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A-1747A
27 July 1971

U. S. Government

Gentlemen:

Enclosed is our revised proposal A-1747A with changes to specifications and additional features as discussed between Government personnel and representatives 21 and 22 July 1971. This proposal will remain valid for a period of sixty (60) days from this date.

If you have any questions regarding this proposal, please contact either or the undersigned.

Very truly yours,



Supervisor, Contract Administration

WGB:eh

Enclosure: as stated

Declass review by NGA/DoD

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Recd 7/28/71 AM

MLT-1540 LIGHT TABLE

BRIDGE MODIFICATION

By

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Proposal No. A-1747A

July 1971

MLT-1540 LIGHT TABLE BRIDGE MODIFICATION

1.0 INTRODUCTION

Two requirements relative to the use of the [] MLT-1540 Light Table have recently been stated by users of these tables. These requirements are in the areas of the microscope mount and bridge and were not included in the initial specifications of the MLT-1540. Use of the light table has shown a capability in the areas of the film transport and light source far beyond that originally expected, providing an instrument which can utilize a high performance microscope bridge and mount. Specifically, the requirements for such a bridge are:

- . An improved drive to allow scanning at high magnification.
- . A mount capable of providing a mensuration platform including the required stability and the ability to point, i.e., align reticles with a target.

This proposal provides two alternatives for meeting these requirements. The first provides improved scanning only, the second provides both improved scanning and a mensuration platform. A third alternative is included to allow disconnection of the bridge from its Y drive providing lower force for manual movement. *New*

2.0 ALTERNATE ONE - IMPROVED SCANNING - IEG

This modification may be applied to any model MLT-1540 with motorized bridge.

2.1 Approach

An improved scanning capability is obtained on the MLT-1540 Light Table through incorporation of circuitry providing an equalization in the X and Y speeds and smoother movement of the bridge in both the X and Y directions. This capability is accomplished through the use of detection of the bridge drive motor currents. These motor currents are fed back to appropriate control circuitry to maintain an equalization of speed and to provide a degree of constancy to the speed of the motor giving smoother bridge movement.

2.2 Modification Description

This modification will consist of replacement of the X-Y control card. The new card will contain all of the necessary circuitry to provide the current sensing and feed back. No other modifications of the light table will be required. Control relays will not be provided with the modification card. Relays from the replaced card will be utilized in the modification, thus reducing overall material cost.

2.3 Performance Specifications

MLT-1540 Light Tables incorporating this modification will meet the following specifications:

- Minimum starting speed 0.015 in./sec. $\pm 20\%$ *added*
- Maximum X-Y speed > .250 in./sec.
- Speed of X travel of bridge equal to speed of Y travel of bridge within 20% throughout entire range
- X-Y speed control shall have no dead band, i.e., minimum speed shall *new* occur at minimum setting of control
- X-Y direction switch shall be lever actuated. *— New*

3.0 ALTERNATE TWO - MENSURATION PLATFORM *DIA*

This modification may be applied to the model MLT-1540-4 only.

3.1 Approach

Requirements for a mensuration platform may be divided into two basic areas as follows:

1. The ability to provide a stable fixed platform for the mensuration instrument.
2. The ability to align the reticle of the mensuration instrument with an appropriate point on a target, e.g., pointing.

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Present MLT-1540-4 Light Tables provide an adequately locked platform in the X direction. The proposed modification will provide locking in the Y direction through a change in the drive point for the bridge in the Y direction thus eliminating those elements in the present drive system which introduce a slackness of movement. Drive elements from the present fail safe clutch through the cross rod at the back of the table are eliminated. The new drive point is directly to the chain attached to the bridge with drive being transferred from one side to the other through the cross rod.

STAT If a drive capability for pointing is provided through the electrical drive system the capability for tracking is also satisfied. This approach to solution of the overall problem has been taken by [REDACTED] Solution to the capability of pointing and tracking combined is through the use of velocity servo drives for the bridge motion. This is accomplished by adding velocity sensing tachometers to both the X and Y bridge drive and the appropriate circuitry to maintain a constant low speed of bridge motion.

3.2 Modification Description

Modification to the Y drive point is accomplished by adding the appropriate drive sprockets and shaft supports to the chain attached directly to the bridge. The fail safe clutch is relocated between the drive motor and the drive point and the present sprocket and chain drive to the cross rod is eliminated.

Modification to the bridge drive electronics is accomplished by the addition of velocity sensing tachometers to the X and Y bridge motions, installation of appropriate harnessing to carry the signals from the tachometers to the control circuitry, and replacement of the X-Y control card with a new card containing the necessary control circuits.

No Changes

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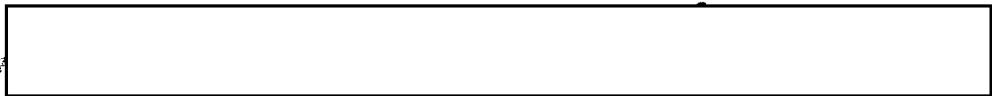
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3.3 Specifications

MLT-1540-4 Light Tables which have been modified for a mensuration capability will meet the following specifications:

- X-Y minimum starting speed ^{correcting} 0.005 in./sec. ± 10% - *changed*
- X-Y maximum speed > .250 in./sec.
- Time to attain set speed 0.5 to 1.0 sec. *or less*
- Time from release of control to stop 0.1 sec. or less *changed*
- Speed of X travel of bridge equal to speed of Y travel of bridge within 10% *changed*

When the motorized drive is in the motorized drive mode



changed ILLEGIB

- Control of carriage speed by speed control shall be approximately logarithmic with slow response at low speed. *changed*
- X-Y speed control shall have no dead band, i.e., minimum speed shall occur at minimum setting of control. *Added*
- X-Y direction switch shall be lever actuated. *Added*
- Movement of microscope carriage and mount when locked in X and Y within the following limitations:

<u>Pressure Applied</u>	<u>Allowable Movement</u>
2 lbs.	.010"
4 lbs.	.020"

Measurement method is as follows:

- A specified force applied in plus direction
- Deflection gage zeroed with force applied
- Specified force applied in minus direction
- Deflection read with minus force applied.
- Force for manual movement of carriage in X and Y directions will be as low as possible commensurate with the above requirements not exceeding 4 pounds.

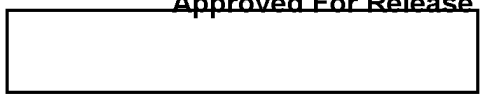
When the motorized carriage is in the motorized drive mode.

• *At any selected setting of the speed control the variation from that speed shall not exceed ± 2% of that speed.*

• *It shall be possible to electrically drive the carriage. Stopping and starting in both X and Y shall not involve*

the engagement or disengagement of clutches.

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4.0 ALTERNATE THREE - Y BRIDGE DRIVE DISCONNECT

New (DIA request)

4.1 Approach

Present MLT-1540 specifications require a force of less than 4 lbs. for manual movement of the microscope bridge and carriage. For manual scanning it is desired to have a force of less than ~~X~~ ^{1/2 to 5/8} lbs. Present MLT-1540 Light Tables require a force of less than 2 lbs. for movement of the microscope in the X direction, however forces approaching 4 lbs. are required for Y. By disconnecting the bridge from the Y drive chain, forces of less than 2 lbs. for bridge movement can be achieved. This proposed modification will provide for manually disconnecting the Y bridge drive chains. In addition interlock switches will be provided so that the tilt motor may not be operated when the bridge is disconnected from the chains. It should be noted that there is no automatic fail safe feature and if the bridge drive is disconnected when the bridge is in a tilted position the bridge may fall. Suitable caution signs will be provided.

4.2 Modification Description

The Y drive chain disconnect mechanism will consist of a lever actuated over center cam with a spring loaded return. The cam will actuate a pair of parallel rods connected together at the ends by tie bars. When in the locked position the end piece of the rods is forced against the chain by the eccentric cam located at the opposite end of the rods. In the unlocked position the end piece is moved away from the chain allowing free movement. The over center cam is manually operated by a handle that rotates from the vertical down position (unlock) to a position parallel with the MLT table top (locked).

A limit switch will operate in conjunction with the over center cam. When the cam has been rotated up into the lock position the limit switch is activated so that the tilt motor is energized. In the unlock position the tilt motor is disabled. This assures the tilt motor will not operate when the Y drive chain is unlocked.

4.3 Specifications

- Bridge may be freed by lever actuated disconnect
- Force required to move Y bridge of less than $1\frac{1}{2} \pm \frac{1}{2}$ lbs.
- Interlock provided to disable tilt motor when drive is disconnected.

5.0 STATEMENT OF WORK

5.1 Alternate One

In providing the modification proposed in Section 2.0 of this proposal

will:

1. Provide printed circuit boards without relays which will contain the necessary circuitry for performance of the MLT-1540 in accordance with specifications listed in Paragraph 2.3.
2. Install and checkout each of the modifications.
3. Revise present ATP to include new features.
4. Begin delivery within 12 weeks after receipt of order.

5.2 Alternate Two

In providing the modifications listed in Section 3.0 of this proposal

1. Provide a modification kit to modify the MLT-1540-4 for performance in accordance with the specifications listed in Paragraph 3.3.
2. Install and checkout each modification. (20 field; 26 factory.)
3. Revise present ATP to include new features.
4. Begin delivery within 12 weeks after receipt of order.

5.3 Alternate Three

In providing the modification listed in Section 4.0 of this proposal

will:

1. Provide a modification to modify the MLT-1540 in accordance with Section 4.0.

