R.S.R.S. Newsletter

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TECHNIQUES OF TEMPERATURE AND WIND SOUNDING WITH THE SKUA METEOROLOGICAL ROCKET

By R. ALMOND

(The following is extracted from an article in the Meteorological Magazine; H.M.S.O. copyright).

(Part II)

Temperature corrections - Measurements were made in the National Physical Laboratory low-density wind tunnel at the required density/speed combinations, and with and without radiation, in order to determine the law governing temperature rise above the true air temperature in the falling sonde temperature element. Dynamic heating and radiation errors are complicated by the different flow regimes (free molecular, slip, and continuum) which are encountered between 70 and 20 km, and also by the fact that the temperature element seems to behave as if possessing a dimension factor intermediate between the diameter of the wire and that of the coil. The dynamic heating correction is found to be unaffected by the yaw angle, at least up to 45°, but the radiation correction increases from a minimum at incidences normal to the plane of the double spiral to a maximum at high incidence angles, being eventually cut off by the shielding effect of the temperature-element mounting ring. From a known radiation error at 50 km, errors below this level are calculated assuming the relationship :

$$\Delta T_i \propto \frac{1}{\sqrt{(V\rho)}}$$

where ΔT_i = radiation error

V = air velocity relative to sonde

ρ = air density

/Some

Some values for radiation and dynamic heating corrections are given in Table II.

TABLE II - RADIATION AND DYNAMIC HEATING CORRECTIONS

Height	Radiation correction (45° incidence)	Dynamic heating correction (0-45° incidence, i.e. all practical angles)
kilometres	degrees C	degrees C
20	1.5	0.0
50	3.5	2.1
60	6.5	7.9
65	10.0	15.3

The radiation corrections have been evaluated on the basis of an average angle of exposure of 45°, resulting from the swing of the sonde, and must include a term, not given in the table, based on the albedo of the surface beneath.

The relationship of the element with respect to free molecular flow and continuum flow was found by the wind-tunnel experiment and from this work recovery factors have been found to apply to the full adiabatic rise for air brought to rest in continuum flow. A factor of 1 is applied up to 50 km, and this increases to 1.3 at 70 km. The lag correction is considered negligible. No error could be detected during wind-tunnel measurements, when the radiation source was switched off, indicating that the lag must be less than 1 second which is the decay period of the radiation lamp. Even at the lowest pressures, equivalent to a 65-km height, it was deduced theoretically that with a fall speed of 200 m/s in a lapse of 5 degC/km the error would not exceed 0.5 degC.

The power dissipated in the temperature element is less than 0.015 milliwatts, and this is spread over 772 cm of wire, yielding a negligibly small self-heating error. Because of the long length of wire involved, end effects are also negligible.

Height and wind data - Data from the automatic tracking of the sonde parachute is converted to give heights and winds.

Ground equipment -

Sonde - A standard Meteorological Office radiosonde ground-recording equipment is used which automatically produces a graphical record of periodicity/time at a maximum sampling rate of 40 readings per minute and accuracy $\pm$ 1 periodic-time unit (i.e. $\pm$ 0.1 c/s at 1000 c/s, $\pm$ 0.05 c/s at 700 c/s).

Radar - The standard Meteorological Office auto-follow wind-finding radar is used both to 'skin-track' the rocket for trajectory details, and to track the sonde parachute for wind/height data.

Computation - Sonde periodicities are converted into temperatures by means of a calibration graph and all the necessary corrections applied. A common time-scale is used for the radar and rocketsonde ground equipments, enabling correlation between the two sets of data. Finally, corrected temperatures, associated with radar heights and a tie-on radiosonde pressure, are used to compute pressures and densities to the top of the ascent. The full wind structure is also computed as mentioned above.

/Personnel

Personnel requirement - The firing of a SKUA round at the Royal Artillery Guided Weapons Range, South Uist, Outer Hebrides, involves three teams of personnel. The Army provides four people in the range safety roll who can be called on for each firing after rocket preparation work has been completed. Their duties are : range surveillance, launcher setting check, all safety checks, and finally giving permission to fire.

The R.A.F. team of four is responsible for all rocket handling, preparation (apart from the payload), loading, launching, boost recovery, a certain amount of refurbishing, and assistance by one member in radar operation and maintenance. The Meteorological Office team of four is responsible for sonde preparation, ballistic wind measurement, launcher-setting calculations, radar and sonde ground equipment operation and maintainance, computation of the sounding and preparation of the 'ROCOB' message. The Bristol Aerojet Company, who are the rocket manufacturers, have supplied trials officers throughout the development stages of the project.

Co-operation at all times has been excellent and, as our hosts, the Army have made our visits to South Uist at all times trouble free.

(concluded)

TWENTY YEARS ON

The recent pictures of the moon, from the moon, have given rise to worldwide comment. Twenty years ago, in the old News Chronicle of 3rd January, 1946, Lunar exploration was even then of sufficient public interest to be allowed a half column. The techniques of radar had just been generally made known and in the words of the Chronicle's reporter :-

> 'Scientists are going to explore the moon. They are going to scale the heights and plumb the depths of the mountains and valleys of the moon's surface.
>
> They will not be going by atomic rocket, but by radar.
>
> Sir Edward Appleton, secretary of the Department of Scientific and Industrial Research, who was made a G.B.E. in the Honours List for his work on radar and atomic energy, predicted in a talk at the Physical Society exhibition in London last night that the technique of radiolocation could be used for systematic exploration of the moon and of its geography.
>
> It could be used to track meteors and study the behaviour of cosmic ray showers which originate in the remoteness of Space.'

Probably the sub-editor thought that prediction sufficiently taxed credibility; had the reporter been able to foretell the true facts one wonders if the article would have been allowed to stand.

/The

The Soviet Union's achievment in landing instruments gently on the lunar surface show how far mankind's control of physical forces has advanced. It is, alas, restating the obvious to remark that our moral progress would have been easier to predict.

THE CHILDRENS PARTY

Our first R.S.R.S. Childrens' Party was held on Saturday, 29th January from 3 to 7 p.m. and has led to the hope that a similar event will be possible in future years.

On this occasion, nearly 50 children entertained over 30 Aunts and Uncles, - or was it the other way round? The onlooker might have found it hard to tell. The afternoon started with the arrival of the children, the orderly disposal of their coats and hats by Peter Bradley and his Reception staff and the quiet disappearance of parent/chauffeurs for a couple of hours uninterrupted shopping.

Through the generosity of our good friends of the N.P.L. Childrens Party Committee and of other friends in industry, we had the loan of a wide range of amusements and these were set out in the Dining Hall together with other items of interest devised by R.S.R.S. staff.

Our Aunts and Uncles made a point of welcoming each child personally and soon the Hall was alive with happy voices as the various amusements were enjoyed in turn. Several Uncles must have lost weight while superintending the trampoline, such was the energy of its users who, we noted with interest, were nearly all girls.

Among the other attractions were an electric organ, closed circuit television, a light controlled Dalek, a teleprinter system, the now famous N.P.L. noughts and crosses machine, a Scalextric race track and an electric typewriter with Eileen Barnes helping the children to type.

Later, the children moved up to the Boardroom to enjoy a cartoon film show, and through John Reed's films, to see some of the work that their fathers were doing.

During this period, a colourful party tea was set out in the Dining Hall Annexe by a number of mothers who had worked with Audrey Jones throughout the afternoon preparing the tea as well as catering for the Aunts and Uncles.

The childrens' appreciation of the tea was probably best judged by their quietness while they ate, - hardly a sound. Their vocal cords were, however, well exercised during the entertainment that followed.

Auntie Lela Kaye with her puppets was, it appeared, rather hard of hearing and required almost deafening responses from the children during her act. She got them. Our M.C. John (Uncle Bob) Cathrew with vocal support from Kathy Sumner and Jock Gourlay then led the children in the singing of popular songs which allowed plenty of audience participation. In particular, one little American visitor from Winkfield earned a generous round of applause for his animal noises in "Old Macdonald Had a Farm". Music for the occasion was most ably provided in the modern manner by Brian May and his Group of Roger Lucas and John Tetlow. They may not be in the Charts yet, but keep on looking.

/Regretfully,

Regretfully, perhaps, all things had to end and so with a friendly word and a small gift from Father Christmas (Thank-you Dump) our little guests departed into the night.

The ripples have now subsided but the Committee do wish to thank all the Aunts, Uncles and helpers who gave so freely of their time and energy to make the Party a success. A special vote of thanks is due to our Treasurer, John Pearson, for his handling of all the Invitations and for his skill in keeping us solvent.

Such, however, is the resilience of R.S.R.S. staff and so great are their powers of recovery that on the Monday morning following the Party we had offers to help next year. With this good will in mind it would be pleasant to contemplate holding a Saturday Party for our own children and then, while everything is prepared, a Sunday Party for an equal number of children from local Orphanages and Homes. Your offers of help would then again be gratefully accepted. Thank you.

Uncle Vic

STAFF NEWS

Congratulations to :-

David and Sheila Croom, on the birth of their son, Peter James on 25th January 1966

Adrian and Margaret Baber on the birth of their daughter on 30th January 1966

Michael and Monica Oliphant on the birth of their daughter, Katherine Ann on 27th December 1965

Margaret Peart and Tony Young who were married at St. Thomas' Heatheryclough, on 29th January, 1966

Welcome to :-

Visitor

Mrs. S. G. Vassileva, a member of the staff of the Geophysical Institute of the Bulgarian Academy of Sciences who is visiting R.S.R.S. for about three months.

New Staff

Mr. G. M. Johnston	T/EO
Mr. J. Garrett	T/AEO
Mr. A. Colsell	Lab/Messenger
Mr. A. Dean	T/EO
Mr. C. A. Anderson	Lab/Messenger
Mrs. S. M. Lowes	T/SA (part time)
Mr. V. D. P Foley	Exec. Officer
Mr. D. Logwinowicz	Labourer
Mr. M. G. Simmonds	Labourer

Resignations

Mr. M. Gough	Lab/Messenger
Mr. H. M. G. Fielding	Sandwich Course Student
Mr. J. F. Gaynor	Sci/Asst. (unest.)

SPORTS AND SOCIAL CLUB

What-oh

How many people, who, if they watched the T.V. Show "The World of Wooster" on Tuesday 8th February, realized that 15 members of the Sports Club were helping to provide the audible appreciation, having been lucky enough to obtain tickets to the B.B.C. Television Studios at Wood Lane.

In spite of the parking problems, it was seen that all ticket holders were present amongst the scaffolding, cameras and lights at 7.30.

Although the finished show runs only 30 minutes, an interesting hour and a half was spent in watching it being filmed. It was most impressive to watch the slick interchange of sets, the skilful manoeuvring of the cameras and microphones, the polished acting of the imperturbable Jeeves and the incomparable Bertie. Richard Waring worked hard to cover the unavoidable gaps in the action to keep the audience awake, and in a responsive mood.

In all, it was voted a most pleasant and enjoyable evening, which it is hoped to repeat in the future.

J. Juleff

Smith-Rose Cup Badminton Tournament

An interesting evening's Badminton was enjoyed on Thursday 3rd February at the Baldwin Institute, Eton when the Annual Matches in this section of the Smith-Rose Cup Tournament were played. The teams, consisting of members from Spurs A, B, Administration and Workshop versus members from Spurs C, D and Winkfield, played three mixed doubles games to decide the match.

The first game resulted in a win for Spurs A, B, etc., when Kathy Sumner and Peter Bradley met Veronica Lovell and Roger Davies. The score was levelled at one-all by the defeat of Margaret Powell and John Cathrew by Dorothy Preece and Tim Bevan leaving the final game as the decider. In this game Annette Bailey and Gus Gordon-Smith held their own against Clare Seabrook and Geoff. Hawkins, the final result being a win to Spurs A, B, Administration, and Workshop by two games to one.

You are reminded that this quite strong section of your Sports and Social Club meets each Thursday evening in Eton and anyone interested should come along. Racquets and shuttles are available.

R.J.C.

Car Rally

There will be a Car Rally held on Sunday, 27th February 1966, details of which are on the main notice board. The event will contribute towards the Smith-Rose Cup, so please let us have YOUR support.

A. B. Lowe

/Bridge Club

Bridge Club

Bridge evenings were held on January 17th and February 7th. The next club evening will be on Friday 25th February. A match was played against the Road Research Laboratory on January 26th which we lost by 63 International Match Points. Our team was:

Dr. Bain and Dr. Hopkins — Dr. Dickinson and Mr. Zavody
Dr. Bramley and Mr. Pratt — Dr. and Mrs. Fooks

The third match in the NPL Inter-division Bridge League was played on February 1st when Dr. and Mrs. Fooks and Mr. and Mrs. Gordon-Smith were placed third for R.S.R.S.

Two teams of eight played in the Smith-Rose Cup match on February 11th; the East team (from Spurs A and B and the Administrative Block) won by 1450 points.

Jean Fooks

Camera Club

A rebuke has been received, on account of the alarm and despondency caused by the message "Jamaica Slides Today" posted recently on the Sports Club notice-board. Despite this, or perhaps because of it, the Tuesday lunchtime slide shows continue to draw capacity crowds. Topics planned for the coming month are:

March 1 : ALL CHANGE ..... A Selection of Transport
March 15 : FLORIDA ..... By Jack Geisler

Henry Rishbeth

Even Engineers are Human

For Valentine's Day

1. A thousand cascaded triodes,
   Each of Gm 10.2,
   Would sorely lack the needful gain,
   To match my love for you.

2. Ten forward biassed diodes,
   To shunt my ardour, dear,
   Could not suffice to attenuate,
   My signal you would hear.

3. Had we been two transistors,
   On a monolithic block,
   Our complementary symmetry,
   Would have withstood any shock.

4. The curves of band-pass filters,
   Spaced at nf/Q,
   Have nothing like the heart's response,
   At the merest glimpse of you.

5. The deepest modulation,
   Of undistorted sine,
   Could not convey to you in full,
   My need to make you mine!

Y. Giagam

(your guess is as good as mine)

LETTER TO THE OUTSTATIONS

Dear Colleagues,

'Send reinforcements, we are going to advance' was telegraphed, so legend has it, as 'send three and fourpence, we are going to a dance'. There are other wittier, less repeatable, examples of signalling errors; but one received here the other day is ground for speculation. 'Birthday, three pounds' it said in the midst of more mundane signals.

What was it meant to be, an announcement for our congratulations column? Three pounds is a bit in the flyweight class I'm told, so that seems doubtful. A mnemonic for some parameter to a useless nineteen decimal places? Not worth the trouble. A reminder and a demand perhaps from a wife or offspring? We never found out, but undoubtedly someone, somewhere, is waiting for something; was it one of you?

Last Monday, sharp at noon, all R.S.R.S. staff could be seen 'gettin' fell in outside' not, admittedly, tallest on the right, shortest on the left; not in three ranks; but at least in some sort of order for the Station photograph. The camera has a tendency to fix one's face into a frozen grin and a brisk February climate did little to improve this. Still there we are for posterity to marvel at. It is a pity all of you could not be included, but at least it means there is no photographic record of your association with such a character as,

Yours sincerely,
The Editor

THE FARADAY MEDAL 1966

Members of Staff will be pleased to learn that the Director has been awarded the Faraday Medal of the Institution of Electrical Engineers in recognition of his extensive researches on the physics of the ionosphere and of his studies of the propagation of low frequency radio waves.

We all join in congratulating Mr. Ratcliffe on the receipt of this most important award.

A. F. Wilkins