

The distance apart of the shock waves can be calculated approximately as follows. The distance between the bow and the front tail wave is equal to the speed of sound multiplied by the time for the body to slow down from sonic speed to just below its critical Mach number. The distance between the bow wave and the rear tail wave depends on the time-history of the accelerated and then retarded motion of the body. When this is known, the calculation can be completed, since it has been shown that the rear tail wave is left behind in the wake of the body at the commencement of the supersonic motion, while the bow wave separates from the body at the conclusion of the supersonic motion. In addition, as a first approximation, it may be assumed that the free shock waves are moving normal to themselves at the speed of sound. The spread of the shock waves after a given time can be found approximately from the corresponding Huygens wave diagrams for the motion of a point source which replaces the body.

In the case of steady motion at supersonic speeds, the bow and tail shock waves are of infinite extent, except where they are reflected from solid surfaces. The rear tail wave is now infinitely far behind the body and hence is not observed.

Noise from High-speed Aircraft

In the case of jet-propelled aircraft travelling at high subsonic speeds, the main noise is due to the turbulent motion created by the jet. At supersonic body speeds, the sensation of noise caused by shock waves, even when they are weak, is very much greater than that due to other sources, although the duration of the noise is very short. For a body flying at constant supersonic speed at a fixed altitude, the bow and tail shock waves will sweep over the ground, and these and their reflexions will be heard by observers as separate bangs, only if their time interval is greater than about 0.02 sec. For a body executing a high-speed dive, during which the speed increases and then decreases through sonic speed, ground observers may hear one, two or three bangs depending upon their location and the time-history of the motion. In the cases where more complicated manoeuvres are executed, simple analysis will determine the number of bangs to be expected.

In the discussion above, the refraction of the shock waves through a non-uniform atmosphere has not been considered. This will not invalidate the above results; but it should be noted that for certain manoeuvres the shock waves produced around the body at altitude will not penetrate to the ground.

¹ Gold, T., *Nature*, **170**, 808 (1952).

² Warren, C. H. E., *Nature*, **171**, 215 (1953).

³ Rothwell, P., *Nature*, **171**, 216 (1953).

⁴ Lilley, G. M., and others, College of Aeronautics Report 71 (1953).

HEALTH OF THE SCHOOL CHILD*

THE report of the Chief Medical Officer of the Ministry of Education for the years 1950 and 1951 shows that the mortality-rate of children aged 5-14 years is still falling. Of the 3,341 children who died in 1950, 851 met their deaths through accidents—about half of them motor accidents. 294 children died of tuberculosis compared with 937 in 1938, 207 of cancer and 153 of poliomyelitis. Deaths from diphtheria continued to fall: 16 children died in

* Health of the School Child. (H.M.S.O.) 5s. net.

1950 compared with 1,733 in 1938. The general health of the children continues to improve.

There has been a remarkable reduction in skin disease among children. During 1947-51 the number of children with scabies, impetigo and ringworm of scalp has fallen from 108,000 to 34,000. Acute rheumatism is being reduced, and although more than 4,000 children a year suffer from this disease, this is less than a third of the number ten years ago.

Cleanliness of school children is also improving. "Even so," states the report, "it is inexcusable that 347,544 children (6%) were found verminous in 1951. Parents of consistently verminous children must have very little self-respect." A persistent campaign is being waged against this problem; but success in preventing repeated re-infestation depends upon the measures taken to deal with possible verminous conditions in other members of the family—in particular, the pre-school child and the young adult. In one area, methods of treatment include an offer of DDT hair-cream to the parent.

Nearly 4½ million children were examined or re-examined during 1951 by school medical officers. 157,566 children were found to have defects in vision and a further 37,499 children required treatment for squint compared with 31,189 in 1949. Nearly three children in every thousand required treatment for defective hearing, and nearly five in every thousand were recommended to be kept under observation. More attention is now being paid to the ascertainment of deafness in children as it is considered vital to treat them early in school-life.

The report includes a highly critical survey of open-air schools by four medical officers of the Ministry. In their account of premises they state: "There are in this country some first-class open-air schools which have been designed to give the children full benefit from fresh air and sunlight, but there are others which are merely ramshackle wooden huts, unpleasant to live in and ugly to look at. In some of the schools the walls were simply screens, made partly of wood and partly of canvas extending from the floor about 2-4 feet from the ceiling. The rooms were without any means of heating and were often without artificial light. In wet, windy weather, rain drove in between and above the curtains so that the floor and furniture were often wet. We saw children scraping frozen snow off the desks and chairs before they could be used. In cold weather the children sat at their desks wearing hats, caps, coats, scarves and gloves, and with blankets round their legs. As doctors, we cannot feel that refrigeration or dampness contributes to health and, therefore, we strongly condemn the 'bandstand' type of classroom. In one school on a wet day we saw the children lying on damp canvas stretchers in an unheated, open-fronted stone-floored shed, with the rain driving in at the front and leaking through the roof".

The report explains that a well-conducted open-air school is of great value for delicate children, and apart from its physical benefits, they usually find sheer pleasure in being out of doors; but they must be kept dry and reasonably warm. There is still a place for these schools, especially in industrial areas; but no expansion of existing provision is considered necessary. "With a rising standard of living, better housing, the provision of meals and milk in schools, and with a fuller appreciation in the ordinary schools of the varying needs of individual children, it may be that the need for special schools for 'delicate' children will diminish with the years."