

Lyndon B. Johnson Space Center
Houston, Texas
77058

Reply to Attn of

SD-90

TO: SD/Sam L. Pool, M.D.
FROM: SD/William E. Thornton, M.D.
SUBJECT: Space Exercise Program Status

As flight duration increases, exercise and exercise devices become increasingly important. This was recognized more than 3 years ago in the Astronaut Office (AO)/Project Office (PO), and a basic program was started to provide the essentials for musculoskeletal and cardiovascular support for both Extended Duration Orbiter (EDO) and Space Station Freedom (SSF). The hardware and experience from this were to be given to SD. Sometime thereafter a much more extensive effort was started in SD. At the same time, the AO program was blocked until I agreed to do it under Life Sciences (LS) aegis - and control - with the understanding that support would be provided. Great effort was made to obtain a NASA contract which allows close technical monitoring and interchange with the contractor. The result of this contract for \$225K of non-SD money is an EDO/SSF treadmill (TM) prototype, an EDO flight dynamometer and a flight rowing machine for EDO/SSF with the final items, an EDO flight ergometer and a SSF ergometer/dynamometer, to be delivered in weeks.

The SD effort has not produced one piece of flyable hardware (1-g), and the best effort is a prototype which has two fundamental flaws and is to be completed in December for \$300K⁺. Total costs for the two efforts are an order of magnitude different. At the same time, SSP now needs, has needed, an upgraded treadmill. Early in 1990, it became obvious that SD would not do the necessary follow-on of the original AO program; and I agreed to do this with the provision that all of the necessary hardware (three items) be supported by both money and organization. As part of that agreement, I directed the technical aspects of setting up an essential test laboratory at the MacDonnel Douglas facility to evaluate designs.

The prototype treadmill was delivered in December 1989, and a program was developed to allow its testing and a schedule to deliver a flight EDO/SSF treadmill by October evolved based on testing of the prototypes. This necessary testing was repeatedly delayed by SD's support contractor and by being displaced from the MacDonnel Douglas test laboratory by other SD elements. Money was assigned to the NASA contract for only a treadmill. Pressure was brought to let the follow-on contract, which could not in good conscience be done until testing of the prototypes would allow

reliable specifications. No money was made available for the remaining hardware items.

In July, sufficient test results were available to allow writing of the specifications for the treadmill; but I was told the money was no longer available. Last week you said that the money would be available for the treadmill, but only through the SD support contractor, i.e., not a NASA contract. The many problems and low probability of success of this approach based on experience was pointed out. Reluctantly, an alternative plan using the support contractor was provided to which there has been no reply. At this time, all of the hardware needed for EDO & SSF support is available or can be produced in less than a year for a very modest sum. The NASA contract will remain open until November. Demonstrated ability to produce is available but cannot go further without support.

There can be little doubt that had the original AO/PO effort been allowed to take its course, hardware would have been available for both EDO and SSF; and if the support subsequently promised had been provided, we could have had an EDO treadmill in October and the remainder of the hardware for SSF support shortly thereafter.

A detailed plan to provide hardware in 9 months has been produced and will be given to SA. A better definition and assurance of support was deemed necessary in light of experience. I remain eager to aid SD and any other organization in any way which will benefit the present of planned NASA spaceflight effort.



William E. Thornton, M.D.