

SYNOPSIS

BIOLOGICAL EFFECTS AND IMPLICATIONS OF WEIGHTLESSNESS

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First, a statement of the problem of weightlessness is given. A brief comparison of gravitational forces is made in the dynamics of space flight and aerodynamic flight. Mention is made of the brief periods of subgravity and weightless states frequently encountered here on earth by the average person.

A short review is given of some of the early experiments and projects in the research on the effects of zero gravity, and is carried up to the present. Present knowledge now available on the effects of weightlessness, including some information from Titov's flight, is summarized.

Since short periods of weightlessness are not the important part of the problem, but rather the effects of prolonged weightlessness, questions are posed regarding these effects on the various anatomical systems of the human body, and on their physiological functions. An attempt is made to answer these questions by studies of two situations, which can be achieved here on the earth's surface, in which there are certain similarities to the prolonged subgravity state or to the weightless state.

These two situations are prolonged rest in bed and the suspension of the human body in water for periods up to two weeks and the changes which occur in the body in these environments. Because these similarities do exist, some estimate can be made of the effects of the prolonged weightless state on the cardiovascular system, the respiratory, genito-urinary, gastro-intestinal and musculo-skeletal systems as well as on certain parts of the central nervous system. Examples of these effects on musculo-skeletal system are the negative nitrogen mineral balances when the loss of normal weight stress on the body occurs. Negative mineral balance increases the possibility of formation of renal calculi.

Finally, methods for prevention of these effects are discussed, and also the advantages which might accrue to the astronaut (space man) from the subgravity or the zero-gravity state.