# SLEEP LOSS AND OTHER STRESSES STUDIED

Had a sleepless night? How efficient and accurate were you at the controls of your car this morning?

Sleeping, like eating, is a basic need of mankind. As we go about our everyday work, we are continually processing information in terms of its predictability or uncertainty. Your performance as a controller of your car, for example, is dependent on your ability to process the information you receive through your senses and to make the appropriate control actions. If you drive to work, you can predict the journey you will take to a fairly reasonable extent, the traffic you will encounter, the buildings you will pass and the streets you will travel. Generally, all these things are highly predictable and, should you be suffering from lack of sleep, you probably will be able to cope with them.

But occasionally an uncertain or improbable event occurs. Because it is improbable, it happens infrequently, and it is then that you may find yourself in trouble. If a motorist has been deprived of sleep, how will he react, and what length of time will it take for him to react? A motor-car may not travel too far in a tenth of a second and a motorist may be able to take evasive action if he runs into difficulty. But what about the pilot of a jet aircraft travelling at supersonic speeds?

Since man's information-processing capacity is affected by psychological stress induced by such circumstances as loss of sleep, interrupted sleep, alcohol consumption, or fatigue, it is of critical importance to control-systems designers to know the precise nature of this change.

What effect, then, does loss of sleep or any form of stress have on skill performance?

## ENGINEERS AND PSYCHOLOGISTS

For the last four years, engineers and psychologists in the Control Systems Laboratory of the Division of Mechanical Engineering of the National Research Council of Canada have been trying to design instruments capable of determining how humans react when performing tasks under stress. This information will be used in the design of control systems that will permit the human operator to give his best performance in the control of the machine he operates.

Why are psychologists involved in this research? Besides being a controller, the human being is also a machine, and psychologists must obtain some knowledge of how that machine works – how the human controls his own behaviour – in order to assist the engineers.

In 1966, the late Dr. C.B. Gibbs joined NRC's Control Systems Laboratory to continue work he had

*Subject tracks moving light on the stressalyzer as engineers and psychologists in the Control Systems Laboratory record his reaction and movement times.*

undertaken during the Second World War on the design of control systems. In order to study movement control (the relation between what you see happening with your eyes and what you feel is happening with your limbs), Dr. Gibbs invented an instrument known as the "stressalyzer". It consists of a steering-wheel that controls the movement of a pointer. Behind the pointer are five positions that can be lit up in turn. The subject's task is to align the pointer with the illuminated position, and to follow the light as it jumps between positions. One feature of the instrument is that the pointer moves the opposite way to the steering-wheel. But its more critical feature lies in the fact that the possibility of predicting the next movement changes from position to position.

"Suppose," says Dr. Leslie Buck, a graduate psychologist from London University, who joined the Control Systems Laboratory in 1967, "that the operator is aligning the pointer with the far-left position. He knows that on the next movement the light will change and he will have to move to the right. Similarly, movement from the far-right position is what is called unequivocally determined."

From the middle position, however, the operator may have to move to the left or the right, each possibility being equally probable – or "equiprobable". From the intermediate position, again, left *versus* right movements are possible in the ratio 1:3. "Thus," says Dr. Buck, "from these positions movements towards the centre of the display are more probable, and movements towards the extremity are improbable."



(Over)