The NZAEI NEWSLETTER

No. 22 April 1971

The 1971 Work Programme

The work programme of the Institute for this year has been finalised and is as follows. A number of the projects will be carried out in association with the Lincoln College Agricultural Engineering Department and the Department of Agriculture Engineering Section.

Tractor Safety Projects

The programme to assist in the establishment of a sound International Standards Organisation test procedure for wheeled tractor safety frames and a national test procedure for frames mounted on crawler tractors will continue.

The relation of tractor noise to safety frame design and performance will be studied further.

The investigation of tractor accidents will only be on a limited scale and will be confined, generally, to checking the performance of certificated frame design.

Machinery and Mechanisation Projects

Work in extending the scope of row crop mechanisation is to be continued with emphasis on horticultural applications and in particular on process cropping. The programme to develop associated equipment includes the design of a tomato harvesting machine.

In conjunction with the Levin Horticultural Centre development work on the blackcurrant harvester will be continued and there will be preliminary studies made of the design and construction of a prototype raspbery harvester. In the field of pip fruit available mechanisation techniques will be studied and harvesting aids will be developed.

Co-operation with the D.S.I.R. in the design and construction of protein extraction machinery will continue.

The Application of Fertilisers, Insecticides and Herbicides

There will be continued co-operation with the Department of Agriculture in the development of subsurface application machinery.

The programme of field and laboratory evaluation and calibration of ground spreading equipment will include the development of improved spreading devices, studies of particle ballistics and an investigation into the best material gradings for manufacture.

The development of equipment and techniques for measuring the distribution of spray materials from aircraft will continue.

Irrigation and Water Supply Projects

A study of orchard irrigation in association with the D.S.I.R. at Nelson will continue. Work on crop water requirements involving soil moisture monitoring and on fertiliser and soil water movement in trickle irrigation systems will be carried out.

There will be more research into the construction of dams in loessial soils. The installation of various North Otago water conservation projects should begin and there will also be an investigation into water conservation in Central Otago.

Agricultural Hydrology

There will be a study of the mechanics of mole tile drainage systems which will include field experiments. The rural catchment flood estimation project will continue together with the development of design techniques and the accumulation of information for the design of spillways, waterways and culverts.

A review of current erosion control structures on agricultural land will be caried out. The mechanics of erosion processes will be studied, including the erodibility of soils and the simulation of rainfall and erosion.

Water Resources Projects

In association with Lincoln College, the Ministry of Works and Regional Water Boards investigation into water resources development problems in Canterbury and Otago will be undertaken.

Structures and Service Projects

Long term trials are to be instituted to determine the durability of various fencing materials and there is to be further development of low-cost fencing techniques.

A set of standard designs for farm bridges is to be prepared and a critical survey of woolshed layouts is to be made.

Extension

Projects will include farm water supply, irrigation and dam activities as requested by the Department of Agriculture and Catchment Board Officers. In addition, work will begin on drafting design manuals and handbooks on farm water supplies, dam construction, irrigation and drainage.

Design assistance will be provided to safety frame manufacture as required.

The Effect of Safety Frames on Tractor Noise

Over the past year Graham Garden has been carrying out noise measuring tests with tractors and tractor safety frames. The object has been to establish the extent to which safety frames may influence the level of noise experienced by the driver, thereby increasing the hazard to hearing. The Occupational Health Unit of the Department of Health was associated with the Institute in this project.

In general noise-induced deafness is progressive and depends on the loudness of the noise and the duration of exposure. Continuous ex-



Detecting and recording noise levels. The tractor driver wears an open framed helmet to which the microphone is attached. The voltage due to noise pick-up is fed to the recording or measuring instrument operated from the tray. The tow chain seen leaving the photograph lower left is attached to a second tractor acting as a variable load through its braking system.

posure to a lower level of noise can be as damaging as exposure to a higher level for a shorter time.

The insidious aspect of this form of deafness is that damage occurs first to that part of the ear which is sensitive to sounds above the pitch of normal speech. The victim seldom realises that his hearing is affected until he has difficulty in understanding conversation. By this time the damage is irreparable.

Only properly conducted hearing tests will reveal the onset of noise-deafness and warn the individual to take protective action before the condition is serious.

Of course, as increasing age can bring progressive deafness and as the susceptibility of individuals varies, not everyone will be affected equally when exposed to the same hazard.

As many tractors are already noisy enough for unrestricted exposure to constitute a hazard to hearing, it was obviously important to establish whether or not the addition of a safety frame increased the risk of hearing damage.

The tests were carried out using three common models of tractor in the 65 horsepower class chosen at random from those which would accept most of the safety frames at present available. Noise levels were recorded for each tractor. First, without a safety frame, then with each of the various safety frames fitted. Where possible, any changes in noise level caused by adding weather or acoustic protection provided by the manufacturer were also measured.

The effect of fitting six different makes of frame on to the three tractors was investigated. Four of these frames were two-post types and the other two were four-post designs each with a roof.

For each tractor and tractor-frame combination noise measurements were made under three conditions, in all cases with the engine running at maximum governed speed. First, with the tractor stationary, second, with the unloaded tractor moving on the road in the highest gear, and finally, with the tractor pulling a progressively increasing load in each gear except top.

As far as possible the test procedures were the same for each tractor-frame combination. The driver wore an opened framed helmet on which a microphone was mounted adjacent to his ear. The microphone was connected to a sound level meter and a tape recorder operated by a second person who was carried in a tray mounted on the tractor three-point linkage.

Noise levels were measured throughout each run and the peak levels were determined.

From an analysis of the results the maximum noise levels measured on the bare tractors were sufficient to cause hearing damage, in varying degrees, to the majority of tractor drivers if exposure on a weekly basis is more than eight hours a day. However, only a small percentage of drivers would be affected if the daily exposure is less than four hours.

With the bare two-post frames fitted to the tractors there was no significant increase in the noise levels measured.

The addition of a roofed four-post frame increased the noise by an amount which varied with the make of the frame. Acoustic pads fitted to these frames reduced the noise level, in one case to approximately that generated by the bare tractor.

Attaching weather cladding may appreciably increase the noise level and reduce the safe time of exposure.

In considering the tests it must be emphasised that the aim of the investigation was to measure the effect of safety frames on noise levels. There was no attempt to survey the full range of available tractor models. Information on the noise generated by bare tractors is generally available from overseas testing results. The working times recommended above refer only to tractor models which give similar noise levels to those tested.

One conclusion at least can be drawn from the results. It is that tractor drivers who work long hours, or who use partially or fully enclosed frames risk permanent hearing damage. The use of ear-muffs or ear-plugs in these circumstances is strongly recommended.

STEPS IN OBTAINING EXPERIMENTAL INFORMATION ABOUT AERIAL SPRAYING

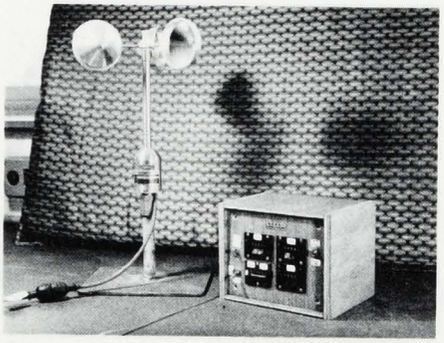
The photographs below show some of the processes which the information collected in the aerial spraying project goes through. This work which was carried on last year by Professor Yates and John Hager is to be continued this year by Graham Garden.



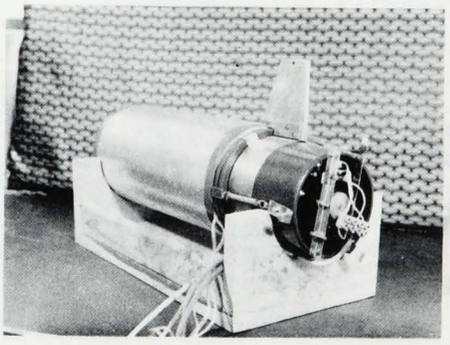
The Piper Pawnee aircraft used in the initial tests. The Transland spray equipment can be seen beneath the trailing edge of the wing.



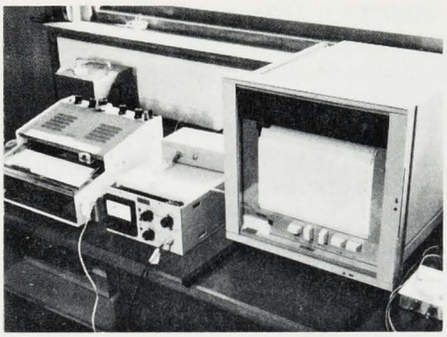
Masts and equipment set up in the field to record micro-weather data for subsequent analysis.



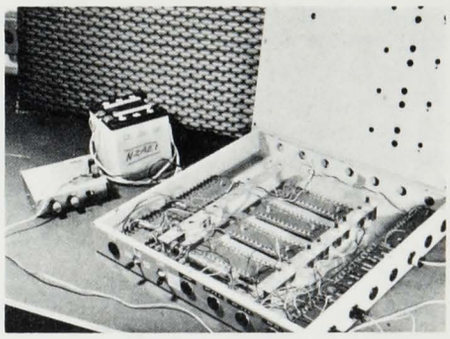
One of the low torque anemometers used in the tests together with the associated mechanical counter.



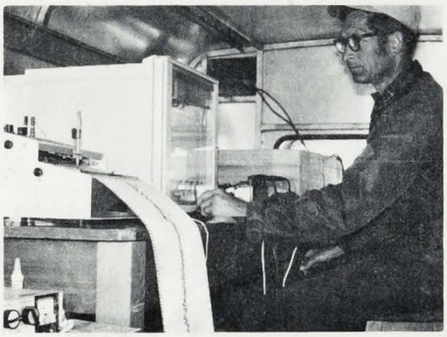
One of the aspirated radiation shields in which the wet and dry temperature sensors were mounted. This instrument was designed and constructed at the Institute.



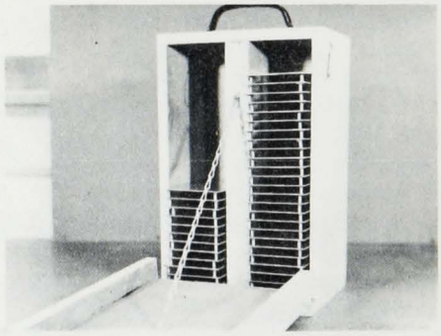
In the centre the ratemeter which converts the pulses from the anemometer into varying direct voltage to drive the recorder. On each side of the ratemeter are recorders used in the tests.



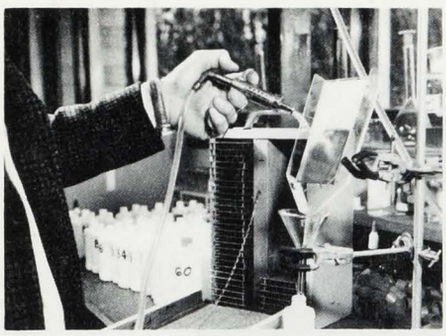
The complex interconnection box which was constructed to provide suitable connecting and terminating facilities between the mast-mounted instruments and the various recorders.



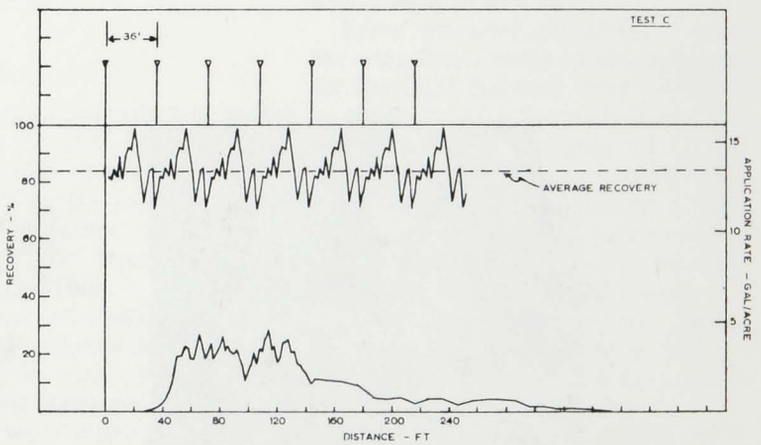
Monitoring the recorders during a test run.



A stack of stainless steel plates mounted in their carrying box. Spray samples are collected on these plates when laid out in the field.



The method of washing the residue on the plates into collecting bottles for later measurement. An automatic vaccinator gun was used to provide the correct quantity of water and detergent used to wash the plates.



The form the results can take. In this case illustrating the deposit pattern of a test. The aircraft run was at 29ft and there was a cross-wind component of 9.8 mph.

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