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Massachusetts Institute of Technology
Department of Electrical Engineering

Servomechanisms Laboratory
211 Massachusetts Avenue
Cambridge 39, Massachusetts
April 12, 1951

File: DD354
By: RRE
Date: 3-15-69

Electronic Computer Division
Telephone ELiot 4-3311
DIC 6673

Gordon S. Brown, Director
Jay W. Forrester, Associate Director
Albert F. Sise, Associate Director

Mr. N. McL. Sage
Room 5-105
M.I.T.

Dear Nat:

The Whirlwind computer in the Digital Computer Laboratory is being used as a part of an experimental air defense system. The computer receives radar data, performs the function of track-while-scan, and computes interception courses. At present it has limited terminal facilities and only one-eighth of its design storage capacity. Results in the past few months have been better than the expectations of most people. Aside from the 1951-1952 operating budget additional funds are needed immediately to extend the capacity of the computer to demonstrate its capabilities for handling low flying aircraft requiring the processing of information from many radar sets. The expenditures proposed below total \$310,000.

1. The internal memory of the machine consists of 16 storage tubes and 16 identical sets of circuits. This memory needs to be substantially increased to handle more targets, interceptors and radars. It can be doubled by duplicating this present equipment. The necessary electronic panels are completely designed. We wish to order the necessary parts and subcontract the assembly of panels.

Estimated Cost.....\$25,000

2. In order to provide tubes for (1) above, our storage tube construction facilities must be expanded. The proposed expansion will also provide for construction of research tubes leading to higher storage density. Given the facilities, we have every expectation of increasing the internal memory capacity of the machine by a factor of 4 within the next year, in addition to the factor of 2 obtained from the second bank of tubes and circuits.

Estimated cost of additional storage tube facilities..... \$25,000

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3. This laboratory has developed a line of special pulse circuit test equipment. Additional test equipment is needed for storage tube research. This equipment is also extremely flexible and useful as building blocks for the rapid synthesis of control and conversion systems which will have to be used for studying means of handling the additional equipment and data which will be integrated into the system. Our designs can be duplicated, or commercially available equipment modeled after our designs can be procured. Depending on the magnitude of systems to be designed the amount of this item could vary greatly. We have immediate use for the amount stated.

Estimate for additional test equipment.....\$20,000

4. As the number of radars and the complexity of terminal equipment necessary for the interpretation of this data increases, more and more rapid switching equipment becomes necessary. This has been designed and should be constructed as soon as possible.

Estimate for input-output register and switches..... \$25,000

5. The designed internal high-speed electrostatic storage capacity (8 times the present capacity) is not sufficient for all the data necessary to the complex multiple-radar defense system now contemplated. There should also be two magnetic drums of a type available from Engineering Research Associates. As procurement will require many months, these should be ordered promptly. Roughly estimated prices are complete with read, write and control circuits.

- a. A magnetic drum and circuits for extending the internal storage capacity of the machine as will be required for aircraft schedules, weather data, radar with coordinates and coefficients, etc..... \$50,000
- b. A second magnetic drum unit for use as buffer storage between radar sets and the computer..... \$50,000

6. The proposed air defense system, although highly mechanized in many respects, requires the display of data for proper human evaluation and command decisions.

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Display systems may have to be very sophisticated and we cannot now make an estimate other than for the immediate future. Our present display system is already inadequate for the amount of data we are able to present with limited storage and we need to improve it immediately.

Estimate for adequate display scopes.....\$12,500

7. We now have a staff of 10 doing analysis and the preparation of coded tapes by which the computer is instructed how to handle the air intercept data. This staff is to be increased and will overload tape preparation equipment.

Estimate for additional flexewriter equipment.....\$ 2,500

8. The communication link between the various radars and the computer is by way of telephone lines. At the radar site, data must be converted to a form which makes the best use of the telephone line bandwidth; at the computer and the data must be converted to a form usable by the computer. For code conversion equipment, scopes, oscillators, etc. to provide matching from telephone lines to the computer, rough estimate..... \$50,000

9. The development work carried on by this laboratory for the air defense program has outgrown present space. Additional space is expected to become available but must be provided with power. We expect to require funds for special high-capacity well-regulated central laboratory power supplies and installation.

Estimate for power..... \$50,000

Sincerely,

Jay W. Forrester

by

Harris Falmestock

Harris Falmestock

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