# Locomotion in Weightlessness:

Background: Kinesimetry

~~Unaided~~

Locomotion ~~in~~ of is impossible in the weightlessness of space flight. This causes a series of adaptations which would ultimately preclude locomotion on earth. These changes include loss of muscle strength, endurance and mass, loss of bone strength and mass, decreased cardiorespiratory capacity and endurance, and blunted neuromuscular coordination. While this does not affect one while in flight, neither the U.S. nor Russian programs have been willing to allow adaptation such that extensive disability and rehabilitation must occur on return. Both countries have done as much as possible to prevent adaptation or "deconditioning."

~~It On the basis of 1 g. physiology it could have been pred~~

L $\bar{W}$ : K

Locomotion is a complex function requiring; large impulsive forces ≠ often repeated thousands of times, ~~coordinated~~ careful coordination of multiple actions, and large volumes of blood for metabolic support. The only practical ~~inflight~~ replacement for walking, jogging, running ~~is~~ ~~walking yoyo~~ on earth is a treadmill to allow the equivalent activity in space. This Russian Tread Mill was first recognized in the Russian program which had a treadmill in flight as early as ___ and also horizontal treadmills for 1 g. ~~Russian TM~~ studies. Little hard data is available on the unit, ~~other than~~ tread ~~sp~~ area appears limited from photos. ~~For use~~ A harness and very long elastic cords are used to provide a relatively constant axial load which is limited to 50 Kg m - It is both

subject & motor driven,

U.S. experience began ~ Skylab which was launched with only a bicycle ergometer and no plans for measurement of muscle function. After the first flight it was clear that some form of locomotor equivalent leg loads were needed. ~~It~~ It was not possible to have leg exercise available by the second flight and by the third less than 5 # launch weight was available. A crude simulation of walking was achieved ~ the arrangement shown in fig —. The first problem was provision of ~~a leg~~ a force equivalent to body weight and this was approximated / ~~accomplished~~ by elastic bungees adjusted to ~~which~~ produced a slightly larger force than body weight. A Teflon plate allowed sock clad feet to slip along its surface. By leaning forward

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Des Gesatz der Transformation des Knochen
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