RSA Newsletter

No. 136 September 1972

ALOUETTE I - TEN YEARS AFTER

On the 29th September 1962, the Canadian scientific satellite, Alouette I, was launched into a near-perfect 1000 km. circular orbit. A decade later, still functioning, its value as an instrument of research has far surpassed the most optimistic hopes of those involved.

This satellite, the first in a series of joint Canadian-U.S. ionospheric sounding experiments, was designed 'To conduct comprehensive studies of the ionosphere during the interval which includes the minimum and maximum of the present solar cycle ....' In an introductory article in this Newsletter in 1963 it was pointed out that the then unfamiliar 'Topside sounder satellite' would perform in a manner analogous to the sweep-frequency ionosonde which had long been part of the Slough Observatory technique, but would have the added advantage of being able to provide a global picture of changing phenomena.

Additionally, though not specifically designed to do so, the topside sounders have provided a great deal of information for plasma physicists, particularly in the realms of plasma resonance theory, etc. In the words of a report by Dr. G. L. Nelms from the Communications Research Centre, Ottawa :

> 'Prior to the launch of Alouette I almost nothing was known about the region of the ionosphere above 300 km altitude. Only a handful of rocket and incoherent scatter measurements were in existence, and the ideas about the region were primitive; it was supposed that the region was in isothermal diffusive equilibrium and that there would be little structure above the peak of the F layer. There has been a vast increase in knowledge of the region from this

programme, which has not only shown that the region was far more complex than had been supposed but has also gone a long way toward providing an understanding of some of the physics involved. For example, it is now clearly recognized, largely as a result of this programme, that the forces that control major regions of the ionosphere are primarily of magnetospheric or extraterrestrial rather than ionospheric origin.

A number of results relevant to communications have arisen from the programme. These are generally in the area of radiowave propagation, and have given us a greatly improved understanding of the way in which a radiowave travelling through the ionosphere is affected by the medium. The results are primarily applicable to HF and LF communications, but some of them, such as information on sources of noise, interference, and non-linear processes within and external to the ionosphere, have a much wider importance.

As has been observed, the ionosphere is one of the best possible laboratory plasmas, because it does not suffer from artificial boundary conditions. In this programme, the use of a wide spectrum of radiowaves permits us to establish the poles and zeros of the index of refraction of the ionospheric plasma, which is the goal of much of plasma physics.'

At the R.S.R.S. we have, in addition to our data acquisition obligations for NASA, been fortunate in being able to process Alouette I telemetry (together with those of later satellites in the series) for our own use, and the past ten years has seen much valuable research carried out here using Alouette and other topside sounder data. Research groups in many countries have found similar use for the rich stream of data made available; indeed an international 'publications count' made a year or so ago attributed some 300 publications to Alouette alone - an average of one every two weeks.

Bearing in mind the associations with its country of origin, Alouette was, indeed, a right and proper choice of name for the first top-side sounder satellite. The wisdom of hindsight suggests, however, that an even more appropriate name might have been Cornucopia.

G. W. GARDINER

JOINT UNITED KINGDOM - CANADIAN STUDY OF QUASARS

In a previous issue, brief reference was made to the long base-line interferometer work in which Chilbolton is participating.

The following joint S.R.C.-N.R.C. press release gives further information about that research.

- Ed.

Canadian and British radio astronomers have begun a joint experiment to shed new light on the nature of the baffling cosmic objects known as quasars.

The team, composed of scientists from the National Research Council of Canada, the University of Toronto and Queen's University on the one hand and the Radio and Space Research Station of the United Kingdom Science Research Council on the other, have combined the signals from quasars that were received simultaneously on radio telescopes in Canada and England, 3,270 miles apart. Such an arrangement, known as a radio interferometer, has an ability to distinguish detail which improves with separation between the telescopes and with decreasing radio wavelength.

Quasars, also known as quasi-stellar radio sources because of their very small star-like appearance, are believed to be the most distant objects in the Universe and are extraordinarily powerful emitters of radio waves. The radio emission is thought to be produced by high-energy electrons travelling in weak magnetic fields and to extend over a region which appears, as do distant stars, to be very small. So compact are the quasars, that interferometers capable of very fine discrimination of detail are needed for any meaningful measurements at all.

The new interferometer uses an unusually short wavelength of 2.8 centimetres at both telescopes, a 150-foot reflector at the Algonquin Radio Observatory, Ontario, Canada and an 85-foot reflector at Chilbolton, England. The combined instrument can measure detail as small at 0.0004 seconds of arc - the equivalent of being able to stand in England and distinguish a marble held in Canada. Detail of this order has been found in several quasars.

The improvement in the interferometer comes about largely from the use of hydrogen maser atomic clocks, which allow the observations to be made at short wavelengths. Not only does this improve the discrimination of detail, but the detail itself is different at short wavelengths. Intriguing evidence from

previous short wavelength observations of some quasars suggests that their size is rapidly changing. These observations can be interpreted in at least three ways : the quasars are expanding faster than the speed of light if they are at the distances inferred from the shift in wavelength of their spectral line; they are expanding at reasonable speeds and are much closer, or we are the victims of a form of optical illusion which depends upon special conditions in the quasar. Because of this puzzling variability in quasars the observations will be made at intervals of a few weeks for approximately a year.

For the experiment to work, observations from the two telescopes must be synchronized to within one ten millionth of a second and the tuning of the two receivers must be maintained identical to within one part in 1,000,000,000,000 (one trillion). The hydrogen maser clocks, which take a million years to gain or lose a second, make this high degree of accuracy possible. Quasar signals are recorded at each telescope with television tape recorders and are finally combined after transporting both sets of tapes to the Astrophysics Branch of N.R.C.'s Radio and Electrical Engineering Division in Ottawa.

STAFF NEWS

Congratulations to:

Tony and Diana Gibson on the birth of their son James Richard Anthony on 5th September.

Mr. M. S. Guest now Craftsman I

Welcome to:

E. G. Westbrook	E.O.
Mrs. V. D. Westbrook	Typist I
J. M. Emerson	H.S.O. (U.S.A.) Goddard Space Flight Center
Miss B. O. Brown	S.O.
D. C. Collerton	Apprentice

Resignations

Mrs. J. M. Cobb	C.A. P/T
A. D. Fordham	S.C.S.
Mrs. H. F. P. Ross	C.O.
Miss M. Lock	Vacation Worker
Miss J. M. Gantlett	S.C.S.
R. J. Berry	S.C.S.
G. M. Naharnowicz	S.C.S.
E. A. Oakman	P.T.O. II - Retired
N. J. Hillsdon	Apprentice - completed apprenticeship

Other Changes

K. L. Seal — S.O. Left Falklands for U.K.

STATION NEWS

The A.G.A.R.D. Electromagnetic Wave Propagation Panel Technical Meeting held at Gausdal, Norway from 18th - 21st September was attended by Drs. Davies, Allnutt and Llewellyn-Jones. The subject of the meeting being Telecommunication aspects on Frequencies between 10 and 100 GHz.

OBITUARY

Mr. F. Peacock

We are sorry to record the death of Mr. F. Peacock on Tuesday 12 September at the age of 71.

Fred Peacock, a Lancashire man, was well-known locally, having spent much of his life in the district. After working at the Manor Hotel, he served with the R.A.F. in Africa and Italy during the war, joining R.S.R.S. on a part-time basis after more than twenty years with Fords at Langley.

A humorous and conscientious man, he bore his years remarkably well despite increasing ill-health, and was held in much affection by his colleagues, some of whom represented the Station at the funeral.

To his wife we offer our sincerest sympathy.

SPORTS AND SOCIAL CLUB NEWS

Cricket Scores

Wednesday 26th July - Wilkinson Sword - Away

Wilkinson Sword	66 for 10 in 20 overs
	Ray 28
	Bolton 5 wickets for 18
R.S.R.S.	70 for 6 (17 overs)

R.S.R.S. won

Saturday 5th August - Wilkinson Sword - Home
(a "40 over each side" match)

R.S.R.S.	75 all out in 25 overs
	Ellen 32
Wilkinson Sword	77 for 6 in 28 overs
	Billington 26
	Dunford 5 wickets for 19

Wilkinson Sword won

Cricket Scores (contd)

Wednesday 9th August - I.C.I. (Jealotts Hill) - Away

R.S.R.S.	75 all out in 17 overs
	Kitt 20
Jealotts Hill	76 for 3 in 15 overs
	Brown 25

I.C.I. won

Wednesday 23rd August - Westminster Bank - Home

R.S.R.S.	75 all out in 20 overs
	Weston 7 wickets for 18
Westminster Bank	79 for 3 wickets
	Weston 48 in 17 overs

Westminster Bank won

J. Cathrew

Smith-Rose Cup Football

The Smith-Rose cup game was played on the 24th August on the Station front lawn.

The Smith-Rose cup is traditionally a north versus south competition but as there are not enough 'Northerners' within the football club, the South played against a North-South combination. The North eventually won 7-4 in a game which seemed to be enjoyed by all concerned.

North	South
D. Wright	D. Berry
A. Hardie	L. Kell
A. Rodger	N. Hillsdon
T. Bevan	P. Burrell
A. Buck	T Adams
D Jones	A Thackray
E. Woods	D. Boys
B. Murphy	J. Bains

D. Wright

RETURN VISIT TO A.C.O.

A very convivial evening was spent by those who participated in the return matches with A.C.O. on August 17th.

The results of the various matches are as follows:-

TENNIS

Five players from A.C.O. came over to our court for the return tennis evening which was again non-competitive. Play started a few minutes after five o'clock and continued without a break until well after sunset when our enthusiastic visitors decided that they could no longer see the ball. Our players were Wendy Harrington, Cheryl Bellanti, Mike Dick and Richard Smith.

R. W. Smith

CRICKET

A.C.O. batted first and were contained by the fine bowling of Alan Rogers, who took 4 wickets for 5 runs in 5 overs. The home team found runs hard to come by and could only muster 64 runs from their alloted 20 overs. The R.S.R.S. innings started disastrously, with us losing two quick wickets. Ali Moosajee and John Kitt then got on top of the bowling and carried the score to within 2 runs of victory before Ali was out trying to hit a winning 'six'. The home defeat we had previousl suffered against A.C.O., was however, avenged.

John Cathrew

TABLE TENNIS

In their return match with A.C.O. the table tennis team failed to complete the double over a much improved team. The A.C.O. provided a much stronger team than in the previous encounter and, in a full 10 game match, won by 7 games to 3. Wright, for A.C.O., played consistently well to become the only player to win all his three games.

The results were:

A.	K. Warington	1.	J. Dudeney
B.	B. Morten	2.	A. Buck
C.	L. Wright	3.	P Eggett

		Winners
A v 1	24-26, 21-17, 21-19	A.C.O.
B v 2	10-21, 11-21	R.S.R.S.
C v 3	21-14, 21-8	A.C.O.

		Winners
A v 2	19-21, 10-21	R.S.R.S.
B v 1	19-21, 21-18, 16-21	R.S.R.S.
A & B v 1 & 2	21-11, 21-18	A.C.O.
C v 2	21-13, 21-18	A.C.O.
A v 3	21-15, 21-12	A.C.O.
B v 3	21-18, 21-15	A.C.O.
C v 1	21-14, 21-18	A.C.O.

A.C.O. 7 R.S.R.S. 3

A. Buck

BOWLS

A most enjoyable evening was spent on the A.C.O. Bowling Green in the return match.

The ladies made history by winning one of their Rinks and giving their opponents in the other Rinks a very close game, losing their match overall by only one shot.

The men won both their rinks, but only by the narrowest of margins, each game being decided by the last wood on the last end. The full results as follows:

A.C.O. v R.S.R.S.

Bowls Section

Ladies

Mary Parissien
Kathie Shand
Daphne Robertson
Queenie Haxton — Won. 12 - 6

Ellen Scammell
Lena Thomas
Margo Clarke
Betty Carroll — Lost. 7 - 14

Ladies' Match Lost by 1 shot

Men

Ross Meadows
Vic Harrison
Cecil Clarke
Alf Haxton — Won. 19 - 17

Nick Bence
Eric Price
Reg Parissien
Alex Carroll — Won. 16 - 15

Men's Match won by 3 shots

FOOTBALL

The 'seven-a-side' match was played on a pitch specially marked out on the A.C.O. cricket pitch. The game opened at a tremendous pace which was maintained throughout the first half but some fine goalkeeping, especially by Alan Buck, kept the score at 0-0. Just after the start of the second half A.C.O. took the lead through a hotly disputed goal which seemed to hit the outside of the upright. Much later in the second half A.C.O. scored a blistering second goal, the final score being 2-0. R.S.R.S., on the whole, were a trifle unlucky and deserved a draw, certainly for effort.

Team: D. Berry
A. Thackray
L. Kell
A. Buck (Goal)
A. Rodger
T. Adams
A. Hardie

D. Wright

DARTS

It is perhaps a reflection on the sobriety of those taking part in the return darts match with A.C.O. that nobody can remember the scores of the games played, or who played against whom. The match was played towards the end of the evening when most people had had one over the proverbial double four and was thoroughly enjoyed by all concerned. It seems logical that we played a total of seven games because we appear to have lost the match by 4 games to 3, which repays our win on home territory, but we left what had been a very convivial evening with the promise of a decider to be held during the winter months.

A. Buck

GUY FAWKES NIGHT

WOOD NEEDED

Will all interested please do all they can to increase the size of the bonfire - you do not have to be able to work out the formula on the notice board to know that what is needed is wood.

SIDELOBES

(being a collection of miscellaneous matters)

Up to the present moment some 75 miles of magnetic tape relating to U.K.4 has been processed.

To Promote Confidence

FM JOE J LOPEZ SAFETY OFFICER
TO SDI-124N
ALL SPACE TRACKING AND DATA NETWORKS AND STATION SAFETY OFFICERS

DURING LOSS PREVENTION CERTIFICATION COURSE CONDUCTED MAY 1972, NT@TF, THERE APPEARED TO BE A MISUNDERSTANDING REGARDING PERFORMANCE OF TRACHEOTOMIES BY TRACKING STATION PERSONNEL TRAINED IN FIRST AID. THRU THE HEALTH @ SAFETY ENGINEERING OFFICE ISSUED THE FOLLOWING: + TO CLEAR UP THE MATTER, TRACHEOTOMIES ARE NOT TO BE PERFORMED BY OTHER THAN PHYSICIANS OR HEALTH PROFESSIONALS UNDER DIRECT PHYSICIAN SUPERVISION.+

Letter to the Editor

Sir,

'The main change is the we are replacing our present computer based system with a manual one. This will enable us to give a greatly improved service to both Borrowers and Sponsors. This improved service will be mainly evident in terms of the speed with which bookings and enquiries are handled.'

Can /the above extract from a catalogue/ be the first sign of the coming revolution?

Is man reasserting himself over the all conquering machine at long last!? Will this date appear in future history books as the red letter day which heralded the end of the industrial revolution and the start of the new manual age? Or, as is more likely, is it a computer having its little joke and demonstrating that it has joined poor, dispensable, puny man at last, in his superiority over the beasts, by the possession of A SENSE OF HUMOUR?

Yours faithfully

J. A. McGivney

LETTER TO THE OUTSTATION

Dear Colleagues

No matter how good the flow of information among a group of people, the desire to speculate upon the significance of straws in the wind is apt to manifest itself from time to time. Such was the case recently when a large, roped-off area appeared hard by the cricket pav—— sorry, furniture store. Much ingenuity was spent predicting the rising up upon the site of various buildings each peculiarly suitable in the mind of the speaker, to supply his long-felt wants.

Now it can be told; a week or two ago our sewage pumps concluded that life held more than the mechanic dredgery they had carried out for so long. They stopped, and only the timely arrival of a mobile pump saved them from the consequences of their own folly - total immersion in a sea of effluent. Speed was of the essence, hence the rescue pump was forced to void its contents over a large area of field nearby.

'They', whose doings form such a valuable basis for conversation below stairs, acted with commendable promptitude and doubtless from that most useful of motives, enlightened self-interest. Quickly the area was cordoned off. Thus were our boots and, indirectly, senior staff carpets, preserved from the powerful and nourishing offering soaking in nearby. Now, some time after, there is evidence that that rich earth a richer dust conceals, for Lo! the grass grows greener there than anywhere.

The above rescue operation was linked in a sort of way with a change in the pattern of station life. As everyone knows, whenever anything constructional-mechanical, mechanical-electrical, mechanical-electrical-pastoral goes wrong it is the inevitable lot of the long-suffering workshops' manager to be called upon for advice and action. This time, as you may see from the Staff news, Mr. Oakman had the skill to retire before the start of our fluid failings.

Without a doubt, during his many years here, he has overcome many and greater difficulties with characteristic aplomb, and with a discreet efficiency and courtesy which has cooled many a situation. Ernie's professional opinions do not carry others by main force, but are, rather, implanted gently to work in the sub-conscious of the opposition so that it is scarcely realised that agreement with the Oakman approach was not entirely due to their own far-sightedness and generosity of nature. All of us wish him well for the future as indeed we do to his successor, Harold Lovesey; that both may thrive and prosper is the hope of all including

Yours sincerely

The Editor

Presentation and Conversation - Mr. Oakman retires

List of Reprints - September 1972

D. Lepine and J. E. Hall	The solar X-ray spectrum deduced from a proportional counter experiment and the resultant production of ionization in the mesophere. J.A.T.P. 1972. Vol 34. 1507-1523.
E. N. Bramley	Very-high-frequency wave propagation by the the temperate-latitude sporadic-E layer. J.A.T.P. 1972. Vol 34. 1495-1505.
P. A. Smith and G. R. Thomas	Comparison between S71A and S71D results from the ESRO I/Aurorae Satellite. ELDO-Cecles/ESRO-Cers Scient. and Tech. Review 1972 Vol 4. 113-132.
D. M. Willis and G. R. Thomas	Geometric Factor of a cosmic ray detector: Equivalence of alternative analytical derivations. ELDO-Cecles/ESRO-Cers Scient. and Tech. Review. 1972 Vol 4 101-112.

INTERNAL MEMORANDA

I.M.353	Investigation of microwave scattering by tall buildings.	E. N. Bramley S. M. Cherry