch. This telephone circuit to Cape Canaveral was the second line of communication to H.M.S. Jaguar stationed in the South Atlantic to observe events on the satellite connected with its injection into orbit. It supplemented a more direct radio link between the Cape and the ship. The state of count-down and lift-off received from the Cape were passed by J. F. Smith (of the British side of the Ariel management team) from Winkfield by telephone to Admiralty who, after the minimum of delay, transmitted the information to the ship from Simonstown.

On the day, all went well. The ship observed the de-spin phase and Singapore next received signals from Ariel as expected on its first revolution, which took the satellite well to the south of the African and Indian continents. Port Stanley received Ariel as planned on the next and subsequent revolutions. Early next morning Winkfield came into play as a receiving station and sound and television activities there intensified accordingly. Later on that morning we had the pleasure of receiving the United States scientific attaché at Winkfield. At Datchet a 48-hour open-house for press and broadcasting people was maintained, and interviews were given and recordings made for various purposes. Altogether the activities of D.S.I.R. received wide publicity in this country, and overseas.

In sum, none of us concerned will soon forget the hectic succession of events nor the long periods without much sleep.

The immediate excitement is over and now the really important work starts - observations, maintenance of equipment, issuing of predictions, maintaining communications with Singapore and Port Stanley, and the provisioning of these stations with magnetic tapes etc. - until the end of Ariel's useful life in a year's time.

This concludes an essentially parochial account. For it must be remembered that our activities form only a small part of the organisation and facilities that are required to get the best out of Ariel, or indeed any other satellite.

H. G. Hopkins.

#### SOME ASPECTS OF THE WORK OF THE THEORETICAL GROUP

The last eighteen months have seen the start of a number of new items on the station's programme of work; one of these new departures has been the setting up of a theoretical group. It is sometimes thought that this term signifies a collection of individuals, usually characterised temperamentally by a marked aversion to matters of practical importance, and physically by a brain-pan of ovoid form, who are engaged on an inconsequential series of abstract mathematical calculations. However, I hope to indicate in this brief article that the R.R.S. theoretical group does not entirely qualify for this description.

One objective of the group is to provide an adequate background of theoretical knowledge and information on subjects relevant to the work of the station, and to make this available to the people responsible for guiding and carrying out the various parts of the research programme. Another aim is to tackle, as research projects, theoretical problems which are related to this programme and which may actually arise in the course of experimental investigations by other groups. As an example of this, experimental work on tropospheric propagation has raised some very interesting questions as to the scattering mechanism involved in vertical-incidence and oblique-incidence transmission; this has stimulated new theoretical work on the effects of different types of irregularities, which may assist the interpretation of measurements in terms of their structure.

The field in which theoretical studies are required is an extremely wide one; with the increasing importance of space research in the station's programme, the sphere of active interest must be regarded as extending out to several earth radii at least, with occasional extensions to much more distant regions, such as the surface of the moon and the outer layers of the sun.

However, it is the ionosphere, which remains a happy hunting ground for experimenter and theorist alike, that continues to claim most attention, and several different aspects of its behaviour are being studied. Two of these investigations are directly related to forthcoming R.R.S. rocket experiments. In the first of these, the electron distribution in the D region will be determined from field strength measurements in a rocket fired over a 200 kc/s transmitter. To interpret the results, a knowledge of the appropriate propagation characteristics is of course required, and at this low frequency the solution of the differential equations describing the propagation is extremely complicated. The Pegasus computer has been brought to bear on these calculations, and is being used (mainly during the long still watches of the night, in keeping with the best R.R.S. traditions of propagation research) in a wider study of many long wave ionospheric propagation effects.

A second rocket experiment is to investigate the behaviour of an aerial when placed in the ionosphere, and theoretical studies of this problem are being made. It is obviously important to understand the effects of the ionosphere on the performance of an aerial, so that it can be used to best advantage in rocket experiments; also there is the prospect of using measurements on aeriels to study the properties of the ionosphere itself.

Several other investigations of the ionosphere are at present in hand, which are aimed broadly at a better understanding of the basic processes which determine its structure, and the variations of this in space and time. In particular, the changes which are associated with magnetically disturbed conditions are at present very little understood, and this subject looks like providing scope for the theorist for a long time to come. Even the determination of electron distribution under relatively simple "quiet" conditions is sufficiently complicated mathematically to demand the use of computing aids, such as the analogue device which was described in an earlier Newsletter. When we come to disturbed conditions the situation is more complex, and even the basic mechanisms which produce an ionospheric storm are not well established. An attempt is being made to relate F<sub>2</sub>-layer effects to magnetic field variations, the connecting link being the electric currents which flow in the lower regions of the ionosphere. This line of attack shows promise; but investigation of ionospheric storm phenomena and other types of anomalous behaviour are based largely on statistical analyses of results from the world-wide distribution of ionospheric observatories. Data accumulated during the I.G.Y. are now providing the basic material for much of this work.

The study of magnetic storms and associated ionospheric effects goes far beyond the limits of the earth's atmosphere. We have to go back to the sun, and its emission of charged particle streams, for the origin of these phenomena. The effects of such streams on arrival near the earth are dominated by the earth's magnetic field, and a number of aspects of this complicated interaction, which starts perhaps a hundred thousand kilometres away, are being studied here. Among these are the trajectories of charged particle streams in the earth's field, and the propagation of hydromagnetic waves which are believed to be generated by the impact of the stream.

E. N. Bramley.

#### RADIO RESEARCH AT DITTON PARK - V

1935-45

The need for development of radiolocation techniques meant that many of the staff who had hitherto worked at Ditton Park were no longer able to do so for many years after 1935. At this period in the station's history the officer in charge was James Herd, who had been associated with Watson-Watt ever since the early days of the atmospherics investigation at Aldershot.

Herd had considerable experience of the various types of investigation being undertaken at R.R.S. and in latter years had taken an increasing part in the administration of the station. Unfortunately he did not live long enough to see the full application of techniques he had helped to create, for he died in 1935 at the early age of 46. In an appreciation, many years later, the first post-war Radio Research Board report praised 'his unsparing energy and resourcefulness.'

Dr. R. H. Barfield was next to hold the position of officer in charge. The station was fortunate in having such an experienced leader at a time when the accurate location of radio sources was being required over an increasingly wide frequency spectrum. In the '20s joint work by Smith-Rose and Barfield had resulted in much new knowledge of the direction of arrival of radio waves.

This partnership continued, for in 1936 Dr. Smith-Rose was appointed superintendent of the Radio Division, N.P.L. the central research organisation to which R.R.S. was responsible. From this time onward the work at Datchet was largely concerned with the improvement of direction finding systems and ionospheric investigations.

The Adcock or spaced aerial D/F method was improved until it was capable of operation with 'a high state of accuracy and efficiency' over a frequency band from 100 kc/s to 30 Mc/s. An alternative method, using spaced loops, showed great

promise /

promise in terms of accuracy and frequency range, and by 1938 a paper by Barfield and Ross showed the application of such a system to the measurement of the lateral deviation of radio waves. The properties of a single loop aerial and its application to this field of work were not neglected. In a contribution on the subject, H. G. Hopkins described a loop apparatus capable of operating at 50 Mc/s, and R. E. Burgess published a 'Theoretical and Experimental Investigation' of a screened loop aerial.

The same year, 1938, saw an end, for the time being, of the long series of studies concerned with the nature and location of atmospherics. However, a short time later, the atmospherics Cathode Ray Direction Finder was being used by the Meteorological Office, on a routine observational basis, to add to their knowledge of European weather conditions. The need also arose for world-wide measurements of atmospheric noise levels, particularly at high frequencies; but this work, although contributed to by the Radio Division, was not undertaken at Ditton Park.

Ionospheric measurement continued at the site with ever improving equipment. Systematic noon vertical incidence absorption observations were begun in 1938 in addition to the P'-f and critical frequency soundings previously instituted.

The outbreak of the Second World War in 1939 naturally affected R.R.S. although the Board did not 'formally alter the general nature of the programme of research.' Much of the work specifically requested by the Services, although not actually a part of this programme, was, for the most part, related to the overall terms of reference governing the station's work.

Many of the staff served with Service departments for various periods of time, among them the officer-in-charge, Dr. Barfield, who was seconded to the War Office to organise and operate a direction finding service. The responsibility for organising and administering the site now rested with Robert Naismith who first came to Slough in 1925, and only recently retired after a career which did much to advance the knowledge of the Ionosphere.

In this branch of science, the war years saw the evolution of the Ionospheric Forecasting Service to supply predictions of parameters that would aid long distance communication, particularly for the Services. The observatory, which originated in the early '30s, gradually acquired improved observational techniques which covered a range of vertical incidence sounding from 0.5 to 20.0 Mc/s made at hourly intervals and recorded photographically.

The original sounding apparatus was operated manually and had a range of 2.5 to 5 Mc/s in discrete steps of 0.1 Mc/s. The sounder of the mid-'40s was not unlike the present Union Radio model, in which transmitter and receiver are kept in tune by electro-mechanical means, whilst the apparatus sweeps over the 20 Mc/s wide frequency span in about 5 minutes. It was also at this stage that an Ionospheric Substation was installed in N. Scotland to provide extra information for the prediction service.

It should not be forgotten that by 1939, although some staff worked both at Slough and at Teddington, many important radio investigations were carried out by those whose duties kept them solely at N.P.L. These notes, however, primarily concern Ditton Park, so this passing reference must serve to acknowledge a field of activity large enough to warrant a history of its own.

Ditton Park was fortunate in that it sustained no damage during the war. Ever since the Tizard Committee had convinced the Services of the practicability of radiolocation the war had, in a sense, cast its shadow before.

Thus /

Thus the year 1939 appears as a marker in a tide of events which had affected the station since 1935, rather than the year which to so many marked a complete change in their work and way of life.

G. W. Gardiner.

CORRESPONDENCE

The British Embassy, Paris 8<sup>e</sup>

le 21 avril, 1962

Dear Everyone,

I hope you will forgive my not having written before I left England, to thank you for all the lovely things which happened to me on the afternoon of Friday, the 13th.

I can't begin to say what I feel about your generosity and kindness to me. I have so much to remind me of it, and although the beautiful radio set had to be left in safe custody in U.K. (I am using up the battery of the one in my "appartement") I have brought with me a huge collection of cards, cables and letters, some now displayed on my table here. So I have a constant reminder, when I get "home" of a truly wonderful last day. With some of the cheque I bought a heater to keep the "caretaker" of my English home warm, and with the remainder I think I shall buy a Parisian Eversharp or similar pencil - which I'm sure Mr. Oakman will duly engrave for me!

I was sorry that I did not really finish my "speech" but just as I was coming to the thanks to the present staff who have been so loyal and helpful to me, I really felt I couldn't go on. I suppose I suddenly realised that I wouldn't be working for any of you any more. So I would like to say here what I should have ended with then - thank you in particular to Avis, whom I first knew as a schoolgirl almost; to Eileen, also a straight from "school", both are the only ones who were with me in the pioneer days of the old huts; and then more recently to those others who have been so zealous and loyal in the work I have called on them to do.

I need not say that I shall never forget my friends of Radio Research; I certainly have a very great deal to remind me of you. And I hope you'll not need reminding of me!

I have kept a special paragraph for that part of my going which must, I'm sure, be rare - the good wishes from over the sea by which I was very moved. This is, I think, something which few executive staff can have to treasure - the knowledge that in faraway places my friends were thinking of me. And I'm sure no other member of my class will ever receive "orchids from Singapore." I think it is not possible for me to attempt to describe how I felt when these were handed to me; the thought and the beauty of the flowers themselves were almost overwhelming. I'm so glad I am "une femme!"

And to all the others who sent me letters, and greetings, to whom perhaps by now I have already written, thank you so much.

Once more to present staff, everywhere, thank you so much for everything, from

Chappie.

P.S. I am thoroughly enjoying my new world, and shall probably be able to supply an article on Paris for a later Newsletter written in my best French.

11, Belmont Drive, Maidenhead, Berks.

16th April, 1962

To Staff of Radio Research Station,

I should like to thank you all very much for your gift which I received, in the form of a cheque, a few days ago.

It so happened that my wife and I were contemplating having some wrought-iron wall lamps fitted in our sitting room and we have decided to use the cheque to purchase these. We will thus have a very lasting memento of my, and also her, days with the Radio Research Organization.

I have now settled in very well at my new job at Bomber Command and find the work most interesting. Already I have had an opportunity to use some of the experience I gained in Radio Research at Ditton Park, so proving the old adage that nothing is ever wasted!

I would like to take this opportunity of sending my best regards to many old colleagues to whom I missed saying a personal good-bye on my last day at Datchet. I trust that the time will not be too long before I am able to meet many of you again and renew old acquaintances.

Yours sincerely,

George Bazzard.

STAFF NEWS

Congratulations

To: Clive Trotman and Jeanette Biggs on their engagement.  
Mr. J. K. Oatley on his temporary promotion to Acting H.E.O.

Welcome

To:

Mr. A. J. Rogers (Recommended after Sandwich Course)  
Mrs. E. Teggart (Temporary Part-time Cleaner)  
Mr. M. R. Wall (College based Sandwich Course Student)

SPORTS AND SOCIAL CLUB

The officers of the Club for the year are:-

President: Mr. Ratcliffe  
Vice-President: Dr. Smith-Rose.

Committee:

Mr. Meadows	Chairman
Mr. Waller	Vice-Chairman
Dr. Dickinson	Treasurer
Miss Peart	Secretary
Mr. Weston	Minutes Secretary
Miss Horwill	
Miss Williams	
Mr. Bates.	

A ninth member will be coopted to the committee at their next meeting to replace Miss Armstrong who has resigned.

Section Representatives /

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Amateur Radio Society	Mr. Flavell
Badminton	Miss Peart
Bridge	Dr. Bain
Camera Club	Mr. Baker
Cricket	Mr. Owen
Table Tennis	Mr. Reed
Tennis	Mr. R. Smith
Winkfield	Mr. Cathrew.

Concert outings will be arranged by Miss Horwill.

Smith-Rose Cup

At the A.G.M. it was decided by a large majority that the teams for the Smith-Rose Cup should be divided on a regional basis.

The committee are now preparing a map of the country, upon which members of the Sports and Social Club are being represented by coloured pins at their places of origin. Associate members (specifically wives, husbands and children under 18, of members) are also represented, and it is hoped will take part where possible.

According to the present state of the parties the 20 or so members whose roots are in the North may well sweep the board. It has still to be decided exactly where the divisions will come, and whether or not the South will field two teams: London area and the South, or will have to combine to combat the North.

The picture is not quite complete as there are still a number of members who have not yet indicated to which town or county they wish to be loyal.

Members who have not replied by Friday, 18th May will be classed as unenthusiastic and will not be considered when the dividing lines are finally drawn!

Tennis Club

The tennis season is now in full swing.

Club evening is Wednesday; tennis balls are provided, and anyone who turns up is sure of some good games. On other days it is hoped that members will arrange their own fours, and a booking system will probably be introduced.

The grass court is now rolled and will very soon be ready for use.

The first of this season's matches will probably be a mixed doubles against the Road Research Laboratory on June 16, to be played at Harmondsworth.

N.B. The summer subscription of £2 - - is now due and should be paid to Dr. Dickinson.

Margaret Peart.

Amateur Radio Society

ANNUAL GENERAL MEETING

The first Annual General Meeting of the Society was held in the Projection Room at 1.0 p.m. on 2nd May. It was attended by the Chairman, Secretary, Treasurer, 14 members and 2 visitors.

Secretary's Report

This first covered the foundation of the Society on 12th June, 1962 and the drawing up of the Constitution and Rules.

Mr. Ratcliffe /

Mr. Ratcliffe, Dr. Saxton and Mr. Wilkins had kindly accepted office as President and Vice-Presidents respectively, and 25 members had joined during the year. Of the latter, one has left the station and five were at present serving overseas, leaving an effective membership of 19.

The Society had cleared and converted Room 14 in the Old Building for use as a Club Room and this had later been redecorated by the Sports Club, and a workbench fitted.

A number of donations of equipment had been made by members, and from them several units had been made for the Club transmitter.

By arrangement with the Station Library, the Society held back numbers of World Radio, Wireless World, Short Wave Magazine and the R.S.G.B. Bulletin. These, and other publications provided by members, had been marked and catalogued by Mr. Clough.

A number of interesting lectures were well attended in the first few months, but attendances later fell to such an extent that the planned programme had to be abandoned to avoid a repetition of the occasion when a visiting lecturer had an audience of only four members. Constructional meetings had been continued, but these were of limited appeal. It was hoped that members would appreciate the position at the Annual General Meeting and guarantee a sufficient attendance to justify bringing in outside speakers once again.

A series of morse classes had been held, but a plan to begin a second series had been postponed from lack of interest.

#### Treasurer's Report

The Society's Accounts had already been published in connection with the Sports Club A.G.M. The Society had a balance of £2 10s. which, together with renewal subscriptions now due, was to be used for equipment, affiliation to the R.S.G.B., QSL cards, etc.

#### Changes of Rules

Two changes were adopted in the List of Rules. One now required that members also belonged to the Sports and Social Club, where they were eligible to do so; the other amended a rule which required a fixed proportion of the total membership to be present for a Change in the Rules.

#### Constitution of the Committee

The Committee for 1962/63 is as follows:-

R. W. Appleton, G3KEA, Chairman; R. G. Flavell, G3LTP, Secretary;  
Miss M. Armstrong, Treasurer; G. W. Gardiner and M. Weedon, Ordinary  
Elected Members.

R. G. Flavell

#### Bridge Club

A bridge evening was held on 4th May at the R.R.S. Eight people were present, and two teams of four played each other. The following team won by 3700 points:

K. and W. C. Bain  
C. and E. Nicolson.

A D.S.I.R. tournament for teams of four is to be held in May and June. The Radio Research Station is entering for this contest.

W. C. Bain.

Camera Club /

Camera Club

The Camera Club did not have its monthly show - "Photographs taken on the Station" - in April, but these photographs are now on display. The May show of "Ships and Boats" is postponed until the end of the month.

The Annual General Meeting will be held on 6th June at 1.0 p.m. when the activities of the Club in the next 12 months will be discussed. We hope all members will attend; we will also welcome others who are interested in becoming active members. We should particularly like to see people who wish to produce prints of a standard suitable for entering in outside competitions which we should like to arrange.

A good darkroom, complete with enlarger, dishes, etc., is available, and also this year we have had heating installed. We feel that greater use could be made of these facilities, and the results shown to other members and discussed at fortnightly meetings.

S. J. Baker.

LETTER TO THE OUTSTATIONS

Slough

15th May, 1962

Dear Colleagues,

The last issue of the Newsletter was published too early to include a report on the farewell ceremony marking Miss Chaplin's departure. The total sum collected was £32 17s. - and she chose a transistorised portable radio set for her leaving present. The Director spoke of her services to the station and was followed by Dr. Smith-Rose who, with Mrs. Smith-Rose, had travelled down specially to recall to the staff the story of their work together over many years and to present her with her leaving gift.

At the end of the ceremony Miss Chaplin was presented with flowers, including a spray of orchids from the staff at Singapore. She had earlier received telegrams from many well-wishers.

Many of you will be interested to know that the N.P.L.'s Open Day was held on 9th May. It was only possible to visit a very limited number of the exhibits, but we were able to see an optical maser in action and to learn of the many new techniques being developed in this fascinating field.

R.R.S. is not to have an Open Day this year, although the members of the Radio Research Board will be seeing the work here on 27th June.

Our side-effect of the successful launching of Ariel, described by Dr. Hopkins on page 1, is that stand-by teams drawn from all groups are being trained for work at the Winkfield tracking station to supplement the present staff there.

Best wishes from us all.

Yours sincerely,

The Editor.