

NPIC/TDS/E-425/67
1 August 1967

MEMORANDUM FOR: Deputy Assistant for Technical Development

SUBJECT: Report on Optical and Fluid Gate Problems
with the [] Briefing Print Enlarger

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A. Summary

Since receiving your directive on 24 July to investigate the dust and fluid gate problems on the Briefing Print Enlarger, the undersigned has completed three days of experimental tests. The following conclusions have been reached:

1) Three design changes are considered necessary. (a) The mounting means for one of the negative gate glass plates must be changed to permit servicing it. (b) Two metal plates of the vapor shielding must be altered in shape for better access, and (c) the lamphouse positioning hand crank must be replaced with a larger one.

2) The use of adhesives for mounting the condensing lenses and negative gate glass plates will make the price of replacement lenses and plates unnecessarily high. It seems desirable to question this means of mounting glass components which should be readily replaceable.

3) Operating procedures are suggested for minimizing the fluid gate bubble problem.

4) Test procedures are suggested for quickly determining the location of troublesome dirt or scratches in the optical system.

B. Necessary Design Changes

1) The spring-mounted glass plate assembly of the negative gate, which is attached to the front of the lamphouse, must be re-designed to facilitate easy removal for cleaning and occasional replacement. The present plate already contains several small surface pits and scratches. This plate is cemented to a rubber-sealed, spring-mounted metal plate which will require a fairly major disassembly project to remove. (Item 1, fig. 11, page 27 of the Preliminary Instruction Manual)

NGA Review Complete

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2) The vapor shield (item 5, fig. 9, page 22) must be re-designed to give the operator more room to see and guide the film in the negative gate. Two full days of experimental testing of the fluid gate has shown that for acceptable performance, the film positioning cannot consistently be accomplished hands-off as intended by the design. The problem is the bubbles which become entrapped in the gate and appear in the image. This difficulty is most pronounced when:

a) projecting at low magnification (because the entire gate area is projected).

b) the center of the film is below the center of the film gate. (The film positioning spring-fingers prematurely push the film forward against the glass stage plate, excluding the fluid).

c) using the new immersion fluid which contains ethanol (the old 10-20-40 enlarger fluid performs much better).

It has been determined that the bubble problem is minimized when the operator uses his fingers to manually hold the film free of both glass plates during both fluid injection and gate closure. This even works well when the top edge of the film is below the nozzles. The present vapor shield is in the way for best accomplishing this. The vertical stainless steel plate on each side of the lamphouse should be re-shaped to provide more clearance for both seeing and for reaching in closer to the film gate.

3) The hand crank for positioning the lamphouse (item 3, fig. 9, page 22) must be replaced with one of larger diameter. The present crank does not offer sufficient mechanical leverage for best accomplishing the necessary slow and steady closing of the film gate.

C. Desirable Design Changes

1) It seems desirable from an economical viewpoint that the mounting means for all of the condenser lenses and possibly the negative gate glass plates should be re-designed. At present these optical components are all cemented and/or set in a rubber type compound and because of this individual glass elements cannot be replaced easily. A spare set of all the optical components should be kept on hand. Several new ones are already needed. The

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present design will require purchasing an assembly of glass element and machined metal housing. The older spring clip method of attaching the glass components would eliminate the need to purchase such expensively machined mounting plates along with each optical component. Of course, we must remember that there is a fluid sealing requirement associated with the negative gate glass plates which may justify keeping the adhesive concept for these plates. (However, the re-design as specified in B(1) above is still a necessity.)

D. The Dust Problem

1) Dust and other foreign matter would be a monumental problem with this enlarger, due to the use of specular illumination, were it not for the saving feature of the liquid gate. Of course, the environment should be kept as clean as possible. The procedure described in B(2) above for obtaining a full injection of fluid also helps.

2) When an objectionable spot does appear in the image, and fluid will not move it, the following procedure may be used to quickly determine its origin so that the offending foreign matter may be removed:

a) Rack the lamphouse back so only the film and fixed stage glass remains in the focal plane. Wiggle the film. Those spots in the image which wiggle are caused by spots on the film. Any remaining spots which do not wiggle are due to dirt or glass defects on the glass stage plate.

b) Move the lamphouse forward so the spring loaded glass procure plate is not quite fully seated. Reach in between the vapor holding and wiggle the side of this spring loaded glass plate and again watch for spots in the image that move. They will be on this glass plate.

c) Other low-contrast out-of-focus marks in the image are probably caused by the condenser lens nearest the film gate. The condenser assembly can be moved up and down very slightly to verify this. (Several condensers are badly smeared and need to be dis-assembled and cleaned. Also a few contain numerous fine scratches and should already be replaced.)

E. Conclusions

Three design changes are considered necessary before acceptable

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performance can be expected. They are not drastic ones and could be accomplished by the manufacturer without taking the BPE out of service. New sub-assemblies could be produced and delivered for replacement.

It is also recommended that consideration be given to the desirable but not necessary change of section C above.

It is further recommended that the operators be instructed to try out and further evaluate the operating procedures contained herein.

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