

## FOREWORD

The University of Michigan Committee on Human Flight (UMCHF) is presently involved in designing a Man-Powered Aircraft (MPA). The Committee realized that the first step in their design is to define the limiting factors of the project. The only limiting factor upon which all other design components are dependent is the power-to-weight (P/W) ratio. This factor is crucial because it determines whether or not a plane can gain enough lift for a take-off.

*organizational  
problem  
and  
context*

Man can generally work harder for a shorter period of time than for a long one, but there are few systematic studies of the exact way in which power output diminishes as the duration of the exercise increases. Extensive physiological studies have been made on running, but in this form of exercise little external work is being done. Therefore, previous studies and the results obtained are of only indirect use for our present purpose—the design of a Man-Powered Aircraft. The need exists for further investigation to determine the work that man can generate. This reason alone brought about the request from Professor Anderson, UMCHF project supervisor, to find the maximum work output that can be generated by man. An attempt is made to examine the properties of man in considering him purely as a source of mechanical power. We will be concerned here with only the production of work by the human arm and leg muscles. The report answers the following questions posed by the Committee on Human Flight:

*technical  
problem*

*assignment*

*technical  
questions*

1. What is the maximum power output that an average man can generate pedaling a bicycle transmission, and how long can he maintain this rate?
2. Will hand-cranking affect the above figure significantly?
3. Should supplying additional oxygen be considered in increasing the power output?
4. Should we consider obtaining a professional cyclist in powering our MPA so that a higher power output can be realized?

The purpose of this report is to state the conclusions obtained in my investigation. Recommendations are made so that decisions can be made by the Committee on Human Flight in the design of the MPA. The knowledge gained from these further studies will also be of considerable interest in the design of all types of man-driven machines.

*rhetorical  
purpose*