

Muscle

Summary 7.7.74

Weightlessness causes disuse atrophy of muscle function and ~~loss~~ ^{with} mass ~~and~~ deconditioning of the C.V.

system. No objective measurements have been made in the ^{previous} American programs and results are unknown from the Russian efforts. Pre and post flight muscle function / measurements of an arm and leg were made with an isokinetic dynamometer on all S.L. crewmen.

The average of the peak forces of 10 maximum effort extensions and flexions of an elbow and the hip & knee ^{on all crewmen} were made pre & post flight, by means of an isokinetic dynamometer. On S.L. which ² was equipped with a bicycle ergometer which was used an average of ^{marked} 31 ~~#~~ WM / KG / day had ¹ losses of almost 25% of muscle strength in leg extensors in arms and legs and up almost 25% loss in leg extensors. Exercisers were added to S.L-3 which provided adequate loading of arms but only slight loading of ~~arm~~ legs and trunk. Bicycle ergometry was increased to an avg. of 65 WM / KGa / day.

Post flight there was virtually no loss in arm strength ^{and} while the rate of loss had been decreased in the legs there was still a loss of $\sim 25\%$ in leg extensor forces.

A ~~simulated~~ treadmill with simulated ^{body} ~~weight~~ producing equivalent body weights of 175 lbs. was flown on S-4 in addition to the devices used on St-3. Post flight

there was a marked subjective improvement in crew's condition as well as a measured leg extensor loss of only 5%.

These ^{measurements} ~~measurements~~ were also supported by anthropometric ~~of~~ which showed a compatible

decrease in a mid calf segment loss. It appears that

^{reasonable} ~~proper~~ amounts of properly designed exercise can prevent atrophy and deconditioning under weightlessness.