

UV-Curable printer for Glass and other rigid materials:



*Sky Air-Ship SkyJet UV
FlatMaster Printer*



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UV-Curable printer for Glass and other rigid materials: SkyJet UV FlatMaster Printer SkyJet UV GlassMaster Printer

INTRODUCTION

There are about 16 manufacturers of UV-cured printers in China who have exhibited at least one UV printer at the Shanghai advertising trade show in July over the past three years. Of these there are about a dozen Chinese manufactures which produce a dedicated flatbed printer. But of these twelve, only about 30% are actual production models; the remaining 70% of flatbeds are only prototypes, made to exhibit at a trade show in the hopes that someone might order one.

There are five major types of UV-cured wide-format flatbed printers today:

- Hybrid (pseudo) flatbed printers (with pinch rollers and grit rollers)
- Combo flatbed printers (with a moving transport belt)
- Dedicated flatbed (really flat and dedicated only to thick rigid material)
- Dual-structure flatbeds (a dedicated flatbed with a roll-to-roll option at one end)
- Dedicated roll-to-roll

Several years ago hybrids and combos were very popular but increasingly printshop owners are realizing that for some jobs, especially to print glass, ceramic tiles, wood, metal, MDO board and any large heavy rigid materials that these are best handled by a real flatbed (what we call a dedicated flatbed).

This report is based on inspecting this flatbed over the last several years at various trade shows and then spending two days in the factory and demo room in Shenyang. It is essential to undertake a site-visit case study of an actual printshop. A full recommendation should not be issued until we can inspect how this printer holds up out in the real world. But something we can document is that the company that designs and manufactures this flatbed printer is deserving of being evaluated. Sky Air-Ship is medium sized, so more agile than a larger company and more experienced than a small manufacturer.



SkyJet UV FlatMaster printer at APPPEXPO Shanghai 2009.



SkyJet UV FlatMaster printer at Sky Air-Ship demo room 2009.

Even as recent as a few years ago most printshops in North America and Western Europe would not consider most brands of printers if they were made in Asia. But gradually the Chinese manufacturers are realizing that the past and recent history of lack of tech support, low-bid components, counterfeit parts, and inadequate tech support is not the way to insure long-range success. Chinese engineers are fully capable of designing and manufacturing a printer that is fully functional and that will hold up a reasonable period (which for a printer would be at least three years and ideally for five years). FLAAR is curious as to which of the 16 manufacturers have reached this stage. So far there are only two Chinese manufacturers which have significant presence outside China: RTZ and Teckwin. At the Shanghai 2009 trade show I noticed another three or perhaps four other Chinese manufacturers who had reached the level where they are potentially a viable product for outside China.



To document printer manufacturers we spend time visiting them, both in trade shows and in their home city back in China.

Sky Air-Ship is one of the three or four Chinese manufacturers who are now ready to be considered for growing export to North America, Latin America, and Europe. Actually Sky Air-Ship is already the #1 seller of flatbed printers in China and has several installations outside China already.



Here you can see Nicholas with Mr. Liang Jian president of Sky Air-Ship at their headquarters in 2009.

THE BASICS

1. Brand name, model?

SkyJet UV FlatMaster

2. If there are two or three (or more) widths of this printer, what differences exist other than the width?

There is a 1.2 x 2.4 meter model, a 1.8 x 2.4 m model and a 1.8 x 3m model.

The basic model is a flatbed platform, but you can have an option with rising balls to help lift up glass. This option does not use vacuum because the glass boards are heavy enough to remain in their place.

3. What is the nature of the company? Is this company the manufacturer, distributor, or rebranding a machine made by someone else?

SkyJet is the original manufacturer.



Sky Air-Ship headquarters in 2009.

4. What other printers are the same or similar chassis from this manufacturer or distributor?

The FlatMaster has had a series of modifications and SkyJet has classified the models in generations. The current is the fourth generation but the fifth is already under development. There was one third generation model being finished in the assembly line; most of the others were fourth generation.

5. Is this same model(s) rebranded and sold under other names?

In the past some models were rebranded and sold under other names. It is hard to trace back the history over the years, but the Calca UV flatbed may have been from this factory. There may have been other different brands as well.

6. What other printers of other brands are comparable?

Similar in size and shape to the Mimaki JV-1631, Gerber ionx. But the FlatMaster is at an entry level price.



SkyJet FlatMaster UV printer at Sky Air-Ship headquarters.

7. How does this model compare with comparable previous printers?

The current third and fourth generation is significantly better in appearance than models I saw two years ago.

8. If this is a rebranded printer, what features are different than the original printer?

It is similar to the previous models, but it has undergone a series of improvements. The model in the demo room was a third generation model and had the printheads parallel to each other. But the models being assembled in the factory had the printheads offset from each other.

9. When and where was this model first introduced?

The current printer appearance was officially launched in July 2008. At FESPA '09 in Amsterdam was the first time in a trade show for the 4th generation, but previous models had already been exhibited elsewhere.

10. Is there enough new on this printer to make it worthwhile buying it if I already have another recent model?

Yes. The mechanics to move the gantry have been improved to make it faster, the printheads have been changed for another brand, etc. SkyJet has constantly upgraded this model since the first generation.

11. What is the history of the development of this printer?

The first generation was actually a combo system (with transport belt), but a combo of these dimensions could not handle heavy materials, so SkyJet moved into a flatbed platform, whose components have been changed through the developmental period of about 10 years.

12. What is the philosophy behind the development of this printer? What did the manufacturer seek to achieve?

This manufacturer does not want to make a me-too printer whose sole advantage is being cheaper. They realize that to separate themselves from competing brands they need to offer technical support (and have a

better printer to begin with so it does not need so much tech support).

13. Is this printer mature or still in alpha-stage or beta-stage?

This printer is long out of beta-stage. More than half of the UV flatbed printers made in China are either only prototypes or are in alpha-stage. Only a few are even in beta stage. About three are mature enough to survive in a printshop. Sky Air-Ship is one of these brands that actually manufacturers a real flatbed (most of the others are only concept-cars which are made for exhibit at trade shows in the hope that an end-user or distributor will buy one).

14. List price?

At FESPA '09 I was told by the distributor for Holland and Belgium that the price is €59,000. The price in US\$ is \$65,000. But prices may vary according to your location and distributor.

15. Does a complete set of full-sized ink cartridges come with the new printer, or merely a "starter set" that is not as full as a regular set?

Yes a complete first set of inks is included.

16. Do you need an uninterruptible power supply (UPS)?

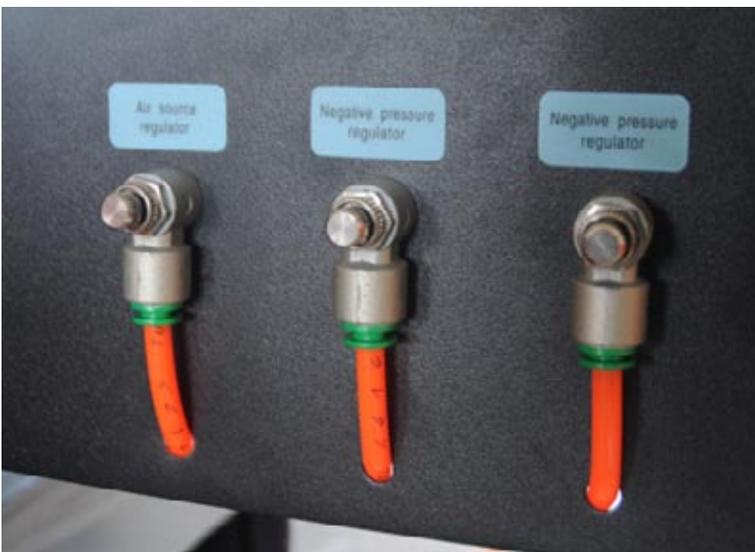
Generally yes. For example, in Indonesia the current is not constant and an UPS is a must.

17. Do you need to provide air pressure for negative pressure for ink in printheads? Do you need to provide compressed air for any other purpose?

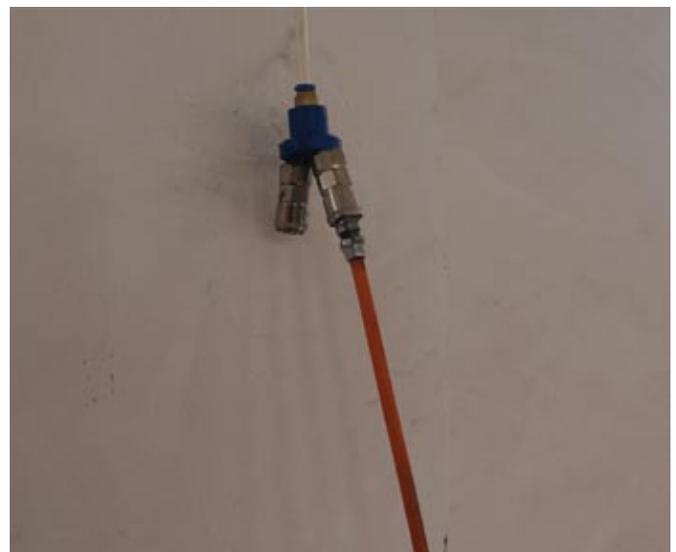
Yes. The factory has an air line for each printer that will be assembled.

18. Is an air suction system needed to be installed as a separate item, or is all the vacuum table or other vacuum requirements already included in the printer itself?

The printer includes the vacuum pumps. There is no need of any other air suction system.



SkyJet UV FlatMaster air pressure controls.



SkyJet UV FlatMaster compressed air line.

19. Is it recommended, or required, to buy a spare parts kit? Or extra printheads?

The warranty includes spare parts and SkyJet covers the shipping.

Most end-users don't wish to buy a spare parts kit up front, in part because they don't yet have the experience to do their own repairs when they are first buying this printer.

20. Or do the dealers prefer that customers not try to make their own repairs?

Every printer manufacturer and distributor has their own policy on whether they wish the end-users to make their own repairs. The philosophy of ColorSpan was to keep the end-user from fiddling with anything inside the printer. This was logical because many were first-time users of this kind of printer. The downside was that once you became experienced, or if your printshop was already advanced, the lack of access to the innards of the printer was self-defeating and undesired.

But there is no right or wrong policy (ColorSpan is not "wrong," they are simply trying to protect newbie's from making a mess of the inside of the printer. In general, the end-user is usually not encouraged to take the printer apart and do repairs on their own. Only later on, when you have considerable experience, and have taken advanced tech support training, would doing your own repairs be realistic. However I have visited many printshops where the printer operator prefers to receive this training precisely so they can do their own repairs. After all, if the manufacturer can train their own tech support person surely a printer operator, who also works with this printer every day all month all year, can also learn how to maintain and repair it (if they have the interest and inclination).

This policy varies by manufacturer. Interest in doing their own repairs varies by the end-user and by the printer operator. A few operators like the opportunity to take service training at the factory and thereby to be able to do basic repairs on their own. Some manufacturers discourage this, but some manufacturers do allow end-users to take advanced service training.

PURCHASING**21. Are dealers national (most companies) or regional (Roland allows a dealer to operate only within a limited regional area)? Does a buyer have any choice in dealers?**

In some cases a dealer covers only a country, but for example MAN, the distributor for Sky Air-Ship in the Netherlands covers also Belgium and Luxembourg. IGE solutions in FL, is the exclusive distributor to promote SKYJET UV FlatMaster in glass industrial field of USA, Canada and Mexico.

22. What kinds of leasing or other financing are available?

Financing programs do not exist yet but are being considered for the near future. SkyJet sells to end users but its major sales are to distributors. Any financing program is more likely to be found with dealers.

FEATURES OF THE PRINTER: Vacuum**23. Is there a vacuum function?**

Yes, the flatbed table works with vacuum although there is a version of the printer that is especially designed to print on glass. This version does not need a vacuum, but instead has a system of balls to allow you to raise and lower the glass sheets more easily.

24. Is the vacuum created by simple fans, or by an air pump?

The vacuum is created by three air pumps.

25. In how many sections?

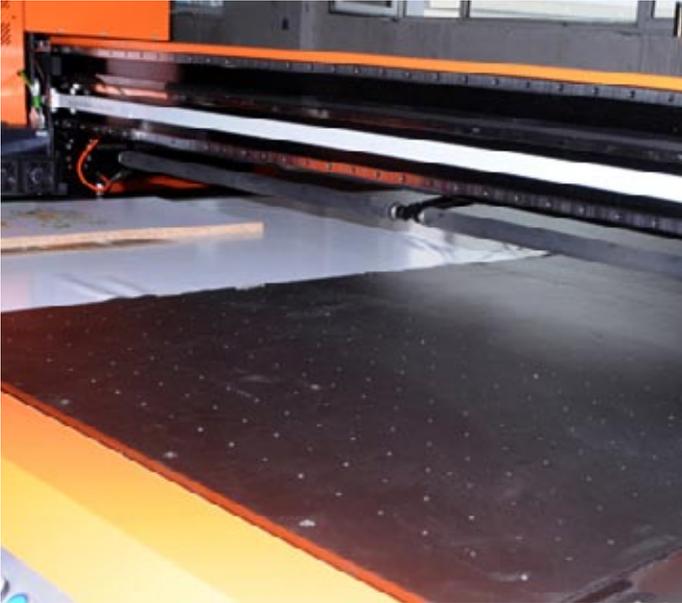
At the front you see the six buttons to activate the six areas of vacuum.

26. Are the vacuum areas (size and position) user definable?

No. The areas are fixed,



SkyJet glass lifter balls that allow you to raise and lower the glass sheets easily.



Here you can see there are two kinds of tables, the one that works with vacuum, at the right, and the one that is especially designed to print on glass, at the left.



SkyJet UV air pumps.

27. Can you turn one or the other section(s) off and on?

You can have any of the six on while the other(s) are off.

28. Just Off and On? Or variable?

Just off and on.

STRUCTURE OF THE PRINTER: Media Transport Mechanism & Media Path**29. Is this a dedicated flatbed with no roll-to-roll capability? Or is this a true flatbed or just add-on feeder platforms at front and back?**

The FlatMaster is a dedicated flatbed without roll-to-roll system. However, roll-to-roll system is one of the improvements being planned for the near future.

Just realize that the best machine to print on flat material is a dedicated flatbed and the best printer to print on roll-fed is a dedicated roll-to-roll. The advantage of a combo printer is that it can print on both flat and rigid and roll-fed material. But no joint-use printer can print on all materials perfectly: irrespective whether it is a \$80,000 entry level or \$300,000 VUTEK or other brand.

30. Is there a moving transport belt (combo style) or a stationary platen (hybrid style)?

The first generation was a transport belt system, but SkyJet decided to go flatbed.

31. Are their edge guards at each side (end) of the platen? At left, or at right, or both?

There is no need to have edge guards on a dedicated flatbed because the substrate is not transported, it is fixed in the same place.

32. Was this printer made originally as a UV-curable ink printer, or is it retrofitted with UV-curing? If retrofitted, what was the original brand or model?

This printer was designed from the ground up to be a UV-curable printer.

LINING UP FLAT MATERIAL (to help it feed straight)**33. What kinds of raised guide bars (alignment bars) along the side of the table exist? Left or right? How long?**

There are no raised bars but there is a system of pins along the edge of the flatbed table. These pins can be raised or lowered with a button (called location cursor)

34. Is there a registration gate that is lowered across the back printing area?

At the time there seems to be no registration system across the gantry.

Most printshops report that most rigid media is crudely cut and rarely are the edges really at 90° to each other. So you don't really want to align a corner, you want to align one side (on one end).

FLATBED ASPECTS (for dedicated flatbeds)**35. If a dedicated flatbed, how many sections is the flatbed divided into?**

The flatbed area is formed by 4 planks.

36. If a dedicated flatbed, do the edges (joins) of the sections of the table cause a noticeable imprint on thin material?

Although you can see the joins of the planks, they are carefully placed and no significant mark is left in the substrate.



As you can see, the flatbed is formed by 4 planks and you can see the moment of its installation.



The careful placement of the planks make the edges almost imperceptible to the eye and touch.

37. Is there a pinch roller system for the flatbed, and if so, where is this located?

Yes, there are actually dedicated flatbed systems that also have pinch rollers. Indeed one Chinese flatbed has two sets of pinch rollers atop the flatbed. There are even some combo systems (with moving transport belt) that also have pinch rollers: the Durst Rho 700. Of course this begs the question of whether its vacuum system needs the pinch rollers. But pinch rollers can be more assistance than moving the media-- a pinch roller can keep the trailing end of a piece of foam core from lifting up (curling up) as the front end is being heated and printed on. So, if you wish to keep an entire foam board flat from front to back, you may need pinch or pressure rollers in addition to a vacuum system underneath.



The previous generation of this printer had a system of pinch rollers (a) where the pressure movement was manually adjusted, which took a lot of time. In the next generations this system of pinch rollers will disappear and media will only be pressed down with the pressure roller (b).

38. Does the table move? Or only the gantry above it?

Only the gantry moves. The flatbed area is stationary.

39. If the table moves, what controls its movement? Lead screw? How many (one on each side, or one in the middle, or three?).

On the third generation, the gantry was moved by a central lead screw, but the system was quite slow. On the fourth generation motion is created by the belts at each side.

The advantage of the new system is that it allows more print speed. The disadvantage is that requires a lot more attention for a synchronized movement.



SkyJet UV FlatMaster new movement system.

40. How much weight can the table hold?

400 kg

41. Is pin registration present? How many pins? What is their position(s)?

Pin registration is normally present only on a dedicated flatbed, not on a moving transport belt. Just realize that not all sheets of rigid material are themselves actually perfectly rectangular!

42. If no pin registration system is present, what kind of other registration system is available?

No other registration is present in the current model nor are multiple registration systems common.

43. Does the printhead carriage move across the widest dimension of the table (like Gandy Jeti or Oce 250), or across the narrow dimension (this is how Inca does it)?

No. On the current model, the movement of the carriage is on the narrower side, but in the next generation already being designed, movement will be in the widest dimension.

44. What are the pros and cons of a dedicated flatbed compared with a combo printer (with moving transport belt) or hybrid printer (with platen)?

But even dedicated printers have their downsides too; with a dedicated flatbed you (the operator) are idle, totally, while the printer is printing. You can't load or unload anything (except on some of the newer million-dollar printer systems). But if you have a \$450,000 combo printer, such as the Durst Rho 700 or 800, you can load at the back while the printer is cranking the previous job of flat material out the front: this can print and load and unload all at the same time. I have seen this ability to feed-while-printing also with the ColorSpan 9840uv (HP Scitex FB910).

But with a dedicated flatbed printer, there is less alignment issue just because the media is not cut squarely from the factory. Poorly cut material is a major disadvantage for combo or hybrid printers. So again, the reason there are more than four different classifications of UV printers (hybrid, combo, dedicated flatbed, dedicated R-t-R) is because each has pros and cons.

In theory, the perfect printer would be a dedicated flatbed with a dedicated roll-fed system across the long axis. Océ is the first with a functioning version of this double concept. (Gerber unfortunately is doing all their printing across the short axis).

MISCELLANEOUS

45. Does the printer have levels built into the structure of the printer?

No visible levels.

The only entry-level or mid-range hybrid or combo printer where I have noticed levels actually incorporated into the structure of the printer are the UV-curable printers of Dilli.

46. Does the printer have leveling supports? How many, and how strong?

Yes, there are leveling supports at each corner.

Leveling any UV printer is crucial. Indeed at the NUR factory, once the structure is leveled in the assembly room, rather than roll it from stage to stage, all construction stages take place with the printer not moving from stall to stall.

47. Does the printer have wheels? How many, and how strong?

Yes, four wheels.

48. Are the leveling supports part of the wheel, or are the wheels and leveling supports separate?

The printer uses casters, modules composed by wheel and leveling support.

49. Do the wheels have a lock on them?

For any printer weighing over one ton it is assumed that no locks or brakes are needed on the wheels because a tank will not roll anywhere if parked on a level floor.



The SkyJet UV FlatMaster has a caster at each corner. Wheel and leveling support are integrated in the same structure.

UPGRADES, Future Improvements?

50. What features have been added, or changed since the printer first appeared?

As explained earlier, the evolution of the FlatMaster has been divided into generations. We explain here the main differences:

First Generation: Used a transport belt to move media; it was a UV combo printer that used XAAR 360 printheads.

Second Generation: SkyJet changed the transport belt for a dedicated flatbed table and the movement was created by a lead screw along the wider dimension. SkyJet began to study Konica Minolta technology and implemented it to substitute the XAAR printheads. Also in this generation, the shutters are controlled by an electronic switch. The UV lamp was also changed. The new lamp is Integration Technology SubZero 85. These UV lamps are ideal for mid-range printers.

Third Generation: Also used the central screw for the movement of the gantry. Some improvements were made in the UV curing system, more precisely in the shutters. In this third generation, the shutters are controlled by air pressure.

Fourth Generation (2009): SkyJet abandoned the movement by a central screw and replaced it with movement generated by belts at the sides of the gantry. Many improvements were made in the technology of the controls, the UV lamp system. The outer appearance was also enhanced. The vacuum table was modified allowing now 6 areas for vacuum.



Integration Technology SubZero 85 UV lamp.

51. What features are being added, or changed, further out in time?

SkyJet engineers are considering moving the gantry so that the carriage moves in the wider dimension, since at present the carriage moves in the narrow dimension. This would be for the 1.2 and 2.4 models.

Also SkyJet wants to add a roll-to-roll system in the smallest model.

Currently you can have up to 12 printheads. In the future there are going to be 16 printheads

There is also going to be a sensor to measure the gap, the distance between the printheads and the substrate.

52. What do end-users ask for; what improvements do owners of this printer wish they had?

Some potential customers want vacuum to be automatically controlled. Others wished the printer had a channel for varnish, especially for acrylics.

Miscellaneous: Movement

53. What moves:

- *the flatbed platform,*
- *the printhead area,*
- *only the material (fed by roller table; then gripped and fed by the printhead area mechanism as on a regular printer; or both?)*

In the FlatMaster what moves is the gantry, like in most flatbeds, the Gandhi, the Océ, etc. SKYJET UV FlatMaster supplies two ways printing mode in "Y" direction, it means it also can print backward(from back side of printer to front side)

54. If the objects you are printing are not as wide as the full width of the printer, does the printing carriage still have to cross the entire space, or can the printing assembly hover just over the area of what has to be printed (and thereby be a bit faster?).

Yes, you set the width of your substrate in the software and the carriage hovers only over the width of your media.

Most sophisticated printers can hover. But this may cause too much heat build up over one part of the printer. So your software also needs to be able to modify the hovering position if so desired. This is a decision the operator has to make.



In the FlatMaster what moves is the gantry, and if the object you are printing is not as wide as the full width of the printer, the printhead carriage can hover only over the length of your media.

OPERATING THE PRINTER

55. Can the operator manage print jobs via the Internet with this printer?

Not normally. It is an option considered for future generations, but not currently.

56. What is the level of ease of use? Can anyone use this printer or do they have to be trained and certified? What about daily and periodical routine maintenance?

Yes, the printer is relatively easy to use. It is thought that a person without previous experience would need 3 to 4 days of training for the basic operations.

57. What sensors does the printer have?

The encoder strip works with a sensor. There is a sensor inside the printheads. In the future there will be a media height sensor.

58. Which materials are pre-established in the software, or do you have to create the settings for each class of material yourself?

SkyJet creates the ICC profiles depending on the substrates most likely to be used by the buyer.

59. In the main area for operation, is the machine software based (touch screen), or with physical control buttons? Or both?

The machine is software controlled in the sense that you use a keyboard and a mouse to control the printer. But it is not a touch screen system. It also has physical buttons at front and in the printhead carriage.

The Durst Rho printers are touch-screen operated. The Gandinnovations are keyboard operated. The Fieldcenter Formosa UV printer has many cranks and manual switches. So clearly there are several equally valid ways of operating a computer.

60. Do you get an LCD screen in the printer or other real computer monitor? How big is the screen or monitor?

It is not included in the purchase price but SkyJet can supply one.

61. What controls are on either end?

No controls at either end. Main control area is centralized in the front.



Main control area is centralized in the front of the printer like you can see on the photo. This model was covered with plastic for shipping.

62. Is a foot pedal included (for operating aspects of the printer)?

I did not notice a foot pedal. Only about 10% of UV-cured printers have a foot pedal.

63. Can you do unattended printing? For how long? How about overnight?

You can set the software so that the machine starts printing immediately after the RIP has processed the image. But considering the nature of a dedicated flatbed (where you load the media manually) you can do unattended printing only for the substrate(s) that is already loaded in your flatbed table.

64. How many operators or operator assistants does this printer require?

Normally one. In some cases you might want to consider two persons, for example to load a large piece of heavy glass.

65. Is there a pole with beacon lights?

Dilli was among the first to use a vertical pole with beacon lights. One person said that DuPont's UV printer from RTZ (Flora) was the first of all. Most other printers do not have such a beacon. Presence of a beacon is not a major plus point; absence of a beacon is not a significant minus point.

CONSTRUCTION (BUILD QUALITY)

66. What kind of testing is done in the factory of the incoming parts?

Parts are tested all together when the printer has been already assembled.

67. What is the solid-ness of the construction of the outer body? Is it plastic? Metal? Heavy gauge?

The framework is steel. The outer parts are also solid metal.



FLAAR analyzes every detail of printers construction to be able to report objectively. At left, Nicholas inspecting the framework of the printer.

SkyJet UV FlatMaster general view of the chassis. You can see the outer parts are made of solid metal too.



68. Is there a hood?

No, this is an open design; no hood.

A hood protects you from most UV lamp light leak. A hood protects you, to some degree, from misting UV ink. With a hood it is easier to exhaust ozone and misting UV ink (if you attach a ventilation system to a vent opening in the top of the hood).

But since it is expensive for a printer manufacturer to add a hood, most cheaper UV printers have no hoods. An exception is ColorSpan; they sell so many UV printers, and many go to relatively family-operated companies, that not to have a hood would be too risky for possible future lawsuits. Yet in the real world most printshops run their printers with the hoods completely off (or opened).

69. Does the printer wobble back and forth when printing?

There is no significant vibration on the FlatMaster, although to some degree vibration is inevitable in most machines due to the fast acceleration of the printhead carriage.

AESTHETICS

70. How would you describe the design of the printer?

Clean design, the FlatMaster looks modern.

71. Can you easily distinguish which is the “front” and which is the “back”?

Yes it is easy to distinguish the front for the position of the main control area and the design of the printhead carriage.

I call the front the area where the LCD and operator panel(s) are situated. This usually means that the other side is where you feed the material in. I call that the back. But many printer companies call the feeding area the front. It makes no difference as long as you define what you mean in advance.

Some UV-curable printers have a moveable control computer that can be situated at one end, or at the feeding area (whichever location the operator prefers). But the standard arrangement is that the LCD and keyboard are on the output side. I call this the front.



SkyJet UV FlatMaster at Shanghai 2008.

SET-UP OF THE PRINTER: PRACTICAL CONSIDERATIONS

72. What is the delivery time, between the time I order the printer and it is delivered?

10 to 15 working days, depending on your location.

73. Do you need to budget installing a ventilation or room exhaust system?

All UV printers need room ventilation, for everything from ozone to misting ink to general odor. Increasingly ozone production is surprising; this has led some companies to claim that “no ventilation is needed.” Such a claim is dangerous, especially in a country like the US where litigation is so common. Has Agfa never heard of misted ink? Ink mist is what the printer operator could potentially breathe if the ink is misting (many printers mist, most notoriously the Infiniti 1600 models; the ColorSpan 72uvX also mists a great deal).

74. Are there any special temperature or humidity requirements or preferences of this printing system?

40% to 60% is the recommended humidity range for this printer. A temperature of 20° to 25° is ideal.

Temperature and humidity are indeed crucial, especially humidity. Even more important is that whatever temperature and humidity is present in the work area, that it not vary during the day: cool in morning, hot by 11 am. Hotter by 2 pm.

75. What about altitude? Some cities such as Guatemala City are at a high altitude?

Almost no spec sheet and not even many User Manuals mention anything about altitude. But Guatemala City is about 1500 meters above sea level (which is rather high; there are four volcanoes visible out my window as I write this), and other parts of the world have even higher elevation.

76. What about dust and cleanliness of the air?

A clean, dust-free environment is strongly recommended for the optimal operation of the printer, although in the factory the windows were open all the time.

Dust in the printing environment is an aspect that is often neglected. It is crucial that if a sign shop, that no sanding, sawing, routing, sandblasting, or grinding operations be nearby. The dust and debris from sawing and comparable operations are extremely unhealthy for a UV printer.

In other words, you need to ventilate away more than ozone and ink odors; you need to ventilate away everything else that is already in the print-shop environment.

77. What is the connectivity? Network, SCSI, FireWire, USB or USB 2, or other?

USB.

78. Realistically, how much surrounding and support space will the equipment need in addition to the machine's own footprint.

You will need 36 sq. meters for proper operation of the printer.

79. Does the printer come in one piece? Does this mean you have to remove a wall to get the printer this size into your office?

Yes it comes in one piece but the gantry is disassembled and placed along the widest dimension to use a smaller crate.

80. What is the size and weight of the printer?

Model	Width (length)	Breadth	Height
SKYJET UV FlatMaster3018	1830mm	3000mm	1370mm
SKYJET UV FlatMaster2418	1830mm	2440mm	1370mm
SKYJET UV FlatMaster2412	1220mm	2440mm	1370mm
SKYJET UV GlassMaster3022	2200mm	3000mm	1370mm

81. How many boxes arrive?

You receive one wooden crate.

82. What comes in the box?

The printer, 3 vacuum pumps and 2 boxes of parts.

INSTALLATION OF THE PRINTER

83. Realistically, what expenses must you incur for the installation, such as a fork-lift truck or crane to lift the printer off the truck?

If the machine is bought by a dealer for the first time of installation or trade show, SKYJET pays the airfare. The hotel and meals are paid by the dealer.

84. What size and kind of forklift truck do you need? Or do you need a crane?

At the factory you could see many industrial sized forklift trucks. Heli AC5 and AC15.

85. Does the printer have spaces for the forks of a forklift truck to get a balanced hold on the bottom of the printer?

Most sophisticated UV printers of most brands have rectangular brackets built into the underside of the printer, usually both front and back, so you can use a forklift truck.

86. Can you install this printer yourself?

No. There are some installation procedures that are not intended to be done by an end-user. For example, the gantry needs to be mounted and tested.

87. Is installation included in the purchase price?

Yes. All installation expenses are included in the purchase price if you buy from a distributor.

88. How many people come for the installation?

1 person.

89. How many people are required to lift, move... the printer during installation? How many people do you need to provide for the installation?

3 or 4 persons are required.

90. Do people also come for a pre-installation site inspection? Or is the inspection just a form sent in by e-mail or fax by the print shop to the distributor? From the factory or from the distributor or from the dealer?

Yes, a person is sent to inspect the site where the printer is going to be installed.

INSTALLATION OF THE PRINTER: INSTRUCTIONS & MANUALS**91. How many manuals are available?**

There is only one manual.

92. Which manuals are hard-copy? Which manuals are only on CD?

The manual is delivered in a CD.

93. Is there a glossary in the User's Manual?

Yes, there is a glossary, but in general the manual is being improved.

94. Is there a Service Manual?

There is a Service Chapter in the main manual.

95. What is the native language of these guides? Is the translation acceptable?

The manual is written twice. There is one version for the local market and another version for the overseas sells. So the manual for the local market is obviously written in Chinese and the manual for customers outside China is written in English. So, according to one sales manager, the manual is not translated but written all over again in English.

The following statement is as valid for a \$400,000 UV printer as it is for a \$70,000 model. No matter how well translated, all translations done by a speaker for whom English is a second or third language should have the translation proof-read by a native English speaker. If a company is selling printers into the US, the translation needs to be fully and completely comparable to spoken English, not literal English.

90% of the manuals whose native language is other than English use terms that are too literal: they are translated terms, not the actual terms that anyone in America would use. This is a polite way to say, that every manual should be read by a native English speaker who is familiar with the jargon of UV printers.

96. How hard, or easy, are the manuals to obtain BEFORE you buy the printer?

Some printer manufacturers hide their manuals because they don't want anyone to see them. Yet MacDermid ColorSpan offered their manuals openly on-line (on their web site). So the policy varies by manufacturer. We do a full report only on those printers where the manual is available to us.

TRAINING**97. Is training included in the purchase price? If so, what kind of training is offered?**

Generally yes, but it depends on the city you are in.

98. Is training necessary?

Yes, training is essential for any UV printer, whether an entry-level machine or high-end. Lack of training, incomplete training, and lack/or of experience are a factor in about a third of the problems that people have with UV printers. Another third is often inadequate cleaning and maintenance of the ink and printhead system. The other third cause of problems would naturally be weak parts (that wear out before they should), wear-and-tear (happens even to the strongest parts made in Switzerland), and features that need improvement, etc).

99. Is classroom training available?

No, classroom training is not common.

100. Is factory training available?

Yes. There are options for training and factory training is one of them. Training can be done in the factory or on the end-user's place. Normally the engineer of a distributor will be trained in the factory.

Factory training is rare, though some companies do welcome factory visits, and a few companies do indeed offer training at the factory.

101. What on-line training is available?

Fewer than 5% of the UV printer manufacturers offer on-line training.

102. Between the day the printer arrives, how soon is it realistic to achieve full productivity?

If a printer is mature (and out of beta stage) you can achieve full productivity within a week or month. But many owners have told me quite frankly, that it took them several months to achieve full productivity (especially owners of the Luscher JetPrint). The longest time before a printer is really productive is when a printer is still in beta stage when you buy it. It takes a while for the firmware and hardware to be improved and updated.

After speaking with many different printshop owners, what I am learning is that if the printer is cheap and junky you will have constant down time due to the printer breaking down (reports from owners of Infiniti UV printer). If the printer is expensive and complex, it takes longer to understand everything and achieve full productivity. And when an expensive and complex printer does break down, it takes longer to repair.

TECH SUPPORT & WARRANTY**103. What is the original warranty period?**

Normally it is one year.

The normal original warranty period is one year but Gerber has had a special offer of "second year free if you buy before such-and-such a date.

104. How does this warranty period compare to warranties of comparable printers?

Roland also now offers a two year warranty but this is because they want to sell you Roland branded ink and Roland branded substrates. They can only sell you these higher priced consumables if they provide a free warranty. If you do not use Roland ink, the warranty is voided anyway. But there are not really any or many UV printer manufacturers who sell their own branded media, so there is no reason for a UV printer manufacturer to offer more than a one year warranty.

In the past Grapo offered a two-year warranty. That is because their UV printers are relatively simple (in a positive sense, meaning less to break down).

105. Does it include parts, labor, printheads?

It includes parts, as for the labor it should be negotiated because most dealers would ask the end-user to pay for the airfare of the technician in charge of repairs. The warranty does not cover printheads.

106. Is there an extended hardware warranty? What price?

Yes, you have the option of an 18-month warranty.

107. What training does my tech support person have? Is he factory trained? In what language? How many tech support people are available to cover the US (or Canada...)?

SkyJet has a center to train new engineers, design department, etc. The full training is for 6 months.

108. For how many months is tech support offered? Is this the entire period of the warranty.

For as long as you have the printer. After the warranty expires, the end-user pays the airfare of the engineer.

109. What happens if the tech support from your local distributor is uninspired or inadequate? Can you telephone the manufacturer directly? If so, will the manufacturer actively assist you, or only begrudgingly?

SkyJet can provide on-line assistance, by email, Skype, etc. or by a phone call or even sending a technician.

MacDermid ColorSpan was good at providing direct manufacturer's tech support. Whether this will continue under HP ownership is not yet known. Dilli also can provide manufacturer's tech support if absolutely needed. Some other manufacturers simply don't provide tech support themselves, or only begrudgingly: they expect their dealers to provide support. We have received information of several instances in Australia of poor tech support for various brands of printers, probably because of the time and expense of sending tech support people to a factory in Japan, Europe, or the USA for training on each model.

An inadequate dealer or distributor is a good recipe for endless headaches. Choosing a distributor is as important as selecting a brand and model of printer.

110. Can the manufacturer remotely diagnose the printer?

Remote diagnosis is rare, and not available on any mid-range UV-curable inkjet printer.

111. What is the native language of the tech support person?

Chinese but it is a requirement that he speaks English. During the several days that we visited the Sky Air-Ship booth at APPPEXPO in Shanghai and during the several days we were in Shenyang (where the factory is) we had no language issues.

CLEANING & MAINTENANCE NEEDS

112. How easy is it to access the area where you have to clean the heads?

It is very easy. Once you open the door of the printhead carriage you can access the printheads.

113. How is head cleaning accomplished? purge, suction, manual, other?

Purging.

114. To what degree is purging automatic (once you press a button), and to what degree is it manual?

Yes purging is activated by a button.

115. To initiate a purge, where is the control or button? Is it software generated or do you have to press a button? Is the button on the outside of the printer, or inside on the carriage?

It is at the left of the carriage.

116. How many levels (strengths) of printhead cleaning (purging and/or sucking) can be accomplished via the firmware (software)?

There is only one level, but you can control the pressure.

117. Is purging done with ink, or with a flush solution?

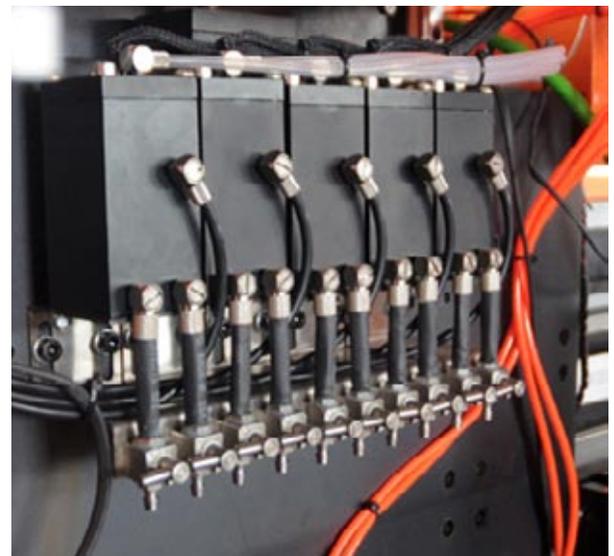
Purging is done with ink.

118. If done with a flush solution, how do you add the flush to the printheads? With a syringe, or a manual button or toggle switch, or automatically with software command, or other method?

With most mid-range UV printers, you manually turn a valve to open the ink lines so that the flush will flow into them. In cheaper printers you have to inject the flush with a syringe by hand.



Recently the buttons to initiate the purge were moved to the front of the carriage.



SkyJet UV FlatMaster ink lines.

119. Can you select which ink lines/printheads to purge, or can you only purge in clusters or all or nothing?

Yes, purging is done separately.

120. The ink that is purged, where does it go? Into a drain/waste bottle, or into a drip tray?

It goes to a container below the purging area (cleaning area).



SkyJet UV FlatMaster purging area.

121. Is there a capping station?

Yes, the print heads are capped automatically once the carriage goes back to parking zone.

122. Where is the service area, at the left, or at the right?

Service area is at the right.

123. Are there wipers?

You need to decide if a wiper is as effective as a well trained operator doing a manual wipe with a special cloth. Also, if you don't clean and maintain an automatic wiper it can do as much harm as good.

Wipers are not recommended by KonicaMinolta for their printheads. Mimaki made the mistake to feature wipers for their Toshiba Tec printheads. These wipers (and those heads in general) are one of the causes for issues with the Mimaki JF-1631 flatbed UV printer. Wipers were also an issue with Ricoh printheads on the ColorSpan 5440uv.

124. Where is the parking area, "home?"

Parking station is at the left. The same place of the capping area.

125. Is the service area the same as the parking area?

No. The service area is at the right and the parking area is at the left.

126. Does this printer spit, or "weep" ("flash") ink at regular intervals?

Solvent inkjet printers spit ink at the end of every pass in order to keep all printhead nozzles open. The reason is that if you are printing a banner with an area of pure cyan, then the other printheads will not be jetting ink (since their colors are not called for). In theory these nozzles will clog while not being used. So spitting allows all nozzles to eject ink occasionally.

Another way to allow all nozzles to squirt ink periodically is to have a band of CMYK or a band of six colors (CMYK light Cyan light Magenta) at one or both edges of the image, immediately outside the image area. This pattern causes every color to jet even if these colors are not being printed in the image itself.

Although most UV printers do not require a band of printable colors along the edge, many UV printer manufacturers do recommend spitting. However some UV printers do not have a spitting capability.

127. Does the manufacturer provide any special cleaning tools?

Yes there is a cleaning kit.

MAINTENANCE**128. What daily procedure is required at start up in the morning?**

Only purging and cleaning nozzles with the manual wiper.

129. What daily maintenance is required at night?

The same previous procedure. The printer does not need to be turned totally off. But in case you turn it off, you should close the ink valve, because there won't be negative pressure to keep the ink from dripping out of the printheads.

130. What maintenance do the UV lamps require, such as cleaning the quartz?

You have to remove dust from lamps, also you have to clean the quartz.

131. What is the most delicate, or complex, or time-consuming cleaning or maintenance chore?

Printhead nozzle plates are fragile. Some manufacturers say never to wipe the actual nozzle plate by touching it. Other manufacturers require that you physically wipe the nozzle plate with a swab. A few manufacturers are unsure and change their recommendations. But no matter that model printer or what model printhead, I would list printhead cleaning as delicate.

132. How much time, media, and ink are used during regular cleaning, calibration, and maintenance?

The time depends on the experience on the operator. It wasn't possible to determine the exact amount of ink used.

133. What is the average number of maintenance calls per printer per year?

One infamous UV printer reportedly had an average of 52 service calls per year.

134. Is there a sleep mode? Should the machine ever be turned off? At night, how much do you turn off? Does this entail having a UPS unit to guarantee it is on all the time?

There is no sleep mode, but the printer was designed so that it does not need to be turned off during the day. This is because every time the UV lamps are turned off and on again, the life of the UV lamp decreases. So you turn it on only early in the morning and turn it off when your last shift is over.

135. How long can the printer sit unused?

If idle for more than several days, it is recommended to flush ink from print heads completely and replace with print head flush solution. Actually it is best to use your UV printer every day. If you are not going to use it every day, fill the system with flush solution and cap the heads (please note: this procedure varies considerably from one printer to another; some have no capping station; others you have to inject flush with a syringe).

Check with an experienced tech support person, but merely turning your UV printer on for a test print every few days is NOT what is meant by using your printer every day. It may be better to fill it with flush and not use it at all. But this depends on the plumbing system of your specific printer, so check with tech support: we are not a medical doctor for specific individual printing problems; just trying to get the message out: UV (and solvent) printers are designed to print; not to sit unused.

136. How should a printer be prepared for sitting unused for a long time?

You should clean the ink lines, purging with solvent to avoid the clogging of the ink system. But in general you should try to print something every week.

Solvent printers need to be used every day. Otherwise the ink dries in the nozzles and nozzle plate of the printheads. It was an early mantra that UV ink escaped all the problems of solvent printers: that you never had to weep (spit at the end of every pass); that you never had to purge; etc.

But in reality UV-curable ink has comparable issues, plus the added problem of curing inside the nozzles. Cationic ink can cure spontaneously (once initiated) all the way back into the ink tubes. Fortunately most printers don't use cationic ink; they use free-radical curing chemistry.

But reflected light can cure the ink inside the nozzles; heat can cause gellation which can clog the heads. So in some printers the heads are capped at night; in some printers you have to fill the ink lines with flush if you don't print frequently. Indeed a UV printer is intended to be used every day. We just received an e-mail from an end-user whose printer had endless issues. He said they used it seldom because of other issues. My first question was whether the infrequent use was a cause of at least some of the issues.

SAFETY & HEALTH CONCERNS

137. How many emergency stop buttons are there? Where are they located?

There are three emergency buttons, two at the back and one at the front.

138. Have you employed an emergency stop yet?

We would need to ask this question to an end-user. Emergency buttons are used in the factory for testing, but it hasn't been used due to an emergency.

139. What keeps UV lamp light from leaving from the space between the bottom of the hood and the platen or transport belt?

At present there is no system to shield the UV light. We hope to see better protection for the operator's retinas on future improvements.

140. What system of ventilation or exhaust system is built into the printer? Or if not required, what would common sense dictate? Is it adequate to clear the work area of gasses and fumes?

This is an open printer, it does not have an enclosed structure. But in general for all printers it would be advisable to work in an open environment (i.e. a ceiling more than 2.5mt tall) to avoid accumulation of heat and ink smell.

141. What is the noise level, primarily of the fans for the vacuum?

The three vacuum pumps produce considerable noise.

Normally the vacuum pump is the noisiest part of any UV-curable flatbed or combo-style printer. Roll-to-roll UV printers do not need as much vacuum table area so are not as noisy in this respect.

142. What moving parts might hit a person if they are standing near the printer?

The only potential hazard in this aspect would be the printhead carriage.

143. How easy is it to obtain the MSDS of the ink?

It is rare that the MSDS of the ink is easy to obtain. If the MSDS is an auto-download from the company website, this is how it should be. But most companies do not wish the end user to know which brand of ink is being used, so hiding the MSDS is not necessarily an attempt to hide the dangers, but may be to hide the source of the ink.

PRINTHEAD TECHNOLOGY

144. Which brand printhead is used?

Konica Minolta.

Most UV printers made in the US, Japan, and Europe use Spectra, Ricoh, or KonicaMinolta heads. VUTEK is one of the few that uses Seiko printheads. It is reported that one downside of Seiko heads is that they must spit (which waste expensive ink). Most Rho printers do not have to spit except for white ink.

145. Which model of printhead is used

512MH.

146. Is the printhead identified in the spec sheet brochure by brand or also by model, or not at all?

Yes, the printhead is identified in the brochure by brand and model.



As you can see in this photo, in the previous generations the printhead position was aligned to each other. In the current models the printheads are staggered.

147. Is this a printhead adapted from solvent ink or a new design made especially for UV ink chemistry?

Konica Minolta has a version of this printhead for solvent printers and another version for UV printers.

148. How many other printers utilize the same printhead? Have they shown any problems?

GCC StellarJet 183UV, K72UV, K100UV,

Agfa Anapurna M

Dilli Neo Titan

Grapo Manta

Sun Neo UV LED

Sun Neo Evolution

All of these printers produce output at very good quality. The Konica Minolta heads has been an important factor in reaching this quality.

149. What are the benefits of this printhead?

The price is lower than Spectra heads. It offers 720dpi x 360dpi and has different levels of grayscale. The alignment is done easily.

Another important advantage is that this Konica Minolta head has a heater sensor integrated inside the printhead. This is an advantage over Seiko printheads, for example, that have a heat sensor outside the printhead and the readings are not accurate.

Because the Konica Minolta printheads offer better quality, SkyJet wants to achieve (sellable) one-pass printing.

150. How many nozzles per printhead?

512 nozzles (256 in 2 lines).

151. How many printheads per color?

Currently you may have up to two heads per color, but in the future there will be the option of four printheads per color.

152. How many total number of printheads?

Currently, up to 12. In the future you will have up to 16.

153. What is the position of the white printheads relative to the rest?

The printhead for white is in a similar position as the other color printheads.

154. Is the printhead for the white ink the same model as the printhead for the other colors?

Yes, white ink uses the same brand and model of printhead.

In the beginning, DuPont tried to use a printhead for the white ink that had a larger droplet size. However gradually they switched to using all the same model printheads. The reason a larger drop size for white ink is a good idea is because otherwise you need two printheads in order to make the white ink opaque enough. But it turns out you need two printheads for white ink anyway, so that you can jet down a flood coat of white before the rest of the colors (when printing on transparent or translucent materials).

Nowadays almost all printer manufacturers use the same printheads for white that they use for colors. What is different is that the ink tanks for white require a method of agitation so that the pigments of Titanium dioxide don't settle out.

The only instance that I have heard of recently where a new UV printer is designed with special heads for white ink is where the newest L&P Virtu uses Spectra M Class heads which are MEMS technology. These are not yet appropriate for using with white ink, so a different model head is used just for the white.



SkyJet UV FlatMaster printheads.

PRINTHEAD DPI & Features

155. What is the drop size in picoliters?

You can choose a version of 14pl or a version of 42pl. The drop size has a variation range of +/- 2pl.

156. What is the true dpi of this printhead? If the spec sheet uses the concept of "perceived dpi" or "apparent dpi" how they calculate perceived dpi instead of true dpi?

The brochure of this printhead lists a 720dpi x 360dpi resolution. The printer brochure lists the resolution of the entire system as 720dpi x 720dpi.

157. How many passes can this printer achieve?

4, 6, 8, and 12.

The lower the number of passes, the faster the printer prints, but the lower the quality. At a printer's fastest rated speed, the output is usually unusable for most applications other than distant viewing for a billboard or banner. To achieve viewing quality for Point of Purchase or an honest photo quality, you generally need to set the number of passes at the highest number (which results in the slowest speed).

158. Does the software use passes or modes to describe quality levels?

Yes the quality levels are differentiated by number of passes.

FLAAR prefers to use consistent terms that are standardized for all printers so that printshop owners, managers and printer operators have a fair chance of comparing speed vs quality. By not identifying the actual passes, or by defining pass in an atypical manner, this results, in effect, in hiding the reality of speed vs quality. Thus we commend those companies that keep to, or return to, the traditional usage of the term pass(es).

Increasingly most printer companies are not listing the passes that their printers run back and forth. The definition of a pass is not consistent in any event: FLAAR defines a single pass as the movement of the printer carriage, while jetting ink, from one side to the other. There is a difference between "single pass" and "one pass" but that needs an entire article (one pass means a page-width row of non-moving printheads).

Mutoh describes one pass as a complete back-and-forth movement (FLAAR defines that as two passes).

Most printer manufacturers would rather avoid having to state clearly how many actual passes it takes to achieve specific quality levels. So they create "modes" that are a combination of passes and possibly other features that result in a specific quality level.

159. If modes, what are the modes called?

4 pass is Draft
 6 pass is Production
 8 and 12 are High-Quality

160. At trade shows, how many passes is the printer operating at to show the results?

At APPPEXPO '09, the FlatMaster was printing at 8 pass mode.

161. Are trade show images done at uni-directional or bi-directional mode?

In most cases the printer will be set to print uni-directional.

BI-DIRECTIONAL VS UNI-DIRECTIONAL PRINTING

162. What is the direction of uni-directional printing? From right to left, or left to right; or both?

Left to right.

163. Is printing bi-directional or uni-directional?

It can be bi-directional or uni-directional. But it depends on your image. For example, SkyJet recommends uni-directional when an image has big areas of blue. For other images, bi-directional is OK.

164. What are the different results in speed; in quality?

Uni-directional printing offers better quality, but this mode decreases speed.

165. Which materials can be printed fast at 2-pass or 4-pass modes?

The number of passes needed may also depend on how worn the printheads are. If the printheads are old you may need more passes than when the printheads are new.

PRINthead Positioning**166. What is the position of the printheads relative to the media? Above, jetting down (the common position) or along-side, jetting horizontally (rare)?**

Above, jetting down.

167. Are the printheads in a straight row, or staggered?

The printer in the demo room was a previous generation. This model had the printheads in a straight row, except for the white channel. But in the current printer, the heads are staggered.

The normal position for printheads is parallel to each other in a row. But there are exceptions, and staggered the positions may have other benefits. Each pattern for positioning the printheads has a reason, but most printheads are simply parallel to each other in one row.

168. Do you raise the heads manually, with click stops, or motorized?

Motorized.

169. How complex is the procedure to align the printheads? When you add a new head, how long does it take to align it?

The HP spec sheet is helpful in alerting you to the reality of aligning their X2 MEMS printhead when you need to replace a failed head with a new one: 45 minutes. Even if this honest estimate was not provided in the spec sheet, it would be ascertainable sooner or later anyway. I commend HP for being ethical in listing this aspect of maintenance.

170. Is there an alarm system to stop the head from hitting substrate if head is not high enough?

Not available currently.

PRINthead: Associated Features**171. Is there a heater associated with each printhead?**

Yes. Konica Minolta has two versions for this model of printhead; the KM512MN (for solvent ink) and the KM512MH (for UV-curable ink). The difference is that the MH model is equipped with a heater inside.

172. Or is the entire plate heated and thereby some heat gets to the heads?

Heating the metal plate that holds the nozzle-plate area of the printheads as a group (the base of the printhead carriage so to speak) is a cheap way that early Chinese printers did their heating. Today GRAPO is perhaps the only serious UV-curable inkjet printer manufacturer outside China that uses a heated plate to heat their ink (but with 45 manufacturers, there are always surprises). GRAPO has plenty of experience since they are themselves a signage printshop, so they would not use any system that was not successful.

173. What is the firing frequency (voltage) of the printheads (in KHz)?

The maximum frequency for this model is 13.2kHz.

174. Is negative pressure required to maintain the ink (without the ink dripping out the printhead when the machine is turned off)?

Yes. The printhead system uses negative pressure to keep the ink from dripping off the printheads.

PRINTHEAD Life Expectancy

175. What is true life expectancy of this print head?

Life expectancy of printheads is expressed in quantity of drops rather than in a dimensional for time. 4x10⁹ drops per nozzle.

176. How many square feet or square meters will one set of printheads produce before the head(s) fail?

A printhead is expected to print approximately 10,000 sq. meters.

177. What are the most common causes of printhead failure?

Poor maintenance, dust and air. However, the assembly area in the factory had all the windows open.

178. What does each printhead cost to replace?

Approximately US\$1,500 per head.

179. Distinguish price for the printhead and also price for the service technician to come and do the installation if it is not user-replaceable?

You have to understand that printheads are not covered by the warranty. If the end user needs a replacement for a printhead and wishes a technician to do this job, he pays the airfare, hotel and meals of the technician. But the printheads are user-installable.

PRINTHEAD CARRIAGE and GANTRY



SkyJet UV FlatMaster printhead carriage.

180. Describe the design and construction of the carriage area?

Rak Kumar has many years of managing wide-format printer companies, so he knows all the design aspects of a printer. If you wish to learn some of the jargon and design features of a UV-curable printer yourself, it is worth visiting the booth where he exhibits (generally the booth of EFI).

181. Where are all the electronics situated? Above the heads, behind the heads? On the back side of the carriage?

The main board and interface board are located in the electrical distributing box.

182. What moves the carriage?

The carriage is moved by a servo motor.

183. What moves the gantry? Lead screws?

A servo motor system. On previous generations, the movement of the gantry was controlled by a central lead screw.



Here you can see Nicholas inspecting the SkyJet UV FlatMaster servo motor at Sky Air-Ship factory visit 2009.

SUBSTRATES

184. Can this printer handle rigid material only, or roll-to-roll only, or both interchangeably?

Currently this printer is meant for rigid materials only. If you need to print on flexible media, you must cut pieces. Sky Air-Ship is planning to design a roll-to-roll system for some models.

185. What sizes of material can be printed on?

For the smallest model the maximum printing dimensions are 2440mm x 1220mm.

For the medium model the maximum printing dimensions are 2440mm x 1830mm.

For the biggest model the maximum printing dimensions are 3000mm x 1830mm.

The maximum width for glass, wood and concrete pieces (heavy media that doesn't need vacuum) is 2.2mt. These materials are not easy to be deformed. For foamboards and other advertising media (lightweight media that needs vacuum) it is 1.83.

186. What about edge-to-edge printing (borderless)?

Yes, it is possible.

187. Can you adjust the rate of media feed?

Yes, you enter the feeding value in the software.

You need to adjust the rate of feed to remove banding lines caused by media feed that is slightly off. This is not entirely the fault of the printer but a result of the fact that each different kind of material feeds slightly differently.



SkyJet FlatMaster printer can print edge to edge . Here is Jose Melgar, Technical Writer, FLAAR Reports, holding a sample.

LOADING MEDIA

188. What thickness can this printer handle?

10cm

189. Can you measure the height of the material with a sensor, or is it manual?

Currently it is manual but there will be a sensor in the near future.

What you really want to measure is the printhead gap height: the space (gap) between the top of the material and the nozzle plate (the “print-head”).

SUBSTRATES, Materials, Applications, and Issues

190. What materials does the manufacturer list?

Any flat surface media.

191. What materials can this printer print on perfectly?

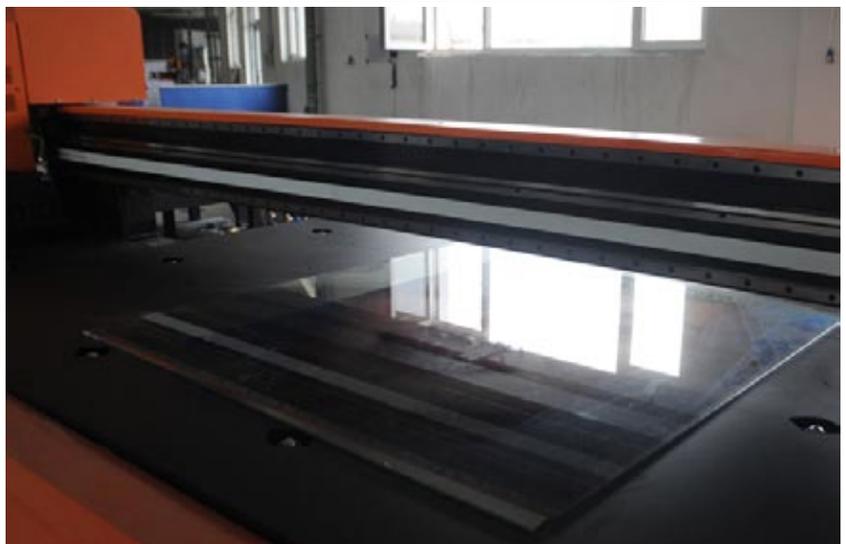
Glass and acrylics are very good.

192. What materials can this printer print on okay?

It helps if the material is a clean, homogeneous surface, and should all be the same thickness.

193. What materials can this printer not print on at all?

This printer can print on most flat materials, but some substrates might need a primer. For example glass, ceramic tiles, metal sheets.



The SKYJET UV GlassMaster printer can print very good on glass and acrylic.



Here are some samples printed on glass with the SkyJet UV FlatMaster.

194. Can you print on mirrors?

Yes.

195. Heat concerns: will the heat generated by the UV curing lamps cause adverse effects to some delicate forms of heat-sensitive media? Which materials might curl, distort or discolor from the heat?

Heat sensitive materials for mercury arc UV lamps would include polyethylene, polypropylene, shrink-wrap, very thin and thermal sensitive papers, plastic coated cartons, PVC and aluminum foil (www.dotprint.com/fgen/prod1297.htm).

Oce lists several other common signage materials as sensitive to the heat of UV lamps. For these reasons we have a separate FLAAR Report on applications and materials.

Heat can build up when the printhead carriage hovers over a small area to print a narrow job. Heat can build up inside the printer as materials (especially metal) absorb heat and hold it (and then radiate it out for a long time). So heat is not only an issue from the obvious and immediate heat of the UV lamps. Residual heat can be an issue as well.

You can in effect lower the heat that reaches the material by raising the entire printhead carriage. However this results in noticeably less quality (because the ink is flying through the air a longer distance while the material is moving away from it). You can also set the printhead carriage to move further away from the printing area at the end of each pass (in those cases that the media is less than the maximum and in those cases where these settings are facilitated by the printer design and firmware).

One way to dissipate heat is to have good ventilation drawing the hot air up and out of the enclosed printer. There are two exhaust tubes at the top for this purpose. These are not only to suck out the odor and ink mist, but to remove some of the heat too.

196. What about build up of static electricity? What kind of materials cause this? Do some materials generate static electricity which cause the media to attract ink in areas not supposed to be printed on. How is it manifested?

Some textiles, some types of acrylic and some plastic media may generate static; you might need to clean it first with alcohol or any liquid to avoid static. Alcohol has the advantage that it dries very fast.

You do need to be aware of how to prevent static electricity build up:

- No carpets or rugs on the floor. Indeed you should consider anti-static tiles or carpet.
- Use a humidifier during winter months to avoid dryness
- Learn which media are susceptible to gathering a static charge.
- Consider a printer that has specific anti-static features:
 - Grounding
 - Static bar(s).

Most printer reps suggest this is more an environmental issue than a printer or ink issue. They say you can't have carpet and you must maintain a high humidity. They admit that the static electricity situation varies depending on each site's situation.

Nonetheless, some UV printers already have anti-static systems carefully built into their printers. When these work it documents that the investment is well spent. However if the low price of your printer is in part because there is no on-board static system, and if you indeed have a static issue, the natural question is why, since this is such a well-known issue, did your brand not have an anti-static system or if so, why does it not work satisfactorily.

One economical way to get rid of some static is to use a fabric softener – Downy-for example, which you can get from the supermarket. But be sure to learn which materials need anti-static treatment. No sense wasting time with those materials which do not have a static issue.

And be aware that the amount of cleaning liquid you put onto a material can cause after-effects when that same material is heated by the UV lamps.

SUBSTRATES: Cleaning, Priming, Preparation

197. Do you have to brush off or otherwise clean each sheet of incoming material by hand before you print on it?

For flat rigid material generally yes. The need to clean incoming materials is typical of any printer. Some materials have more detritus or dust or issues than other materials. And some suppliers offer better materials than others.

I rarely see any printer operator attempting to clean roll-fed materials.

198. What liquid cleaning material should you use to clean your materials? Which kind of cleaner, and which kind of materials per cleaner?

Alcohol is commonly used. In the market you can find a liquid especially formulated to clean inkjet media.

199. How often is pre-treatment required, either receptor coating or other special surface treatment to the material to be printed?

Clear glass would tend to need pre-coating and some times after-coating.

200. Which substrates must be or ought to be prepared before printing by being corona treated? Corona treatment is to improve surface tension to promote adhesion.

Corona treatment may help on some materials if you do the treatment within a few hours or day or so before printing. Otherwise the corona treatment wears out after a while, so has to be refreshed before printing to be effective. So buying pre-treated material is only a good idea if it is fresh (but you have no way to know how long the material was in a warehouse before reaching your shop).

WHAT IS THE INTENDED MARKET FOR THIS PRINTER?

201. What is the market that the manufacturer has designed this printer for?

The intended market is broad. This printer is not only aimed to print traditional signage because it would be limited. The range of applications is very wide.

202. Are other markets buying this printer that were unexpected?

This printer is being used in specialized markets like ceiling boards, tiles, glass. Screen printing companies use this printer to do short runs. You can print doors, furniture.

203. What kinds of companies have bought this printer models in the last two years?

The FlatMaster has been sold to companies in the glass industry, advertising industry, and many others.

APPLICATIONS

204. Can you print fine art photos, giclee, or décor?

You can print output very close to photo realistic quality.

205. What other kinds of applications can you print?

Mats, wood, floor tiles, etc.

The biggest problem with UV-cured inks on vehicle graphics is when the material has to stretch or conform to the shape of the vehicle, especially over rivets, decorative trim, or anything that is not flat. Most UV printers are not recommended for vehicle wrap unless they use a special ink made to be flexible. Also be careful by making sure that adhesion and cleanser-resistance is adequate.

That said, today (2008) the inks are a lot better and you can consider experimenting with UV-curable vehicle wrap especially since 3M inks are specifically directed towards allowing vehicle wrap. Actually I have seen vehicles being wrapped with prints from GRAPO Octopus, using their normal UV ink.



Here are some other print samples of the SkyJet UV FlatMaster.



Here you can appreciate some wooden deco printed with SkyJet UV FlatMaster.



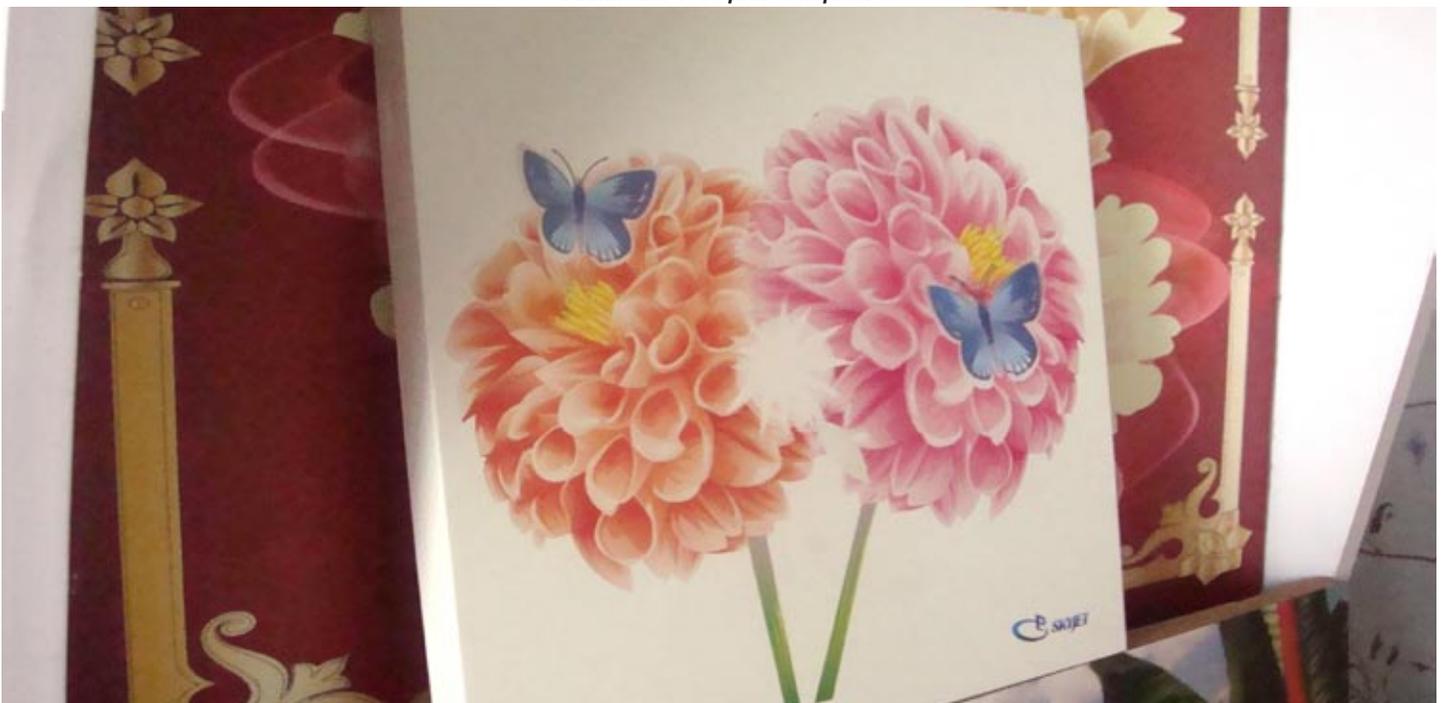
Tile printed with the SkyJet UV FlatMaster.



Transparent & solid acrylic samples printed on with the FlatMaster.



Aluminum deco print samples.



Aluminum deco and ceiling print samples.

INK

206. Is there a special ink for flexible material, and another ink for rigid material? What other inksets are available? Is there any choice in inks?

Since a roll-to-roll system is being planned for the near future, SkyJet is working with some ink manufacturers for an appropriate ink for flexible material.

207. How many colors are used to produce output - four, six, or eight?

(CMYK) or (CMYK + W) or (CMYK + W, Ic, Im).

208. What company makes the inks? Choices include Hexion, Sericol, Sun, Triangle, Toyo, and several others.

The SkyJet FlatMaster uses Toyo inks.

209. Does the printer manufacturer have its own ink chemists on staff?

Grapo, being a printshop, uses UV-cured ink on a regular basis. So their printshop for billboards, banners, POP, thermo-formable and other applications gives them daily experience. In some aspects this counts more than having an ink testing laboratory per se (which they do not have).

Durst, HP and comparable large printer manufacturers have their own ink chemists (even when they don't necessarily manufacture their own ink). But even when a company owns their own ink factory, sometimes they also rebrand the ink from completely different ink companies when they need an ink that they themselves do not yet make.



SkyJet UV FlatMaster ink containers.

INK: White & Varnish

210. Is white ink available?

Yes.

211. To use white ink does that require not using light colors in order to make space for the white ink?

No. As mentioned earlier, you have options for ink configuration:

1. CMYK
2. CMYK + W
3. CMYK + W, Ic, Im

So there is no need to eliminate light colors in order to have a channel for white ink.

It is claimed that if you have variable droplet heads (and thus can achieve really small ink droplets) that you don't absolutely need light Cyan and light Magenta. But on the Oce 250, they claim this and I am skeptical; or maybe it is just the dithering pattern of their PosterShop RIP that causes the noticeable dithering pattern (this RIP is renowned for this issue).

212. How many ink lines or printheads are dedicated to white ink? One or two?

This depends on your ink configuration, 1 or 2. When SkyJet changes the ink system to handle 16 ink lines instead of 12 you could have more than 2 whites.

213. Is the white ink situated in the same area as the other inks?

This question is in the FLAAR FAQs because the Zund 250 situated their white ink up inside the printhead carriage. If you have 500 features on a printer, 200 tend to be standard (similar solutions on most UV printers); another 200 are special or have a few tweaks, and one or two are unique.

214. Is varnish simply as though it were an extra color, or is it handled specially?

Varnish option is available, negative pressure of normal ink, white ink and varnish are controlled separately.

INK Cost**215. Does the refill container of ink come in cartridge, bottles or bulk? How large are the ink containers for this replacement ink?**

Ink tends to come either in bottles (where you pour the ink into the ink container on the printer) or containers that are themselves the ink container: you take the old one out; throw it away; and place the new container in its place. Cartridges tend to only be used in printers with Epson printheads. No currently functioning UV printer other than the narrow format Roland LEC-300 uses Epson printheads: one Eastech printer tried, but it is not widely used.

216. What is the cost per container? What is this cost translated to liters?

Between \$100 and \$120.

Cost of ink varies depending on the dealer/distributor, and depends on what country you are in. Usually the smaller and cheaper the printer, the more the ink costs. The larger the printer is, and the more ink it uses, the lower the ink is priced.

217. How much ink is used to print a square unit?

1 to 1.2ml/sq.ft.

218. How many square units does 1 liter of ink print?

1 liter of ink prints 833 to 1000 sq. ft. (77.4 to 92.9 sq. meters).

INK: Supply System, Tubing, Filters, etc**219. Where are the printer's ink containers located? Front, back, or end? Up on top or lower down?**

You open a door located at the right.

220. How is new ink added? Pouring into the on-board container? Switching the container to the new ink container?

You remove the empty container and plug in the new one.

221. What is the situation with the ink gelling?

Ink gels from heat; not only from UV light (since in theory the inside of the printer will have black ink lines so no UV light can reach the ink). But overall heat will cause UV ink to gel. But if you have some circulation within the tank and if the ink is far from the heat, gellation will not be as much an issue.

222. What filters are on the ink system to trap particles or trap gelled ink?

It is worth mentioning that SkyJet does not use Pall filters which are used in most wide-format UV-curable printers. They said they tried these common filters but they had issues with filaments which they believed came from the filter material itself.

223. Is there an issue with "ink starvation?"

It was an issue in the past, but SkyJet has successfully dealt with this problem. The first Gandinnovations solvent printers had severe ink starvation, so this issue is common. What is important is to recognise the situation, and then to revise the ink and software so that the problem is minimized.

"Ink starvation" means that not enough ink can get to the printheads in fast printing modes. Ink starvation is a real issue that affects even some quarter-million dollar printers. So you need to check with end-users to see if they have issues with ink starvation.

224. Are ink tubes black, opaque but white, another color, transparent?

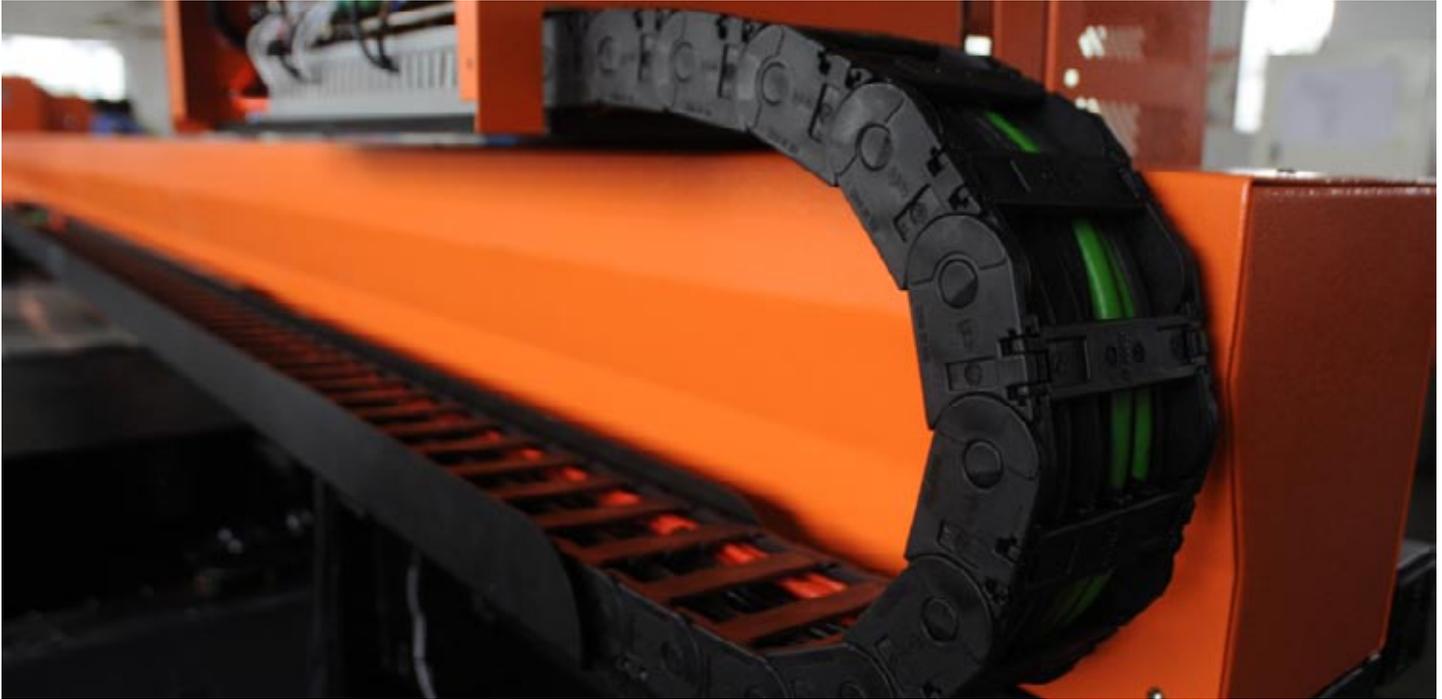
The first year's production of the hybrid UV printer of Infiniti used ink tubing so flimsy that the tubes split, dissolved, or became disconnected on a regular basis. This is what happens when you take a solvent printer and try to retrofit it to take UV-cured ink. But something similar happened when Roland and other companies tried to run the first generation eco-solvent ink through their printers which previously were made only for water-based ink: the fittings and other parts of the original ink delivery system were made to handle water, not solvents. There were endless tech support issues for more than a year as a result. At least Roland and Splash of Color finally fixed these issues (and two different eco-solvent ink chemistries were developed in subsequent years as well).

225. What kind of e-chain is used? Igus brand?

Igus e-chain. The model is 2500.07.100.

The energy chain is the plastic linked system that holds all the cables and ink tubing so that it does not get rubbed while being moved back and forth to feed the carriage. Most mid-range and almost all high-end UV printers have an energy chain from the company Igus.

In trade shows in the US 99% of the printers use Igus. In fact, I thought Igus was the only manufacturer of e-chains in the market. But at APPPEXPO '09 I could see many printers using other brands of e-chains. A printer manufacturer has to have its own research and testing on brands of parts and components, but there must be a reason why virtually all printers manufactured in the US and in Europe use Igus.



Igus e-chain. This chain holds wires and hoses inside protecting them and providing an easy movement.

226. Where, and in how many locations, is the ink heated?

In over 80% of the UV-curing printers that I have inspected, ink tends to be heated in two locations: in a sub-tank, and on the printhead. Most UV printheads have special features in or on the printhead to facilitate heating the ink. This is to prepare the viscosity so the ink is liquid enough to jet out the nozzles; this ink heating has nothing to do with the ink needing to be cured.

So far, the only printer whose ink does not get heated at the printheads is the new Roland LEC-300. This is also the only UV printer, so far, which successfully uses an Epson printhead.

227. Can the end-user vary the printhead temperature, or is the temperature fixed?

It is not advised to change the printhead (ink) temperature arbitrarily. However in certain situations, a sophisticated end-user, with a high level of knowledge of the overall ink chemistry, UV-curing situation, and experience in the ramifications of varying the factory-set temperature, then changing the temperature could be considered.

228. Has any misting or spray been reported? What about ink inside the machine parts?

SkyJet managers honestly commented they have had problems with misting of ink, but they have solved the problem.

Just ask any ink chemist about ink misting; then ask most sales reps. Most people in a typical booth are in a state of denial, or do not fully understand the concept of misting.

Most safety instructions do not mention the potential of the UV ink misting during printing. Some chemists have told me that there is no way to totally prevent all misting since you are generating x-million drops a second from a rapidly accelerating carriage. Misting is inevitable. The most misting that I have seen so far was inside an Infiniti UV printer: the entire surface of the inside (platen, rollers, etc) was totally covered with misted ink). The second most amount of ink misting that I have seen was in a ColorSpan 72UV X. But many other printers mist as well. You can check simply by putting a white swab or white cloth or white paper in a fixed location inside the printer (under the hood). Check it every week or so to see how much misted ink has settled on it.

This is the amount of ink that you may be breathing if the workplace is not adequately ventilated.

INK Color Gamut

229. Which colors print best?

Yellows are very good.

Color gamut will depend on the color of the material on which you are printing, on your experience with color management, and whether you are using canned ICC color profiles or custom profiles that you made yourself.

230. Which colors print poorly or not at all?

The green tones in the FLAAR print sample looked a little bit yellowish.

When you do test prints, try various reds; try a wide range of yellows and greens. Try a red-brown. These are colors which may present issues.

231. Is the color gamut what your clients need for their logos and products? How about red? Does it turn out more orange? Is red bright enough in saturation to satisfy clients? Or are the colors overall a bit dull?

SkyJet engineers are doing efforts in the Magenta channel to achieve the traditional red that Chinese culture expects.

THE UV CURING LAMPS

232. How many different sets of lamps are there? Is there pinning first and then curing later?

95% of UV-curable printers have only curing UV lamps. Only the Inca Spyder 150 and a few other innovative machines have a pinning lamp before the curing lamp.

233. What technology is used in curing lamps: microwave, continuous (mercury arc), LED, or flash (pulsed Xenon)?

Mercury arc technology.

Virtually all UV printers use mercury arc UV lamps. Only NUR and a few others use microwave UV lamps. Pulsed Xenon lamps have failed the few times they were tried (an early VUTEk UV printer circa 2000-2001; a cheap Océ Arizona 60uv printer). LED lamps are now being tried in several UV printers, such as by Sun LLC (in Russia), Mimaki, and Roland. The Gerber Solara ion uses a rare type of long relatively cool UV lamp that is not used by any other wide-format inkjet printer manufacturer.

234. How many watts are the lamps?

The power for this model is stated as 100 W/cm.

235. What wave length do the lamps cover?

The wave length advertised for this model of UV lamp is 85mm (3.3")

236. What brand of lamp is used?

Integration Technology SubZero 85. This is one of the most used UV lamps in entry-level and mid-range UV printers.

The NUR Expedio Inspiration uses Nordson microwave technology. Gandinnovations uses Dr Honle, but these are traditional mercury arc, not microwave. Mid-range and entry-level UV-curable printers tend to use UV mercury arc UV lamps from Integration Technology.



SkyJet Integration Technology Sub Zero UV lamp.

237. How many lamps does the printer use?

Two lamps.

Two is the usual number of lamps. Some cheap Chinese printers use only one lamp. Mimaki uses one lamp on several of their narrow-format UV printers to avoid the lawnmower effect that is caused by bi-directional printing (bi-directional print requires two lamps, one for each direction of ink laydown by the printer carriage).

The Agfa :Anapurna 100 (a printer that was never finished due to being too complex), and its recent replacement, the :Anapurna XLS, have three sets of lamps: all curing, not for pinning. The Lüscher JetPrint, due to its über-dimensional size, may also have needed more than two lamps (whatever it had did not function fully adequately).

238. How long does the lamp last, in terms of hours of operation?

1,800 hours. After that, the strength of the lamps decreases about 25%.

239. How many hours are used up by each "strike" (by each time you turn the lamps on)?

GCC is one of the few companies that clearly, specifically, and openly mentions how many hours are wasted by each strike: namely three hours. So the 1,800 hours is not use time, but depends on how many times you turn the lamps off and on. Each time is one strike (so uses up more than one hour's worth of lifetime).

240. Is the lamp fan filter a user-replaceable item? How often should this be cleaned or replaced?

If the filter gets clogged with dust then it is less efficient in keeping down heat. Heat build-up is not good for the overall carriage area.

UV CURING, and ODOR of the printed image**241. Are the UV lamp fixture set at an angle or perfectly parallel to the printing plane?**

The current models have the UV lamps in a straight (vertical) position but SkyJet is planning to install the lamps at an angle.

As of 2009 many printer manufacturers are experimenting with an angle position of the UV lamps. The lamps have to be angled outwards, so that the light of the UV lamp won't reflect toward the printheads, because this would solidify the ink inside. It was refreshing to see how well the engineers here were already aware of the improvements that should be added to their next generation. So during the two days we were at their factory our main contributions were on quality control, marketing concepts, new ink chemistries for the future, and reality of attracting OEM manufacturing business in the future.

242. What is the true drying (curing) time of the inks used with this set of lamps? What factors influence the true (total) drying time?

No UV ink really cures within seconds. Some colors, depending on how thick the ink is laid down, may cure "instantly." But several factors may result in a cure that takes 24 hours, 48 hours, or weeks. If you set the print mode for "glossy" this reduces the lamp intensity. These prints will outgas for weeks.

243. Is there any heater to assist in drying the inks (drying as opposed to curing)?

I believe (if I remember correctly, I am writing this on a train from VISCOM Germany in Frankfurt, to inspect two UV printers in a printing company in Hamburg), the Mimaki LED-curing model 160 has a heater to assist curing; if not the Mimaki, then the Roland; one of the two appeared to have a heater.

UV LAMPS: Cooling**244. Are there shutters?**

Shutters help control light leak and save from having to turn the lamps off. So the lamps last a bit longer and you can be more productive, not having to wait for the lamps to cool down and then warm up all over again. But shutters are primarily for controlling the extreme heat of mercury arc UV curing lamps.

245. How often do the shutters stick?

The shutters on the Gandinnovations printer are pneumatic, so don't stick as often as mechanical shutters. DuPont Cromaprint 22uv printer seems to have issues with its shutters getting stuck (either stuck open or stuck shut). So DuPont had to switch to another solution. We occasionally hear of shutters of other brands of printers sticking as well. Indeed one company said they don't use shutters at all due to the possibility of them not opening or closing. Making them pneumatic resolves many of these issues. Of course one reason for not using shutters is to save cost. Most Chinese printers and low-cost UV printers made in the US and elsewhere may skip shutters.

But it may be safer to have no shutters at all rather than have shutters, then depend on them, and if they fail nonetheless, then the UV lamps can set the printer on fire.

246. How long does it take to cool the lamps down before you can touch them to change them?

The operator's instructions for the Durst Rho 800 Presto is the first user's manual where I have seen mention of how long you need to let the lamp cool down enough to touch it safely: they recommend one hour.

UV LAMPS: Reflectors**247. Is the curing unit totally enclosed?**

No, UV light is strong and unprotected. We have suggested improvements here.

248. Are the reflectors at an angle? What angle, and why?

A wrong direction would be light that reflected off the surface of the material up into the nozzle plate.

RIP SOFTWARE & Printer Software**249. Which RIPs are featured?**

Caldera and PhotoPrint. At the factory, the printer being tested was using PhotoPrint.

250. Does the price of the printer include a RIP?

It includes PhotoPrint. Caldera is optional.

251. Is a computer and monitor included (to run the RIP)?

No monitor included.

252. What is the operating system of the RIP software?

PhotoPrint runs with Windows. Caldera runs with Linux.

253. If no RIP is bundled with the printer, how many and which RIP brands can work with this printer? What is your rating of these various RIPs? Is one RIP brand preferred more than another by current users?

SkyJet can set the printer to work with Wasatch.

PRODUCTIVITY & ROI (Return on Investment)**254. Can you sell the output at the machine's fastest output speed or is the quality at that speed not acceptable to most client standards?**

SkyJet engineers are working on the technology so that end-users are able to sell output at one pass.

90% of the different brands of printers can't produce usable output at their fastest claimed speed. So I call these speeds "junk mode." It is false advertising in probably half the spec sheets.

255. What is the level of productivity, high, medium, low?

The FlatMaster is designed to print all day long. It has a high level of productivity.

256. Can this printer hold up to two or three shifts per day all week?

Yes.

257. Does this printer have to be turned off to rest between shifts?

No. SkyJet FlatMaster can be turned on all day through. Especially because every time you turn off and back on the printer, the lifespan of the UV lamps decreases.

GENERAL CONSIDERATIONS

258. How many printers of this model are in use; in the USA; in the rest of the world?

SkyJet has sold about 150 printers in China.

It is crucial for a printshop owner, who is making their short list of which printers to consider buying, to know how many printers of each brand have been sold.

SUMMARY: Image Quality Issues: General

259. Can the system produce glossy finish? To what degree is surface glossiness an issue? Can you select glossy or matte or do you get what the system provides and that is all? If you get only one, or the other, which is it you get?

There is a control for the UV lamps to produce glossy finish.

CONCLUSIONS:

260. Are you satisfied with this printer to the point that you would recommend it to someone else?

I would not waste my time spending days inspecting this printer and weeks preparing this report if I did not find that this printer had merit.

261. If so, why would you recommend that others buy this same printer?

There are four stages to a FLAAR evaluation:

- "first look" at major international trade shows
- demo room testing,
- factory visit,
- and site-visit case study in a printshop.

So far we have taken initial notes on trade shows and have evaluated the printer at the factory after APPPEXPO '09 trade show in Shanghai. We would like to find a business that has bought the printer to complete this evaluation. There are a few issues of course. No printer is immune to issues, but in general, we have found the FlatMaster a solid and reliable industrial printer.

Pros

Sky Air-Ship is a solid company that has been developing this Skyjet flatbed printer for years. Many improvements have been made since it first appeared.

The machine is strongly built and if you make a list of all the components used in the printer (Konica Minolta, Integration Technology, Iigus, Caldera, etc), you realize the manufacturer has invested in reliable components to assemble a high quality UV printer.

One of the most frequent complaints of buyers and distributors of other brands of Chinese-made UV printers is when they use "home made" UV lamps. The problem is because there is no way to repair or replace these anywhere else in the world. The second problem is that it is traditional in China to change components in mid-stream, so the printer you buy in February 2009 may not have the same UV lamps that you buy in July 2009. So it is a positive feature that Sky Air-Ship recognizes this issue and they spec, and use, Integration Technology UV lamps from the UK.

The distributorship system is well organized. There are dealers in many regions and printers have been delivered in many countries as far as Ecuador and Peru.

With 150 units sold in China I would estimate that Sky Air-Ship has sold more flatbed UV printers than most other manufacturers put together.

Company by company the Chinese manufacturers are learning that merely producing cheap solvent printers will not insure their future. Cheap solvent printers got them started, and paid for their impressive factory buildings. But the market for cheap solvent printers in Western Europe and North America is drying up. Plus there are new inks coming out at SGIA '09, ISA '10, and FESPA '10 that will pretty much spell the beginning of the end for hard solvent and even mild-and eco-solvent printers. So there are other factors that contribute to the recent and future potential success of Sky Air-Ship within the changing (no-more-solvent-success era), and that is their owner, their head manager, and their overseas sales team. Here one key factor is their openness to learn, to learn also by listening to new ideas.

Dedicated flatbed printers are a more reliable structure than hybrid UV printers. Dedicated flatbed printers are also more reliable for glass than combo systems with moving transport belts. And dedicated flatbed printers will remain desirable even as new ink chemistries in 2010 offer alternatives to UV-curing for signage (most of the new inks can't print on glass).

Sky AirShip also produces innovative solvent printers (double-sided with a cylinder system) and this company also has a promising textile printer (again, based on a large cylinder system). So they are innovative.

Cons

No printer is perfect. We get frequent lists of issues from owners of the #1 best-selling Océ Arizona flatbed printers (though the Mimaki JF-1631 UV flatbed had even more issues). So issues on dedicated flatbed printers are by no means limited to machines made in China. What counts is that you seek to have more positive features than negative features.

As is common in most UV printers, the air pumps for the vacuum are noisy.

In general it is recommended that the printer be operated in a clean dust-free environment, especially because of the fragile parts such as the print-heads. But in the factory, all the windows were open, without control of the cleanliness of the air.

The color gamut still needs to be improved, especially to produce better reds and better greens, but SkyJet has been successful in overcoming previous problems and it is almost certain that they will solve this problem.

If this printer is available used, should you consider it?

Because the fourth generation is now available, it would be preferable to consider (if available used) only a recent third generation or present fourth generation model).

Concerns (of the past) that are currently being addressed for the future

Because the structure of the flatbed is so robust (the iron is so thick), the presence of rust is not considered a detriment (because the rust is only on the surface). So I would not list rust as an engineering negative point because rust is cosmetic and will not affect the performance of the printer (the primary part that rusts are the girders that hold up the under-structure of the machine). But gradually the concept of rust will become understood and diminished. But in the meantime, do not be surprised if, when you look underneath the frame, that you spot a bit of rust. This is inherent in the current production environment.

Being an industrial machine, the level of noise is inherent to the printer and almost inevitable.

An exhaust system in the factory is suggested to have better control of the quality of the air in the assembly area.

Concluding Remarks

Since Sky AirShip already has capable engineers, our program is not in engineering, or software (firmware). This company has already (before we arrived) initiated systematic changes, upgrades, and improvements in their printer. They provided us their list for improvements on their 5th generation machine (the last of the 3rd generation machines was being prepared for shipping the day we were in the factory; all the other flatbeds on the assembly line were already 4th generation models. And the 5th generation is already being conceptualized (before we arrived).

Our interest is instead to assist companies (in all countries equally) on what end-users seek for their various applications. So in China FLAAR is providing primarily consulting on general improvements, such improving basic Quality Control, and basics such as adding skirts to help shield the intense UV lamp light. FLAAR is asked about OEM manufacturing opportunities in Asia, so we are always on the look for which factories show potential.

Our goal is to assist printer manufacturers improve their printers with features that our 428,000 end-users (per year) ask for. Our background at FLAAR is in architecture (and museums) so printers that can print on glass (for museum displays as well as general architecture) are of special interest to us. I estimate that over 90% of the flatbed printers sold in China (before we became consultants) were already being used for printing on glass or other architectural materials. At the APPPEXPO '09 exhibition of wide-format printers in Shanghai (July 2009) already almost every one of the dozen manufacturers of flatbed UV-curing printers were focusing on industrial applications (especially glass) rather than only printing for signage.

Plus, while we were in China we visited one printshop that had bought a combo-flatbed for décor based on an earlier FLAAR Reports on printing on ceramic tiles with special primers and chemical treatment. So it turns out that the FLAAR Reports are read also in Asia.

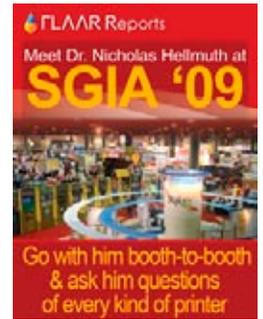
FLAAR has a comprehensive evaluation format that we have developed and initiated over the last twelve years. The UV printer evaluation portion was initiated at DRUPA 2000 and launched full-time at DRUPA 2004. This FLAAR evaluation format is intended to assist end-users (printshop owners and operators) as well as printer manufacturers.

What's next at FLAAR ?

Our report on Caldera RIP is being updated. We are receiving more training on the HP latex ink printers, since more people are writing asking FLAAR about this ink than we anticipated. FLAAR was initially trained on HP latex ink first in Israel and then at the world headquarters of Hewlett-Packard wide-format printers in Barcelona (all before the printer was even released to the public or shown at any trade show).

To meet Nicholas and ask questions directly, you can make a reservation for consulting with him at SGIA in New Orleans.

If you are in Europe, you can make a reservation for consulting with Dr Hellmuth at VISCOM Madrid, VISCOM Dusseldorf or VISCOM Milano.



[click here](#)

XY Cutters options



Once you have a UV-curable printer, the next item you should consider is a digital XY contour cutter-router.

FLAAR has been inspecting various brands of XY contour cutters and routers, including visiting factories where they are manufactured and doing site-visit case studies.

During October more FLAAR Reports will be issued on this subject. Here are a few photos to show you what we will be evaluating



Reality Check

Being a university professor for many years does not mean we know everything. But intellectual curiosity often leads us to enter areas that are new to us. So we do not shirk from entering areas where we are obviously not yet expert. In your years of wide format printing experience have encountered results different than ours, please let us know at ReaderService@FLAAR.org. We do not mind eating crow, though so far it is primarily a different philosophy we practice, because since we are not dependent on sales commissions we can openly list the glitches and defects of those printers that have an occasional problem.

FLAAR and most universities have corporate sponsors but FLAAR web sites do not accept advertising, so we don't have to kowtow to resellers or manufacturers. We respect their experience and opinion, but we prefer to utilize our own common sense, our in-house experiences, the results from site-visit case studies, and comments from the more than 53,000 of our many readers who have shared their experiences with us via e-mail (the Survey Forms).

Licensing Information

If you wish to distribute this report to other people within your company, please obtain a site licensing agreement for multiple copies from FLAAR by contacting ReaderService@FLAAR.org. Substantial discounts are available for licensing to distribute within your company; we call this a subscription. The advantage of a subscription license is that you can opt for automatic updates. You may have noticed that FLAAR reports tend to be updated as additional information becomes available.

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To distribute this report without subscription/license violates federal copyright law. To avoid such violations for you, and your company, you can easily order additional copies from www.wide-format-printers.NET.

Update Policy

Starting in 2008, updates on UV-curable wide-format inkjet printers are available for all individuals and companies which have a subscription, or to companies who are research project sponsors. If you are a Subscriber or manager in a company that is a research sponsor, you can obtain the next update by writing ReaderService@FLAAR.org. If you are neither a Subscriber or a research sponsor, simply order the newest version via the e-commerce system on www.wide-format-printers.NET. Please realize that because we have so many publications and many are updated so frequently that we have no realistic way to notify any reader of when just one particular report is actually updated.

There is a free PDF that describes the UV-curable inkjet printer Subscription system. Subscriptions are available only for UV-related wide-format printer publications.

FLAAR Reports on UV-curable roll-to-roll, flatbed, hybrid, and combo printers are updated when new information is available. We tend to update the reports on new printers, on printers that readers ask about the most, and on printers where access is facilitated (such as factory visits, demo-room visits, etc).

Reports on obsolete printers, discontinued printers, or printers that not enough people ask about, tend not to be updated.

FLAAR still publishes individual reports on solvent printers, and on giclee printers, but subscriptions on these are not yet available; these FLAAR Reports on solvent, eco-solvent, and water-based wide format printers have to be purchased one by one.

Please Note

This report has not been licensed to any printer manufacturer, distributor, dealer, sales rep, RIP company, media, or ink company to distribute. So, **if you obtained this from any company, you have a pirated copy.**

If you have received a translation, this translation is not authorized unless posted on a FLAAR web site, and may be in violation of copyright (plus if we have not approved the translation it may make claims that were not our intention).

Also, since this report is frequently updated, if you got your version from somewhere else, it may be an obsolete edition. FLAAR reports are being updated all year long, and our comment on that product may have been revised positively or negatively as we learned more about the product from end users.

If you receive any FLAAR Report from a sales rep, in addition to being violation of copyright, it is useful to know if there is a more recent version on the FLAAR web site, because every month new UV printers are being launched. So what was good technology one month, may be replaced by a much better printer elsewhere the next month.

To obtain a legitimate copy, which you know is the complete report with nothing erased or changed, and hence a report with all the original description of pros and cons, please obtain your original and full report straight from www.FLAAR.org.

Your only assurance that you have a complete and authentic evaluation which describes all aspects of the product under consideration, benefits as well as deficiencies, is to obtain these reports directly from FLAAR, via www.wide-format-printers.NET.

Citing and Crediting

A license from FLAAR is required to use any material whatsoever from our reports in any commercial advertisement or PR Release.

If you intend to quote any portion of a FLAAR review in a PowerPoint presentation, if this is in reference to any product that your company sells or promotes, then it would be appropriate to ask us first. FLAAR reports are being updated every month sometimes, and our comment on that product may have been revised as we learned more about the product from end users. Also, we noticed that one company cited the single favorable comment we made on one nice aspect of their printer, but neglected to cite the rest of the review which pointed out the features of the printer which did not do so well. For them to correct this error after the fact is rather embarrassing. So it is safer to ask-before-you-quote a FLAAR review on your product.

The material in this report is not only copyright, it is also based on years of research. Therefore if you cite or quote a pertinent section, please provide a proper credit, which would be minimally "Nicholas Hellmuth, year, www.FLAAR.org." If the quote is more than a few

words then academic tradition would expect that a footnote or entry in your bibliography would reference the complete title. Publisher would be www.FLAAR.org.

If you intend to quote any portion of a FLAAR review in a PowerPoint presentation, if this is in reference to any product that your company sells or promotes, then it would be appropriate to license the report or otherwise notify us in advance. FLAAR reports are being updated every week sometimes, and our comment on that product may have been revised as we learned more about the product from end users. Also, we noticed that one company cited the single favorable comment we made on one nice aspect of their printer, but neglected to cite the rest of the review which pointed out the features of the printer which did not do so well. For them to correct this error after the fact is rather embarrassing. So it is safer to ask-before-you-quote a FLAAR review on your product.

Legal notice

Inclusion in this study by itself in no way endorses any printer, media, ink, RIP or other digital imaging hardware or software. Equally, exclusion from this study in no way is intended to discredit any printer.

Advisory

We do our best to obtain information which we consider reliable. But with hundreds of makes and models of printers, and sometimes when information about them is sparse, or conflicting, we can only work with what we have available. Thus you should be sure to rely also on your own research, especially asking around. Find another trustworthy end-user of the same make and model you need to know about. Do not make a decision solely on the basis of a FLAAR report because your situation may be totally different than ours. Or we may not have known about, and hence not written about, one aspect or another which is crucial before you reach your decision.

The sources and resources we may list are those we happen to have read. There may be other web pages or resources that we missed. For those pages we do list, we have no realistic way to verify the veracity of all their content. Use your own common sense plus a grain of salt for those pages which are really just PR releases or outright ads.

We are quite content with the majority of the specific printers, RIPs, media, and inks we have in the FLAAR facilities. We would obviously never ask for hardware, software, or consumables that we knew in advance would not be good. However even for us, a product which looks good at a trade show, sounds good in the ad literature, and works fine for the first few weeks, may subsequently turn out to be a lemon.

Or the product may indeed have a glitch but one that is so benign for us, or maybe we have long ago gotten used to it and have a work-around. And not all glitches manifest themselves in all situations, so our evaluator may not have been sufficiently affected that he or she made an issue of any particular situation. Yet such a glitch that we don't emphasize may turn out to be adverse for your different or special application needs.

Equally often, what at first might be blamed on a bad product, often turns out to be a need of more operator experience and training. More often than not, after learning more about the product it becomes possible to produce what it was intended to produce. For this reason it is crucial for the FLAAR team and their university colleagues to interact

with the manufacturer's training center and technicians, so we know more about a hardware or software. Our evaluations go through a process of acquiring documentation from a wide range of resources and these naturally include the manufacturer itself. Obviously we take their viewpoints with a grain of salt but often we learn tips that are worthy of being passed along.

FLAAR has no way of testing 400+ specifications of any printer, much less the over 101 different UV printers from more than 46 manufacturers. Same with hundreds of solvent printers and dozens of water-based printers. We observe as best we can, but we cannot take each printer apart to inspect each feature. And for UV printers, these are too expensive to move into our own facilities for long-range testing, so we do as best as is possible under the circumstances. And when a deficiency does become apparent, usually from word-of-mouth or from an end-user, it may take time to get this written up and issued in a new release.

Another reason why it is essential for you to ask other printshop owners and printer operators about how Brand X and Y function in the real world is that issues may exist but it may take months for these issues to be well enough known for us to know the details. Although often we know of the issues early, and work to get this information into the PDFs, access to information varies depending on brand and model. Plus with over 300 publications, the waiting time to update a specific report may be several months. Plus, once a printer is considered obsolete, it is not realistic to update it due to the costs involved.

For these reasons, every FLAAR Report tries to have its publication date on the front outside cover (if we updated everything instantly the cost would be at commercial rates and it would not be possible to cover these expenses). At the end of most FLAAR Reports there is additionally a list of how many times that report has been updated. A report with lots of updates means that we are updating that subject based on availability of new information. If there is no update that is a pretty good indication that report has not been updated! With 101 models of UV printers, several hundred solvent printers, and scores of water-based printers, we tend to give priority to getting new reports out on printers about which not much info at all is available elsewhere. So we are pretty good about reporting on advances in LED curing. But glitches in a common water-based printer will take longer to work its way through our system into an update, especially if the glitch occurs only in certain circumstances, for example, on one type of media. With several hundred media types, we may not yet have utilized the problem media. While on the subject of doing your own research, be sure to ask both the printer operator and printshop owner or manager: you will generally get two slightly different stories. A printer operator may be aware of more glitches of the printer than the owner.

If a printer is no longer a prime model then there is less interest in that printer, so unless a special budget were available to update old reports, it is not realistic to update old reports. As always, it is essential for you to visit printshops that have the printers on your short-list and see how they function in the real world.

But even when we like a product and recommend it, we still can't guarantee or certify any make or model nor its profitability in use because we don't know the conditions under which a printer system might be utilized in someone else's facility. For ink and media, especially after-market third-party ink and media, it is essential that you test it first, under your conditions. We have no way to assure that any ink or media will be acceptable for your specific needs in your specific print shop. As a result, products are described "as is" and without warranties as to performance or merchantability, or of fitness

for a particular purpose. Any such statements in our reports or on our web sites or in discussions do not constitute warranties and shall not be relied on by the buyer in deciding whether to purchase and/or use products we discuss because of the diversity of conditions, materials and/or equipment under which these products may be used. Thus please recognize that no warranty of fitness or profitability for a particular purpose is offered.

The user is advised to test products thoroughly before relying on them. We do not have any special means of analyzing chemical contents or flammability of inks, media, or laminates, nor how these need to be controlled by local laws in your community. There may well be hazardous chemicals, or outgassing that we are not aware of. Be aware that some inks have severe health hazards associated with them. Some are hazardous to breathe; others are hazardous if you get them on your skin. For example, some chemicals such as cyclohexanone do not sound like chemicals you want to breathe every day. Be sure to obtain, read, and understand the MSDS sheets for the inks, media, and laminates that you intend to use. Both solvent, eco-solvent, and UV-curable inks are substances whose full range of health and environmental hazards are not yet fully revealed. It is essential you use common sense and in general be realistic about the hazards involved, especially those which are not listed or which have not yet been described. FLAAR is not able to list all hazards since we are not necessarily aware of the chemical components of the products we discuss. Our reports are on usability, not on health hazards.

Most inks are clearly not intended to be consumed. Obviously these tend to be solvent inks and UV-curable inks. Yet other inks are edible, seriously, they are printed on birthday cakes. Indeed Sensient is a leader in a new era of edible inks. Therefore the user must assume the entire risk of ascertaining information on the chemical contents and flammability regulations relative to inks, media or laminates as well as using any described hardware, software, accessory, service, technique or products.

We have no idea of your client's expectations. What students on our campus will accept may not be the same as your Fortune 500 clients. In many cases we have not ourselves used the products but are basing our discussion on having seen them at a trade show, during visiting a print shop, or having been informed about a product via e-mail or other communication.

Results you see at trade shows may not be realistic

Be aware that trade show results may not be realistic. Trade shows are idealized situations, with full-time tech support to keep things running. The images at a trade show may be tweaked. Other images may be "faked" in the sense of slyly putting on primer without telling the people who inspect the prints. Most UV inks don't stick to all materials; many materials need to be treated.

Or the UV prints may be top-coated so that you can't do a realistic scratch test.

Both personnel have many standard tricks that they use to make their output look gorgeous. In about half the cases you will not likely obtain these results in real life: in most cases they are printing uni-directional, which may be twice as slow as bi-directional.

Trade show examples tend to be on the absolutely best media. When you attempt to save money and use economy media you will quickly notice that you do not get anywhere near the same results as you saw in the manufacturer's trade show booth, or pictured in their glossy advertisement. Five years ago we noticed Epson was laminat-

ing prints to show glossy output because their pigmented inks could not print on actual glossy media. The same equipment, inks, media, and software may not work as well in your facility as we, or you, see it at a trade show. All the more reason to test before you buy; and keep testing before you make your final payment. Your ultimate protection is to use a gold American Express credit card so you can have leverage when you ask for your money back if the product fails.

Images printed at trade show may be in uni-directional mode: so you may not realize the printer has bi-directional (curing) banding defects until you unpack it in your printshop. Bi-directional curing banding is also known as the lawnmower effect. Many printers have this defect; sometimes certain modes can get rid of it, but are so slow that they are not productive.

You absolutely need to do print samples with your own images and the kind provided by your clients. Do not rely on the stock photos provided by the printer, ink, media, or RIP manufacturer or reseller. They may be using special images which they know in advance will look fabulous on their printer. Equally well, if you send your sample images to the dealer, don't be surprised if they come back looking awful. That is because many dealers won't make a serious effort to tweak their machine for your kind of image. They may use fast speed just to get the job done (this will result in low quality). Check with other people in your area, or in the same kind of print business that you do. Don't rely on references from the reseller or manufacturer (you will get their pet locations which may be unrealistically gushy): find someone on your own.

Factors influencing output

Heat, humidity, static, dust, experience level of your workers (whether they are new or have prior years experience): these are all factors that will differ in your place of business as compared with test results or demo room results.

Actually you may have people with even more experience than we do, since we deliberately use students to approximate newbies. FLAAR is devoted to assisting newcomers learn about digital imaging hardware and software. This is why Nicholas Hellmuth is considered the "Johnny Appleseed" of wide format inkjet printers.

Therefore this report does not warranty any product for any quality, performance or fitness for any specific task, since we do not know the situation in which you intend to use the hardware or software. Nor is there any warranty or guarantee that the output of these products will produce salable goods, since we do not know what kind of ink or media you intend to use, nor the needs of your clients. A further reason that no one can realistically speak for all aspects of any one hardware or software is that each of these products may require additional hardware or software to reach its full potential.

For example, you will most likely need a color management system which implies color measurement tools and software. To handle ICC color profiles, you may need ICC color profile generation software and a spectrophotometer since often the stock pre-packaged ICC color profiles which come with the ink, media, printers and/or RIPs may not work in your situation. Not all RIPs handle color management equally, or may work better for some printer-ink-media combinations than for others.

Be aware that some RIPs can only accept ICC color profiles: you quickly find out the hard way that you can't tweak these profiles nor generate new ones. So be sure to get a RIP which can handle all aspects of color management. Many RIPs come in different levels.

You may buy one level and be disappointed that the RIP won't do everything. That's because those features you may be lacking are available only in the next level higher of that RIP, often at considerable extra cost. Same thing in the progression of Chevy through Pontiac to Cadillac, or the new Suburbans. A Chevy Suburban simply does not have all the bells and whistles of the Cadillac Escalade version of this SUV.

Don't blame us... besides, that's why we are warning you. This is why we have a Survey Form, so we can learn when you find products that are inadequate. We let the manufacturers know when end users complain about their products so that the manufacturers can resolve the situation when they next redesign the system.

Most newer printer models tend to overcome deficiencies of earlier models. It is possible that our comparative comments point out a glitch in a particular printer that has been taken care of through an improvement in firmware or even an entirely new printer model. So if we point out a deficiency in a particular printer brand, the model you may buy may not exhibit this headache, or your kind of printing may not trigger the problem. Or you may find a work-around.

Just remember that every machine has quirks, even the ones we like. It is possible that the particular kind of images, resolution, inks, media, or other factors in your facility are sufficiently different than in ours that a printer which works just fine for us may be totally unsatisfactory for you and your clients. However it may be that the specific kind of printing you need to do may never occasion that shortcoming. Or, it may be that your printer was manufactured on a Monday and has defects that are atypical, show up more in the kind of media you use which we may not use as often or at all during our evaluations. Equally possibly a printer that was a disaster for someone else may work flawlessly for you and be a real money maker for your company.

So if we inspect a printer in a printshop (a site-visit case study), and that owner/operator is content with their printer and we mention this; don't expect that you will automatically get the same results in your own printshop.

In some cases a product may work better on a Macintosh than on a PC. RIP software may function well with one operating system yet have bugs and crash on the same platform but with a different operating system. Thus be sure to test a printer under your own specific work conditions before you buy.

And if a printer, RIP, media, or ink does not function, return it with no ands, ifs or buts. Your best defense is to show an advertising claim that the printer simply can't achieve. Such advertising claims are in violation of federal regulations, and the printer companies know they are liable for misleading the public.

But before you make a federal case, just be sure that many of the issues are not user error or unfamiliarity. It may be that training or an additional accessory can make the printer do what you need it to accomplish. Of course if the printer ads did not warn you that you had to purchase the additional pricey accessory, that is a whole other issue. Our reviews do not cover accessories since they are endless, as is the range of training, or lack thereof, among users.

The major causes of printer breakdown and failure is lack of maintenance, poor maintenance, spotty maintenance, or trying to jerry-rig some part of the printer. The equally common cause of printer breakdown is improper use, generally due from lack of training or experience. Another factor is whether you utilize your printer all day

every day. Most solvent and UV printers work best if used frequently. If you are not going to use your printer for two or three days, you have to put flush into the system and prepare it for hibernation (even if for only four or five days). Then you have to flush the ink system all over again.

Also realize that the surface of inkjet prints are fragile and generally require lamination to survive much usage. Lamination comes in many kinds, and it is worth finding a reliable lamination company and receiving training on their products.

Also realize that no hybrid or combo UV printer can feed all kinds of rigid materials precisely. Some materials feed well; others feed poorly; others will skew.

Although we have found several makes and models to work very well in our facilities, how well they work in your facilities may also depend on your local dealer. Some dealers are excellent; others just sell you a box and can't provide much service after the sale. Indeed some low-bid internet sales sources may have no technical backup whatsoever. If you pay low-bid price, you can't realistically expect special maintenance services or tech support later on from any other dealer (they will tell you to return to where you paid for the product). This is why we make an effort to find out which dealers are recommendable. Obviously there are many other dealers who are also good, but we do not always know them. To protect yourself further, always pay with a level of credit card which allows you to refuse payment if you have end up with a lemon. A Gold American Express card allows you to refuse payment even months after the sale. This card may also extend your warranty agreement in some cases (check first).

Most of the readers of the FLAAR Reports look to see what printers we use in our own facilities. Readers realize that we will have selected the printers that we like based on years of experience and research. Indeed we have met people at trade shows who told us they use the FLAAR web site reports as the shopping list for their corporate purchases.

Yes, it is rather self-evident that we would never ask a manufacturer to send a product which we knew in advance from our studies was no good. But there are a few other printers which are great but we simply do not have them in our facilities yet.

So if a printer is not made available by its manufacturer, then there is no way we can afford to have all these makes and models in our facility. Thus to learn about models which we do not feature, be sure to ask around in other print shops, with IT people in other corporations, at your local university or community college. Go to trade shows... but don't use only the booth...ask questions of people in the elevator, in line at the restaurant, anywhere to escape the smothering hype you get in the booth.

Realize that a FLAAR Report on a printer is not by itself a recommendation of that printer. In your local temperature, in your local humidity, with the dust that is in your local air, with your local operator, and with disorientation of the insides of a printer during rough shipment and installation, we have no knowledge of what conditions you will face in your own printshop. We tend to inspect a printer first in the manufacturing plant demo room: no disjointed parts from any shipment since this printer has not been lifted by cranes and run over a rough pot-holed highway or kept in smelting heat or freezing cold during shipment.

Taking into consideration we do not know the conditions in which you may be using your hardware, software, or consumables, neither

the author nor FLAAR nor either university is liable for liability, loss or damage caused either directly or indirectly by the suggestions in this report nor by hardware, software, or techniques described herein because.

Availability of spare parts may be a significant issue

Chinese printers tend to switch suppliers for spare parts every month or so. So getting spare parts for a Chinese printer will be a challenge even if the distributor or manufacturer actually respond to your e-mails at all. Fortunately some companies to have a fair record of response; Teckwin is one (based on a case of two problematical hybrid UV printers in Guatemala). The distributor said that Teckwin sent a second printer at their own expense and sent tech support personnel at their expense also. But unfortunately both the hybrid UV printers are still abandoned in the warehouse of the distributor; they were still there in January 2009. But Teckwin has the highest rating of any Chinese company for interest in quality control and realization that it is not good PR to abandon a client or reseller or distributor all together.

Recently we have heard many reports of issues of getting parts from manufacturers in other countries (not Asia). So just because you printer is made in an industrialized country, if you are in the US and the manufacturer is X-thousand kilometers or miles away, the wait may be many days, or weeks.

Lack of Tech Support Personnel is increasing

The book of sales in the third quarter of 2008 resulted in many tech support problems.

The recession resulted in even more: some manufacturers may need to skimp on quality control during a recession, or switch to cheaper parts suppliers. Plus they are not hiring enough tech support during a recession. So the bigger and more successful the company, in some cases the worse these particular problems may be.

Any new compiled printer may take a few months to break in

Any new printer, no matter who the manufacturer, or how good is the engineering and electronics, will tend to have teething issues. Until the firmware is updated, you may be a beta tester. This does not mean the printer should be avoided, just realize that you may have some downtime and a few headaches. Of course the worst case scenario for this was the half-million dollar Lüscher JetPrint: so being "Made in Switzerland" was not much help.

Counterfeit parts are a problem with many printers made in China

Several years ago many UV printers made in China and some made elsewhere in Asia had counterfeit parts. No evaluation has the funding available to check parts inside any printer to see if they are from the European, Japanese, or American manufacturer, or if they are a clever counterfeits.

Be realistic and aware that not all materials can be printed on equally well

Many materials don't feed well through hybrid (pinch roller on grit roller systems) or combo UV systems (with transport belts). Banding, both from poor feeding, and from bi-directional (lawnmower effect) are common on many UV-curable inkjet printers.

It is typical for some enthusiastic vendors to claim verbally that their printer can print on anything and everything. But once you unpack

the printer and set it up, you find that it requires primer on some materials; on other materials it adheres for a few weeks but then falls off.

And on most hybrid and many combo printers, some heavy, thick, or smooth-surfaced materials skew badly. Since the claim that the printer will print on everything is usually verbal, it is tough to prove this aspect of misleading advertising to a jury.

Not all inks can print on all materials. And at a trade show, many of the materials you see so nicely printed on, the manufacturer may be adding a primer at night or early in the morning: before you see the machine printing on this material.

We feel that the pros and cons of each product speak more than adequately for themselves. Just position the ad claims on the left: put the actual performance results on the right. The unscrupulous hype for some printers is fairly evident rather quickly.

Be sure to check all FLAAR resources

Please realize that with over 200 different FLAAR Reports on UV printers, you need to be sure to check the more obscure ones too. If a printer has a printhead issue, the nitty gritty of this may be in the FLAAR Report on printheads. The report on the model is a general introduction; if we discussed the intimate details of printheads then some readers might fall asleep. And obviously do not limit yourself to the free reports. The technical details may be in the reports that have a price to them. Our readers have said they prefer to have the general basics, and to park the real technical material in other reports that people can buy if they really want that level of information.

So it may be best to ask for personal consulting. The details of the problems with the ColorSpan 5400uv series are rather complex: namely the center row of the Ricoh printheads. This would require an expensive graphic designer and consultants to show the details. And the design of the printhead would probably be altered by the time we did any of this anyway. So it is essential to talk with people: with other end-users, and with FLAAR in person on a consulting basis.

Acknowledgements

With 12 employees the funding has to come from somewhere, so we do welcome project sponsorship, research grants, contributions that facilitate our educational programs, scholarships for co-op interns and graduate students, and comparable project-oriented funding from manufacturers. The benefit for the end-user is a principle called academic freedom, in this case,

- The freedom of a professor or student to speak out relative to the pros and cons of any equipment brought to them to benchmark.
- The freedom to design the research project without outside meddling from the manufacturer.

Fortunately, our budget is lean and cost effective as you would expect for a non-profit research institute. As long as we are not desperate for money we can avoid the temptation to accept payment for reprinting corporate PR hype. So the funding is used for practical research. We do not accept (nor believe) and certainly do not regurgitate corporate PR. For example, how many manufacturer's PR photos of their products have you seen in our reports or on our web sites?

Besides, it does not take any money to see which printers and RIPs function as advertised and which don't. We saw one hyped printer grind to a halt, malfunction, or otherwise publicly display its incapacities at several trade shows in a row. At each of those same trade

shows another brand had over 30 of their printers in booths in virtually every hall, each one producing museum quality exhibits. Not our fault when we report what we see over and over and over again. One of our readers wrote us recently, "Nicholas, last month you recommended the as one of several possible printers for our needs; we bought this. It was the best capital expenditure we have made in the last several years. Just wanted to tell you how much we appreciate your evaluations...."

FLAAR is a non-profit educational and research organization dedicated for over 36 years to professional photography in the arts, tropical flora and fauna, architectural history, and landscape panorama photography.

Our digital imaging phase is a result of substantial funding in 1996 from the Japanese Ministry of Public Education for a study of scanning and digital image storage options. This grant was via Japan's National Museum of Ethnology, Osaka, Japan. That same year FLAAR also received a grant of \$100,000 from an American foundation to do a feasibility study of digital imaging in general and the scanning of photographic archives in particular.

The FLAAR web sites began initially as the report on the results of these studies of scanners. Once we had the digital images we began to experiment with digital printers. People began to comment that our reports were unique and very helpful. So by 1999 we had entire sections on large format printers.

FLAAR has existed since 1969, long before inkjet printers existed. Indeed we were writing about digital imaging before HP even had a color inkjet system available. In 2000 FLAAR received an educational grant from Hewlett-Packard large format division, Barcelona, Spain, for training, for equipment, and to improve the design and navigation on the main web sites of the FLAAR Network. This grant ran its natural course, and like all grants, reached its finishing point, in this case late 2005.

In some cases the sponsorship process begins when we hear end-users talking about a product they have found to be better than other brands. We keep our ears open, and when we spot an especially good product, this is the company we seek sponsorship from. It would not be wise of us to seek sponsorship from a company with a sub-standard or otherwise potentially defective printer. So we usually know which printers are considered by end-users to be among the better brands before we seek sponsorship. After all, out of the by now one million readers, we have heard plenty about every single printer out there.

We thank MacDermid ColorSpan (now part of HP), Hewlett-Packard, Parrot Digigraphic, Color DNA, Canon, Gandinnovations, and other companies for providing funding for technology training for the FLAAR staff and our colleagues at Bowling Green State University in past years and for funds to allow us to attend all major international trade shows, which are ideal locations for us to gather information. We thank Sun LLC, Caldera, Raster Printers (EFI Rastek), DEC LexJet, DigiFab, Barbieri electronic, Seiko, Mutoh Europe, IP&I, Dilli, Yuhan-Kimberly, GCC, Grapo, Durst, and WP Digital for providing funds so that we can make more of our publications free to end-users. During 2000-2001 we had grants to cover all the costs of our publications, and all FLAAR Reports were free in those early years. As that early grant naturally expired after a few years, we had to begin charging for some of our reports to cover costs. Now (in 2009), we are seeking corporate sponsorship so we can gradually make another 20% of our publications free to our readers.

Since 2006 we do a major part of our evaluations at a factory and headquarters demo room. Since the university does not fund any of

these trips, it is traditional for the manufacturer to fund a research sponsorship. In the US this is how most university projects are initiated for decades now, and it is increasing. In fact there is a university in Austria that is not an "edu" but is a "GmbH", funded by the chamber of commerce of that part of Austria. In other words, a university as an educational institution, but functioning in the real world as an actual business. This is a sensible model.

It has been helpful when companies make it possible for us to fly to their headquarters so we can inspect their manufacturing facilities, demo rooms, and especially when the companies make their research, engineering and ink chemistry staff available for discussions. When I received my education at Harvard I was taught to have a desire to learn new things. This has guided my entire life and is what led me into wide-format digital imaging technology: it is constantly getting better and there is a lot to learn every month. Thus I actively seek access to improving my understanding of wide format printer technology so that we can better provide information to the approximately quarter-million+ readers of our solvent and UV printer web site (www.large-format-printers.org) and the over half a million who read either our wide-format-printers.org site or our roughly half million combined who read our digital-photography.org and www.FineArtGicleePrinters.org sites.

Barbieri electronic (color management), Caldera (RIP), ColorSpan, DEC, Durst, Gerber, Grapo, IP&I, Mimaki USA, Mutoh, Dilli, GCC, NUR, Oce, Shiraz (RIP), Sun, Teckwin, VUTEK, WP Digital, Xerox, Yuhan-Kimberly, Zund have each brought FLAAR staff to their headquarters and printer factories. Bordeaux, InkWin and Sunflower ink have brought us to inspect their ink manufacturing facilities and demo rooms. We have visited the world headquarters and demo rooms of HP in Barcelona and received informative and helpful technology briefings. We are under NDA as to the subjects discussed but it is important that we be open where we have visited. Mimaki Europe has had FLAAR as their guest in Europe to introduce their flatbed UV printer, as have other UV-curable manufacturers, again, under NDA as to the details since often we are present at meetings where unreleased products are discussed. Xaar has hosted an informative visit to their world headquarters in the UK. You don't get this level of access from a trade magazine writer, and I can assure you, we are provided much more detailed information and documentation in our visits than would be provided to a magazine author or editor. Companies have learned that it's a lot better to let us know up front and in advance the issues and glitches with their printers, since they now know we will find out sooner or later on our own. They actually tell us they realize we will find out on our own anyway.

Contributions, grant, sponsorships, and project funds from these companies are also used to improve the design and appearance of the web sites of the FLAAR Information Network. We thank Canon, ColorSpan, HP, ITNH, and Mimaki for providing wide format printers, inks, and media to the universities where FLAAR does research on wide format digital imaging. We thank Epson America for providing an Epson 7500 printer many years ago, and Parrot Digigraphic for providing three different models of Epson inkjet printers to our facilities on loan at BGSU (5500, 7600, 7800). We thank Mimaki USA for providing a JV4 and then a Mimaki TX-1600s textile printer and Improved Technologies (ITNH) providing their Ixia model of the Iris 3047 giclee printer.

We thank 3P Inkjet Textiles and HP for providing inkjet textiles so we could learn about the different results on the various textiles. IJ Technologies, 3P Inkjet Textiles, ColorSpan, Encad, HP, Nan Ya Pepa, Oracal, Tara and other companies have provided inkjet media so we can try it out and see how it works (or not as the case may be; several

inkjet media failed miserably, one from Taiwan, the other evidently from Germany!). We thank Aurelon, Canon, ColorGate, ColorSpan, ErgoSoft, HP, PerfectProof, PosterJet, Onyx, Ilford, CSE ColorBurst, ScanvecAmiable, Wasatch and many other RIP companies for providing their hardware and software RIPs.

We thank Dell Computers for providing awesome workstations for testing RIP software and content creation with Adobe Photoshop and other programs. We also appreciate the substantial amount of software provided by Adobe. As with other product loaned or provided courtesy of ProVar LLC (especially the 23" monitors which makes it so much easier to work on multiple documents side by side).

We thank Betterlight, Calumet Photographic, Global Graphics, Westcott, Global Imaging Inc. Phase One, and Bogen Imaging for helping to equip our archaeological photo studios at the university and its archaeology museum in Guatemala. Heidelberg, Scitex, CreoScitex (now Kodak) and Cruse, both in Germany, have kindly provided scanners for our staff to evaluate.

We really liked some of the results whereas some of the other products were a bit disappointing. Providing samples does not influence the evaluations because the evaluators are students, professors, and staff of Bowling Green State University. These personnel are not hired by any inkjet printer company; they were universities employees (as was also true for Nicholas Hellmuth). The testing person for the HP ColorPro (desktop printer) said he frankly preferred his Epson printer. When we saw the rest results we did not include this Hewlett-Packard ColorPro printer on our list of recommended printers, but we love our HP DesignJet 5000ps so much we now have two of them, one at each university.

Sometimes we hear horror stories about a printer. The only way we can tell whether this is the fault of the printer design, or lack of training of the operator, is to have the printer ourselves in-house. Of course some printer manufacturers don't understand the reasons we need to have each make and model; they are used to loaning their demo units for a week or so. That is obviously inadequate for a serious review.

Some of the media provided to us failed miserably. Three printers failed to meet common sense usability and printability standards as well (HP 1055, one older desktop model (HP Color Pro GA), and one Epson). Yet we know other users who had better results; maybe ours came down the assembly line on a Monday or Friday afternoon, when workers were not attentive. One costly color management software package was judged "incapable" by two reviewers (one from the university; second was an outside user who had made the mistake of buying this package).

So it's obvious that providing products or even a grant is no shield from having your products fail a FLAAR evaluation. The reason is clear: the end user is our judge. The entire FLAAR service program is to assist the people who need to use digital imaging hardware and software. If a product functions we find out and promulgate the good news. If a product is a failure, or more likely, needs some improvement in the next generation, we let people know. If a product is hyped by what an informed user would recognize as potentially false and misleading nonsense, then we point out the pathetic discrepancies very clearly.

This is what you should expect from an institute which is headed by a professor.

Actually, most of our reviews are based on comments by end users. We use their tips to check out pros and cons of virtually every product

we discuss. You can't fool a print shop owner whose printer simply fails to function as advertised. And equally, a sign shop owner who earns a million dollars a year from a single printer brand makes an impact on us as well. We have multiple owners of ColorSpan printers tell us that this printer is their real money earner for example. We know other print shops where their primary income is from Encad printers. Kinkos has settled on the HP 5000 as its main money maker production machine, and so on.

Yet we have documentation of several print shop companies whose business was ruined by specific brands that failed repeatedly. It is noteworthy that it is always the same brand or printer at both locations: one due to banding and printheads then simply no longer printing one color; the other brand due to pokiness of the printer simply not being competitively fast enough. Same with RIPs, we have consistent statements of people using one RIP, and only realizing how weak it was when they tried another brand which they found substantially better. Thus we note that companies which experiment with more than one brand of product tend to realize more quickly which brand is best. This is where FLAAR is in an ideal situation: we have nine RIPs and 25 printers. Hence it is logical that we have figured out which are best for our situation.

Grant funding, sponsorship, demonstration equipment, and training are supplied from all sides of the spectrum of printer equipment and software engineering companies. Thus, there is no incentive to favor one faction over another. We receive support from three manufacturers of thermal printheads (Canon, ColorSpan and HP) and also have multiple printers from three manufacturers of piezo printers (Epson, Seiko, Mutoh, and Mimaki). This is because piezo has definite advantage for some applications; thermal printheads have advantages in different applications. Our reviews have universal appeal precisely because we feature all competing printhead technologies. Every printer, RIPs, inks, or media we have reviewed have good points in addition to weaknesses. Both X-Rite and competitor GretagMacbeth provided spectrophotometers. Again, when all sides assist this program there is no incentive to favor one by trashing the other. Printer manufacturer ad campaigns are their own worst enemy. If a printer did not make false and misleading claims, then we would have nothing to fill our reviews with refuting the utter nonsense that is foisted on the buying public.

It is not our fault if some printers are more user friendly, print on more media than other brands. It is not our fault that the competing printers are ink guzzlers, are slow beyond belief, and tend to band or drop out colors all together. We don't need to be paid by the printer companies whose products work so nicely in both our universities on a daily basis. The printers which failed did so in front of our own eyes and in the print shops of people we check with. And actually we do try to find some redeeming feature in the slow, ink gulping brands: they do have a better dithering pattern; they can take thick media that absolutely won't feed through an HP. So we do work hard at finding the beneficial features even of printers are otherwise get the most critique from our readers. Over one million people will read the FLAAR Information Network in the next 12 months; 480,000 people will be exposed to our reports on wide format printers from combined total of our three sites on these themes. You can be assured that we hear plenty of comments from our readers about which printers function, and which printers fail to achieve what their advertising hype so loudly claims.

An evaluation is a professional service, and at FLAAR is based on more than 11 years of experience. An evaluation of a printer, an ink, a software, laminator, cutter or whatever part of the digital printing workflow is intended to provide feedback to all sides. The manufacturers appreciate learning from FLAAR what features of their printers

need improvement. In probably half the manufacturers FLAAR has dealt with, people inside the company did not, themselves, want to tell their boss that their pet printer was a dog. So printer, software, and component manufacturers have learned that investing in a FLAAR evaluation of their product provides them with useful return on investment. Of course if a printer manufacturer wants only a slick Success Story, or what we call a "suck up review" that simply panders to the manufacturer, obviously FLAAR is not a good place to dare to ask for such a review. In several instances it was FLAAR Reports that allowed a company to either improve their printer, or drop it and start from scratch and design a new and better one.

And naturally end-users like the opportunity to learn about various printers from a single source that covers the entire range from UV through latex through all flavors of solvent.

We have also learned that distributors often prefer to accept for distribution a printer or other product on which a FLAAR Report already exists.

We turn down offers of funding every year. These offers come from PO Box enterprises or products with no clearly visible point of manufacture. Usually the company making the offer presumes they can buy advertising space just by paying money. But that is not what our readers want, so we politely do not accept such offers of money.

Contributions, grants, sponsorships, and funding for surveys, studies and research is, however, open to a company who has an accepted standing in the industry. It is helpful if the company has a visible presence at leading trade shows and can provide references from both end users and from within the industry. Where possible we prefer to visit the company in person or at least check them out at a trade show. Obviously the product needs to have a proven track record too. Competing companies are equally encouraged to support the FLAAR system. We feel that readers deserve to have access to competing information. Competition is the cornerstone of American individualism and technological advancement.

FLAAR also covers its costs of maintaining the immense system of 8 web sites in three languages and its facilities in part by serving as a consultant such as assisting inkjet manufacturers learn more about the pros and cons of their own printers as well as how to improve their next generation of printers. It is especially useful to all concerned when manufacturers learn of trends (what applications are popular and for what reasons). For example, manufacturers need to know whether to continue designing software for Mac users, or concentrate software for PC users. So the survey form that you fill out is helpful to gather statistics. You benefit from this in two ways: first, you get the FLAAR reports in exchange for your survey form. Second, your comments bring (hopefully) change and improvement in the next generation of printers. When we do survey statistics, then the names, addresses, and telephone numbers are removed completely. A survey wants only aggregate numbers, not individuals. However, if you ask about a specific brand of printer, and do not opt out, we forward your request to a pertinent sponsor so you can obtain follow-up from that brand, since we ourselves do not have enough personnel to respond to each reader by telephone. But we do not provide your personal information to outsiders and our survey form has an opt out check-off box which we honor.

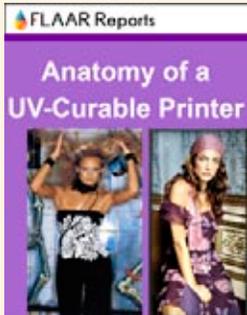
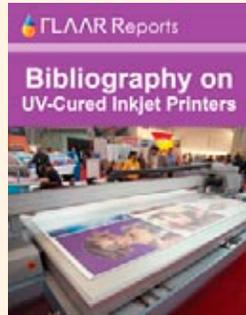
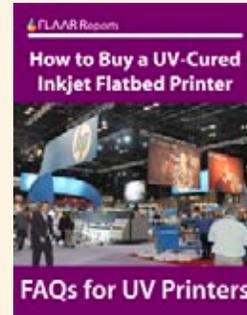
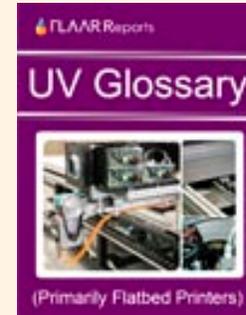
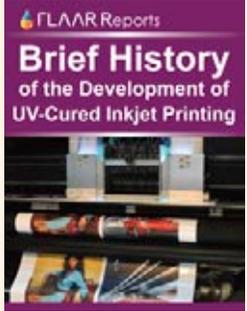
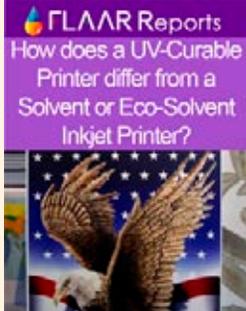
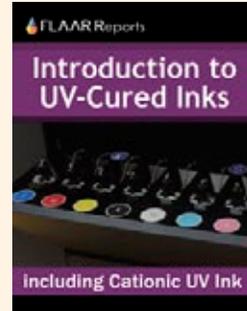
FLAAR also serves as consultants to Fortune 500 companies as well as smaller companies and individuals who seek help on which printers to consider when they need digital imaging hardware and software.

A modest portion of our income comes from our readers who purchase the FLAAR series. All income helps continue our tradition of independent evaluations and reviews of inkjet printers, RIPs, media, and inks.

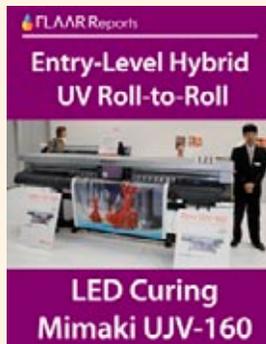
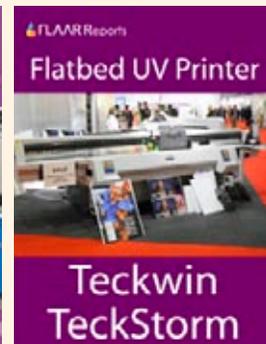
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 <p>Brief History of the Development of UV-Cured Inkjet Printing</p>	 <p>How does a UV-Curable Printer differ from a Solvent or Eco-Solvent Inkjet Printer?</p>	 <p>UV Lamps for flatbed Inkjet Printers</p>	 <p>Introduction to UV-Cured Inks</p> <p>Including Cationic UV Ink</p>	 <p>Tips, Info, Help, Documentation on Piezo Printheads Used in UV-Cured Inkjet Printers</p>

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Comments on UV Inkjet Printers at Major Trade Shows 2007-2009

<p>Trends in UV Flatbed Printers documented at DRUPA 2008</p>	<p>UV Printers Trends 2008 SGIA '08 PART I</p>	<p>Flatbed & Roll-to-Roll UV Printers SGIA '08 Part II</p>	<p>Chinese-Made UV Flatbed Printers Shanghai '08 Trade Show</p>	<p>UV Printer TRENDS VISCOM ITALY '08</p>
<p>Trends in UV printers at VISCOM Germany 08</p>	<p>TRENDS, Part II: Markets & Technologies UV-cured printers at ISA 2009</p>	<p>TRENDS, Part I: Analysis One by One of the UV-cured printers ISA '09</p>	<p>UV Market TRENDS Observable at FESPA Digital Europe 2009</p>	<p>TRENDS in 2009 Analysis One by One of the UV-cured printers at FESPA Digital Europe</p>
<p>TRENDS of UV-Cured Wide-Format Printers Shanghai '09</p>	<p>UV COMBO FLATBEDS Shanghai 2009</p>	<p>TRENDS IN HYBRID STRUCTURE UV PRINTERS Shanghai 2009</p>	<p>UV Roll-to-roll Observable at Shanghai 2009</p>	<p>UV Flatbed Printers at APPPEXPO, Shanghai '09</p>

UV Printers Manufactured in China, Korea and Taiwan

<p>Chinese UV Inkjet Printers 2009 Comprehensive FLAAR Inventory</p>	<p>Chinese UV Inkjet Printers 2008 Comprehensive (Complete) FLAAR Inventory</p>	<p>UV Printers Manufactured in Korea 2009 Trends, Markets & Applications</p>	<p>UV Printers Manufactured in KOREA 2008</p>	<p>List of UV Printers Manufactured in Taiwan 2009</p>
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