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13 ABSTRACT

Describes a method for evaluation of optical equipment operational and functional performance characteristics. Identifies supporting tests, facilities, and equipment required. Provides procedures for safety, visual resolution range, infrared detection and range resolution, and depth perception (stereoscope). Not applicable to test of peripheral equipment external to and used in conjunction with optical equipment.

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KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Binoculars						
Metascope						
Night Vision Optical Device						
Optical Equipment						
Rangefinder						
Stereoscope						
Telescope						
Theodolite						
Infrared Detection Devices						

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U.S. ARMY TEST AND EVALUATION COMMAND
SYSTEM SERVICE TEST OPERATIONS PROCEDURES

AMSTE-RP-702-109

*Test Operations Procedure 10-3-106

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OPTICAL EQUIPMENT

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SECTION I
GENERAL

1. Purpose and Scope. This Test Operations Procedure (TOP) describes test procedures for evaluating the operational, performance and maintenance characteristics of optical equipment to determine the degree to which such equipment meets the requirements of Materiel Needs (MN) and whether it is suitable for Army use. Testing is conducted using personnel representative of those who will operate and maintain the equipment in the field and under all climatic and environmental conditions representative of those areas where the equipment will be used. These procedures are not intended to service test peripheral equipment external to and used in conjunction with the optical equipment.

2. Background. Military operations become more effective through the use of optical equipment which materially enhances the perception of visually transmitted information. A wide variety of optical equipment has been developed to accommodate the many conditions requiring visual interpretation. Typical of such equipment are binoculars, telescopes, infrared binoculars, metascopes, theodolites and stereoscopes.

a. Binoculars permit the user to view distant objects or events not otherwise discernible and at the same time retain and enhance the natural

*This TOP supersedes MTPs 10-3-107 (27 Mar 68) and 10-3-109 (19 May 69), including all changes.

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stereoscopic vision provided by normal unaided vision. This instrument is used for fire control and/or range-finding and observation. The effectiveness of binoculars is limited by the amount of illuminating light available at the target.

b. For night operation, infrared binoculars and metasopes are provided. Infrared binoculars can be hand-held or helmet-mounted. The receiver of the metascope is an infrared telescope capable of viewing objects illuminated by infrared energy as are the binoculars. In addition, the metascope contains an infrared transmitter which illuminates the target for better viewing by the telescope.

c. Theodolites provide accurate angular values for traverse, triangulation and resectioning operations. They are of extreme importance in artillery survey and target acquisition and also valuable for plotting upper air movements in weather observation.

d. Stereoscopes are designed for photo or image interpretation and are of great assistance in the area of military intelligence. They permit a three-dimension or depth view of plane-view photographs providing valuable information for intelligence interpretation.

3. Equipment and Facilities. In addition to the equipment and facilities defined in the documents listed in Section II the following are required:

- a. Target personnel and vehicles (Paras 6 and 7).
- b. Inter-communications equipment (Paras 6 and 7).
- c. Test photographs and film (Para 8).

SECTION II TEST PROCEDURES

4. Supporting Tests. Common Service TOPs, the tests defined in Section III, and other published documents to be considered in formulating a service test plan are as follows:

<u>TEST SUBJECT TITLE</u>	<u>PUBLICATION NO.</u>
a. Operator Training and Familiarization	10-3-501
b. Photographic Coverage	7-3-519
c. Pre-operational Inspection and Physical Characteristics	10-3-500

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TOP 10-3-106

<u>TEST SUBJECT TITLE</u>	<u>PUBLICATION NO.</u>
d. Safety Radioactivity (Refer to para 5)	10-3-507
e. Electrical Power Requirements (Applicable to Metascope)	6-3-517
f. Performance Tests (1) Visual Range Resolution (Refer to para 6) (2) Infrared Detection and Resolution Range (Refer to para 7) (3) Depth Perception (Refer to para 8)	
g. Qualitative Electromagnetic Interference (Applicable to Metascope)	6-3-513
h. Effects of Weather	6-3-509
i. Immersion	6-3-508
j. Maintenance Evaluation	10-3-504
k. Reliability	10-3-512
l. Human Factors Evaluation	10-3-505
m. Transportability	2-3-519
n. Air Portability, Internal	7-3-515
o. Man Portability, Transportability	10-3-506
p. Durability	10-3-502
q. Value Analysis	USAMC SUPPL 1 to AR 11-26

SECTION III
SUPPLEMENTARY INSTRUCTIONS

5. Radioactivity. Prior to testing new optical equipment, a written evaluation of the radioactive thorium content of all glass components, indicating the human hazards incident to the use of such equipment, must be obtained from the Surgeon General.

6. Visual Resolution Range. (Binoculars, Telescopes, Theodolites)

a. **Objective.** To determine the visual resolution range of the test item and accuracy of indicators when applicable.

b. **Method.** The test item is positioned at a bench mark in the center of an area typical of normal field operations. A communications net is established between the observer using the test item and moving targets consisting of personnel and vehicles. The observer views the moving targets as they move away from the bench mark using all controls and adjustments provided on the test item. As the resolution of the moving target becomes impaired or the target disappears over the horizon he halts the moving target and determines its range, bearing and elevation. The range, bearing and elevation indicated on the test item, if so equipped (rangefinder, theodolite, etc.), is also recorded. These procedures are repeated for different types of targets in all directions.

c. **Data Required.**

- (1) Nomenclature of the test item and type of target.
- (2) Conditions of visibility existing at time of test.
- (3) Simultaneous recording of range, bearing and elevation of target and test item indication (when applicable) at impairment of resolution or disappearance.
- (4) Number of test observations for each type target.
- (5) Comments on the effectiveness and operation of the test item controls and adjustments used.

d. **Analytical Plan.** The recorded data (range, bearing and elevation, actual and indicated) are arranged in tabular or graphic form and analyzed to determine test item accuracy. The total data are further analyzed to determine its conformance to the requirements of range resolution stated in the MN and recommendations are prepared as to the suitability of the test item for use by the Army.

7. Infrared Detection and Resolution Range. (Infrared Equipment)

a. **Objective.** To determine the infrared detection and resolution range of the test item.

b. **Method.** The test item is positioned at a bench mark in an area typical of normal field operations and aligned on known check points. A communications net is established between the observer using

the test item and moving targets consisting of personnel and vehicles. The test item is operated for continuous surveillance of designated sectors during hours of darkness and poor visibility. Different types of targets are introduced into the sector under surveillance and the observer indicates when he is able to detect and when he is able to identify the targets. The maximum and minimum distances (range, bearing and elevation) are determined for detection and identification of each type of target. These procedures are repeated using different types of targets, different test item operators and different types of ground cover.

c. Data Required.

- (1) Nomenclature of test item, type of target and name of operator.
- (2) Conditions of visibility existing at time of test.
- (3) Simultaneous actual and test item indicated recordings of range, bearing and elevation of each target at maximum and minimum points of detection and identification.
- (4) Accuracy of target identification.
- (5) Number of test observations for each type target.
- (6) Comments on effectiveness and operations of test item controls and adjustments.

d. Analytical Plan. The recorded data on range, bearing and elevation, actual and indicated, are tabulated for point of detection and point of resolution for each test item and each test item operator. The accuracy of each identification is also annotated. The simultaneous actual and indicated data are compared to determine test item detection and resolution ranges and analyzed for conformance to the requirements stated in the MN. A recommendation is then prepared relative to the suitability of the test item for Army use.

8. Depth Perception. (Stereoscope)

a. Objective. To evaluate the three dimensional effect or depth perception capabilities of the test item.

b. Method. Photographic prints and film are viewed through the test item by several experienced photo interpreters who evaluate the degree of depth perception provided by the equipment.

c. Data Required. Nomenclature of test item and written evaluations prepared by each photo interpreter.

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d. Analytical Plan. Analyze and summarize the evaluations of each photo interpreter and prepare recommendations relative to the suitability of the test item for Army use.

Recommended changes to this publication should be forwarded to Commanding General, U.S. Army Test and Evaluation Command, ATTN: AMSTE-PA-M, Aberdeen Proving Ground, Maryland 21005. Technical information related to this publication may be obtained from the preparing activity, President, U.S. Army Armor and Engineer Board, ATTN: STEBB-MO, Fort Knox, Kentucky 40121. Additional copies of this document are available from the Defense Documentation Center, Cameron Station, Alexandria, Virginia 22314. This document is identified by the accession number (AD No.) printed on the first page.