REFERENCE

MASTER

CD-769

Astronuclear Laboratory

September 4, 1962

Transmission of WANL-TME-117
to Aerojet, Re: Action Item 1
from August 10 Technical Direction
Meeting

ASTRONUCLEAR LABORATORY

Mr. H. F. Faught

cc: Mr. F. E. McLane

Please transmit the information in WANL-TME-117 to Mr. J. Carroll,
Aerojet, per Action Item 1 from August 10 Technical Direction Meeting.

H. S. McCreary
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FEMcLane/lel

Attachment

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POWER SOURCE FREQUENCY CONSIDERATIONS

The NERVA Reactor Control System can be designed to operate from any of the power sources between 400 cps and 3200 cps that have been suggested, but there would be various advantages and disadvantages to changing from the 400 cps power source originally planned. This report is for the purpose of describing these advantages and disadvantages.

The major advantage to using a frequency higher than 400 cps would be that all transformers would be smaller and lighter for the same power rating. This would enable magnetic amplifiers to be designed which would have high gain and high power output but would still be smaller and lighter than comparable 400 cps equipment. Unfortunately, there are very few items of equipment presently on the market for power source frequencies above 400 cps, therefore, essentially every item would have to be designed specially for this project. Not only would each item have to be designed, but it would require reliability testing since no reliability data would be available on the newly designed items.

The work done to date on the NERVA Reactor Control System has presumed that 400 cps power would be furnished so components have been selected which are standard production items and completely new items have been designed only where absolutely necessary. If a higher frequency were now selected, a study would have to be made to determine if some of the amplifiers now of the transistorized type should be replaced with magnetic types, but the overall size and weight saving does not appear at the present time to be significant due to the small numbers required.

A summary of the advantages and disadvantages of a power source frequency higher than 400 cps is as follows:

ADVANTAGES

1. Transformers and magnetic amplifiers would be smaller and lighter.
2. Some amplifiers presently planned as transistorized could be replaced with magnetic amplifiers. Magnetic amplifiers, in general, have higher reliability factors.

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DISADVANTAGES

1. 400 cps equipment is readily available, but equipment for higher frequencies must be designed as needed requiring additional time and expense.
2. Reliability information is available for standard 400 cps equipment, but higher frequency equipment must undergo lengthy reliability tests.

If the decision were made to increase the power source frequency due to a significant advantage to other components of the NERVA Engine other than the Reactor Control System, the control system could be designed for operation on any frequency from 400 cps to 3200 cps. It is not considered to be advantageous to the Reactor Control System to change the power source frequency.

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