Physiological Aspects of Flying

seconds at 25 radial, one minute 15 seconds at 35 radial. One subject was unable to complete the task at 36.

The acceleration in rocket-propelled take-offs of piloted aircraft would be limited by the personnel carried. It would be important to learn what maximum g in the transverse position, relative to the pilot, could be tolerated while still allowing him to perform accurate movements with hands and feet. If the pilot was in the prone position ahead forward, linear acceleration at take-off would result in positive g and in a reduction of negative g would be experienced. The tolerance of man to positive g when fully stretched out was known to be very low, and the limiting g for this position should be determined.

Dr. Lovelace said that at the Aero Medical Laboratory at Wright Field it had been found that exposure to negative g for several seconds would lead to over-distortion and rupture of vessels within the head, but exposure to higher accelerations for times under 0.3 seconds did not cause such injury. Means were necessary to exert counter pressure on the veins in the head and neck. Experiments under zero gravity demonstrated that flight suit design and equipment that would function in any part of the world at an operational temperature range of from -90 deg F to +100 deg F. In addition to the effect of solar heat upon the man, without cooling, the cockpit of some aircraft could easily reach 180 deg F at extremely high speeds. It had been necessary to develop experimental flying clothing that could be ventilated internally. Results had indicated that it might soon be possible to protect pilots over the temperature range quoted by the use of a single lightweight clothing assembly.

Regarding noise and vibration, the author said that Army and Navy pilots had uniformly expressed their great appreciation of lack of noise and vibration during flights in jet aircraft, stating that there was less fatigue present.

Pressurization and Decompression

Cabin pressurization was next discussed, and a definition of comfort was given as "the state in which one is unconscious of adaptation to environment." Passengers did not have a sense of comfort or complete freedom of sensation above 5,000 ft until they were acclimatized. Normal healthy people could accommodate to altitudes as high as 12,000 ft.

Loss of pressure in present-day pressurized aircraft could be considered a minor hazard in view of existing laboratory and flight test information. The degree of compression that would function in any part of the world at an operational temperature range of from -90 deg F to +100 deg F. In addition to the effect of solar heat upon the man, without cooling, the cockpit of some aircraft could easily reach 180 deg F at extremely high speeds. It had been necessary to develop experimental flying clothing that could be ventilated internally. Results had indicated that it might soon be possible to protect pilots over the temperature range quoted by the use of a single lightweight clothing assembly.

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The toxic effects of carbon dioxide at both ground level and altitude deserved more study. Although direct evidence in the literature was not available, various animal experiments by Dr. Lovelace (White, 1948) tentatively fixed the maximum safe allowable carbon dioxide concentration at ground level at 5 volumes per cent for 5 minutes or less, 4 volumes per cent for 15 minutes or less, and 3 volumes per cent for not more than two hours. Carbon dioxide was better tolerated at altitude, and tolerance, being a function of the partial pressure, allowed calculation of altitude equivalents from ground level data.

Four volumes per cent carbon dioxide at ground level, for example, was equivalent to 5, 6, and 7.5 volumes per cent of a velocity of 60-64 ft/sec with maximum acceleration of 15g, or 90 g/sec to 480 m.p.h. for a few seconds without tearing tissues. With proper positioning of headrests on ejector seats it was found that the head could be kept erect during the ejection stroke, thereby preventing hyper extension.

Modifications to the ribbon type parachute used in Germany and now undergoing constant test in America would undoubtedly provide for safer escape from high-speed aircraft at both low and high altitudes.

Bailing Out at Transonic Speeds

Safety provisions for the pilot of the Douglas D-558 Sky streak in case of extreme urgency at transonic speeds entered discussions in 1945. The design of a jettisonable bubble canopy, a nose section or an escape hatch, would function in any part of the world at an operational temperature range of from -90 deg F to +100 deg F. In addition to the effect of solar heat upon the man, without cooling, the cockpit of some aircraft could easily reach 180 deg F at extremely high speeds. It had been necessary to develop experimental flying clothing that could be ventilated internally. Results had indicated that it might soon be possible to protect pilots over the temperature range quoted by the use of a single lightweight clothing assembly.

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