ARTICLE II-STATEMENT OF WORK

1. No Change.

a. No Change

b. No Change

c. No Change

d. The following items of equipment will be furnished hereunder:

(1) A computer with the following amounts of memory:

Seventeen words of fast core memory

Six 16,384 word units of large core memory

ARTICLE II-STATEMENT OF WORK

(2)   One 4,194,304 word magnetic disk memory

(3)   Four IBM Type 729-II magnetic tape units

(4)   No Change

(5)   No Change

(6)   No Change

(7)   No Change

(8)   No Change

(9)   1 Input-output exchange

e.   The above-described items of equipment will have the following general characteristics and speeds in accordance with subsection 1.f., of this article.

(1)   The basic computer will be so designed as to achieve a reasonable maximum of efficiency in the use of the primary arithmetic unit. The design will include 4 levels of special registers which will serve as a high speed virtual memory to the arithmetic unit, and two levels of special registers to serve as a high speed virtual memory to the instruction unit.

(2)   The manner in which information is transferred from the memory registers to the high speed virtual memory will be such as normally to add no time to the order speeds listed in paragraphs 1.f.(3), 1.f.(4), and 1.f.(5) of this article.

(3)   No Change

(4)   A word will consist of 64 binary information bits. To this

       will be added 8 additional bits for checking and error correction.

(5)   No Change

(6)   A set of computer instructions will be provided to facilitate edit-

       ing, arrange input data for use by the computer, and con-

       vert computer results into the form required by output

       devices. It will be capable of converting data from one

       radix to another as it enters and leaves the computer for

       those cases in which the input-output radix and computer

       radix are not the same. It will similarly translate data from

       any one machine code to any other as it flows in and out of the

       machine,permitting direct input of data from instruments and

       from other machine systems which do not use the same code

       language as the computer. It will also compress input data

and instructions into the more compact format of the data words used within the machine.

(7)   The computer will provide programmed access to a register of selector devices for use in logical control. Some of these selectors will be set by the status of parts of the machine and some will be set by data in the machine registers. Instructions will be furnished which allow any bit in memory to be treated as a selector which can be set and/or tested by the program. Using these instructions and the selectors provided for the input-output channels, a very flexible system of selectors can be programmed, set, and sensed both by the program and from the operator's console or other devices connected to the system.

(8)   The computer will include new and powerful logical instructions. A special logical control system will permit any of the 16 logical connectives to be executed under program control upon the bits of each of two data fields to produce a third field representing the logical result. Any field size from 1 to 64 consecutive bits may be used.

(9)   No Change

(10)   The magnetic core memory will be supplemented by 16

       words of fast core memory for data and indexed quantities

       which are used with great frequency by the program.

(11)   One magnetic disk memory of 4,194,304 words will be

       provided to supplement the core memory for storage of

       data and instructions for large problems. Information

       will flow between the disk memory and the computer at

       the rate of 16,000,000 information bits a second or one

       word each 4 microseconds. The arrangement of the mag-

       netic heads will be such as to permit, for sequential tracks,

       a continuous flow of information as the magnetic reading and

       writing proceeds from one track to another on the disk memory.

       The design will be compatible with the later inclusion of

       additional magnetic disk memories.

(12)   The input-output exchange will function as an integrated com-

       munication system between the input-output devices and the

       several memories. It will be provided with its own control and

       counting mechanism, so that address modification, counting, and

       similar operations relating to input and output will generally

       not interrupt primary computation. In addition, it will provide

a transfer control for communication between the input-
output units and memory over the bus system.   The design
of the input-output exchange will be compatible with the instal-
lation of   equipment capable of communicating over wire
lines with instruments and control devices at remote points.

(13)   Provisions will be made for use with the computer of IBM Type
729-II tape units, 4 of which are to be furnished hereunder.
The tape units furnished hereunder will be capable of operating
in a manner compatible with the reliability of the overall
system required under subsection 1.g.   of this article. Two
tape control units will be provided so that these tape units may
be attached to the input-output exchange.

(14)   No Change

(15)   No Change

(16)   The computer system will include an IBM 600 lines-a-

minute mechanical printer for direct communication with

the computer.   The mechanical printer will be capable of

operating in a manner compatible with the reliability of the

overall system required under subsection 1. g.   of this article.

(17)   The computer system will include a 1000 cards-a-minute

parallel card reader for direct attachment to the computer.

(18)   The computer system will include a 250 cards-a-minute

card punch for direct attachment to the computer.

(19)   No Change

(20)   Automatic checking will be provided throughout the computer.

The nature of the check used in each area of the machine

will depend upon the requirements of the mechanism.   Gen-

erally speaking, the check will detect all single errors and

most multiple errors.

Parts of the machine will be equipped to correct as well
as detect errors.   In these areas, the mechanism will
be designed to detect all single and double errors and
most other multiple errors and will correct all single
errors.

When an error is detected as much information as is
reasonable and possible will be recorded about its
location and nature to assist in the removal of the faulty
part or other corrective action at a later time convenient
to the user and the engineer.

During addition, subtraction, multiplication and division,
the general interrupt system will be activated.   The
appropriate correction procedure may then be accom-
plished by programmed intervention.

(21)   No Change

(22)   No Change

(23)   No Change

(24) No Change

f.   No Change

(1)	Base Frequency	The computer will have an asynchronous design and therefore base frequency has no precise meaning.
(2)	No Change	
(3)	Add and Subtract	0. 95 microsecond fixed or floating point, single or double precision
	Load	0. 65 microsecond fixed or floating point
(4)	Multiply	1. 9 microsecond fixed or floating
(5)	Divide	7. 0 microsecond fixed or floating
(6)	Large Core Memory	Units of 16,384 words with a full read-write cycle time of 2 microseconds
(7)	Omitted	
(8)	Fast Core Memory	17 words with a read cycle of 0. 4 microsecond and write cycle of 0. 8 microsecond
(9)	Magnetic Disk Memory	Units of 4,194,304 word capacity Continuous 16,000,000 bits per second information transfer

(10) IBM Type 729-II   Performance as follows:
       Tape Units   1/2 inch by 2400' magnetic oxide tape;
                               6 information tracks in parallel;
                               A seventh track for checking
                               Speed: 75" per second
                               Density: 200 bits per inch

(11) Mechanical Printer   600 lines per minute
                               132 characters per line
                               Automatic checking

(12) Card Reader   1000 cards per minute
                               Parallel Reading
                               Automatic checking

(13) Card Punch   250 cards per minute
                               Automatic Checking

(14) No Change

g. No Change

by LASL

(1)   Pre-installation testing shall take place during the six months

period prior to shipment

(2)   For purpose of this testing, representatives of LASL will

supply one or more coded test problems considered by them

to be typical of large scale problems and which IBM agrees

is adequately demanding of the computer system.   The first

of these problems is to be supplied not later than 6 months

prior to shipment.

(3)   Upon mutual agreement that the computer system is performing

adequately upon the test problem, the system will be delivered

to the place of installation at Los Alamos, New Mexico.   This

delivery to be performed within the time required by the article

of this contract entitled "Time for Performance" subject to any

delay resulting from causes not within the control of IBM.

(4) (No Change except for one sentence noted:)

During this period IBM engineers will make every

effort to improve the performance of the computer

system, including the incorporation of applicable

Engineering Changes during such period, on the

test problem to such an extent that its performance

is highly satisfactory.

(5) (No Change except to capitalize "Engineering Changes"

in first sentence.)

2. No Change

3. No Change

4.   No Change

5.   No Change

6.   IBM will furnish competent personnel to train 20 persons designated

by the Commission in the programming and operation of the computer

system furnished hereunder at IBM's plant, Poughkeepsie, N.Y. or

such other location as shall be mutually agreed, for a period of 3 weeks.

IBM will not pay transportation and living costs for such persons desig-

nated by the Commission.

7.   No Change

8. a.   No Change

    b.   Prior to the completion of the six-month period of

         maintenance required by Section V of this article, no

         alterations shall be made in nor shall any attachments

         be affixed to the computer system furnished hereunder

         by the Commission or LASL which interferes with the

         normal and satisfactory operation or maintenance of

         the computer system in such manner as to increase

         substantially the cost of maintenance thereof.

9. a.   No Change

      b.   No Change