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15X Eyepieces and
3X Mono and Stereo Objective Lenses

Attachment II

Declass review by NGA/DoD

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Recently the photo interpreters have been expressing a requirement for higher magnifications than the 60X maximum presently available in the Zoom 240 Stereoscope optical system. Indeed, some photo interpreters have been resorting to the 20X eyepiece even though this eyepiece is distinctly inferior to the 10X eyepiece commonly in use. There are, of course, two approaches to extending the total magnification of the basic power pod zoom system--either by increasing the magnification of the eyepiece, or by increasing the magnification of the objective lenses. R&D has investigated the problem and has in hand proposals from [redacted] demonstrating that both of these approaches are possible with the Zoom 240 Stereoscope system. However, both approaches also have disadvantages and limitations.

25X

Eyepieces are very difficult to design and very little can be done to improve the existing designs appreciably. The designer is therefore limited in his design efforts to modification of an existing design and many of the aberrations introduced by that design must be accepted as they come out, since little can be done about them. Furthermore, the function of an eyepiece is to observe the image presented to it by the preceding optical system and magnify this image for observation by the eye. However, the eyepiece will magnify the aberrations presented to it by the preceding optics as well as the desired imagery.

X1

[redacted] has proposed a 15X wide-field eyepiece that is in most respects comparable in performance to the existing 10X eyepiece. And, at the same system magnification, the 15X eyepiece is expected to present a 1.4 times larger field of view than the 10X eyepiece. As indicated in the preceding paragraph, the aberrations presented to the eyepiece by the preceding optics will be magnified 1.5 times more by the 15X eyepiece than does the 10X eyepiece. However, the aberrations as viewed through the 15X eyepiece are not expected to be objectionable, and should not be of the order of the 20X eyepiece.

Additional differences between the proposed 15X eyepiece and other existing eyepieces should be noted:

1. The 10X eyepiece and 1X objective is capable of 240 lines/mm at 30X, or 8 lines/mm/power. The 15X eyepiece and 1X objective is expected to be capable of 225 lines/mm at 45X, or 5 lines/mm/power.

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very short working distance may make orientation of the imagery under the optics rather difficult and would not allow use of the commonly configured hold down ring without first elevating the optics and refocusing.

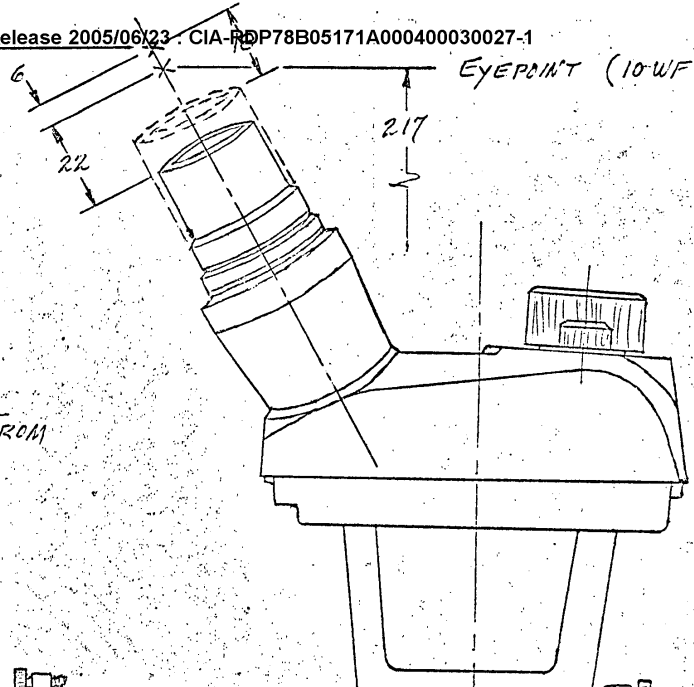
The focus adjustment range available in the rhomboid arms equipped with the 3X stereo lenses is expected to be 0.078 inch. This is larger than the 0.056 inch available with the 2X stereo lenses and is possible only by providing an additional focus adjustment on the objective lens itself. The 3X objective system provides, therefore, two focus adjustments on each rhomboid arm--one that is normally on the arm itself, and the second that is proposed for the 3X objective lens. This presents the operator with four focus adjustments in the rhomboid arms, plus the usual carriage focus and eyepiece focus adjustments. The photo interpreter, therefore, is allowed considerably more latitude to get into trouble with focus adjustments than at present.

Although deficiencies have been pointed out with respect to both the 15X eyepieces and the 3X mono and stereo objective lenses, both the eyepieces and objectives should prove to be useable equipments capable of extending the magnification range of the Zoom 249 Stereoscope system from the present maximum of 60X to a maximum of 135X.

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EYEPOINT (15 WF EP)

EYEPOINT (10 WF EP)



DIMENSIONS IN MM FROM DOVETAIL DATUM

DOVETAIL DATUM PLANE

3X STEREO OBJECTIVE

3X MONO OBJECTIVE

