

Laboratory 5: Bullet Photography

To: R&D Team
From: James W. Bales
Date: 19 October 2005
Re: Comparison of Nikon D100 and Film Images
IM5-JWB

I'm considering the purchase of a Nikon D100 Digital Still Camera to expand our electronic imaging capability. I've arranged to have a camera on loan so that we can evaluate it. I need a head-to-head comparison of the D100 against our standard 35-mm B/W film.

Also, I'd like to take this opportunity to revive the "bullet" pictures that this lab made famous. So, use images of a bullet in flight as your subject. You may wish to take color photographs with your own film in addition to the B/W photos required for the memo.

Assignment

Take pictures of bullets splitting playing cards with both the D100 and 35 mm film. Next, take similar images of an object of your choosing as it is being shot. You *must* discuss your proposal beforehand with the TA\Laboratory Manager or myself. Write up your results in a memo. Your memo should:

1. Present D100 and B/W print images of playing cards being shot by bullets.
2. Present any additional images you obtained that you feel are relevant.
3. Describe your procedures in sufficient detail that we can reproduce your results.
4. What items of equipment and software must we purchase for the D100 to be useful, and what is their expected lifetime? What consumable materials and supplies will we have to buy? Estimate the annual cost of using the digital camera over four years.

Compare this annual expense to the approximately \$4,000 per year we spend on film, paper, and chemicals for the wet darkroom, including equipment upkeep. As the lifetime of darkroom equipment is very long (of order 15-25 years), as the technology is quite mature, do not consider the cost of the darkroom equipment in your comparison.

5. Make a recommendation for our decision to purchase the D100 system. When is the D100 preferred? When is film preferred?

Laboratory 5 - BULLET PHOTOGRAPHY

History: Edgerton may be best known for his bullet photographs. The .22 caliber, single-shot rifle he used to make most of his photos was used in this lab until 1996, when it was stolen without its bolt (and thus is inoperable by the thieves). We suspect that this is a trophy theft, and that the rifle is somewhere around campus. We would like to have this historic artifact returned. Information concerning its location is appreciated, and if it reappears, we will ask no questions.

Preparation: In this lab you will use bullet photography to compare the performance of the D100 electronic still camera to that of 35-mm film. ***Read the safety section below.*** Your group may select a target to be shot, but must follow the guidelines of Item 8, below.

Safety

Only authorized Strobe Lab/Edgerton Center personnel may discharge firearms in the Edgerton Center under any circumstances. All observers and experimenters must wear appropriate ear and eye protection. Never stand in or near the trajectory of the bullet when the bolt is in the rifle.

Procedure:

1. Learn the equipment:

EG&G Microflash unit. Set up the vacuum tube photocell and oscilloscope. Measure the Guide Number and flash duration ($\Delta t_{1/3}$) for the Microflash. The peak BCP is quite high, so you will need to place the photocell some distance from the Microflash. Note the controls on the Microflash for Range, Delay, and Sensitivity. Set both sensitivity and delay to 0, and set the range to 0.1 Msec (i.e., 0.1 μ s).

Note - the Microflash should not be triggered at high repetition rates. Wait 10 to 15 seconds between successive flashes of the unit.

D100 Digital Still Camera. At least one member of your team needs to become proficient with the D100 still camera. Set up the camera as per the instructions in the Nikon D100 Quick Reference Guide, which can be found in the study materials section.

2. Set up the target: Place a chalkboard eraser on top of the stand. Move the eraser until it is flush with the up-range edge of the stand, and position a card between two felts at the up-range edge of the eraser.

Set up a halogen lamp to illuminate the edge of the eraser. Bore sight through the rifle, and have a team member adjust the position of the eraser until the image of the edge of the card bisects the bore, and the card is not twisted with respect to the line of flight. Mark the location of the stand and eraser.

3. **Frame the Image:** Set up the D100 and a 35-mm camera roughly perpendicular to the face of playing card. Frame the image you want, including where you want the bullet to be when the strobe goes off. You will probably want to hang a colored backdrop behind the subject. Carefully focus both cameras.
4. **Position the Microflash:** Aim the hot-spot of the Microflash at the desired location. Turn out the lights, and (using the manual trigger button on the Microflash) fire the strobe a couple of times, and adjust its position and aim until the image is illuminated correctly.

Select your aperture - consider the location of the hot spot when doing so. Capture trial images on the D100. These will help you decide if you have the strobe where you want it. Also, with the “film speed” of the D100 set to ASA 400, you can use its aperture settings to help you select the aperture for the film camera.

5. **Set up the Sound Trigger:** Position the trigger slightly downrange from the card. Connect it to the synch input of the Microflash. Set the sensitivity of the Microflash to 6.5. Test the system by rapping the case of the sound trigger with a pen or pencil. If the Microflash does not fire slightly increase the sensitivity setting on the Microflash and try again.
6. **IF THE MICROFLASH STARTS TO FLASH WITH NO TRIGGER, TURN DOWN THE SENSITIVITY AND/OR TURN OFF THE UNIT!**
7. **Take Photos of Bullet striking a playing card:** Use both cameras, bracketing apertures with the film camera. Print your best results from each. Compare and discuss them in your memo.
8. **Take a Photo of a Special Subject you Bring to Lab:** It should be small and relatively soft, so as to not deflect the bullet. Bars of soap, candles, playing cards are all good subjects. No Jello® or other very sticky, gooey stuff.

The limitations include:

- No animal products
- No hard objects
- No liquids

****You must have your target approved in advance!****