



APPLETON LABORATORY NEWSLETTER

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A Double First



"Five four three two one FIRE!" The jagged mountain ridge on a remote island in arctic Norway lit up in sharp relief against the night sky as a Skylark 12 rocket roared away from its launcher and climbed almost vertically overhead. "Twenty seconds thirty thirty five thirty six thirty seven FIRE!" The launch area was flooded with light again as a second rocket, a Fulmar, charged after the Skylark on a lower trajectory, cutting the corner in a race towards a bright aurora some 300 km to the north over the Norwegian Sea.

These momentous events, the launching of the first 3-stage Skylark, destined to reach an altitude of more than 700 km instead of the usual 250 km, and the first Fulmar rocket 38 seconds later, are captured in the time exposure above. The more distant buildings are those of the launch area, and the one in the foreground houses the control centre, laboratories, and living quarters (the occupants of which have complete faith in the safety precautions!).

This double launching was the opening salvo of the S.R.C.'s 2nd High-Latitude Campaign. It followed more than a year of intensive preparation by BAC, AWRE, groups from the universities of London, Southampton, and Sussex, and several groups at the Appleton Laboratory. The purpose was to unravel one of the most puzzling aspects of the spectacular and intriguing phenomenon of the aurora, or Northern Lights. The immediate cause of the aurora is well understood: it is produced by streams of charged particles, mainly electrons, entering the atmosphere from space and making it glow like the gas in a fluorescent lamp or like the screen of a television set under similar bombardment. The puzzling fact is that the electrons speed up as they approach the atmosphere. They behave as though accelerated by an electric field in a region of space where, because of the high electrical conductivity, the required electric field should not exist! Theories have been put forward to explain this state of affairs, and these flights were designed to test them. There were several special advantages: the very high altitude of the Skylark 12 would enable us to measure all relevant particles and waves, its long range would traverse the whole auroral structure, it carried a comprehensive set of experiments most of which had improved sensitivity, using the Skylark and Fulmar it would be possible to take measurements at two different altitudes simultaneously, and the high-speed telemetry would give great accuracy. However, both Skylark 12 and Fulmar were untried rockets, and no one could be sure that they would work properly.

After several nights spent watching auroral displays and waiting, not unlike hunters, for a suitable one to appear, the ideal target emerged through clearing in the clouds. It is shown below in a single frame from the record made using a television camera. The field of view is $30^\circ \times 30^\circ$ looking northwards in the direction taken by the rockets. The bright band across the centre is an array of auroral arcs, each one being a vertical curtain of light extending beyond the picture to the horizon in both directions. Stars can be seen through the aurora and between the clouds in the lower half of the picture. The numbers give the date (November 21) and time (in GMT) to the nearest 1/100th of a second.



When these arcs appeared there followed some even-more-than-usual tense moments, caused by a rather taxing form of "local colour", before the launching could take place. They were caused by a car travelling painfully slowly across the public road which crosses the range, and a

blissfully unaware fishing boat that came bobbing round the seaward end of the ridge at the last moment. Fortunately the aurora waited for all this to be sorted out, and remained in position for more than the 15 minutes needed for the flights before it broke up and eventually faded from sight.

The Skylark flight was particularly successful and has produced, even at this early stage, some results which are soon to be published in Nature. The full analysis of the wealth of data produced by all experiments on both rockets is well under way.

D. A. BRYANT

Staff News

Congratulations to :

Heather Welch and Steve Giles on their recent engagement.

Mrs. E. D. Stephenson now C.O.

Welcome to :

J. L. Monk

A.S.O.

R. S. Lewin

Lab. (Ind.)

F. J. Swales

P.S.O. (Trans. from Rutherford Lab. to Winkfield)

Resignations etc. :

P. R. McNamara

S.C.S.

Mrs. L. P. Chipperfield

C.O.

H. A. Cook

Cfn. I

T. S. Bains

Cfn. I

Miss Y. E. P. Dias

S.O.

Other Changes

M. P. Brincat

Ex.O. from Finance to Personnel

M. A. Roberts

Ex.O. from Personnel to Finance

Mrs. P. G. Willmott

Sp. Typ. now full time

C. C. Bray

S.S.O. from A.L. to State House

Universities 'Representatives' Visit

A number of Universities' Representatives will visit the Laboratory on Monday 4th April to meet the Communications and Data Sub-Committee of the Engineering Board. They will see various aspects of the radiowave propagation and related research being carried out here for which the Engineering Board has responsibility.

It is hoped that areas will be found where closer integration may be achieved between our work related to communications and relevant work in the Universities.

Stop Press

Congratulations to :

Pauline and George Walters, on the birth of their son Matthew on 2nd March.

Mike Johnson and Barry Martin, who won the 1976 Southern Regional Civil Service Pairs Bridge Competition at Basingstoke, on 27th February.

LETTER TO THE OUTSTATIONS

Owing to pressure of work there will not be a 'letter' this month.

Parting Gifts

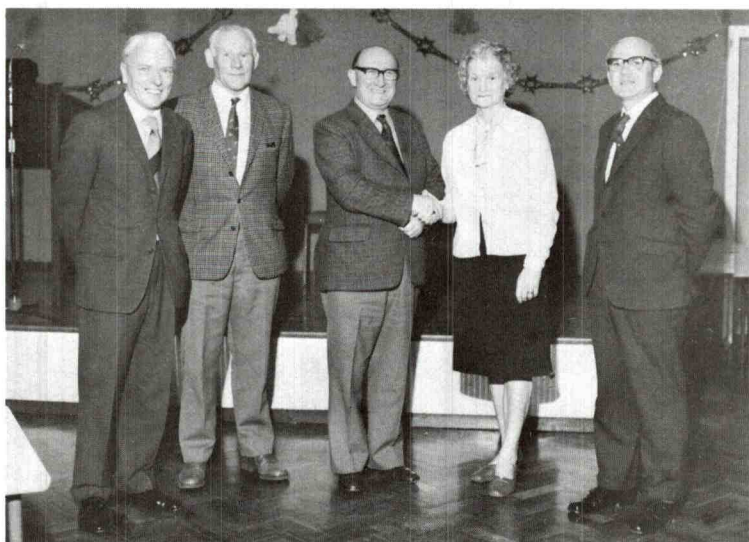
Presentation Ceremonies to retiring staff



Mrs. I. Titford



Mr. G. W. Luscombe



Mr. C. Nicolson M.B.E.



Mr. H. F. Lovesey M.B.E.

Reprint List February 1977.

- A 1181 M. R. Bowman, L. Thomas
'The numerical calculation of wave fields for gravity waves propagating
in an inhomogeneous atmosphere',
Planet. Space Sci., Vol. 24, 1977, pp. 1199-1205.
- A 1187 L. Thomas
'Atmospheric temperatures and the formation of water cluster ions in the
D region',
J.A.T.P., 1976, Vol. 38, pp. 1345-1350.

Internal Memorandum

NIL