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Houston, Texas  
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TO: Distribution

FROM: SD/William E. Thornton, M.D.

SUBJECT: Flight Bicycle Egrometer for Shuttle

The only exercise device currently available on Shuttle is a degraded version of the first true U.S. treadmill (TM) designed for Space (1974). It had many recognized limitations and was never intended for some of the uses to which it has been put and has never had basic flight evaluation and testing. It does not surprise me that many criticisms have been levelled at this device.

To alleviate some of these problems, I am recommending that a bicycle egrometer be quickly obtained for use in some of the Detailed Supplementary Objectives (DSO's). This egrometer is a much simpler unit and produces "pure" aerobic exercise. Since the investigations frequently purport to be aerobic studies, this would have the further advantage of providing such exercise, i.e., not complicated by strength and other effects of locomotor exercise. A very simple, efficient device can be procured from Whitmore Enterprises in 2-4 months and at modest cost, a small fraction of the treadmill. This unit is now highly refined and the most efficient available. It has evolved from our (Thornton/Whitmire) first collaborative effort in the 1960's and has been through design and test for an in-bed hospital exercise and a miniature Apollo egrometer. The basic load unit (eddy current disc and super permanent magnets) has been used in a series of rowing machines. It allows unmatched savings in weight, reliability, and efficiency. The unit will weigh  $\leq 30$  lbs., have load accuracy of  $\leq 5\%$ , require no power, indicate speed and load settings (e.g., be equivalent to a standard Monark) with inputs of 25-300 W/m at speeds of 50-100 RPM. It would be locker stowable. It is my recommendation that this device be procured as soon as possible. It would require flight verification but this could be done in conjunction with ongoing studies.

Several advantages would accrue from this action including: relief of dependence on an overloaded outmoded TM; provisions of a "pure" aerobic exercise which already has extensive, proven experience in space flight; provision of another exercise resource on EDO; and experience with a device which will be baselined for Space Station.

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