HOW FAST WILL MAN TRAVEL?

BODY LAGS FAR BEHIND MACHINE IN ABILITY TO TRAVEL AT SPEED

SCIENTISTS, hoping to step up flying speeds from the 500 miles-per-hour mark to within range of 1,000 m.p.h., are worrying more about man's physical constitution than they are about such things as wind resistance, stream-lining, engine-power, lift, acceleration and the host of mechanical factors which have to be reckoned with. For them, the probable behaviour of the blood is harder to estimate than the behaviour of assemblies of mental hurtled through the air at higher and higher speeds.

At the moment, really high speeds have been attained only in exceptional circumstances. For example, in a power dive (in which an American military plane has reached 650 miles per hour) or in a fast combat turn, the top speed is attained suddenly, within a few seconds of the lower speed. And the inability of the human body to face sudden accelerations of this intensity is the main obstacle to research in this sphere.

It is the actual acceleration itself, and not the very high speed, which causes the trouble. Experts are confident that any person of average sound constitution can smile comfortably through an acceleration in level flight of 30 metres per second, right up to 1,000 m.p.h. (1,610 km. per hour) in 15 seconds, and would feel no ill-effects afterwards. But even if peace-time should follow up military experience with 1,000 m.p.h. stratoplanes, no airborne machine which reaches such speeds can hope to keep all its accelerations to level flight. That is why scientific preoccupation in aeronautics is with tests on pilots after close turns at speed and after pulling out of power dives.

Different physical reactions occur according to the direction of the acceleration, the amount of acceleration, and the time it lasts. The scientific conclusion is that the position of the pilot's body may eventually decide his ability to withstand acceleration strain. For normal purposes the ordinary sitting posture is satisfactory. But the centrifugal force exerted at combat speeds drives blood from the head, concentrates it round the heart. The inturruption of the circulation which occurs reduces the brain's supply of oxygen, impairs the vision and rapidly produces what pilots call "blackout". If acceleration continues, "blackout" changes to complete loss of consciousness, lasting several seconds. Consciousness is regained and vision restored rapidly after acceleration ceases.

In theory, a method of minimising ill-effects would be to support the body in a dense fluid contained in a sealed rigid tank. The U.S.A., whose researches into air speeds and altitudes have given the world some remarkable new devices, have recently internationally patented just such a flying suit: a double-walled suit which can be filled with air, or liquid, under pressure. But improvements in body resistance have also been effected by bandaging the legs and stomach, and by lowering the seat, raising the legs and adopting a crouching position. Greatest improvement, however, has resulted when the pilot is in the prone position. Turns and dives bring centrifugal forces to bear at right angles to the blood stream, in this position, and there is less abrupt displacement of blood. Much greater accelerations can be endured lying prone—face downwards, or upwards,—than in any other known position.

The Germans have produced a Heinkel plane which can reach 400 m.p.h. The British hold the world's land-speed record over a long course, when a Spitfire averaged 408·75 m.p.h. for 200 miles. The American "Thunderbolt" is the most powerful single-seat fighter in the world, and has easily topped the 400-m.p.h. mark. But all these planes carry heavy arms, ammunition, fuel, wind-resisting radio aerials and all the necessary equipment demanded by combat conditions. And so powerful have the engines which lift and accelerate these loads become, that when peace-time aviation comes back into its own, record speed levels will undoubtedly jump suddenly. Science cannot yet guarantee, however, that man's body will be able to withstand the stresses and strains which the metals that enclose him can easily resist.

Imagineering.—This is a fascinating word coined by the Aluminium Company of America. This new word admirably describes what is constantly taking place in scientific progress, writes *The Journal of Scientific Instruments*, 1942, p. 192. It seems to be especially applicable to the applications of physics to industry. Physicists in these times have usually to be also part-engineers. It has often been pointed out that physics is a subject requiring a good deal of imagination, and as was recently stated in *Nature*, the research physicist's 'real affinity is with the creative artist and the value to the community lies in the spark of originality which he brings with him into the world'. It is this combination of the creative artist with the more mundane engineer that seems to be so beautifully described as an 'imagineer'. It is to be hoped that imagineering which has come so much to the fore in recent years will develop under that name or any other that proves equally convenient and expressive.