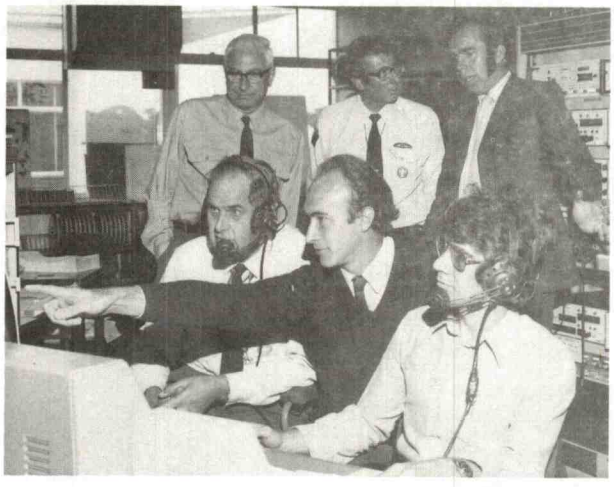
APPLETON LABORATORY
NEWSLETTER

No. 162 November, 1974

SRC - JOTA - BP - ARIEL 5 - GB3BHK - OCT 19/20 - 1974

Not a new computer programme language but abbreviations to explain why the site was invaded by Scouts over the weekend of 19/20 October. Every year they hold an international radio weekend, called the Jamboree-on-the-Air (JOTA), when they gather together on the short waves. As the organiser of the event for the U.K. is also a member of the Appleton Radio Club it is easy to understand why Hut 20 sprouted more wire and equipment than ever before and launched the callsign GB3BHK for this particular weekend. Not only this but a "haggle of hams" assembled too. Dave (G3UKS) and Les (G3BHK) from Appleton were joined by Knut (LA2NL) a Norwegian Scout Leader at present with Sussex University, another Scout Leader Jeff (G3SDG) a B.B.C. engineer, Dave's wife Pat (G4AYL) an ex-Guide and Harry (G3ZTK) a research chemist. At the instigation of John Cathrew the Radio Club also decided to play host to the 1st. Hurst Air Scouts.



IN THE CONTROL CENTRE

IN THE RADIO CLUB

On the Friday evening there was the traditional gathering of the operators to ensure all the equipment actually worked. Contacts quickly followed with Scouts in Northern Ireland, Scotland and the World Scout Bureau in Geneva.

The following morning an early start found two of the operators joined by a Scout from Sydney, Australia and his father hoping to hear their Group Station on from Randwick. The natural law of cussedness allowed us to make contact with a station in Japan, two JOTA stations in New Zealand, Scout HQ in Algiers and only one unsatisfactory contact in Sydney! During the weekend various Air Scouts dropped in and enjoyed listening to the contacts despite the extremely poor radio conditions. (Must be all those rockets they keep firing up into the ionosphere!). In the afternoon we were joined by a Cub Scout and his parents from Rhodesia hoping to hear us contact their old Scout Group in Umtali. Natural laws intervened again and we could speak to Scout stations in South Africa and even one in Perth, Australia but not to Rhodesia! (Of course we did finally work their station ZE1JUM the following morning!). Other stations of interest were ZB2FFG where the Scouts were operating from the top of the Rock of Gibraltar taking their power from the cable car station. Also ZS6JAM at Mafeking where the operator described the Baden Powell Museum there.

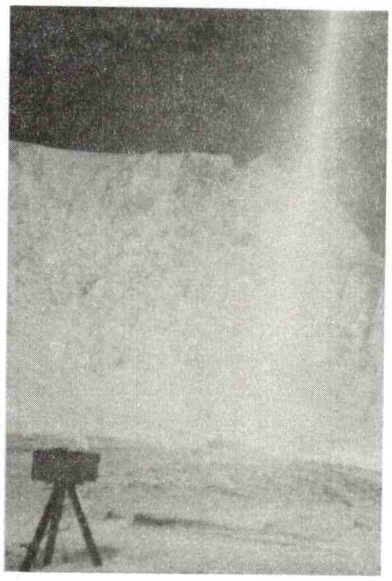
Sunday morning found Dr. Barry Martin sporting his best tie and Les Mitchell his smartest uniform for this was to be our big day! We were to be visited by none other than Air Vice Marshall Sir Bernard Chacksfield, K.B.E., C.B.E., C.Eng., F.R.AcS., R.A.F. (Rtd), Chief Scout Commissioner for England. By kind permission of the Director he was to visit the Ariel 5 Control Centre prior to his visit to Hut 20 to witness JOTA in progress. He showed considerable interest in the Control Room and afterwards remarked on the comparative youth of the staff concerned and on the quiet confident way they had dealt with a pass in comparison with similar activities he had witnessed "elsewhere". Then on to Hut 20 where the operators were certainly not quiet and in the still prevailing poor conditions were anything but confident! Still several interesting contacts were made whilst "Chacks" was with us not the least being GB3GP operating from Gilwell Park, the Scout International Training Centre. Before the station finally closed down in the early evening, contacts were made with Scouts in South Africa, U.S.A., Greece and Malta.

A subsequent check of the log books revealed that the operators of GB3BHK had spoken to 112 JOTA stations in 28 countries. Very creditable results in the circumstances.

P.S. Other S.R.C. news :

Conrad Bray was involved with a JOTA station in Crawley as were members of staff from Rutherford, R.G.O. and U.C.L. with stations in their own home localities. Perhaps the luckiest of all was FØBJO/P John Wright, an Appleton exile at present in the Pyrenees. He reports a long chat with GB3ANT, a station organised by Ranger Guides in the Norwich area. It seems they took pity on John and his lonely plight amidst the winter snows and letters are likely to be exchanged. Look out, they'll be knitting you long woolly socks and balaclavas next John !

Les Mitchell (G3BHK)



PICTORIAL NEWSLETTER

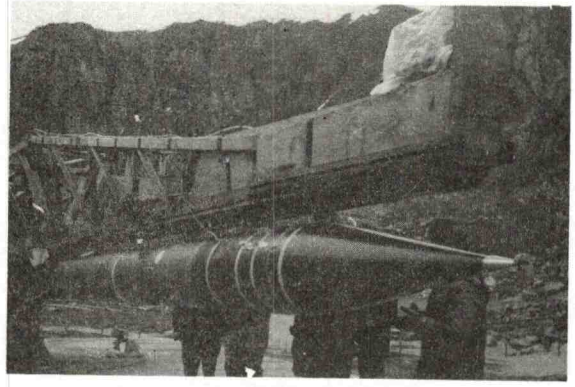
LAUNCH OF SKYLARK ROCKET SL 1221

Skylark Rocket SL 1221 was launched at 20 : 43 : 42 GMT on November 1st 1974 from the high latitude range on the Island of Andøya (68° 18' N) off the Arctic coast of Norway. It was one of a series, from the British National programme, prepared to study various aspects of the auroral substorm.

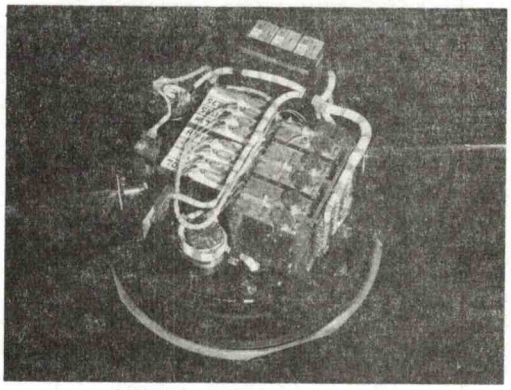
The general aim is to understand how energy is transferred from the solar wind, through the magnetosphere to the atmosphere, and to evaluate the effect of this energy input on the atmosphere. Several times a day, there occurs in the magnetosphere a sequence of events known as a substorm, during which energy is redistributed among the fields and particles. One of the results of this disturbance is the occurrence of aurorae at high latitudes.

The rocket climbed to an altitude of 225 km, and finally splashed down in the Norwegian sea at a range of 240 km after a 500 second flight. The payload carried experiments from the Auroral Particles Group at Appleton, and from a group in the Department of Plasma Physics at the Royal Institute of Technology (KTH) in Stockholm. The experiments were designed to investigate the fine structure in auroral electron and proton precipitation, and to determine the associated electric field vector during an auroral event.

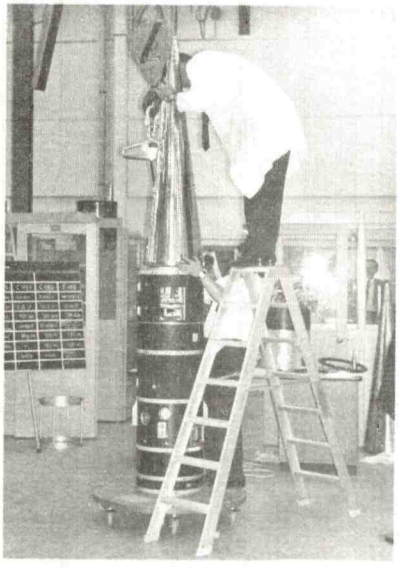
The payload was constructed in two sections. The 'main' payload, remaining attached to the rocket motor, contained electron and proton detectors from A.L. and electric field probes from KTH. Above this, under the nose cone, was a separating package, carrying its own telemetry sender, batteries and attitude sensors, supporting further electron and proton detectors from the A.L. group. At an altitude of 90 km, the nose cone was jettisoned and the package released from the rocket by a pneumatic piston system initiated by an explosive charge, giving the package a velocity of 20 metres per sec forward with respect to the main payload.



LAUNCHER CHECKS



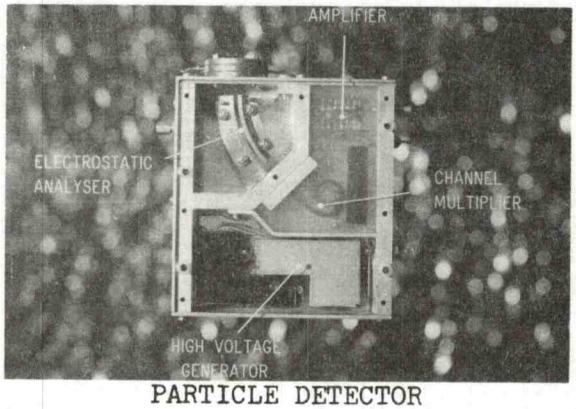
SEPARATING PACKAGE



FITTING THE NOSE CONE

With this mother-daughter system, it will be possible to distinguish between changes in electron and proton intensities that occur as a result of the payloads passing through regions of different intensity in an auroral form which is stable in space, and intensity variations that occur due to the motion of the auroral structure past the payloads.

The rocket was launched over an auroral arc, shown in the all-sky photograph exposed during the burn phase. The dotted lines indicate the path of the rocket throughout the flight. Data was transmitted back to the ground receiving station from all of its twenty-one detectors from the switch-on time at 90 seconds until re-entry into the atmosphere caused breakdown at about 430 seconds. During this time, counting samples were taken 100 times a second. The result is that for this flight there are about $\frac{3}{4}$ million data points recorded on magnetic tape for analysis. The raw data shows clearly the transition in count rate as the rocket traversed the sharp Northern

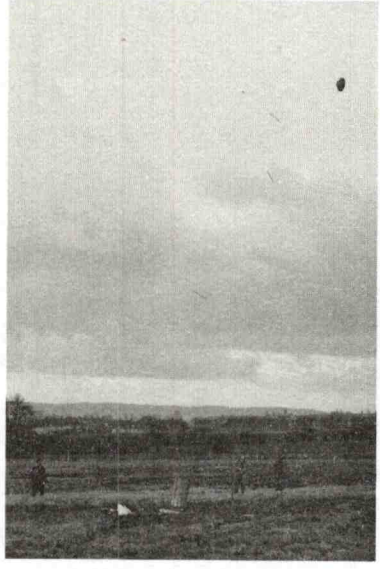


PARTICLE DETECTOR

border. This could help to establish theories about the source of these energetic particles and the large-scale geophysical processes that direct them onto field lines that bring them into the atmosphere in the auroral zone.

The rocket range itself is situated in the centre of the auroral region, 5 km from the town of Andenes, on a strip of land sandwiched between rocky cliffs and the sea. Andenes boasts a flourishing fishing industry, with a busy harbour kept open all year round by the proximity of the Gulf stream. The weather conditions, while stormy at times, are not as severe as those inland.

Two members of the Appleton group travelled up to Andøya at the end of September to join four from the BAC team for the beginning of the preparation period. BAC were responsible for instrumentation and motors. Every unit of the experiment and payload instrumentation was



TRIAL PACKAGE SEPARATION

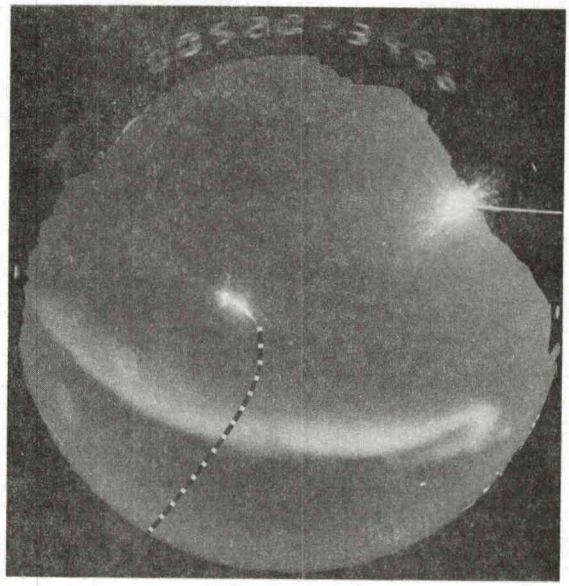
carefully checked, and final adjustments made to the telemetry system. In the middle of October, forces were increased to five from Appleton, six BAC and two KTH. Ground equipment was set up and calibrated. This included a sensitive T.V. system used to record the aurora during the rocket flight - valuable for the detection of fast-moving structures - as well as extensive photographic coverage. These were sited on an optical platform in an exposed position only 10 metres from the beach, and the Norwegian sea. Photometers and magnet-ometers, although provided by the range, were also operated by A.L. personnel.

Out of working hours, time was normally spent mastering the uncertain art of surviving away from home without the support of a wife or a canteen. There were cafés and restaurants in town which served as well during our stay, and many of us returned home with a passion for salted herrings and fried cods tongues. At other times, though, during the long hours of waiting in count-down, we were forced to make use of the kitchen at the range to prepare our midnight feast. For some, this meant a self-inflicted diet of omelettes and cold baked bean sandwiches, while the more adventurous prepared some ambitious dishes, with some memorable results; i.e. we will not forget them in a hurry!

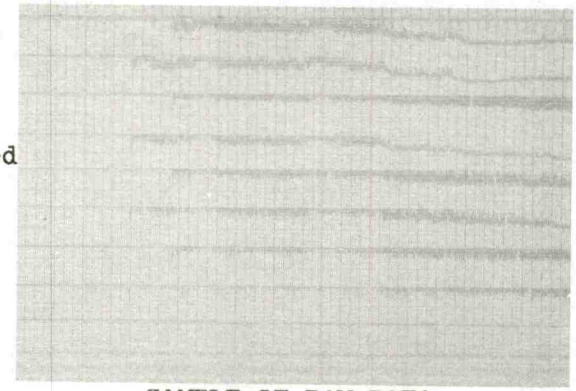
The washing machine also provided endless diversion, owing to its voracious appetite for various items of clothing, depositing them in the most inaccessible parts of the machine. A screw-driver and torch were always at hand to assist the unfortunate victim to reassemble his complete wardrobe. Odd socks were not an uncommon sight.

Such are the conditions that lead to the onset of campaign fever - did someone suggest a moonlit midnight bathe? 100 krona are offered as an inducement to some English daredevil to confirm their likeness to mad dogs (apologies to Noel Coward). The water is tested with one finger - with two - there must have been dangerous currents anyway!

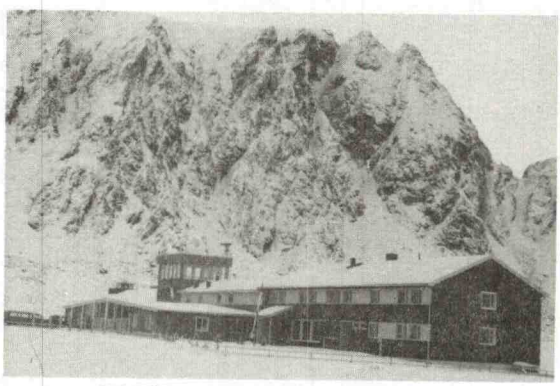
October 21st - the tension and excitement mounted - the first countdown was due on the 23rd. Protective covers were removed



ALL-SKY PHOTOGRAPH SHOWING AURORAL ARC AND ROCKET BURN



SAMPLE OF RAW DATA



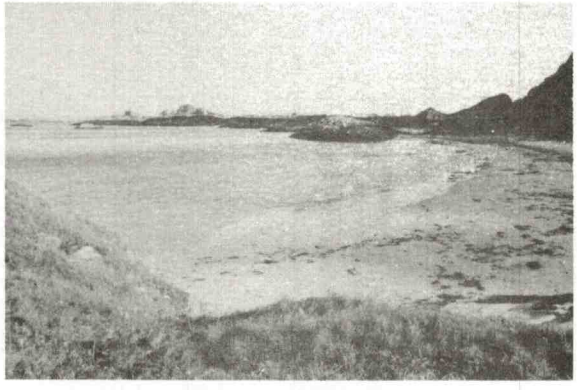
RANGE CONTROL CENTRE

T.V. SYSTEM ON OPTICAL PLATFORM

from the detectors, the nose-cone fitted and the payload transported down to the launch area to be manacled to the awaiting rocket motor already installed on the launcher. Safety precautions are strict, and all operations are cautious and methodical to minimize the risk of accidents. With umbilicals connected, the payload was ready for the final launcher checks. Problems of some sort are inevitable, and much time was spent ensuring all systems were functioning correctly.

So now, after months of preparation, everything was ready we had only to wait for suitable combination of weather and auroral conditions. Each evening, commencing at about 1600 HRS. a countdown was run for the routine of arming the payload and motors and checking the experiment, finally to hold at T-3 minutes, awaiting scientific conditions. A constant vigil was kept at the optical platform for signs of the desired auroral arc, an order from the project scientist over the intercom system now being all that was required to restart the countdown into the final launch sequence. Many cold nights passed, with tantalisingly clear and settled weather - but no auroral activity, until close to magnetic midnight on November 1st, an arc developed rapidly at high elevation and miraculously moved down to the right position. The countdown restarted, the final 3 minutes seemed to run for an eternity. Final vital measurements on internal supplies were made and reported, and all safety aspects checked and double checked. But then 3-2-1 fire, and with breathtaking noise the rocket surged up towards the arc to probe the secrets of these fascinating phenomena.

OMELETTES AGAIN



EXPOSED POSITION

That may seem to be the end of the story, but in fact it represents the start of a new chapter. The data received looks very interesting, and could hold the key to more of the mysteries of the magnetosphere, but there will be many months of work before we will know whether these hopes will be realized.

AURORA

T. Edwards

OBITUARY

MR. C. MACFARLANE

We much regret to report the death of Mr. C. MacFarlane on 27th October 1974. After service with the R.A.F. and a period in industry Campbell MacFarlane joined the Radio Research Station, as it then was, in 1963. His recent years had been marred by increasing ill-health over which, however, his spirit always seemed to triumph. The remembrance he leaves with us is that of a cheerful personality and valued colleague. In that sense, he overcame the odds against him.

To his wife and family we offer our deepest sympathy.

STAFF NEWS

Congratulations to:-

Mike Roberts on his engagement to Miss Barbara Long
Paul Springate on his engagement to Miss Ann Lees
Roger Burdett on his being awarded the Diploma in Management Studies.
Dr. J. Lang now S.S.O.
Mrs. J.I. Scislowski now S/H Typ.I

Welcome to:-

R. Holdaway	HSO
Miss. S.S. Cutts	CO
Miss. N. Gallagher	CA
B.J. Kent	HSO
D.W. Roberts	CO
Mrs. L.P. Chipperfield	CO

Resignations :-

C.J. Burrows	ASO
J.C. Lewis	ASO
Mrs. M.J. Spence	CO

SPORTS AND SOCIAL CLUB NEWS

CHRISTMAS EVENTS

Tickets for the Christmas Dance on Saturday December 14th are now available from members of the Sports and Social Club Committee, at a cost of 80p.

The Children's Christmas Party is on Saturday December 21st and the names of children wishing to come should be written on the sheet provided on the Sports and Social Club Notice Board.

BONFIRE NIGHT

That peculiarly British event took place during November - the celebration of Guy Fawkes attempt to blow up Parliament, and the opportunity for A.L. to

dispose of large quantities of its rubbish, assisted this year by the sad demise of some of the stately elm trees that adorn Ditton Park.

Word of this magnificent event even crossed the boundaries of D.P. when an inquisitive reporter from a local newspaper rang up to enquire about the burning of elms on November 5th, but who seemed quite crestfallen when informed that the said elms were first to be felled and transported to a bonfire. No doubt the reporter envisaged some kind of pagan ceremony with the Appleton inmates pounding through the woods applying flaming torches to all the trees.

The event itself, however, although somewhat less spectacular than this figment of imagination, proved successful, and was aided once again by that Master of Fireworks - Paul Dickinson - for which many thanks, these being extended also to all those who gave their valuable time and efforts to building the bonfire and helping with the fireworks, food, first aid, fire precautions, transport and last, but by no means least, that most important element - the guy.

Chris Gibbins

LETTER TO THE OUTSTATIONS

Dear Colleagues

Since climatology is all the go these days, it fits in well with my intention to report the coming of the rains. We don't, so far, run to the delights which have made the name of Venice and, I suppose, we can no longer be said to hold the gorgeous East in fee since the Singapore outstation was dismantled. Still there is, or at any rate has been, a Grand Canal. It lasted for several days and ran between the end of the Spurs and the Huts.

Those of us who live out there were not ferried across by a sturdy Thames wherryman all done up with Doggett's Coat and Badge or whatever. No carolling gondolier conveyed us beneath the bridges; we trudged and splashed, improving our character the while. But wait - there was one Adriatic touch - two pretty girls sporting around with a trolley. The appeal of aquatic ladies is, I'm told, readily explained, but what Dr. Freud would have made of that trolley is perhaps best kept from one as innocent as,

Yours sincereley,

The Editor

REPORTS AND REPRINTS - NOVEMBER 1974

A.1031 B.C. Fawcett M. Galanti N.J. Peacock	Spectral classifications in the FeXIX to FeXXIII isoelectronic sequences	J.Phys B Atom Mole Phys.	Vol.7 No.10 1974	1149-1153
A.1028 W.M. Burton R.G. Evans W.G. Griffin C. Lewis H.J.B. Paxton D.B. Shenton F. Macchetto A. Boksenberg R. Wilson	Ultraviolet Spectra of Gamma Velorum and Zeta Puppis	Nature Phys Science	Vol.246 No.151 1973	37-40
A.1042 C.J. Gibbins	Tropospheric Emission and Attenuation Statistics at 110 GHz	Electronics Letters	1974 Vol.10	
A.1061 D.M. Willis	Phase variations at millimetric wave lengths on an Earth-space path through model atmospheres	Electronics Letters	1974 Vol.10	2p
A.1067 P.A. Bradley	Computer procedure for deriving the value of the ionospheric characteristics M(3000) F_2 from h'(f) data	Electronics Letters	1974 Vol.10	2p
A.1034 E.N. Bramley	Fluctuations in direction and amplitude of 136 MHz signals from geostationary satellite	JATP	1974 Vol.36	1503-1513
A.1016 J.R. Norbury	A rapid-response rain-gauge for microwave attenuation studies	Journal de Recherches Atmospheriques	1974	245-251
A.1056 C. Jordan	The measurement of electron densities from beryllium-like ion line ratios.	Astron. & Astro-phys.	Vol.34 1974	69-73
A.1106 C. Jordan	The Structure of Solar Active Regions from EUV and Soft X-ray Observations	Proc. of IAU Symposium No.68	June 14 1974	1-41
A.1033 R.W.P. McWhirter R. Wilson	The spectroscopy of plasmas carrying sound waves 1. Spectral Intensities	J.Phys B Atom Mole Phys.	1974 Vol.7 No.12	1588-1601
A.1054 B.C. Fawcett H.F. Henrichs	An extended analysis of Fe V spectra and additional identifications of Fe VI	Astrom Astrophys Suppl.18	1974	157-167
A.1080 H.J.B. Paxton R.F. Turner	An engineering profile of a sounding rocket payload for observation of the sun	Journal of the British Interp. Soc.	1974 Vol.27 (11)	849-859
A.1020 G.M. Courtier M.J. Smith D.A. Bryant	Auroral electrons observed using a mother-daughter rocket	Magneto-spheric Phys.	1974	207-271
A.1081 P.G. Davis	Land, sea and atmospheric thermal noise	Agard	1974	5-1 - 5-13
A.1038 T.R. Larsen G.R. Thomas	Energy spectra measured during a relativistic electron precipitation event on 2nd February 1962	JATP	1974 Vol.36	1613-1622
A.1000 H. Rishbeth	Ionospheric dynamics 1945-1970	JATP	Vol.36 No.12	2308-2319
A.998 L. Thomas	Temporal and geographical variations of D-region electron concentrations.	Cospar Symposium	23-26May 1973	153-167