BRITISH AND FOREIGN OFFICIAL PUBLICATIONS

Pilot Error : Some Laboratory Experiments. By D. Russell Davis, M.D., M.R.C.P., D.P.M., of the Applied Psychology Research Council of the M.R.C. 1948. Air Ministry A.P. 3139A. Pp. 39. Price 9d.

This forty-page monograph describes the results of tests carried out by pilots in the Cambridge cockpit testing machine, in which 355 pilots carried out a test lasting forty minutes. The Cambridge cockpit is a replica of the normal aeroplane, and the apparatus is designed to copy flying conditions with suitable changes in the readings of the instrument panel, and alterations in position of the cockpit, noise, etc., which accurately mimicked flying conditions. The test was divided into four ten-minute periods, and the movements of the levers by the pilot following the changes in the instrument readings were all plotted. The test was standardized, and about 75 per cent. were regarded as normal.

Those who were abnormal (87 subjects) were marked by two distinct reactions. Two-thirds were classified as showing the *overactive* reaction. Their movements to stabilize the plane, correct direction and height, etc., were rapid and excessive. They became irritable, and angry either with the machine or themselves; they swore, and thumped on the controls, but seldom damaged the machine. They tended to concentrate upon one part of the problem, and neglected others. Those who showed this reaction returned later and wanted to do the test again, and they clearly showed an abnormal reaction to the procedure. The test had produced a post-experimental, too persistent, wrought-up feeling.

One third of the abnormal group showed an inert reaction. In the last period of the test these subjects' errors were large and the activity to correct the machine was small. There was a general omission of the necessary readjustments, but deterioration was selective and did not affect all parts of the test at once; the instruments furthest away from the centre of vision were most neglected. They became indifferent, they lacked the appreciation of the changed readings which they should have shown, and they markedly underrated their own faults.

Both groups showed much worse reactions when they *knew* they were reaching the end, than when they did not. The abnormal subjects often showed preoccupation with one part of the task and were unable to organize their attention in such a way that they could attend to all the details at once. This apparent failure in behaviour was not associated with failure in the ordinary tests of intelligence, and surprisingly the author can find little justification for the belief that fatigue alone is the cause of failure.

There was good reason to believe that when it could be pointed out to the subjects what difficulties were likely to be encountered, and how these can be checked, the performance was improved. Results were impaired seriously by alcohol. Benzedrine in small doses gave conflicting results, but it did improve capacity after a sleepless night. The effects with barbiturates, caffeine, and vitamins were observed in some subjects. With the

first two no conclusions were reached. With the latter, no alteration was produced despite large doses. *It was not found possible to explain the results on the theory of fatigue*, since no simple relation existed between frequency of errors and the duration of the test.

If fatigue cannot be incriminated, what explanation of the results can be given? The author indicts "anticipatory tension," a process in all normal persons which lessens as success is gained. In the abnormal subjects the wish to succeed and the fear that they may not, result in the errors found. Confirmation of this was found in the study of the responses of thirty-nine patients, where the findings in the cockpit experiences were compared with the results of interviews with two independent psychiatrists, and where there was close correspondence between test results and subsequent flying career.

The application of these results to industry may seem small. Yet every factory has its overactive and inert persons, some of whom are problems when they are not actually accident-prone. It is seldom that matters of life and death weigh so heavily as in the conditions copied in the Cambridge cockpit. Yet such a study can hardly afford to be neglected, for several reasons. It confirms the doubts as to how far fatigue alone plays a part in accidents. It emphasizes human variables. It throws doubt on the efficiency of aptitude tests alone, divorced from the problem of the persistence of skill. We may find by the new tests the apt workman. Can we ensure so far as the delicate processes go that his skill will continue, or will he constantly be giving variable results because his performance can so seldom be relied upon? Dr. Davis's paper should be studied alongside Grinker and Spiegel's *Men Under Stress*, a study of breakdown in U.S. airmen. The memorandum under review is very silent upon psychiatric problems and theory. But it does quietly emphasize how important these theories are, and it throws into commendable perspective the relationship between theory and the practical results which are presented.

This contribution from an academic psychological laboratory is an admirable survey. Is it too much to hope that bequests and grants should be given to quiet investigations of this sort, even though large-scale or immediate benefits are unlikely to follow?

Henry Wilson.

Central Mining—Rand Mines Group. Report for the year 1947. By A. J. Orenstein. Johannesburg: Health Dept., Rand Mines Ltd. 1948. Pp. 18. No price given.

This is a statistical report on the native labour employed in the Rand mines. There are 91,108 natives employed and this labour showed a turnover during the year of 90.7 per cent. It is concerned with mortality rates, morbidity rates, food, the incidence of diseases in general, occupation, cost of hospital beds, and other such data. It states that silicosis does not play an important role in the health of native employees. This

is probably related to the large turnover mentioned above, the interrupted service, and the relatively low total years of service. In 1947, there were 58 cases (0.64 per 1,000) and 4 deaths (0.05 per 1,000). The pneumonia rate was 33.72 per 1,000, tuberculosis 2.39 per 1,000, and influenza 33.08 per 1,000. There were 12 cases of enteric fever, 22 of scurvy, and 2 of pellagra. There were 6 cases of heat stroke with 3 deaths.

K. M. A. Perry.

Legislacion Sobre Seguridad e Higiene del Trabajo. Published by the Spanish Ministry of Labour, with appendix for 1947. Pp. 202. No price given.

This volume deals with occupational safety and hygiene. It refers to legislation as early as 1900, from which date it would appear that the Spanish Government began to investigate and control industrial conditions more thoroughly than before. The book is in sections devoted to industrial accidents, including those occurring in agriculture or at sea. The insurance measures con-

cerning these are also described, and the regulations designed to limit their incidence. Certain diseases are recognized as of occupational origin and are the reason for special precautionary and compensation legislation. The Ministry of Labour has a statistical department and also controls or suggests scientific investigation of accidents and occupational diseases. It has a staff of medical and lay factory inspectors, and appears to take particular care of women and children in industry. Their employment is completely prohibited in many occupations, and much restricted in others. There is special legislation to deal with women in the period before and after childbirth. This volume is not a complete description of all legislation, but rather a supplement describing recent additions or modifications thereof. The illustrated "safety first" posters are particularly well designed and worded. The worker's attention is drawn to the existence of a safety committee at his place of employment, and he is exhorted to keep in touch with it for mutual advantage.

G. C. Pether.

ABSTRACTS

(This section of the JOURNAL is published in collaboration with the two abstracting Journals, *Abstracts of World Medicine*, and *Abstracts of World Surgery, Obstetrics, and Gynaecology*, published by the British Medical Association. The abstracts are divided into the following sections: toxicology; industrial physiology; industrial lung disease; industrial dermatitis; accidents and orthopaedic surgery; industrial ophthalmology; environment; general. Not all sections will necessarily be represented in any one issue)

TOXICOLOGY

Exposure to D.D.T. ANDERSON, A., and KHORRAM, M. A. (1948). *Brit. med. J.*, 1, 1132.

A survey was made of 32 persons exposed more or less continuously for 9 months to DDT in oil. Sprayers who used 3 to 4% DDT in kerosene as a residual spray were liable to absorb the drug through the skin and by inhalation. Workers who used 2.5% DDT in a 75% gas-oil and 25% fuel-oil mixture for the control of mosquito larvae were also liable to absorb the drug through the skin, as were the workers employed in mixing the two solutions. A comparison of the exposed group with a control group of 36 men in similar social circumstances and of similar nutrition (although of higher average age) revealed no difference in the average weight and blood pressure after the 9-month exposure. Vesiculation was observed in the sprayers where the straps of the spraying machine had chafed, but this was thought to be due to the kerosene. No significant signs or symptoms were noted in the exposed group, the recording of tremor of the hands in 9 men being regarded as doubtful. The urine of the exposed group was examined for organically bound chlorine but none was found, and it is suggested that this is not a reliable method for estimating absorption of DDT. It is concluded that the continued use of 3.1% DDT in kerosene, without protective clothing, is not likely to give rise to toxic effects. A plea is put forward for the use of a less noxious solvent than kerosene, or the increased use of emulsions of DDT.

Rachel MacHatton.

The Treatment of Acute Poisoning Produced by Gamma Hexachlorocyclohexane. MCNAMARA, B., and KROP, S. (1948). *J. Pharmacol.*, 92, 147.

The high toxicity of the γ -isomer ("gammexane") of hexachlorocyclohexane and the expected widespread use of it as an insecticide present possible poisoning hazards. Suitable treatment is suggested by the authors' findings that the marked hypertension and central stimulatory effects of gammexane do not occur in dogs given pentobarbital, and that gammexane action is antagonized by other isomers of hexachlorocyclohexane. In addition, the structurally related *i*-inositol (hexahydroxycyclohexane), which is a growth factor for certain yeast strains, is known selectively to antagonize the toxic effect of gammexane on certain yeast strains. Massive dose of *i*-inositol administered prophylactically to rabbits over prolonged periods before the administration of lethal doses of gammexane (6 mg. per kg.) failed, however, to lower the mortality significantly.

The prophylactic intravenous administration to rabbits of 20 mg. per kg. of pentobarbital markedly reduced the toxicity of gammexane given intravenously, and afforded protection against 10 times the lethal dose. [Phenobarbitone is also stated by the authors in their comment and conclusions to be effective against the intravenous toxicity of gammexane.] The antidotal value of the α , β , and δ isomers of gammexane is much inferior to that of pentobarbital.

Gammexane administered orally to rabbits in the form of a 10% solution in peanut oil produced in 30 minutes to 4 hours symptoms qualitatively similar to