R.S.R.S. NEWSLETTER

No. 90 October 1968

Aurorae

Some years ago I wrote in an I.M. that the research satellite ESRO I - now called Aurorae - would be an experiment in cooperation as well as in geophysics. Both experiments have proved successful - after considerable testing at all stages.

The R.S.R.S. has two (physics!) experiments in this satellite, both designed to detect and measure high energy charged particles in space. The detectors were designed and manufactured on the station: the electronics were designed on the station and manufactured for us by the G.E.C. at Portsmouth. Mr. Harden's group are to be congratulated on the successful function of their two experiments in Aurorae adding to the success of their Ariel III experiment - which, by the way is still going strong after seventeen months in space.

R. Dalziel

British Experiments in ESRO I Satellite

Two British research groups have experiments in the European Space Research Organisation's second satellite in the ESRO - NASA co-operative space research programme. ESRO I was launched from the Vandenburg Range in California by a National Aeronautics and Space Administration (NASA) Scout rocket. The launch was successful and the satellite has gone into an elliptical polar orbit. This orbit was chosen to give a good distribution of measurements and during the first few months the satellite's sub-orbital track will enable auroral phenomena to be observed throughout the northern winter.

The SRC Radio and Space Research Station experiments will measure electron flux and energy spectra in the 40-400 keV range and proton flux and spectra in the 6 - 30 MeV range.

University College London's Mullard Space Science Laboratory at Holmbury St. Mary, Dorking, which received SRC support totalling over £150,000 for space research during 1968, is making electron temperature and density measurements and studying the composition and temperature of positive ions in the upper atmosphere.

The polar ionosphere satellite ESRO I is stabilised along the magnetic field lines by permanent magnets in the structure. When over the northern polar region, the auroral photometers will be looking downwards to the Earth while the particle detectors will be looking upwards towards the incoming particles.

Radio and Space Research Station Electron Experiment

Two detectors are used, one to observe trapped electrons travelling nearly perpendicular to the Earth's magnetic field and the other to observe precipitated electrons near the direction of the Earth's magnetic field.

Each detector consists essentially of two similar assemblies of collimators, plastic scintillators and photo-multipliers placed side by side but one of the collimators contains a magnet to reject electrons. In this way the background radiation can be detected and appropriate corrections applied.

Two types of measurements are made. A six point integral energy spectrum is obtained by pulse height analysis of the outputs of the photo-multipliers. Measurements are made simultaneously in the six energy bands by using six counters and the data are recorded on magnetic tape. The second type of measurement is to investigate fine structure: the total flux of electrons of energy greater than 40 keV is measured 10 times a second and the data are transmitted by high speed real time telemetry.

The R.S.R.S. Proton Experiment

A single detector points in the direction of the Earth's magnetic field. Spectra are obtained by pulse height analysis of the outputs from a telescope consisting of a semiconductor detector followed by a caesium-iodide scintillator with a photomultiplier. The output data are recorded on magnetic tape for subsequent replay.

The University College London Langmuir probes

The electron temperature and density measuring instruments are two plasma probes which are small cylindrical discs mounted on booms about 0.5 m away from the skin of the satellite. The probes are identical to those flown successfully on Ariel I though modifications have been made to improve the reliability and accuracy of the measurements. One sensor is perpendicular to the magnetic field, the other looks backwards in the reverse direction to the field. A novel method of analysis of the probe characteristics is used: it reduces the effect of certain errors in the experiment - such as those arising from the photoelectric emission - and renders the data particularly suitable for on-board processing and tape storage.

A spherical ion probe, mounted on a boom in the direction of the spin axis of the satellite and about 0.5 m away from the skin, studies the composition and temperature of positive ions in the ionosphere. When taken together with a global survey of electron temperature these observations can give a comprehensive description of the temperature distributions and composition of the high atmosphere above the F_2 maximum. This experiment, with a new method of analysis, offers important advantages over the simple ion trap. The measurements yield the ion energy spectrum directly and in considerable detail.

Ionospheric measurements by Langmuir probes carried aboard spacecraft were started by University College London in 1962 with the launch of Ariel I. They were continued with an ion probe aboard Explorer XX in 1964, an ion probe and an electron temperature and density probe aboard Explorer XXXI in 1965, and an electron temperature and density probe aboard OGO-E in March this year. Measurements have thus been made continuously for six and a half years.

Millimetre and Sub-Millimetre Waves

Work in this area, at present carried out in Projects 16/06 and 16/07, was discussed at a recent review.

There have been very few investigations of the effect of the atmosphere on the propagation of electromagnetic waves in the waveband 0.01-1.0 cm. and in view of the lack of further channels at longer wavelengths for the expanding needs of communication links it is important to determine how far millimetre and sub-millimetre waves might have a practical application. Some laboratory measurements of absorption in water vapour at wavelengths of 0.6-0.8 mm are nearing completion and the results are being compared with recent Russian measurements obtained at similar wavelengths but by a different technique. The main effort is now being concentrated on studies of propagation in the free atmosphere over links representative of practical systems. Experiments are in progress at 0.33 mm over a distance of a few hundred metres and at 2.9 mm over a distance of 2 km. In both cases it is the intention to study absorption and scintillation fading and to relate the results to meteorological measurements and to theories of propagation through absorbing and turbulent media. By kind permission of the College authorities, one terminal of the 2.9 mm link is on the roof of the Slough Technical College; and following a Very Special Arrangement the other terminal is being located on the roof of a prominent building in Windsor.

Work has also started, in collaboration with the Post Office, on studies of rain attenuation in the waveband 0.85 - 2.7 cm. An important requirement here is to investigate the detailed structure of rain showers and hence to provide information on how best to plan route or space diversity systems to reduce the effects of absorption fading. Attempts are being made at R.S.R.S. to develop a new type of rapid-response rain-gauge suitable for use with digital techniques in an automatic data-processing system with about 100 gauges linked by telemetry to a central facility. It is also hoped to study the spatial distribution of the rain by oblique-incidence, "off-beam" scatter on a microwave link and possibly by using a weather radar for direct back-scatter.

J. A. Lane

Station News

Mr. R. W. Meadows will be attending the N.A.S.A. Satellite Ground Stations meeting which will be held in Paris starting Tuesday 29th October. Matters relating to communication satellites will be discussed with particular reference to a programme for experimental satellites.

Dr. R. Bent has left for the U.S.A. where he is to spend eighteen months' leave without pay engaged in work for the Wolf Research and Development Corporation.

Dr. Burrows and Mr. Rogers are leaving for Woomera at the end of October. They hope to launch rocket-borne magnetometers to investigate Sporadic-E phenomena in the ionosphere.

On 30th October the first meeting of the VLF/ELF panel of Working Group II of the S.R.C. Space Policy and Grants Committee will take place at R.S.R.S.

Mr. C. W. Spencer having retired, the station Technical Training Officer is now Mr. Clarke, whose group has also become responsible for visits, exhibitions and related matters. Mr. Gardiner assists him in these duties. Welfare matters relating to male staff are dealt with by Mr. Addison.

Staff News

Congratulations to:

Peter and Betty Reader on the birth of their daughter Jane Louise on 8th October.

Ken Slater and Audrey Jones on their engagement

Maureen Stacey now Photoprinter I

Welcome to:

R. A. Marsh	A.E.O. (Perm)
L. D. J. Harris	A.E.O. (Non-Perm)
A. M. Davies	A.E.O. (Perm)
A. L. Hardie	A.E.O. (Perm)
B. J. Murphy	S.A. (Perm)
H. S. Roberts	A.E.O. (Perm)
K. Tapping	A.E.O. (Perm)
K. Acheson	S.A. (Perm)
Mrs E. M. Morgan	P/T. S.A.

Welcome to: (contd:)

Mrs A. Colclough	P/T Typist II
Miss J. Clarke	S.A. (Perm)
Miss M. L. Kendall	A.E.O. (Perm)
K. Gregory	Gardener II
Mrs I. J. Haigh	Canteen Assistant P/T

Resignations

C. W. Spencer	S.E.O. (Retired)
C. A. Owens	Sandwich Course Student
C. Hale	A.E.O.
Mrs M. W. Stratta	C.A.
T. P. Wigley	Sandwich Course Student
J. C. T. Young	A.E.O.
S. J. Thompson	A.E.O.
G. C. Anderson	A.E.O. (Perm)
P. T. Bhakta	A.E.O. (Perm)

Sports and Social Club News

Coming Events:

Tuesday 5th November	Bonfire
Saturday 14th December	Christmas Dance

Bob Fitchew

Bonfire

Dare we say it? It already looks as though this year's bonfire will be the biggest ever! Certainly it should be the most spectacular fireworks display ever seen in Ditton Park, as we have two crates of extra large set pieces and rockets, sent to us direct from Standard's works. Pieces like a 20-foot long "Niagara Falls", "Jodrell Bank" which appears to spin about two axes, and ... well come and see for yourselves. Tuesday November 5th at 6.30 by the White (green) Elephant Shed (known to some as the Vehicle Store). The organisers would appreciate it if you would sign the list on the Sports Club Notice Board if you will be coming to the bonfire, because this helps with the catering. You wouldn't want to miss your hot dog and coffee would you?

About 70 children from local children's homes have been invited and we should be grateful for offers to chauffeur them to and from the event.

Paul Dickinson

Motor Club

Antifreeze is once again on sale, at 2/6d per pint as before, and will be distributed at 1 pm and 5 pm by the Old Buildings until further notice. As the supply of containers is limited it is probably easiest for cars to be brought over, with radiators flushed, ready to fill up with antifreeze.

Oil is ordered regularly now, and a small stock kept. The most popular is 20W/50 Multigrade in 5 gal. drums at 67/-.

On the club site the ramp is at last finished and has been used by a number of members. Oil changes and M.o.T. checks will no doubt be frequent now - why pay 14/- to be told of an obvious fault when you can see it yourself?

The last few weeks of work have taken the writer on a number of journeys to Bedfordshire via the M1, and it seems worth commenting on the standards of driving. We have surely had motorways long enough for people to be used to them, but it is amazing and worrying to the writer that quite a number of drivers cannot keep a safe distance from the car in front. Small cars, often minis are driven this way, sometimes only a few yards apart at 70 m.p.h., but the drivers do not seem to realise that if the car in front had to brake, their cars and faces would be flattened wrecks even before their foot had touched the brake pedal.

Night driving is as tiring as ever - I wonder when the M.o.T. will understand that centre fences can make driving easier and safer by being a light barrier as well as a crash barrier? Surely a tired driver is more accident prone, just as is one who is suffering from 'flu or 'just plain drunk?'

It almost takes a quiet day watching balloons in Bedfordshire to recover.

E. Golton

Festina Lente

The metric system. - We note with pleasure that Messrs. Williams and Robinson of Thames Ditton (Surrey) have adopted the metric system for their measurements. They took this decision owing to the practical convenience of the metric system and because they are sure that it will be easier to obtain orders in countries where the metric system is used; it will also be possible to exchange parts for the machines they make with those made by their concessionaries abroad. They will not alter the standard sizes of their machines so as to avoid complicating matters for present users; they will simply stamp the gauges, templates, etc. to the nearest hundredth of a millimetre with a view to standardisation. It is very likely that this innovation will not stop here and that all machine makers in England will soon follow suit.

(Electricity)

Journal telégraphique - July 1893

SLOUGH

(With no apologies to Mr. Betjeman)

No friendly bombs explode to please the planners,
No aide for Christian waits in modern dress,
For Help has turned his back or lost his manners,
And restoration work has scant success,
With renovating structures under stress.

Much concrete has been mixed by bright reformers
And, reinforced by Friends of Brother Marx,
The Sons of Freud and other smooth performers,
They leave their paths and statues in the parks
But fail to save the victims from the sharks.

Nor will the Gods from these machines bear witness
To hoards of Venuses enslaved by Mars,
Emerge with icy eyes to state our fitness
For instant nemesis in public bars,
Or tread the motorway to crush the cars.

With no divine or other intervention
Is optimism rendered obsolete?
The pylons wait, like soldiers stiff with tension,
(The semis lying doggo at their feet),
For fear to spread like gas through every street.

For one-track minds see signals set to "danger",
Bad sleepers find suburban dreams provoke:
"Around each corner waits a sallow stranger,
Black power pollutes the Chalvey chimney-smoke,
So find a smokeless zone before you choke".

But home-made plans and poisons merely nourish
The unofficial child they seek to kill -
Our underground and smiling Slough will flourish,
The councillors of caution may fall ill,
Their enemies will entertain us still.

And summer suns will burn away their terrors,
Those intermittent winds of change will blow,
To shake the wolf-reflections from the mirrors
And gesture with the weather-vanes to show
Despairing bards and giants where to go.

J. Weathersby

Letter to the Outstations

Dear Colleagues,

I am one who enjoys a garden. The more so, perhaps, because, enjoying the complementary vices of laziness and impatience, the act of gardening is loathsome to me. Therefore, as I say, a walk in a garden, created and maintained by the other fellow's effort, is doubly dear. Today's routine après lunch amble was pleasant enough, remarkable only for the shades of autumn, and the dead wood being heaped up diligently by our Sports and Social Club stalwarts in readiness for the coming Guy Fawkes' night.

All was as it should be, until coming to the Director's Lawn. You may recollect that in the centre of this stood a tree known to some of us as the Japanese Tree, though whether it is indeed from the far East, I do not know. In mid-winter the tree pleased us all by flowering in a delicate, whispy, sort of way; for the rest of the year it was politely and inoffensively there, just making like a tree. The past tense has robbed my message of surprise and you will have to imagine my reaction on finding no tree, just a muddy crater a few feet across.

What has become of the plant? Who knows; for some months it's been looking a bit under par, so maybe 'they' took it away. There are other possibilities though; the depredations of an international gang of Japanese-tree thieves; A mystic apotheosis and ascent to an arboreal heaven; rapid rot. Bearing in mind the time of year, one solution more comes to mind. There are those indoor fireworks which turn into trees; was this a tree which reverted to a firework? Is there, at the bottom of the crater, a small pellet which needs but the touch of a cigarette-end to restore our winter-flowering tree for the pleasure of all, including,

Yours sincerely,

The Editor

Reprint List

J. A. Lane	Small scale variations of radio refractive index in the troposphere (Part 1. Relationship to Meteorological conditions). Proc. I.E.E. September 1968 Vol. 115. No. 9
J. A. Lane and G. W. Paltridge	Small scale variations of radio refractive index in the troposphere - Part 2 - Spectral Characteristics. Proc. I.E.E. September 1968 Vol. 115 No. 9
G. W. Paltridge	Application of the technique of ionospheric drift analysis to the study of atmospheric turbulence. Quarterly Journal of the Royal. Met. Soc. July 1968 Vol.94 No.401.

Internal Memoranda

311 BENT, R. B. Attitude determination of the Ariel 3 satellite.

312 HORNER, F.& BENT, R. B. A satellite experiment for the measurement of terrestrial radio noise.

313 This has now been sent for publication in a journal and will not be appearing as an I.M.

314 HALL, J. E., HALL, A. J., DICKINSON, P. H. G. A solar attitude sensor for use in a spinning rocket.

315 HARRISON, V. A. W. A remotely controlled precision traverse mechanism.

316 HALL, M. P. M. Correlation of radio field-strength on transhorizon paths with radio refractive index profiles near the path centres.

317 BRIGGS, B. H. The analysis of observations of atmospheric turbulence made with four spaced refractometers.