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Memorandum L-134

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Division 6 - Lincoln Laboratory  
Massachusetts Institute of Technology  
Cambridge 39, Massachusetts

CLASSIFICATION CHANGED TO:  
Auth: D12254  
By: RCE  
Date: 3-15-60

SUBJECT: DIVISION 6 FISCAL 1954 EXTRAORDINARY BUDGET

To: Jay W. Forrester

From: Robert A. Nelson

Date: 5 January 1954

The attached budget of \$822,000 for extraordinary expenses for Division 6 for Fiscal 1954 is a revision of the budget proposed in L-105, 3 July 1953. It represents the upper limit of realistic probable expenses and should not be increased unless special new items presently unforeseen need to be brought up. The amounts include commitments already made since 1 July as well as items we expect for the remainder of the fiscal year; commitments from Fiscal 1953 outstanding on 30 June are not included.

Several of the items are uncertain:

1. Under Account 6-205 an amount of \$3000 for a Barta courtyard power installation. This work may not be required.
2. Under Account 6-212e, the drum for MTC may remain the property of Project High (IBM).
3. Under Account 6-212g, it is not certain when MTC will be moved. Thus, part of this amount may not be committed until Fiscal 1955.
4. Items b, c, e, and f under Account 6-215 are uncertain to various degrees depending on how much is included in the original building. If they are to be taken care of by us, there is some doubt as to whether commitments for all of them will be made during this fiscal year.

Account 6-224 is new.

Signed: Robert A. Nelson  
Robert A. Nelson

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Approved: JWF  
Jay W. Forrester

RAN:t1

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Accounts

6-202 Cape Cod

a. Drum Display.

It has been decided not to incorporate a flicker-free display in the Cape Cod System using Whirlwind I.

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b. Scopes and Consoles.

Installation of the Cape Cod System requires additional costs in fiscal 1954 beyond those incurred in 1953. Included in these costs are amounts for consoles and associated equipment, and special switches.

\$11,000

c. Tote Boards.

The tote boards considered desirable for the Cape Cod System are being supplied by Division 2 from the Quick Fix system.

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d. Drum Parts and Spares.

The operation of the Cape Cod System is dependent upon magnetic drums. The auxiliary drum is still being improved and requires additional auxiliary equipment, including improved writing units. We do not have a complete spare drum and must have a certain supply of spare parts in case of damage to a drum.

14,000

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6-202 Cape Cod (continued)

e. Manual Intervention.

The Cape Cod System, as constructed in the last few months, provides a variety of types of manual intervention. Some expenses are required for additions and modifications in this category during fiscal 1954.

\$ 5,000

f. Marginal Checking.

The marginal checking system of the Whirlwind I Computer, which was designed several years ago containing a large number of relays, has not proved entirely satisfactory. To reduce the maintenance time for the Cape Cod System, we plan to replace these relays with a hermetically sealed type.

30,000

g. Miscellaneous (Cape Cod).

We will be providing improved lighting, an improved character generator, and other miscellaneous facilities for the Cape Cod System.

9,000

h. Additions to MITE.

To provide for the use of additional radars in the Cape Cod System, as the second drum becomes available, more terminal equipment must be installed.

7,000

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6-202 Cape Cod (continued)

i. Magnetic Tape.

A supply of multi-channel magnetic tape is required for recording input data to the Cape Cod System.

\$ 3,000    \$79,000

6-205 Power Supplies

A variety of items is included in this account as a continuation of work planned during the past few months. Included are spare supplies for the central D.C. distribution to experimental areas, spare supplies for the Whirlwind I Computer, and some work to provide power supplies for a circuit research and development group to remain in Cambridge.

7,000    \$ 7,000

6-206 Ceramic Equipment

Additional ceramic processes and molding equipment for the production of experimental memory cores.

5,000    \$ 5,000

6-207 General Ceramics Subcontract

General Ceramics has made valuable contributions in their research on memory cores under our subcontract. We wish to have them continue this research. The subcontract has been extended to 31 December 1953,

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6-207 General Ceramics Subcontract (continued)

and \$15,000 of 1954 money was previously committed for the extension. The additional \$20,000 is included to cover an additional six months through 30 June 1954.

\$20,000    \$20,000

6-211 Terminal Equipment (Typewriters)

Three additional typewriters and some associated equipment are being added for use in connection with preparation of tape and printing out of results for the System.

9,000    \$ 9,000

6-212 Memory Test Computer

MTC, recently put into operation, has proved very valuable for the purpose for which it was designed. We expect to add to it considerably to give it greater flexibility and to help in the use of testing new components and ideas.

a. A new control and possible extensive modifications to allow testing a variety of FSQ-7 components.

50,000

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6-212 Memory Test Computer (continued)

b. A new memory using small cores, close spacing, transformer drive, and other modifications, and having 64 x 64 cores per memory plane.	\$50,000
c. Rental of IBM equipment for input and output purposes.	2,000
d. A magnetic drum is being added to MTC which requires special materials for its integration with the computer.	3,000
e. Cost of magnetic drum from IBM. This may be paid for by Project High (IBM).	15,000
f. A magnetic-amplifier power supply for experimental use is being purchased.	5,000
g. In moving MTC to Lexington, considerable expense will be necessary to provide the air conditioning necessary for the proper operation of the equipment. Some recabling will be necessary because of rearrangement.	25,000
h. Additional computer equipment applicable to use in the memory test computer.	10,000

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6-212	Memory Test Computer (continued)		
	i. Estimated contribution during fiscal 1954 by MTC in materials and outside labor to the Whirlwind I Computer in connection with replacement of electrostatic storage by magnetic memory.	<u>\$10,000</u>	<u>\$170,000</u>
6-213	Test Equipment		
	Estimate of the Test Equipment Committee, representing all groups in the division. Includes equipment for testing cores, the various components of FGQ-7, and general Laboratory use.	70,000	<u>\$ 70,000</u>
6-215	FGQ-7 Installation		
	a. Consultation by Francis Associates on lighting for the operations rooms.	10,000	
	b. Installation of special lighting to be specified by Francis Associates for the operations rooms.	25,000	
	c. Making basement and first floor lighting suitable for special requirements after the installation of equipment.	25,000	

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6-215	FSQ-7 Installation (continued)		
	d. Purchase and installation of two primary power transformers for FSQ-7.	\$25,000	
	e. Transformers for auxiliary power and utility use not provided by general building specifications.	10,000	
	f. Distribution of power for test and maintenance services.	<u>10,000</u>	<u>\$105,000</u>
6-216	FSQ-7 Display		
	We expect to build a considerable amount of equipment in the course of developing the display system to be used in the operations center. Much of this is tied in with the program for Charactron development.	75,000	<u>\$ 75,000</u>
6-217	FSQ-7 Terminal Equipment		
	In the course of our development of FSQ-7, we will have to work on a variety of specialized terminal equipment, including mappers, low-speed counters, high-speed printers, etc.	10,000	<u>\$ 10,000</u>

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6-218	FSQ-7 Magnetic Drums		
	The development of FSQ-7 will require the construction or purchase of a large amount of circuitry associated with magnetic drums.	\$10,000	<u>\$10,000</u>
6-219	Purchase of Magnetic Cores (Development)		
	The continued development of magnetic core memories requires the purchase of large numbers of cores from a variety of sources.	25,000	<u>\$25,000</u>
6-220	Development of New Magnetic Materials		
	a. We expect to do further development on possible memory materials such as ferrite crystals, electroplated magnetic films, ferroelectrics, etc. Some of this work may be subcontracted.	25,000	
	b. Instrumentation and equipment for basic magnetic measurements including a high-power magnet, a temperature recorder, and x-ray equipment. The planning and budget for this program has been coordinated with that of Group 37.	30,000	<u>\$55,000</u>

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6-221 Cape Cod Mappers

The extension of the Cape Cod System to include all the gap-filler radars will require purchasing 10 additional Raytheon Pathfinder radar indicator units and modifying them for use as video mappers. In addition, an improved azimuth drive should be incorporated.

\$70,000 \$70,000

6-222 Vacuum Tube Developments

Expenditures are anticipated in the purchase or development of special vacuum tubes and other components. Some of this amount may be used in preparing companies to produce tubes adequate for our needs.

75,000 \$75,000

6-223 Cape Cod Magnetic Storage

Our experience of the Cape Cod System indicates the necessity of increasing the reliability of Whirlwind I by replacing the electrostatic storage with magnetic core storage. Much of the cost of this was borne by MTC, from which the first bank of storage was physically taken (summer 1953). The amount reported here consists of materials charged to Whirlwind I and a sum of \$4,000 for further necessary improvements in the sensing amplifiers.

12,000 \$12,000

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6-224	Special Facilities, <del> </del> Lexington <del> </del>		
a.	Partitions for space assigned to Division 6 in Building B.	\$8000	
b.	Telephone paging system. A system similar to those in use at Barta and Whittemore Buildings is considered necessary for the closely coordinated Division 6 activities.	5000	
c.	Laboratory power supplies and distribution system.	9000	
d.	Additional furniture.	<u>3000</u>	<u>\$25,000</u>
	Total Division 6 Extraordinary Budget, Fiscal 1954		\$822,000

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