The IOF MC PrintTech project

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IOF Map Commission

Map printing for orienteering - Observations

- Traditional spot colour offset printing
  - Print shops / printers
  - Cheap for large runs. Large formats possible
  - High start-up cost (one plate per colour)
  - Inconvenient (and expensive) course overprinting
- CMYK printing
  - Print shop or private
  - Low startup cost for non-offset
  - Most competitive for small runs. Smaller sizes: A4-A3
  - Convenient (flexible) and cheaper course overprinting

IOF PrintTech project - Purpose

- Monitor the development of new printing technologies
  - Collect samples and experiences
- Disseminate information
- Update rules and guidelines (?)

PrintTech project

Autumn 2002	Project started Project leader: **Jukka Liikari**, IOF MC
October 2002	Request for map samples and experiences (technical details) -> All member federations
2002-2003	Received maps (from 7 member countries)
	Sample reviewing
2004-2005	First project deliverables
2005	Presentation in ICOM 2005 in Japan

PrintTech project

Autumn 2005	PrintTech project Test Sheet
2006	Test sheet sent to all member countries, received some test prints
2007	Questionnaire sent to map correspondents
2007	Presentation in ICOM 2007 in Ukraine
2007-	Project continues

Map printing for IOF events

- Ski-O
  - Good quality non-offset allowed
  - *Emphasis on ski-tracks, little emphasis on other details*
  - *Colour important (visibility of green tracks and purple overprint)*
- MTBO
  - Good quality non-offset allowed
  - *Emphasis on rideable tracks, little emphasis on other details*
- Trail-O
  - Good quality non-offset allowed
  - *Map reading while standing still*
- Foot-O
  - **Only spot colour offset** printed maps allowed
  - *Small details (in many colours) are important for navigation / map reading. Map reading at high running speed in rough terrain*

PrintTech - Main Quality Issues

- Graphical resolution
  - Dots per inch (ISOM)
- Colour and Appearance
  - Standard colours (ISOM)
  - Overprinting effect (ISOM)
  - Reflections
- Durability
  - Paper
  - Colour

PrintTech - Other Issues

- Price
  - Cost / map
- Time consumption
  - Copies / minute
- Convenience
  - Course overprinting
  - Competition timetable
  - Map scale

Printing technologies

- Spot colour offset printing
- Process colour (CMYK) offset printing
- Laser / LED printers
- Ink-jet / Bubble-jet printers
- Dye sublimation printers
- Thermal wax / Solid ink-jet printers
- Colour copiers

ISOM & printing I
Resolution

- *Maximum deviation in symbol dimensions allowed on the final map: +/- 5%*
- Minimum line thickness (black, green, blue and brown):
  - 0.12 mm 415 - distinct cultivation boundary
  - 0.12 mm 407/409 - undergrowth
  - 0.10 mm 310/311 - marshes
  - 0.14 mm 101 contour
- ISOM demands - printing resolution (minimum):
  - 0.10mm: 5080 dpi
  - 0.14mm: 3628 dpi
- ISOM 1990 (+/- 20%):
  - 0.10mm: 1270 dpi.
  - 0.14mm: 906 dpi.

ISOM & printing II
Colour

- *PMS colours*
  - Colour appearance depends both on the paper and the ink/pigment. PMS inks are paper type specific
- CMYK equivalents?
  - Cyan, Magenta and Yellow can vary from printer to printer
  - Setting are also paper specific
- Colour calibration

ISOM & printing III
Paper

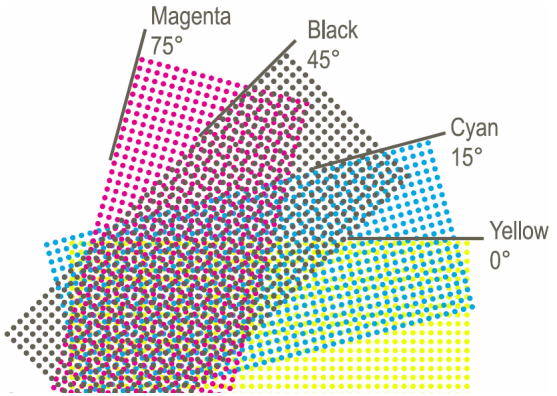
- *Good, possibly water resistant paper*
- *80-120 g/m²*
- Suitable paper for orienteering
  - Matte, coated paper
  - Not completely white
  - (In Norway: G-Print, 110g)

ISOM & **Overprinting** - translucency - transparency

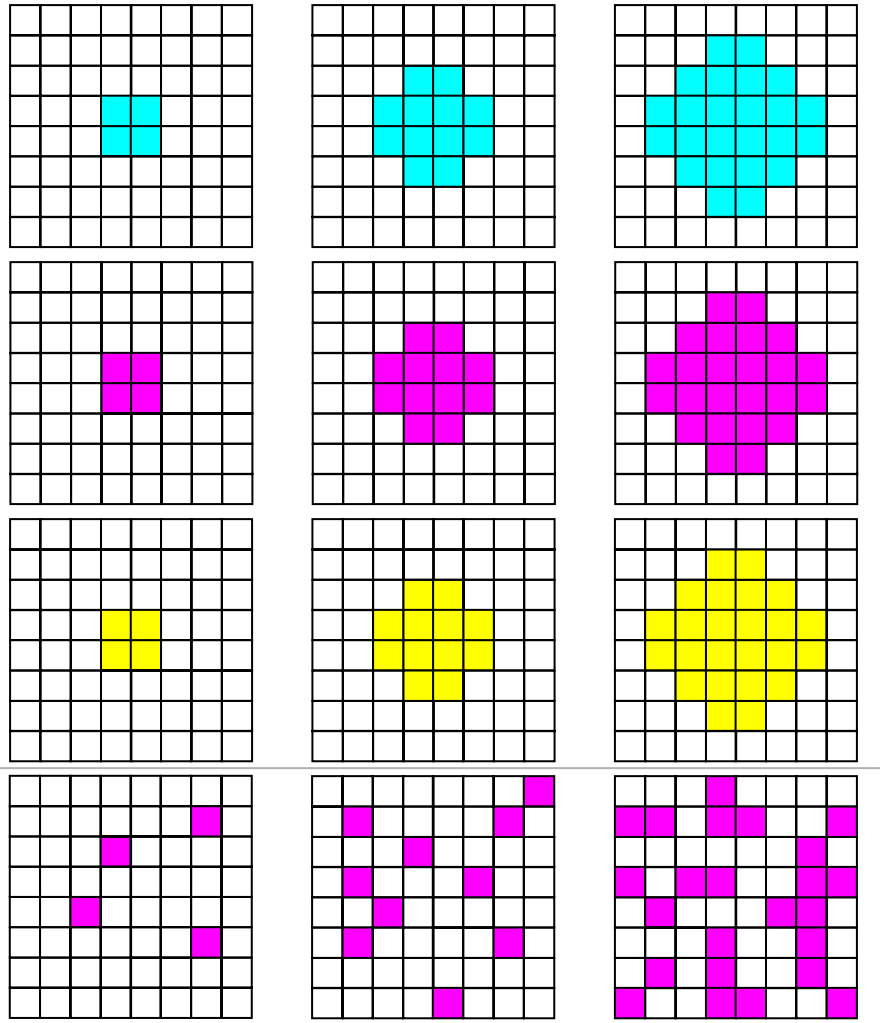
- Simulated overprinting effect, not transparency / translucency!
  - Difficult!
  - Orienteering map software does not currently do a good job simulating the overprinting effect
  - Specialist job(?)
- Postscript level 2-3 supports (some kind of) overprinting
  - Not device-independent!

```
true setoverprint
1 0 1 1 setcmykclolor
20 20 100 80 rectfill
%%(+ setoverprintmode)
```

Graphical resolution

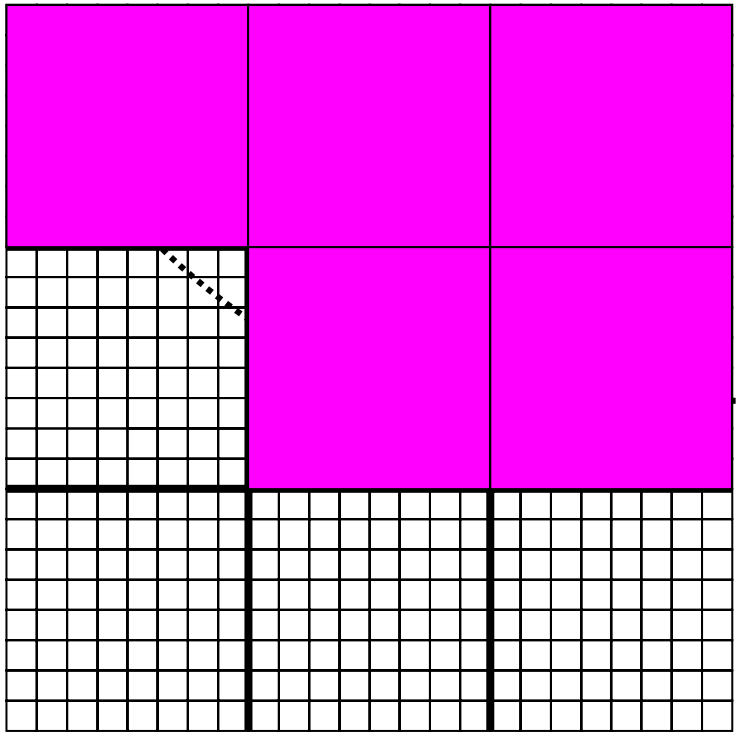


- Maximum resolution
  - example: 1200 dpi
- Effective non-CMYK colour resolution (spot colour "simulation")
  - Regular raster
  - Stochastic / Frequency Modulated

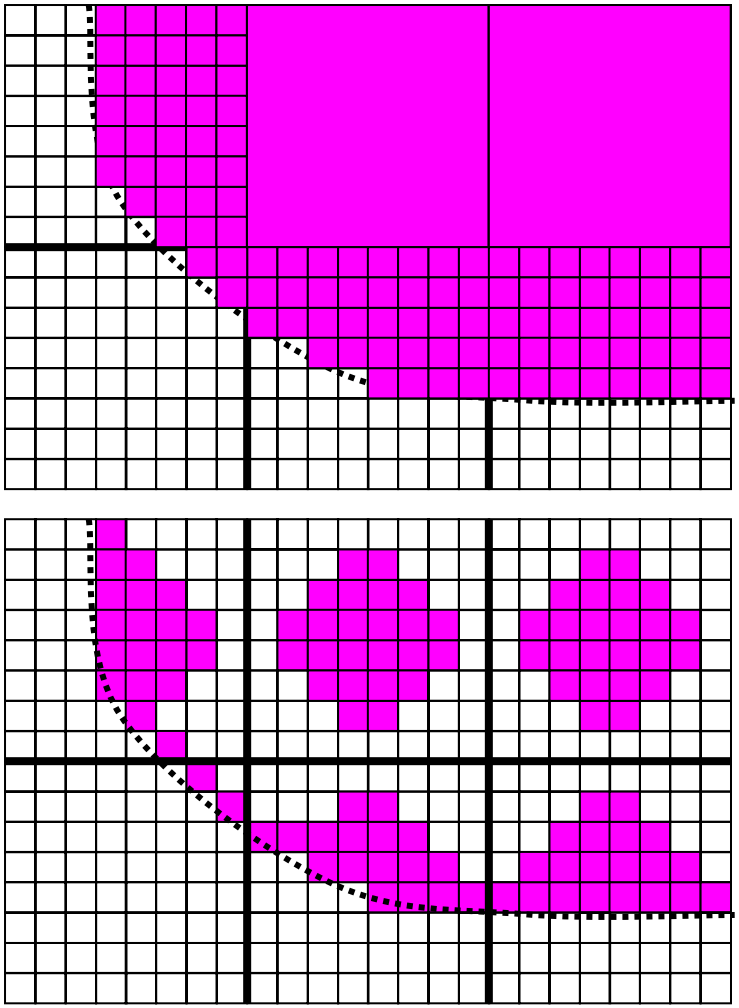


Edge rendering

- effective resolution



- utilising max resolution



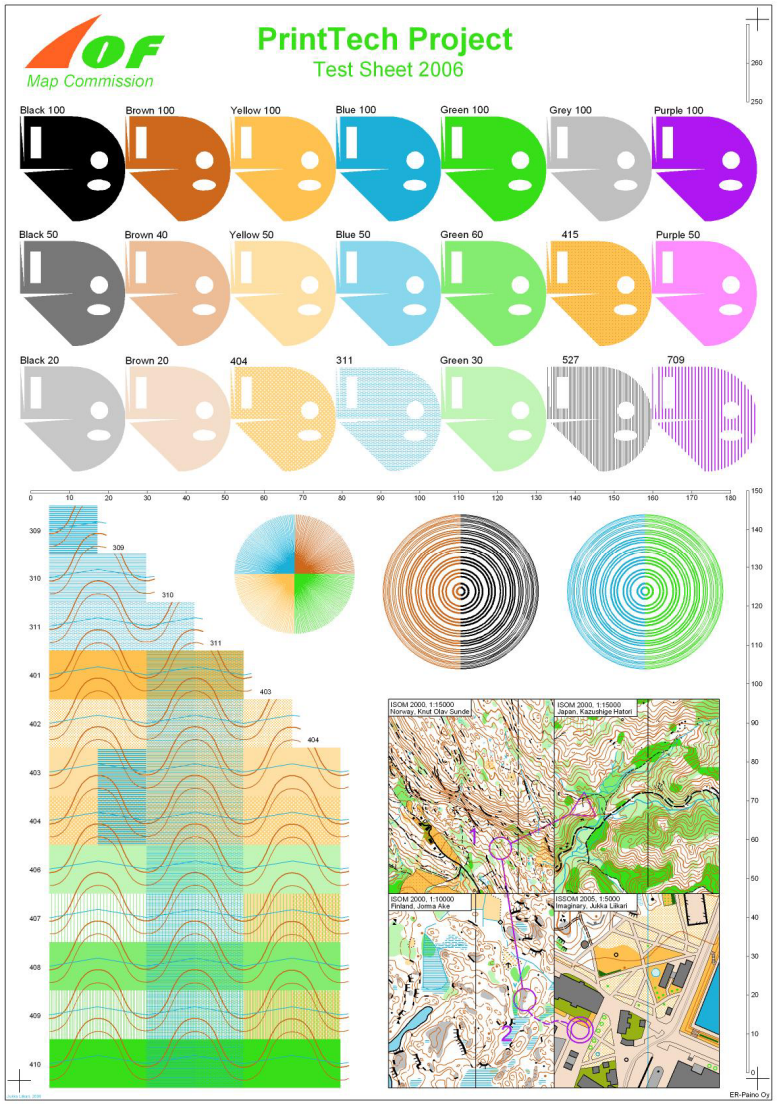
Colour

- Toner (laser/LED)
  - The use of oil/wax - glossy -> reflections ☹
  - Artificial toner (polymer)
    - smaller particles, more evenly sized
    - cheaper technology, less energy required, less toner usage
- Ink
  - Liquid
  - Solid

Standard colours - the future

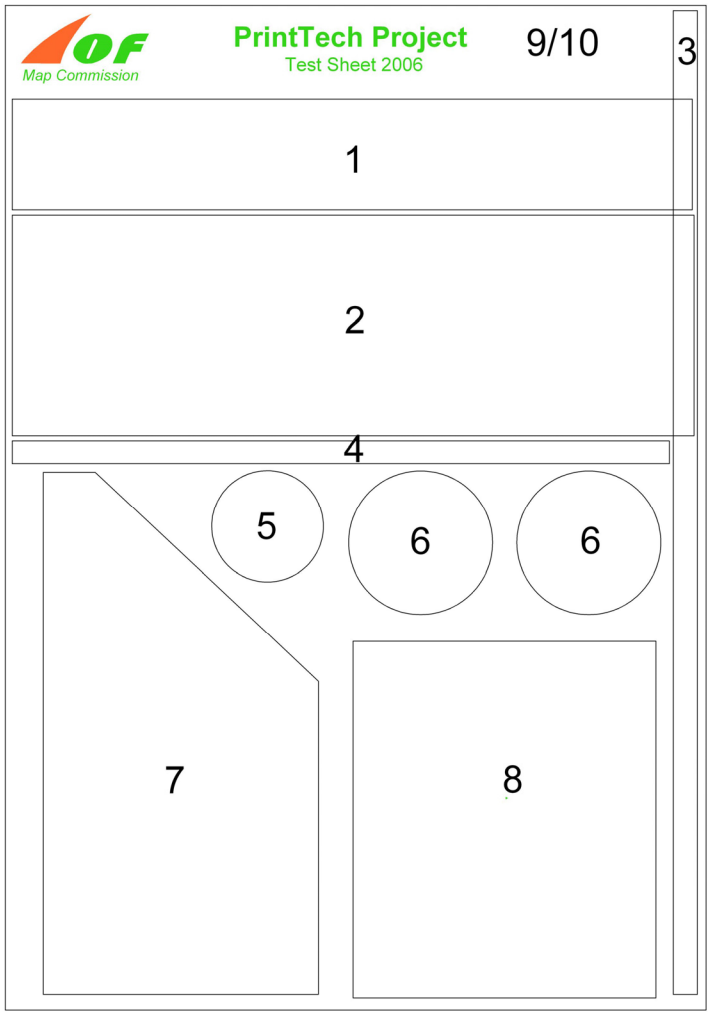
- Either
  - Support for PMS in printers / printer drivers (self-calibration)
    - Produce print files specifying layers of PMS colours in print order and the nature of the overprint effect (simulate offset spot colour printing)
- Or
  - Some new colour system?
- Or
  - ...

Test Sheet 2006



Test Sheet

1. Basic colours
2. Most common screens
3. and 4. Accurateness of measurements
5. and 6. Resolution
7. Combination of screens
8. Sample maps



Pros and Cons - non-offset CMYK printing

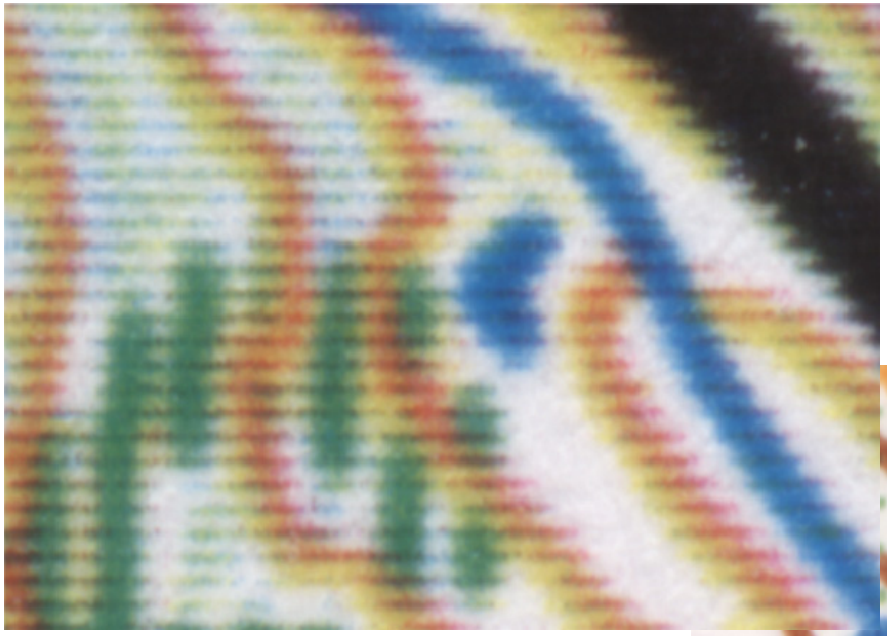
Aspect	*Advantage*	*Disadvantage*
Price	"Small" numbers Concurrent course overprinting	Maps for other purposes? One course per file may be necessary
Resolution	CMYK is approaching spot colour offset printing	CMYK is still inferior compared to spot colour printing. A big problem for the contours (brown colour)
Course printing	Easy and fast	Overprinting effect must be ensured
Timetable	A few days faster than traditional	Continuous updating may cause problems!
ISOM colours	Adjusting colours is possible	Need for frequent colour calibration, yellow is difficult, brown is very important
Other colours	Can produce millions of colours	The ISOM overprinting effect is currently not supported device-independently by Postscript printers. The software has to do the "Rip'ing" (time consuming and error prone!).
Durability		Ex. hard paper and surface colours
Water resistance		Ex. colours that are not water resistant
Cold resistance		Ex. colours that fade in cold conditions
Appearance		Ex. glossy colour / glossy paper

Samples, PrintTech project

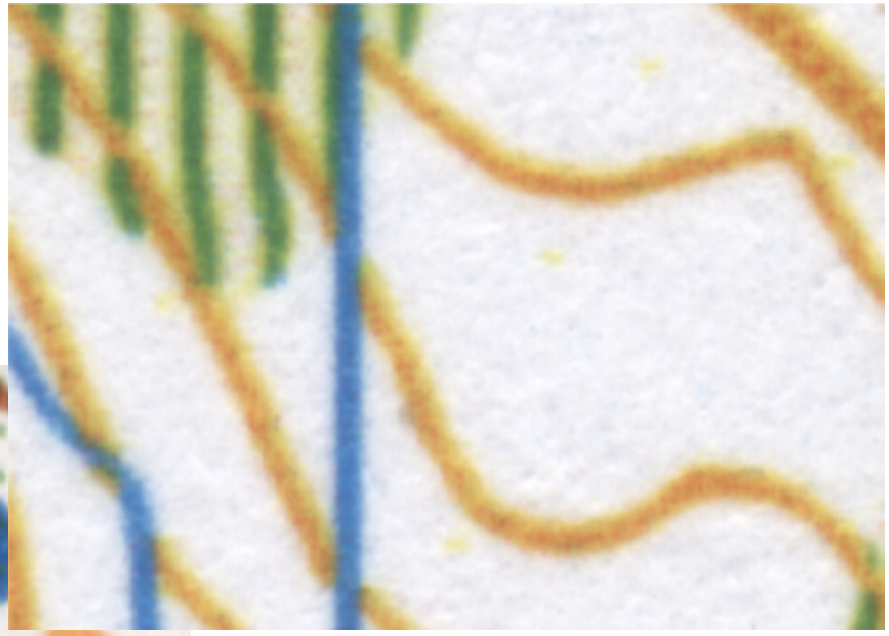
Scanned with an
Epson Perfection 3200 Photo

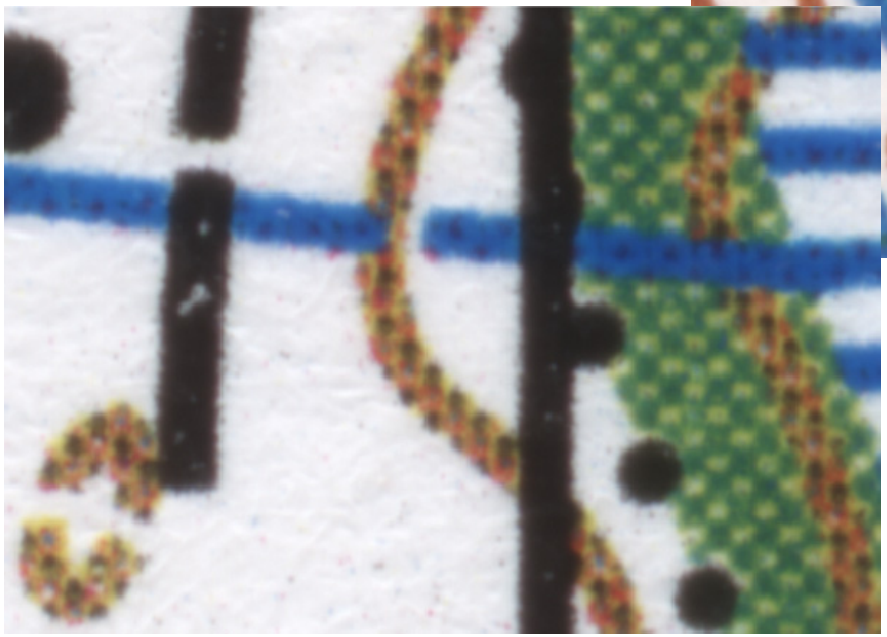
Settings: 24 bit colour, 3200 dpi

Slovakia, Canon CLC1000

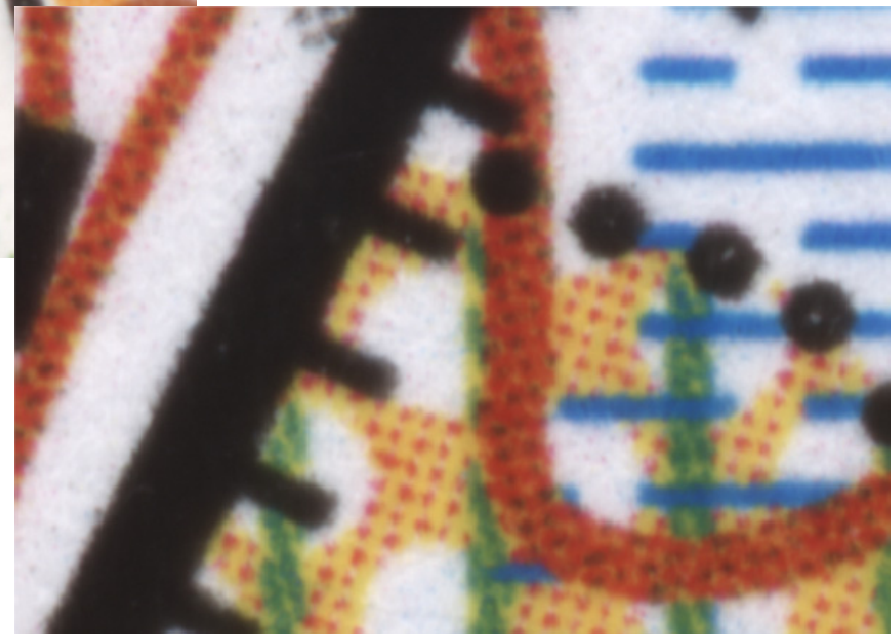


Slovakia, Canon CLC1130



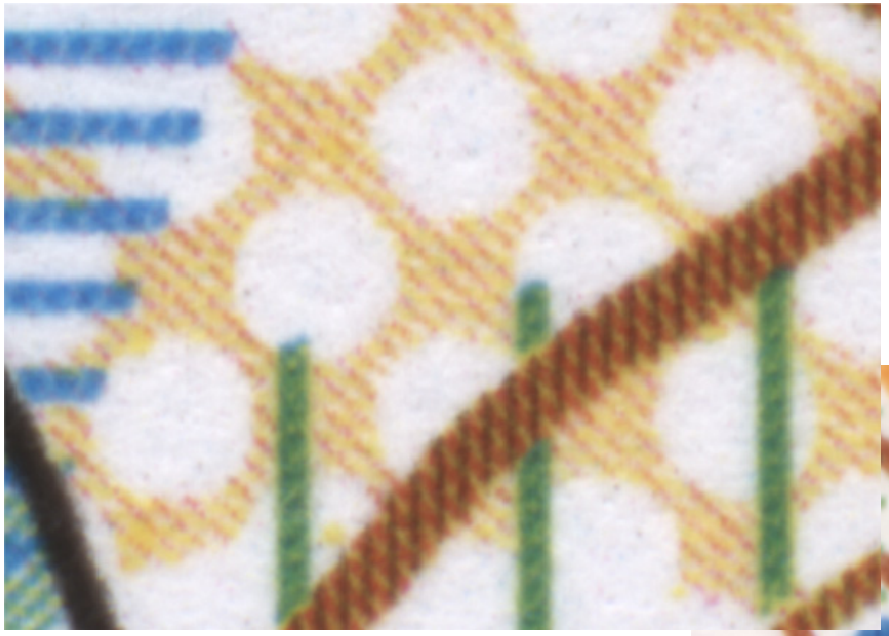


Scotland, Minolta QMS330

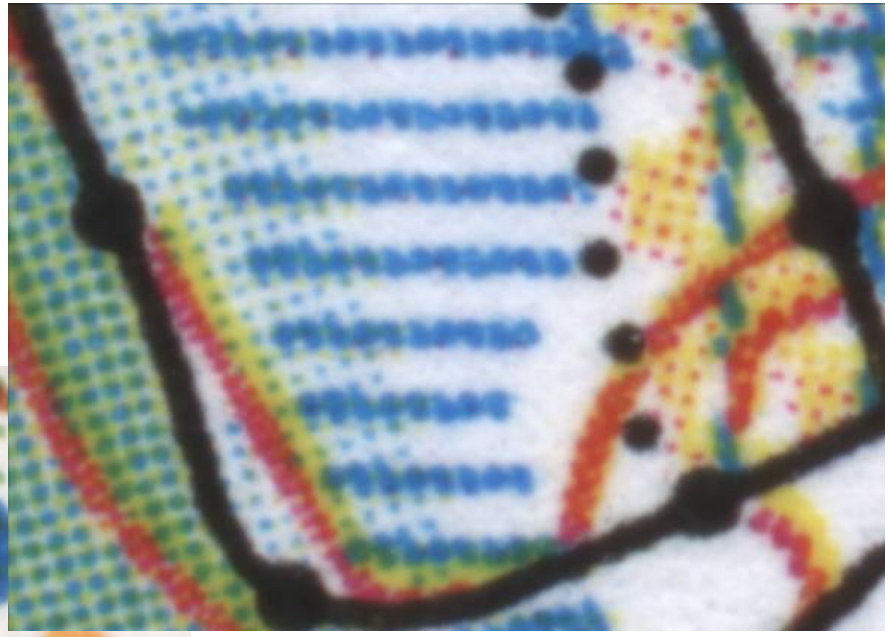


Finland, Tektronix Phaser 780

Finland, Xeroc DC2060



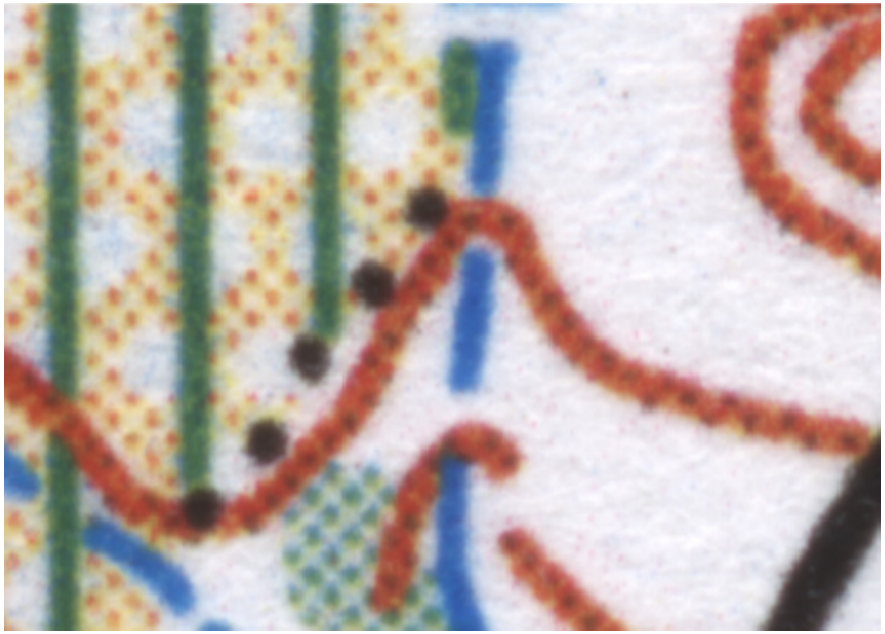
Czech, Ricoh Aficio AP3800 RPCS

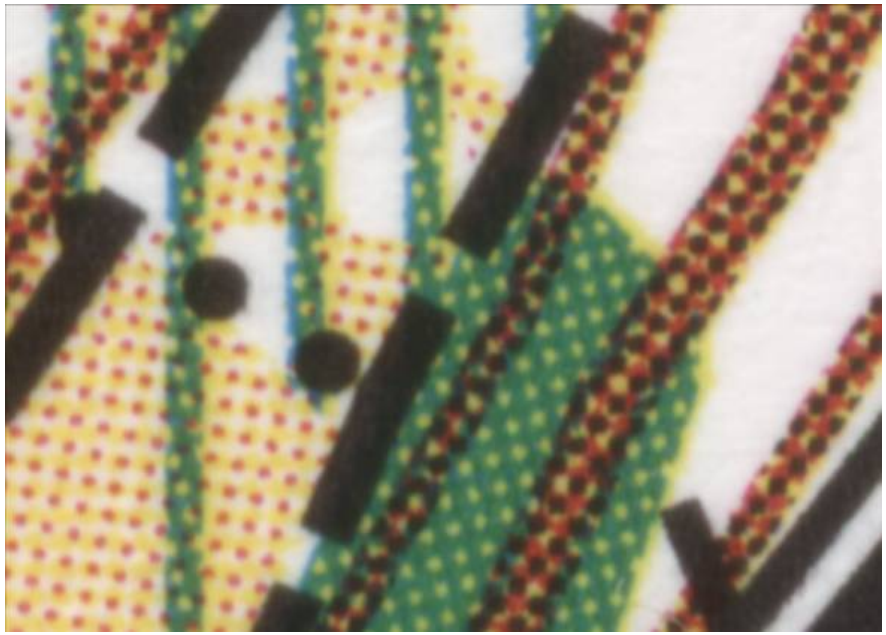


USA, Epson Stylus Photo 2200

Sweden, Canon CLC 1150

Sweden, Minolta QMS 330





Great Britain Heidelberg Speedmaster

Great Britain, Xerox DC12

Other samples

Offset

CMYK stochastic

CMYK 160 lpi

Spot colour

Spot colour

CMYK + brown

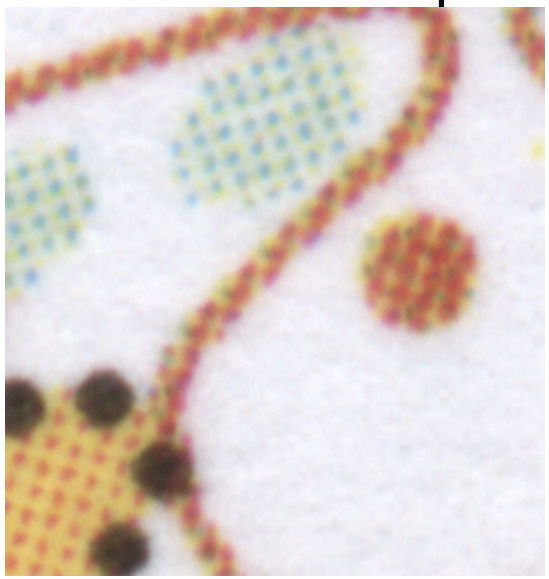
CMYK stoch. (P Luscher)

Colour copiers

Oce

Canon

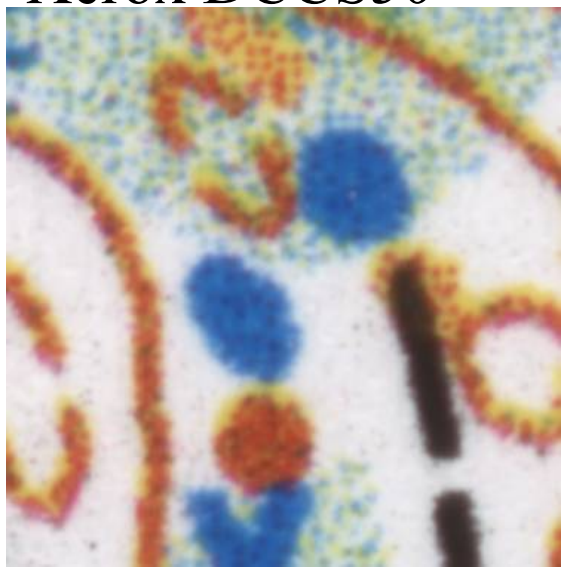
Xerox DC3535 point



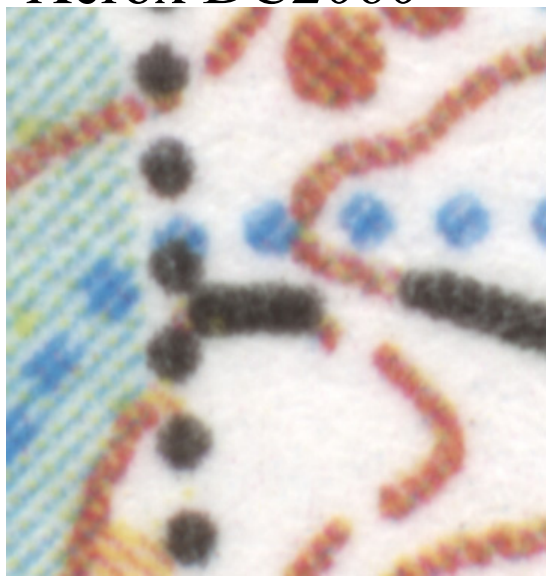
Xerox DC3535 line

Xerox DC3535 line

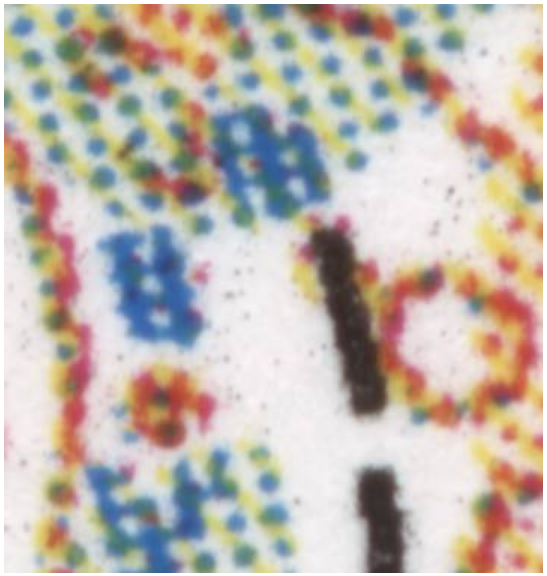
Xerox DCCS50



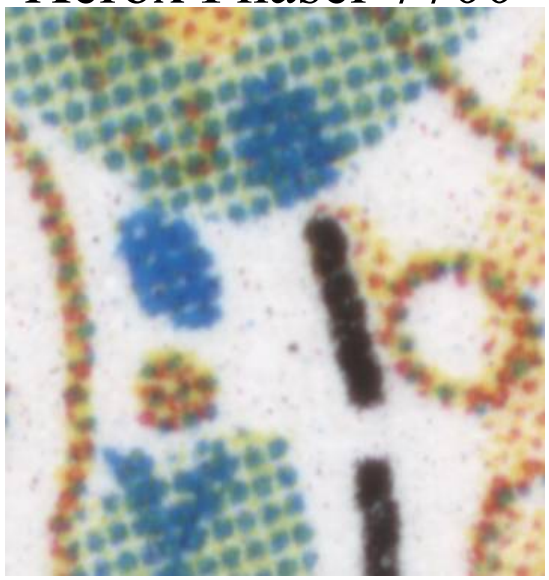
Xerox DC2060



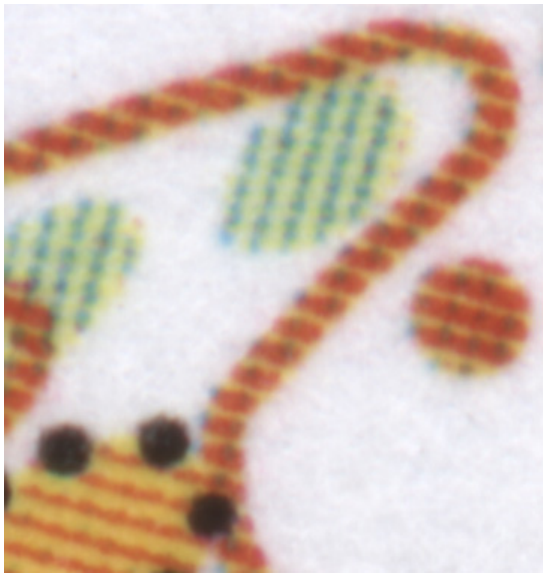
Xerox Phaser 7300



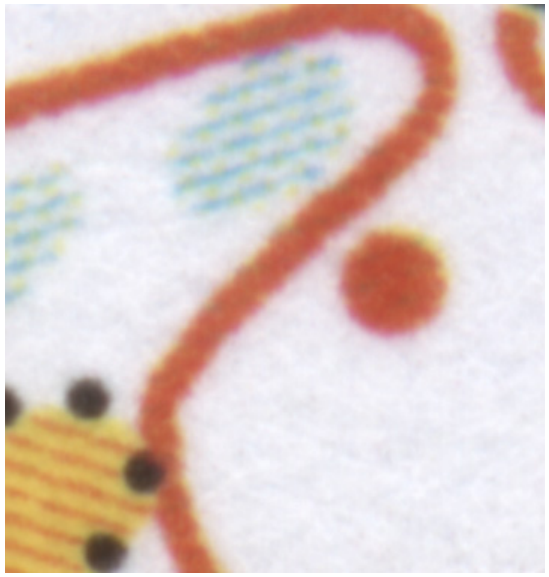
Xerox Phaser 7700



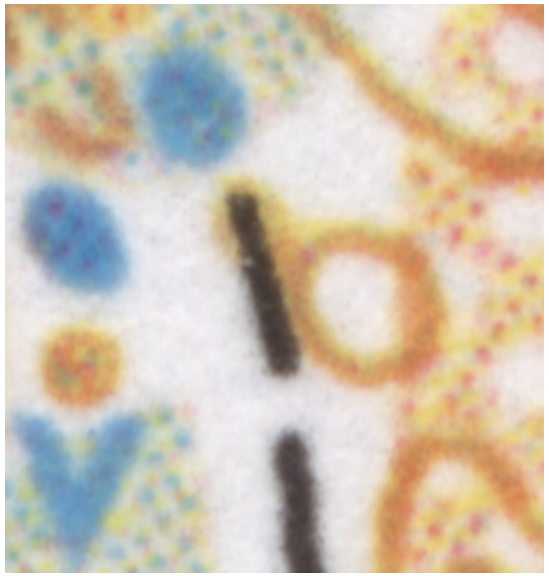
Xerox Phaser 7750



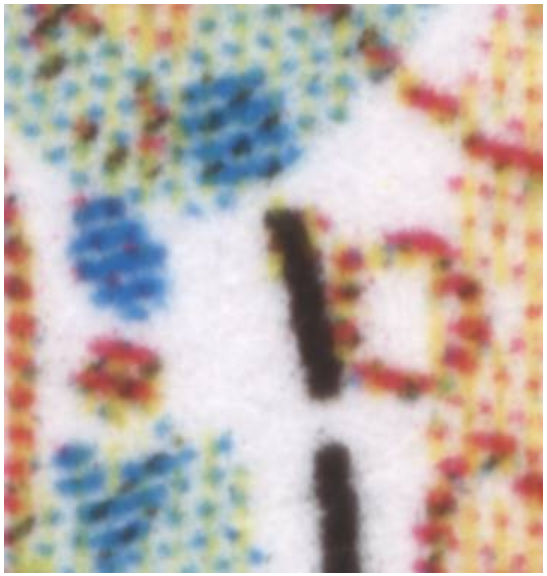
Xerox M24



Konica 8031

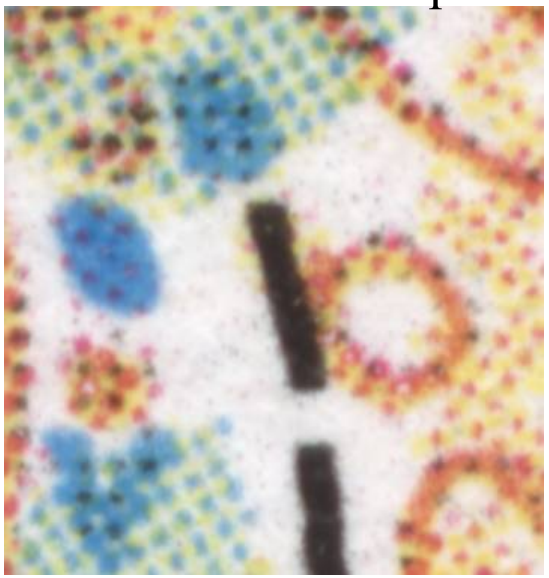


Lexmark C912



Konica 8050

Minolta CF2002 Optima

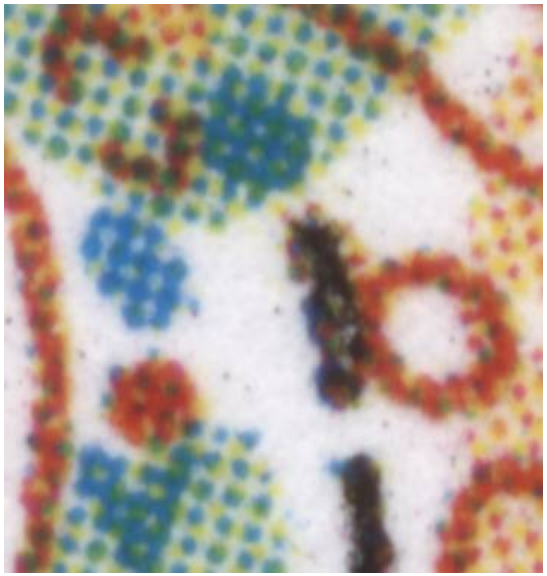


Minolta CF2002 G-print

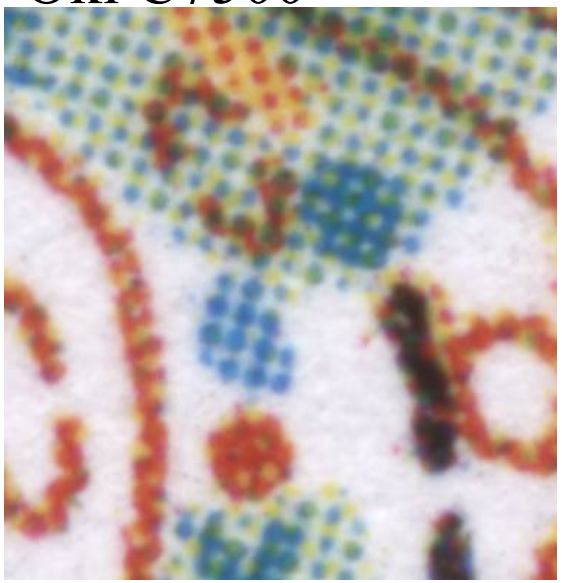
Konica Minolta C350

Oki C9500

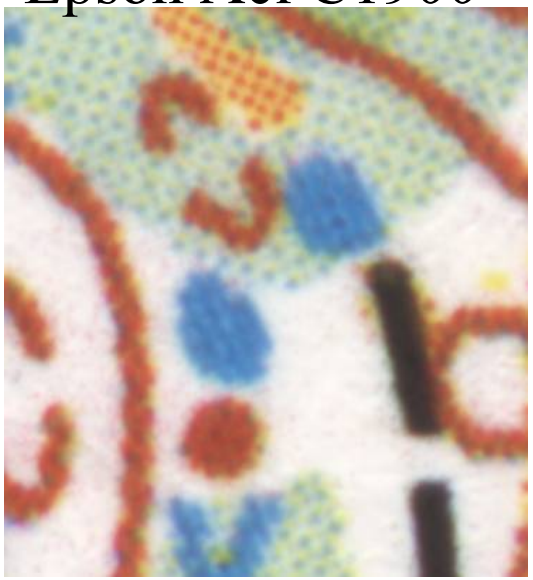
Oki C9500



Oki C7500



Epson Acl C1900



Epson740 (RIP'ed in OCAD)

Watch the IOF MC Web pages!

Link at

www.orienteering.org

PrintTech Project
STATUS REPORT

IOF
Map Commission

What is a digitally printed map?

In this presentation a digitally printed map is printed with:

- digital printing press (not so common)
- laser printer (almost all)
- inkjet printer (some)
- dye sublimation printer
- thermal wax/solid inkjet printers
- colour copier

Other maps are printed with:

- spot colour offset printing machine
- frequency modulated 4 colour offset

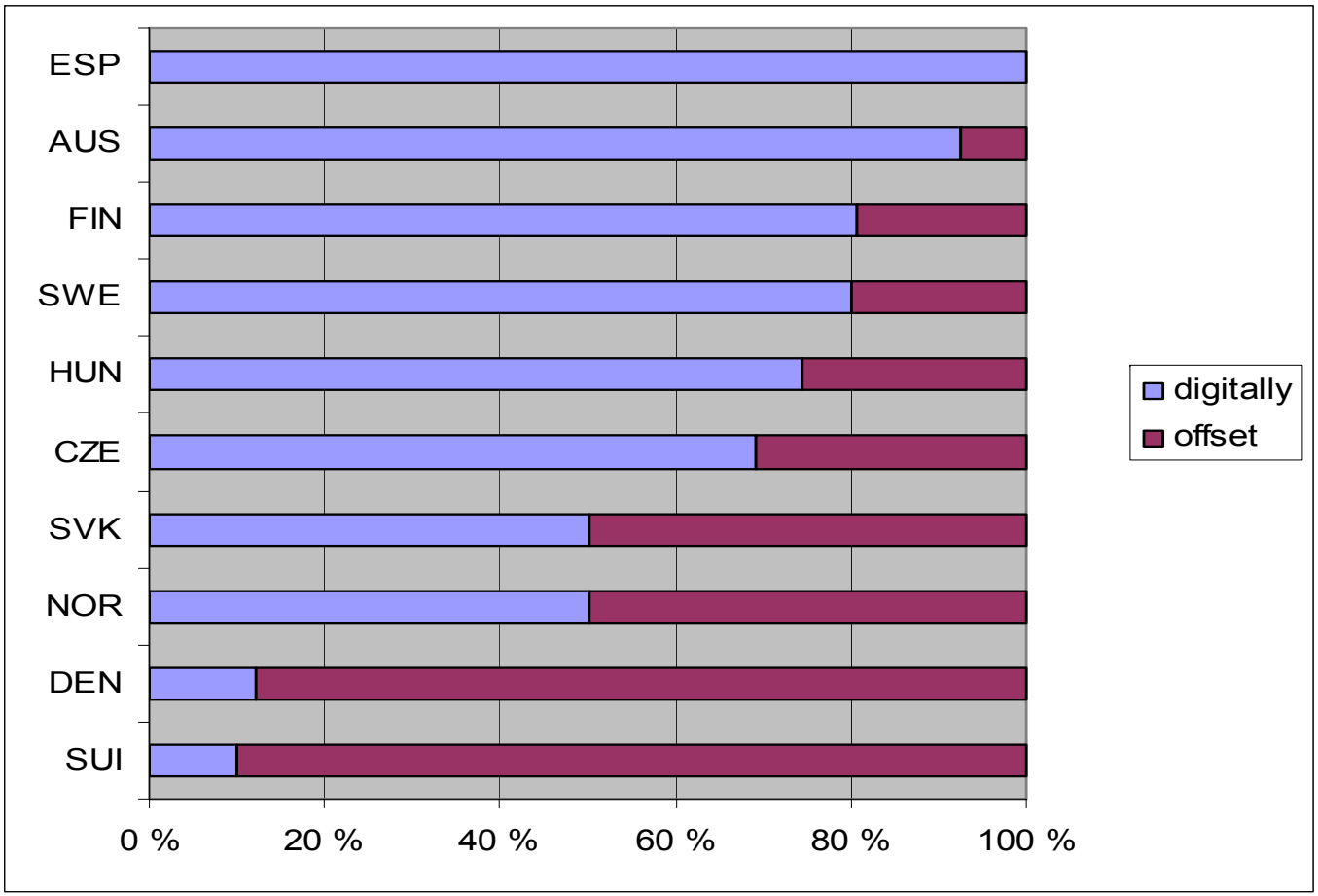
The Questionnaire

The questionnaire was sent to the 33 map correspondents and other recipients in 33 countries.

Only 10 answers were received, but those were very good.

The production of the maps

- How many maps a year are produced in your country and how many of them are digitally printed?


ESP
AUS
FIN
SWE
HUN
CZE
SVK
NOR
DEN
SUI
0 %
20 %
40 %
60 %
80 %
100 %
digitally
offset

The maps in local events

Is it allowed to use digitally printed maps in local events?

YES	AUS, CZE, DEN, ESP, FIN, HUN, SUI, SVK, SWE
YES, IF	NOR: the map must be readable
NO:	-

The maps in national events

Is it allowed to use digitally printed maps in national events that are official events in national federation´s calendar?

YES	ESP FIN HUN SUI SVK
YES, BUT	AUS: not in events where IOF rules are followed CZE: after approval by national map committee DEN: only in 1:10 000 SWE: not in elite classes on 1:15 000 map
NO:	NOR

The maps in national championships

Is it allowed to use digitally printed maps in national championships?

YES	ESP HUN SUI SVK
YES, BUT	AUS: not in events where IOF rules are followed CZE: after approval by national map committee DEN: only in relay
NO	FIN NOR SWE

Is the quality good enough?

If you think about the best digitally printed maps in your country, is the quality of the maps good enough for national events?

YES:	CZE ESP FIN: almost every map is now digitally printed HUN: (due to financial reasons) SVK
YES/NO	AUS: yes for maps 1:10000, not 1:15000 DEN: depends very much on the type of the terrain NOR: perhaps for 1:10000 in suitable terrain types SWE: yes for maps 1:10000, not 1:15000
NO:	SUI

Is the quality good enough?

If you think about the best digitally printed maps in your country, is the quality of the maps good enough for international top events if IOF would allow it?

YES:	-
YES, BUT	AUS: only in the scale 1:10000 CZE: you must know how to reach the high quality ESP: not always SVK: only in the scale 1:10000 and bigger scales
NO:	DEN, FIN, HUN, NOR, SUI, SWE

The advantages

What are the main advantages of using the digitally printed maps?

- price (6)
- printing courses together with maps (6)
- easy and fast updating (6)
- fast production (3)
- print on demand (3)
- colour flexibility in case of advertisements (2)

The disadvantages

What are the main disadvantages of using the digitally printed maps?

- quality (poor legibility, fuzzy and unclear image etc.) (6)
- costs (2)
- underestimating the complexity of printing (under stress) (2)
- no maps without courses left after competition
- requires special knowledge
- the size of maps usually limited to A4
- water resistance not good
- the lack of specialised printers
- long duration of printing with transparent colours

Some conclusions

It is usually - but not always - fast, easy and cheap to use a digital printer while organising a competition.

The quality is not perfect, but good enough for all local events and for the majority of national events (especially 1:10000 maps).

There is no international pressure from active O-countries to allow digitally printed maps in IOF events.

The future?

One comment in the answers:

”I have a strong feeling, that laser printed map will dominate the world of o-maps pretty soon, unfortunately with less quality!
The participants accept it without any criticism!”

Thanks to

Noel Schoknecht	Australia
Zbynek Krejcik	Czech Republic
Flemming Norgaard	Denmark
Petteri Palmi	Finland
László Zentai	Hungary
Håvard Tveite	Norway
Radoslav Jonas	Slovakia
Mario Vidal Triquell	Spain
Christer Carlsson	Sweden
Thomas Gloor	Switzerland