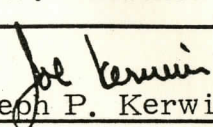


MEMORANDUM

Lyndon B. Johnson Space Center



REFER TO: DF	DATE MAR 23 1976	INITIATOR DF/JPKerwin:cl:3/19/76:2421	ENCL
TO: DB6/John A. Rummel		cc DA/L. F. Dietlein W. H. Shumate P. Whittingham DF/S. Musgrave W. Thornton	
FROM: DF/Chief, Life Sciences Astronaut Office		SIGNATURE  Joseph P. Kerwin	

SUBJ:
Shuttle Exercise

Your proposed exercise program has been received and reviewed.

There are three parts to the exercise problem, and each one belongs to different people - albeit with considerable overlap.

The determination of standards of physical fitness, defined as the strength, dexterity and endurance required to do a job, belongs primarily to those responsible for performance of the job - in this case, FOD. The coach decides how many laps the halfback ought to be capable of running. Naturally the responsible person looks to those with expertise in the field for advice and recommendations, and he may delegate testing. It applies to the entrance requirements and to the maintenance of fitness pre and inflight, in the absence of special medical requirements.

As you correctly pointed out, exercise stress testing is also used as a tool for determining cardiovascular status and detecting the presence of incipient disease. As such, it is a legitimate part of a periodic physical examination, and is the purview of the flight surgeon, supported by the necessary specialists. Additionally, if the evidence clearly shows that exercise inflight is required to prevent disease or disability, it becomes the flight surgeon's responsibility to recommend its proper use.

The determination of the effect of exercise or its lack on adaptation to zero G and readaptation to one G is the province of the researcher. Formal research programs, such as the Skylab experiments, are designed to elicit this information. If the results of research show that crew health is threatened, the problem becomes the responsibility of the flight surgeon. Those are the three aspects of the problem: performance of duties, maintenance of health, and gathering of physiological information. It is, of course, important that each element involved knows just what the others are doing; hence, any exercise used inflight must be properly logged.

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Your proposals, I believe, fall into the research category.

You are correct in noting that the use of exercise inflight may affect other aspects of human adaptation to weightlessness. However, I do not consider this a valid argument for the rigid control of exercise on all shuttle flights. On the contrary, it is a powerful argument for restricting in-depth physiological studies to dedicated life sciences missions, on which all physiological parameters may be controlled and their interactions understood. I consider it completely unjustified to apply such controls, which are necessarily restrictive and time-consuming, to all flights. Most shuttle missions in the foreseeable future will be of less than 14 days duration. Exercise on these flights should be the prerogative of the crew.

Exercise testing for crew selection (I refer to entry into the astronaut corps, not assignment to specific flights) has traditionally been part of the medical examination, and I have no problem with your testing plans or proposed standards. Annual exercise testing of crewmen is also an ongoing program, and a valid one, although there is a tendency for it to accumulate research add-ons. I suggest that the physical fitness information which is a by-product of these tests be passed to the Chief, Astronaut Office, for his review, if he so desires.

Inflight exercise should be clearly distinguished into research and routine, the routine to be the province of the FOD. I do have a personal axe to grind in this area. Dr. Thornton's treadmill is being designed and tailored for use as an operational exercise device: compact, lightweight, efficient and self-powered, and we plan to recommend it for this function. It will be effective, as the bicycle is not, of minimizing leg muscle deconditioning. It will, of course, require calibration so that logging of exercise will be meaningful.

As to the specification of inflight exercise, I agree with you that on missions of much less than 14 days duration exercise is not medically required. Further experience, with end-of-mission g-tolerance might alter this. I do not believe that, when exercise is required, it is required only for individuals of marginal preflight fitness.

Thanks for sharing your ideas.