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[redacted]

MEMORANDUM OF UNDERSTANDING

26 April 1971 — Meeting to resolve MLT-1540-4 rejection

U.S. Government

STAT [redacted]

STAT [redacted]

Prior to the start of the meeting, an MLT 1540-4 (S/N 002) was adjusted per instructions from manufacturing. This unit and a [redacted] MIM-4 table were at hand during the meeting for first-hand evaluation of the characteristics under consideration. STAT

Morgan B's letter was reviewed and briefly discussed. The most important points under item 1 were interrelated and unique to the macroscope mensuration procedure. An instrument was installed on the MLT and a sample film threaded to demonstrate the operation and to clarify the areas of difficulty.

Play in the bridge-locking mechanism was cited as a major problem in alignment of the target and reticle cross hair. Measurements of both tables were made to arrive at a quantitative means of evaluation. Tests were performed with four and ten pound forces applied to each bridge in ± "X" and "Y."

STAT [redacted] STAT [redacted]

	4#	10#	4#	10#
X	.020	.032 inches of movement	.022	.066 inches of movement
Y	.029	.077 inches of movement	.021	.055 inches of movement

Declass review by NGA/DoD

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Little significant difference was noted in the slack in each of the bridges. It was noted that the [redacted] bridge was easier to move manually in the unlocked condition requiring about 1 to 1-1/2 pounds of force to move. The [redacted] MLT 1540 bridge movement, specified at 2 to 4 pounds, was measured to require 2 to 2-1/2 pounds in the X direction and 3-1/2 to 6-1/2 pounds in the Y direction. High readings in the Y movement were found due to an excessively tight drive chain. When this was readjusted the Y movement required from 2-1/2 to 4 pounds and was considered to be in spec.

Another area of difficulty in operation was attributed to the X-Y bridge motor drive. Whereas the MIM-4 has only manual positioning knobs for the bridge, the MLT 1540 is motorized to work in a speed range of 0 to 0.5 inches/sec. The total range of speeds had been considered completely adequate for all other applications since mostly the upper speed limit was of concern in traversing. However, it was demonstrated that even at the slowest speed (measured as 0.003 inches/sec.) it was difficult to position the reticle cross hair precisely on a target. The total speed range, exceeding 150 to 1, was not sufficient for this application.

Part of this is due to the nature of the measurement method being used. Commonly, traversing measurements are made without an absolute zero reference position. Two micrometer dial readings must be taken and the difference between them is the desired value. To avoid arithmetic errors in subtraction, an alternative method is used. The micrometer is "zeroed" and the cross hair positioned precisely over one edge of the image to be measured. The micrometer then gives a direct reading of the measured distance when the traverse is completed. Successfully positioning the cross hair at the initial point is obviously a critical part of obtaining accurate measurements.

In order to derive meaningful, quantititive parameters it was agreed to readjust five additional MLT 1540-4 units and have the operators evaluate the performance of this operation. Morgan B. agreed to furnish additional data to [redacted] for upper and lower bridge drive-speed limits and mechanical play tolerances in the locking system. Alternatives such as a manual drive with or without motor assist or an overall reduction in bridge drive speed, perhaps using a dual range system were also discussed. [redacted] engineering is to be contacted for possible other approaches to facilitate precise positioning of the bridge carriage for this application.

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The remaining items in Morgan B's letter were also examined on the unit with the following agreements reached. Item 2 relates to screw heads and the Mode switch protruding above the rear panel of the table surface. The knobs are currently being
STAT replaced on all units by [ ] at no cost to the customer. The screw heads were examined as a possible source of damage to microscope objective lenses. In each instance, the optics were recessed well beyond the screw head height so that no damage could result. No changes are contemplated in this area.

Item 3 concerns the human engineering shape factor of the tilt and elevation control switch handles. Initial production used a "bat" handle and a "paddle" handle for distinct differentiation. Later units were equipped with a truncated bat handle with a skirt instead of the paddle handles. A distinguishable difference in feel was retained
STAT (in [ ] opinion). Whereas a sharp corner on the paddle switch which was a "knee banger" had been eliminated Morgan B. expressed a strong preference for the paddle switch with rounded corners. "I want my paddle switches" was Morgan's last statement on the subject.

Item 4 was an overall criticism of [ ] quality control. It was conceded STAT
by everyone that considerable improvements over initial production were evident.
STAT Efforts on the part of [ ] to achieve and maintain high quality standards were described in a general discussion of the subject.

Item 5 related to possible scratching of wide films with bad edge curl caused by the 70 mm film guides. It was pointed out that the guides can be raised an additional 3/16 of an inch to avoid any interference. [ ] agreed to implement this change. STAT

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