

Notes About Hand Planes

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As a life-long home handyman, I assumed I knew something about handplanes. I was wrong. I started out with a few planes, including an older (1960-70) #4 Stanley that was quite frustrating to use until I replaced the iron and did quite a bit of work flattening the sole. This is a summary of what I learned over my first 2-3 years of serious woodworking. I have to update this continually because I continue to learn.

First, I did not appreciate how useful hand planes are. Second, I did not appreciate the variety of hand plane types that would become essentials in my work.

Third, and probably most important, I incorrectly assumed that a plane can be used as received from the manufacturer. (I also assumed, again incorrectly, that I knew how to sharpen a plane iron).

Some hand planes may need extensive tuning, as I describe further below. The best, e.g., Veritas/Lee Valley (LV), may need only final sharpening. Apparently this is also true of other high-end planes like Lie-Nielsens (LN) and Cliftons. Also, there are people who sell refurbished (tuned) planes that may also be ready to use as received. I have no personal experience with them, yet.

The plane iron (blade) should be as heavy as possible, e.g., 3/16-1/8" thick and as sharp as a razor (See [Notes on Sandpaper Sharpening](#)). In most cases, the plane iron must be perfectly flat across all or most of its width. An exception is a scrub plane, which is cambered. (Some people very lightly camber or relieve the corners of the irons on smoothing planes, also.)

Fourth, if planing is to become a routine method of work, hand planes require more technique (and, eventually) more subtlety than I had imagined.

Learning about planes and how to use them was difficult at first. I was skeptical about much that I read, so I tried to identify the authorities I wanted to follow. Among other technique issues, there is the amount of wood to remove in each pass (usually a few thousandths of an inch or less) and how much pressure to apply. For years, I had tried to remove too much wood with a too dull a blade.

Learning about hand planes is somewhat of a vicious circle. You need a good, well adjusted tool to learn how to use it, you need to know how to plane before you can know what to buy, and most people would need to actually value hand planes as tools before they were willing to spend the time or money to get a proper tool.

Perhaps the best way, if you can manage it, is to find someone with decent tools to teach you. Next, would be to buy a plane that is ready to use, so that you know how a good plane works, and so you can learn to use it correctly. This will not come from Home Depot or Harbor Freight. You could buy a LV or LN, or a reconditioned one. I bought a LV to find out what a good plane was like. I'm glad I did.

Price

This seems to be a topic of endless debate on the web. Vendors shy away from discussing the topic, probably as a time-waster. They say that it is a "personal preference", which is insolent

and patronizing, unless there are actually people out there who enjoy slicing half way through a cut before the plane stops or starts to chatter. They could be correct if they refer to one's willingness and ability to tune a cheaper plane. If so, it would be kindness to say so.

How much to spend on a plane, and the best value for money, bothered me a lot when I first realized what was available in the market. A Stanley #4 cost about \$60, while a Clifton #4 sold for \$300. I could not believe that people would actually spend hundreds of dollars for four pounds of iron with handles.^a

How could the price range be so wide? About the same time, I discovered, to my considerable surprise, that people collected old hand planes. (OK, I was naive.) So for a while I thought that the high prices must have something to do with obsessive-compulsive collectors. I have learned better. Yes, collectibility does raise prices beyond some tools' practical value. Some older tools are valued, however, because they are better than their newer replacements. Also, low priced and high priced planes are worlds apart in quality as well as price.

That does not mean that expensive planes are necessarily worth the money to me or to any other woodworker. If you know what a good plane is supposed to feel like, and have developed passable technique, you can buy cheaper planes and learn how to make them work correctly.

David Savage pointed out in one of his essays that a cabinet maker in the hand tool era would expect to pay a week's wages for a plane. That does not justify a hobbyist's paying the prices charged for high-end planes but it certainly changed my perspective.

Two Stories. Partially out of curiosity, I bought an inexpensive #5 Anant plane. I am very happy with it, after replacing the iron with a thicker iron and flattening the sole (it was almost flat out of the box). The sides are square to the sole, so I can use it for shooting. I bought another one as a gift, and it just required light flattening and sharpening of the stock blade to work very well.

On the other side of the ledger, I wanted a scraper plane but did not want to spend the price of a LN scraper. I brought home a much less expensive Kunz #112 scraper. It chattered terribly even after the sole was dead flat and the blade was as sharp as a razor (and burnished). I bought a thick, new Krenov style blade for it. It was actually a bit too thick to fit, so I had to file down the blade holder until it fit. Then I could cut thin shavings without chattering, but only if I held it just right.

Next, I posted a question about this problem on Woodnet. Among the wrong answers were two right answers that lead me to Peter Korn's book on hand tools. I modified some washers to take out some side-to-side sloppiness along the shaft, and the chattering went away. The plane still did not cut correctly, however, despite my most exacting efforts to sharpen it and to turn a hook with a burnisher.

Next, I bought a jointer jig for a file, and jointed the scraper blade so that it was flat along

^a These numbers refer to original Stanley/Bailey model numbers. Basically, #1 - #8 are bench planes, from 5 1/2" long to 24" long; called smoothing, jack, fore and jointer planes as the soles get longer. Block planes have numbers all over the place. See Garrett Hack, Patrick Leach in references.

its edge and perfectly 45°. Finally, the scraper plane became useful. It still does not cut as smoothly as a Veritas cabinet scraper, however.

Since I have never used a high-quality scraper plane, I still don't know whether they are worth the price to me. That was a long road, however. If a high-priced scraper plane works correctly out of the box, I can see why people would pay the premium price.

I find some consensus that LV are as good or better than LN. LV are usually a bit less expensive than LN or Clifton, but still way above Kunz or Anants. (Most people insist that most modern American Stanleys should be avoided by a cabinet maker, but that would depend on what you were willing and able to do to improve it.)

Tuning (fettling) a plane can turn a plane that barely works, and is quite unpleasant to use, into a quite decent plane. The many articles describing how to fettle a plane are, so to speak, structural definitions of a useful plane. In terms of operations, if a plane can cut very thin (.001 - .002"), continuous, long shavings it will be useful and pleasant to use. There seems to be one more issue. According to David Savage,

The casting on modern planes tend to be so green that you can spend half a day getting the plane dead flat only to find it continues moving and is no longer flat in a few weeks time - so you are back to square one.

So the alloy, casting and annealing are important in a new plane. In an older plane, this presumably would have settled down, but you can't tell what will happen if you remove very much steel from the sole.

Practical Set of Hand Planes

I didn't have ready access to a thickness planer until recently, and I still prepare some rough lumber partially by hand. Of course, I flatten wide panels with hand tools. (I bought the planer when I needed to surface a large quantity of rough-sawn oak in the middle of a hot Florida summer.)

If the board is 8" wide or less, I can surface two adjoining edges on my 4" jointer, set for as thin a cut as possible. Then I scribe the desired thickness all around with a mortise gauge and handplane the remaining two surfaces.

Sometimes, I can cut the stock to approximate dimension on my table saw and then finish surfacing with a few light cuts. If I need to remove more than 1/8" from the flat surface of a board, I will usually resaw it on my band saw (about 1/16" oversize) and then smooth it on the jointer or with hand planes.

I prefer to use planes for finish smoothing. Despite my best efforts to tune my power jointer, set knives to within .001" of each other, level, etc. etc. I still need to finish smoothing with a hand plane, e.g., step 2 or 4 below. This also explains why I don't use the jointer to surface all four sides.

Here is my list of necessary hand planes, followed by a wish list. This was influenced by a similar list by Robert Feaser (see references). Also, Robert Savage wrote articles for Good Woodworking magazine giving lists of recommended tools, including handplanes, for his fine woodworking students. The lists seem appropriately frugal and wise. These articles are not listed on the index page of his website but are available as I write this at the end of 2007. (See

References)

The Short Version. I think that every woodworker should have three hand planes and a shooting board. The planes are: a good #4 or #5 bench plane, the best low angle block plane he can afford, such as the LV and a shoulder plane.

Beyond that, my advice on buying hand plane *types* is to choose based on what operations you need to do. For example, if you can buy straight S4S lumber that needs only sanding, you can skip the planes used mainly for flattening.

For Flattening and Smoothing Faces

1. A ***scrub plane*** is my first step in preparing rough lumber or for leveling glued-up panels. I cut diagonally across the grain to get rid of coarse saw marks, take off the highest spots, find defects, etc. If the board is still too thick I repeat the process on the opposite diagonal, i.e., 90° from the first. I usually set the iron to cut about the thickness of a piece of typing paper or less. This leaves gouges in the surface. A scrub plane is one of the simplest planes and not very expensive. I have a LV. The wooden ECE scrub plane is quite inexpensive and also very useful. Metallic and wooden smoother or jack planes can be converted to scrubs by heavily cambering (rounding) the plane iron and opening up the mouth of the plane, but this is not ideal.

Even if you buy S4S lumber, a scrub plane is useful for flattening the surfaces of glued-up panels if they didn't quite match.

2. I often follow the scrub with an old no-name #3 bench plane, just to partially remove the gouges. Next I use an Anant ***#5 jack plane***. Depending on my progress in step 1 and the type of wood I am cutting, I may use it diagonally or lengthwise. I may initially set the iron for a thicker cut but I finish lengthwise with about a .002 to .003 thick shaving. At this point, the board is looking pretty smooth.

With figured wood, including many pieces of oak, tear-out becomes a problem as soon as the ridges are gone and the surface is flat. See the section on tear-out below.

3. Feeser recommends using a #6 fore plane next, for flattening faces and getting rid of the coarse plane marks left by the jack plane. He says to use it after the jack plane and before the smoother. I don't have a #6 plane.

4. If the board is very long, I use a LV ***#7 low angle jointer*** to make it flat. Otherwise, I skip this step

5. I use a LV ***low-angle smoother*** for final smoothing of faces. This is my primary smoother. It is an excellent tool, and has reduced the amount of rough sanding I do to nearly zero. The edge must be kept extremely sharp. If I see any tear-out or expect it, e.g., from oak, I replace the 38° bevel iron with a 50° bevel iron. Planing oak with the 50° iron is a real workout. I take very thin (0.001") shavings, use a tight (0.004" - 0.008") mouth, and lightly touch up the edge frequently to keep it as sharp as possible. I have not cambered the iron on any of my planes but the scrub, but I may someday round the edges of the iron on this one. A well-fettled #4 would also serve this purpose.

6. Often, I use a LV ***Cabinet Scraper*** or my highly modified Kunz ***scraper plane*** to finish smoothing the board. Sometimes, I wait until the piece has been assembled. Even after all my fiddling with the scraper plane (see above) I find the cabinet scraper preferable to the scraper plane. Also, a card scraper is such a very inexpensive and useful tool, I doubt that I would buy a

scraper plane if I had it to do over. Card scrapers were among the pleasant surprises of studying this fine craft. They are surprisingly under-rated or under-publicized tools.

Toothed Irons and High Bevel Angles

Luckily, the first woods I planed were straight-grained mahogany, walnut and poplar. I got a bit of a surprise when I began to plane oak. Unless the grain is straight and parallel to the surface you are planing, you run the risk of tearing out small chunks of wood instead of slicing it smoothly. That is, unless the plane just stops dead. (A power planer or jointer won't stop dead but it will tear out chunks of wood.) Softwood is likely to split out large pieces. You have to keep the plane iron as sharp as possible, learn how to read the grain, and plane in the direction that the grain is rising. (See [Working With Red Oak](#))

Wood with figured or inter-locked grain usually cannot be planed "with the grain" because the grain rises and falls unpredictably. The solution to planing such wood is to use a toothed iron for wood removal and a high angle of attack for the smoothing step.

Some authorities say that you may make as deep a cut as you want with a toothed iron. I tend to prefer shallow cuts for two reasons: first, I have had to work too hard to remove the grooves when I made deep cuts. Second, I tend to remove wood with power tools and use hand planes for final work where shallow cuts are necessary. I make them diagonal to the grain and at right angles to each other.

One great advantage to a low-angle (bevel-up) plane is that the angle of attack can be changed by changing the plane iron. The LV bevel-up smoother has a bed angle of 12°. Irons are available with 25°, 38°, and 50° bevels, giving an angle of attack from 42° to 62°. (A bevel down bench plane normally has a 45° bed angle, which is also the angle of attack.) Planing oak with a 62° angle of attack is quite a workout, which is why I prefer shallow cuts with the toothed iron.

The highest angle of attack is obtained using a scraper plane, cabinet scraper, or card scraper. I have never had tear-out occur from using a scraper. (But I have no experience with really difficult exotic woods.) In fact, I have removed quite a few tear outs with a scraper.

Card Scraper.

The best scraping tool for small surface areas, final leveling of edge-banding or removing dried squeeze-out is a card scraper. A flush plane is also useful for cleaning up squeeze-out and other small projections from a smooth surface without actually re-planing the surface. I also use my shoulder and small rabbet planes for cleaning squeeze-out but is somewhat of a mis-use since it craps up the plane.

For Straightening and Squaring Edges

1. I joint the edges with my power jointer.
2. Next I use my #5 or my low angle LV jointer, with a jointing fence. The fence makes it possible for me to obtain a square edge to a face. I could not resist buying a LV iron ***edge plane***. Sometimes I use it instead of the #5 with fence to joint shorter boards. It will produce shavings as thin as I could want, in long beautiful curls. Both of these planes take some care. I

understand that old-timers could make square edges without sissy things like fences. In contrast, I have to be extra careful even to keep the *fences* registered against the face of the board. It is too, too easy for me to let the sole of the plane guide the angle instead of the face of the board.

Trimming End Grain – Block Plane

Block planes are primarily for trimming end grain, when I can't accomplish the goal on my table saw, or occasional light edge planing, e.g., trimming edge banding. I have an old no-name *high-angle block plane*, a *Stanley #63 low-angle* and a *LV low-angle block plane*. Like the other LV planes, this one fits my hand and is a pleasure to use.

The advantage of a low-angle block plane over a normal angle one is that it cuts end grain more smoothly. The low angle is not necessary if the iron is really sharp, but the low-angle block plane is much cleaner and easier to use. I keep the mouth about the thickness of two pieces of paper, and cut very thin shavings.

High-angle or low, and no matter how sharp the iron is, it is essential to have a backer board tight against the “exit” edge of the work before trimming end grain. Otherwise, the board may tear along the edge. At first, I just clamped a board in place. But then, I discovered shooting boards and I made myself one. It is now indispensable. Not only does it hold the work square horizontally and vertically (or at 45°) but it prevents the plane from tearing the board at the back. The adjustable mouth is an advantage because it is supposed to reduce tear-out when planing with the grain. (But Feaser says a tight mouth is not a help when planing end grain, so an adjustable mouth is no advantage in a plane that will only be used to plane end grain.)

Miscellaneous Planes

Shoulder Plane & Rabbet Plane – I use a *LV medium shoulder plane* for final flattening of rabbets and trimming the corner where a tenon shoulder meets the cheek. I tend to cut tenons slightly (1/64") thick, and lightly sand them down with sandpaper. (Because of the way I cut tenons I am sneaking up on a perfect fit, but it takes time.) I also use a *Stanley (UK) #90 rabbet plane* that converts to a small chisel plane for trimming into corners and up against edges.

Spokeshaves – These were a late addition. I bought them when I started making chairs. A concave spokeshave is very useful for rounding arrises and re-sizing round tenons. A flat or convex spokeshave is very useful for fairing concave surfaces like chair slats.

Molding Planes – I don't have a proper molding plane, but I do have two little wooden block planes that round over and bevel arrises. They are very handy.

Dovetail Plane

I inherited a funny-looking wooden plane from Dad. It turned out to be a 6° dovetail plane, which I have used once to trim sliding dovetails. It was indispensable for that use, however.

Dowel Plate

A dowel plate is a piece of tool steel with holes in it that will trim a rectangular stick into a precise dowel size. Think about it – if it isn't a plane then what is it?

Pullshave

I bought this to scoop out a chair seat. It is also useful for trimming & cleaning up any concave radius. It's quite difficult to control, and I get my best results with rougher work.

Beading Tool

I bought a beading tool because it seemed like a great idea for beading table legs. I have not needed it for that, yet. It tears the wood when used across the grain and so was not useful for decorating drawer fronts.

Tenon Cutter

I bought a round tenon cutter for making chair rungs but I have not used it yet. (I'm not sure that this is a hand plane, but once I included the dowel plate I could not stop myself from including it here.)

Next Planes

A router plane for cleaning & slight deepening of dados and grooves A molding plane for edge work seems like a good idea but I need to learn more about them.

A higher quality scraper plane (?)

I'm starting to think that I should have a LV #4 bench plane, but I think that this is merely hoplophilia. (See the entry for WOODWORKER in [Truth in Woodworking](#).)

Getting Started -- Comments on Using Handplanes

Most of what I have learned is summarized above in my list of planes. However, planing is personal. It really illustrates the esthetics of craftsmanship and tools. (See [The Handplane Mystique](#) in Reflections.) Some details of preparing and using handplanes could not possibly seem important to someone who did not already know them. (If that's not mystical, I don't know what is!)

- a. If the plane iron cannot shave hair off your arm with *no* pulling – or if it can't slice a piece of newspaper hanging from your other hand, it is not sharp enough. See *Notes on Sharpening*.
- b. Learn how to use a plane, or try out a new plane, on poplar or other fine-grained soft hardwood. Do not judge yourself or the plane on oak, hard maple, etc until you are experienced.
- c. If the grain of the wood is not parallel to the surface, plane in the direction of rising grain. If the grain runs up and down, the wood is challenging and perhaps should be scraped or sanded instead. At least, don't try to learn on such wood.
- d. A bit of oil or wax on the sole of the plane makes a big difference.(Apply sparingly and rub off vigorously.)
- e. Start by retracting the iron so that it does not cut at all and then advance it by tiny degrees until it barely cuts.
- f. If a plane skips and digs, and is otherwise well-fettled, probably the iron needs to be sharpened or you are taking too thick a shaving.
- g. Learn to keep your fingers on the tote (handle) and knob of a bench plane.

Keep your fingers over the body of a block plane. Otherwise, eventually you will jam a finger between the plane and a hold-down or other obstruction. At least, that's how I learned this valuable tip.

- h. The main exception to the preceding rule is when using a jointing fence or edge plane – keep the fingers of your left hand against the fence and the side of the board. It is surprisingly easy to plane a bias on the edge.
- i. Remember that the plane is a guided knife blade. On difficult wood, try to cant the plane slightly, so that the iron can slice sideways as well as forward. (You still hold the plane flat on the board and push it parallel to the grain direction.)
- j. Especially, when trimming edge banding or the ends of box joints, don't push the plane forward as much as use it like a knife in a holder. Rest the sole on the surface that you are trying to match, and cut off the proud material with a sideways slicing action.
- k. Find some writers who really know what they are talking about and study them.

How to Tune Up (Fettle) a Plane

There are many articles describing how to tune up a plane. One of the most respected is the one by David Charlesworth, available from Fine Woodworking's web site. Garrett Hack's *The Handplane Book* is considered a classic and also describes the procedure.

Much advice about planes is received wisdom. For example, how flat must the sole actually be? Some question the emphasis a dead-flat sole. See the article by Schortzcopft.. It may depend on where the hollows are, and what work you want to do with the plane. Certainly, the plane must not rock on its sole. The scratches from your lapping must show on the front, rear and both sides of the sole, as well as around the mouth. Hollows in the middle of the sole may not matter. Reportedly, some Japanese planes are made with hollows in the soles. It would reduce friction. Also, excessive lapping widens the mouth of the plane and can conceivably allow the iron to warp

For example, the sole of my Stanley #4 is flat everywhere but around the mouth. It still works well for stock removal and initial smoothing. It will take very fine shavings from smooth-grained wood. The slight depression around the mouth, however, may limit its usefulness with unevenly-grained wood..

How important is a perfectly seated frog? My no-name #3 plane has a sheet metal frog (!) and the original iron. All I did was flatten the sole somewhat. It cuts beautifully, shavings as thin as you like, as long as it's sharp.

My opinion at present is that a complete tune-up on a new plane may not always be necessary, especially endless work lapping the sole flat. I would rearrange the conventional order as follows. The following leaves out some details – it assumes that you have Charlesworth's or another article available.

A. First, check that the sides are square to the sole. If they are not, you can still use the plane to flatten or to smooth, but not to joint edges with a fence. You can't use a shooting board or fence without some fiddling to adjust the effective angle between the sole and the fence

(shooting board) to 90°. You can lap one side square or send it back for a refund.

B. It's probably wise to hone and polish the end of the cap iron (chipbreaker) as described by Charlesworth, to keep shavings from getting under it. Re-install the cap iron a few thousandths back from the sharp end, if possible.

C. Sharpen the iron and try out the plane. (That means literally as sharp as a razor blade – See the [Notes on Sharpening Hand and Turning Tools](#).) Start with the iron even with the sole, so that the plane does not cut. Advance the iron about a quarter-turn at a time until the plane just cuts. If the plane can cut paper-thin shavings without tearing the wood, the iron may be sharp enough.

D. If the plane rocks at all on a flat surface, skips, or digs in and is impossible to adjust to cut thin shavings, flatten the sole or reject the plane. Flattening the sole is straightforward. Most people recommend flattening the sole while the plane is assembled and the blade is fully retracted.

1. Find a dead flat surface. You can use a piece of heavy float glass, polycarbonate (Lexan) glued to a piece of *good* plywood (like Baltic birch), or a cutoff from a stone counter-top. The tables of your jointer or table saw are also probably dead flat but you might not want to wet them or gunk them up with swarf and glue. This is messy, so you may want to lay down a towel under the flat surface, if the surface is stiff enough.

2. Lay a half-sheet of 400 grit wet or dry sandpaper (silicon carbide) on the flat surface. It may stay in place with just a few drops of water underneath it. Wet the paper and push the sole of the plane across the sandpaper, or move it in a figure "8" about 10-20 times, being careful to keep the plane perfectly flat on the sandpaper. The scratches from the sandpaper will be brighter than the rest of the sole. If the sole is flat enough, the scratches will show all around the mouth of the plane, along the sides, at the front, and near the back.

Starting with 400 grit is conservative. This will not remove much iron, but you can use it to inspect the flatness. If the test shows that the sole needs to be lapped, replace the 400 grit with 100 grit. Repeat the lapping process until the coarser shiny scratches show all around the mouth of the plane, along the sides, at the front, and near the back.

3. The sole is now flat. You can go on to successively finer grits to polish the sole: 200, 320, 400, etc. I usually do. After all that work, I want the sole to shine.

4. Wipe the plane carefully and apply a thin coating of non-silicone paste wax to the sole.

E. If the plane still chatters at all, and the iron is not at least 3/16" thick, consider replacing it with a new one from Hock or an A-2 iron from LV. It will also be nice to have a spare iron handy. (Check first to make sure that a thicker iron will fit in the plane.)

F. If it still chatters with a thicker blade, after flattening the sole, then see to the fit of the plane iron to the frog, etc., as recommended in the references. This is a bit more tedious and more difficult to do well. That's why I recommend it only after you have tried the other steps.

Frequent, light sharpening (15 μ and finer paper or stone) and light application of silicone-free wax (e.g., Butcher's) should keep a tuned plane working nicely. Wipe it on and scrub it off with a rag. Some people use oil from beside their noses for the same purpose. If a

well-tuned plane starts to skip and dig, it probably needs to be sharpened.

References

David Charlesworth: HandplaneTune-up Step-by-step instructions to get maximum performance from any plane. *Fine Woodworking* September-October 2004.
<http://www.taunton.com/finewoodworking/ToolGuide/ToolGuidePDF.aspx?id=2933>

Robert Feeser is a contributor to the hand tool forums on <http://www.woodnet.net/>. His screen name is *rfeeser*. He has written extensive postings on woodnet in response to questions and has collected them into three parts. The collection is available on many other sites, for example, <http://workshop.tjmahaffey.com/workshop/planes1.php>. Some of my choices and remarks above were influenced by his writing.

Garrett Hack: *The Handplane Book* is considered to be the classic compendium. Hack is, however, a bit of an afficianado. He does not give enough attention to modern medium-priced planes.

Kirby, Ian. He's in Fine Fettle <http://www.woodworkersjournal.com/index.cfm/ian>

Patrick A. Leach: The Superior Works: Patrick's Blood and Gore. This is an encyclopedic listing of handplanes, mostly antique
<http://www.supertool.com/StanleyBG/stan0a.html>

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