Chapter 6.

Patterns for a Variety of Planes

You may wish to build a plane for some specific purpose, or recreate an old type from a picture or description, and in the preceding chapters I have attempted to explain what details need to be considered to ensure your plane functions properly. This chapter provides the basic dimensions for a selection of planes for those with no prior experience who just want to try their hand at a metal plane. You can follow the drawings closely or modify them to suit your own taste (or material you happen to have on hand). The drawings were made on 5mm grid paper, so you can re-draw them full-size to make side & sole templates (cardboard is adequate for templates that will only be used once or twice).

Most patterns can be followed closely if you use the same thicknesses of materials and the same size/make of blades as listed in the plans, but do check all dimensions before you begin cutting; human error (mine or yours) sneaks in wherever it can. Blade thicknesses & widths vary between brands, and even between batches of some brands which is why I don't give precise dimensions for mouth-openings. If a very tight mouth is your objective, *always* start by obtaining the blade you intend to use.

You may wish to use a different thickness of material for sides & soles according to what is available to you. Be cautious making sides or soles any *thinner* than I've suggested or the plane may not be stiff enough. If you wish to use thicker material, bear in mind that every mm of extra thickness adds noticeably to the labour involved and can also add significantly to plane weight, particularly on a larger plane. The thicknesses specified have been chosen partly for convenience (readily available sizes) but mainly to give adequate body stiffness without excessive weight.

If you change bed angles from those in the patterns, a few degrees either side of the pitch shown should make little or no difference. If you wish to raise the pitch substantially (by 10 degrees or more) on a bevel-down plane it might require altering the centre 'hump' of the sides in order to accommodate the cross-pin for the lever-cap or wedge. Likewise, using a very thick cap-iron may require adjustment of the lever-cap pivot points. Minor alterations like these are easy to make as long as you are aware they may be necessary & incorporate them from the start. If designing your own plane or making substantial alterations to the plans, making a mock-up is the best way to be certain everything fits according to plan.

If you have a CAD programme and the skill to use it (I don't), you can have it work out the most efficient widths of brass or steel to buy, but my low-tech approach is to arrange the relevant templates on pieces of wood or cardboard cut to standard stock widths to find the best fits. The kerf of a #8 jewellers saw blade is less than a millimetre wide, so leaving a millimetre gap between pieces is enough once you are confident you can saw close to a line, but you are likely to make slightly wobbly cuts at first so it's wise to allow a slightly wider margin until your sawing skills are up to par.

The general instructions in chapters 2 & 3 plus the drawings given here should be adequate, but some extra detail has been added with the drawings where I thought it was helpful.

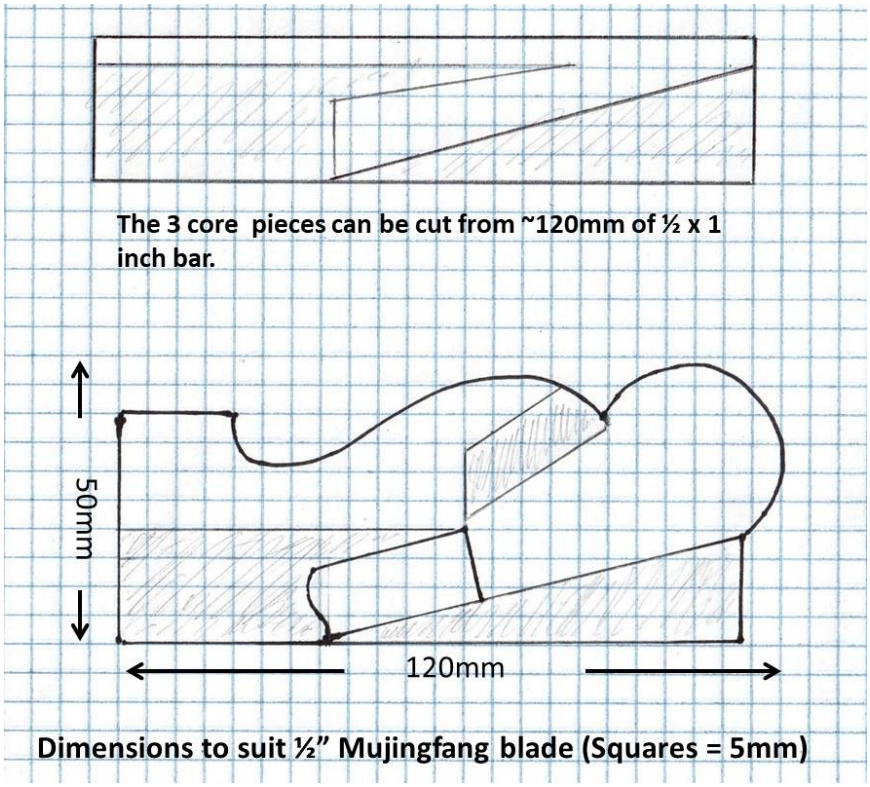
Shoulder planes.

The dimensions of the profiles as drawn suit the brand of blade I used for each width. If you wish to use blades from other makers there is plenty of choice (e.g. Lie-Nielsen, Veritas Record, Stanley), but check precise dimensions of these before laying out your plane because both the length of the functional (wide) part of the blade & the length of the tang vary, sometimes slightly, sometimes significantly. You may need to alter the length of the escapement opening to fit the wide part of the blade. I've even found some minor variation in the 'working' length of different batches of the same brand. The notches on the tangs for the adjuster wheel are also variable in number, width & spacing, so if you intend fitting an adjuster, take that into account.

You can vary the profile of the sides to suit your tastes but bear in mind that with a fixed-mouth design like these the blade can only be withdrawn through the body so you must make the escapement cut-out tall enough that you can rotate the blade 'vertically' & withdraw it under the wedge abutment or bridge. Ensure there is enough tang protruding at the back of the plane to allow easy adjustment, or if you are planning to fit an adjuster, that the grooves or slot for the adjuster wheel protrude enough to be accessible.

1. Small shoulder plane with a ½ inch (13mm) blade This is a pretty specialised little tool & not likely to see a huge amount of use in the average workshop, but it can be very handy for small, precise work. It weighs about 350g, if you follow the core dimensions given but you can make it lighter or heavier by altering the sizes of toe & bridge core-pieces. Material costs are not high (<$30 for brass at current prices), so this could be a good 'starter' project.

Squares are 5 x 5 mm.



Copy, or re-draw to suit your own taste in side-profiles if desired.

The blade-bed angle may be raised (18^0 was a common pitch on old SPs), but if using brass, I would not advise going any lower than the approximately 15 degrees shown because the sharp end becomes very thin & easily damaged (if using steel you can go down to $12^{0)}$.

File a smooth curve on the entry side of the bridge for the wedge before riveting in place, so it doesn't cut into the wedge as it is tapped in.

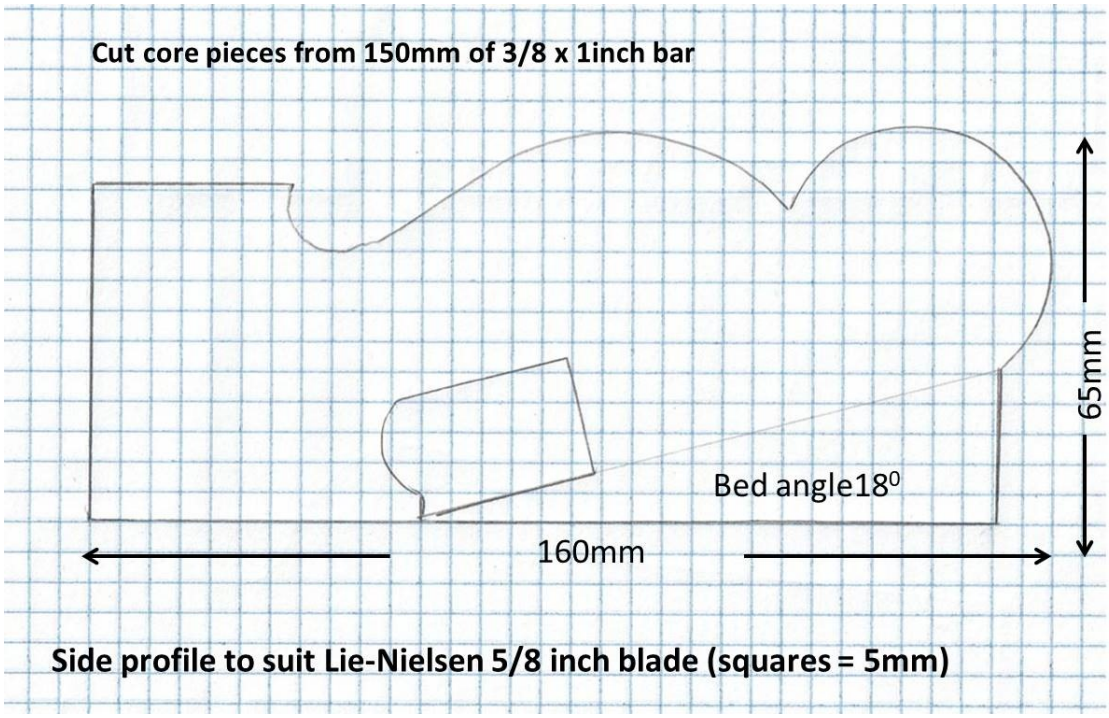
Using ¼ inch brass for the core and 1/8" for sides simplifies construction, but it means there is little room for the blade tang to move sideways, which limits lateral adjustment. I haven't found this to be a major problem, as long as the edge of the blade is kept square, or at the correct angle in the case of skewed planes.

Using thicker core material and thinner sides (2-2.5mm thick sides should be sufficiently stiff for a plane of this size) and would give a little more internal room, but the gain would be small & probably not worth the effort to reduce a piece of brass to the non-standard thickness required for the core (with hand tools), but if you have access to a milling machine it would be easy enough to do.

For the rivets, 2.5mm diameter is a suitable size.

2. A plane for the Lie-Nielsen 'small' (5/8 inch) shoulder plane blade

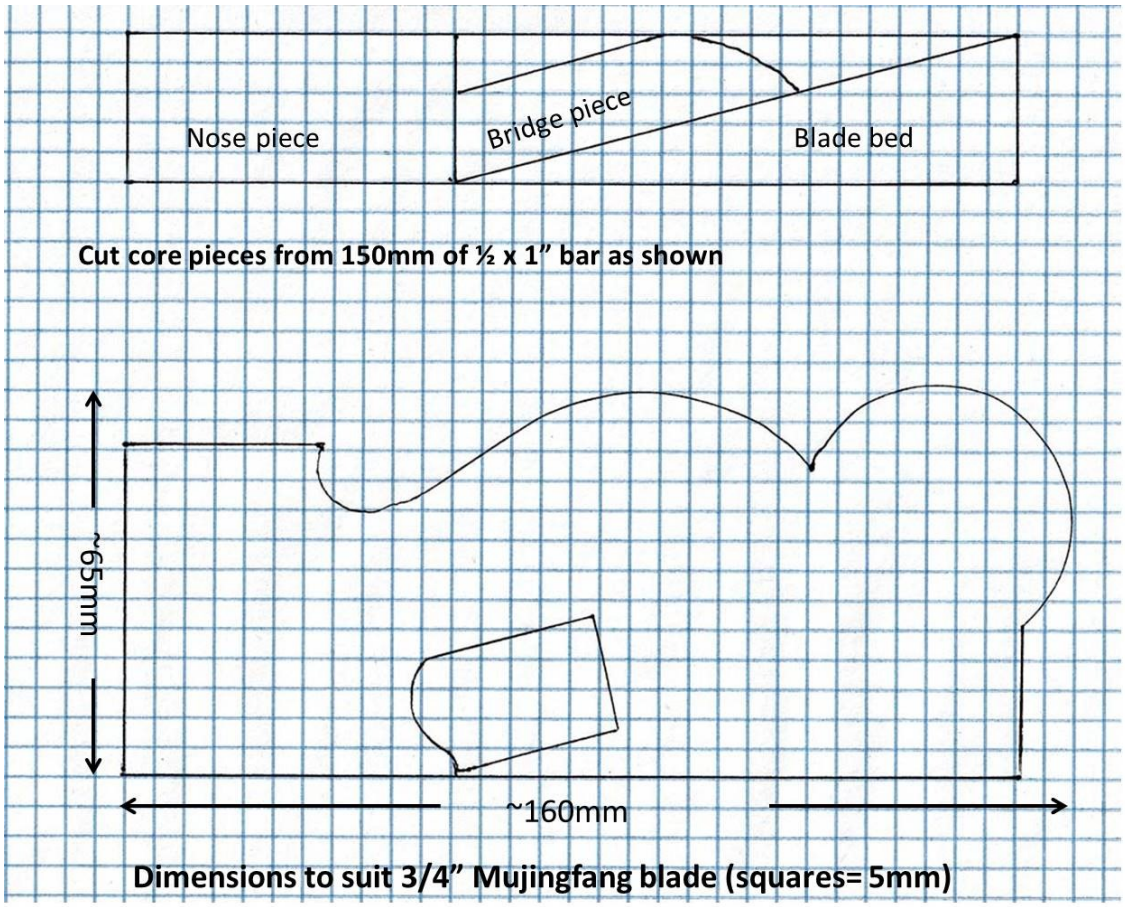
This is a slightly larger plane with a bit more heft than the ½", but still suited to small work. I have only made a single plane of this size, and did not use it extensively myself, but it did seem to be a nice little plane, and probably more suited to larger hands than the half-inch version. I have drawn side profiles only; you should be able to work out the sizes for nose & bridge pieces. Making the nose core the full height of the 1" bar suggested provides plenty of weight to the front. In this case I have drawn the bed angle at 18^0, the same as LN use, in order to keep the sole-length similar and give the adjuster adequate room for travel.



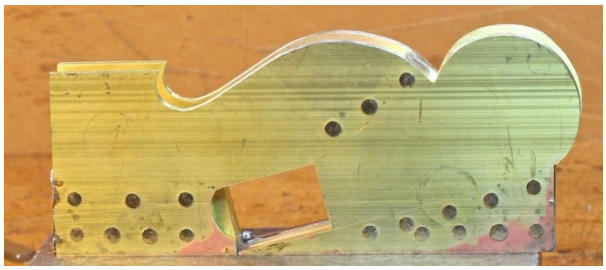
If you are fitting an adjuster, the L-N blade has a single slot in an expanded section at the end of the tang, which means the stud for the thumbwheel needs to be quite long to provide enough travel to get full use from the blade. An alternative is to cut extra slots in the tang so the thumbwheel can sit under the tang as shown for the ¾" version below. LN blades are hardened for their full length so you will need to either grind the slots (I did this using a Dremel tool & a cut-off disc in a crude jig) or anneal the end of the tang so it can be cut with hacksaw & files. Either method works. Torching a shiny new (& expensive) blade may not appeal, but there is little danger of damaging the business end and there is no need to re-harden the tang. Old blades were not hardened beyond the useable section (& when making blades I harden & temper only the wide section), all-hard blades are a by-product of modern manufacturing processes.

3. Medium-weight plane with a 3/4 inch (19mm) blade.

This is a good size for small to mid-sized work & I suggest either this size or the following 1" are good choices if you want a single shoulder plane for general work. It is a comfortable size & weight to hold (the finished plane should end up weighing around 900-950g. depending on the depth of the toe core & infill wood used). It is small enough for fine work, but has enough heft & width to trim shoulders of most tenons likely to be used in routine cabinetmaking. The amount of work involved in preparing the parts is not huge, so it is a good choice for a first attempt.

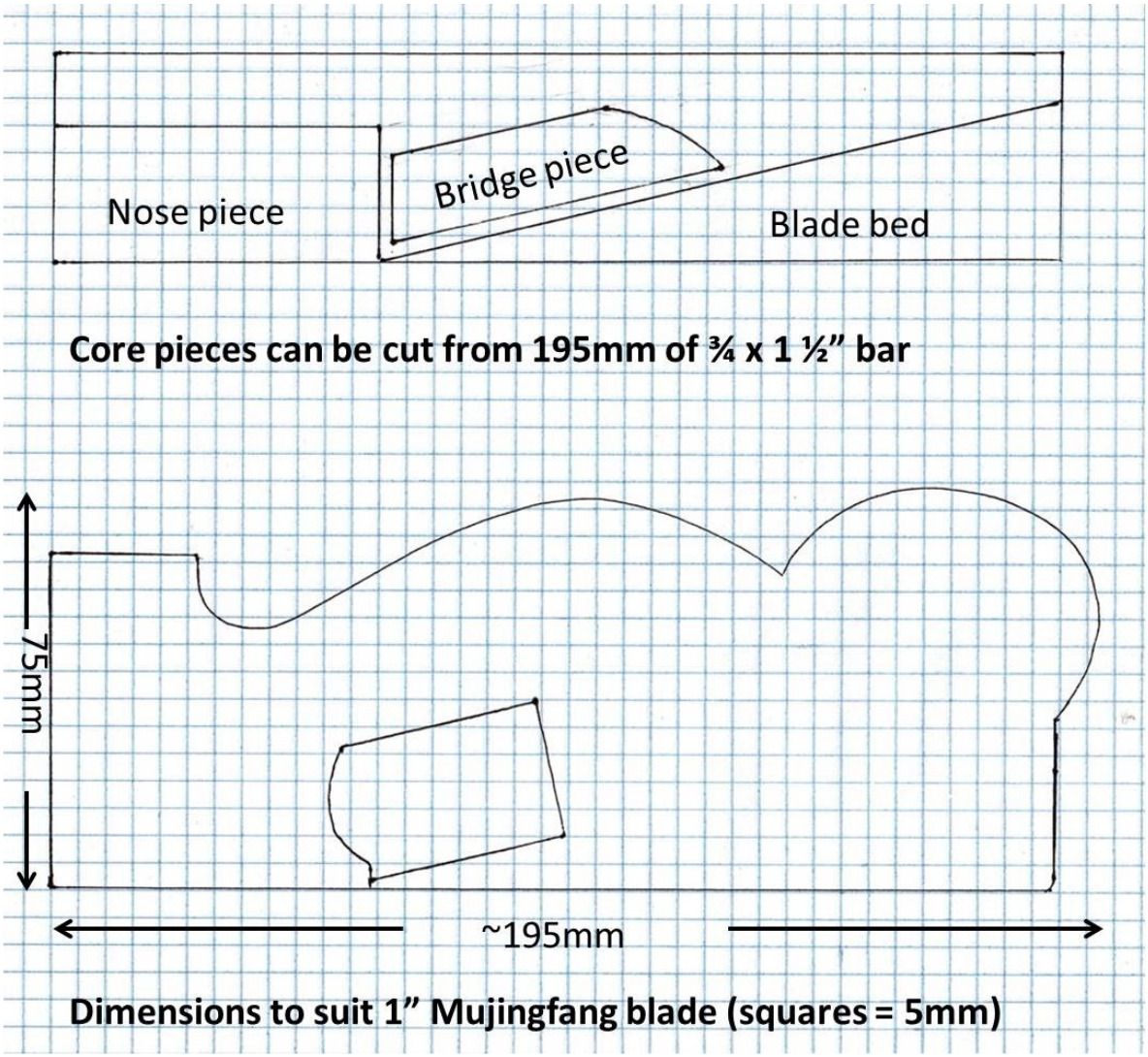


I suggest either 3mm or 1/8" rivets placed 6-8mm from edges and spaced at 12-15mm intervals. This may be slight overkill, but better to have too many rivets than too few.



4. Medium-large plane for 1inch (25mm) blade.

If you want a shoulder plane for routine cabinet-making this is a very good size. If you follow the given dimensions for brass core pieces and use a dense wood like gidgee for infill, it will end up around 1.4-1.5Kg., giving it the heft desirable in a shoulder plane without being too bulky. This makes it a versatile tool that can be used comfortably for a wide range of tasks. One inch blades are the least common & the only commercial one inch blade I'm aware of is for the Mujingfang 'large' shoulder plane, which at time of writing is available from a limited number of retailers in Australia. Making your own blade is not very difficult and a very good blade can be made from 3mm 1084 knife steel. The sides just fit on 3" (75mm)wide bar.

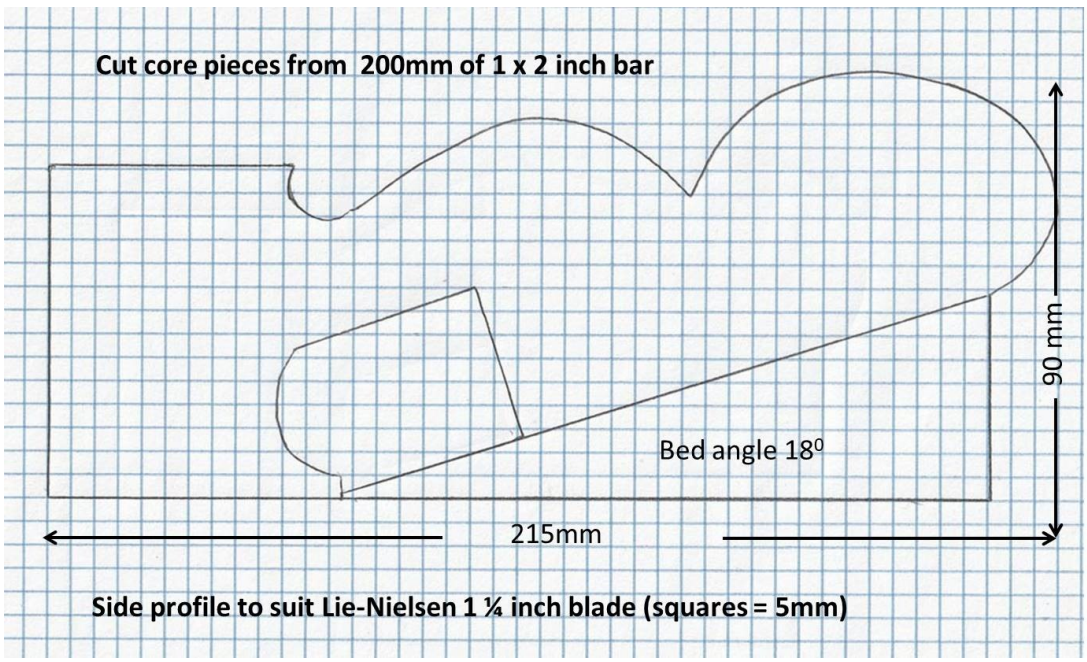


5. A large 1.25 inch (32mm) plane.

This is a substantial beast, about the size & weight of the larger late 19th century shoulder planes. With a dense wood wedge & infill, the finished weight will be between 2.2 & 2.5kg, which is substantially heavier than the large Veritas (1.7Kg) and Lie-Nielsen (1.8Kg) large shoulder planes. The sides are deeper than for previous patterns and require wider (4") plate. The large Veritas & Lie-Nielsen shoulder planes and the Record/Preston 073 & some clones use 1 ¼ inch blades & replacement blades for all of these are easily obtained. The LV & L-N blades are substantially thicker than the Record, which does not affect dimensions, but length of tang and useable blade length vary between brands so as always, procure your blade first & make any necessary adjustments to the body plan if necessary.

You will have quite a bit invested in blade & brass before you start (around $150 at current prices), so you need to be reasonably confident you are up to the challenge, but if you work carefully, it's really no more difficult than the smaller planes.

I made the height of the nose-piece about 30mm, which gives the tool good balance. The blade is pitched at 18^0, the same as LN's version.



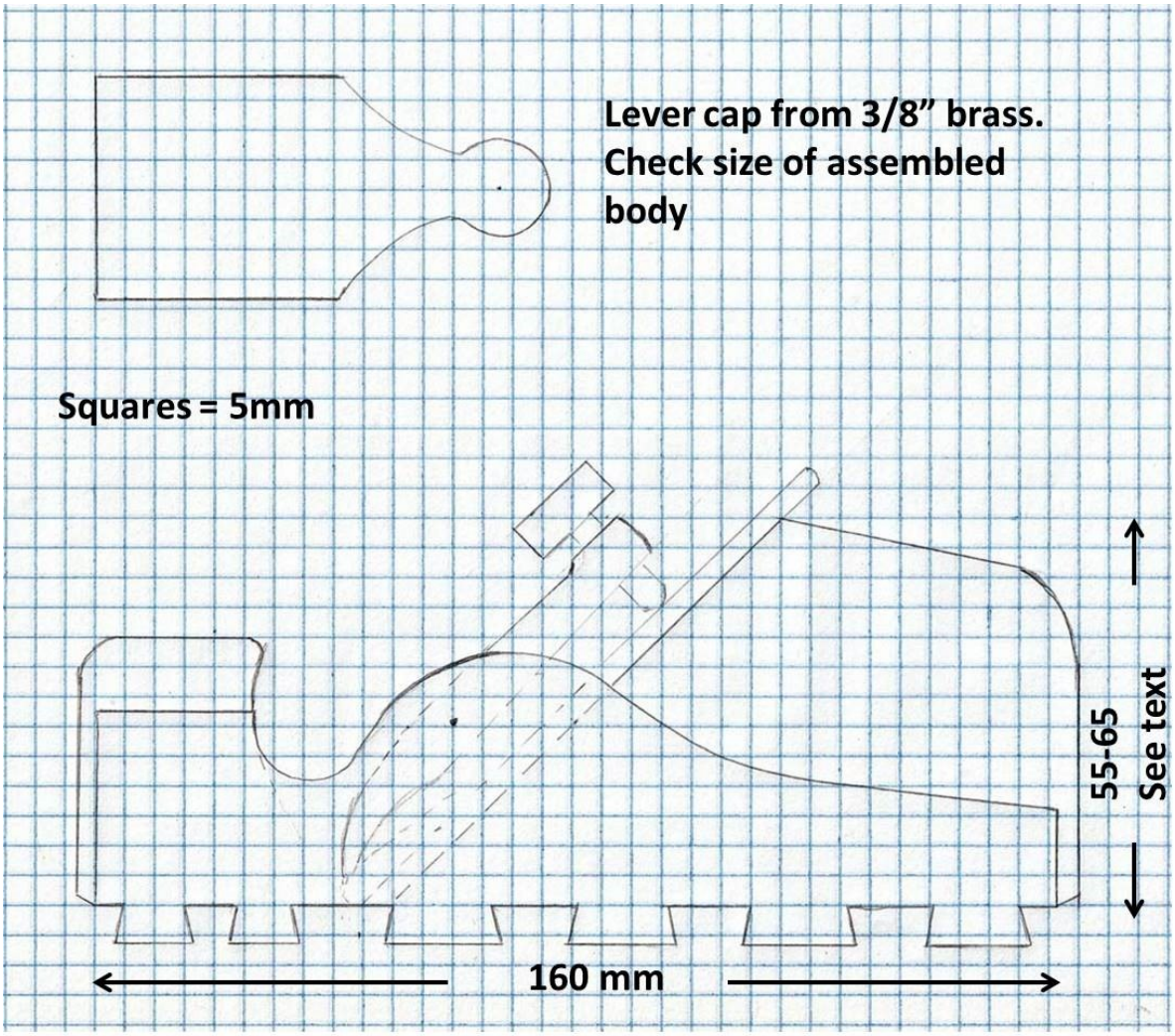
Bench planes

1. Variations on a theme: a small smoothing plane that can take on various shapes & configurations.

3 small planes made from the same side pattern. Variations include blade angles, curved sides and an adjuster.

This little plane is a versatile platform that you can keep simple with straight, parallel sides, or go for the full treatment & give it curved sides with over-stuffed woodwork. It was initially designed to fit the Veritas small plane kit, which includes a screw adjuster (rear example in illustration), but you can substitute a standard block-plane blade and forget a screw adjuster (front). The example in the centre has a 6mm thick, single-iron blade of high-speed steel set at 60 degrees.

These 3 planes were made as models for demonstrating general construction techniques in chapter 3, so what is written there applies directly. While curved-sides aren't all that much more difficult, a parallel-sided version is definitely easier and I think it makes an excellent project for your first foray into building a dovetailed infill.

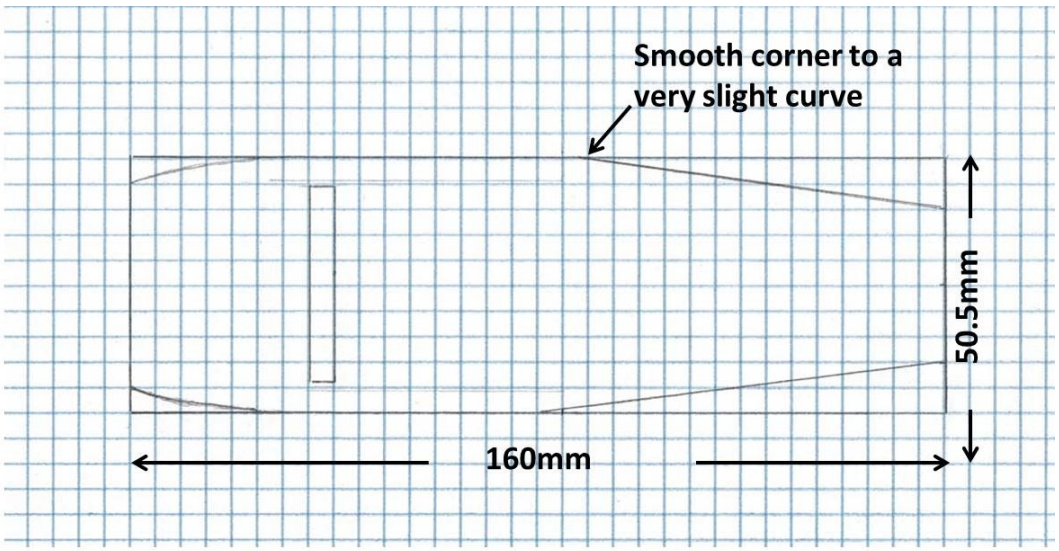


Pattern for small smoother. Sides 1/8" brass, sole 5mm mild steel.

If you plan to use the Veritas kit & include the adjuster, be careful to observe the bed dimensions given in the kit instructions. The bed must be long enough to accommodate the adjuster, but not so long it fouls the knob of the adjuster shaft. If you are not using an adjuster, a good maximum height for the rear bun is about 55-60mm. This results in an adequate size for an average hand but keeps the centre of gravity low, which makes the plane feel more stable to push. However, the difference is very slight & a larger/taller bun may suit better if you have large hands.

The drawing shows the lever cap position with a blade and cap-iron and 45^0 pitch. As far as I'm aware, you cannot buy cap-irons for block-plane blades, so you will need to make your own if you wish to include one (see chapter 4 for instructions on making cap-irons). Note that the position of the pivot point of the lever-cap may need to be adjusted depending on blade pitch and whether you use a single iron, a blade with cap-iron, or fit an adjuster (it requires a little extra room under the LC to manoeuvre the blade over the adjuster spigot).

Sole plan:



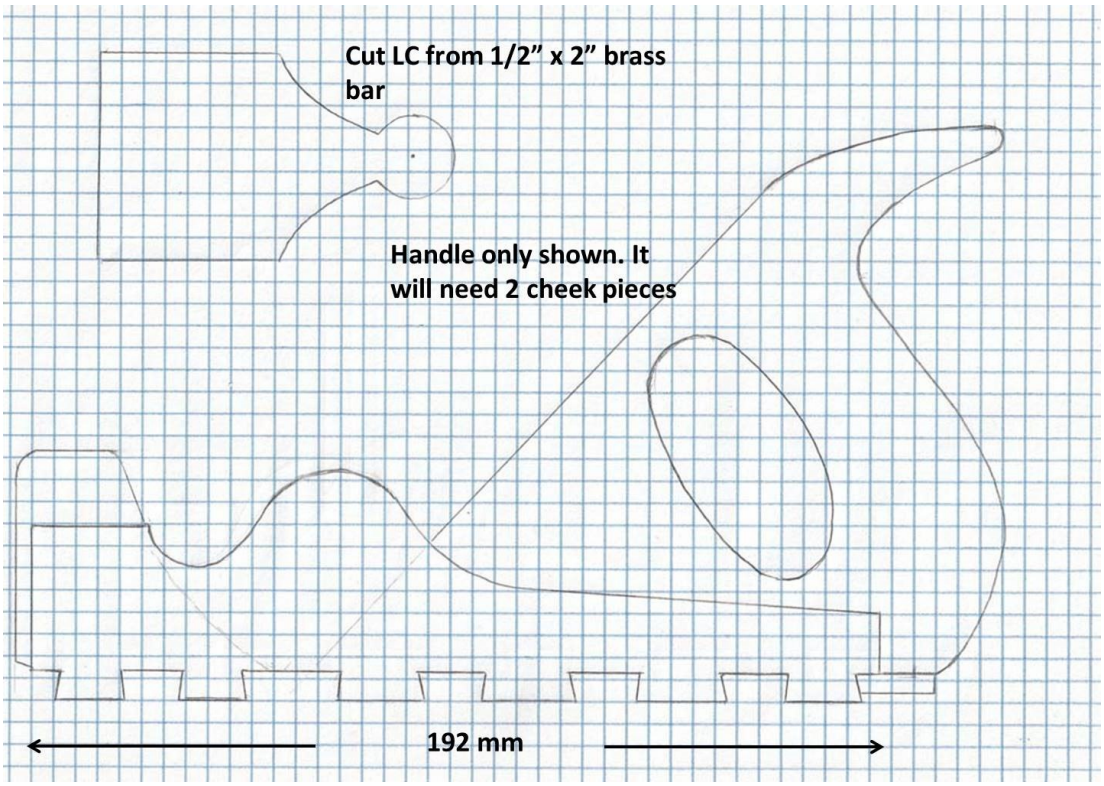
Sole for small smoother with option of straight or curved sides . Width given is for a standard block plane blade; adjust if necessary.

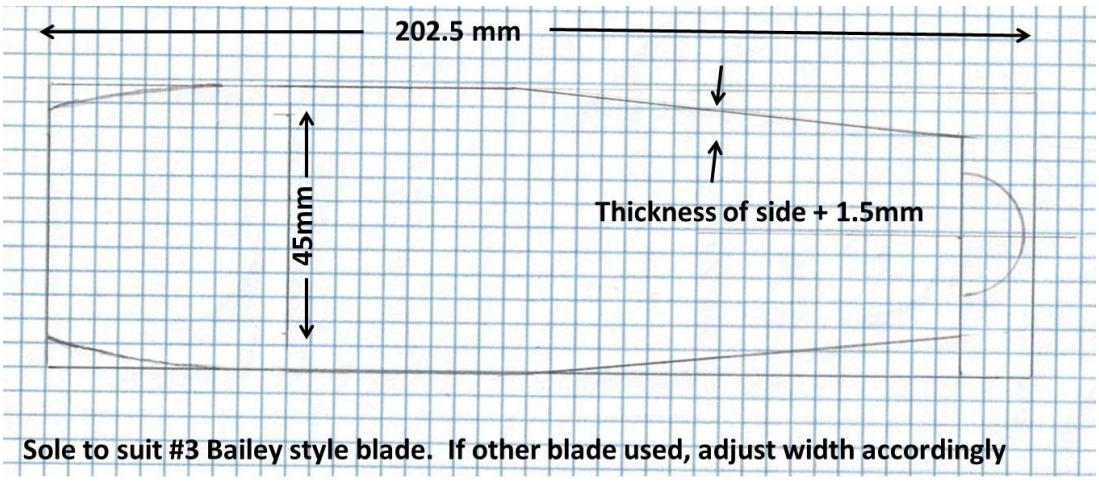
Check blade width before setting-out the sole (see chapter 3 for details on calculating sole widths).

You may wish to include a blade-block or "chatter block" (also described in chapter 3). A blade block isn't strictly necessary if the sole is 5mm thick and the blade you are fitting is 3mm thick or less. In that case the back of the blade should still sit on the bevel of the sole with normal grind angles, and the blade-block is unlikely to make any difference to performance. If the sole is less than 5mm thick or you are using a very thick blade, adding a blade block is advisable if you want to be sure the blade is resting against metal, particularly if you opt for a higher pitch.

2. A small, handled, smoothing plane

This plane was designed around the 1 ¾ inch used on a Bailey #3, but could easily be made wider to accept a #4 sized blade (2”). It is modelled after the Norris A5 (minus adjuster) and has curved sides. The sole length is at the lower limit for fitting a handle/tote at standard pitch, so I added an extension of the sole at the rear to support & protect the handle. If you have a large hand you can gain a bit more finger-room by raising the blade angle a few degrees, or making an “open” handle. Make sure the lever cap can be accommodated neatly within the centre hump if you raise the bed angle. Planes of this size were often made with a rear bun instead of a handle.





I make the rear stuffing from 3 separate pieces as described in chapter 3. Shaping the grip of the handle is easier done before gluing the side cheeks on. After installation the bottom of the grip and the rear of the cheeks can be faired into the sole with rasps & samdpaper.

If you are “over-stuffing” a curved body this part of the construction requires patience & care. Especially if it’s your first attempt at over-stuffed infill, I think it is worth the trouble to make a mock-up from scrap to sort out the various issues before cutting into more valuable material. I have seen a couple of makers use a solid chunk for the rear stuffing, but that will make carving out the grip & finger-hole more difficult.

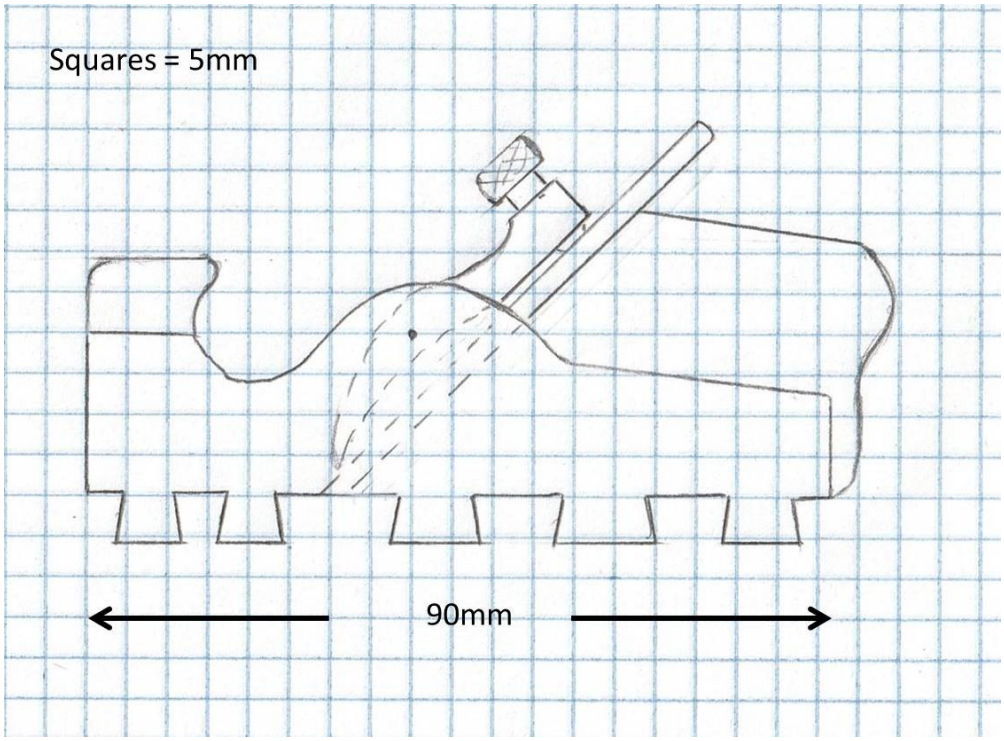
3. Tiny planes

These go by various names, like “finger”, “palm” & “instrument makers’” planes, and were/are made in various configurations & with various sole shapes (most commercial examples have cast bodies). A simple, flat-soled version is a great project to use up small scraps of metal & wood. If you don’t have any suitably-sized bits, you can buy 100 x 100 sheets of 2.5mm brass on the internet for about $15 which is more than enough for two sides. The thinner brass not only suits a small plane better, the (Chinese-made) H62 alloy I’ve bought on ebay is softer than 380 & peens very nicely.

For the sole, I happened to have a small piece of 4mm thick steel, which gave me a long enough bed bevel at 45^0 to suit the 1/8” (3.2mm) x 1” piece of high speed steel I used for the blade. If you use thinner material for the sole, using a slightly thinner blade would ensure that the back of the blade sits on metal. For example, sheets of 304 grade stainless steel are generally available in thicknesses of 3.2mm (the thinnest I would recommend), 4, & 5mm. SS is much harder on saw blades & files than mild steel, but peens well. Fitting a blade block to such a small plane is probably overkill.

The lever-cap was made from ¼” thick brass bar and the axle screws are 3mm ‘cheese-head’ machine screws.

The dovetail sockets are very narrow, & I used an old 4” saw file with the edges ground off to tidy them up after sawing out the waste. A jewellers’ needle-file can do the job (I’d recommend a #2 cut), they have sufficiently sharp edges and can get into the corners sufficiently. The small size of individual parts does make things a bit awkward, but it’s a straightforward task otherwise.



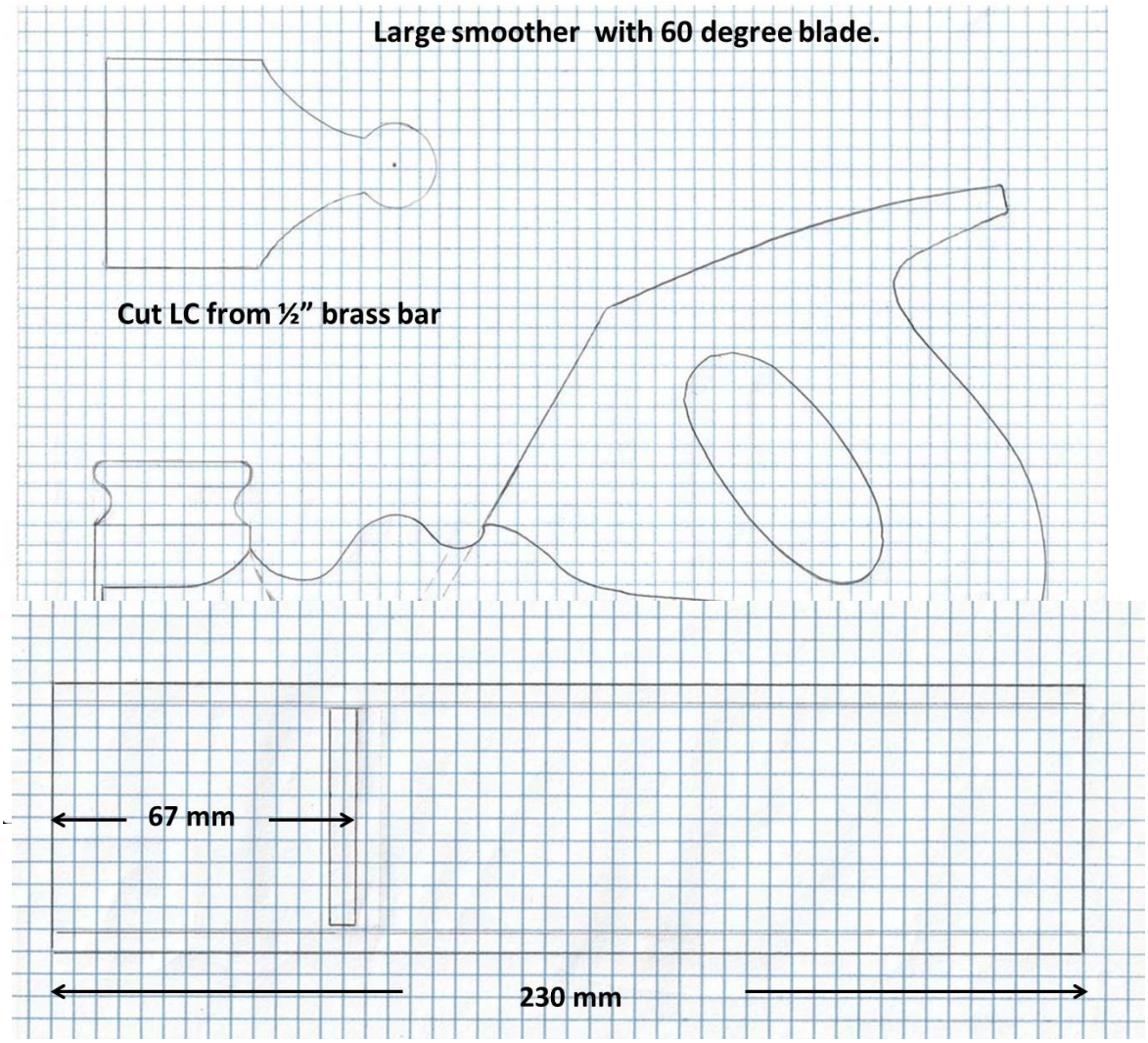
This little plane is cute & fun to make but is certainly not a toy. It's just a little longer than the old Stanley 100 "squirrel-tail" and has the same width cutter, but I think this infill version is much nicer to use. It works well either pushed or pulled (I shaped the rear bun to make a convenient finger-hold when it's used in the "pull" mode), but you can apply your own imagination to how you want it shaped.

In fact, it turned out to be such a winner I've since made several more, some a little larger, with curved sides, and one with a double-iron blade instead of single-iron. (The latter requires making your own blade & chipbreaker, there is nothing available commercially in that size that I'm aware of). The chip-breaker can certainly improve its ability to cope with cranky grain, but is not really necessary for the majority of small trimming jobs these planes are likely to be used for.

4. A large (250mm) smoother with a 60^0, single-iron blade

The side profile for this plane was copied from an old Spiers plane. I made it as a single-iron with the blade bedded at 60^0 but the pitch can easily be reduced to standard 45^0 or anything in between, just check that the lever-cap will fit comfortably within the side profile. The tote will need to be set back a little to accommodate a lower angle of the bed. The blade I used is from Lee Valley & made for wooden planes and very solid. Lee Valley sell both tapered & parallel blades, but a plain, parallel blade is more suited to use with a lever-cap. A blade made for Bailey type planes is unsuitable unless you cover the cap-iron screw slot or the thumbscrew has nothing solid to bear on. I would use a Bailey blade & cap-iron if making it standard-pitch, but I think a single iron is better on a high angle bed, a cap-iron is liable to promote choking. You could use a blade from a derelict single-iron wooden plane, but most of these had tapered blades, not parallel. They will work, but the taper makes it more difficult to make very fine adjustments of the set.

The plane shown has an all steel body, with 5mm gauge-plate for the sole and 1/8" (3.2mm) for the sides. If you want the dovetails to be visible, use 1/8" brass for the sides instead of steel.



“Split-soled” Planes

Mounting the blade ‘bevel-up’ at a low angle introduces the challenge of making a “split” sole in order to form the support bevel on the sole. This is covered in chapter 5 so the following descriptions are brief.

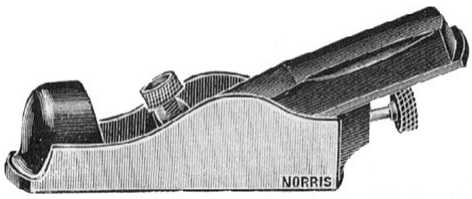
As always, I think it best not to be too ambitious to begin with, start small and progress to a larger plane once you have gained some confidence. The process of forming the tongue & groove joint and bed bevel is more tedious than demanding of great skill, patience & steady, methodical work are most important.

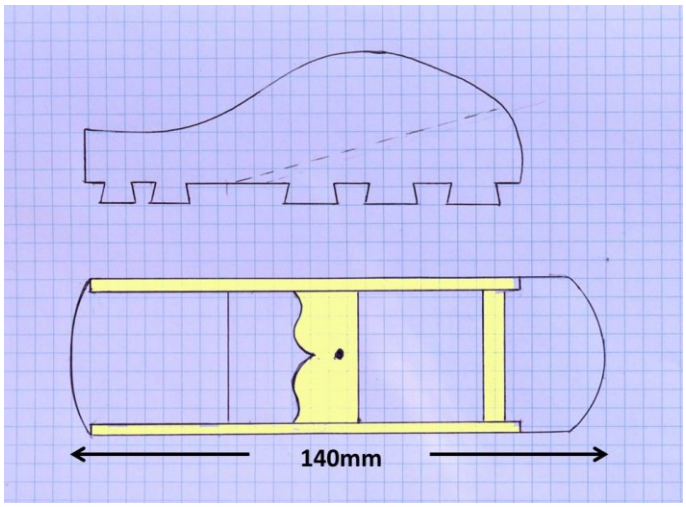
The following drawings are for 3 planes with split soles. They are all based on styles that were made by several manufacturers, each of which had their own particular styles. Mine are not exact copies of any of the originals, I have made some minor changes to make construction a little easier. In the case of the bull-nosed chariot, I have never had the opportunity to inspect an original fabricated version, so I made the nose in the way that seemed most logical to me.

By the time you come to trying your hand at a split sole, you will probably have made a couple of other planes and have enough confidence to introduce changes or new design elements for yourself. So you can choose to follow the drawings closely, or use them as a starting point. You may wish to make them larger or smaller, depending on the size of your hands.

5. English thumb plane

So-called 'thumb planes' were small, bevel-up planes with fine, fixed mouths. They were made by several makers in slightly different styles and a range of cutter widths but they are essentially equivalent to the ubiquitous block planes made by Stanley et al. They were supposedly favoured by piano & other instrument makers as handy little trimming tools. My version is based on the Norris A31 (right), which has straight, 'open' sides and a wooden wedge clamped by a thumbscrew. The adjusterless model (31) had a continuous, curved back and a lever-cap, whereas the A31 (illustrated), used the wedge & thumbscrew system. Norris only offered theirs with a 1 ¼" (~32mm) cutter, which suits my slightly smaller than average hand very nicely, but if your hands are on the larger size of average, you may find a slightly wider version more comfortable to hold.





Norris used their pivoting combined adjuster but I chose to fix a 6mm cross-piece at the back to take a stud for a simple, cut-depth only adjuster.

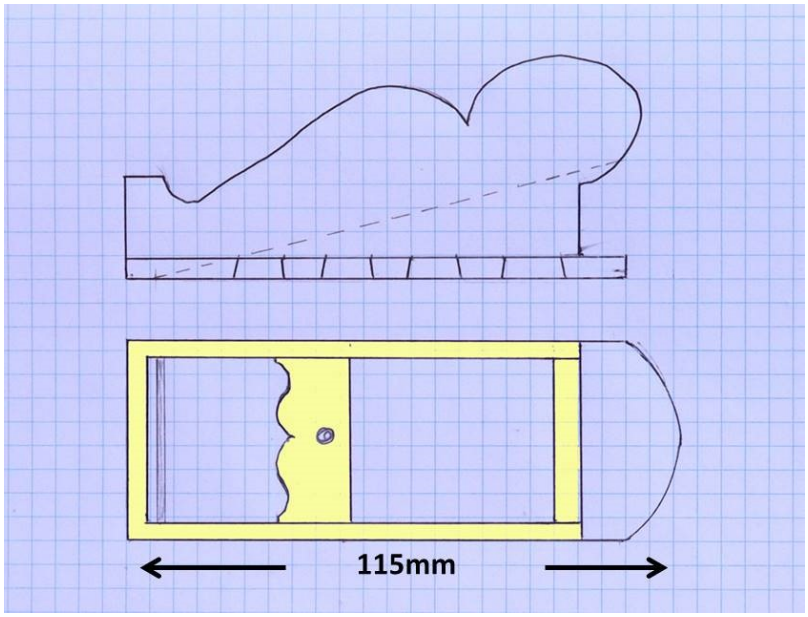
The general details given in chapter 5 for small split-soled planes should be enough to guide you through building the thumb plane, there are no problems peculiar to it. If not fitting an adjuster, you can leave out the rear cross-piece, but it does give a bit of extra support to the sides. With these small planes, I fit the infill so it is slightly low & the blade only contacts the sole bevel & the back piece. Some makers leave it out altogether, but I like to fill the space that can otherwise become a receptacle for rubbish.

Without adjuster, ebony wedge & bun

With adjuster, ringed gidgee wedge & bun

6. Bull-nosed chariot plane

"Chariot" planes take their name from their shape, they are not specialist tools for chariot-makers but yet another variant of the many, many 'block' planes made throughout the latter 19th century. Their main feature is the interesting shape! Norris offered a chariot plane in three sizes of cutter, ranging from 1 ¼" to 1 ½" wide. The vast majority of chariot planes sold were "bull-nosed", so my first attempt followed the trend.



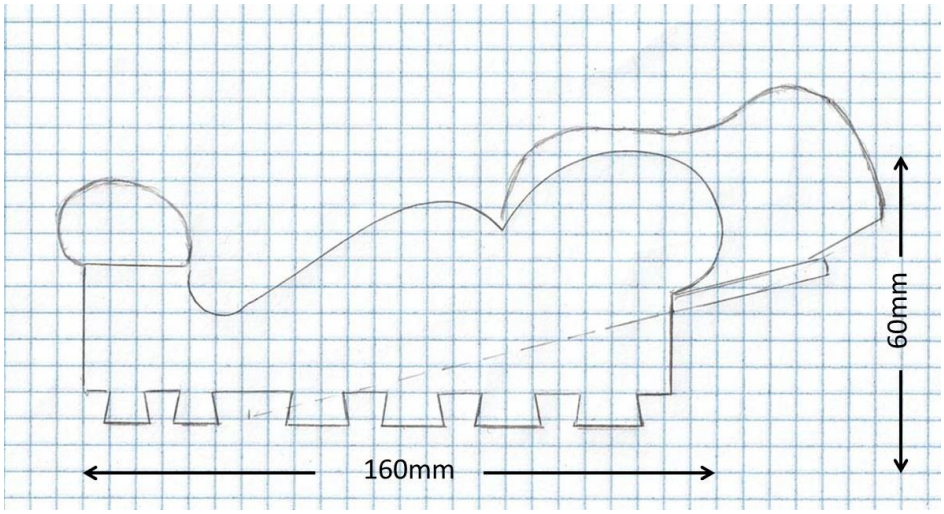
The inspiration for this plane is the Norris 28, which has a slightly shorter body (88mm) and no rear extension of the sole. It was later offered with a version of Norris's patent screw adjuster (model # A28) which had a fixed bridge & thumbscrew as used on the plane shown here. If using a simple wedge as on the original 28, fitting the bridge with a single axle screw or pin is a better alternative to a fixed bridge. Attaching the nose-piece is different from other planes because it also forms the very short 'toe'. Two alternatives for making the front piece are given in the section on split soles in chapter 5.

Adjusterless version with swivelling bridge and simple wedge

With adjuster and fixed bridge/thumbscrew

7. Chariot plane with 'full' toe

Most chariot planes were of the bull-nosed type but a few were made with a "full" toe, which requires the sole to be split in orfer to form the low-angle bed. The extra toe makes the plane into more of a standard block plane, much easier to start on the edge of a board & less prone to following dips & depressions.



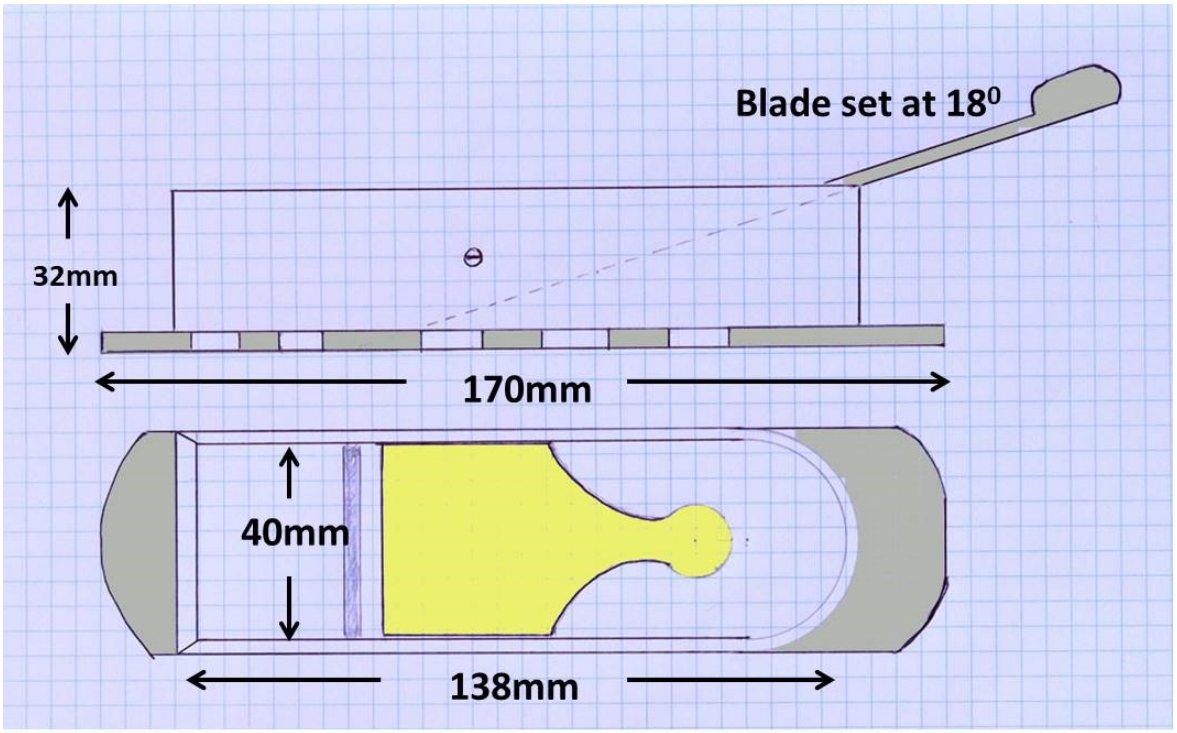
For construction details see 'split-soled planes' in chapter 5.

Version 1, with fixed bridge and thumbscrew but no screw adjuster. Blackwood infill

With screw adjuster and pinned bridge. Black wattle infill.

8. A "Box Mitre" plane

The continuous sides of this plane need be bent around a former of 40mm diameter. Hard (C385) brass would tolerate the bend easily, but not the extensive peening required for creating the dovetailed effect so I used the more ductile H62 (Chinese-made) brass which tolerates peening very well. Because the longest piece of 3mm stock I could get was 300mm long, that dictated the length of the body. With an internal width of 40mm it is a little tight for a 1 ½" (~38mm) blade, but if the blade is ground accurately, there is enough room for minor lateral adjustment.



Construction is a little bit more difficult than with separate sides and is covered in detail in chapter 5. You should be able to set out a side template from the drawing below. Take care placing the "dovetails" at the back, to avoid having them fall on the curve. Note that the 'tails' are made with straight sides so they can be inserted from above. It would be possible to cut them as tails, and persuade the sides into place before the front piece is fitted, but I think you will find it far easier to follow tradition & create the tails by peening. The pin in the centre of the curve is optional, some makers placed pins only on the sides, but it does help to pull the back tightly against the sole.

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