

Mapping issues relevant to controlling

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- 2 OA policy on digital printing
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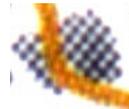
1 Printing techniques

Some definitions:

CMYK colours

CMYK refers to the use of 4 colours (Cyan, Magenta, Yellow and Black) to generate a wide range of colours.

For example, brown is composed of tiny dots/lines of cyan, magenta and yellow which, when viewed by the unaided eye, look brown. With a hand lens the individual dots can be seen. Different percentages of C, M, Y and K can produce virtually any colour. CMYK colours (also called 4-colour printing) are the standard in most colour work and can be used in both offset and digital printing.



Example:

Contours made up of dots of three colours: Magenta (56%) and yellow (100 %) and black (18%)

Rock surfaces made up of black dots (30%)

1 Printing techniques

SPOT (PMS) colours

Spot colours are pure colours made by mixing inks to colour specifications as defined by the Pantone Matching System (PMS). Each PMS colour has a number (e.g. PMS 471 is the brown specified for earth features by the IOF), and each colour is mixed by the printer (just like at a household paint shop) before inking the press.

SPOT colours can only be used in offset printing.



Example:

Contours made up solid colour PMS 471 (brown)

Rock surfaces made up of solid colour PMS 429 (grey)

1 Printing techniques

Offset printing

Offset is the most common form of large-volume commercial printing, involving the creation of printing plates directly from digital files (in the past this was done from the hand-drawn artwork via negatives), and the transfer of ink spread on rollers (one colour per roller) via printing plate to paper.

A typical offset printing press will have 2 to 4 rollers in series, so a typical orienteering map with 6 colours will be done in 2 passes through the press.

Offset printers do both four-colour (CMYK) and Pantone Spot colour printing

1 Printing techniques

Digital printing

Digital printing refers to any process printing directly from digital file to paper in one pass using the four CMYK colours. This includes commercial printers, the home printer and colour laser printers.

1 Printing techniques

CMYK vs Pantone Spot colours

Each method can produce a range of colours.

Many Spot colours lie outside the range of CMYK printing.

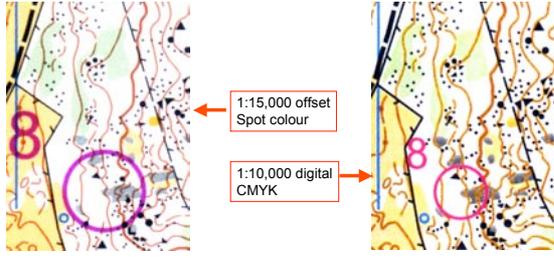
In orienteering, all the IOF recommended Spot colours are not exactly reproduced using CMYK printing (black is the exception). Yellow and purple are especially difficult to reproduce.

In response to this issue Pantone has produced HEXACHROME, a six colour process colour definition which will cover about 80% of the Pantone spot colour palette. This technology is starting to be introduced into digital printing, and is likely to lead to much better colour rendition for digital printing in the future.

1 Printing techniques

Digital or offset – a comparison

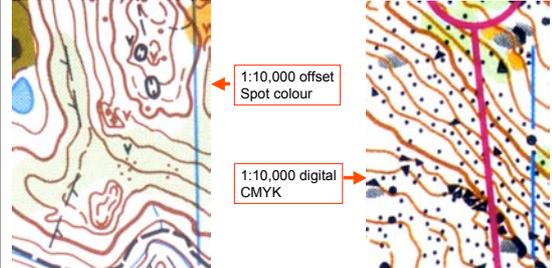
Sneak preview 2004 printed at different scales and methods compared at the same scale. Note difference in colour rendition and clarity



1 Printing techniques

Digital or offset – a comparison

Another example: Different 1:10,000 maps printed using different printing techniques. Note spread of inks in digital printing leading to more fuzzy boundaries

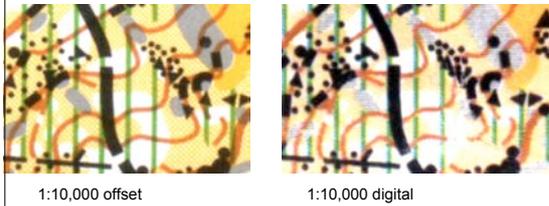


1 Printing techniques

Digital or offset – a comparison

Another example: Different 1:10,000 maps printed using different printing techniques.

Note spread of inks in digital printing leading to more fuzzy boundaries and more merging of black features. Grey is harder to distinguish.

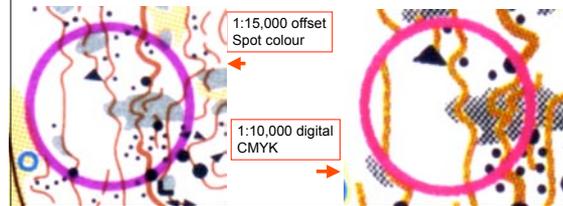


1 Printing techniques

Digital or offset – a comparison

Overprinting using transparent inks on offset printed maps doesn't obscure underlying detail

Overprinting at the same time as digital map printing risks obliterating underlying detail. This can be avoided by judicious cutting of circles, and correctly ordering colours in OCAD (colour ordering not possible in Coripse)



1 Printing techniques

Cutting control circles



The circle cut to show all features

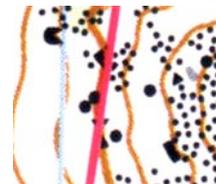


Significant rock features obscured by the circle and line from the approach side

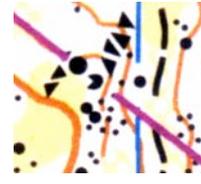


1 Printing techniques

Cutting overprinting lines



Significant rock features obscured by the lines between controls. Line should be cut.



Appropriate level of line cutting



1 Printing techniques

Conclusions and comparisons

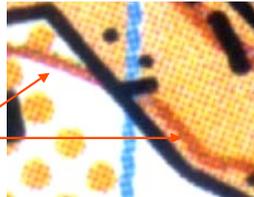
For the competing orienteer, the key issues are:

1. line quality
2. legibility
3. colour appearance
4. map durability

1 Line quality

Offset printing produces clearer, sharper lines.

There is often considerable spread of inks in digital printing when lines pass through colour areas.



Easter 2005, 1:10,000 digital print

1 Printing techniques

2 Legibility

Offset printed maps are invariably more legible.

At larger scales (1,10,000 and larger) digitally printed maps are usually acceptable.

For major events only relatively simple maps are acceptable when digitally printed at 1:15,000.

1 Printing techniques

3 Colour appearance

This is a major issue:

For some colour-blind orienteers the colours produced by digital printing are more difficult to read than the recommended IOF Sport colours.

Major concerns recorded to date is an inability to differentiate between screened (not solid) yellows and greens, and purple (which in OCAD is defaulted to 100% magenta).

The IOF Spot purple is impossible to reproduce, but the closest mixes are M80 – 90%, and C20 – 30%. In maps with lots of colour areas, 100% magenta is often the best digital colour for overprinting

It is essential to experiment with the printer and colour settings in OCAD to get the best result when digitally printing

1 Printing techniques

4 Map durability

Not a big issue, and many suitable papers are now available for digital printing.

Note that colours on home printers are often not waterproof.

1 Printing techniques

Digital or offset – the issues for the controller

Both methods have advantages and disadvantages, and the final decision will depend on a number of factors such as:

- number of maps required for the event
- if extra maps are required after the event
- cost
- convenience (especially wrt overprinting)
- colour control
- likelihood of the area changing
- complexity of the map
- event standard
- the durability of the map
- map scale
- the need for colours other than the standard orienteering colours (e.g. logos etc.)
- skill of the map makers
- quality of the digital printer

1 Printing techniques

Digital or offset – the last word

Offset printing still produces the best product, however if well managed, digital printing is not far behind.

Almost all maps can be successfully digitally printed.

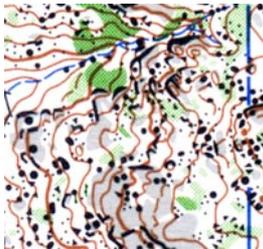
The key is what level of reduction in print quality is acceptable. The controller has an important role in the quality assurance role

As 1:10,000 maps become more common, orienteers become more aware of the pitfalls associated with digital printing, and digital printing technology improves, digital printing is likely to be the main printing technique into the future

1 Printing techniques

Digital or offset – the last word

One map I wouldn't recommend digitally printing.



Cascades, QLD at 1:15,000!

2 OA digital printing policy

For Group A events

Approval for digital printing must be obtained from the OA mapping committee convenor at least 6 months before the event.

For Group B and C events

Approval for digital printing made at the State/Territory association or Club level.

2 OA digital printing policy

Guidelines for approval for Group A events

Digital Printing **will** be approved when it can be demonstrated that there will be no significant loss of line quality, legibility, colour appearance and map durability for the competing orienteer.

Maps with the following terrain will require a demonstrated high standard of digital printing before approval is given:

- Significant areas of bare rock, especially those with small areas of bare rock amongst other detail
- Complex contour features (e.g. gold mining)

Note that complex maps printed at a larger scale (such as 1:10,000) are more legible and more likely to be suitable for digital printing.

3 Digital mapping

OCAD and GPS

OCAD 8

- Can put maps in real co-ordinate space
- Can have one or more geo-referenced maps/photos as templates
- Can import tracks from GPS (via DXF files)
- Can import contour and other data via DXF file

OCAD 9

Features in soon to be released OCAD 9 include:

- Direct import of tracks from Garmin eTrek GPS
- Improved GPS input
- Improved course-setting options

3 Digital mapping

Digital mapping in the field

Ruggedised tablet PCs (waterproof, shockproof and dust proof) with sunlight readable screens make digital mapping in the field a possibility



iXplore tablet PC



Integrated GPS unit (no wires)

3 Digital mapping

Digital mapping in the field

With a ruggedised tablet PC, integrated GPS and one or more maps/aerial photos as templates, mapping in the field is now a reasonable option.



Drawing on iXplore tablet PC with photogrammetry as template

3 Digital mapping

Digital mapping in the field

Advantages

- Real-time mapping, using final symbol sizes etc. – you see the map developing in the field
- No drawing up and end of day – just download file to computer
- Ruggedised tablet PC – can use in rain, hail or shine.
- The mapper knows their location in area at all times – no need to puzzle over photogrammetry
- Layers of geo-referenced information can be accessed – high resolution aerial photos, photogrammetry, existing OCAD maps etc.

3 Digital mapping

Digital mapping in the field

Disadvantages

- Batteries last about 4 hours, so spares are required, and somewhere to charge them
- GPS accuracy is about 5m without differential input – although this is usually OK for relative placement of most features
- The unit is reasonably heavy – a carrying harness is required.
- Drawing features, especially line features such as contours, takes a little while to master with pen drawing implement
- Cost – the setup on previous screen costs about \$6000 with GPS, spare battery/charger etc.

3 Digital mapping

What's next

The next generation of GPS satellites (Europe's Galileo series) will provide much higher GPS accuracy without the need for differential correction. The first satellites will be launched in late 2005.

Field based tablet PC technology continues to improve and get cheaper.

The technology is out there, it will be interesting to see how much is adopted, and when.