IMAGE TRANSFER INFORMATION

For Engravers ©

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The transfer of images to various kinds of surfaces is widely practiced by the graphics arts and crafts communities. While many of their practices are not appropriate for engravers, their websites are worth examining. What works for one person may not for another. Most of the procedures presented below are meant for flat surfaces, though some can be modified for non-flat surfaces. Image transfer becomes increasingly more difficult as the receiving piece deviates from flat, to simple curve, to complex curves.

I am going to make the assumption here that the reader is a newcomer to engraving and the matter of "images" and image transfer. I realize this may not be true for all who read this. Please take no offense at my approach – it merely reflects that I am very much a novice in all of these aspects.

Please note that the companies, products, materials, and websites listed do not imply endorsement in any way. These lists are not intended to be all inclusive. I provide these as an aid to those who wish to explore further.

Please note the following color codes:

1. Specific products.
2. ITN: Suggestions for searching the internet for further information.
3. CAUTIONS and important NOTES.
4. My personal experience.

1. PREPARATION OF THE METAL.

The metal which is to receive the image must be prepared. The metal (Brass, Cu, Ag, Au, Argentium™, etc) should have its surface textured for engraving, such as by sandblasting, sand paper, etc, before the surface is cleaned of all oils, etc. Texturing the metal will remove a considerable amount of surface deposited material, including oxidized metal, but further cleaning improves the likelihood of a successful transfer.

A simple method is to use Penny Bright™ (EZ Brite Brands, Inc, POBox 40025, Cleveland, OH, 44141; www.ezbritebrands.com). Powdered pumice (ITN: "powdered pumice" for sites and types) comes in various meshes. I have not used it, but believe a 200 mesh would work. Through continued scrubbing (ScotchBrite™ pads are useful; ITN: scotch brite) and rinsing the metal will eventually be clean enough that water will not bead upon its surface. At this point, the metal is appropriately cleaned. Using warm to hot water will facilitate drying with a paper towel. The Gas Engine website (www.gasenginemagazine.com/archive/0403/0403_feature1.html) recommends cleaning the metal surface with fine steel wool, flushing the surface with brake cleaner, and then washing with soap and water. Ritchie recommends using Comet™, medium steel wool and latex gloves (see: http://www.emeralda.com/halfwood/minidemo/platmkg1.htm). CAUTION: Be careful not to touch the cleaned surface with your bare hands because body oils will transfer readily to the surface and will negate all the cleaning done.

2. PREPARATION OF THE IMAGE.

Digital images are easier to work with because both they and the printing process can be manipulated relatively easily. A wide variety of image acquisition, image manipulation, and image printing programs are available commercially. I acquire images from books, magazines, newspapers, etc, as well as with a digital camera. Any sort of printed image can be used, whether B&W, color, or sepia, etc. A scanner is an ideal way to capture an image. The image manipulation program I use is: CorelDRAW Graphics Suite X3™; there are many others. In etching, one is cautioned to avoid lines more narrow than the depth to which the etching will occur[i]; this dictum probably applies to engraving, as well.

CAUTION: When using others' images, please be aware of the author's copyrights. A website discussing the legal issues is quite helpful here (see: http://fairusenetwork.org/reference/copyright.php). Usually permission can be acquired simply by

contacting the author or whoever holds the copyright. There are a variety of copyright-free books full of images (ITN: copyright free images) (see also: http://www.doverbooks.co.uk).

There is an important aspect of engraving images which might not be immediately apparent. That is, the engraver usually works from a "line" image or, in other words, an image as if it were drawn with a pencil. In fact, that is a well worn way in which an image may be placed on the surface of the metal (see below). The images captured by a camera or an artist, however, is often far more complicated and is composed of gradations of color or gray tones. Hence, it is sometimes necessary to transform, or "abstract," a so-called continuous gradient image into one of lines. The importance here is based upon the fact that the "line" image transfers far more crisply than a "gradient" image. Even with line images, there is some blurring with most of the transfer methods (there are exceptions – see below). Further, the engraving process does not easily handle the concept of "color," at least for us novices.

Hence, those images which are fine, dark lines and with no shades of grey, or colors for that matter, will transfer best. The thickness and darkness of the image lines can be manipulated by the choice of drawing utensil as well as the printer. The size of the image is, of course, an issue. In the graphics arts world images are usually considerably larger than, for instance, the 2x2 inch practice plates used by the engraver. Here, the graphics package used becomes quite important. It is desirable, for instance, to be able to reverse the image before printing when working with letters; otherwise they will be reversed when transferred. Also, it is desirable to be able to manipulate the image in terms of variables, such as: gamma (ITN: gamma and image), intensity, contrast, brightness, line thickness, etc.

With regards to printers, it is important to add that image transfer methods tend to be very "printer specific." For instance, the acetone transfer method (see below) works with dry toner laserjet-type printers but does not work with inkjet-type printers. Further, not all so-called inkjet printers are the same. For instance, the dammar varnish transfer method (see below) does not work with HP DeskJet 6940™, yet reportedly works very well with Epson deskjet-type printers. Further, the dammar varnish method works best with Epson transparency sheets and variably, or not at all, with other types of transparency sheets.

The matter of printers is very complicated. At least some of the variables involved, in terms of image transfer, are:

1. The type of printer – ie, LaserJet vs InkJet.
2. Whether the printer uses dry or wet toner.
3. Whether the printer uses inks or dyes and the nature of those substances.
4. The operating temperature.

It is difficult to gather specific information just on these variables alone. Probably, there are a lot of trade secrets involved.

CAUTION: Before trying a transfer method which utilizes something other than the usual paper in your printer, make sure that the "medium" used is going to be compatible with your printer. Otherwise, you might terminally damage your printer. Such information can usually be found in the printer manual, the help facility or may be acquired from the manufacturer.

3, TYPES OF TRANSFER METHODS.

Transferring Design to Metals – General:

If your artistic talents are satisfactory, the design to be engraved may be directly placed upon the metal – although, this is not as easily done as described. For instance, polished metal will not accept pencil graphite well. But, the principle is quite appropriate. If you can secure the image to the metal you can then engrave using the image lines as guides. Some of the means by which this may be accomplished are[ii]:

1. Pencil lines – provided the metal has a "tooth" (ie, roughened surface created with fine sandpaper, pumice powder or "sand" blasting.
2. India ink or tusche (a black liquid used for drawing lithography and as a resist in etching and silk-screen work
3. Felt marking pens.
4. Chinese white (a dense pigmented zinc white; painted on and allowed to dry; can then be drawn upon after which the image may be placed into the metal with a scriber; the Chinese white can then be washed off.) Note that other water soluble paints and similar materials (such as tempera, liquid white paints, yellow ochre powder, whiting powder chalk/calcium carbonate), layout dye (a commercial product), carbon transfer (design or tracing paper rubbed with soft graphite), and Saral® Wax Free Transfer Paper (www.saralpaper.com)) can be used in the same way.
5. Attaching the paper image to the metal.
6. Transfer wax (beeswax or plasticene clay; ITN: plasticene).

NOTE: These methods all require that the metal be appropriately cleaned before transferring the image.

My first exposure to image transfer came during a beginner's engraving class with the Master Engraver Sam Alfano (www.MasterEngraver.com). In this case, we used 2x2 in brass practice plates whose surface was prepared by sanding with 15_ (micron) (600 grit) paper (ITN: 3M and sandpaper) (see: Rio Grande Tools & Equipment Catalog, Abrasives[iii]). The procedure was:

TRANSFER WAX: Plasticene™ and 9H Pencil Method:

1. The surface of a brass practice plate was dabbed with plasticene, leaving an oily/greasy surface.
2. The image desired was "drawn" on the plate with a 9H pencil (Prismacolor™; www.prismacolor.com).
3. The image created was engraved.
4. The "image" engraved was transferred to clear "Scotch" tape by attaching the tape to the engraved plate surface. I like to use 3M brand Scotch Storage Tape – long lasting™. In actuality, what happened was that part of the oily/greasy surface was transferred to the sticky side of the tape. Of course, where the engraving occurred, there was no oily/greasy surface. Hence, a reverse image was created of the engraving upon the sticky surface of the tape.
5. The tape was placed on the prepared surface of a blank practice disk and lightly burnished with a finger tip. This transferred the oily/greasy material on the sticky side of the tape to the new practice disk. Now, the engraved image was shown as an image where there was no oily/greasy surface. Where the oily/greasy material transferred to the new disk, the disk surface was somewhat more opaque than where the metal was still clean.
6. The image transferred was then used as a guide for engraving a copy of the original made by the master.

Notice that this method can be used both to create and transfer images. Variations of this theme, at least for creating original images on the metal, include the use of pencil lines on "toothed" metal, India ink, tusche, Chinese white, tempera paints, yellow ochre, whiting powder, and layout dye. Other ways of transferring to metal an image created on paper would include carbon transfer, and Saral® Wax Free Transfer Paper (a modern type of "carbon" paper; see: www.saralpaper.com) (see below: 4. Detailed Techniques).[iv] Essentially, what these materials do is create a surface into which the image may be "scratched" to reveal a "line" or the underlying metal. The scratch will actually go into the metal with a 9H pencil or a scriber. Caution must be used, especially with the scriber, to avoid making a scratch so deep that its removal later would be difficult. These temporary surfaces are then removed with an appropriate solvent, such as water. When the image is directly placed upon the metal using felt marking pens, the removal solvent might have to be acetone, alcohol, or another non-polar solvent. There are felt tip-type pens which have water soluble inks but their disadvantage is that they readily smudge when touched.

I find the transfer wax method very satisfactory for the transfer of already engraved images. I am not yet accomplished enough to primarily create images on metal plates.

The second method which Sam Alfano demonstrated was the transfer of LaserJet printed images (such as initials) using acetone. The method is relatively simple:

ACETONE AND OTHER SOLVENT-BASED VARIANTS:

1. The image desired is printed onto regular printer paper using a LaserJet printer. You may want to review the section above labeled "Preparation of the Image." In short, it is important that the printing method use dry toner and that the printer is a laserjet-type device. This will not work with iInkjet produced prints. Also, note that printed images, such as initials, must be reversed upon printing because the printed image will be placed face down on the receiving plate – thereby creating a reverse image of the printing.
2. The printed page/image is cut to conform to the size of the receiving plate and placed thereon.
3. A small amount of acetone is placed on a folded paper towel. Too much acetone will smudge the transferred image.
4. The printed image (face down on the plate) is lightly and quickly burnished with the paper towel. If you burnish for too long or with too much acetone, the image transferred will be blurred.
5. The printed paper is removed from the plate and the plate is allowed to dry.

There are two variants of the acetone method: 1. a blender pen and 2. so-called Prismacolor™ transfers.

The first variant method uses a device termed a "blender pen" (ITN: blender pen). I use one made by Chartpak (Blender P-O (201)) (see: www.art-e-zine.co.uk). However it is done, this is a powerful method because it means that virtually any sort of digital image can be transferred – although, not every digital image is amenable to transfer for engraving purposes (see above: Preparation of the Image). I find that the blender pen tends to excess much solvent application and results in a

smudged transferred image.

I find the acetone transfer method to work very well, especially if I have taken care to use a thin line image or otherwise properly prepare the image. I also have used successfully a combination of acetone-based transfer of laserjet-generated images and felt tip pens (Pigma Micron 005™, 0.2mm line width, archival ink, made by: Sakura Color Products Corporation, Japan; http://www.gellyroll.com/httpdocs/about_Sakura.htm). With these very fine line pens it is possible to "sharpen" the image which has been transferred to the metal plate, thus making the lines to be engraved more specific. Further, color coding is possible.

The Prismacolor™ (ITN: www.prismacolor.com) variant (from: Deborah Lane, via: inkjet_transfers@yahoogroups.com, uses colored pencils to create the image, which is then transferred. These pencils are described as being composed of a wax binder, some clay and pure pigments. The colored lines dissolve completely when turpenoid (low odor turpentine), turpentine, acetone (as in nail polish remover), or "other" solvents are applied. The "other" solvents were not defined, but I assume they would be other organic solvents, such as one might find in a blender pen. The method is as follows:

1. Create the image desired, using the colors desired, onto paper.
2. Paint the solvent onto the receiving surface.
3. Lay the colored drawing face down onto the surface.
4. Burnish the surface of the paper to assist transfer to the surface.

Lane also notes that "*Prismacolor will lift into a "decal" too. I mean that you can paint mat or gel medium on top of a Prismacolor and, like you can with other images, and lift the image that is then trapped in the gel.*"

ISOPROPYL ALCOHOL – DAMMAR VARNISH – TRANSPARENCY SHEET METHOD – FROM SAM ALFANO SYLLABUS:

1. Print the image desired onto Epson InkJet transparency sheets.
2 Trim the printed transparency to "fit" the metal plate.
3. Place the transparency, with the image side down (ie, facing the metal plate), upon the metal plate.
4. Apply the isopropanol/Dammar varnish solution to the surface of the transparency sheet, as if lightly burnishing.

Formula for the isopropanol/Dammar varnish (ITN: dammar varnish) solution:

1. 95 mL isopropanol.
2. 5 mL Dammar varnish.

I have very limited experience with this method. So far, I have found that the isopropanol/varnish solution is a sticky mess, this is hard to clean from whatever it touches. Also, although using the prescribed Epson Transparency film, the process does not work when I print the image with my HP Deskjet 6940. Sam Alfano says this is a very effective method and has the advantage that you can see through the transparency sheet and monitor transfer of the image.

NOTE: This method only works with Epson printers (C66 or C86) and works best with Epson transparency sheets. Also, the image, especially if written, such as with initials, must be reversed.

Recommended settings for the Epson printer are:

1. Best photo.
2. Gamma 2.2.
3. Black ink only.
4. Brightness – 18.
5. Contrast – 25.

NOTE: It may be necessary to experiment with the printer settings.

There are two other major methods for transferring an image to the metal plate. One involves attaching a printed image to the metal and the other is drawn from etching techniques. They will both be discussed under the following general title: ATTACHING THE IMAGE TO THE METAL. The first includes the use of decals and associated heat transfer methods. The second includes use of a product named PnP Blue™ (Press-n-Peel paper; ITN: press n peel blue)[v] and an etching system sold by Rio Grande (see: Rio Grande Tools & Equipment Catalog[vi], Etching, Rio Grande Master Etch-Press™ system)[vii]. These methods go beyond the rather simple matter of gluing a paper-based image onto the metal plate.

ATTACHING THE IMAGE TO THE METAL – decals and related heat transfer methods:

The graphic arts and arts & crafts communities have a wide variety of ways of attaching images to other objects, such as cloth, glass, rock, metal, etc. These methods include:

1. Decal transfer.
2. Heat transfer.
3. Medium transfer.
4. Photo paper transfer.

Various decal transfer systems are available and include:

1. Decal Transfer: A wide variety of transfer papers from Papilio Premium Digital Media (www.papilio.com). This company also makes various "glues" for increasing the adhesiveness of the decal to the medium to which it is being transferred. The company produces products which are meant for use with both LaserJet- and InkJet-type printers.[viii] Lazertran™ is another product used in decal transfer (ITN: lazertran)

2. Heat Transfer: These products are similar to the decal transfer materials but utilize heat to make the transfer (ITN: heat transfer). Some of these products and techniques may be found at or include: www.bestblanks.com, HP Iron-on Transfers™, Magic PTransfer – Low Temp Image Transfer™ (Boyd's Imaging Products; www.iboyds.net, Opaque InkJet Transfer Paper (Dharma Trading Co; www.dharmatrading.com); for techniques see: www.shopping.hp.com, www.art-e-zine.co.uk/imageshirt.html, www.images-magazine.com.

3. Medium Transfer: This method is a variant of decal transfer which first transfers the image to a medium, such as matte, and then transfers the matte-impregnated image to the metal. For information on this technique ITN: liquitex and technique, go to: www.talbot.com/collage, or www.art-e-zine.co.uk/imagegel.html, www.goldenpaints.com/technicaldata/transimg.php. The technique may be combined with images printed onto inkjet transparency film (the author referenced used 3M InkJet Transparency Film™) (www.art-e-zine.co.uk/imageinkjet.html). Another product is called OmniGel™, the instruction for whose use is at: www.abovethemark.com/howtos/omnigel.htm.

4. Photo Transfer: This method is a variant of the medium transfer method which uses an image printed onto photographic paper (the author referenced used 4x6 HP Photo Glossy Paper™) (www.art-e-zine.co.uk.imagewater.html).

I have limited experience with these methods, having attempted only Decal and Heat Transfer methods. I have not tried Medium or Photo Transfer methods. I have had no success with Heat Transfer methods using paper imprinted with images made either with LaserJet or Inkjet printers. I have used the Lazertran™ product with some success utilizing images printed with an HP Laserjet 4P™; Lazertran™ is not designed for use with InkJet-type printers.

The Lazertran product is a sheet of paper with the decal attached; in this respect, most of the decal-type image transfer products are very similar. The image is printed onto the decal side. Soaking in water liberates the decal from the paper sheet. The free decal is then applied to the metal plate and any bubbles are gently burnished out with a wet finger tip. The decal has its own glue with which it attached to the metal plate – essentially the same as decals put on models.

In my hands, the Lazertran™ decal glue is not sufficiently adhesive and the decal fractures and tears as engraving proceeds. To some extent I was able to overcome this by first coating the metal with Scotch Quick-Dry Tacky Adhesive™ (ITN: 3m tacky adhesive). This reduces the amount of fracturing and tearing as the engraving is done, but I do not find decal transfer a satisfactory solution in my hands. Others have recommended using matte to increase adhesion but I found this produced a nasty, splotchy discoloration on brass plates and was not willing to try it on silver. The Papilio company recommends the use of an aerosol spray with their rub-on decal papers (ITN: www.papilio.com).

ATTACHING THE IMAGE TO THE METAL – etching techniques:

The general principles of etching have been used for a very long time by those in the printing, graphic arts and jewelry community, among others. The underlying principle, as used in etching jewelry for example, is to produce an image on a piece of metal. This image is called the resist. A chemical substance is then applied to etch, or remove, the metal not protected by the resist. There are, however, a number of ways in which the actual etching process may be accomplished. In general, various chemicals are used for various substances to be etched. Many of these etching chemicals are highly toxic and dangerous. Fortunately for the engraver, the actual etching process need not be used, as the initial purpose is completed by transfer of the

image to the metal. Of course, etching and other jewelry methods could be combined. An example of this is the combined etching and enameling method called champlevé, where the area etched is then filled with enamel (ITN: champleve enamel).

Two attractive methods utilizing the application of an enamel-type resist to transfer an image for engraving are:

1. MA Scherr's Rio Master Etch-Press System.[v, vi]

Scherr's system is available as a virtually self-contained and relatively simple method for introducing the image to metal. A silk screen is created which is then used to silk screen print the image using a material called asphaltum.[ix] I have not tried this approach, but it is attractive in that it is a self-contained system. It is said that asphaltum is a messy substance with which to work and that it dries slowly. After the engraving is completed, the remaining asphaltum may be removed with an organic solvent. Photocopy transfer etch is variant method– more may be found about this at: www.ganoksin.com.

2. PnP Blue™ transfer system.

The computer chip production industry is extensively involved in the transfer of fine-lined and detailed images to other surfaces. In the computer industry the images are highly detailed and refined and the images are transferred to amazingly small areas. The technology and equipment involved is both complex and very expensive. Fortunately, there exists an electronics hobbyist genre which, among other things, creates their own circuit boards. Circuit board images are on a much larger scale than computer chip images and more amenable to the needs of the engraver.

There are numerous websites which detail procedures for the use of PNP Blue™ [x]; fundamentally, the procedure is as follows:

1. Prepare the receiving surface appropriately (see above: Preparation of the Metal). The metal surface must be meticulously cleaned and have a "tooth."
2. Photocopy or laser print the image onto the dull (emulsion) side of the PnP Blue™ transfer film.
3. Place the printed/photocopied image side down onto the metal and place a piece of paper over it. The metal should be resting on a surface suitable to endure the heating process.
4. Press a heated clothes iron on the paper and bring the metal plate temperature to that of the iron (see below for details).
5. Cool the metal plate/ PnP Blue™ sandwich and peel off the film.

The use of clay-faced paper is touted as an alternative to PnP Blue™ transfer sheets (see: www.buildyouridea.com/hardware/4 axis controller/4 axis.html; this site discusses the clay-faced paper method). Both PnP Blue™ and the "clay-faced paper" methods are a type of heat-based image transfer. They are different, however, in that a decal is not involved and that the printed image itself is being transferred – they also differ in their origin from the "printed circuit board" community.

4. Detailed Techniques.

I. Preparation of the Image:

I cannot provide a detailed technique for image manipulation, particularly for digital images, because it depends upon the software and hardware you use.

II. Preparation of the metal:

1. Initially prepare the surface as you would for any other engraving project. Commonly, 600 grit (15_) sand paper is used to create a matte surface which will contrast with the bright engraving. I have also used sandblasting to produce such a matte finish (Garnet media; 55 mesh ≅ 250-297_; Rio Grande[xi]). Note: with sandblasting any errors are much more of a problem.
2. Further preparation of the surface requires removal any residual oils, such as easily come from fingers. Scherr recommends using a non-oily pumice powder.[vi] Others use Penny Brite™ cleaner and ScotchBrite™ scouring pads. However this cleansing is done, the final result must be a metal surface which shows no water breaks when rinsed.

3. Dry thoroughly with a clean paper towel and do not touch the cleaned surface/s. Clean cotton gloves are a good step, from this point on when handling the metal.

CAUTION: Each of the following methods assumes that appropriate image and metal surface preparation has been done!

III. Transfer Wax Method:

1. Dab the surface of the metal with plasticene (synthetic clay) or beeswax so as to produce a consistent oily/greasy surface. Sam Alfano has a product which is ideal for this purpose – Sam Alfano's Hand Engraver's Transfer Wax™ (ITN: www.masterengraver.com).
2. If drawing, use a 9H pencil, or a scriber, or follow the pencil with a scriber. Having created the image on the oily/greasy surface and/or the metal, the engraving may proceed. Upon completion, the oily/greasy surface may be removed by washing or a few minutes in an ultrasonic jewelry cleaner.
3. If the purpose is to "copy" an already engraved image, then attach clear "Scotch" tape to the oily/greasy surface of the engraved plate surface, with the sticky surface down or attaching to the plate. Lightly burnish the tape to the metal to assure a thorough contact.
4. The tape is then removed and placed sticky side down upon the metal piece to receive the image – this surface must be appropriately prepared and should not have been dabbed with the wax. The transferring tape can be lightly burnished with a finger tip so as to cleanly transfer the image.
5. The "image" transferred is then used as a guide for engraving a copy of the original image. Note that the engraved image is not actually transferred. It is the oily/greasy surface around the engraved area which has been transferred producing, if you will, a negative image of the engraving.
6. Upon completing the engraving, any residual oily/greasy surface can be washed off.

IV. Organic Solvent Method and LaserJet Printed Image Method:

1. Print the image desired onto regular printer paper using a laserjet-type printer. Note: the printer must be a laserjet-type which uses dry toner. So-called photocopied images are also said to work. Also, note that printed letter images, such as initials, must be reversed upon printing because the printed image will be placed face down on the receiving plate, thereby creating a mirror image of the printing.
2. Cut the printed page/image to conform to the size of the receiving plate and place it thereon.
3. Placed a small amount of acetone on a folded paper towel. Note: too much acetone will smudge the transferred image.
4. Lightly and quickly burnish the printed image (face down on the plate with the paper towel. If you burnish for too long or with too much acetone, the image transferred will be blurred.
5. The printed paper is removed from the plate and the plate is allowed to dry.
6. Engrave the image.
7. After engraving, any residual transferred image/toner may be removed with acetone.

A blender pen may be used instead of acetone.

V. Isopropyl Alcohol – Dammar Varnish – Transparency Sheet Method:

1. Print the image desired onto an Epson InkJet Transparency Sheet.
2 Trim the printed transparency to "fit" the metal plate.
3. Place the transparency, with the printed image side down (ie, facing the metal plate), upon the metal plate.
4. Using a Q-tip, apply the isopropanol/Dammar varnish solution to the surface of the transparency sheet, as if lightly burnishing.
5. Engrave the image.

Formula for the isopropanol/Dammar varnish (ITN: dammar varnish) solution:

1. 95 mL isopropanol.
2. 5 mL Dammar varnish.

NOTE: This method only works with Epson printers (C66 or C86) and works best with Epson transparency sheets. Also, the image, especially if written, such as with initials, must be reversed.

VI. Decal Transfer Method:

1. Print the desired image onto the decal transfer product – note: my experience has been with Lazertran™, which requires the image be printed by a laserjet-type printer (I use an HP LaserJet 4P).
2. Cut the printed decal so that it is roughly the size of the plate to which the decal is to be attached.
3. Place the trimmed decal into warm water. Within a minute or less, the decal itself can be separated from the paper backing.
4. Some recommend further preparation of the metal surface for receipt of the decal. These additional steps involve moistening the metal surface with isopropyl alcohol or applying matte to the metal surface. I have successfully used **Scotch Quick-Dry Tacky Adhesive™** to increase adhesion of the decal to the surface.
5. The separated decal is removed from the warm water and placed upon the metal surface and burnished lightly with a moistened finger tip so as to remove bubbles and assure uniform attachment.
6. The decal/metal plate combination is left to dry, which results in attachment of the decal to the metal plate. This drying is usually completed at room temperature overnight. Drying can be accomplished more rapidly by the application of heat, such as from a hair dryer, a heat gun, or in an oven. However, the temperature should not be about 200° F because at higher temperatures the decal will melt to the metal, after which it is essentially impossible to remove without scouring the surface.
7. Engrave the image.

VI. PnP Blue Method:

1. Transfer the image to the matte side of PnP Blue™ paper using a laserjet-type printer (ie, carbon-based toner; InkJet-type printers will not work). Use the darkest image possible without smudging.

   Carlson[i] recommends taping the PnP Blue™ paper about _ in down from the top of a sheet of normal printer paper before printing. The PnP Blue™ is very thin and taping it to printer paper avoids printer jams. CAUTION: Make sure there is no excess adhesive on or around the tape as this will damage the print drum.

2. Place the metal plate to receive the image on a flat, heat resistant surface.

   Goss[xv] recommends a piece of smooth wood.

3. Cut the image from the PnP Blue™ paper so that there is a _ inch (6.5 mm) border.
4. Place the image-impregnated PnP Blue™ paper on the metal plate, image or matte surface down.

   The Gas Engine website recommends taping the PnP Blue™ paper image impregnated-paper to the metal plate and placing a twice-folded paper towel between the metal plate and the underlying heat resistant surface.

5. Apply heat evenly to the PnP PnP Blue™ paper via a regular, household, clothes iron; a heat press can also be used, having the advantage of controlling both temperature and pressure.[xii]

   The iron can also be held inverted in a vise and the plate, with attached image impregnated PnP Blue™ paper placed upon it; light burnishing can be done with a wooden stick. Either way, the metal becomes very hot and the image more clear through the PnP Blue™ paper as the transfer occurs.

   NOTE: Temperature is an issue here; Carlson[i] recommends setting the iron to "high." Goss notes that all irons are different, in terms of temperature settings, not to use steam, to experiment and that the temperature sought is 200-225° F. The Techniks, Inc website (see below) notes that: *The temperature setting on the iron is critical, and dependent upon your laser printer or photocopier. Suggested starting temperature is 275-325° F. Iron setting is generally "polyester." DO NOT USE THE STEAM SETTING."* The Gas Engine Website recommends "the second highest setting" or about "250-270° F and no application of pressure, because the copy toner melts as it is heated. A Printed Circuit Board SOP (www.mitghmr.spd.louisville.edu/lutz/resources/sops/pcbsop.html) recommends a temperature of 200-225° F or the "lower" region of steam settings, or about 2/3 of the iron's maximum setting, cautioning that this is a dry process and to not use water. The solarbotic website recommends 300° F. Ritchie uses an iron set on steam without water.[xiii]

6. Duration of heat and pressure is also important. Carlson[i] recommends "a couple of minute of heating and pressure;" Goss[xv] recommends 45-100 seconds, larger images taking longer time; the Techniks, Inc website recommends 1.5-10 minutes; The Gas Engine website recommends 2-3 minutes; the above noted Printed Circuit Board SOP recommends 45-100 seconds, but to "*continue to iron for at least 5 minutes.*
7. Alternatively , pre-heat the metal plate with the iron, place the PnP Blue™ image-impregnated paper matte surface down on the plate and burnish with a cloth. Carlson[i] recommends preheating the metal plate with a hot air gun until it is too hot

to touch (about 140° F), laying a piece of printer paper on the PnP Blue™ image-impregnated paper and then pressing with the hot iron; he recommends "a couple of minutes of heating and pressing."

8. Carlson[i] also recommends applying pressure with "a few books" while the plate cools and waiting until it reaches room temperature before any further manipulation.
9. After cooling, carefully peel the PnP Blue™ off the plate. If the image transfer is not complete, return to the heat step. Areas which did not transfer can be touched up with black permanent marker or nail polish. Cooling can be hastened by placing the warm metal plate on a steel block. The Technniks, Inc website recommends quenching under cold running water to cool the metal. The Printed Circuit Board SOP recommends 10-15 minutes cooling.

This is a methodology modified or extracted from those of Clee[iv], Sanchez[xiv], Sandra Noble Goss[xv], Technniks, Inc (www.techniks.com/how to.htm), and an article from The Gas Engine Magazine (www.gasenginemagazine.com/archive/0403/0403 feature1.html).

Further details about PnP Blue™ may be found at: www.techniks.com/information.htm. Alternatives to PnP Blue™ paper include the "Toner Transfer System (DecalPRO™)" from Pulsar (see: www.pulsar.gs/) and the use of laser-printed clay-coated (magazine)(Epson Photoquality Inkjet Paper (#S041062)™) paper (see: solarbotic, in end note x).

VII. Saral Wax Free Transfer Paper Method:

1. Place the product color side down (ie, facing the metal plate) onto the metal plate.
2. Place the image on top of the Saral paper.
3. Using some sort of stylus (ie, ball point pen, pencil, tracing wheel, etc) apply enough pressure to create an image replica on the metal plate.
4. Engrave the image.

There are 5 colors of Saral paper (ITN: www.saralpaper.com/products/html):

1. Graphite – all purpose and appropriate for paper, wood, fabric, canvas and metal.
2. Red – for ceramics and china; the colors will fire out; also on photographs, Photostats, acetate overlays and enamel.
3. Blue – a non-photographic blue.
4. Yellow – for dark surfaces and clear or stained glass.

4. END NOTES.

[i] Carlson, J, Making Brass Builder's Plates, in: Home Metal Shop Club, April, 1997, see: www.homemetalshopclub.org/news/jul97/jul97.html.

[ii] Untracht, O, Jewelry Concepts and Technology, Robert Hale Limited, 45-47 Clerkenwell Green, London EC1R OHT (published in the United States by Doubleday & Company, 1985; see: Chapter 4: Basic Techniques – Processing sheet metal without deformation – Design transfer to metal – materials and methods, pp 74-75.

[iii] Rio Grande, Tools & Equipment Catalog, 2006-2007, Abrasives, pg 296.

[iv] Saral transfer paper is particularly interesting because it comes in a variety of colors and the types are meant for use with specific materials to which the image is to be transferred.

[v] Also see: Clee, M, Easy Etching, pp 38-48, Art Jewelry 2006 (November) 3:38-41.

[vi] Rio Grande, Tools & Equipment Catalog, 2006-2007, Etching, pp 370-371.

[vii] Also see: Scherr, MA, The Instant Etch Process, in: Metals Technic, pp129-140, Edited by: Tim McCreight, Brynmorgen Press, Cape Elizabeth, MA, 1992.

[viii] Other companies which produce decal-type image transfer products may be found at or include: www.DecalPaper.com, Lazertran™ (ITN: lazertran),

[ix] Definition: Asphalt \As"phalt\, Asphaltum \As*phal"tum\, n. [Gr. ?, of eastern origin: cf. F. asphalte.] 1. Mineral pitch, Jews' pitch, or compact native bitumen. It is brittle, of a black or brown color and high luster on a surface of fracture; it melts and burns when heated, leaving no residue. It occurs on the surface and shores of the Dead Sea, which is therefore called Asphaltites, or the Asphaltic Lake. It is found also in many parts of Asia, Europe, and America. See Bitumen. (from: dictionary.com)

x Websites with procedures for PnP Blue™ image transfer: www.techniks.com/how to.htm; www.cibs.co.uk/etch/x7.html; www.solarbotic.net/library/techniques/buildpcb trnsfr.html; www.mitghmr.spd.louisville.edu; www.gasendinemagazine.com/archive/0403/0403 feature 1.html; www.emeralda.com/halfwood/minidemo/platmkg1.htm; www.ganoksin.com/borisat/neman/gom-etching-pnp.htm.

[xi] Rio Grande, Tools & Equipment Catalog, 2006-2007, Compound and Blasting Media, pg 341.

[xii] Techniks, Inc makes a heat press designed for PnP Blue™ transfer (see: www.techniks.com).

[xiii] Ritchie, WH, Laser Print Etching: Using laser prints for etching on metal, see: http://www.emeralda.com/halfwood/minidemo/platmkg1.htm.

[xiv] Sanchez, J, see: www.hgtv.com/hgtv/cr accessories jewelry/article/0,1789,HGTV 3225 3273675,00.html.

[xv] Goss, SJ, see: www.makersgallery.com/goss/pnp.html.