

Marking Pens for Aerial Photographs and Transparency Material

Which pen to use on a given surface depends on the desired ink character, line width, and pen tip durability.

INTRODUCTION

MARKING PENS are a necessity in aerial photo interpretation, delineation, and final mapping. Although there are many marking pens on the market, few are designed specifically for these needs. Technical hollow-tube drafting pens give excellent results on photographic surfaces and transparent overlays in the office; however, their utility for field use is questionable due to maintenance problems and relatively high cost. Technical pens cannot withstand abusive conditions, clog easily, are not easy to refill under field conditions, and the ink degrades easily under conditions where there is high potential for surface abrasion, bending of photos, or moisture.

We have been asked many times in shortcourses and through personal contacts which pen is best for the many photographic and transparent surfaces and conditions of use, especially in the field. Since we could not be explicit in our answer, we decided to conduct a limited study using commonly available ink pens on different surfaces.

OBJECTIVE

Our objective was to compare a variety of plastic-tipped and synthetic fiber tipped pens with a technical hollow-tube drafting pen, using the following criteria: (1) ink adherence on many surface types, (2) erasability, (3) pen tip size and type, (4) ink line width consistency, (5) durability of pen tip, (6) cost, (7) availability in many colors, (8) opaqueness of ink, (9) excessive water solubility, and (10) trouble free use.

PROCEDURES

Ten transparent overlay and photographic surfaces commonly used in aerial photo interpreta-

tion were used to compare the performance of 21 pens with that of a Faber-Castell* technical pen using Pelikan ink. We made the assumption that all technical hollow-tube pens and their inks have similar characteristics. The pens and surfaces are listed in Table 1.

The pens were used on each surface and checked for the following:

- Adherence: Ink either did or did not adhere well to the surface; repelled ink was characterized by beading and/or streaking.
- Erasability: After approximately one hour, ink that adhered to the surface was tested for removal by the following means: wiping with a cotton swab soaked with (a) water, (b) a weak ammonia solution, and (c) isopropyl alcohol; and, by (d) erasing with a soft drafting eraser.
- Line width consistency and ink line edge character: These features were determined for newly purchased pens by drawing a line using light pressure and then measuring the line using a magnifying monocular comparator.
- Pen tip durability: This characteristic was determined by applying normal application pressure on the pen tips for a longer length of time and then measuring the line width.
- Excessive water solubility: This feature was subjectively determined after applying water and allowing the ink to dissolve without rubbing.

RESULTS AND DISCUSSION

Pen and ink character, ink line widths and erasability, and cost for ink pens are shown in Table 1. Generally, the water-base ink pens were not suitable due to poor ink character, except for a few exceptions on matte mylar surfaces. On other

* Mention of trade names or products does not constitute endorsement by the American Society of Photogrammetry or the authors. Opinions are those of the authors only.

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TABLE 1. MARKING PEN PERFORMANCE: INK CHARACTERISTICS BY PRODUCT SURFACE, PEN TIP TYPE, LINE WIDTHS WHEN NEW AND USED, AND PEN COST. TABLE CODES ARE SHOWN IN FOOTNOTES 2, 3 AND 4.

	PRODUCT SURFACE											PEN CHARACTERISTICS			
	Glossy Print	Matte Print (luster)	Cibachrome	Emulsion Side, Transparency Film	Back Side, Transparency Film	Clear Acetate	Matte Acetate (frosted)	Clear Mylar and Laminate	Matte Mylar (Frosted)	Pen Tip Type	Line Width New (mm)	Line Width Used (mm)	Cost (\$)		
OIL BASE INK PENS															
Micropoint Unimark 960 ¹	5 ²	r	5	5	5	5	5	5	5	LF ⁴	0.3	1.2	0.79 ⁵		
Pilot Ultra Fine Point Permanent SC-UF	5	5	ea	e	ea	ea	ea	e	n	LF ⁴	0.3	1.2	0.79 ⁵		
Sanford's Sharpie Extra	5	r	ea	e	ea	ea	ea	e	n	DF	0.2	0.4	0.69		
Fine Point Marker 0.4 mm	ea	r	ea	e	ea	ea	ea	e	n	P	0.4	0.4	0.79		
Stylist Permanent (Niji)	5	5	5	5	5	5	1,2,3	5	1,3	DF	0.4	0.7	0.69		
	r	r	ea	e	ea	ea	ea	e	n						
SEMI-PERMANENT WATER BASE INK PENS															
Faber-Castell w/ Pelikan Ink	5	r	5	1,3,4	5	5	5	5	5	T	0.1	0.1	5.50		
Sanford's Vis a' Vis	1,2,4 maw	1,2,4 maw	a	n	1,2,4 maw	1,2,4 maw	1,2,4 maw	1,2,4 maw	1,2,4 maw	LF	0.5	1.0	0.69		
WATER BASE INK PENS															
Design (Art Pen)	0	1,3	1,3,4	1,4	0	0	1,4	0	1,2,4 maw	P	0.2	0.3	0.79		
Flair Hardhead	0	1,3	1,3,4	1,4	0	0	1,4	0	1,2,4 maw	P	0.4	0.4	0.98		
	n	n	n	n	n	n	r	r	n						

Flair regular	0	1,3 n	1,3,4 n	1,4 n	0	0	1,4 r	0	1,2,4 maw	DF	0.5	0.7	0.69
Flair Ultra Fine	0	1,3 n	1,3,4 n	0	0	0	0	0	1,2 maw	DF	0.3	0.4	0.79
Nikko Finepoint (99L & XL-2)	0	0	1,3,4 n	0	0	0	0	0	1,2 maw	DF	0.2	0.4	0.69
Pentel Color Pen Fine Point No. 5630-114	0	0	1,3,4 n	1,4 n	1,2,4 maw	0	0	0	1,2 maw	LF	0.3	0.7	0.39
Pilot Ball Liner	0	0	1,3,4 n	0	0	0	0	0	0	P	0.3	0.3	0.98
Pilot Fine Liner	0	1,3 n	1,3,4 n	0	0	0	1,4 r	0	1,2,4 maw	DF	0.2	0.4	0.69
Pilot Razor Point	0	1,3 n	1,3,4 n	0	0	0	1,4 r	0	1,2,4 maw	DF	0.2	0.4	0.79
Sanford's Big Sig II	0	1,3 n	1,3,4 n	1,4 n	0	0	0	0	1,2 maw	P	0.2	0.3	0.39
Sanford's Espresso Fine Point 0.3 mm	0	1,3 n	1,3,4 n	0	0	0	0	0	5 a	DF	0.3	0.5	0.69
Sanford's Espresso Medium Point	0	1,3 n	1,3,4 n	0	0	0	0	0	5 a	P	0.4	0.5	0.79
Stylist 0.2 mm (Niji)	0	1,3 n	1,3,4 n	0	0	0	0	0	5 a	DF	0.2	0.3	1.35
Stylist regular (Niji)	0	1,3 n	1,3,4 n	0	0	0	0	0	5 a	DF	0.3	0.4	0.69
Wonderiter	0	1,3 n	1,3,4 n	0	0	0	1,4 r	0	1,2,4 maw	P	0.3	0.3	0.49

¹ Brand names are listed for reference and do not, in the commercial sense, constitute endorsement by the authors or the University of Idaho.

² Ink characteristics are based on the following criteria: (0) ink meets none of the following criteria; includes pens whose ink does not adhere to surface; (1) ink adheres to surface; (2) ink is semipermanent and erasable by some means; (3) ink, when dry, is not excessively water soluble; (4) ink line has constant width and clean edges; (5) ink meets all criteria.

³ Ink line erasable by following means: e—eraser; m—ammonia; a—alcohol; w—water; r—ink erasable by all these means; n—ink not erasable by these means. Ammonia damages the emulsion surface of Cibachrome. Water, ammonia, and alcohol damage the emulsion surface of transparency film.

⁴ Pen tip type: LF—loosely packed fiber tip; DF—densely packed fiber tip; P—plastic tip; and T—technical hollow-tube tip.

⁵ Determined at the University of Idaho Bookstore January, 1980.

surfaces where they did adhere, the ink was either excessively water-soluble or not erasable.

The semipermanent water-base pens adhered to all surfaces and were erasable on all surfaces except the emulsion side of transparency film. The Sanford's Vis a' Vis pen's ink is excessively water-soluble.

The oil-base ink pens generally adhered well, had consistent line widths, and the ink was erasable on all surfaces except the matte mylar. In general, where ink adhered, the longer the ink remained the more difficult it was to erase.

The nontechnical ink pens were judged to be easily used in the field. None required special care or maintenance except for keeping the pen tip capped when not in use. By contrast, hollow-tube drafting pens become clogged easily and are troublesome to fill in the field. The oil-base ink pens are not excessively water soluble on a given surface and have durable ink which does not degrade under field conditions. Technical pen ink does not exhibit similar durable character as it is easily cracked or scratched off and is more susceptible to moisture in the field.

Pen tip durability and line width consistency were judged subjectively. Tip durability was dependent on pen tip type. Plastic tips were the most durable, with densely-packed fiber and loosely-packed fiber tips being progressively less durable. Line width consistency was dependent on pen tip durability. Technical pens were not tested for these characteristics, as these pens are designed for different methods of application which result

in little or no pen tip wear or variation in line width.

All pens were available with black, red, green, and blue ink, and some pens were available in other colors as well. In all cases, ink translucence or opaqueness was related to ink color. Black was relatively opaque on all surfaces, whereas other colors showed varying degrees of translucence. Cost of the nontechnical pens ranged from \$0.39 to \$0.98 (except for the Stylist 0.2 mm, which cost \$1.35) in contrast to hollow-tube drafting pens which range from \$5.50 to \$11.00 (depending on make and tip size).

Many pens were suitable under certain conditions and, although they did not meet all our criteria, would be ideal for special uses. The final decision as to which pen to use on a given surface depends on the desired ink character, line width, and pen tip durability, aside from cost.† Given this limited study and our desire for a pen other than the hollow-tube pens for use under field conditions, the Pilot Ultra Fine Point Permanent pen was judged to provide the best performance, followed by Sanford's Sharpie Extra Fine Point and the Stylist Permanent.

† More specific information is available on these pens if requested. We ask that other users send their comments, either on the pens tested here or other pens they may have used.

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