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SURVIVAL SKILLS

The current rash of storms and mega weather events across the country has, you would think, taught us many things. One, I hope, will be an increased encouragement for the development of workshop skills in the younger generation.

We must accept that the weather is in charge, not us — we are not even close — and when it is in the mood to mess with us, it can happen anywhere. Auckland, Northland, the Coromandel, Gisborne, and Hawke's Bay were the most recent victims but anywhere in the country could be next. None of us will avoid these now-annual 1 in 100-year weather events.

I think it is accepted that most rural folk are ready, willing, and very able to sort a multitude of problems, think on their feet, and make good decisions when the unexpected turns up on their doorstep. However, most of us now live in cities — and how well equipped are the screen-obsessed, TikTokking, Uber-loving, city-dwelling younger generation to deal with these situations?

I know that I am in danger of being a "well, back in my day" old bugger, but back in my day there were apprenticeships aplenty and technical streams in all colleges. Having a trade was highly sought after and respected. These days, we mostly have to import these types of skilled workers. You'd think we would have a lot of institutions turning out our young men and women as skilled and capable Kiwi tradies.

How many of your mates started as chippies, plumbers, or drain layers and are now off the tools and running their own companies? I have a mate who trained as a humble mechanic way back when but now runs an international travel company in the US — directly as a result of his becoming a car mechanic.

We need to upskill our youngsters — and darned quickly — to help themselves and our country cope with what is coming in the years ahead. The weather has changed forever — and let's not even start with the other natural disasters our piece of paradise endures. Changes in attitudes all around and upskilling the younger generation are now absolutely essential.

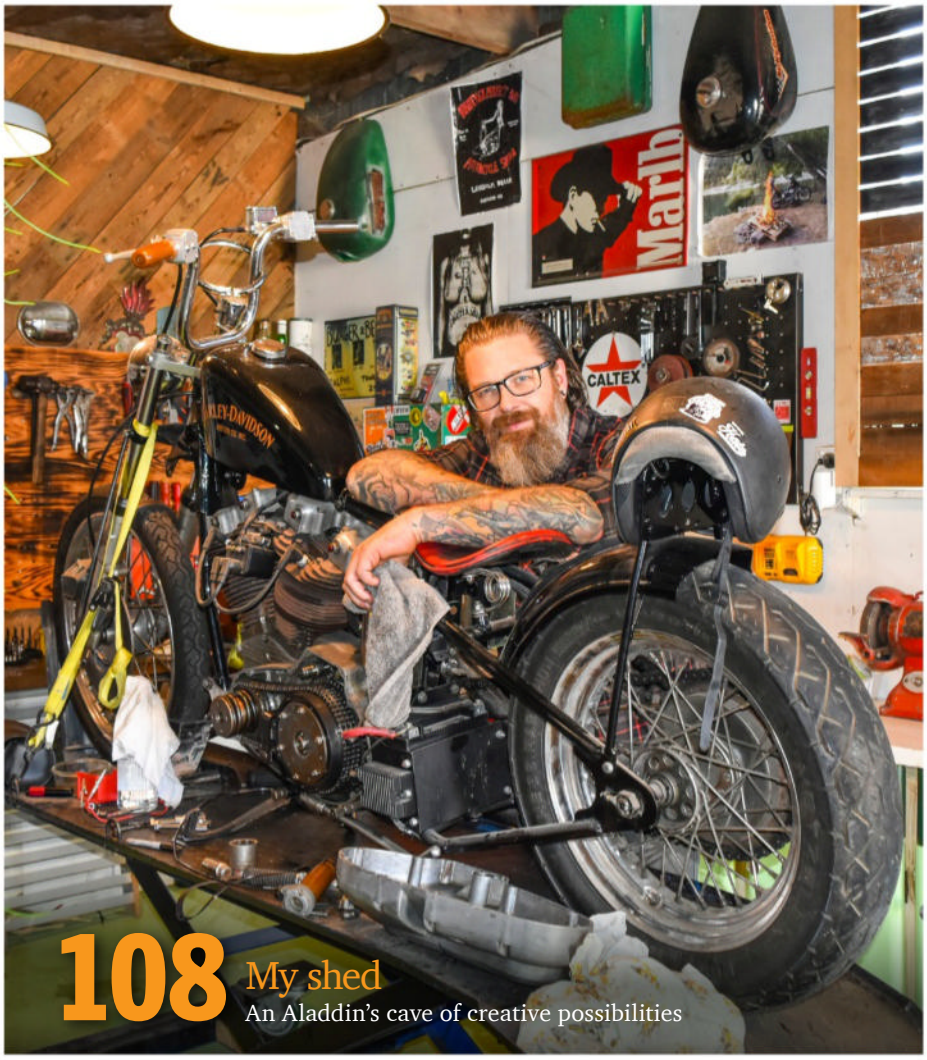
Rave over! Time for a cup a tea and a biscuit, I think.

Greg Vincent
editor@the-shed.nz

Note: Some readers may have noticed that we have altered our issue sequencing — this issue is titled April/May 2023.

Some readers were getting confused — for example, when the March/April issue came out at the end of January — so we have adjusted our issue titles to fit more comfortably with when the magazine is on sale. The next issue of the magazine will be labelled 'June/July 2023' and on sale 22 May.

Contents



EVERY ISSUE

WOODCRAFT WITH SPIRIT

The DIY ethos flows through this sheddie's veins

By Helen Frances
Photographs: Tracey Grant and Peter Loidl

In Peter Loidl's living room, a 1:2 scaled-down Model T Ford made from various timbers does duty as a liquor cabinet. The bonnet and trunk lift up to reveal a stash of spirit and wine bottles that have accumulated for years — they are mostly unopened, Peter tells us. He has wired up the headlights, back lights, and dashboard. He has also installed concealed colour-changing lighting where the bottles sit. There's no drink-drive message intended; the car bar serves a functional purpose and is also an unusual decorative feature.

Peter has built three of these vehicles. The second also serves as a drinks cabinet and the other, called 'Moonshine Express', sits in his double-garage shed.

In the living area, two other cabinets display collectables and books. Peter has made them in rectangular quilt-like patterns from offcuts. He uses offcut timber he sources free from local joiners for most of his woodwork. ▶

The car bar serves a functional purpose and is also an unusual decorative feature

The trunk of the Ford Model T serves as a drinks cabinet, complete with mood lighting

Peter has been a home renovator for many, many years

Keith Hughes, a fellow club member, admires the Moonshine Express

A man of many talents

A home renovator from way back, Peter has recently been landscaping, making large square pavers that he is concreting into the ground inside wooden frames. This outside area is framed by decorative panels that he has made, inspired by a commercial bulrush design. He drew the design on exterior plywood, drilled holes around the design, and cut it out with a jigsaw.

Peter also plans to make a pizza oven; a barbecue; and, further down the garden, a smoke-house, in which he will make smallgoods specialities for family consumption.

Change for good

Always a lover of wood, and already a skilled carpenter and furniture maker, Peter turned his hands and his problem-solving skills to wood-turning following a work accident.

"I went down to the market and saw the wood-turners there. They said, 'Come along; join the club'. They are very good people, very helpful, especially Des Kendrick — he has loads of experience," Peter says.

Peter joined the Wanganui Turners and Woodcraft Group in 2021, and his three Model T Fords, along with 182 other exquisite works made by ▶

> Peter turned his hands and his problem-solving skills to wood-turning following a work accident

Some homemade screens add a nice touch to a deck at the Loidl home

Variety — the spice of life

Peter, now 68, grew up in Austria. In his 20s he trained in hospitality, completing an apprenticeship in all aspects of the industry, with a focus on catering. After doing compulsory military service, he took off overseas, working in Germany, South Africa, Namibia, and other parts of the globe.

"From there, it snowballed and I went from job to job through word of mouth," he says. "In the hotel industry over there, you do a season and then you move on to another place, then another, so you get quite a lot of travel time and experience and you see a lot of places."

Travel broadened Peter's horizons; he loved seeing new places and meeting people: "You learn a lot, and probably my narrow-mindedness suddenly opened up. You meet different people, you meet different cultures, and suddenly you get more tolerant of what is not your own."

Peter arrived in New Zealand aged 24 and walked into a job at the THC hotel company in Auckland and, later, at Dominion Breweries.

As a chef, and someone who appreciates good-quality products, he relished Kiwi seafood: Bluff oysters, Coromandel scallops, and orange roughy — all more plentiful in the 1980s.

A natural problem-solver with extensive experience in catering, he went into trouble-shooting for restaurants — not Gordon Ramsay style — travelling frequently to Australia.

"I tried to straighten them out, see what they were doing wrong, and, if I could, increase the profit," he explains. "It was really frustrating, really amazing, and also really satisfying when you showed after a month that it did work."

Always interested in working with his hands, Peter left catering for a less stressful job, building a business making smallgoods, such as European-style sausages and salamis, and curing various kinds of hams, such as prosciutto — all made the traditional way, without chemical additives. Hence the smoke-house, where he will continue doing this on a smaller scale.

This led him to work overseas in places such as Southeast Asia, where he made smallgoods from local meat.

Over the years, Peter has refurbished various houses that the family has lived in and has cycled twice across Europe with wife Leigh. They started in Paris, and, doing 100km a day, biked along rivers such as the Marne, Rhine, Danube, and smaller tributaries, finishing in Vienna.

Wanganui Turners and Woodcraft Group

Wanganui Turners and Woodcraft Group started out as a carving club in the mid '70s, initiated by Austin Brasell from Sovereign Woodworkers. The group meets from 7.30pm until 10pm on the first, second, and last Tuesdays of the month at City College, St Hill Street, Whanganui.

Skilled at all kinds of woodcraft, such as wood-turning, fretwork, intarsia, and carving, the members, who are a diverse bunch of men and a few women, welcome newcomers and will teach people from beginners onwards whatever they want to learn.

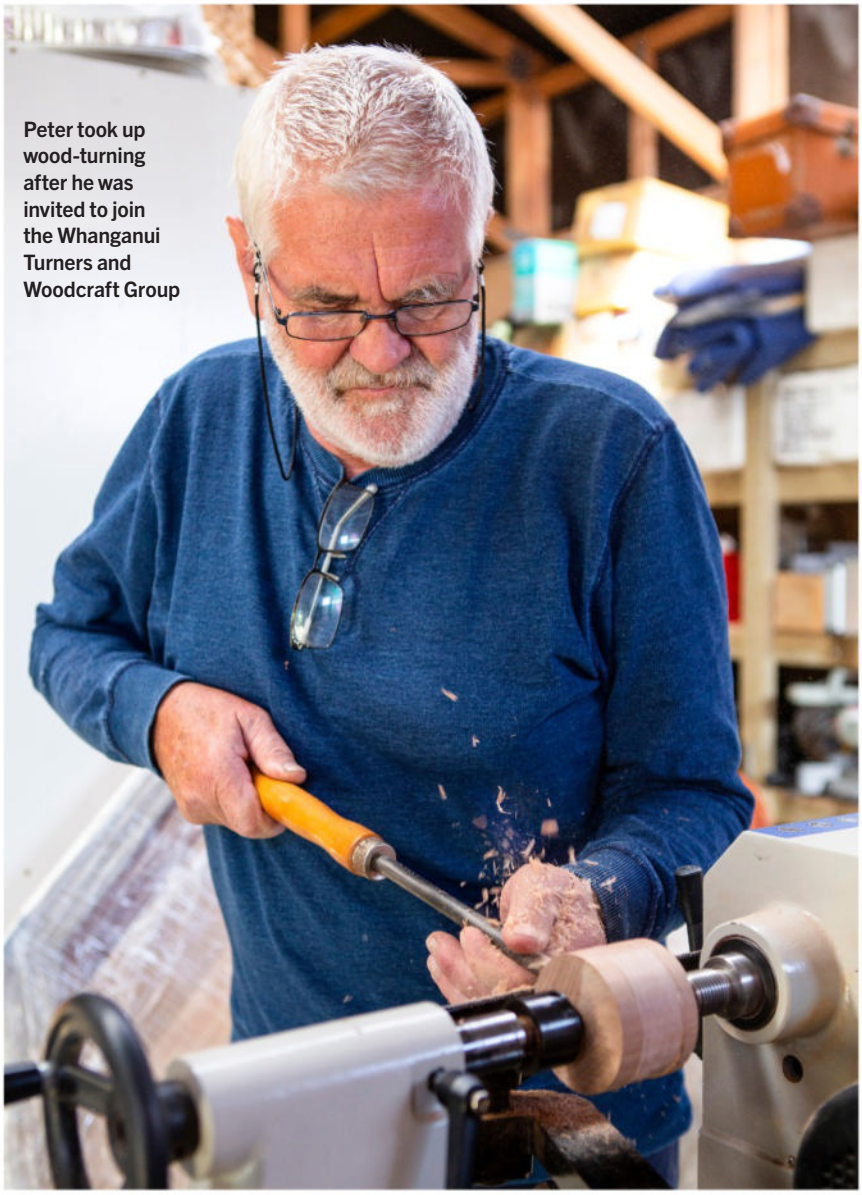
The group has a stall at the Whanganui River Markets every Saturday morning. Items for sale include rolling pins; knives with wooden handles; bread, cheese, and chopping boards; spoons; goblets; ornaments; and children's wooden toys.

"The market was something we decided to do to attract more members, which it has done," says Des Kendrick.

Des, and Bill Rod, who both joined in the 1980s, are now lifetime members of the club.

In 2021, as a potential contribution to the Whanganui Walls art project, the group made a scaled-up model of a giant wētā. The 2.8-metre-long wētā is made of donated macrocarpa and driftwood; the real leaves encased in resin at the bottom of the wētā will appear forever fresh. The wētā is on display in the Whanganui iSite information centre on Taupo Quay.

For more information about the Wanganui Turners and Woodcraft Group, go to facebook.com/WanganuiWoodcraft/.



Peter took up wood-turning after he was invited to join the Whanganui Turners and Woodcraft Group

the members, were displayed at the group's exhibition, *Wood as Art*, in Whanganui last year.

Peter is largely self-taught but also received mentoring from members, in particular Des, whose large model of Whanganui's Durie Hill Memorial Tower was admired by Prince Harry in March 2019.

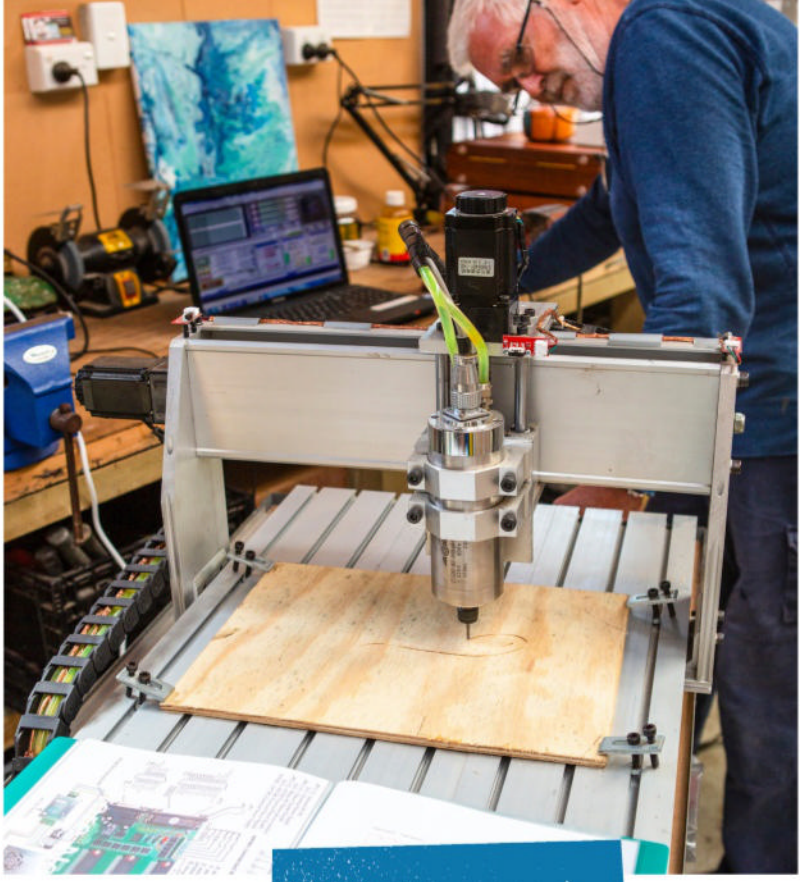
Machines and tools

Peter's shed is a sizeable garage and was one of the reasons for buying the property three years ago. Along a wall, well-stocked shelves with boxes of equipment and materials organised and labelled overlook the space where machines vie for room with timber, cabinets, the Moonshine Express, and ▶

Members of the Wanganui Turners and Woodcraft Group with the 2.8m, scaled-up model of a giant wētā that they made, on show at the Whanganui iSite

Peter's shed is a sizeable garage and was one of the reasons for buying the property three years ago

Peter has a Mach 3 operating system for the CNC machine and Lightburn for the laser, and uses Ez-Cam design software as well as Inkscape and Gimp software



various projects Peter has under way.

He has a lathe, of course, and many essential wood-turning tools, such as chisels; spindle gouges; scrapers; skew chisels; and boring, hollowing, parting, and detailing tools. Add to that a drill press, a band saw, a belt and disc sander, a thicknesser, a scroll saw — the works.

Peter sends programs from his laptop to his CNC machine and laser engraver and cutter (Two Trees), and, while he vacuums up the wood shavings, it carries out tasks such as engraving the name 'Ford' with a drill for his cars or a 'TGIF' on a wooden briefcase that he has made.

He has a Mach 3 operating system for the CNC machine and Lightburn for the laser, and uses Ez-Cam design software as well as Inkscape and Gimp software, which are free. He can program the depth to which the drill goes. ▶

Peter sends programs from his laptop to his CNC machine and laser engraver and cutter

You could say Peter has 'the works' when it comes to woodworking tools

Peter also undertakes decorative intarsia work, using ready-made designs on contrasting timbers

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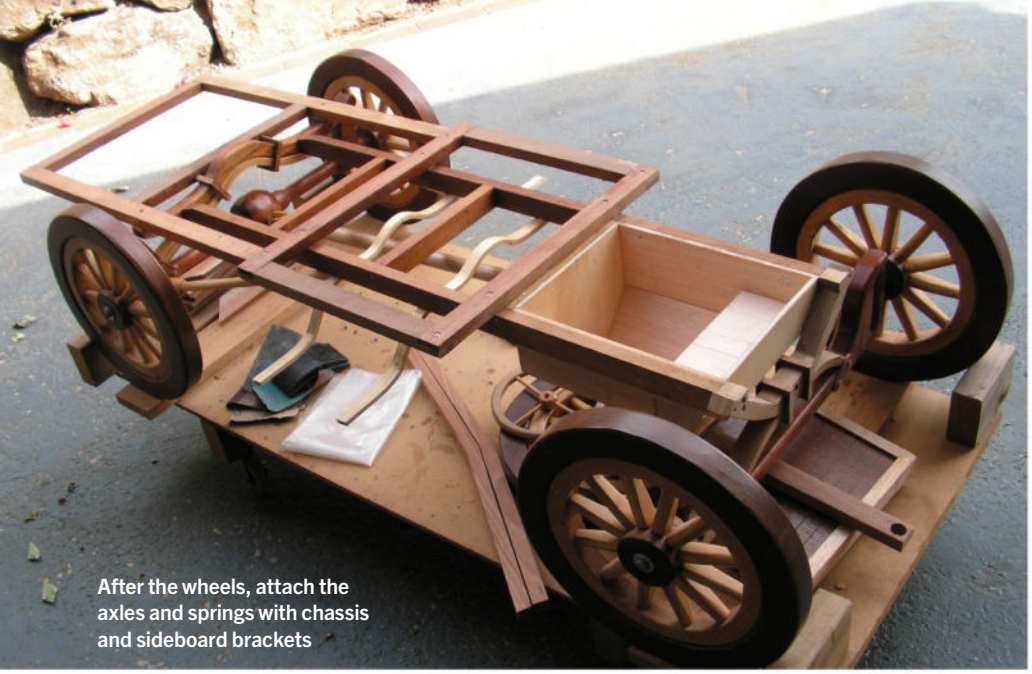
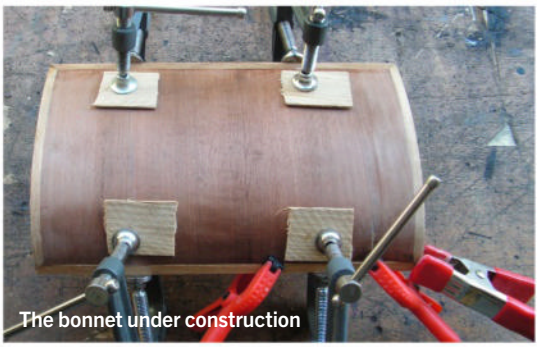


After the wheels, attach the axles and springs with chassis and sideboard brackets

The back gate of Moonshine Express



The bonnet under construction

The model trucks have different bonnets, either edged or rounded, as they vary according to the year of manufacture of the original vehicle

Moonshine Express

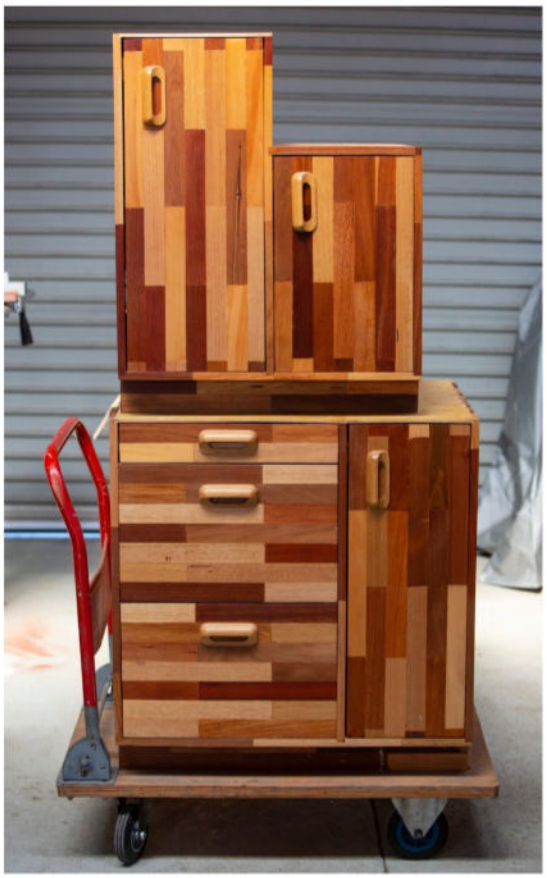
"My wife said, 'No more furniture; why don't you make a car bar instead?' So I bought a die-cast Model T from eBay and thought I'd make vehicle furniture instead," Peter says.

The little model stimulated a search on the internet, where Peter found plans from which he made the three different Model Ts. We will focus here on the Moonshine Express.

Peter downloaded the designs and used them to create his own version, which he downsized into scale models, half the size of the steel original. For example, the trucks have different bonnets, either edged or rounded, as they vary according to the year of manufacture of the original vehicle. Peter has made a trunk in the back to hold the booze. ▶

Roof-structure detail

This page: Peter turns pens and bowls and also turns his creative hand to intarsia (the eagle head) and furniture



A man of many parts

Peter turns out ballpoint pens, fashioning the barrels on his lathe; bowls, such as the one pictured, made from yew and resin; and has just completed a kauri whisky bottle for a friend.

He also does decorative intarsia work, using ready-made designs on contrasting timbers. Intarsia images are mosaics of wood, fitted and glued into a wooden support. He glues the design onto the wood and cuts it out with a scroll saw, using the grain of the wood to match the look of the image — for example, the eagle feathers of a design that Des gave him (see photograph).

The scroll saw is made for cutting intricate designs and tight curves; a platform on which to rest the wood allows greater control while cutting. A jigsaw may also do the job; however, it is not able to make cuts as finely as a scroll saw does.

Each piece is then smoothed and rounded with a belt sander. The rounded shaping of the individual pieces gives the image a three-dimensional look.

One of Peter's favourite woods to work with is yew. It is a tight-grained softwood that is also hard, strong, and flexible.

Peter has also made a Mexican-style patterned sheepskin rug, cutting and sewing 2891 squares, each 5x5cm, in natural white, black, and brown skins.

Not wanting to pay a technician to trouble-shoot, Peter started fixing business computers while managing a business. He has built "a few computers", using his know-how as a Microsoft Certified System Engineer (MCSE).

Living in Queensland at the time, Peter studied for the MCSE at home. In 2001, he went to Brisbane, where he sat and passed a dozen or so timed exams in which a pass of 96 per cent was required.

He has built trailers for himself and his friends; trolleys for catering; and cars from scratch, including the engines, doing research on the internet and reading books — but he says that the actual doing of it is the best lesson.

Making the front mudguards by gluing five sheets of veneer over a mould and clamping until dry and solid

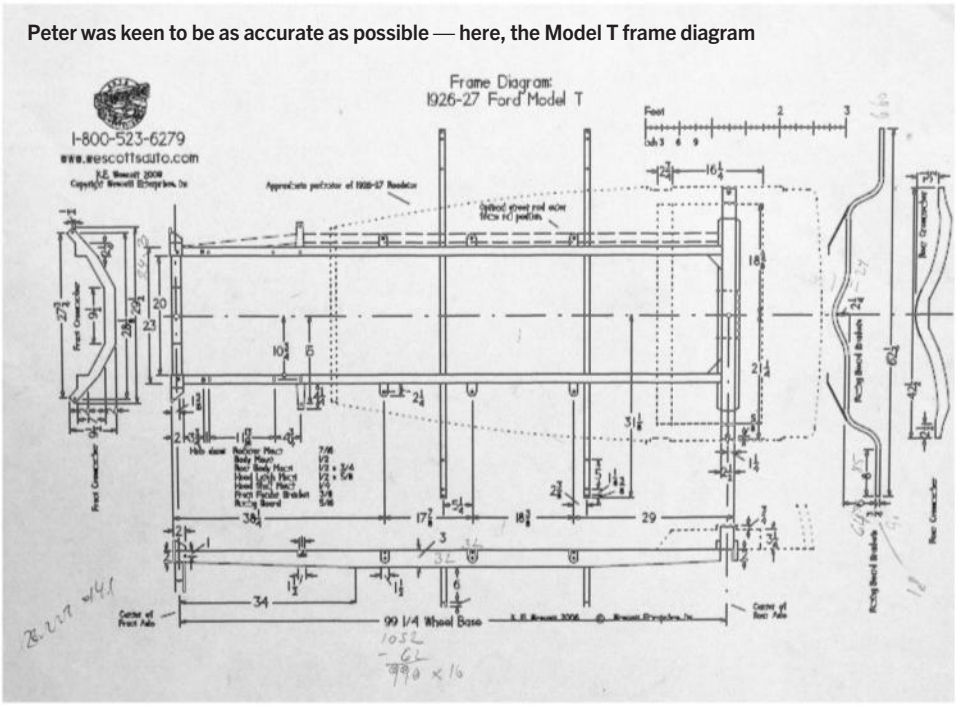
Building the firewall

Construction of tray number two

Once he had done the maths — converting the US imperial to metric — Peter drew the various parts of the truck to scale: chassis; axles; wheels (hubs, spokes, rims, tyres); suspension with leaf springs, which he had to modify; body and cabin (hood, firewall, windows, windscreen that opens just like the original, door); and so on (see diagrams with the measurements).

"I started to construct the chassis, and from there [continued] on and on and on, with a lot of thinking and ideas and research into 'how to' on the internet," he says.

Peter was keen to be as accurate as possible — here, the Model T frame diagram



Templates and timber

Peter made templates for the flat pieces, drawing the pattern on the pieces of wood before cutting, and moulds from cheap pine and plywood for curving items such as the running board, bonnet, and suspension leaf springs. He chose different timbers — mainly offcut hardwoods such as jarrah, rimu, birch, ash, and gum — for colour, added interest, and solidity. For the rounded shapes, such as the bonnet, he chose dark wood edged with a lighter shade, and for running board and mudguards he used veneer, sourced from a supplier in Whanganui.

In each front mudguard there are five sheets of veneer, the top layer matched and chosen for its decorative patterning, then formed and glued together over a mould and clamped until dry and solid.

Not a lot of metal

Peter turned the steering parts of the front axle — the steering knuckle and hub, and the tie-rod connection to the hub — on his lathe. He also turned the back axle with the differential in the middle.

"The suspension was built to suit the wooden model, and made as necessary a bit longer so it could be cut accurately for a good fit," he says.

The leaf spring required a curved mould, over which Peter layered strips of veneer.

To construct the firewall, he made panels in graduated sizes to slope down from the car body and cabin to the engine. There is very little metal in the trucks — no nails, just some hinges and a few screws — as Peter has used Aquadhere Exterior or Titebond Ultimate wood glue as the main connecting element. ▶

Front window frame with side panels. As glue is a major construction material, so too are clamps

There is very little metal in the trucks — no nails, just some hinges and a few screws

The internet was a rich source of designs and plans

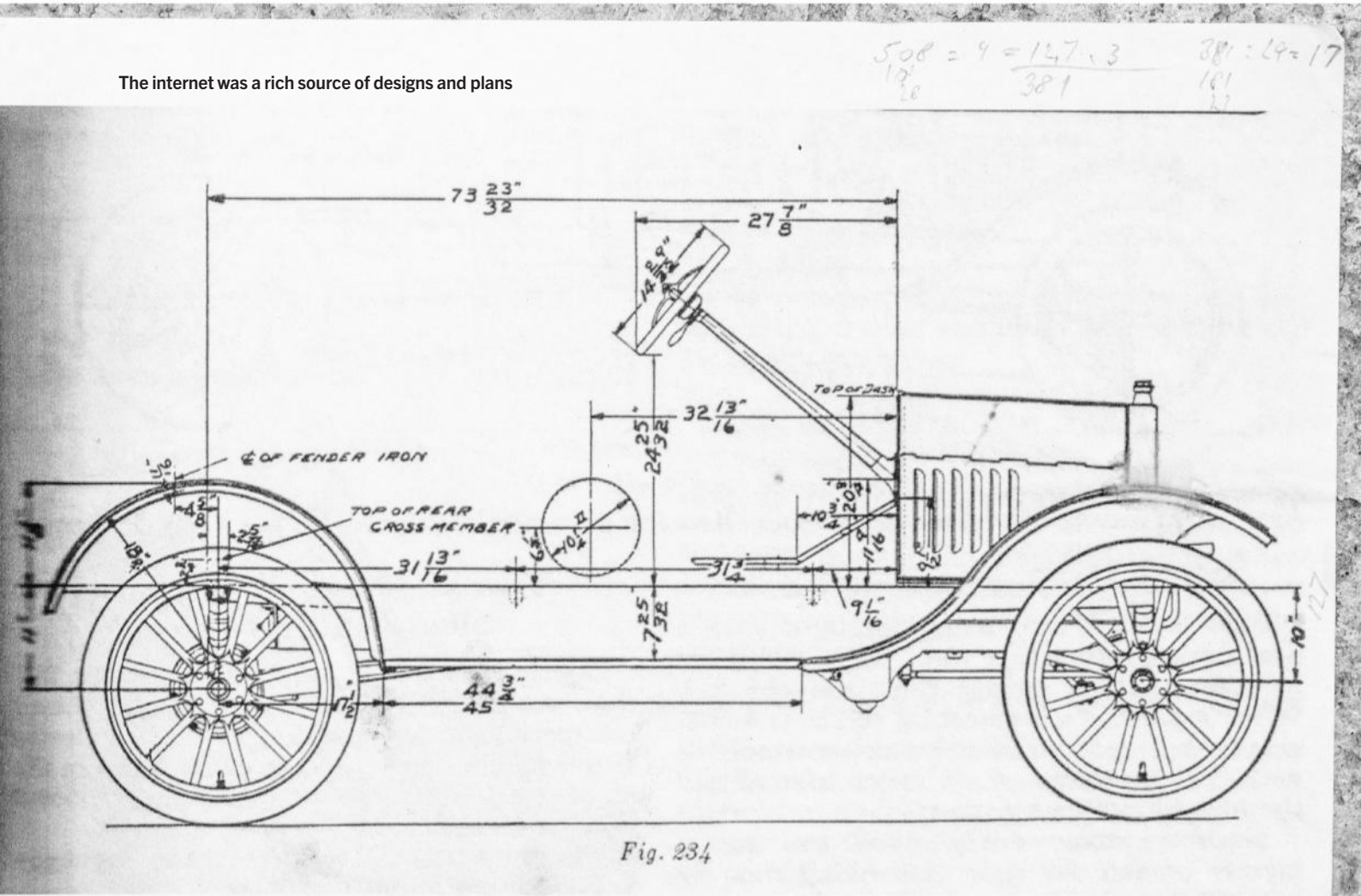


Fig. 234

Fitting the spokes into holes drilled in the hub

The wheels

After building the chassis, Peter really got the project rolling.

"I started making four wheels, first by turning the spokes — they're made like wagon wheels," he says.

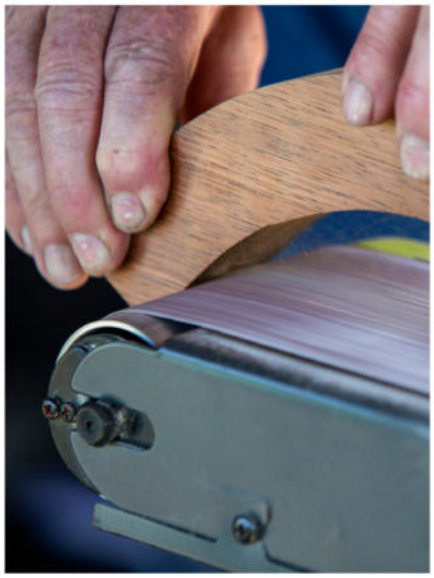
The 12 spokes are made from eucalyptus and were shaped on the lathe, as was the rimu hub.

Peter started by drawing a wheel to size on a piece of ply, with the 12 spokes, rims, and tyres, which he intended to make in a different-coloured wood: jarrah.

The following is a rough step-by-step guide.

Note: All parts need to be sanded before assembly.

1. Make the hub by turning a piece of timber on the lathe; place it in the centre of the wheel plan and draw where the spokes will go.
2. Make a curved jig for the hub, and drill the holes ready for the spokes.
3. Make templates for the rims — six curved pieces that go around the wheel and into which the spokes are inserted.
4. Make a metal jig/template for drilling spoke holes in the rims.
5. Drill holes in the rims, into which the spokes will fit.
6. Fit the spokes into the holes drilled in the hub.
7. Make the six outside tyres out of wood. ▶



Peter upholstered the seat with leather

The hubs are turned on the lathe

8. Begin to assemble the wheel components.
9. Fit the spokes into the hubs.
10. Fit the rim parts onto the spokes — the rims need to be trimmed to the right size during assembly to ensure a tight fit.
11. Fit the six tyres — trimmed to the correct size — to the outside — "On a real wheel," Peter explains, "that would be the tyre; on old-fashioned cartwheels, it would be the metal ring on the outside."

Peter covered the Moonshine Express with oilskin. He made the cabin upholstery with leather, and he finished the truck with varnish.

A Harley?

Designing and making the Model T Fords was a very detailed project — a manual's worth. Peter took nine months to build each truck, using time after work, at weekends, and during holidays. There are now enough Model Ts in the house and shed, so Peter is currently working on intarsia projects, smaller models, and wood-turning, laser, and CNC projects.

"My dream would be to build a vintage Harley-Davidson, but plans are very hard to come by. Maybe somebody can help?" he says.

Putting out a call to all sheddies! Please email Peter if you have plans for a vintage Harley-Davidson: loidlp@hotmail.com.

Outstanding finish on the truck's tray

After nine months, Moonshine Express was finished

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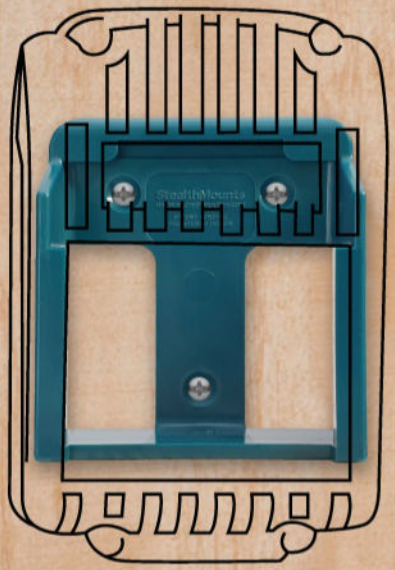

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MEANZ CONVENTION

CANMOD 2022 may have been delayed for a year, but the impressive displays more than made up for the wait

By Ritchie Wilson Photographs: Ritchie Wilson

The National Convention of the Model Engineering Association of New Zealand (MEANZ), known this year as 'CANMOD 2022', was run at two Christchurch venues between 5 and 11 January 2023.

Powerful vehicles towing immaculate custom trailers set out from many parts of New Zealand to deliver more than 80 model locomotives, overwhelmingly steam powered, first to the Halswell base of the Canterbury Society of Model and Experimental Engineers (CSMEE) and then, five days later, to Christchurch Live Steamers (CLS) located in the Mcleans Island Recreation Reserve.

Some of the locomotives preparing to raise steam in the steaming bay. In the background, catching up: (from left) Dave Giles, Rob Wilson, and Don Ellis

All shapes and sizes

The locomotives ranged in size from small to impressively large; the largest weighed about half a ton. Even the tiniest was able to pull its driver and a couple of passengers around the track. Also present were model traction engines, a model Foden steam truck, and a display of small-scale model engines. CSMEE's large pond was used for boating activities.

While tropical cyclone Hale was pounding the north of the country with exceptional amounts of rain, CANMOD 2022 experienced mostly benign climatic conditions, especially on the fine Friday and Sunday, when clever publicity attracted thousands of passengers, who were pulled around the Christchurch club's 900m figure-eight-shaped track by the visiting locomotives.

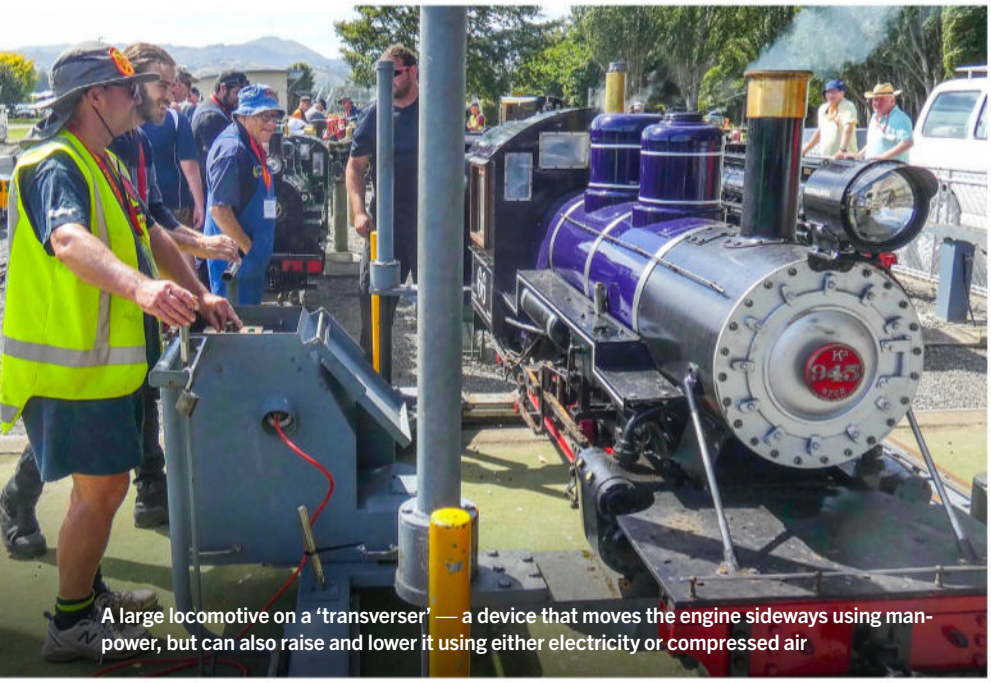
The smoke, the steam, and the crush of passengers were reminiscent of the golden age of steam trains in New Zealand. Indeed, many of the model locomotives were scale recreations of the locomotives of that era. The garb of some of the visiting drivers, hats especially, was also similar to that of the drivers and firemen of the old New Zealand Railways.

The locomotives ranged in size from small to impressively large

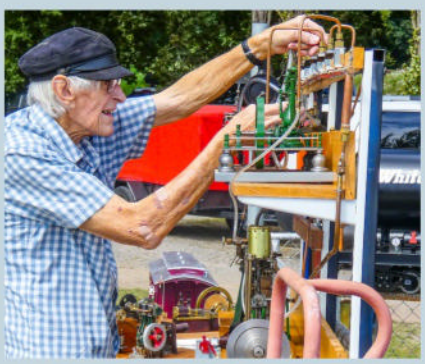
Precise planning

The CSMEE had made a very substantial investment in treasure, planning, and volunteer labour to prepare for the event. One of the club's transversers was substantially redesigned and rebuilt. This is a heavily built, manually operated, tracked trolley, which moves a locomotive, on a section of railway track, sideways, between parallel rail sidings. By using compressed air generated by a very large compressor — also new — the transverser can also raise the track section so that it is the same height as the various locomotive transporting rigs arriving at the convention, allowing a locomotive to be moved quickly from its road trailer to CSMEE's tracks.

In preparation for CANMOD, the Christchurch club had, over the past year, built an extra 15 ride-trolleys on which the visiting locomotives could pull passengers. Another major project, finished just in time for the convention, was a rugged turntable, able, as the name suggests, to turn a locomotive through 180 degrees, so that it points in the right direction. ▶



A large locomotive on a 'transverser' — a device that moves the engine sideways using man-power, but can also raise and lower it using either electricity or compressed air



CSMEE member Russell Gifford setting up a display of model stationary engines that power a variety of miniature devices

What is MEANZ?

MEANZ president, Christchurch's Rob Wilson, had this to say:

"MEANZ is the acronym for the Model Engineering Association of New Zealand Incorporated. It has 32 affiliated clubs, from Whangārei to Invercargill.

"The MEANZ executive comprises members of affiliated clubs who have been voted to the positions: president, vice-president, secretary/treasurer, NI [North Island] representative, and SI [South Island] representative.

"MEANZ was formed in 1999 to bring together all kindred incorporated model engineering clubs, providing a single point of contact with the government's regulatory bodies: the Ministry of Business, Innovation and Employment, and WorkSafe.

"MEANZ ensures that there are common rules and regulations that promote both safety and uniformity of standards for such things as rail/track gauges, wagons, brake systems, couplings, wheel machining tolerances, etc.

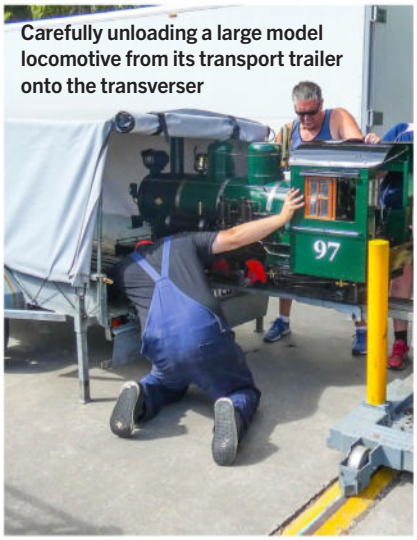
"Most importantly, clubs are required to be registered as an 'amusement device' with WorkSafe NZ and have a 'permit to operate' from their local territorial authority. A prerequisite for admittance to the Amusement Devices Register is passing the robust MEANZ safety audit on all aspects of their railway."

A model traction engine. These have the advantage that they don't require a track to run on. They can also — as in this case — power model farm equipment

The Christchurch club had built an extra 15 ride-trolleys on which the visiting locomotives could pull passengers

The public entraining at the CSMEE's station

Model of a Foden steam truck



Carefully unloading a large model locomotive from its transport trailer onto the transverser

Event planning ain't what it used to be

These are interesting times, and anyone who has tried to organise any sort of largish event recently will have stories to tell of how difficult it can be. For instance, it is traditional to have a large marquee at the convention to provide a place for model engineers to chat over a cup of tea, to house static displays, and to stage the conference dinner. At the end of two years of unpredictable

The Age of Steam didn't end because we ran out of steam

The model steam locomotives that attended CANMOD 2022 were mostly fired by coal. The organisers had a ban on the burning of smoky coal, and coal that burns virtually smoke-free was used, so that the effect on air quality — and the driver's eyes — was kept to a minimum. This type of coal, which has always been relatively expensive, is becoming increasingly difficult to source. The coal provided at CANMOD to the visiting engines came from three different mines, two in New Zealand and one in Wales. Historically, Welsh steaming coal has been highly regarded, but it is now a thing of the past, as the last mine producing coal in Wales has recently closed. Experiments to manufacture a green substitute to fire model — and full-sized — steam locomotives are urgently taking place in Britain.

The New Zealand mines providing the coal were the Giles Creek mine, on the South Island's West Coast, and the Takitimu Mine, which is near Nightcaps in Southland. The quality of different types of coal was a common topic of conversation at the convention.

Interestingly, one of the principal reasons for the shift in the 1960s from indigenous coal to imported diesel, to fuel New Zealand Railways locomotives, was a chronic shortage of coal, especially energy-rich, clean-burning coal.

A steam locomotive needs constant attention: steaming coal and water have to be continually replenished, and the oil can is regularly in action

disruptions, the cost of hiring one of these in Christchurch was found to be prohibitive. The organising committee bravely decided that keeping the cost of attending the convention to a minimum was more important than having a big tent. Uncertainties over staffing availability and food costs also meant that, understandably, very few caterers were prepared to quote for providing food at an event planned many months in the future.

CANMOD 2022 was originally scheduled to occur in January 2022, but the threat of cancellation because of probable changes to the Covid-19 pandemic's traffic-light settings caused it to be postponed to this year. Convention items had already been produced with the 'CANMOD 2022' logo printed on them so the decision was taken to retain the 2022 title for the 2023 event.

The MEANZ convention is a biennial event and the next one — to be held in the North Island — should take place next year.

Designer Dave Giles at the controls of a Shay locomotive built by a CSMEE member. Dave's design is based on a North American geared logging locomotive. He has personally built eight of these very large devices, each taking two years of 40-hour weeks

THE SHED ONLINE

What's happening online at the-shed.nz?

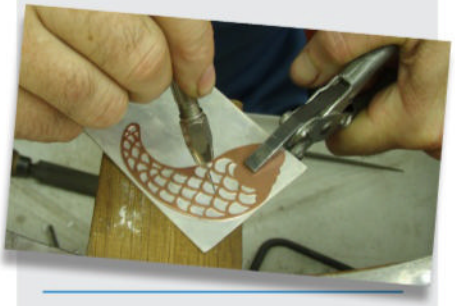
Every week, we upload new content onto The Shed *website to add to the hundreds of articles and videos already on the site for readers to discover, learn from, and enjoy. Some uploads of the past few months include:*

Make your own off-road vehicle

`https://the-shed.nz/this-offroader-project-is-a-beaut/`

Make a shubunkin fish pendant in silver and gold

`https://the-shed.nz/gold-fish/`

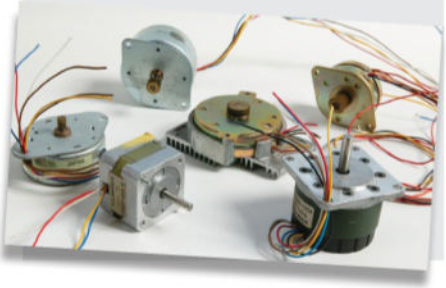


A look at the most common types of nuts

`https://the-shed.nz/assorted-nuts/`

Make great use of old printer motors

`https://the-shed.nz/rescue-those-versatile-stepper-motors/`



LETTER OF THE MONTH

NO EASY ACCESS TO THE SPINNING-WHEEL SHOP

There was a New Zealand manufacturer of spinning wheels — a Mr JW Graham of Ōkaihau. *The Shed* reader Robin Shepherd visited his workshop aged eight years old

Dear Sir,

My grandson has been buying a yearly subscription for me as a Christmas present for three years. I so enjoy receiving my copies of *The Shed*.

Issue No. 106 is again a treasure. I was fascinated to read Spinning, Spinning, Spinning. There were many spinning wheels in our extended family. My father and mother took turns in the evenings carding, teasing, and spinning. Mother later knitted the yarn into jerseys for us all.

On page 90 of this edition, mention is made of a wheel maker at Ōkaihau, Mr JW Graham. I can recall our family visiting him in 1943 or '44 to buy one of his wheels. As an eight-year-old boy I was not that interested in his workshop, but my parents were.

Off the grid

SPINNING, SPINNING, SPINNING ...

SOMETIMES A HAND-TOOL IS AN EXAMPLE OF PERFECTION, DOING EXACTLY WHAT IT WAS DESIGNED TO DO, WITH VERY LITTLE FINE-TUNING, FOR HUNDREDS OF YEARS

Words and photographs by Murray Grimwood

Hand spindles

She plucks wild-sheep wool from bushes, spinning it as she walks

Drop spindles

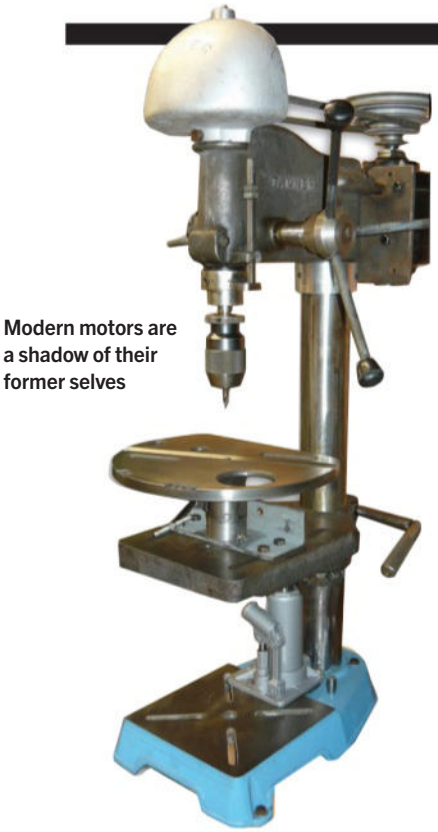
Wheels

I recall having to twiddle my thumbs for a while. Mr Graham gave me a wooden top to play with as I waited. No doubt he had turned it on his lathe. I was intrigued, however, by the mode of access to his property — via a caged flying fox across a ravine-like gully. This needed some skill. Passengers hauled on a rope, which ran through guides above one rail of the cage. Alternatively, one of the party could haul the cage up the final incline while standing in a terminus on either bank. I assume there was an endless rope arrangement.

Mother still had the wheel when she died but sadly it has not survived in the family.

Keep up the great work; *The Shed* is a true gem.

Robin L Shepherd
Kaitaia



Modern motors are a shadow of their former selves

MOTORS AREN'T WHAT THEY USED TO BE

Hi Greg,

I was surprised to see my smiling, charismatic dial glancing back at me on page 32 of Issue No. 107.

I wrote *The Shed* article on restoring the Tanner drill press a considerable number of haircuts ago, so, accordingly, please feel free to pass my email onto Peter Hansen as I may have a spare motor for the drill press he has been given.

I guess any motor rewinder in Auckland may be able to help him as Auckland City is likely to be closer for him than Palmerston North.

However, in my opinion, modern motors are a shadow of their former selves and don't seem to last like the older English and American models.

Cheers and best regards,

Bryce Clifford

PS. I even made the May pin-up shot in the 2023 *The Shed* calendar!

LETTER OF THE MONTH PRIZE

Every issue, our Letter of the Month winner will receive a copy of *Best of* The Shed *1* & *2*. More top projects from 15 great years of *The Shed* magazine.

Letters should be emailed to editor@the-shed.nz, or posted to Editor, The Shed, *PO Box 46,020, Herne Bay, Auckland 1147.*

Darrell Christieson aka 'Hoon'

THE PASSING OF HOON

22 July 1969–13 January 2023

By Tom the car painter

The Waikato car fraternity lost a great happy-go-lucky character on 13 January.

I had worked with Hoon, a talented panel beater, on multiple occasions, on hot rods, classic cars, and restorations, and he was great to work and socialise with. His panel beating was excellent, and he loved a challenge; others would not have had the balls to take on some of these projects. He could make 'honey out of dog shit'. Hoon actually took on a lot of these complicated jobs just to help the owners out.

On one occasion, I jokingly complained that he could at least leave me some pinholes to fill and that priming his work was too easy. So, the next job I received from him was full of them — I learnt then not to take the piss as there were consequences!

Hoon was also a very clever bugger, who had crewed for V8 Touring Car teams. He usually had a good attitude to life — except for when those bloody Fords won at Bathurst, when he would be a bit upset with the ribbing he would get from his Ford-supporting mates for the next few weeks.

Hoon had green fingers, and was especially talented at growing special tomatoes that he loved sharing with friends and customers, relieving their stress and resulting in lots of smiles. One night, with a gathering of mates, I consumed too many tomatoes and had to face off with Hoon's dog, Eva, as to who was to be in charge of the couch. With a bit of growling and baring of teeth, I was able to share a small corner of the couch for a bit of a rest.

I hope that, wherever Hoon is now, tattoos, dog food — for his beloved dogs — and petrol are free; classic Holdens are cheap, all with 600-plus horsepower; and you can do as many smoky skids as you like without being busted by the clowns in blue.

Cheers, Hoon — we will all miss you very much, and wish all the very best to Baldrick and family. So sorry for your loss.

Air tools suit tyre shops perfectly

WHICH AIR COMPRESSOR?

When choosing an air compressor, you need to know the 'free air delivery'

By Hamish Brown

Selecting the correct air compressor for a particular job should be a relatively painless exercise. The right choice will provide you with a useful machine that can last for many years, provided you maintain it well.

However, far too often, choosing a compressor can come down to a random weighing up of price, cosmetic appearance, or misinformation about the compressor's specifications. In fact, the most important thing to consider is the air consumption of any tool to be used with the compressor.

The saying, 'You wouldn't buy a Mini to tow a boat', holds true. If the compressor is too small for the job, either the tool won't work or the tool will work below an acceptable level. It is also possible that the compressor will fail.

Factors to consider

The things you need to consider when buying an air compressor are the same as for any power tool. First, the quality and performance of the compressor will be dependent directly on the price. However, you also need to think about several other important factors.

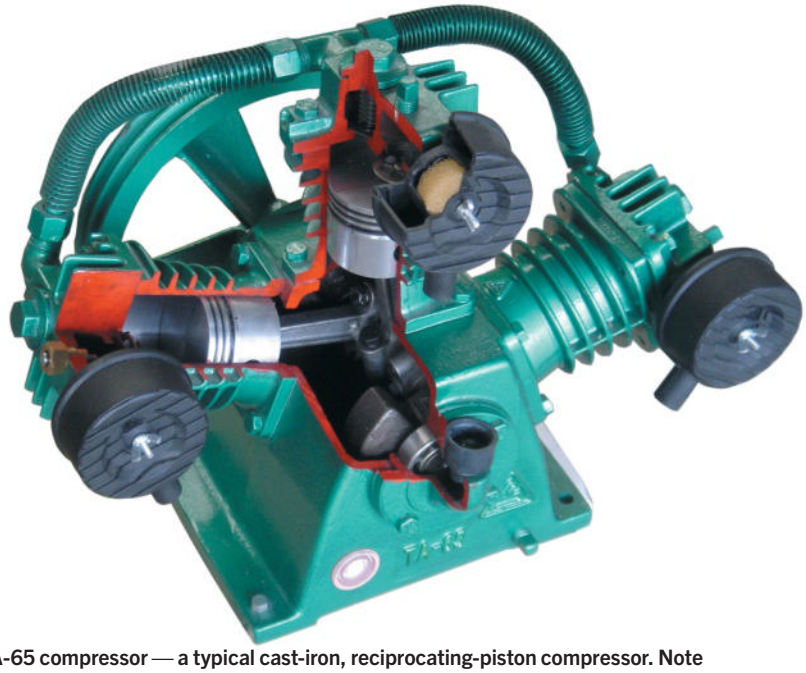
1. Choose a good retailer

When looking for a retailer, choose someone you have bought tools from previously and in who you have confidence. Buy from an outlet with a good reputation, where the staff have a working knowledge of the products they sell, and where future service can be assured and parts and accessories are available.

2. Check the air delivery

Most air-tool packaging will have the air consumption of the tool marked on the box. This is the minimum amount of air required to make the tool operate. When more than one tool is used at the same time, the air consumption of each tool must be added up to establish the total amount required. The rated output of the air compressor should exceed the air consumption required by the tool.

Most air compressors now state on the



A TA-65 compressor — a typical cast-iron, reciprocating-piston compressor. Note the three piston rings to ensure an airtight fit for the pistons. Cast iron effectively dissipates heat generated by compressing air

You need to select a compressor with an output to match the consumption of the tool

machine the 'FAD' or 'free air delivery' of the compressor in either cfm (cubic feet per minute) or L/m (litres per minute). This is the output. Marketers of air compressors who are members of the Compressed Air Association of Australasia (CAAA) have the FAD clearly marked on the compressor, either on the air receiver or on some other clearly visible part. An air compressor sold on the basis of horsepower, air displacement, air-receiver size, number of cylinders, or number of stages can be misleading, cause confusion, and lead to a wrong choice. The only true measure of a compressor's effectiveness is the FAD.

3. Calculate the duty cycle needed

You need to ask how often you will use the tool — not very often, frequently, or something in between? This will determine what kind of compressor you buy.

Matching consumption

For short jobs like using an air blow-gun to clean a workbench, you need to select a compressor with an output to match the consumption of the tool — note: some air blowguns can consume a lot of air.

For jobs of continuous duty such as spray painting, the output of the air compressor must exceed the air consumption of the tool by up to 100 per cent, depending on the type of compressor — whether heavy-duty and rated for continuous use, or less than heavy-duty.

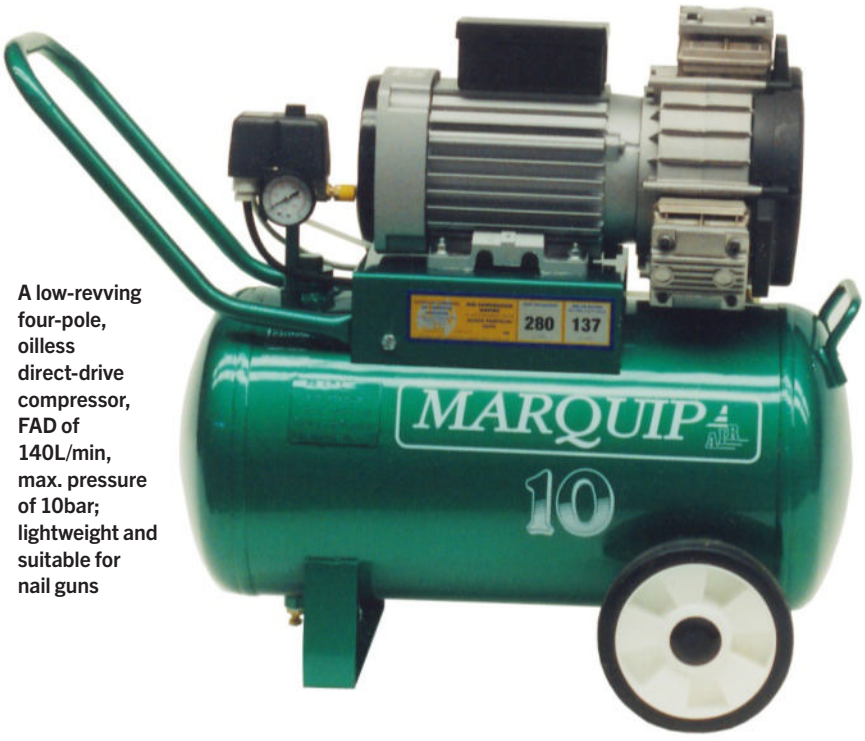
Tools used intermittently, such as an impact spanner, will have different air requirements. Ask yourself why you want the compressor: is it for DIY, or is it crucial to your trade or livelihood, where a larger output compressor should be selected?

Choosing a compressor is not as daunting as it seems, provided you know the air consumption required by the tool. If you intend to use a number of different tools, size the compressor to the requirements of the most demanding tool. If in doubt, seek advice from a reputable dealer.

So far, we have kept numbers out of the equation and not even referred to what makes up a compressor. Provided you get correct advice about air consumption and output, you don't need to know the components of a compressor.

Power source

The most common sources of power are diesel, petrol, electric, or a power take off (PTO) generator. These all operate at different efficiencies, hence the unreliable method of assessing a compressor by its horsepower. Even with electric power alone, there can be some confusion, because some manufacturers quote output power while others quote input power. ▶



A low-revving four-pole, oilless direct-drive compressor, FAD of 140L/min, max. pressure of 10bar; lightweight and suitable for nail guns

A heavy-duty, belt-drive compressor with cast-iron pump, FAD of 280L/min; a large-capacity single-phase unit suitable for a wide range of air-tool and spray-gun applications

Compressors can vary greatly in their output, ranging anywhere from 20 per cent to 80 per cent efficiency

Electric power also requires care to ensure that the running amps of the compressor do not exceed the rating of the circuit. Machines of 3hp and up require a 15A power supply, while machines up to 2hp take 10A.

Many people have purchased a 15A compressor only to find the maximum rating of their circuit is 10A. This can be an issue with workshops when the distance from the main board causes a voltage drop in the circuit. Inadequate power can cause motor overload.

There is potential for the motor to burn out if there is no overload protection either built into the motor or as an add-on.

Drive system

Compressors can be either direct drive or belt drive. Direct-drive systems have the motor direct-coupled to the compressor pump. Historically, direct-drive units have been high revving, designed to operate at 2800rpm, and priced to suit the budget end of the market. New technology has permitted four-pole (1400rpm) direct-drive machines to run more quietly and efficiently than high-revving machines, and they are now suitable as a medium-duty machine for trade use. They can more easily sustain a higher pressure than the high-revving models, and can be on a par with more traditional belt-drive compressors.

Belt-drive compressors are generally quieter and more efficient than direct-drive machines.

You can also choose drive pulleys to enable the compressor pump to run at lower speeds.

Compressor pumps

Different types of compressor pumps include screw, piston, diaphragm, and rotary vane. Here, we will limit the discussion to reciprocating piston–type pumps — the most common type on portable machines.

These pumps can be either cast iron or aluminium. Cast-iron pumps usually operate at lower speeds and are more efficient; aluminium pumps are lighter. Piston pumps may have up to three cylinders, and the design of valves, rings, and other components all affects pump efficiency.

Compressors can vary greatly in their output, ranging anywhere from 20 per cent to 80 per cent efficiency — ratio from FAD divided by displacement. In the case of small fast-running direct-drive units, valve leakage and losses from around the piston can be higher than 50 per cent, meaning that the FAD is half the displacement. ▶

An air-powered ratchet spanner is designed to operate in areas with limited/narrow space. Air-powered ratchet spanners are usually equipped with a built-in power regulator that allows the user to control speed and power level

Air-powered reciprocating saw

Air tools can make a surprising difference

No serious workshop should be without its complement of air tools. No matter what your craft or work, there is an air tool that will make your hard labour easier and faster. The versatility and sheer scope of the range of air tools are staggering — there are few jobs that they cannot do, and quite a few they do better than their electric-powered equivalents.

Air tools in general are lighter — they don't have to contain a motor — smaller, and usually have more torque and a higher rpm than their electric-powered cousins. They can be used safely whenever you are working near water and solvents. This makes them a favourite with panel beaters, spray painters, and dentists, whose modern drills are powered by compressed air.

Air tools can't be overloaded to burnout. If a machine stalls due to overloading, the air simply exits through the exhaust valve.

As well as these advantages, all they require is the odd drop of oil to keep the rotating surfaces lubricated.

There is little to go wrong in a well-made air tool. Most of the cost in the machine is in the quality of the bearings and the turbines in the tool itself. With so much compressed air rushing through the tool, they can get a little cool to the touch after prolonged use, although there is a trend now to making tools with composite materials that eliminates much of this problem. The need for a compressor and a hose tends to even the playing field with electric power tools a little, but no more so than the need for a power cord.

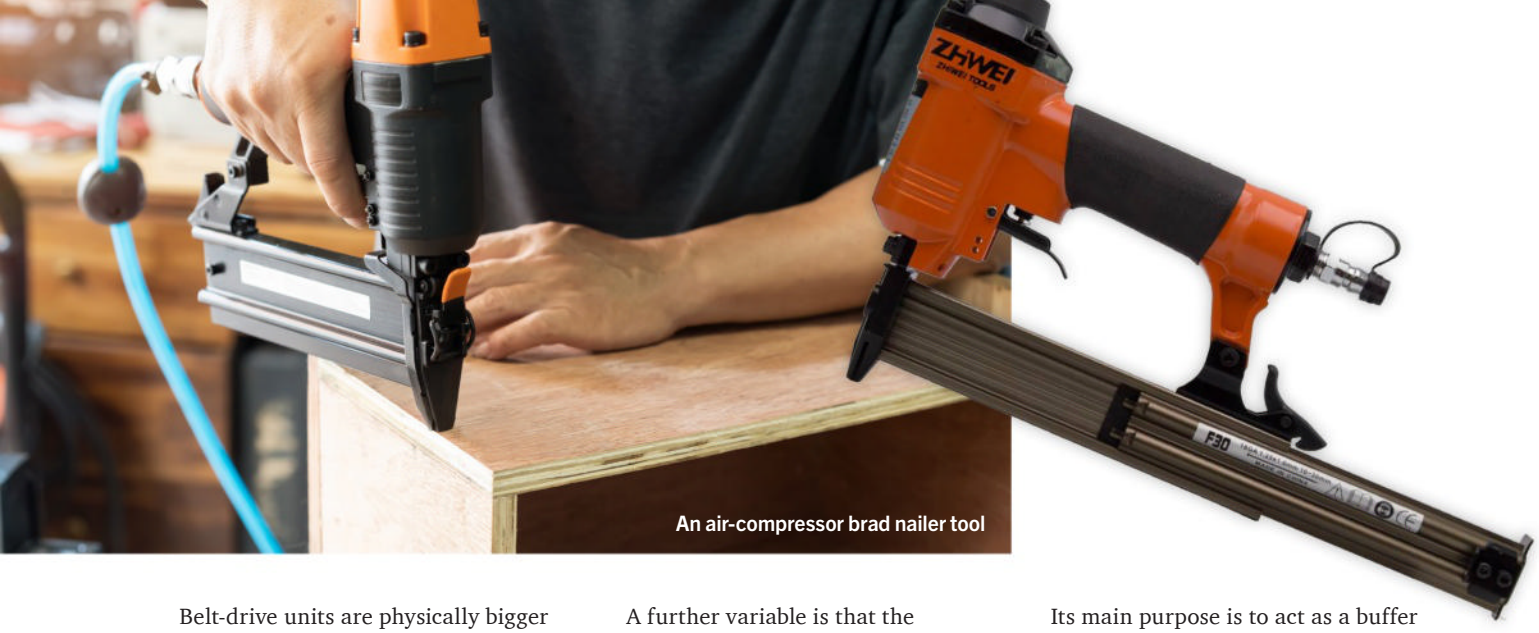
Panel beaters

Air tools suit panel beaters and metal fabricators perfectly. There are many tools intended to cut and shape metal, from grinders to saws, shears, and nibblers. The air impact spanner is familiar to anyone who has had his or her tyres replaced at a tyre retailer. That they are extremely effective is also well known to anyone who has had to undo wheel nuts manually to change a wheel when the nuts have been applied with an impact spanner.

However, this is just a small part of the galaxy of air-powered tools. They come in shapes and forms that are impossibly big, such as rock breakers, and extremely small, as in a spanner you can hold in the palm of your hand or the handpiece of a dentist's drill. There are grinders, polishers, orbital sanders, palm sanders, and belt sanders. The sanders can be used both wet and dry with no fear of shock.

For the wood worker, the different nailers, from framing guns for construction to fine brad-finish nailers and air-powered staplers, take much of the fatigue out of repetitive work. Air-powered brad nailers can save time, as they fix fine mouldings without splitting the timber, even in hardwood, and leave the brad below the surface ready for finishing. Air-powered drills are smaller and lighter and ideal for those repetitive jobs. As for the handy air duster — who couldn't use one to blow clean their equipment or work area?


Air tools are very compact



An air-compressor brad nailer tool

Belt-drive units are physically bigger and run at generally lower speeds than direct-drive units, so their efficiency is much higher — more like 75 per cent.

Two compressors side by side may look the same but provide totally different FAD; hence the importance of finding out the actual FAD of a compressor — irrespective of horsepower, air displacement, air-receiver size, etc.

A heavy-duty pump and motor are required when a compressor operates continuously in this manner

A further variable is that the compressor may be oil-lubricated or oilless. Oil-type pumps are more common. From a sump, an oil dipper disperses oil to lubricate the bearings and piston rings. Oil-type pumps are more efficient than oilless pumps because they suffer less compression loss and dissipate heat better. However, they require more maintenance, although this is largely limited to checking and occasionally changing the oil. Oilless pumps are more expensive.

Air receiver

The pump forces compressed air under pressure into the air receiver via a check valve, filling the receiver until it reaches maximum pressure. When air tools are used, compressed air is removed from the air receiver.

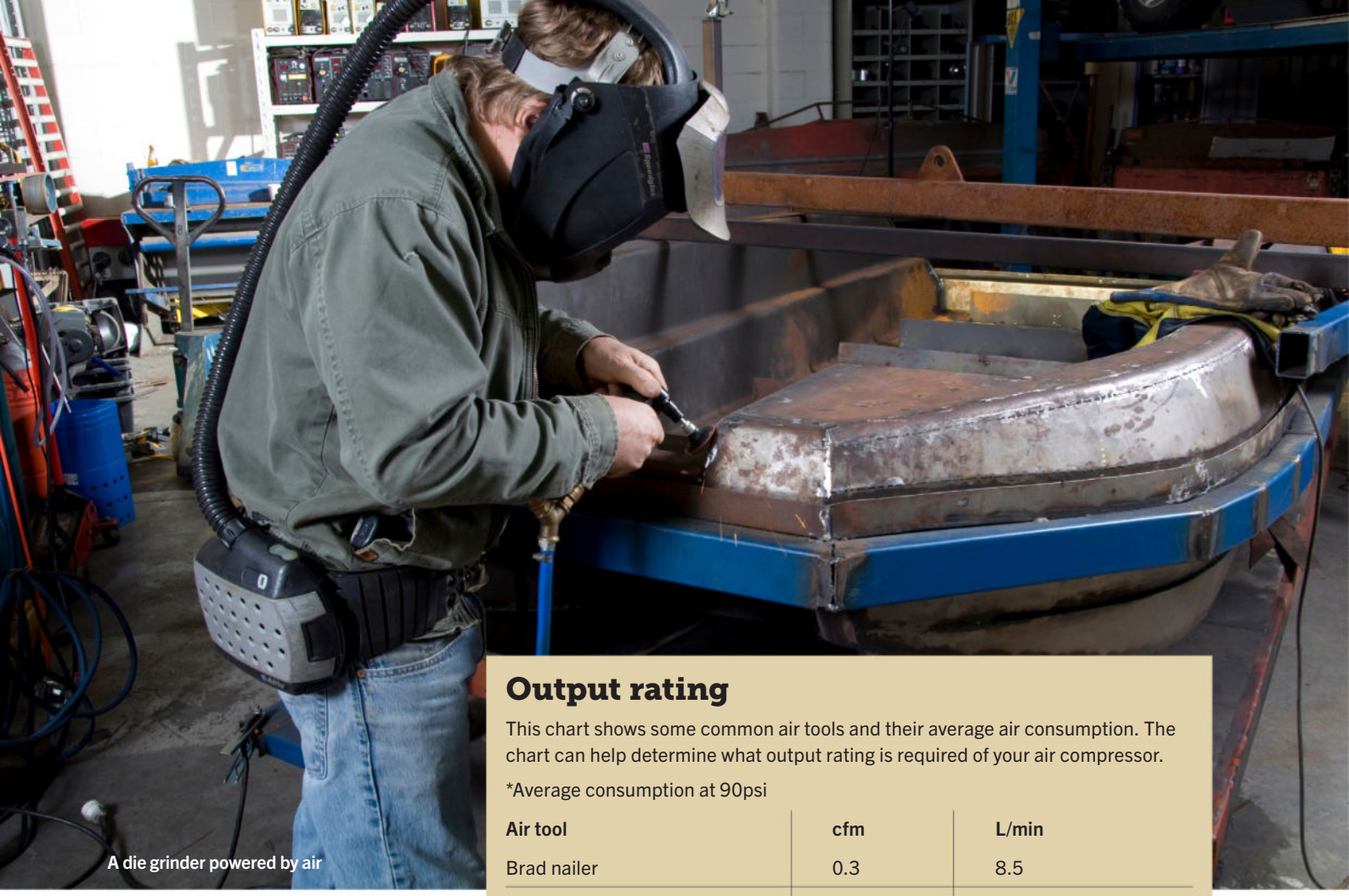
The air receiver serves two functions. Its main purpose is to act as a buffer and extend the time between on/off operations, which must not become too frequent. A large air receiver may be a benefit when a short blast of air is required for a specific duration or there is a desire to reduce background noise from frequent stops/starts.

The second purpose of an air receiver is to gather water. During the process of compressing air, water vapour condenses when it is cooled in the receiver. Air naturally contains a large amount of water vapour, and, particularly on humid days, a large amount of water can be deposited in the air receiver. This water should be drained from the air receiver regularly.

Cut-in, cut-out

Most electric compressors are fitted with a pressure switch. When the


Air-compressor paint sprayer



A die grinder powered by air

pressure in the air receiver goes below a preset level, the compressor commences pumping. It stops when a preset maximum pressure is reached. The difference between cut-in and cut-out pressure is termed the 'pressure differential'.

The number of times an air compressor switches on and off should not be excessive; otherwise, there is a risk the motor will burn out. Some compressors are fitted with a bypass to permit continuous operation. If there are a lot of stops/starts, these compressors can be switched to continuous run. A heavy-duty pump and motor are required when a compressor operates continuously in this manner. ▶

Using a compressed-air orbital sander

Output rating

This chart shows some common air tools and their average air consumption. The chart can help determine what output rating is required of your air compressor.

*Average consumption at 90psi

Air tool	cfm	L/min
Brad nailer	0.3	8.5
Framing nailer	2.2	62
Drill, reversible or straight-line	3–6	85–170
Mini die grinder	4–6	113–170
Angle disc grinder, seven-inch	5–8	142–226
Orbital sander	6–9	170–255
Rotational sander	8–12.5	226–354
Random orbit sander	11–13	310–368
Chisel/Hammer	3–11	85–310
Cut-off tool	4–10	113–283
Grease gun	4	113
Impact spanner, ⅜ inch	2.5–3.5	71–99
Impact spanner, ½ inch	4–5	113–142
Impact spanner, 1 inch	10	283
Needle scaler	8–16	226–453
Nibbler	4	113
Ratchet, ¼ inch	2.5–3.5	71–99
Ratchet, ⅜ inch	4.5–5	127–142
Shears	8–16	226–453
Speed saw	5	142

*The average cfm is typically based on a 25 per cent duty cycle — 15 seconds a minute. This is fine for intermittent-use tools, such as nail guns and drills or impact spanners. For tools requiring a continuous rating — for example, orbital sanders, grinders — multiply the 'average consumption' by four to approximate the continuous supply required. Remember that consumption can vary considerably with different brands and different-capacity machines.

Accessories

Air tools are connected to the air receiver by an air hose. If the hose is too long, pressure losses can occur before the air reaches the tool. But it is better to use a long hose than a long extension lead. If the pressure keeps dropping, it is necessary to increase the diameter of the hose.

Hose fittings may also be a source of lost performance by impeding flow and causing the pressure to drop. High-flow fittings can reduce losses and may be a worthwhile investment to overcome these problems.

A pressure regulator will be required at some point between the air-compressor outlet and the air-tool inlet. This maintains suitable pressure into the air tool for optimal operation. You will also have to have some form of filtration to remove impurities and the water not trapped in the air receiver.

Some tools also require lubrication to operate satisfactorily. Filters, regulators, and lubricators can be combined in one unit.

When even-better-quality air is required, an air dryer can be used to provide the high-quality air needed — for example, for perfect automotive paint finishes. Desiccant dryers can provide almost moisture-free air, which is necessary for air-supply lines for precision instruments.

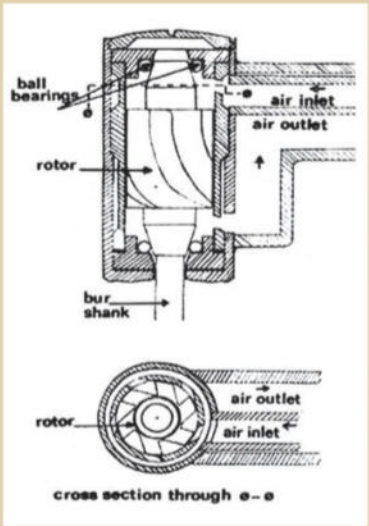
Dental drill

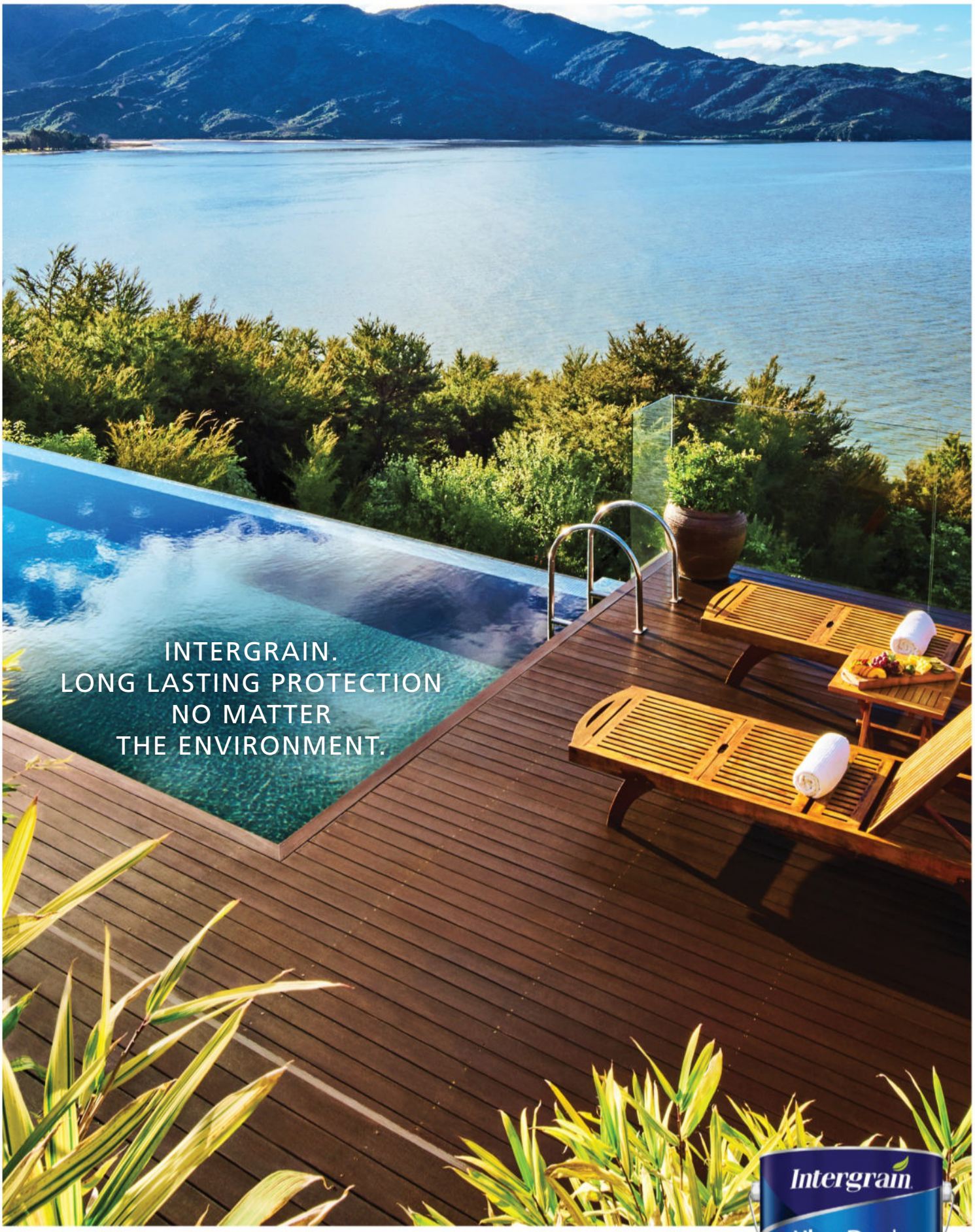
A New Zealander invented one of the world's most well-known air tools — one that revolutionised its profession: the air-turbine dentist's drill. Sir John Patrick Walsh, dean of the University of Otago School of Dentistry from 1946 to 1971, developed the air-turbine dental-drill handpiece with members of the staff of the Dominion Physical Laboratory in Wellington.

According to Wikipedia, the first application for a provisional patent for the handpiece driven by compressed air was granted in October 1949. The New Zealand patent number is No. 102433/104611. The final model is held by the Commonwealth Inventions Development Board in Canada.

The patent was granted on 27 November 1950 to Sir John, who had conceived the idea of the contra-angle air-turbine handpiece after he had used a small commercial-type air grinder as a straight handpiece. The *British Dental Journal* obituary noted that Sir John observed the relation between the frequency of vibration applied to teeth and pain perception. From this base, he sought to produce a rotary instrument with a frequency above the "discomfort level". The original air-turbine drill required 80L/min to reach a speed of 120,000rpm. Today, air-driven turbine dentist's drills can spin at more than 300,000rpm.

It's probably not surprising that in New Zealand Sir John found little initiative for the commercial development of the novel drill, and it was out of the US that the commercial version of Dr John Borden's Airotor hit the market in 1957. Melbourne-born Sir John Walsh, a sometime Dunedin city councillor, died in 2003 aged 92.





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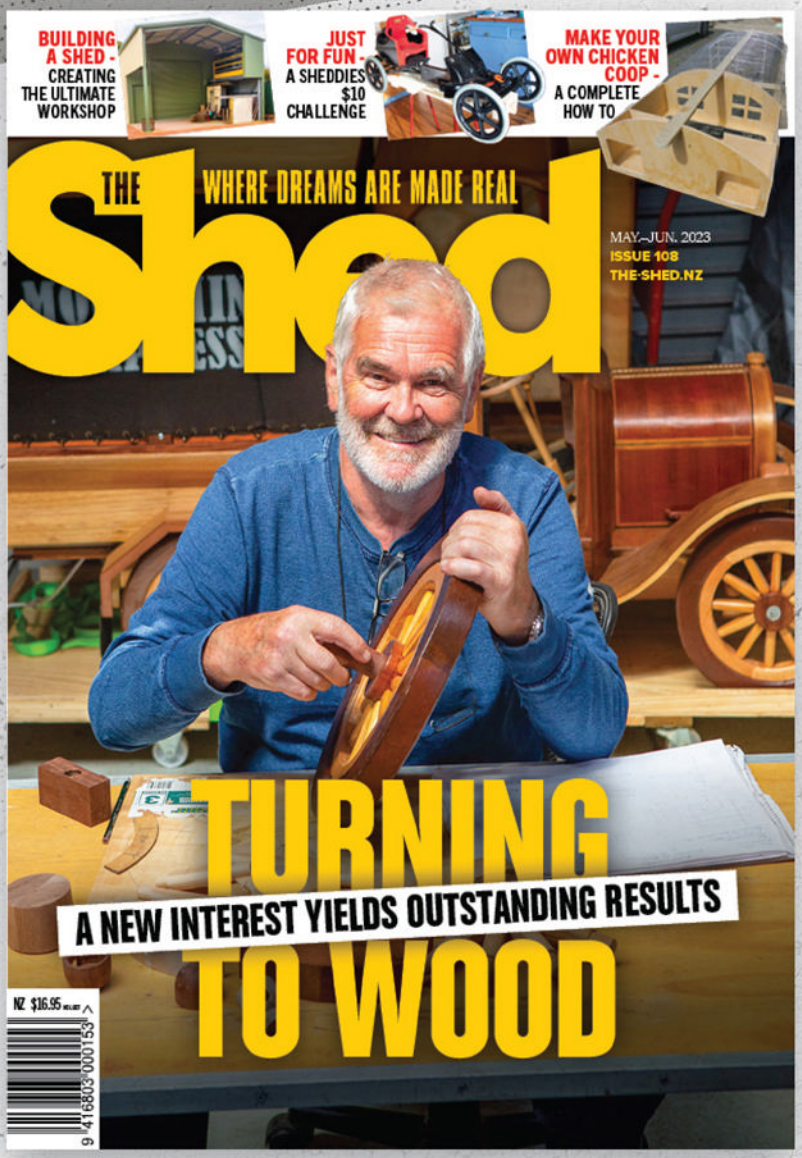
Above image features Intergrain UltraDeck at Split Apple Resort, New Zealand.



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BUILDING A BUDGET CHICKEN TRACTOR

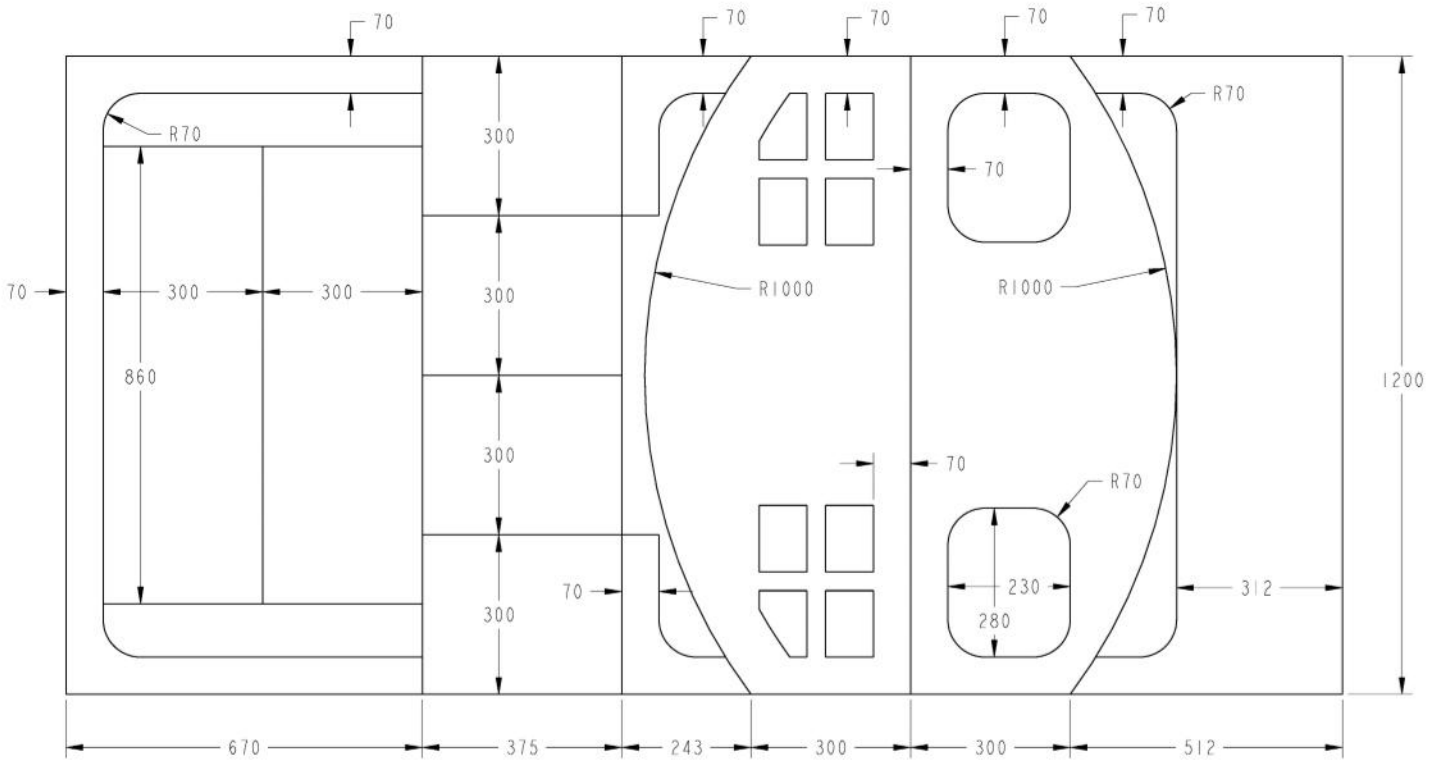
Taking on a new-build is a special challenge for someone with upcycling/recycling in the blood

By Murray Grimwood
Photographs: Murray Grimwood

I was all fired up to report on the tree-house I was planning for the grandkids, when Greg (*The Shed* editor) emailed asking about chicken coops. I thought about it for a while; we already have adequate housing for our two flocks, and a comet-trail of used coop-age scattered about. Plus, I'm more of an opportunistic upcycler than a new-builder. Then I realised this wasn't about me; besides, it might be an intellectual challenge. So, I set myself a task: design an urban-scale coop, and run, using common off-the-shelf materials, on as tight a budget as practicable.

Tractors — for chickens on the move

Chickens should be kept in tandem with a food garden. They are comfortably carnivorous, and will turn food scraps into fertiliser in short order. With a fixed-in-place coop, you are limited to scooping/scraping out the poop; how



The biggest chicken tractor I've been associated with; started from a Datsun ute and accommodating 50 birds

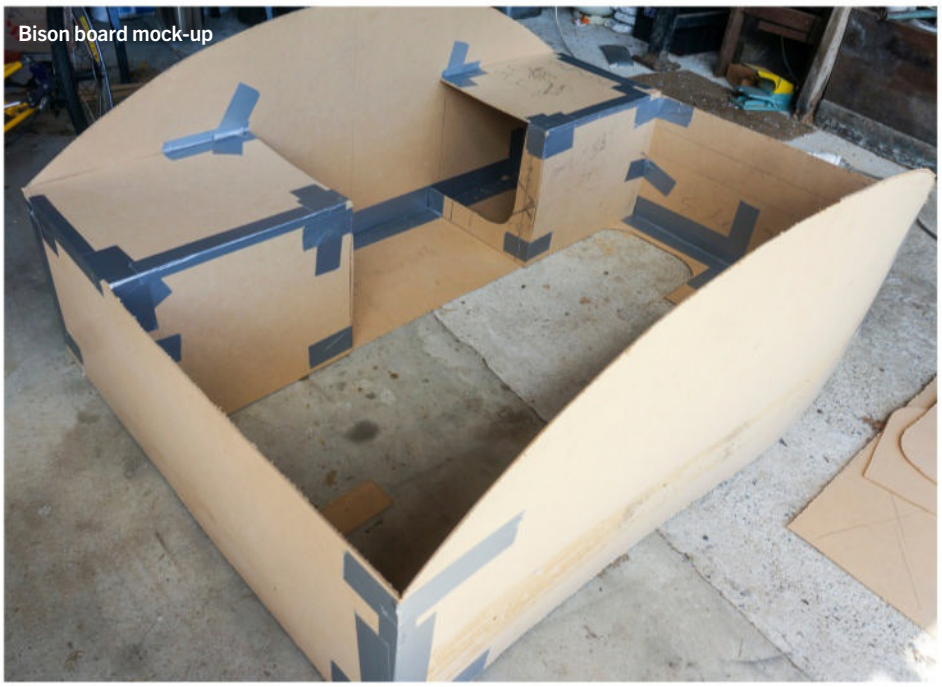
much better to let them drop it straight onto the soil, shift the coop, and plant behind them in rotation?

Movable coops are known as 'chicken tractors', and they come in all sizes. Our smallest is a mere 1300x500mm and is used when a hen goes broody, to separate her — and eventually the chicks — from the flock. The biggest one that I've been involved with was one we built with some people who had bought a run-down farm. They wanted to regenerate whole paddocks using 50 birds. We started with a Datsun 1600 flat-deck, stripping the cab and motor off. A fellow visitor welded an A-frame for towing. It was a lot of fun — but I digress.

Easy to move

The tractor proposed here won't need wheels or an A-frame; we'll just skid it around by hand. I tried to spend as little as possible on the new materials, and tried to use as much of what had been bought as I could. More framing would have meant more mesh; a bigger house would have required more plywood

So, I set myself a task: design an urban-scale coop, and run, using common off-the-shelf materials, on as tight a budget as practicable



Bison board mock-up

Nesting layout; not bad usage of a sheet of ply

$55 worth of virgin plywood succumbed to the jigsaw

and a longer sheet of iron. Many building materials have skyrocketed in cost, but there are things that haven't; waratahs are one such — cheap as chips, considering the energy and resources it must take to make one. I thought — because they last so long — that we could use them as our sledge runners, and as some of our framing. I initially based the whole concept on them but, as you'll see, I discarded that idea partway through the build.

Plywood — your choice

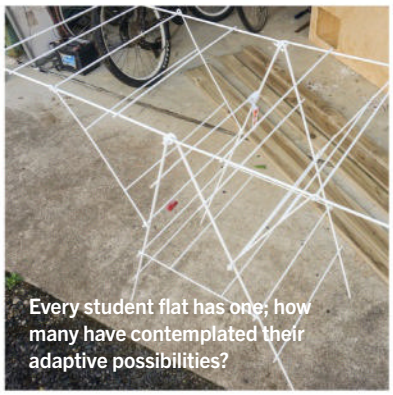
Plywood is amazing stuff. It is hard to buy less than a whole sheet. I plumped for a sheet of 12mm untreated, given that this was an experiment; thicker stuff would accept fastenings better, but be heavier and more expensive. Treated or untreated is entirely a personal choice.

Long-term rain protection is better done by steel than ply, so a 1.8m sheet of corry iron went on the list.

Beginning assembly

Nesting-box wall stepping over curve


Window template being transferred


Every student flat has one; how many have contemplated their adaptive possibilities?


Trying it out

Add 10mx900mm of square mesh or bird mesh — small-aperture stuff will keep small birds from getting at your expensive chook food. Add some screws — I used 100x15mm 8G, 100x32mm 8G, and a handful of 60mm treated-pine square-drive. Finally, some latches, a small amount of lacing wire — and a clothes-drying frame and a toilet seat; don't worry, it will all pan out.

Nesting

Getting the most out of a sheet of plywood, sometimes called 'nesting', is a process I enjoy. (Peruse any of Phil Bolger's boat plans to see nesting taken to an art form.) Nowadays, there are programs that do it for you — much less fun.

Rather than waste a sheet of ply in the development stage, I laid an old cover sheet — a thin sheet of Bison board — on the workshop floor, and started to sketch. Then to firm lines in; then to rub them out; then to pen them in again — you know how it goes. Eventually, I figured that I'd got it pretty right, fired up the jigsaw, and taped the pieces together. It looked good enough to go ahead and make a plywood version.

Then I had a cuppa with a mate who does CAD for a living. He was quite happy to draw it up properly, and even suggested getting it into a form that could be sent to a CNC router. These are skills I've never learned; but it opened up the idea of offering such a file for a small fee, if there was enough demand. I left it with him, and it came back differently, with a one-piece floor — which I'd abandoned for nesting reasons — and smaller nesting-box sizes because of his own nesting restrictions. It had some advantages, certainly for DIY-learner types; a one-piece floor is a good starting point. Interestingly, he'd found that the 300/500/300mm curves I'd drawn on the 1200mm width worked out to be exactly a 1m radius; how convenient is that!


Legs going on


Hand sawing still works

Oh bother

Applying his drawing to the ply, I realised that there was a best-of-both-worlds possibility. I could make the floor out of two pieces, and nest one curved piece hard into the crook of one of those floor pieces, with the other back to back, and place the nesting-box bits one, two, three, and four across the sheet. I made the call; $55 worth of virgin plywood succumbed to the jigsaw.

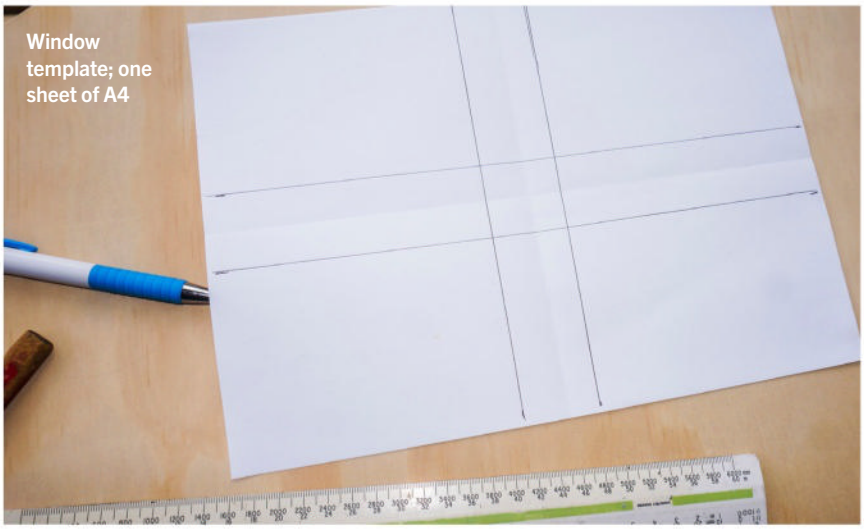
The downside of screwing thin plywood pieces together is that you can split the receiving panel. I did this once — *No worries*, I thought. *I won't do it again*; twice — "Bother," said Pooh, "I'd better drill from now on." I worked out the drill sizes to best handle my 32mm 8G screws — 4.5mm for the clearance hole, 2.5mm for the deeper receiving hole — and had no further bother.

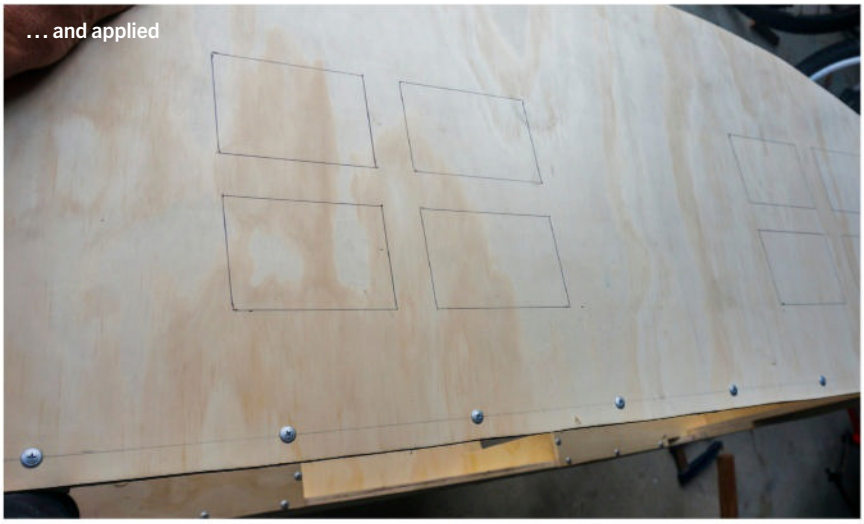
Fixing the floor

I started by screwing the nesting-box floor to the adjacent end wall; both are 1200mm long. Then I added both long sides, running them outside the 1200 width rather than flush, trying to make the run as wide as possible within a one-sheet-of-plywood budget. By the time I'd stacked each framing addition each

side this way, the width of the footprint had gone from 1200mm to 1310mm. Next, I offered up the other part of the floor — the square-cornered U-shaped piece — trimming its wings (bad chicken pun, sorry!) so that it fitted flush with the outer end of the side walls, and stopped next to where the nesting-box walls will be. I added the other curved wall, noting that this part of the floor is double-ply thickness, having been lapped over the nesting-box floor, sitting it up on offcuts of ply while the outer panels are screwed to it.

The nesting-box walls needed stepping over my radiused curve in the floor — somewhat klutzy, but I doubt the tenants will mind; without the radius it would be better looking but not so strong bracing-wise.


Window template; one sheet of A4


… and applied

An easy lay?

At this stage I had in mind that the other two 375x300 panels would be nesting-box lids, and that I'd use the bits jigsawed out of the back wall for the access doors. However, to make a perfect door using the piece that's been cut out requires not pre-drilling for the jigsaw. This means digging the blade in and through, with the tool firmly held, front down, on the work, and rotated down — and forward by feel — slowly. I did one good one, then one 'stabber', and decided that it isn't something to advocate. Let's stick to pre-drilling — which means we'll use those were-to-be nesting-box roof panels as access doors.

I'll try the boxes without roofs for a start, and we may be lucky. However, two things are likely: that the chickens will take to sleeping there, and that they'll poop there because they can stand up comfortably. I can't remember where we learned about putting a lid on nesting boxes to stop the pooping, but well remember working at an eco-lodge in the Marlborough Sounds a few years ago, where the chef wouldn't take the on-site eggs for poop-covered reasons — fair enough, from his perspective. We added lids — just flattened cardboard boxes — and, instantly, clean eggs. He still refused to accept them; perhaps the resentment had a philosophical angle as well. Anyway, if we have trouble of the pooped-egg kind, I will do height trials with cardboard lids — hens differ in height, just like people — then maybe use a bit of mesh offcut to fashion a permanent roof.


Notched for the top plank

The chef wouldn't take the on-site eggs for poop-covered reasons

Ready to knock?

I'm still friends with one of the presenters of *Play School* — windows: one, two, three, four — and the bland curved panel looked decidedly in need of that programme's legendary introductory treatment.

In the spirit of sheddie repeatability, I devised a cunning plan; take a sheet of A4; fold it in half, both ways. Open it out, lay a ruler along the folds, draw lines both sides of it, both ways. Use the outside of the A4 and the lines as your template. Simple. Later, though, I decided that, in the interests of panel strength, I might curve the upper/outer squares parallel with the roof profile. The windows will add to air circulation and let a bit more light in — and they do add a certain cuteness.

A perch, around 45mm wide and 50mm deep and offset — to give the hens one big fly-up space rather than two restricted ones — got screwed to the 'wings', to finish the woodwork part. Chickens prefer a flatter-topped perch of less than 50mm; parrot-type birds like a rounder profile; neither like it smooth.

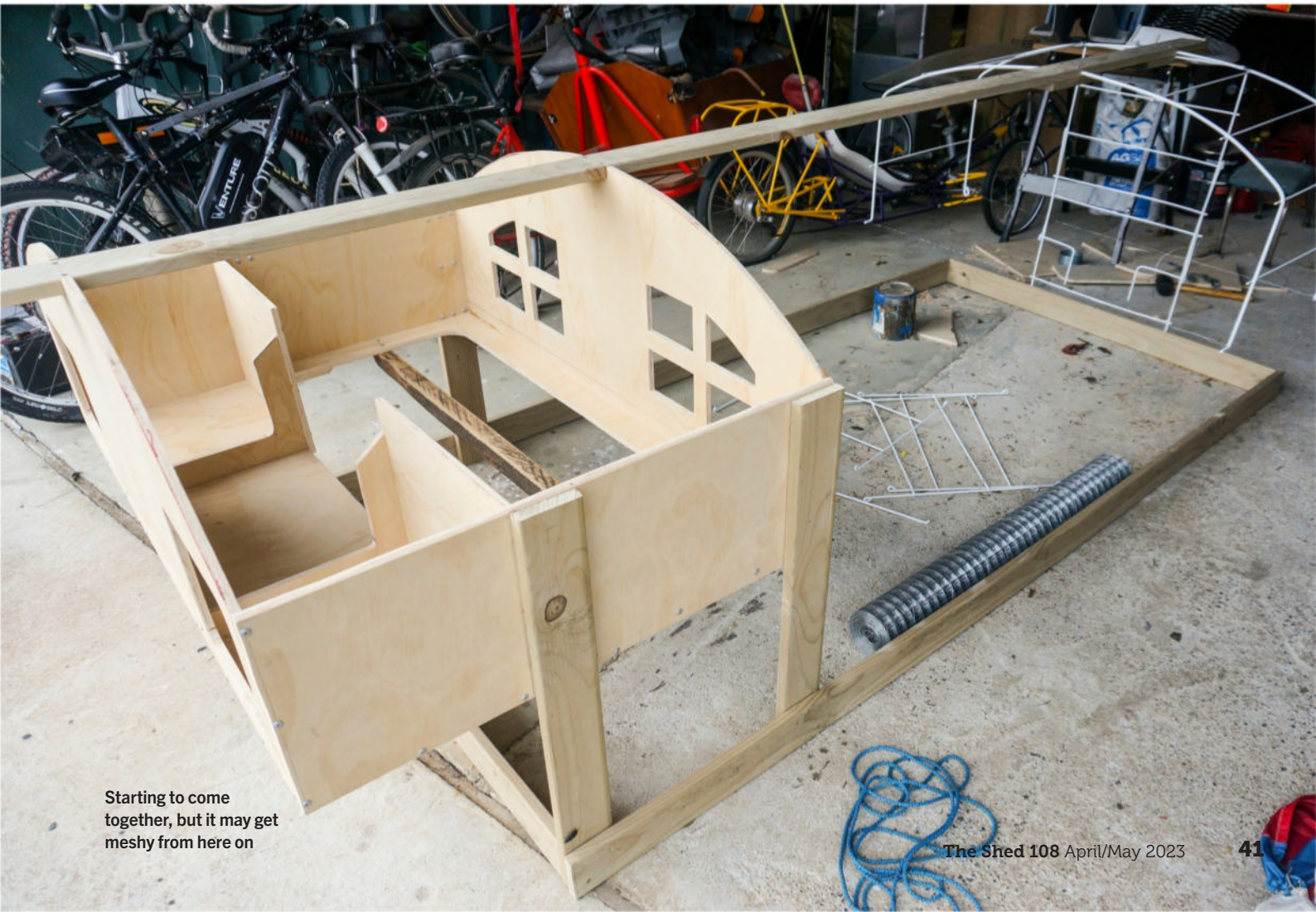
Floor pieces lapped (below), outer wall (left), nesting-box wall (right)

Plan B

At this stage of the game, I turned to the two waratahs that I'd stashed nearby, waiting to become sledge runners for the structure — and got cold feet. They might look like Meccano, but they are high tensile. Last time I tried to drill one — with my 12V cordless running off a car battery — I found it a real pain. Also, I couldn't see a tidy way to do the uprights and the hacksawed ends aren't exactly user-friendly. So, off to the hardware store for an alternative, which turned out to be the thinnest decking timber, H3 treated (M10 was cheaper than Bunnings this time around).

A quick sketch, based on an optimum

I decided that, in the interests of panel strength, I might curve the upper/outer squares parallel with the roof profile



Starting to come together, but it may get meshy from here on

Square mesh lends itself to neat stitching. Here, two panels are being stitched before being unfolded as one flat expanse

target of 3m² of run and given that the width was already limited to 1.2m, suggested the two long ones needed to be at least 2.5m. If I got two more of that length, to cut into a 1.2m cross-piece and two 700mm uprights each — adding up to 2.6 — and another slightly longer one for the ridge (it seemed like a good idea to extend the ridge plank to make a couple of convenient lifting handles), I could have gotten another length and framed the end wall of the run out of it. However, as readers of past issues will be aware, boringly conventional materials aren't really my thing — lateral thinking and repurposing being my happy hunting-ground — and I couldn't help myself; I went off on my high (clothes) horse, flushed with inspiration, following a little cisterns analysis. The four 700mm uprights — 400mm of ground clearance, then 300mm up the plywood sides — went on a treat. I'd chosen to raise the coop over the run rather than put it on the ground alongside, for the same reason that David Parker allowed three, three-storey buildings on a postage-stamp section: getting more from a given footprint. Stretching that optimisation, I cantilevered the nesting boxes outside the footprint — a little like the minister allowing a first-storey bay window to overhang a neighbour's fence. That gives 300mm more sunlit run length — important, given that we were already pushing the lower acceptable run-area limits.

Hung out to dry

The clothes dryer worked out better than I expected. The two top wings clipped together as the central upright, only one rung having to be severed to accommodate the 'door'. The main uprights slotted nicely into clearance holes drilled in the ridge plank, and were easily persuaded to emulate the curve of the plywood — indeed, it was over that curve that I started to bend them! I was a little concerned about the

Mesh draped over

Doors on

Mesh being attached

small amount of wood remaining below the horizontal holes, so I screwed some offcuts underneath to reinforce it. All the buried-in-wood ends got cotter-pinned by woodscrews, aimed a little to the side — although, once the mesh is in place, none of the buried rods will be able to jump out.

Later in the build, I used four eyes from the remaining pieces as latch pegs and one eye-to-eye length sprung over the toilet lid to keep it closed. There wasn't much left unused.

The downside of these frames is that the plastic degrades in UV, followed by rust. The easy staving-off action is to paint it; we once brush-painted a Zodiac inflatable in acrylic, successfully warding the Queensland sun off the boat's delaminating glue joints for the year we owned it.

Making a mesh of things

The next operation is easy to mesh up (bad netting pun). I want to keep small birds out, as mentioned. Square, welded mesh looked ideal, although bird mesh is an obvious alternative; chicken mesh lets the wee fellows in. I'd seen 10m rolls of the square stuff, 900mm wide, but when I went to buy one, only 5m rolls were available — 10 has been discontinued, apparently. So I bought two, paying $6 more than a 10m used to cost.

It worked out pretty well; two 2.5m lengths for the sides put paid to one roll. A 2m length for the ridge, a 1.2m piece for across the end, and a small piece for under the nesting boxes put paid to much of the other. Square mesh has the big advantage of ensuring that our cuts are guaranteed to be horizontal or vertical.

It also has rigidity; indeed, it works very well as its own lacing wire. Lacing it was a tad repetitive, but the visual result is pleasing; tidier than some of my past efforts.

Roof time

Easy, this. Take one sheet of corry, 1.8m long. Cut it into two of 900mm. Lap them so the outer wings go 'down', and inevitably the top sheet will have an 'up' at the overlap — as drawn, there will be four 'ditches' of overlap. Trim half a web (the 'up' one) off it so it ends 'down'. Rivet the sheets together so they become a single wide one. Drape over. ▶

Square mesh has the big advantage of ensuring our cuts are guaranteed to be horizontal or vertical

Allow more overhang over the rear curve, to shelter the nesting-box doors. Rivet the latches to the corry, in line with frames. Mark the frame, through the latch slot. Mount the four latch receivers on the frame. Stand back and smile smugly. Finish by trimming sharp corry corners into non-cutting radii. Repeat the 'smile smugly' bit.

Stuffing it up

Hunting for budget latches and/or hinges, I bought 10 latches — the cheapest of the cheap. I figured I'd work out how to make them do all things, and it almost worked out that way. Riveting four of them to the wings (hen pun again) of the roofing iron, I pulled them down satisfactorily and also let them be raised for access. Adapting four more as hinges for the access doors wasn't quite as successful — as I arranged things, the doors open only so far. I won't change it, but a very few dollars for proper hinges might have been worth it. Alternatively, we could go without hinging entirely; screw the cut-out ply to the door ply, and we would have a self-centring plug that could be held in with a rotating block of wood, or maybe even with a bungee hook.


Marking hatch slot

A very few dollars for proper hinges might have been worth it. Alternatively, we could go without hinging entirely

Flush-mounted

We've used toilet seats as chook access doors for years; they are, after all, primarily designed to accommodate evacuation! Nothing does as well at turning a snaggy hole chopped through mesh into a smooth, gated door. For every rejective comment, we have a hundred laughing approvals; everybody 'gets it'. So, I've used one here. Other options would be using the biggest ply offcut as a hatch or even just cutting a flap of the mesh. The loo seat will be enough to let chickens in and out, and to pass food and water containers through — with two to three birds as an optimum in this space, we're not really in big-feeder territory, great though those are.


Wire ends ready to use as lacing


Mesh wire twisted together as lacing

Wire staples hold the loo seat on

Preferences

My CAD-proficient friend prefers the idea of running the upright frames inside the structure, making it stronger and easier to attach the plywood; he even drew a version with the floor-corner cut-outs required for that option. I quite like the Tudor-house / gypsy-wagon external-frame look, and, as built, it is entirely rigid enough. The choice is the builder's. The H3 is perhaps marginal in permanent ground contact — maybe a lick of Metalex or similar on the underside would be worthwhile.

Having to stick to new only is counter-instinctive for me, and I had to repress the urge to improvise. I assumed a small urban setting and enough eggs for home use, rather than more for selling. I also aimed the project at sheddie newbies

Door finished and . . .

. . . latch pins made from dryer

One side of the roofing raised as an access lid. Perch (centre) allows droppings to . . . drop

Our long use of loo seats

> But the dream comes with some hard facts; getting eggs free is not the reality

and at those who don't have 'resource libraries'; the rest of us presumably need less egging on. Given that I wasn't building out of necessity — rare, hereabouts — I will either donate it or sell it for the cost of the materials. It was a fun wee exercise.

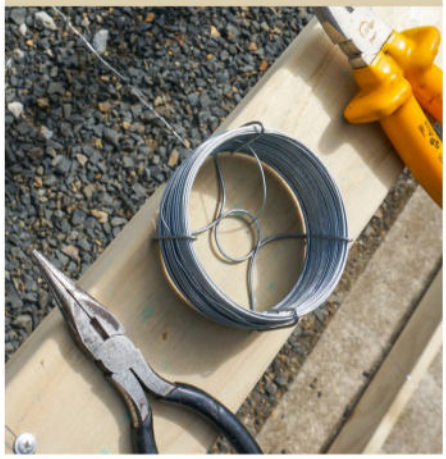
A free-ranging discussion

The recent changes in commercial regulations and the resulting empty supermarket shelves have had a lot of folk contemplating chook-keeping, but the dream comes with some hard facts; getting eggs free is not the reality.

There are things you'll need to shell out for; chooks need to be fed — no urban area is big enough for free range; indeed even those of us with acreage wouldn't see as many eggs per day without importing mash, wheat, or a commercial chook food. The hens will need grit, calcium carbonate to make their egg shells, water, and maybe delousing and de-miting, and their houses need to be cleaned regularly. Also, neighbours can get catty about the chooks. You can set up a system whereby the chooks are automatically fed/watered for a day or three, but beyond that they need someone checking on them.

Costs

Sheet of plywood, 12mm untreated	$55
Decking timber	$29
Clothes horse	$17
Sheet of corrugated iron	$56
10m mesh	$67
Screws	$36
Hasps	$37
Lacing wire (part roll)	$10
Toilet seat	$24
TOTAL	**$331**



My thanks to Lindsay Graham, for the drawing featured on page 39 and his design insights

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ALEXA
WHAT'S IT ALL ABOUT?

Alexa and similar devices can both simplify and complicate our lives

By Mark Beckett
Photographs: Mark Beckett

Alexa, part one

By now, many readers will have heard the term 'Alexa' and wondered what it is, how you use it, and if they need it.

'Alexa' is a virtual or voice assistant that connects to the internet via your Wi-Fi and listens for your command. This gets processed and Alexa responds verbally or by activating a smart device or devices.

History

Humans have always been keen to find an easier way to control simple devices. Television remotes were developed in the 1950s, but it wasn't until the 1970s that the modern style of remote control became mainstream. Back in the 1980s, Joseph Enterprises manufactured a clap-controlled switch — 'The Clapper' — which you can still buy today. This provided a simple and convenient way to interact with lights or mains-powered devices.

Originally, 'home automation' was the catchphrase, but, as we've observed from car commercials, a new marketing campaign yields a new slogan to describe the same feature. 'Automation' is a misused term for many of the devices and systems being marketed; having a human pressing a button on a screen is simply changing the method of control. True automation is when something else acts on the device — for example, a wall thermostat controls a heater, or a daylight sensor opens the blinds or turns on a light.

The smart home

The concept of a 'smart home' has been around for a long time, according to a post by Tristan Perry (smarthomepoint.com/history/). Many of these developments are labour saving, but fast forward to the 1980s when true automation kicked off.

Many manufacturers have produced devices that can be controlled, but each manufacturer used its own protocols or method, so there was no single control

Shelly 1 size

point. This saw the rise of 'open source' products that allowed some interaction between devices, but these were far from user-friendly and not suitable for the general public.

In 2013, Amazon bought 'Ivona' from the Polish inventors and developed it as 'Alexa' (https://en.wikipedia.org/wiki/Amazon_Alexa). The hardware has been revised, with some models better suited to certain tasks, so there is a price and solution for everyone.

While developers and marketing people suggest that these devices are labour saving, many provide real benefits for people who have mobility issues or need assistance with normal day-to-day activities.

How does it work?

The 'internet of things' (IoT) has been around since the 1970s, when it was called 'embedded internet' or 'pervasive computing'. Kevin Ashton coined the phrase 'IoT' in 1999. Wikipedia will show that there is no simple answer as to who or what started it, but IoT is a simple device connected to a network or server. These devices can be controlled by automation, human interaction, or another device.

Alexa, and others, connects to the internet via your Wi-Fi. When you ask Alexa to do something — for instance, "Alexa, turn on the bedroom light" — Alexa forwards the command to Alexa Central, where software parses the command looking for the device name, 'bedroom light', and what to do with the device: 'turn on'. Alexa issues the appropriate instruction to the named device over the home network and, in this example, the bedroom light turns on.

Most 'Alexa-ready' or 'works-with-Alexa' devices work straight from the box. You simply say "Alexa, discover devices". However, most guides recommend using the Alexa app so that you can add the device to a group or change the device name. There are many smart-home devices out there, but we can still use DIY to create something else, as I'll show in a later article.

Does Alexa have to control devices?

No, it doesn't. I was at an Auckland hotel that provided an Amazon Echo Dot with a clock. You could set alarms, listen to music, check the weather, or ask Alexa to tell you a joke. If nothing else, the clock was self-dimming and told the correct time.

Why do I need it?

There are many things in modern society that we don't need, but then there are some that offer assistance in managing our daily chores. One of the interesting uses is a shopping list (or lists).

In our house, we have a note attached to the fridge and items get added until one of us goes to the supermarket — usually without the list. While Alexa won't do the shopping for you — not in New Zealand — it is good at managing a shopping list. You can ask Alexa to "Add xyz" to the shopping list and it isn't picky about how you ask, ▶

When you ask Alexa to do something — for example, "Alexa, turn on the bedroom light" — Alexa forwards the command to Alexa Central

Powertech unit with manual button on side

or what you ask for.

When you reach the shops and open the Alexa app, the list is there. As you purchase items, you can tick them off or ask Alexa to remove them. You can view the list, or ask Alexa to read it out — but, be warned: since Alexa is not locked to your voice, anyone can add anything. So, if you don't want Alexa to read out 'bomb-making equipment', don't use the read-it-out option without first checking the list.

In the US, Alexa is connected to emergency services, so, if you have a fall, you can ask Alexa to call for help. It would be nice if that feature gets rolled out to other countries, although I can see a few companies that offer a monitor service having concerns that their income stream might disappear — so expect obstacles needing to be overcome.

Skills

Alexa and other voice assistants use 'skills' to link providers. Air New Zealand has embraced it; you can link Alexa to your Airpoints account, which can then link to your flight information. This is handy if you want to check that the flight is on time and saves you trying to browse the site.

All this account cross-linking is fine until one vendor has a security breach, so, while it may be convenient, it can have some hidden dangers.

Unfortunately, most of the smart devices require you to download their app and create an account before you can even connect the device to your Wi-Fi. Once you've set it up, you then link it to Alexa. You may wish to consider one of the free emails and use a special password for these devices and accounts.

In the US, Alexa is connected to emergency services, so, if you have a fall, you can ask Alexa to call for help

Alexa, part two

In the first part we talked about Alexa, its history, and some of Alexa's features. In this part I'd like to introduce integrating it with existing infrastructure (wiring).

Unless you designed your house to have everything controlled remotely, chances are you use physical switches and controls to control lights and sockets. You can add a smart device downstream, but that means the switch needs to be 'on' before you can remotely control the light or socket. It does provide the ability to isolate it, which may be part of the consideration, but it's not useful if someone turns off the switch. For some applications this might be OK, or you can add a label or change/remove the switch or control.

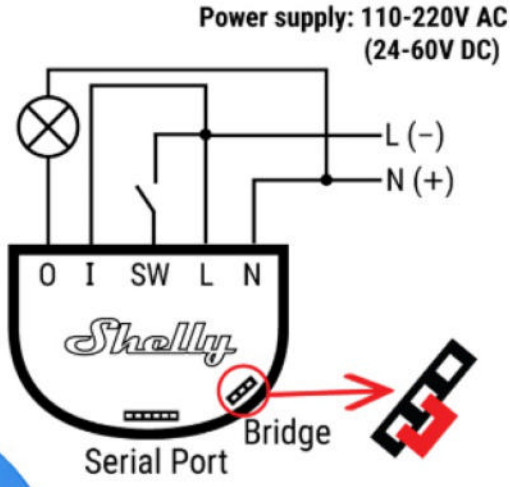
Is a hub for you?

Many of the smart devices require a 'hub' that connects to the Wi-Fi, and then the devices are controlled through the hub using UHF, Zigbee, or other communication methods. This can be costly if you want to control a single device, and it becomes a single point of failure. If the price is right then consider it, but, as we all know, support for older technology soon becomes difficult or very expensive.

Sonoff is a Chinese company that supplies mains relay units based on the ESP8266 Wi-Fi microchip. These are very cheap, have certification and a robust design, but are large and not exactly suited to fit behind a switch or socket. The later designs have overcome the earth-wire continuity problem, but

Powertech RGBW LED strip and controller

Shelly 1 internals



Shelly 1 relay connections

They have also been certified for use in New Zealand and Australia, so you can use them without compromising your insurance, but you will need an electrician to install them

they really need to be in an enclosure, which adds to the cost.

There is a 'smart switch' range of plug-in sockets. These are larger than those of the other manufacturers, but I had problems trying to connect to them so I could program them. It could be a firmware problem, but the average user will not be capable of reprogramming these, so they have been relegated to the box of technology that might be useful in a museum one day. There are plenty of resources on the internet to release Sonoff units from the eWeLink app and they have a range of DIY and low-voltage applications.

Technology changes quickly

Until now, Sonoff units have been the go-to devices, but technology changes quickly and manufacturers are all vying for your dollar. Luckily, the people at Allterco in Sofia, Bulgaria, saw a need to retrofit existing switches and sockets and produced the Shelly range of relay units (shelly.cloud/en). These are small enough to fit inside the light switch or socket, and allow physical switching and remote control.

They have also been certified for use in New Zealand and Australia, so you can use them without compromising your insurance, but you will need an electrician to install them.

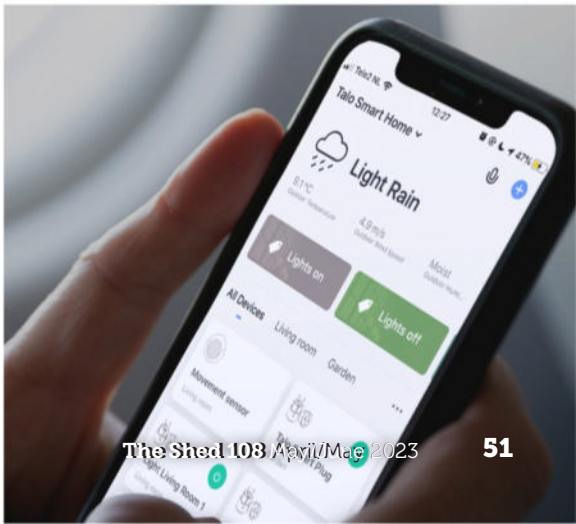
Shelly 1 is a single-channel relay designed to fit inside the wall socket/switch and operates on 110–240V AC, 12V DC, or 24–60V DC. The relay handles 16A, which means that it will handle most needs. The Shelly range includes dimmers and sensors that will allow integration with other domestic functions and are priced very reasonably.

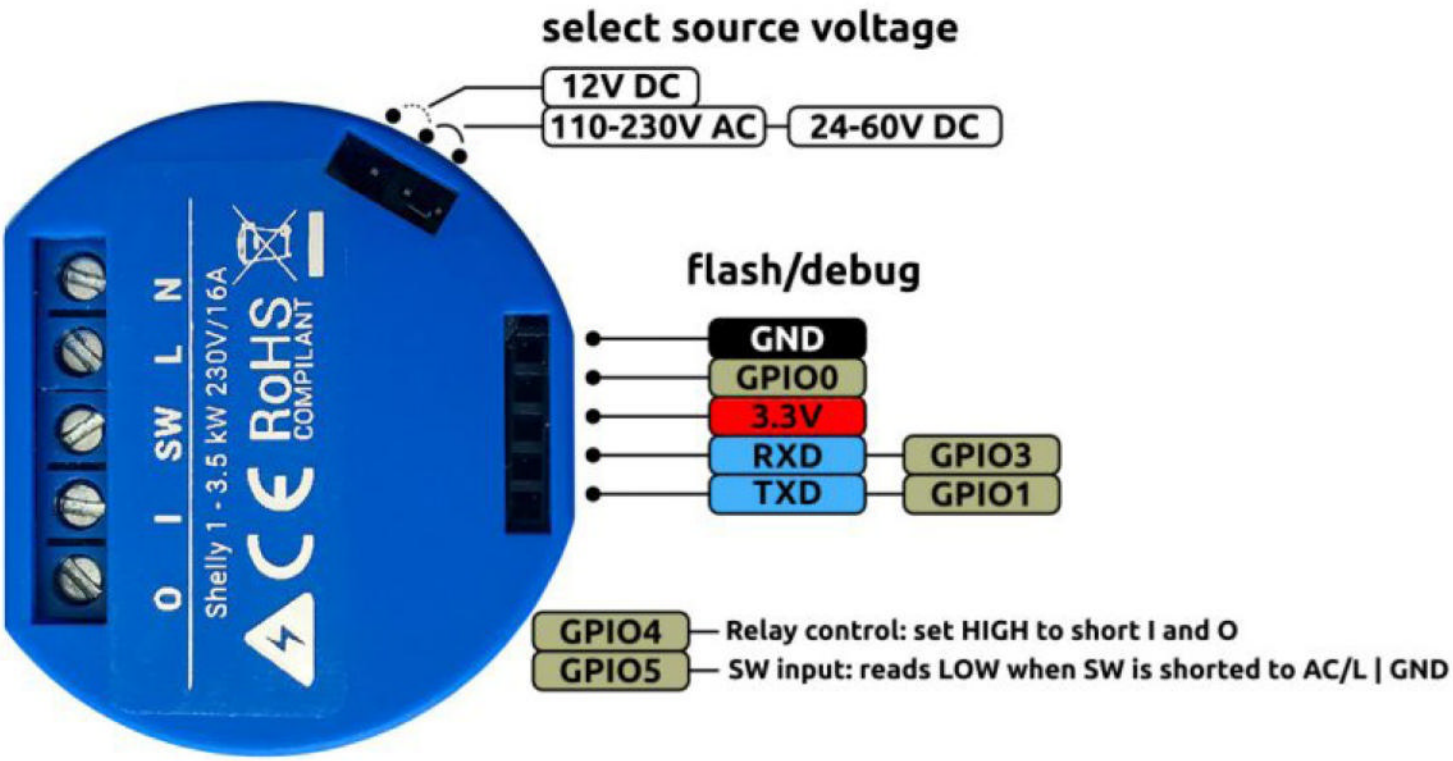
More options

Many retailers are offering units that plug into your power socket and can be controlled remotely, or by the switch on top/side, giving you both control methods. I have some from TP-Link (Tapo), but lately I've invested in units from Powertech, which use the Smart Life Plus app to connect and configure them. The size is small enough to allow other plugs next to them on a power distribution board, and mine were $29.99 each — but check sales/deals.

Relay units are handy, but there is a range of LED strips that can be remotely controlled. I picked up a Powertech RGBW unit locally, and it uses the same Smart Life Plus app to interact with it. The advantage of these is that they have a white LED, meaning that you can have the funky party colours and 'normal' white lighting. The app gives a wide range of colours, but sadly the Alexa options are limited.

The intention is to fit the LED strip under a Bowranda and power an Alexa from 12V to control the LEDs. It will require a plastic box to protect it from the weather, but power and location are the current hindrance. ▶





Shelly 1 reprogramming connections — use power from the programmer when reflashing

Shelly 1 relay switch — Wi-Fi smart-home automation — compatible with Alexa and Google Home

Once you decide that you need a bunch of controllable devices, it's important to have a plan about where you will use them

Once you decide that you need a bunch of controllable devices, it's important to have a plan about where you will use them. The Alexa app allows you to allocate devices to a room or a function, which means that you have better control. It's also worth thinking about the naming. I used '1', '2', and '3', and added labels on the plug since they all look the same — if you unplug it, you can have the 'where did this come from' situation.

Connecting

The advertising material would suggest you just plug Alexa in and then control it, but that is a misconception that needs clarifying.

You buy the device and power it up, but it doesn't know what Wi-Fi to connect to — yours, your neighbour's, the house across the street — and it certainly doesn't know the Wi-Fi password. Unlike a phone or computer, there is no display and keyboard, so it uses a different process.

ESP32 and ESP8266 (the tech inside) have an inbuilt ‘wireless access point’, and the app you download tries to connect to this. Once it communicates with the device, you enter the Wi-Fi and password you want it to connect to. The device then connects to your Wi-Fi, so it can be controlled.

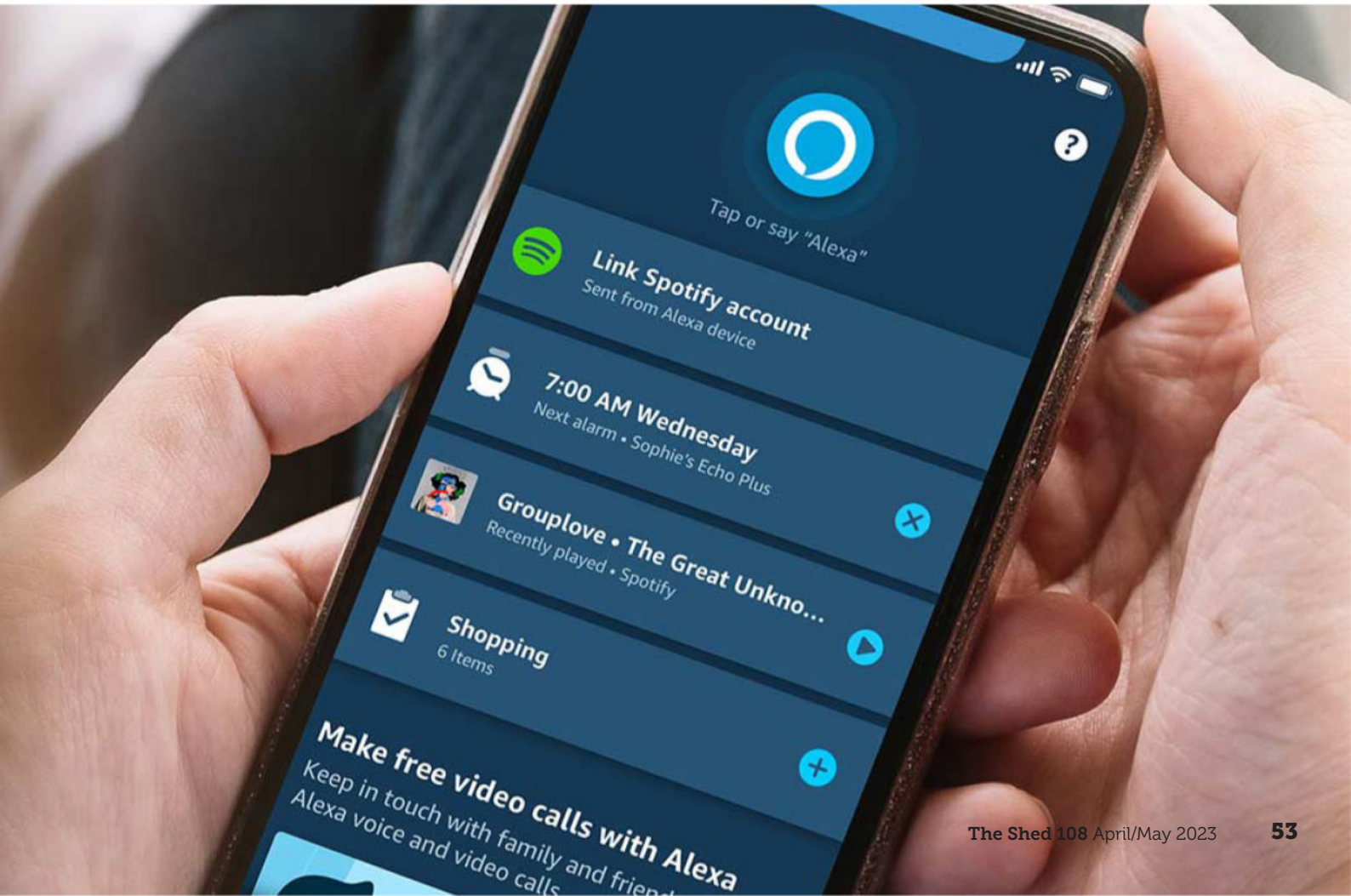
The process to achieve this varies, but I have had issues when there are multiple Wi-Fis; mine even tried connecting to a wireless printer until I switched it off. Sonoff units were a pain, while the Powertech units were easy.

The trick to all these is to read the instructions and use a search engine to help if it still doesn’t work.

Once a device has connected to the Wi-Fi, Alexa needs to discover them either by receiving the command “Alexa, discover devices” or via the Alexa app. For some devices, you may need to link the ‘skill’ through the Alexa app, which means that Amazon (Alexa Central) has some more data about you. (Remember the suggestion about using a free email and separate passwords.) Once the device is discovered, you can add it to a room or a function.

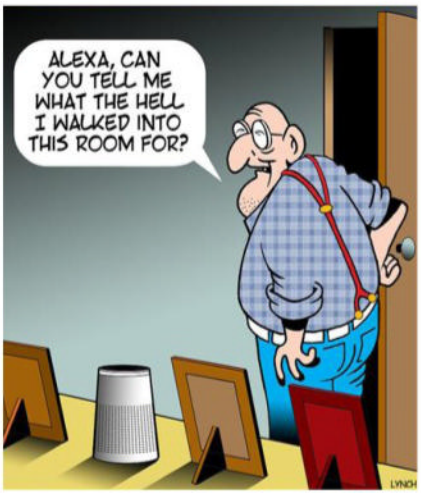
Shortcomings

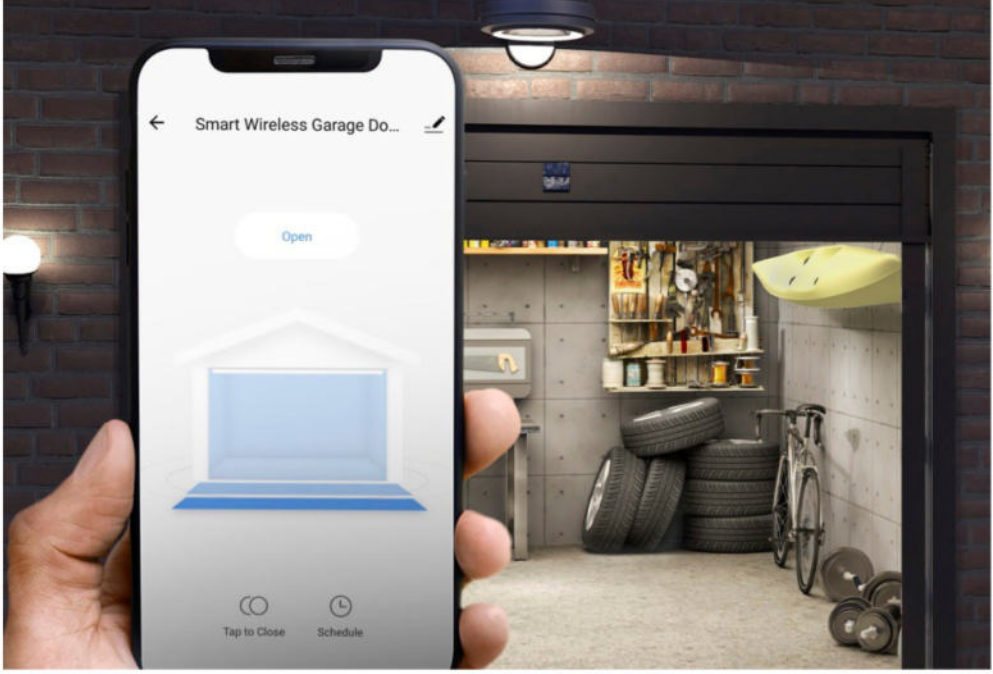
Alexa is touted as a great device with various features to help you. However, it can’t do momentary actions — that is, on for xx seconds, then off. Normally, this is not a problem — unless you want to connect to your garage door controller, which has a button you press and release. Most units have a single button on the remote or the wall switch, which changes the door state — that is, if closed, it will open; if open, it will close. Pressing it while in motion stops the progress, but the function is momentary rather than latched. ▶



To connect a garage door, you need hardware that can translate the Open and Close command into the appropriate signal or button sequence, as well as providing the current state.

I retrofitted my roller doors with Chamberlain RollerLift units. They offer a myQ Connected kit, which includes one intrusion beam and can control six compatible door openers. The unit requires an ethernet connection (cable) to your router, and will control the door or doors using radio frequency (RF). The information suggests that you can see the status, so I'm presuming that it uses the internal electronics and sends the state back to the myQ hub using RF.





Safety feature

By law, garage doors that are controlled from a distance require an intrusion beam to ensure that someone is not standing under the door when it's been commanded to close. If you use the remote or the wall switch, they assume you're looking at the door, but when you are not home, you can't see it, so it's a good safety feature.

The Chamberlain door controllers provide an intrusion-beam connection, but if I use custom hardware, I'll need to add sensors so that the system can report the state.

Regardless of the solution, one tip I did pick up was to name the garage door something less obvious. The thinking was that it's possible for someone outside the house to yell "Alexa, open garage door", and gain entry.

Hopefully this has enlightened *Shed* readers to some of the mysteries around Alexa and if it can help with their day-to-day activities.

Alexa is inexpensive to purchase, so if you find it doesn't suit, you can sell it or gift it to someone else. If you have elderly parents, it may be helpful even if they only use it to set alarms and get the weather forecast.

What does the future hold?

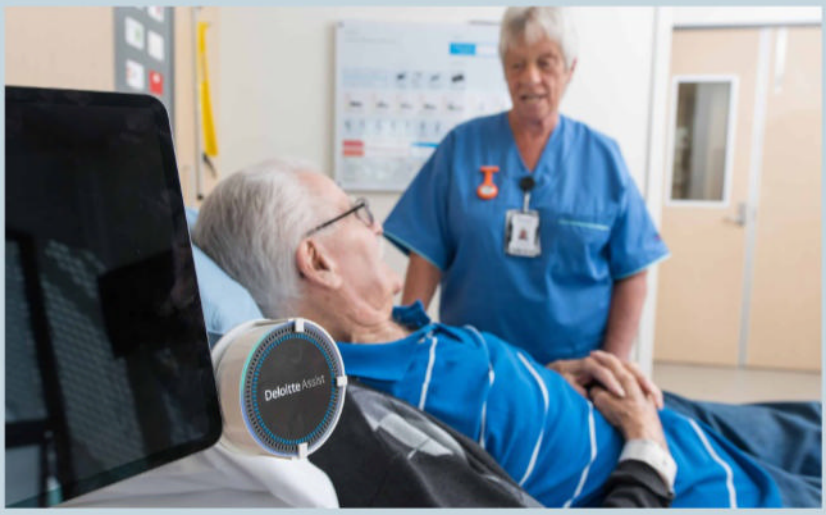
If I knew that, Lotto would be easy. But with voice assistants, there are some predictions that might come true.

Subscriptions may be on the horizon. Apart from an initial cost, there are no ongoing charges despite the huge amount of infrastructure required to support these devices. We've seen it with Fusion360, and while Alexa is tied to Amazon and its shopping, I can't see how it provides enough without subsidising it.

For anyone building a new house and adding the latest technology, be prepared for a subscription and for the technology to become outdated quite quickly, meaning it'll be a case of replacement when it breaks

Security needs to become tighter by default. Alexa does allow voice identification to restrict some parts, but you have to go hunting for it. Business uses will increase. Christchurch Hospital uses a voice assistant hands-free device to call between staff members (think *Star Trek*'s "Beam me up, Scotty") which helps and saves time.

Burwood Hospital has a hands-free call attendant for patients (cdhb.health.nz/media-release/voice-activated-help-for-some-canterbury-hospital-patients/), which means they don't need to try to find the cord when they require help.



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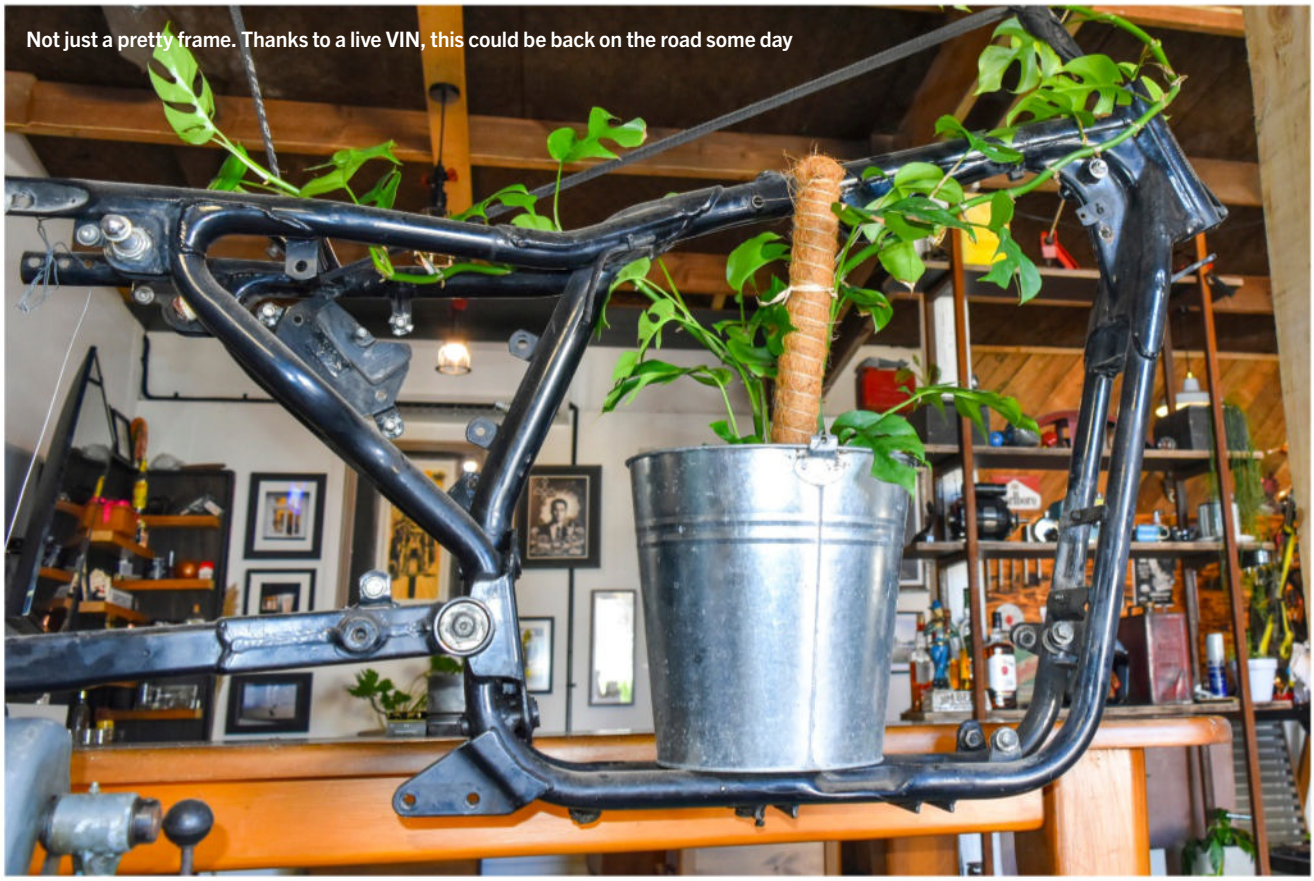
THE GARAGE MAHAL

An Aladdin's cave of creative possibilities

By Chris Hegan
Photographs: The Shed



Not just a pretty frame. Thanks to a live VIN, this could be back on the road some day

Promoting Bodhi's place would stretch the most creative real-estate agent to breaking point:

"Enjoy generous vistas of shipping containers. Privacy guaranteed by a 3m high hurricane-wire fence topped with razor wire. Superb indoor–outdoor flow by way of 4x6m sheet-iron front entrance doors."

It even has its own distinctive aroma, perhaps best described as 'fleurs du political incorrectitude', with top notes of toasted Virginia tobacco and sawdust, a tantalising hint of lager, and a musky base note of engine oil — not that it lingers long, thanks to that indoor–outdoor flow.

Then there's the artwork — posters recalling motorbike conventions — and the grand centrepiece: a 1974 Ironhead Harley-Davidson Sportster, in pieces.

They do say that it takes all sorts, and to Bodhi Hegan this is the perfect living space — apartment, garage, and workshop all rolled together under one tin roof. This is the Garage Mahal. ▶

The course of true love never did run smooth — Bodhi with his 'cursed' Sportster

Some tastes favour crystal decanters and Meissen ceramics. Bodhi's tastes are . . . otherwise

Nothing is wasted

Bodhi makes his living as a building contractor, one who loves his work so much that he never really stops. He is always making something, almost always out of materials hoarded over two decades of hating waste, accumulating potentially useful stuff — timber, metal odds and ends, sheets of Perspex, lengths and tubes of various composite materials, old machinery. His stints building sets for film and television were particularly productive.

Bodhi's latest masterpiece has just been delivered to his nephew: a custom case for a gaming computer. The working parts are mounted on black board with a cover of custom-cut Perspex supported by four copper columns with steel fastenings. The power switch is an industrial Bakelite job from the 1950s, the start button a glowing button inscribed with 'Engine Start', set into what was the lid of a small aluminium tool case. A French cleat at the back turns it into an artistic but functional wall hanging. It is a thing of beauty and wit.

Appearances can be deceiving

Most of the work carried out at the Garage Mahal, though, is either on the place itself or on Harley-Davidson motorcycles — Bodhi's greatest love. He looks the part, from heavy work boots in all seasons, black jeans, and T-shirts to brawny tattooed arms, bushy beard, and long slicked-back hair. However, a look is all it is; Bodhi was a vegetarian for two decades and still doesn't eat red meat. I doubt he has ever been in a serious fight.

As a teenager, he was set upon by a gang of heavies at an open-air music event. He escaped, not by retaliating but by being buried under a pile of girls. Bodhi has 'friendly guy' written all over him, and it is that instinctive hospitality that has made the Garage Mahal an informal HQ for a small tight-knit group of Bodhi's mates, all besotted owners and riders of Harleys united by a particular, if not to say, peculiar, aesthetic.

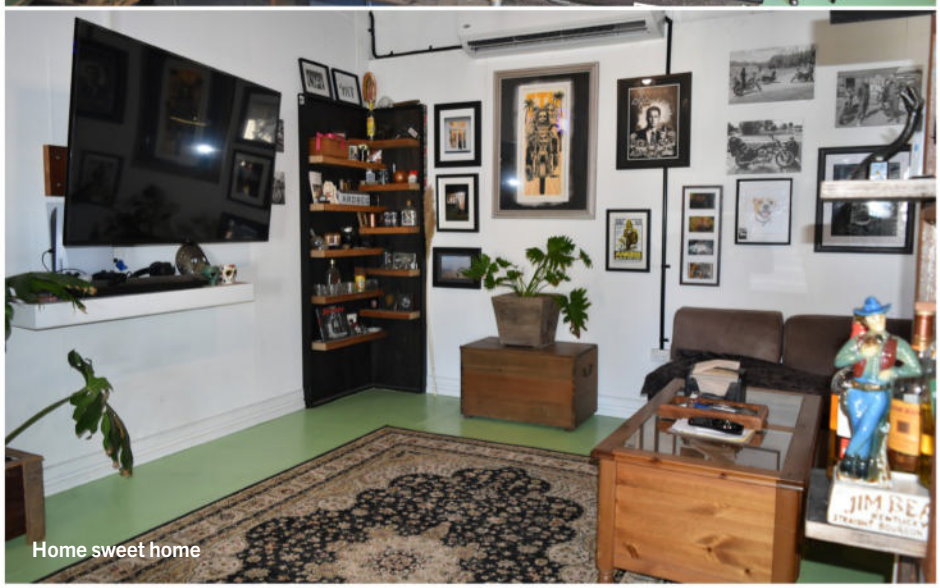
When I point out the impracticality of

His stints building sets for film and television were particularly productive

The collector's dilemma in a nutshell

What's wrong with a mudguard? Apparently, it just looks better without one

Massive win from garage clear-out: a Myford ML7 lathe, a sought-after British post-war classic



Home sweet home

their much-favoured small gas tanks, Bodhi just grins and declares, "Form over function — always."

Where's the flash?

Chrome has its place, but a small and secondary one. Absence of flash is important. It is hard to pin down these aficionados' ideal Harley in words, but it is clearly embodied in Bodhi's friend Nick's gas tank, a muddy yellow thing that looks as if it holds about a litre and a half. The colour has been lovingly distressed with artful, streaky blacks and browns that cleverly give the impression of wind-blown engine oil, the finishing touch added by a single, solid rap with a ball-peen hammer. Then there's the old-style car cigarette lighter set into the headlight of Bodhi's current ride — very much in 'the style'.

I notice that the front wheel of Bodhi's other Sportster has no mudguard. Isn't that a drag when you're riding in the rain? Again, that grin opens a white gash in the thick beard.

"Not if you lean over a bit — and there's nothing to stop you pulling over."

What's wrong with a mudguard? Apparently, it just looks better without one. I can't help but think, *Just as well it doesn't look better without brakes!*

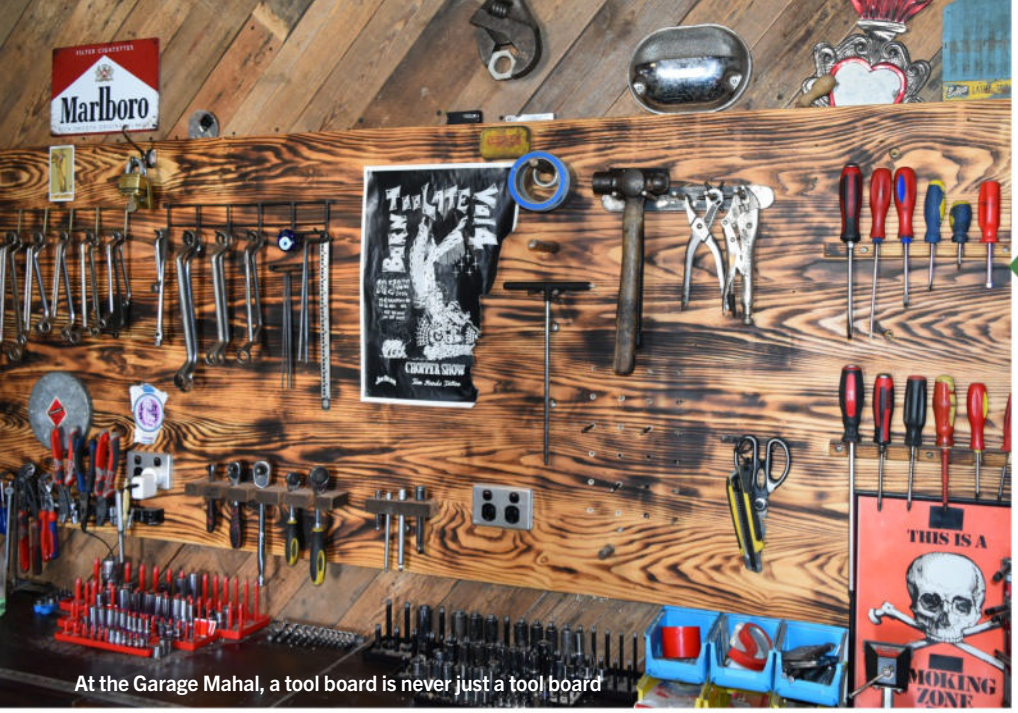
Where to move to?

Getting the Garage Mahal sorted to Bodhi's satisfaction has been an adventure, perpetually unfinished. Living happily in his former flat on Sandringham Road, with a huge garage out the back, he found out by accident from his neighbour that the owner was floating a plan to get together and flatten both properties for a big residential development. Old houses had been turning into clusters of new town houses all along the road for some time but now the writing was on the wall in bold clear letters. Finding another inexpensive flat with lots of space in mushrooming Auckland was a distant long shot.

"I had probably three months of anxiety and panic over where I was going to move all my stuff to. A one-bedroom

Some day my Harley will run . . .

Impractical, retro — and perfect



At the Garage Mahal, a tool board is never just a tool board


The boys ponder 'The Curse'

place with off-street parking and a two-car garage was unheard of — especially for what I was paying," he says.

I ask how he found this place.

"I had actually been here once, and when I heard that the tenants had bought a house and were moving out I got cracking; I was desperate for this place," he replies. "When I came and looked at it again, I saw there was so much I could do with it."

Bodhi spent a few days shifting his stuff in. The next day, Auckland went into lockdown.

"With Level 4, you could only buy essential items. Couldn't buy a nail. But with the lockdown, I realised I had lots of time and piles of scrap and timber that I could figure out what to do with," he says.

See? Hoarding is clever

"I made most of this out of stuff that people had been teasing me for years for hoarding," says Bodhi. "The kitchen bench is made out of offcuts and scraps that I've put together. That workbench is the back and sides of an old vanity. It was actually made out of decent timber. The kitchen sink was buggered, so I knocked one together out of timber, lined it with a really hard, glossy two-pot resin. It works great."

> "In the end, I got that effect with old motor oil and a blow-torch"

The water flows out of bent copper tubing and two in-line plumbing taps. Who needs Methven?

I ask about the huge, rustic-looking tool board on the back wall, everything meticulously arranged by size and function.

He says, "That was a really bright, pale timber. I wanted it to go with the old cedar wall lining from a 1940s packing case above it, and wanted it to look old. I looked up and tried a few things, like all-natural stains you could make out of kitchen ingredients. In the end, I got that effect with old motor oil and a blow-torch."

We move on to the battered old metal first-aid kit on the wall.

"That was something from the '80s that someone left behind. It still had some stuff in it," he explains. "After I drilled through my finger, my sister Rose made sure it was filled with a modern, proper first-aid kit."


A kitchen like no other

Lord of all he surveys: Bodhi in his happy place

Who needs curtains?

"I made all the boxes, shelves, planter boxes," he says. "Made those stairs on the second night here. Then I made those shutters on the window."

Why shutters?

"Same reason people put up curtains, but curtains in here would get filthy."

A lot of work has gone into the kitchen. The walls are lined with rimu tiles manufactured from offcuts. The tiny window has gone, replaced with a set that a client had asked Bodhi to take to the dump.

"A big, double sliding window? To the tip? Don't think so. Jackpot!"

Bodhi also made a lot of the light fittings.

"The bathroom light is an LED panel surrounded with milled-down rimu flooring. I made the light fittings in the bedroom too," he says.

Looking around, I can see that, apart from the walls, there is very little that is not the product of Bodhi's considerable ingenuity.

Good mates

Of course, he has had a lot of help. His friends help each other with everything.

"It's through them that I've learned everything I know about bikes," he says. "And the second night I was here, Dex asked me if I was going to paint the bare walls. I told him I didn't have time for painting and I'd just cover them up with lots of pictures. The next night, he turned up with all his painting gear and did all the prep and priming. Next night, he came back and finished the whole lot with two coats. That sort of set the tone for the place."

I have to say it: "I can't see — how can I put it? — a cohabitating female wanting to live here."

He laughs, not at all ruefully. "Yeah; too cold, too dusty."

"The look might have something to do with it," I suggest.

"Possibly. But it's my place. Everything here is exactly how I want it, and I kind of like it that way. And I really enjoy my own company," he says.

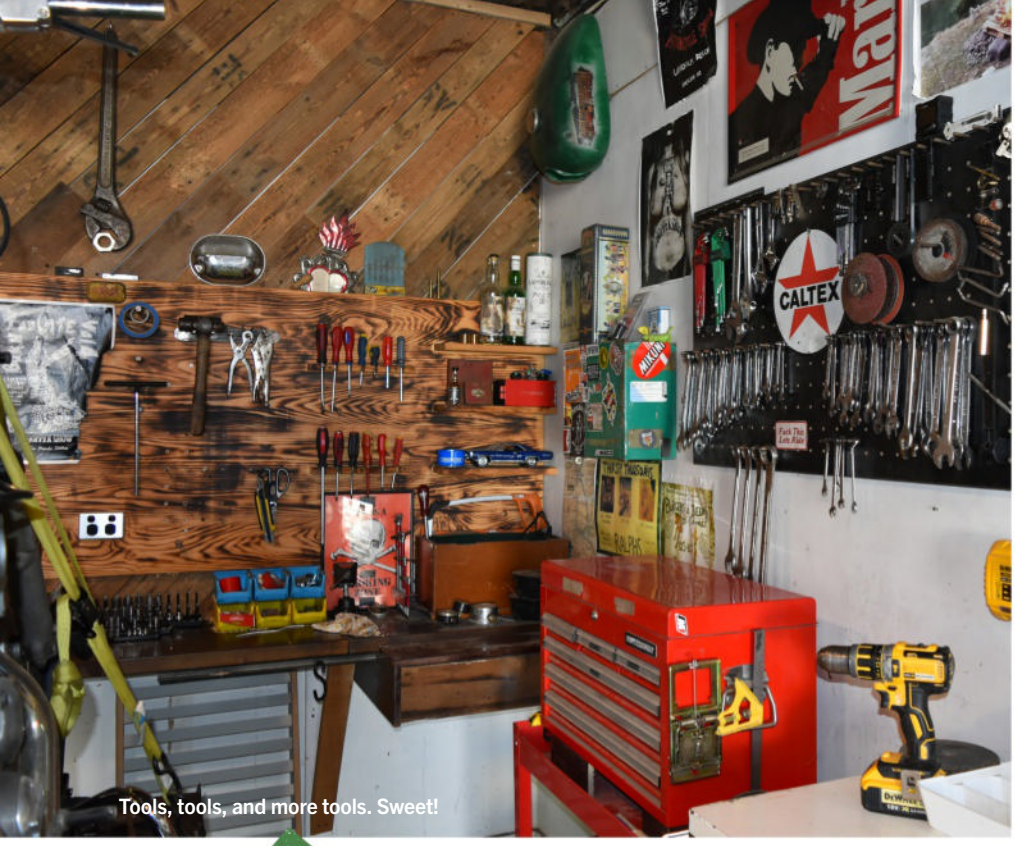
That leads to reminiscences about the ups and downs of my serial polygamy, about which — as my son — he is well informed.

"You only get one go around," he says. "Why would you spend it being unhappy? But I have met girls who have said they would love to live in a place like this. I don't think they've quite grasped the reality of it."

"Well, they say every pot finds its lid," I observe, fighting a losing fight for the joys and otherwise of the shared life.

"But it would start: 'Oh, do the doors have to be open?' 'Do you need the soldering iron on the coffee table?' 'You're not going to cut that in here, are you?'"

Laughing, I fold my cards. ▶



Tools, tools, and more tools. Sweet!

> "They didn't seem like the kind of fellers you dispute with in the back of a parking lot"

A life of loving Harleys

Bodhi's thing with Harleys has been another adventure right from the get-go.

"I bought my first Sportster 10 years ago from two rather unsavoury gentlemen from Ōtorohanga, on Trade Me, unseen," he says. "It was a basket case. They had piled all the parts together for a photo so it looked like a bike; said all it needed was an oil change and the brake line bled and it was good to go. They agreed to meet me halfway at the Ngāruawāhia BP.

When I got there, what greeted me was a trailer full of parts. They were big guys — maybe 10 years older than me. I figured I could leave with a pile of parts in the back of my ute or I could leave with a hiding and $4K lighter. They didn't seem like the kind of fellers you dispute with in the back of a parking lot when they know you've got four grand in your pocket."

Although the pile of parts was complete, it didn't include a licence plate.


Bodhi's 1998 Sportster 1200XL

"They assured me it had one," says Bodhi, "but one of their friends was using it. I put [the bike] in my name as fast as I could and got a new plate. I found out later that having a live registration was worth thousands of dollars, because re-VINing a bike like that, getting it back into the system, is a nightmare, especially if it's been modified."

This was all part of getting to know the ins and outs of owning and messing with Harleys.

"You can put a rego on hold indefinitely. That frame over there, with the plant growing through it, has a live registration. I've just got it on hold if I ever need a rego for a different bike. As long as I use that frame, I'm good."

I ask how long it took to get it going.

"It's still not going. That's it over there." Bodhi points to the machine behind us on a bike lift. "Well, that's not exactly true. It's been what you might call 'cursed'. The motor was totally shot. That was a pricey rebuild."

The Harley engine guy

Older Harley engines are notoriously temperamental, so Bodhi handed it over to a 'friend of a friend' in south Auckland. The work took over a year.

"That was sort of the deal," Bodhi says. "It's not his full-time job. He had four on the go, so mine got one day a month, but he's considered the best person in New Zealand on those motors."

Then there was trouble with the electrics that took ages to pin down. When Bodhi finally got it going, he let one of his mates take it for a spin. He crashed it. Now, it sits waiting for a new primary casing.

Bodhi's other bike, however — a '98 Sportster with an Evolution engine — has seen plenty of miles. Photos on the walls of the Garage Mahal tell of long rides with his friends to distant places, leaning on their bikes on beaches, outside the only pub in some one-horse town out the back of beyond. I can't help pointing out that such outings make an even greater anomaly of mounting minute gas tanks on 1000cc engines.

"You just adjust to a different way of

riding. You stop at every petrol station, every time. And we do carry spare gas."

Surely they must run dry sometimes on bikes with a range under 150km?

"Yeah, but there always seems to be someone ready to help," he says. "We've met some great people. Happened on the last ride I went on. We had passed the Twin Bridges turn-off just after Parakao heading on a back road up to Kaikohe. The plan was for one of us to stay with the bikes and the other to hitch to Kaikohe with a gas can. It wasn't far — maybe 20km. A farmer came wandering down the drive. Wouldn't hear of it. He drove me to Kaikohe, I filled the can, and he drove me back again."

Hadleigh's Sportster 2000 S


Awaiting the replacement casing

Just as well they can't be seen from the road . . .

"The plan was for one of us to stay with the bikes and the other to hitch to Kaikohe with a gas can"

Good buggers

It's not always as simple as running out of gas: "We were on that same road a while back and Nick came off his bike. The tyre just came off the rim. He would have been doing 90, maybe 100km. It was a serious crash, and Nick was pretty banged up. We'd had a meal at The Old Parakao Store, so I rang them up to see if they could help. [Gav] looked out the window and saw a car with a trailer. He had a word with the owner, hitched it to his car, and came and picked up Nick and his bike and brought them back. Gav's wife, Jodie, had done a first-aid course, so she patched him up. They said we could keep the bike in the workshop till we could get back with a ute, then offered us a house truck they were doing up to stay the night in. We always go that way now, because they're just awesome people to stop and see. It's a really cool place to stop. Lots of cars in all states, from rust buckets in a field to fully restored old cars, mostly American. Got a few old bikes too."

Taking a look around, I ask what the next project is.

"Haven't got anything specific planned; there'll be something," he says.

At the Garage Mahal, that has to be the safest bet in town.


Nick, Bodhi, and Dex — all for one and one for all!

WINTER'S HARVEST

Imagination and a dose of Kiwi ingenuity

By Jude Woodside
Photographs: Jude Woodside

John Priest with his winter project

The raw materials

John Priest, 83, lives in Woodville, a thriving country town at the eastern end of the Manawatu Gorge — at least, it used to thrive, until the gorge road was closed permanently. Although it can now hardly be called thriving, it does host some useful second-hand shops and a close-knit community.

Clearly, John hasn't been idle since he arrived here. He has remodelled his 120-year-old cottage, he has added a carport and a couple of useful sheds — one of which is becoming a handy workshop — and he has an extensive and well-tended garden.

Still, the long and rather wetter than usual winter that even the East Coast suffered left him with a quandary. What do you do to while away the cold winter nights in a quiet country town?

If you are John Priest, you set yourself a challenge to turn a pile of scrap into something delightfully whimsical. On top of the obvious difficulties, John set himself the further challenge of a limit of $10 on the cost of auxiliary parts.

What about that old mower?

The idea was born from the realisation that the old push mower that no longer worked might be repurposed. Add to that the chance find of the abandoned body of an old motor mower and an abandoned bicycle frame, and the seeds of an idea began to germinate. The shape of the old push mower handle sealed the deal, and a very classy-looking pedal car began to take shape.

The base is made from the handles of the push mower and the bicycle

You set yourself a challenge to turn a pile of scrap into something delightfully whimsical

The ingenious steering mechanism

At the start, John hadn't ever welded or brazed anything

frame. The handle from the motor mower was transformed into the front section, and the rest used to good effect in the frame. The body of the old motor mower base was cut in half and forms the front of the buggy.

The old catcher has been cleverly fashioned into an adjustable seat. The seat runs on two sliders made from an expanding curtain rail. It ingeniously uses an old hand drill to control the steering mechanism and sports a chain cover — also from the motor mower — complete with the embossed warning to keep fingers away. The car even sports rather natty exhausts made from an old water-wheel.

The ready-made safety warning from the motor mower case

Learning on the job

The build wasn't without its issues. At the start, John hadn't ever welded or brazed anything. So, a trip to the nearest town, Masterton, was in order to purchase a bottle of oxygen and a gas brazing set. A bit of practice ensued. Later, he found himself needing to tap and form screw threads to fix the wheels — handy skills, but just an addition to his other self-taught practical skills in building, joinery, jewellery, taxidermy, and gardening.

The majority of the build — with the exception of the brazing — took place in the living room, where John could enjoy the comfort of the log fire. John admits that he did exceed his budget on the wheels, being unable to find anything else suitable.

Fertile imagination

Like many of us, John long ago dispensed with television, but retains a monitor to play videos. The monitor, mounted on a wall, required extensive cabling, which could have proved unsightly — unless you had the kind of mind that could see possibilities. The cabling suddenly took on the form of a London Underground map, complete with labels — an example of making a virtue out of a necessity, and a strong hint that John has a very fertile imagination.

John's next adventure is a bit more daunting but equally whimsical. He and a couple of friends plan to explore the west coast of India by tuk-tuk. Those skills acquired over the long wet winter might come in handy on that journey.

Custom-made exhausts fashioned from an old water-wheel

No more gaps

All those annoying little gaps in kitchens and bathrooms that can be a host for nasties like mould and water build-up can be dealt to easily with Selleys No More Gaps Bathroom & Kitchen. Cracks and gaps will be hidden for longer as No More Gaps features up to 25 per cent movement flexibility, as well as superior water resistance. With a fungicide to help protect against unsightly mould growth, it can also be painted over with water-based or oil-based paints.

Selleys No More Gaps will adhere to most surfaces, from ceramics and glass to cement, plasterboard, and most plastics. It's perfect for touching up bathroom vanities, cabinets, glass, tiles, and features such as skirting boards, benchtops, windows, and door frames. Selleys No More Gaps is easy to apply and is also available in convenient tube format.

Gases for the ultimate shield

Welding takes skill, knowledge, and patience, which is why you don't want your job to be let down by using poor-quality gases. Used for MIG welding, Eziswap Gas's Shieldmix Argon/CO_2 gas mixes provide arc stability, puddle control, and reduced spatter compared to pure CO_2. It's the greater weld quality and reduced clean-up that make Shieldmix the shield gas of choice. It is available in 90/10 (mild steel) or 98/2 (stainless steel) Argon/CO_2 mixes and comes in a wide range of cylinder sizes.

Pricing starts at $292 for a B-size cylinder. When you run out of gas, simply take the empty cylinder to any one of more than 57 swap centres nationwide and swap it out for a full cylinder. No cylinder rental fees apply; you own the cylinder and pay only for the gas.

To find your nearest swap centre or buy online, go to eziswapgas.co.nz.

Hi-Q Components has it all tied up

If you're looking for plastic cable ties and mounts, and cable management components, it's hard to beat Hi-Q Components' comprehensive range, which covers just about anything you'll need for the job in hand.

Its selection of plastic fixings and fastenings includes standard strap-type cable ties, from 75mm x 2.4mm to 1500mm x 9mm; as a bonus, many sizes are available in weather-resistant black nylon for outdoor use. Hi-Q also has specialist ties covered, with stock including HVAC duct straps, heavy duty for hydraulic hoses, releasable, screw mount, marker, push mount, double loop mounting, hanking, and beaded ties. As well as cable ties, Hi-Q offers a great selection of cable tie mounts, such as quick and easy self-adhesive tie mounts, and push and lock clip mounts for through-hole panel mounting.

For further information and samples, contact: sales@hiq.co.nz or phone 09 415 3333.

Water in, leaves out

Autumn in New Zealand is a beautiful time, but all those golden and scarlet leaves can be a real pain when it comes to your spouting and downpipes functioning efficiently. That's where the Marley Curve® leaf diverter comes in — combining sleek, sophisticated design with innovative filtering technology, its unique screen draws rainwater in while preventing leaves and other debris from entering your water tank or storm-water system.

Marley Curve diverters are available in six colours to match the Marley Stratus Design Series®, and will integrate easily into the Marley RP80® downpipe system. Even better, the Marley Curve diverters carry the same 15-year guarantee for peace of mind.

Marley Curve is available in store for around $114.95; check out marley.co.nz for more information.

18+

WHAT IS AVAXHOME?

PART 5

ALIBRE 101

Learn how to create complex shapes that would be difficult to draw by hand

By Bob Hulme
Photographs: Bob Hulme

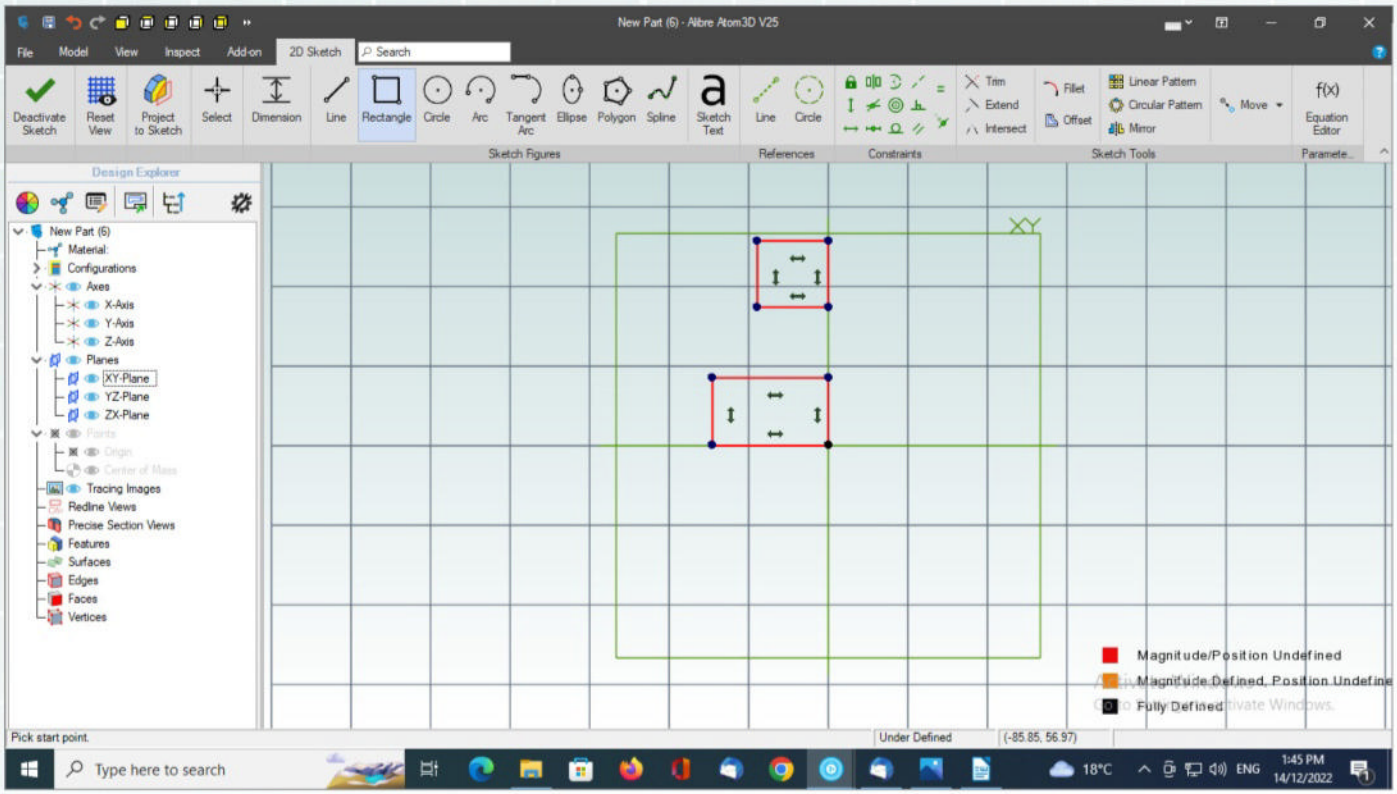


Fig. 1. Starting the sketch with two rectangles

In part five of this series about learning the basics of the Alibre Atom 3D digital design program, we are going to lift our skills to lofty heights by tackling 'lofting'. This is how complex shapes are formed that would be difficult to draw manually. With CNC machining now commonplace, a digital drawing can be used directly to program the machine tools, such as lathes and milling machines, to create the shape needed.

The example is basically the same vee pulley we designed in the last issue. When we drew it up back then, we designed it as if it was going to be machined from a solid piece of steel — which might be the right thing to do for

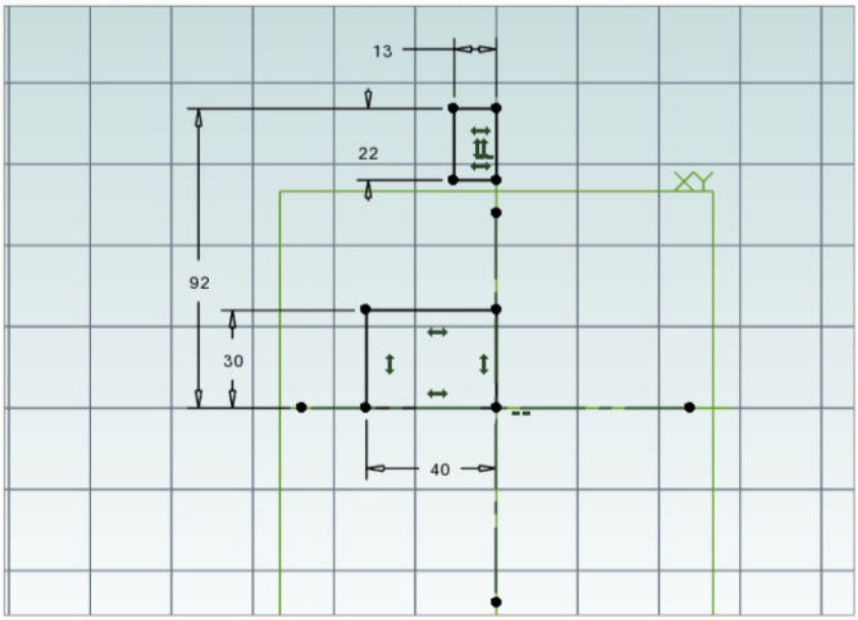


Fig. 2. Sketch dimensions

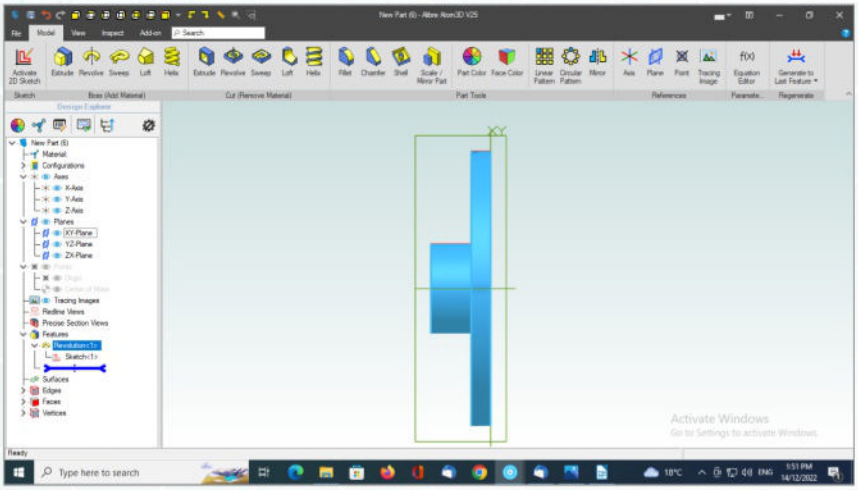


Fig. 3. The Revolve tool creates the solid boss and rim

a one-off. However, if we want to make a production run of these vee pulleys, it makes more sense to cast them. This saves material and minimises the machining time. Cast iron or aluminium would be common materials used, and the choice would depend on the intended use.

Planning ahead

Some prior planning is a good idea so that we achieve a design that can be used for pattern making as well as a finished product design to be used for the machining of the castings. So, the plan is to model the casting before machining and save that as a file called 'Vee Pulley Casting'. Then, carry on by making the bore and vee groove using the Extrude Cut tool to replicate what machining needs to be done. The work done is to be saved as 'Vee Pulley Machined'.

Clean slate

We will start afresh rather than try to use our previous pulley design, as this time our approach is quite different. So, click on the Create New Part icon in the Alibre home page. Click on the Activate 2D Sketch tool in the toolbar ribbon across the top of the screen. You need to select a plane to draw on. In this instance, let's pick the XY plane so that we are all doing the same thing. It doesn't usually matter all that much which plane you select, but sometimes there can be a reason to pick one in particular to start off with.

Click on the Rectangle tool. Draw two

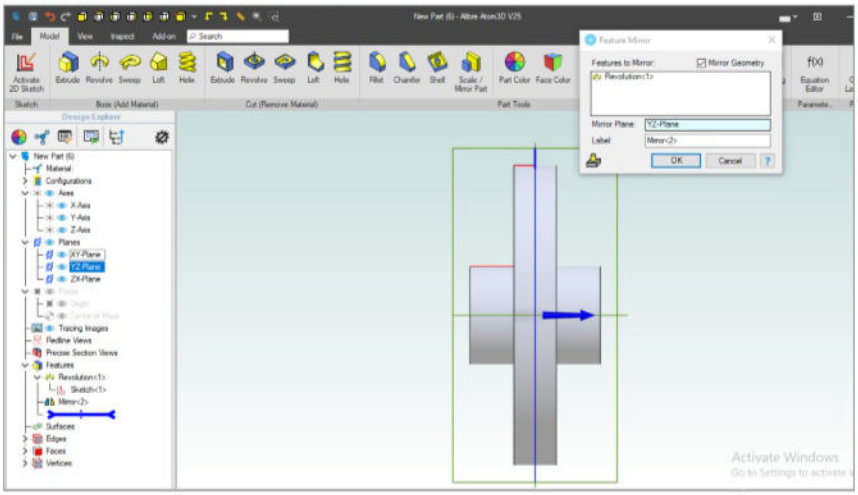


Fig. 4. Mirroring to make the full-width solids

However, if we want to make a production run of these vee pulleys, it makes more sense to cast them

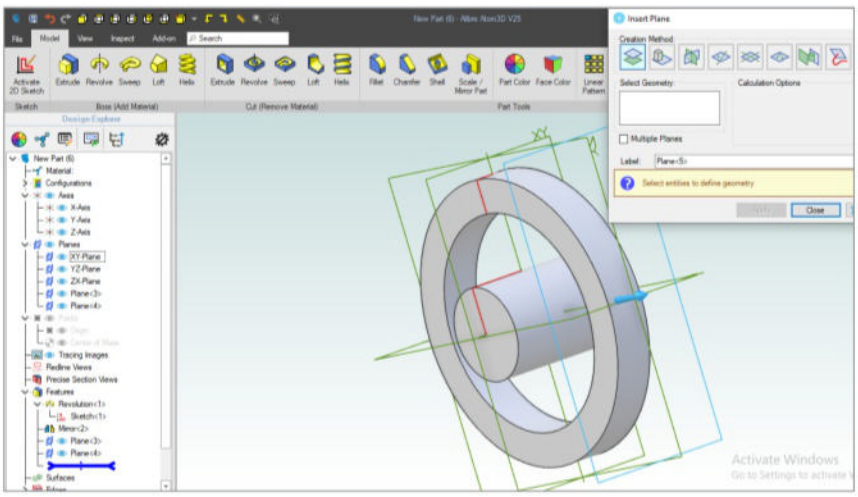


Fig. 5. Selecting a reference plane

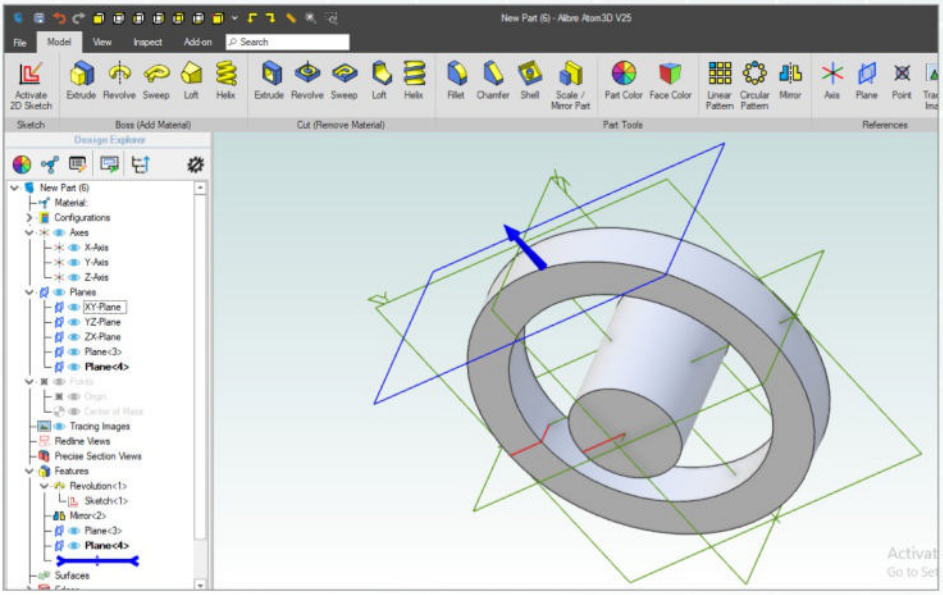


Fig. 6. The reference plane highlighted in blue

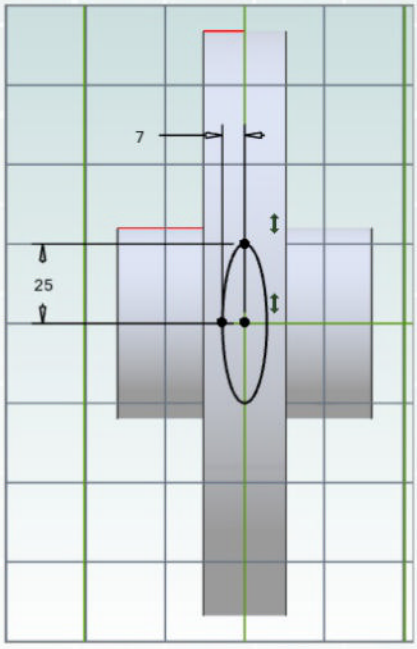


Fig. 7. Ellipse dimensions at the rim end of the spoke

As we are casting the pulley from a pattern, we can have some shapely looking spokes connecting the outer rim to the centre boss

rectangles as shown (Fig. 1). These will be the centre boss and the outer rim of the pulley. To use the Rectangle tool, you click to position diagonally opposite corners. Just two clicks make a rectangle.

In this case, we want to place one vertical edge of the rectangles on the vertical line coming up from the origin point. For the lower rectangle, we want its bottom horizontal line to be directly on the horizontal line coming from the origin point. This can be achieved simply by clicking on the origin point for the first corner of the rectangle. For the upper rectangle, you will need to constrain the vertical line to be in the same position as that vertical axis coming up through the origin point. Use the Collinear tool from the Constraint Tools section of the tool ribbon.

Next, add dimensions to fully constrain the sketch (Fig. 2). The sketch lines all turn black to indicate that it is fully constrained.

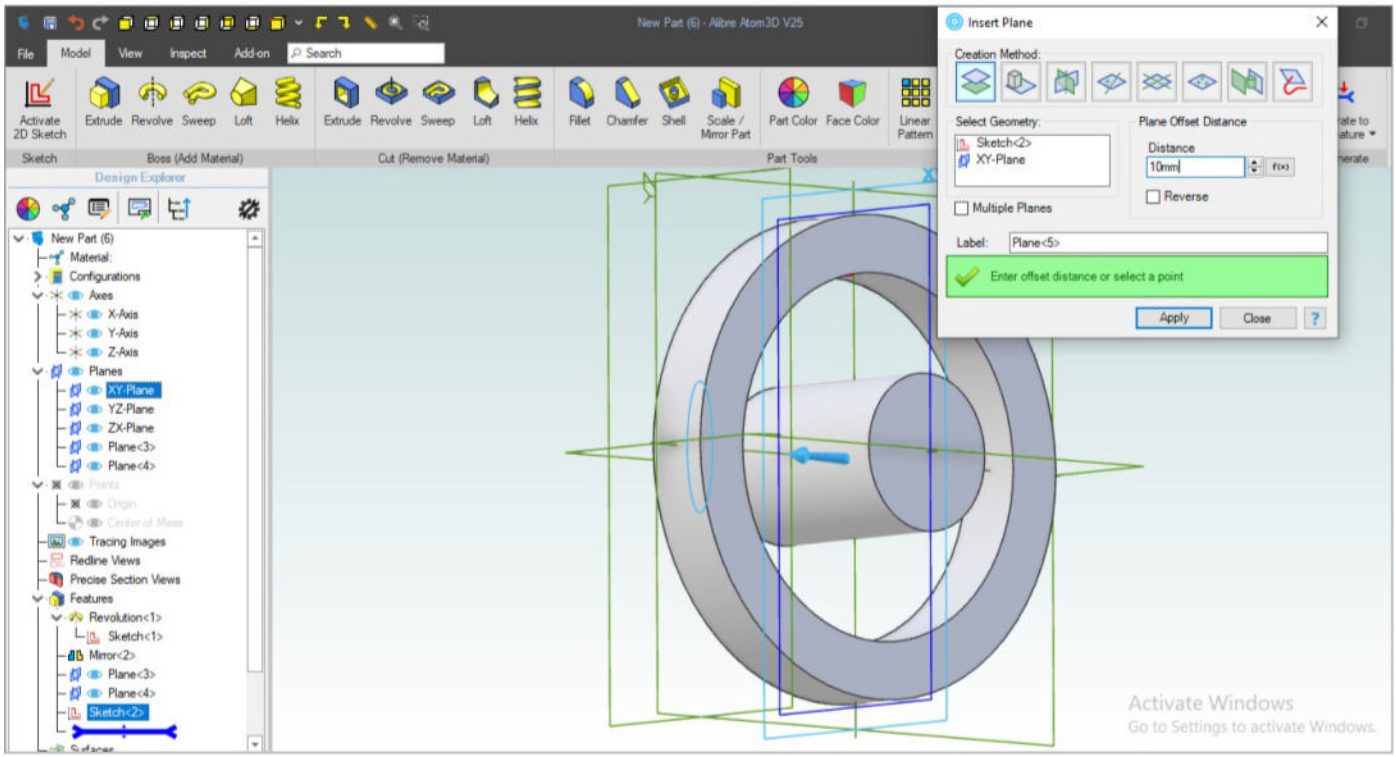


Fig. 8. Reference plane for the boss end of the spoke

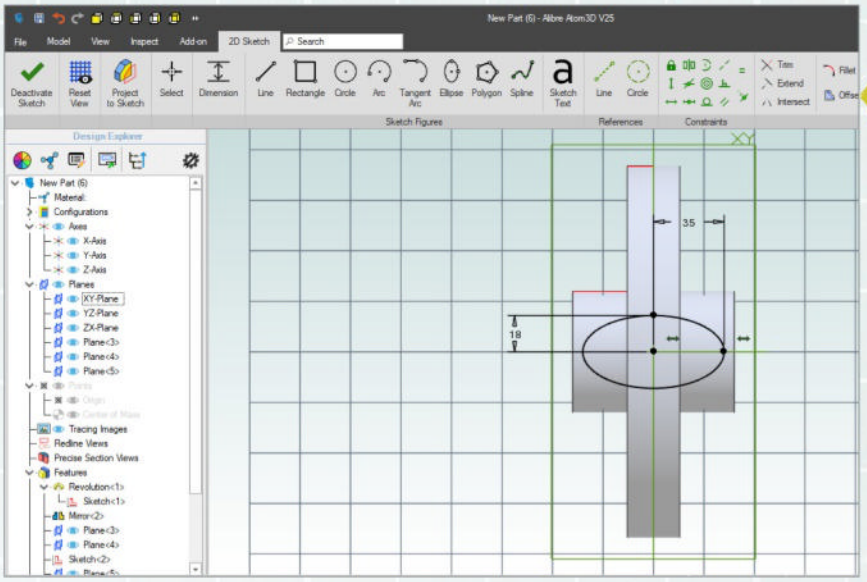


Fig. 9. Ellipse dimensions at the boss end of the spoke

The program will know that you want to revolve the shapes in the sketch you have just done, but will want to know the axis to revolve around

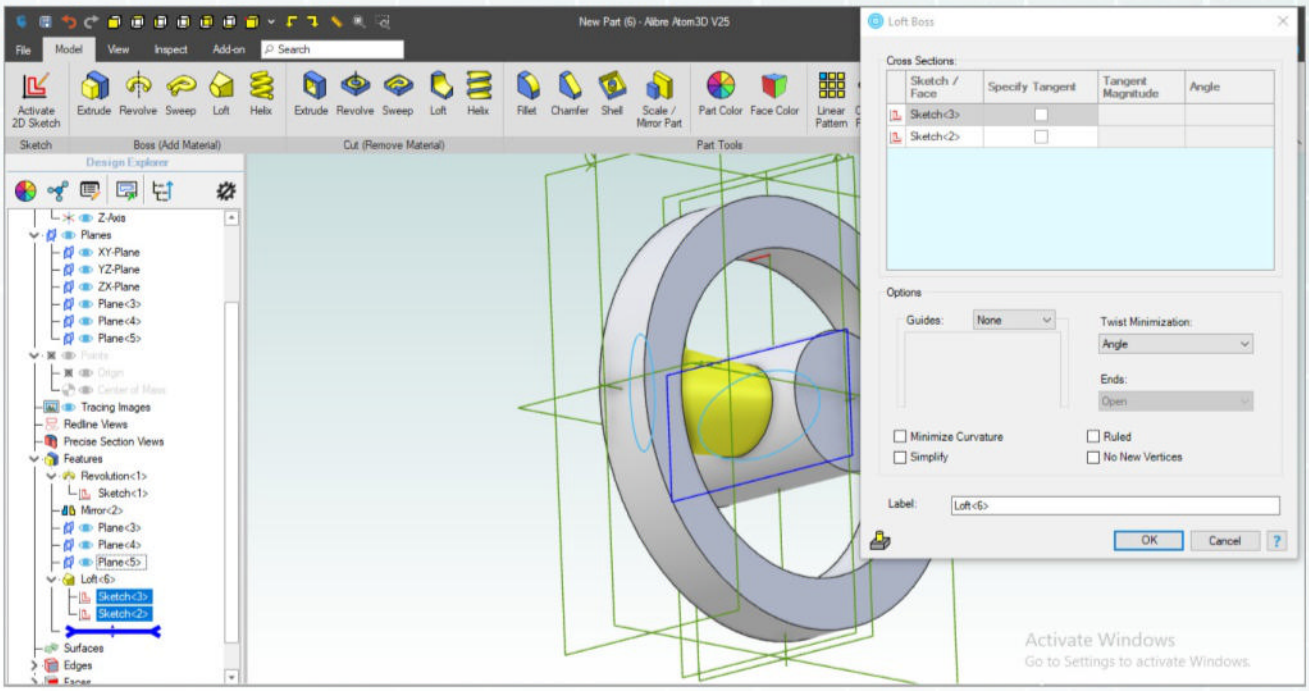


Fig. 10. Preview of the loft

Solid stuff

Click Deactivate Sketch in the toolbar ribbon. Click on the Revolve tool in the Boss (Add Material) section of the toolbar. The program will know that you want to revolve the shapes in the sketch you have just done, but will want to know the axis to revolve around. Click on the centreline of the pulley — which is the horizontal line that the lower rectangle is sitting on. This could be difficult to click on unless you magnify the image to see more clearly. Just rotate your mouse wheel to enlarge or decrease the image size. The axis line will turn blue when the cursor is over it. A preview shows the solid part created. If it looks right, click OK. You should have an image that looks like Fig. 3. You can move the image by holding both mouse buttons down while moving the mouse around.

Select the Mirror tool from the Part Tools section of the toolbar ribbon and enter the plane for mirroring. This will be the face of the pulley, which we created against the vertical line-up from the origin point. Click OK when the preview looks like the full pulley (Fig. 4) and you have our basic pulley less the spokes.

Plane sailing

This is where it gets interesting. As we are casting the pulley from a pattern, we can have some shapely looking spokes connecting the outer rim to the centre boss. This is when the Lofting tool makes itself useful.

To get our heads around this, it might be helpful to pause for a moment and consider the concept of 'sketches and planes'. Think of a plane as a piece of paper on which we draw a sketch. If we are sketching what a part looks like from above, the paper will be flat on the table top; but if we sketch a side-on

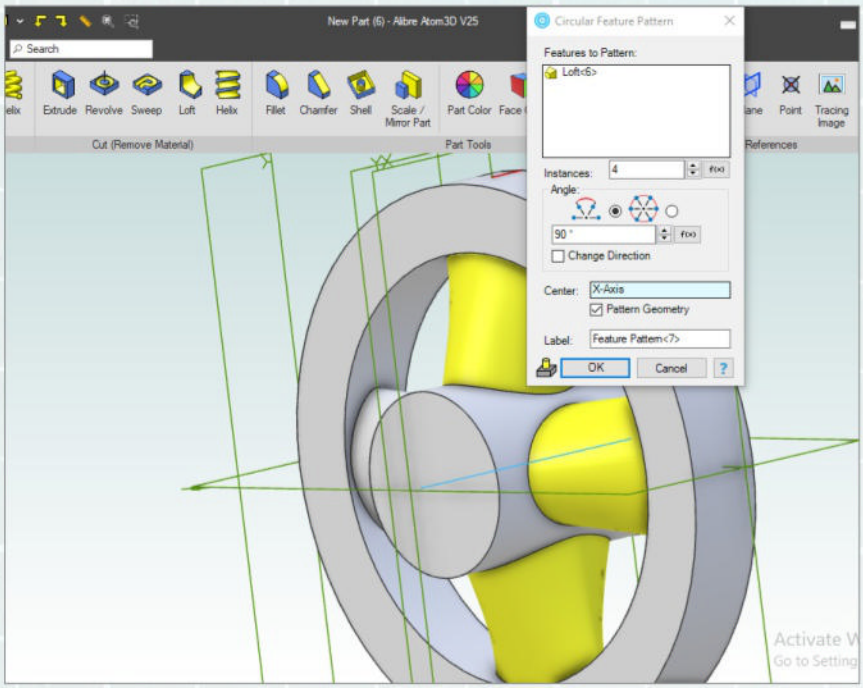


Fig. 11. Preview of the four spokes created by the Pattern tool

view, then the paper will be vertical to represent the part. 3D programs need to know what plane something is in to be able to come up with a 3D solid model. That is why identifying the plane where a sketch is drawn is vitally important.

Lofting introduces us to the idea of establishing planes other than the three options that present themselves to us when we begin a new part design. The References section of the toolbar ribbon has tools for creating planes (or pieces of paper) to draw on at pretty much any place we want. This is essential for us to create the spokes of this pulley because we need to make a sketch at each end of the spoke. The spokes will taper from one end to the other.

Lofty spokes

Let's get on with creating the spokes. We will start at the end of the spoke that attaches to the outer rim. From the References section of the toolbar ribbon across the top of the screen, select the Plane tool. A dialogue box will appear with several choices for the creation method (Fig. 5).

If you move the cursor over each one, a description of each method appears.

Select the Offset Plane / Face tool. This will give us the ability to establish a reference plane that is parallel to and offset from a plane we already have. A dialogue box will appear asking for some details. Enter the XY plane and an offset of 80mm. Click Apply. You will see the outline of the reference plane we have just created (Fig. 6).

Close the dialogue box.

The 80mm offset distance is simply one I have picked that will be within the material of the outer rim. Overlapping is not a problem, as having solids overlap does not cause a crash in this cyberworld. However, if we were to position our reference plane where it did not reach the rim of the pulley, there would be a gap when we filled in the solid spoke. That would be a problem.

Fully defined sketch

Click on the Activate Sketch button at the left-hand end of the toolbar ribbon. Then select the reference plane just created. Select the Ellipse tool from the Sketch Tools group. Click once on the origin point, and draw the cursor up the vertical line from the origin point. Click again. That is the long axis of the ellipse. As soon as you move the cursor sideways, an ellipse begins to draw. Take it out a small distance and click again. Don't worry about the actual size. We will dimension it next, and the image

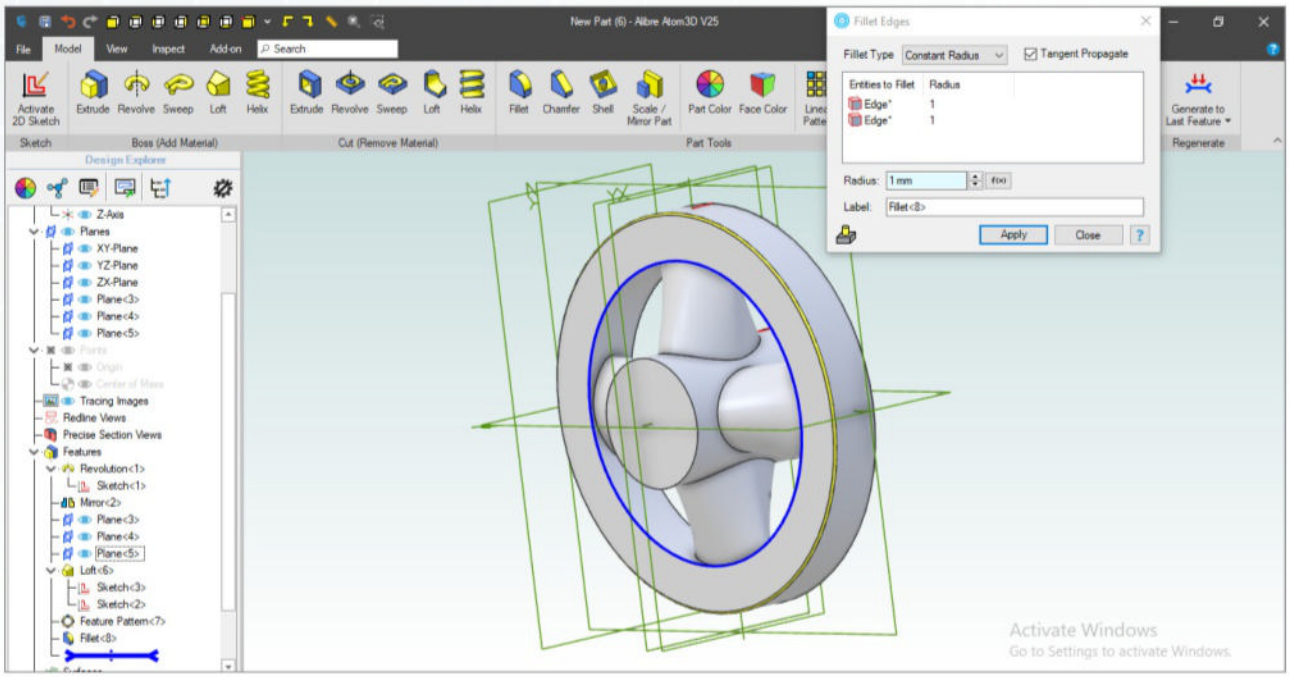


Fig. 12. Putting a fillet radius on the pulley rim

This is the easy bit, and is the most fun. Select the Loft tool from the Boss (Add Material) section of the toolbar ribbon

will comply with that sizing. Select the Dimensioning tool and dimension the ellipse as shown in Fig. 7.

The sketch should now be fully defined. Click the Exit Sketch button.

It is much the same process for sketching the shape of the other end of the spoke. Select the Plane tool from the References section again. Select the Offset Plane tool and then select the XY plane, with an offset of 10mm this time.

Click on the Activate Sketch button and select the reference plane just created. Make another ellipse as before, but this time with its long axis the other way and with different sizes (Figs 8 and 9). Deactivate the sketch.

The fun bit

This is the easy bit, and is the most fun. Select the Loft tool from the Boss (Add Material) section of the toolbar ribbon. The dialogue box will appear and want to know which sketches it needs to work with. You can specify which sketches by having the cursor hover over the sketches in the Design Explorer table. In this case, they will be the two most recent ones near the lower end.

When the cursor is over a sketch in the listing, the related shape will light up in blue colour in the image of the pulley. Click on the sketches in the Design Explorer for each end of the spoke. A preview will appear (Fig. 10). If this looks right, click OK. Our first spoke is done.

Patternity

This is just my silly attempt at a play on words — but this is your creation and you may feel as if you are its parent. We are going to use the Pattern tool to make the other spokes. Select the Circular Pattern tool from the Part Tools section of the toolbar ribbon. It already has the loft we just created in its dialogue box, as it expects that this would be what we want to work with. If we wanted to pattern something else, we could, of course, change that. All we need to do is fill in the number of spokes (instances) and the degrees between them.

The last thing to enter is the axis of rotation (Centre). Click in that panel in the dialogue box and select the centreline through the middle of the pulley. This is the axis around which it would rotate when being used. Be careful to select just that line — it will turn blue when the cursor is properly positioned over it. Often, it helps to enlarge the image and rotate it a bit to see the line more easily. When you click on the line, it will pop up in the dialogue box and a preview of all four spokes will appear (Fig. 11). If it looks right, click OK.

Some finesse

We now need some of the finer details, such as some nice fillet radii around the edges. Select the Fillet tool from the Part Tools section of the toolbar ribbon. Set the radius to 1mm and click on the four edges of the rim area of the pulley (Fig. 12). Click Apply. Set the radius to 2mm and click on the lines around the ends of each of the spokes (Fig. 13) and on the lines around the ends of the boss. You will have to manipulate the view of the pulley as you do this so that you can

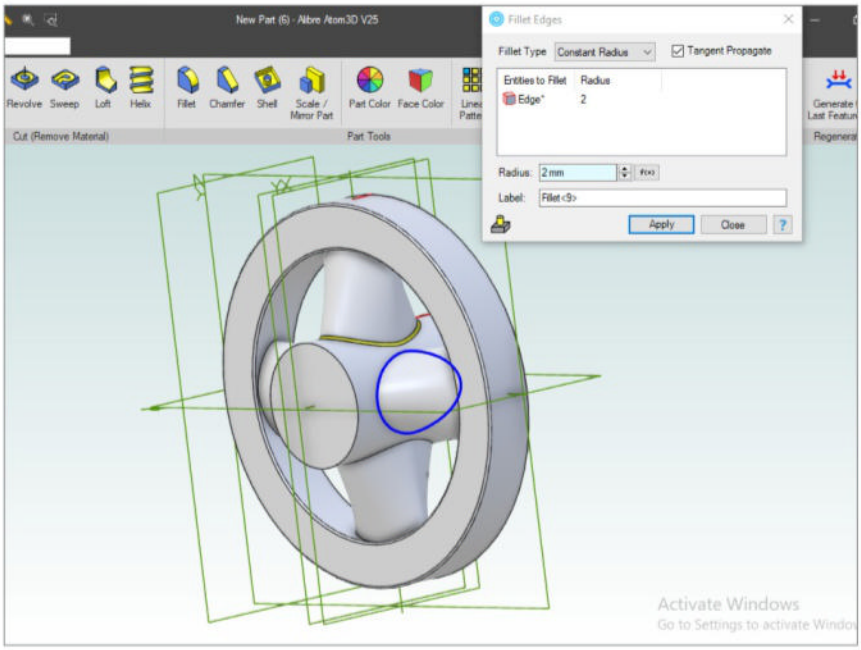


Fig. 13. Putting a fillet radius at the ends of the spokes

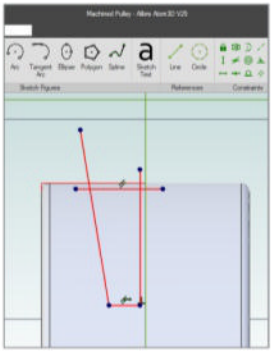


Fig. 14. Starting a new sketch for the vee groove

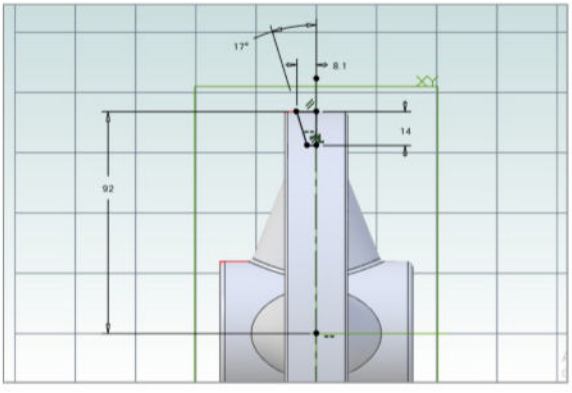


Fig. 15. Dimensions for the vee groove

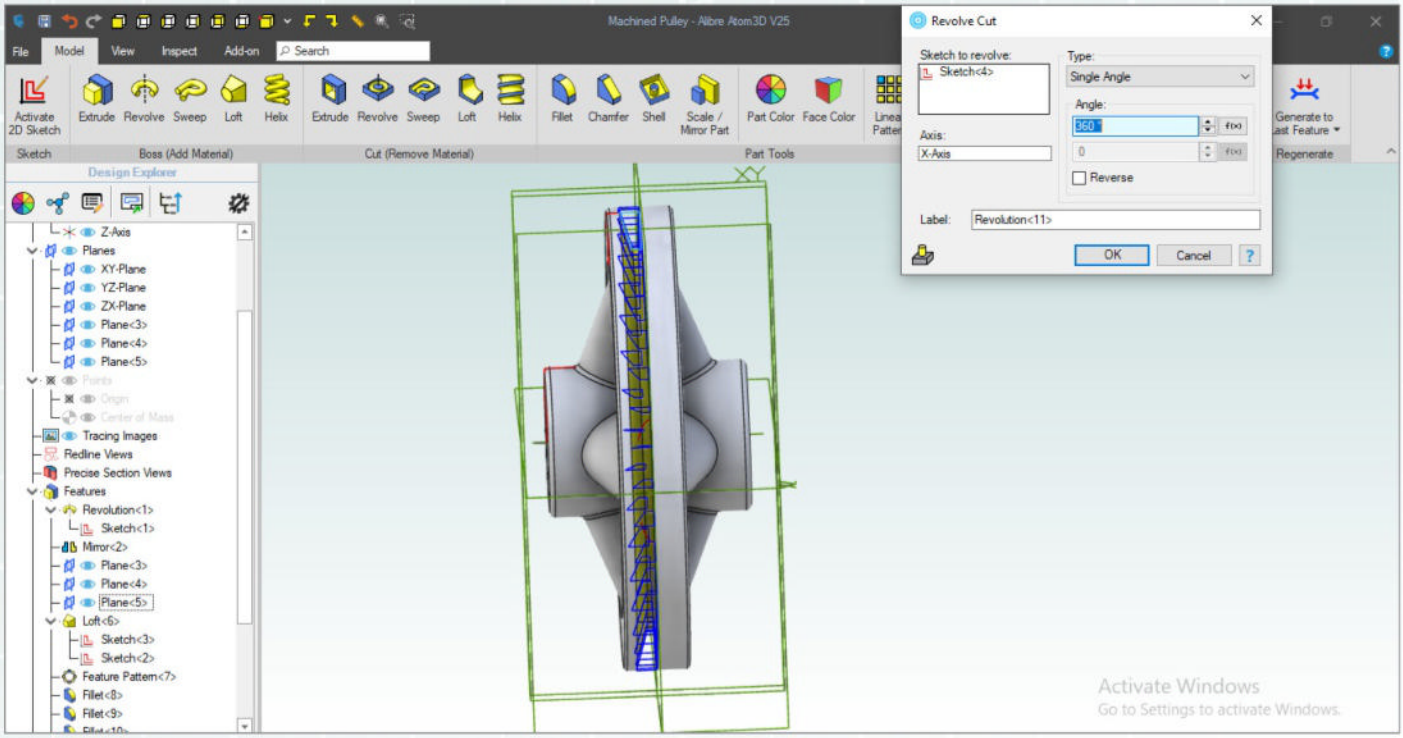


Fig. 16. Preview of the revolve cut

get the cursor onto the areas where you want the radii to be. Do this by holding down both mouse buttons and sliding the mouse around. The created part is now ready to be saved as the casting model.

Sharper readers will be muttering that I have not put any draft angle on the casting or made any allowance for shrinkage. In my defence, I didn't want to cloud the techniques I am demonstrating by putting draft angles on things. As far as shrinkage goes, these days the clever CNC machine operators can change tool offsets so that the item being machined can be slightly oversize. This means that this one casting file can be applied to a variety of materials, as it represents what is needed as the cooled casting and can be used for making the pattern to suit any material. Clever stuff!

So, save the work so far, naming it something like 'Pulley Casting'. Then, straight away, save it again as 'Machined Pulley'. This will avoid any issues if the program does an automatic save — or if you, yourself, do a save without realising that you have saved into the wrong file.

Cutting into the metal

Here we go, making chips of hot metal fly around as we machine the casting in important places such as the vee groove and the bore. No mess for us to clean up, though. It just magically happens on screen.

Click on the Activate Sketch button and select the XY plane to sketch on. Be careful not to select one of the reference planes we created earlier. Use the Line tool to make the sketch as shown in Fig. 14. Notice that it is just one half of the vee groove. We will mirror the groove to complete it, and this will ensure that it is symmetrical as well as in the centre of the rim. Notice that the sketch lines are a bit all over the place. That is so that they can easily have constraints applied to align edges with the centre and other lines. As they move to where they are to be constrained, it is easy to see if any have not been constrained. Also, the lines are all different lengths so are unlikely to be presumed to be and automatically constrained.

Making chips of hot metal fly around as we machine the casting in important places … No mess for us to clean up, though. It just magically happens on screen

The only aspects snapped to the lines when they were drawn are vertical and horizontal constraints to lines that we know from the outset will be like that. Hopefully that is clear; if not, perhaps read the last paragraph again. Understanding now how constraints operate will save a lot of grief later on!

Applying constraints

So, back to our sketch. Applying constraints, whether they are dimensions or collinear with other lines or whatever, is the next step to complete the sketch. First, use the Collinear Constraints tool to make the vertical line of the sketch collinear with the vertical centreline of the pulley — that's the line that goes through the origin point. We could make the upper horizontal line that we sketched collinear with the top edge of the pulley, but it makes more sense to dimension it back to the centre of rotation of the pulley so that it is a measurable dimension for machining (Fig. 15).

Trim off the excess bits of the sketch lines using the Trim tool in the Sketch Tools section of the toolbar

ribbon. It is then just a matter of dimensioning the width of the vee groove at the top and the angle of the sloping side. Click Deactivate Sketch.

Next, select the Revolve tool from the Cut (Remove Material) section of the toolbar ribbon. Select the rotation axis for the cut by clicking on the centreline of the pulley (Fig. 16). If the preview looks right, click OK.

To make the full groove, click on the Mirror tool and select the YZ plane. Remember to click the Mirror Plane panel in the dialogue box first. A preview will appear. If it looks right, click OK.

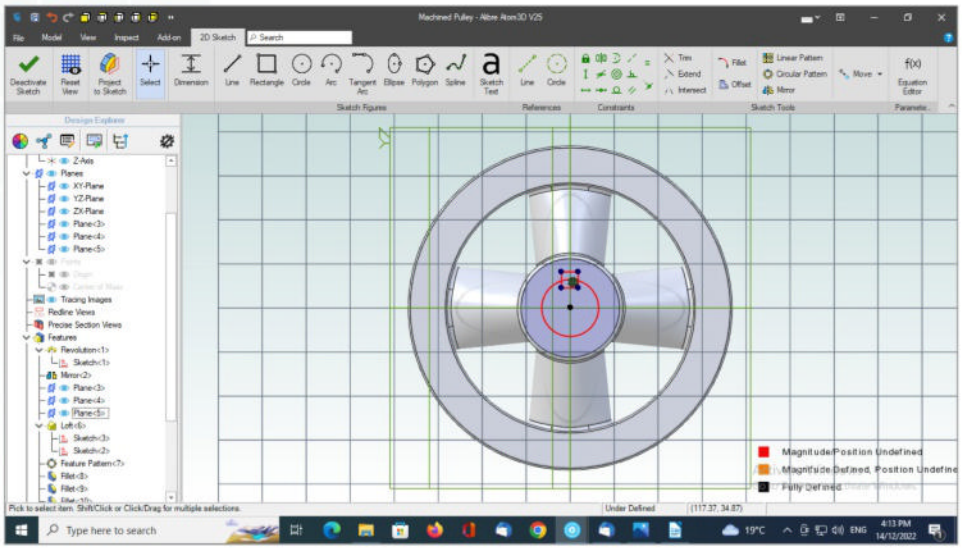


Fig. 17. Basic sketch for the bore and keyway

The hole thing

The bore through the centre is something that can vary to suit the shaft it will be fitted to. Pulleys are often sold with the vee groove machined but just a pilot hole through the centre so that customers can bore them to suit their application. However, we will machine this pulley's bore as if we know exactly where it will be used.

Click on the Activate Sketch button and select one end of the boss as the plane to sketch on. Use the Circle tool to draw a circle with its centre on the origin point, and use the Rectangle tool to draw a rectangle for a keyway as shown in Fig. 17. Dimension the sketch and trim away surplus line (Fig. 18). Deactivate the sketch and select the Extrude tool in the Cut (Remove Material) section of the toolbar ribbon. In the dialogue box that appears, select Through All for the type. Click OK and the bore is done, complete with keyway.

Grubby

There are usually tapped grub screw holes over the key and, at 90 degrees to it, through the boss of the pulley. We can do this by creating reference planes again. Select the Plane tool from the References section of the toolbar ribbon. We will use the offset type again. Select the XZ plane and an offset of 30.5mm. This positions the plane just slightly above the surface of the boss diameter. Click Apply, then close the dialogue box. Click the Activate Sketch button and select the plane just created. Using the Circle tool, make two small circles as shown, with their centres on the horizontal centreline, and dimension them as shown (Fig. 19).

Select the Extrude tool from the Cut (Remove Material) section of the

Understanding now how constraints operate will save a lot of grief later on!

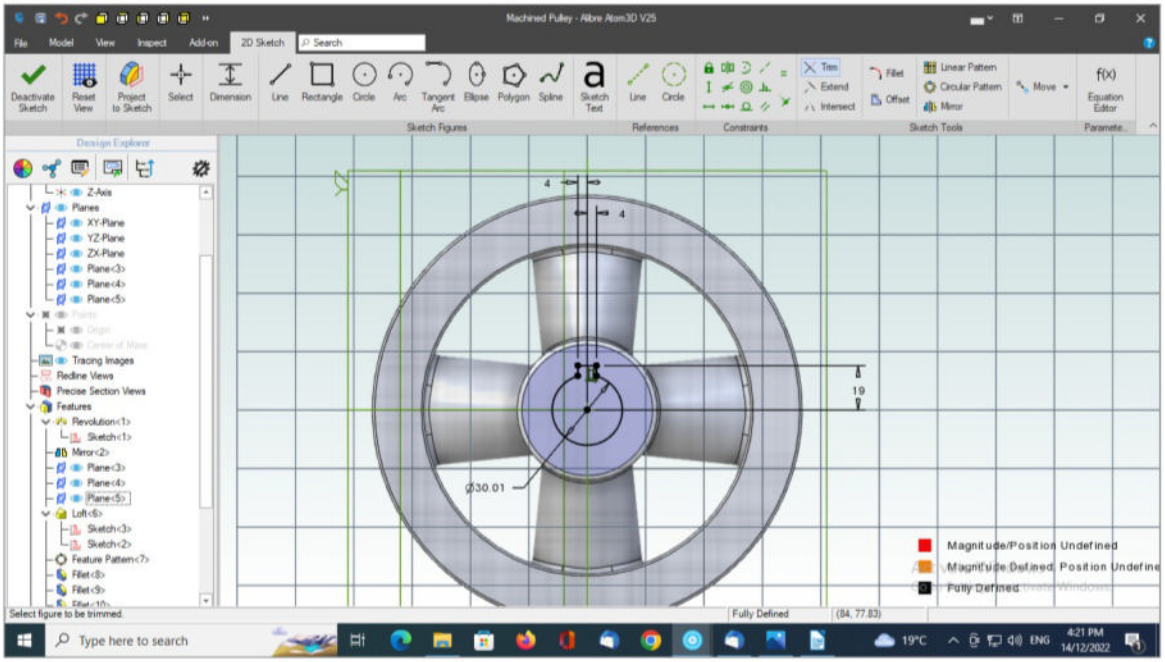


Fig. 18. Dimensions for the bore and keyway

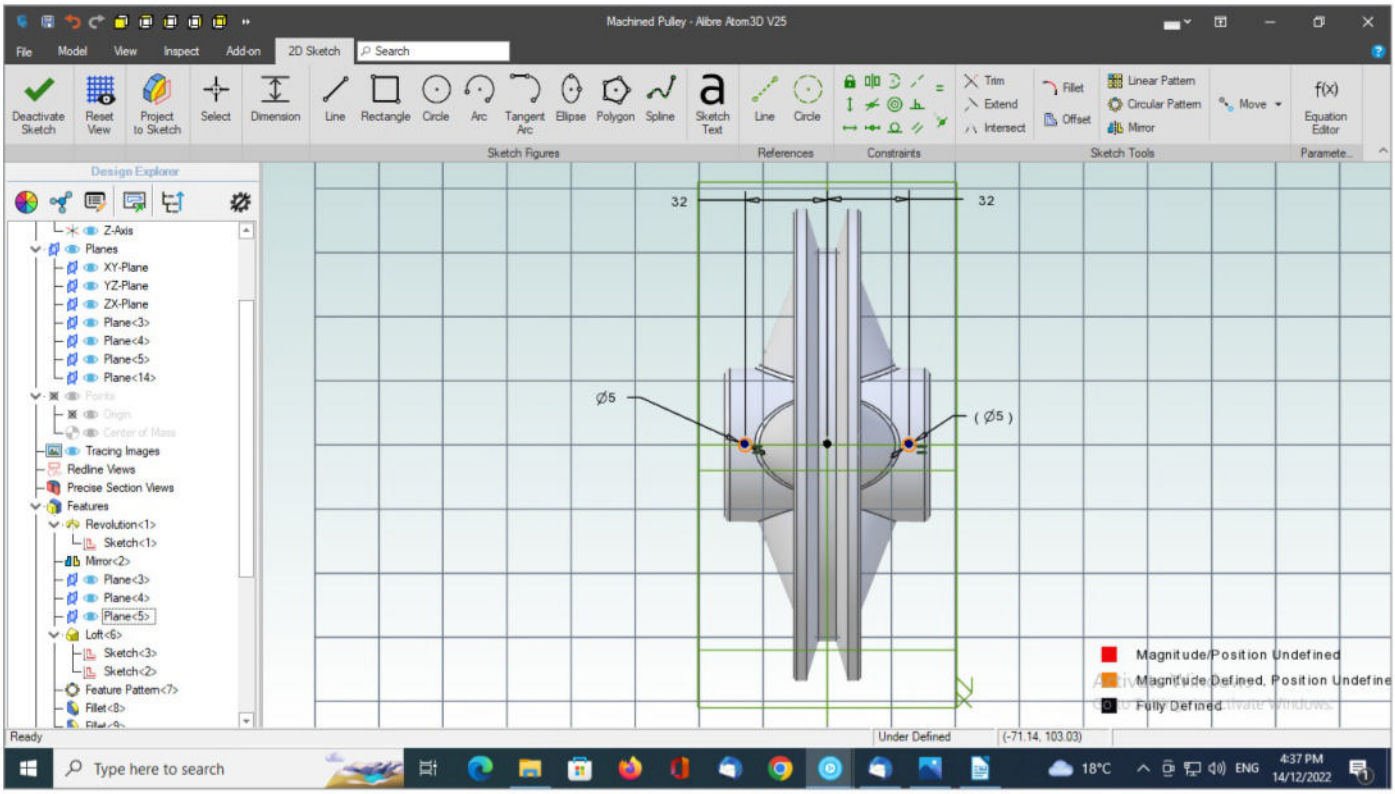


Fig. 19. Grub screw holes

toolbar ribbon and in the dialogue box select To Depth as the type of cut. Set the depth to 16mm. Take a look at the preview and take note of the direction the cut is set for — it could be cutting thin air instead of cutting the hole into the boss. If this is the case, click the Reverse box. You will notice an arrow on the pulley image; this will indicate the direction of the cut. Click OK when ready to commit, and the holes are done.

Repeat this to make two identical holes at 90 degrees around the boss for a second set of holes. This time, project a plane out from the XY plane.

Well spotted

Sharp-eyed readers will be scratching their heads and asking why these are not tapped holes. That is a very good question. I have dimensioned them as 5mm drilled holes, as that is the tapping size for M6 screws. Unfortunately, Alibre Atom 3D does not have the ability to specify threaded holes. To include that capability would involve a lot more cost and require a lot more processing ability from your home computer. I guess the line has to be drawn somewhere. It's not a big deal — just a bit annoying when you want to create tapped holes or screws. There is a way of making threaded components in this software, and it is fine for larger parts that you are putting into an assembly image. I will go into this at a later date.

Hopefully, you now have a finished, machined vee pulley much the same as Fig. 20.

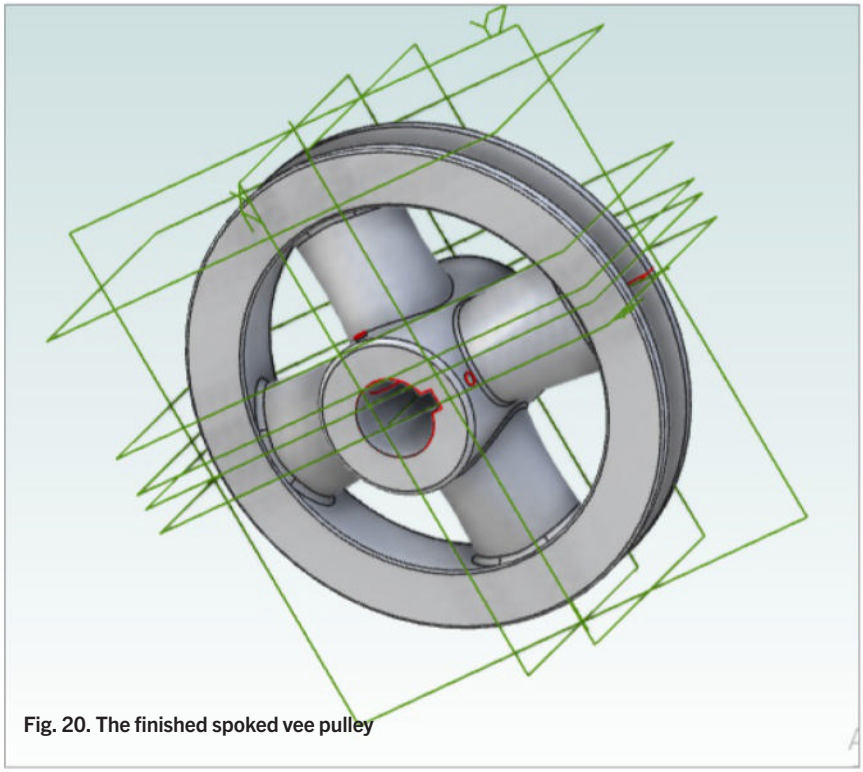


Fig. 20. The finished spoked vee pulley

What have we learnt?

That you can do lofting at ground level and produce smooth, flowing shapes at the touch of a button; that there is more to planes than the ones we queue up to have a ride on; that your own skills have built to a level at which you feel you can create almost anything.

(Hopefully, you have kept your copy of *The Shed* Issue No. 106, which contained an article about legally protecting your inventions!)

Coming up in part six

We discover the Sweep function, a handy tool for lifting lofts to a new level.

The welding bay

A SHED FOR ALL SEASONS

Work begins on an envy-inducing ultimate shed

By Des Bromilow
Photographs: Des Bromilow

Photo 1b. Ronson

This article outlines the design, planning, construction, and internal fit-out of a shed at my property in Australia. I have a varied range of interests, including machining, welding, casting, robotics (CNC, electronics), woodwork, and composites. Over the years, I have made do by storing my tools in garden sheds and working either on the veranda or in the driveway. When we purchased this property, one of the selection criteria was a decent-sized backyard to permit a dedicated shed for me to work in. I've tried to keep the concepts outlined in this article fairly general in their direction, so it will fall upon anyone looking to copy design elements to tailor them to their local conditions and regulations.

Design

The shed design involved the floor plan, storage options, height of door, mezzanines, and hot-works area. It started with determining what space I had available on my house block, and the constraints of shed construction imposed by the local council and planning regulations. I then started modelling shed layouts using grid paper and some small-scale footprints of the machines I expect to use — milling machine, lathe, shaper, drill press, bench for desktop machines, and so on.

Several layouts were considered, and the one settled on was based on a long, narrow shed with metalworking tools along one side and woodwork and general work on the other side. The metalwork side was also designed so that long stock coming out of the lathe headstock would pass over the shaper / drill-press area.

Another feature incorporated into this layout was that all grinding works — bench grinder, tool and cutter (T&C) grinder, etc. — were located far from the slides of the big lathe and milling machine, and separated from the slides of the desktop machines by a partition wall. Photo 1a shows the design sketches used to determine the floor plan.

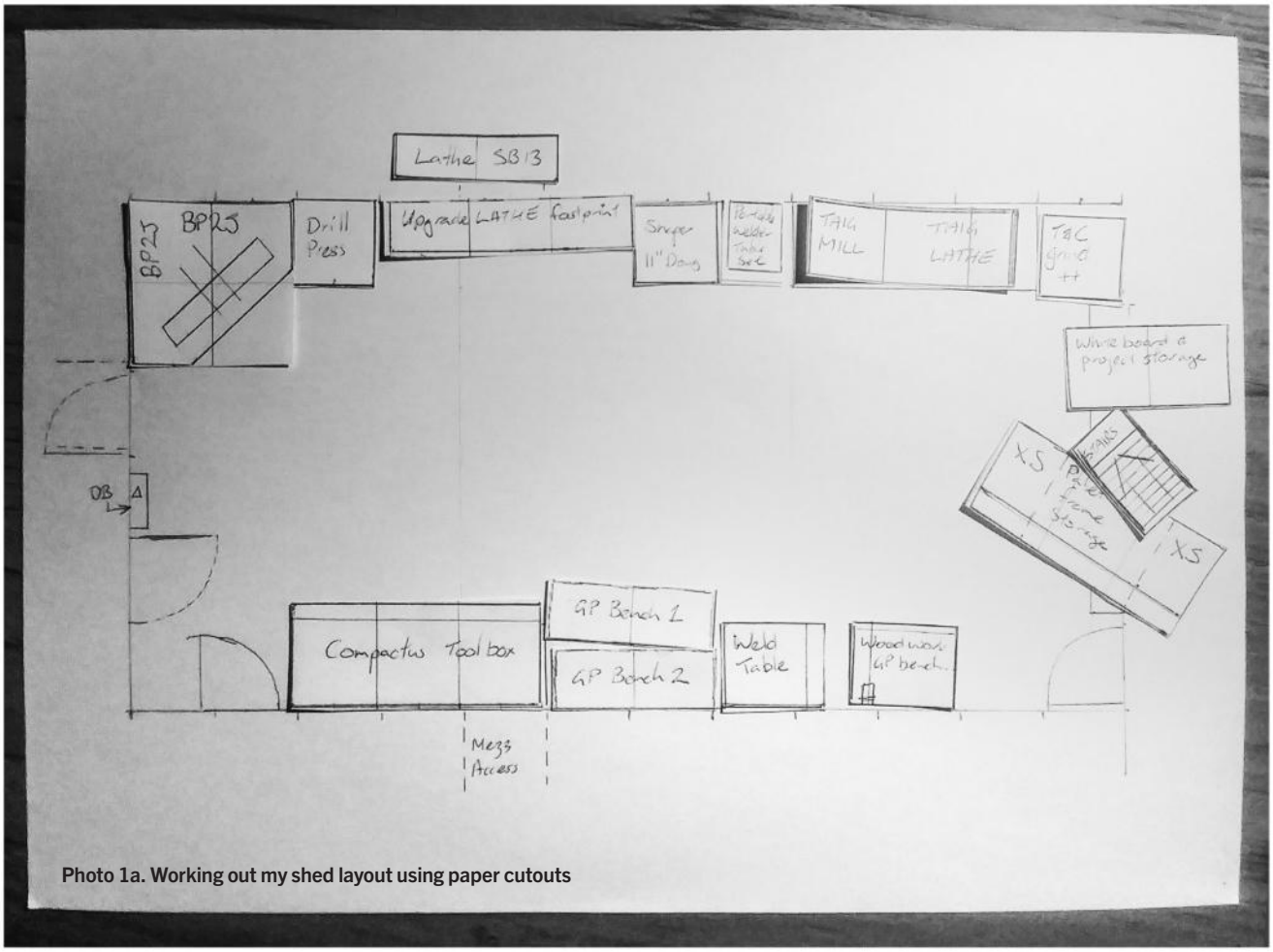


Photo 1a. Working out my shed layout using paper cutouts

Separate areas

I dabble in electronics — microprocessors, robotics, and CNC — so an area designed to support that work was needed. The available space lent itself to creating an office or clean room separated from the main workshop. This was designed to capitalise on the space left over after allowance was made for the rainwater tank. The office is nominally 3x4m and has a stud wall between itself and the remainder of the workshop. A door reduces debris from the main workshop from entering the room, thereby reducing the chances of metal filings getting into any of my electrical projects.

Since I do a reasonable amount of hot work — namely, welding, forging, and casting — I tried to make sure that my shed had an area designed to minimise fire risk, while providing storage and working space. This area is known as a 'hot-works area', 'welding bay', or 'Ronson's cave' — Ronson is the name of the baby dragon that is the resident shed mascot for hot works; it was named after the Canadian World War II armoured vehicle. Photo 1b is an image of Ronson.

My hot-works area

The hot-works area is outside the main workshop so that I do not have to worry about where the grinding sparks go. It is 6x4m with a concrete floor, and a roof above that.

The bay is designed for welding and forge work. I have never been able to accurately estimate the effect of rising heat from my furnace, so I planned the casting area not to have a roof over the top, and for the floor to be suitable for use around molten metal. ▶

The hot-works area is outside the main workshop so that I do not have to worry about where the grinding sparks go

The welding table being moved on a pallet jack with modular stand

Photo 2. Fired red clay pavers (traffic rated) are used under the furnace to prevent spalling from the heat

> I was concerned about being able to drive heavy vehicles into the workshop

Given that concrete will explode (spall) when exposed to heat, I chose to pave the casting area floor with fired clay-based pavers instead of cementitious-based flooring materials. The clay pavers should not spall when exposed to heat, but, if they do crack, replacement is a simple case of levering up the damaged paver and replacing it. The paved hot-works area is shown in Photo 2.

I did consider a cinder floor as an option, but, given that the hot-works area forms part of the entrance to the main workshop, I was concerned about being able to drive heavy vehicles into the workshop. The absence of a roof over this floor meant that rain falling on a floor made of compacted material would cause the floor deteriorate in a short time and require constant maintenance.

Storage

With the main areas of the shed planned on the basis of expected usage, the issue then was storing the various materials, partially completed projects, and other things I seem to accumulate.

Looking at comparative pricing for sheds, and the constraint imposed by my available footprint, I considered designs based on wall-mounted shelving, mezzanines, and other storage options above the main floor. There was a marginal increase in cost between a high-walled shed with shelves above the work area and a shed with a proper rated mezzanine floor (Photo 3).

The higher roofline brought other

Electronics bench in the office / clean room

benefits, including natural cooling during the Australian summers, no foreseeable height restrictions on moving machines within the shed, and implications for the design of the rainwater tank. Those benefits outweighed the slight cost increase.

A rainwater tank was designed — part of the energy-efficiency rating scheme used in my local council — and I designed the tank stand with a storage enclosure underneath it (Photo 4). This gives me a decent head pressure for the collected water and allows me a storage option for gases, flammables, and other materials that I might wish to store outside my main workshop space.

Photo 4. The tank stand is closed in as a small detached shed for storing dangerous materials

Council sign-off

The basic design was settled then proposed to the council planning authority for endorsement. Once endorsed, the design sketches were passed through an engineering company for design and certification. The certified design was then submitted for building approval, and I arranged detailed fabrication design and quotes from a number of manufacturers.

The final design has a wall height of 4m, with a ridge height of 4.6m. The main works area is 12m long and 6m wide, and the hot-works bay is 4m long by the same 6m wide. The roller door between the workshop and the hot-works bay is 3.4m high and can comfortably allow entry of a four-tonne Hiab truck. The office located at the other end of the workshop is 3m wide and 4m deep.

The engineering design took into account other elements, including slab design, ground considerations (active soil), and various loading forces. ▶

The issue then was storing the various materials, partially completed projects, and other things I seem to accumulate

Photo 3. Strip mezzanines were incorporated into the design

Photo 6.

Photo 7. Single M16 ferrule for floor anchor

Pad and slab

The area where I live has soil containing some clay, and this means that the ground type had to be factored into the engineering design of the shed floor.

When I gave my sketches to the engineer, I indicated that the main floor was to be 100mm thick everywhere, except where the machines — milling machine, lathe, etc. — would be; those areas were to be made 150mm thick.

That thickness was taken from the bolt-down instructions for the Bridgeport milling machine. I have seen too many sheds with floors only 75mm thick that were cracked when large machines or vehicles were brought in.

The engineer suggested that concrete was relatively cheap, and that having steps or level changes in the floor would aggravate the concreter more than the cost of extra concrete. I ran the models of the concrete volume/cost, and decided to make the floor a uniform 150mm thick. That way, I would not have to worry about where things were put in the future.

The engineer then designed the various thickened beams, which add stability and strength to the shed, and the floor design was complete.

Floor features

The biggest feature of the floor is the inclusion of a number of Elephant Foot

I can use the points in the floor to pull a disabled car into the workshop, pull a chassis straight, anchor a lifting frame, or whatever I want

Photo 5. M12 nest after floor curing

Elephant Foot ferrules come in a variety of sizes and are reasonably priced

ferrules (Photo 5). Originally designed for creating threaded holes in cast panels for tilt-up construction, these ferrules were cast in the floor on a grid pattern of 2x2m. Each ferrule is able to take the load of an M16-grade 5.5 bolt in shear and tension. I can use the points in the floor to pull a disabled car into the workshop, pull a chassis straight, anchor a lifting frame, or whatever I want. Each ferrule added A$10 to the cost of the shed — another small investment to add considerable versatility to the building. I added a few ferrules near the roller door for locking the roller door in place, for increased security, and in two locations added a nest of M12 ferrules in a 200x200mm square arrangement. These nests will be used for anchoring floor-mounted tools such as pipe benders or vices (Photo 6).

In Australia, the ferrules are available through Reid (https://reid.com.au/product/elephant-foot-ferrule), which can supply the ferrules, chairs, caps, and reinforcing bars needed (Photo 7). All up, the ferrules added A$200 to the cost of my shed, whereas the aftermarket roller-door locking options would have cost A$140 each — so the small investment has already paid off.

Pouring the floor

The shed project has been progressing for several years, each step in a sequence leading towards pouring the slab for the shed.

I cleared the land — removed all the overgrown native garden the previous owners had left, and then removed the underground reticulation pipes in the area. As part of the fencing rebuild, I put in a retaining wall, which allowed the area to be levelled properly.

Once the ground was level, I marked out the borders of the shed slab, and had the topsoil removed. Typically this is done only to a depth of 100mm in my area, but, due to the clay soil underneath, and my intent of making the footing work easier, I removed all soils to a depth of 300mm — 500mm in the tank-stand area — and had the soil replaced with compacted yellow Brickies sand. This sand is free of any organic materials and forms the pad under the slab.

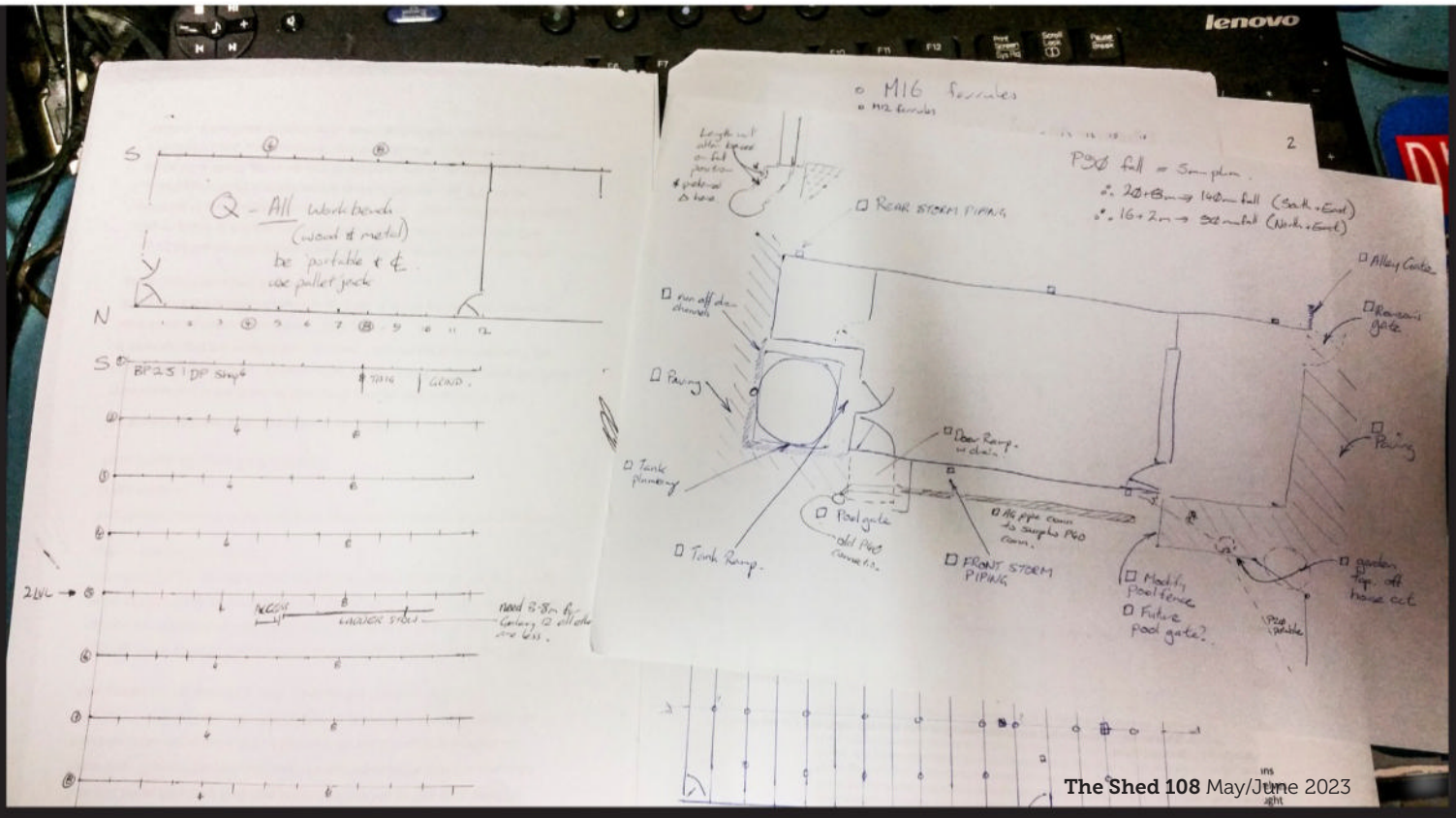
Prior to the sand being placed, a pest-control treatment was undertaken to protect against termites. This treatment was repeated just before the plastic sheeting was installed for the concrete pour.

Photo 8. Ferrules are placed with the reinforcing prior to pouring the concrete floor

Slab formwork

With the pad prepared, the concreting contractor dug the footing beams, installed the formwork, and laid down the moisture barrier — 200μm plastic sheet— and reinforcing mesh. I installed the Elephant Foot ferrules (Photo 8).

After another termite treatment, the concrete was poured in. The slab was



By having a gap — typically 5mm — the corrosion risk is removed

sized so that there is a gap between the edge of the slab and the back of the overlapping sheet metal cladding. This is a deliberate design choice, and prevents the cladding sheets touching the concrete. A number of people erect a shed, including cladding, on a dirt pad, then pour the slab to the wall sheets, using the wall sheets as formwork for the slab. That is a cheaper option, but the alkali concrete corrodes the cladding where they touch; in approximately 10 years, the owner is replacing the bottom of the cladding sheets. By having a gap — typically 5mm — the corrosion risk is removed. The gap was later closed with bitumen-impregnated foam and flashing tape to stop vermin, and so on, entering the shed under the cladding.

The floor's finish

The concreting contractor was consulted regarding the finish of the concrete for the floor. I was particularly concerned about having slip hazards. ▶

The north mezzanine is filled with shelves of crates for material storage. The shelves are made using the offcuts from lining the shed

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Building a shed?

Here's a product to consider

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After the rain events at the beginning of the year, no one will need reminding of the importance of installing a fit for purpose drainage system when you're building your shed. All those tools and projects deserve a little extra attention to protect them from the possibility of water damage. Connecto Trade's Dux Plastics water drainage systems are just the ticket for Kiwi sheddies — the interlocking modular surface water drainage systems are made from UV stabilised recycled materials designed in New Zealand for our climate. The channels are available in 1m or 3m lengths that can be cut and connected at 100mm intervals, offering the flexibility to suit any project.

A range of sturdy grate styles has a 5-tonne vehicle load rating. Accessories include patented support brackets to strengthen the joins between channels, adaptors to enable components and offcuts to fit together without the need for silicone, and solvent weldable 100mm end and bottom outlets which make assembly to New Zealand pipes faster and easier. Belgium-based Dux Plastics have been designing, manufacturing, and distributing in NZ for more than 90 years. Check out Connecto Trade for more info: www.dux.co.nz.

Photo 9. The conduits for power, communications, and the storm-water pipes were trenched in once the slab had cured

The main workshop and office area have a tooled burnished finish — as typically used in house slabs. This means that I can roll machines around easily, and do a good job of sweeping the floor. The hot-work area has a trowelled finish — slightly rougher, and non-slip when wet. I can sweep it easily, but there is always a slight residue of dust due to the surface. I had considered what is called a 'broomed' finish, but determined that it would be too rough to sweep easily, and would make moving the furnace harder. My furnace weighs more than 700kg and moves on four wheels — two of which have steel tyres — so floor roughness is noticeable.

Some other features of the floor are centred on the floor of the tank-stand shed and the drainage around it. Once the tank stand was in place, I cast the mass footings, then added some electrical conduit between the inside of the tank shed and the main shed. This conduit was sized so that electrical and alarm cables can be run between the buildings. The floor and drains of the tank shed and interposing space (pavements) were all cast as one piece. The pavement has a cast in-drain channel, and all surfaces slope to direct water away from the shed foundations and into drains, which take the water away from the structure and into the storm-water piping.

Drainage, power supply, etc.

Once the main shed slab had been poured and cured, work was completed on the storm-water piping and other conduits in the trench that goes to the shed. This trench contains the main storm-water pipe, two 50mm communications conduits, and a 50mm heavy-duty electrical conduit, which contains the 16mm^2 three-phase

Photo 10. Cable ladder is affixed in the frame before cladding is put up

electrical sub main cable (Photo 9).

The communications conduits are designed so that network cables — fibre and copper — alarm cables, and other extra low voltage (ELV) cables can be run between the house and the shed. This means all bends are the 'sweep' bend type, which maintain a radius that is suitable for fibre-optic cables and make pulling cables through much easier.

All conduits are trenched in at the appropriate depths and separation distances, as dictated by the relevant electrical standards. This compliance to standards includes underground marker tape, mechanical securing, armouring at above-ground locations, and suitability of bedding sands.

Shed erection

The shed erection involved marking out the slab for the ChemSet anchors, drilling and setting those, craning the columns into position, attaching the rafters, and tying the portal frames back into the other frames via the purlins and girts.

This shed was too big for me to erect by myself, so I engaged a local contractor to assist me. Several small issues were found during the erection, and these were fixed on the fly — often by cutting and welding, and in other cases by simply adding members to the structure. ▶

Photo 11. Magnets with survey tape flags are used to hold the sarking in place during construction

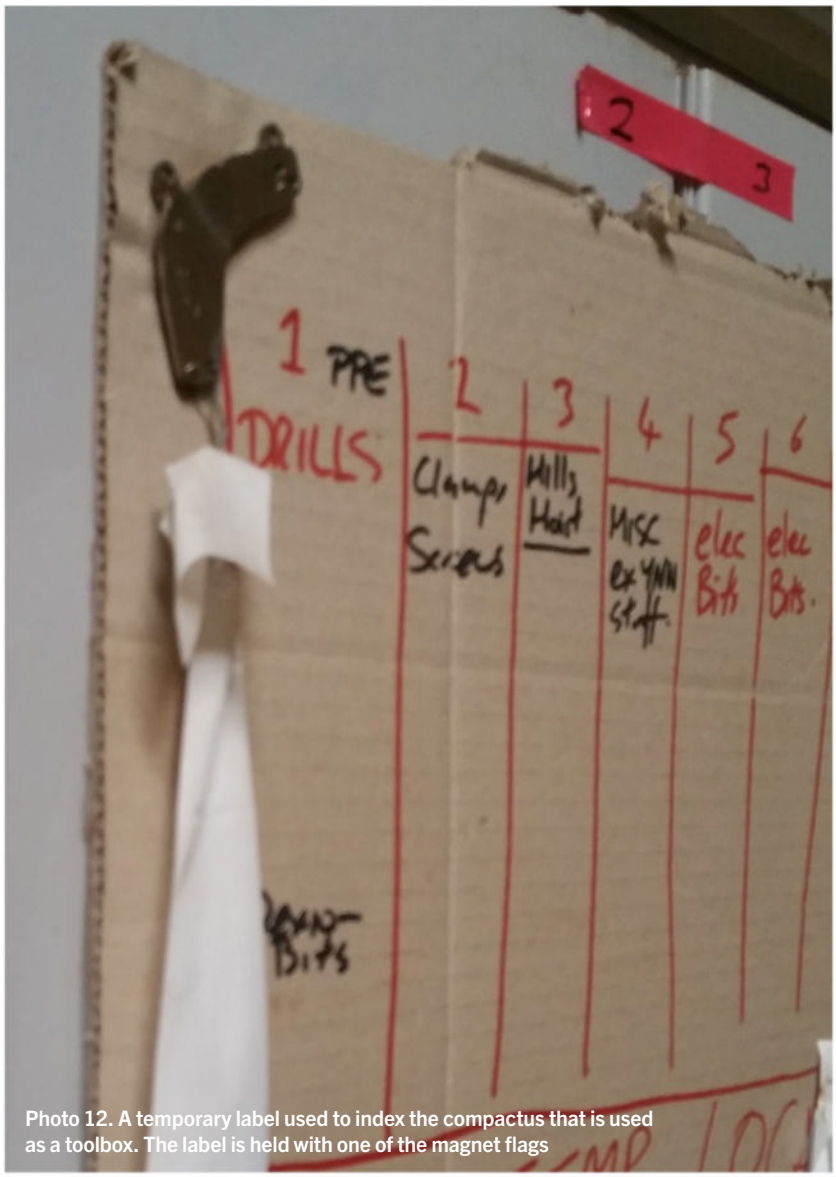


Photo 12. A temporary label used to index the compactus that is used as a toolbox. The label is held with one of the magnet flags

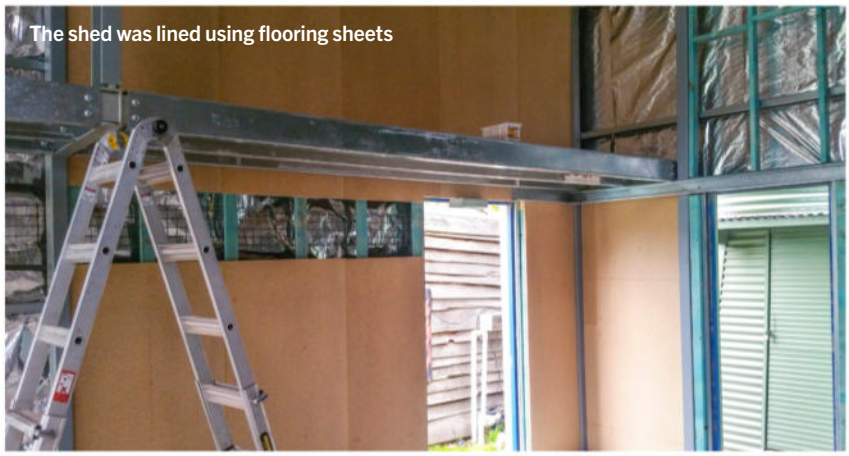
A few extra elements were added while the frame was being put up, including a folded mesh cable ladder up each side of the main workshop (Photo 10), mounting girts for the switchboard, and some headers in the welding bay. These headers are to add shade in the open bay but with minimal impact on ventilation or heat loss.

Post frame

Once the frame was erected, a layer of sarking was installed on all walls to act as an anti-condensation layer. The sarking reduces the condensation a little via its small insulation effect, but mostly serves to direct any condensation between the cladding sheet and the sarking, keeping the girts dry and preventing water coming into contact with the internal lining. The sheets of sarking were covered by the external cladding, which was screwed to the framing as per normal practice (Photo 11).

Tip: manhandling pieces of sarking and 4m long pieces of cladding can be difficult; using a number of magnets made it possible to hold the sarking in place, and then affix the cladding without having the sarking move. We used old hard-disk magnets, with lengths of survey tape added for increased visibility (Photo 12).

A note about the cladding: consultation with my neighbours as part of the planning process included asking about colours and visual impacts. My nearest neighbours requested that the wall facing them be matched to their fence and roof — easy, as nearly every fence and roof in the district is that same green colour. I was concerned about the wall facing my own house. At 12m long and 4m high, a solid block


The shed was lined using flooring sheets

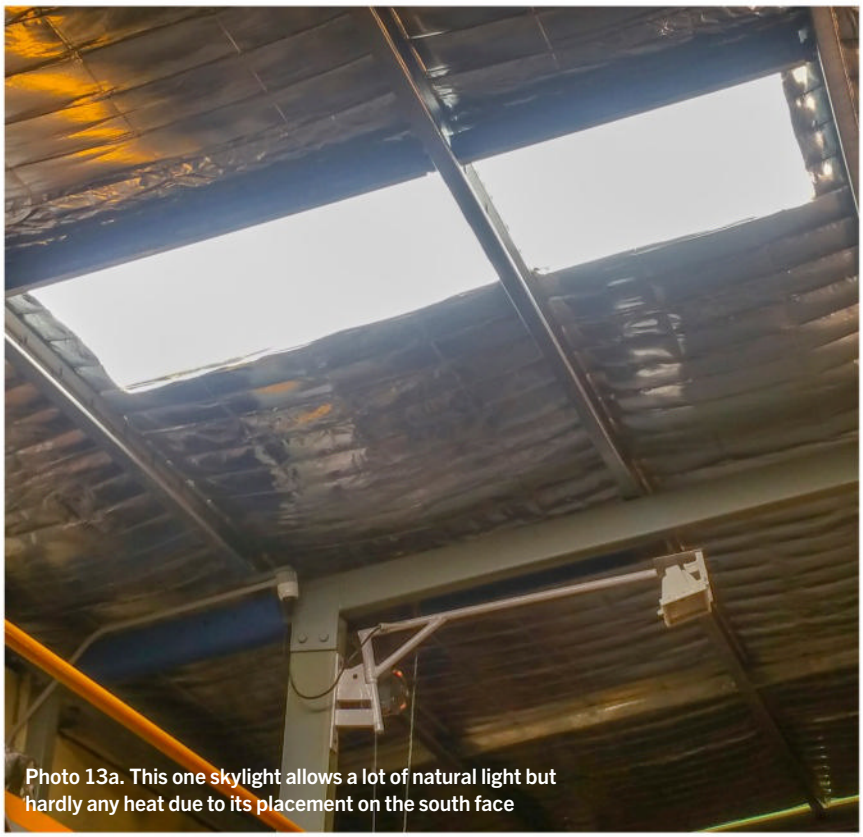


Photo 13a. This one skylight allows a lot of natural light but hardly any heat due to its placement on the south face

of green would be visually intimidating, and make the distance between the house and shed seem smaller. It is accepted that light colours visually open up a space, so I made that wall cream coloured — as much to visually alter the space as to help with the sun exposure, as this wall faces north.

Translucent roof panels

Another tip regarding sun exposure came with the roofing. A lot of people fit a translucent panel in their roof as a way of getting natural light into the shed. I placed one sheet of fibreglass sheeting in the roof — on the south-facing side.

Had I placed it on the north-facing side, I would have had direct sun, along with the increase in heat. By placing it on the south, I still get sufficient sunlight to work without lights, but a considerable reduction in heat. I put a short sheet of roofing metal under the fibreglass sheet where the mezzanine passes underneath. ▶

Photo 13b. The skylight allows sufficient light for working during the day. Mezzanines have safety rails with a single opening for access

It also had the cleanest and most uncluttered floor it ever will

Although this reduces the amount of light slightly, it means that a person up on the mezzanine is exposed to less heat; it also reduces fading of things stored on the mezzanine. This skylight — measuring 2000x700mm — provides enough light to the entire 12x6m workshop floor to enable walking around and non-detailed work (Photo 13a, b).

It is becoming a common practice in industry to place translucent sheets in the walls rather than on the roof to achieve a similar effect of increasing light without heat. Lining the shed walls made this option unsuitable for my shed.

Once the walls were clad, safety mesh was wired into the roof area, and the insulation was rolled on as each pair of sheets was lifted up and screwed down. After the roof sheets, it was ridge capping and flashings, doors, and gutters, which were added to complete the weather sealing.

Access doors

The roller door was fitted into position, and the personal access doors fitted into place. This was the minimum to get the shed lockable. Further security has been added, including strengthening to the doors and fitting better locking to them. The door openings were flashed in as part of the cladding work.

Flashings were needed on the underside of the roof where the welding-bay wall joins the workshop to prevent birds entering the shed. A Christmas laser projector was screwed to the wall in the welding bay, projecting against the roof and roller door, to prevent the invading swallow population from trying to roost or nest in the bay. This projector runs for three hours each evening, covering dusk and the hour afterwards, and has proven very effective at deterring the winged vermin without endangering native birds. As you can see in Photo 14, the laser covers a fair bit of the welding bay.

Finally, the shed was erected, weather tight, and lockable. It also had the cleanest and most uncluttered floor it ever will.

In part two of this shed build (Issue No. 109, July–August 2023), we will cover the design of the electrical layout and lighting strategy, and the lining of the shed, including options considered.

Photo 14. A cheap laser projector (shown left) runs at dusk to deter swallows from nesting in the roof

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A regular catch-up over a coffee with mates is a good thing!

FILL UP THE TANK! 2023

Some of us can go it alone successfully, but, to thrive, most humans need social interaction

By Mark Seek
markseek@rocketmail.com

I have been delighted by the response shown by the men who attended the monthly men's group Fuel Tank here in Christchurch at the Throttlestop Cafe. The most outstanding aspect for me has been the generosity of encouragement towards each other when clearly everyone is there because they have stuff going on or they have experienced personal hardships. Despite this, these men have found the capacity to listen and offer support without judgement or criticism. The blokes themselves agree that it has been worthwhile, relevant, and effective for them.

Prevention

A deep social connection is an essential foundation of a happy healthy life. Authentic community protects against premature death and disease. It sounds extreme, but it is true.

Loneliness is as much of a cause of death for men as smoking or physical inactivity is. Loneliness can cause changes in your body that make one more susceptible to disease, both physically and mentally. Everyone has the need to belong. It is biological. Loneliness is not a weakness. Loneliness is only a sign that your needs are not being met. You do not feel connected. You do not feel seen. You do not feel like you belong. Friendship, connection, and community are viewed as elective — but they are not! Connection is a true need; it is not something that can be ignored.

There are serious individual and society-wide consequences of not having close connections, of not being known and cared for, of not feeling significant. We men are hardwired for connection, closeness, and to talk through things, yet modern-day society is pushing us towards isolation — and men are bearing the greater part of the burden of this isolation. Research shows that isolation is detrimental to a man's happiness and well-being, to the degree that social isolation is now considered worse than smoking 15 cigarettes a day.

Most men struggle

While some guys can go it alone and do simply fine, most men privately struggle with life's challenges. Isolation only adds further pressure and emotional lows. An alarming trend worldwide is the degree to which a sense of isolation among men is leading to an increased rate of incarceration and suicide — much more so than for women. ▶

Even before Thelma and Louise drove their '66 Thunderbird across the screen, The Beach Boys had recognised the car's role in US culture. In this issue Sarah Kneebone's stunning 1966 Ford Thunderbird cruises through the pages of our magazine. An incredible example of Ford's personal luxury car, something that only Ford could call 'slim and sleek', reflects a shining era of Americana.

PLUS: The BMW Batmobile, an Austin 7 Special, the Lamborghini Gallardo, a visit to a Shelby shrine, another to the Queen Street car scene of the 1970s, lunch with ex–race team owner Murray Taylor continues, Kits and Pieces and a de Joux Mini, and a golden era of New Zealand car racing in both Motor Sport Flashback and Motorman.

The Throttlestop cafe, 127 Ferry Road, Christchurch

Benefits of a men's support group

With a group of supportive men behind them, many men experience the following benefits:

- more success in work and life
- getting through a divorce in a healthy way
- being a better father
- having a place to vent and lighten the load
- more happiness
- building real friendships with guys who share their values and goals
- a healthier romantic relationship
- improved mental health
- better communication with loved ones
- less money spent on other similar options: counsellors, coaches, and weekend men's retreats
- less time and energy spent than in trying to go it alone.

How do men need support?

We have seen that what the majority of guys need most these days is the opportunity to share what they are facing in life and how they truly feel about it. This alone in men's groups can take so much weight off men's shoulders and bring clarity to their situations.

If you ask most guys how they are doing, they will say, "All good, no worries" — unless they have a man cold! Even when things are horrible, most guys will say they are fine out of fear of being seen as weak. If they were being honest, at any given time, most would respond with, "Yeah, I am all right — not that great."

What is interesting is that, despite the wide variation in topics, many of the discussions apply to every guy in the room

We have found that a lot of men just need support by way of someone listening, empathising, and validating their feelings about whatever situation they are facing. Receiving perspective and guidance from other men in men's support groups is exactly how a lot of them need to be supported. This explains why so many men desire to discuss a variety of men's group topics. Nobody wants to need support, but the reality is that we all could use some empathy, perspective, and guidance at times.

What is discussed in men's support groups?

No two meetings are ever the same. Men will talk about whatever is most pressing in their lives, so the subjects change every week.

In general, though, there are some topics that get discussed more frequently, including:

- divorce and child custody
- communication in relationships
- career and purpose
- mental health
- work–life balance
- parenting and being a better dad
- health challenges
- grieving the loss of a loved one
- personal finances
- how to control emotions as a man
- being a better man.

What is interesting is that, despite the wide variation in topics, many of the discussions apply to every guy in the room. That makes sense, as although, at the end of the day, everyone finds themselves in unique situations, most of the issues or opportunities being discussed still fall under the umbrella of health, wealth, relationships, and so on. There are no new challenges in life.

All walks of life

Men come to men's groups from all walks of life. Some are retired, some are businesspeople; others are young dads, some struggling financially; some are fit, some are out of shape; some are single, others have big families. **However, in the men's support group, even with diverse backgrounds and beliefs, all the guys share a special something, including:**

- a strong urge to become a better man
- a desire to learn and augment personal growth
- a genuine pull towards more community and friendships
- a naturally motivated interest in helping others; making a contribution.

Even though these things are intangible — they cannot be measured — when it comes to your betterment as a man, these traits are everything.

I hope this has been insightful, or reminded you of those men/mates in your life and how valuable they are to you, and, more important, how special you are to them.

Cheers to the team at the Throttlestop Cafe and my colleague Christos. An up-to-date list of contacts/resources to support men's health and well-being can be found at: https://docs.google.com/spreadsheets/d/1UHW4cqS8fTjElDKk2G8FET05FGTYq0bP/edit#gid=109966448.

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THE SAND MACHINE

The creation of the Sand Machine — also called the 'Mandala Machine' — turned out to be quite complex

By Enrico Miglino
Photographs: Enrico Miglino

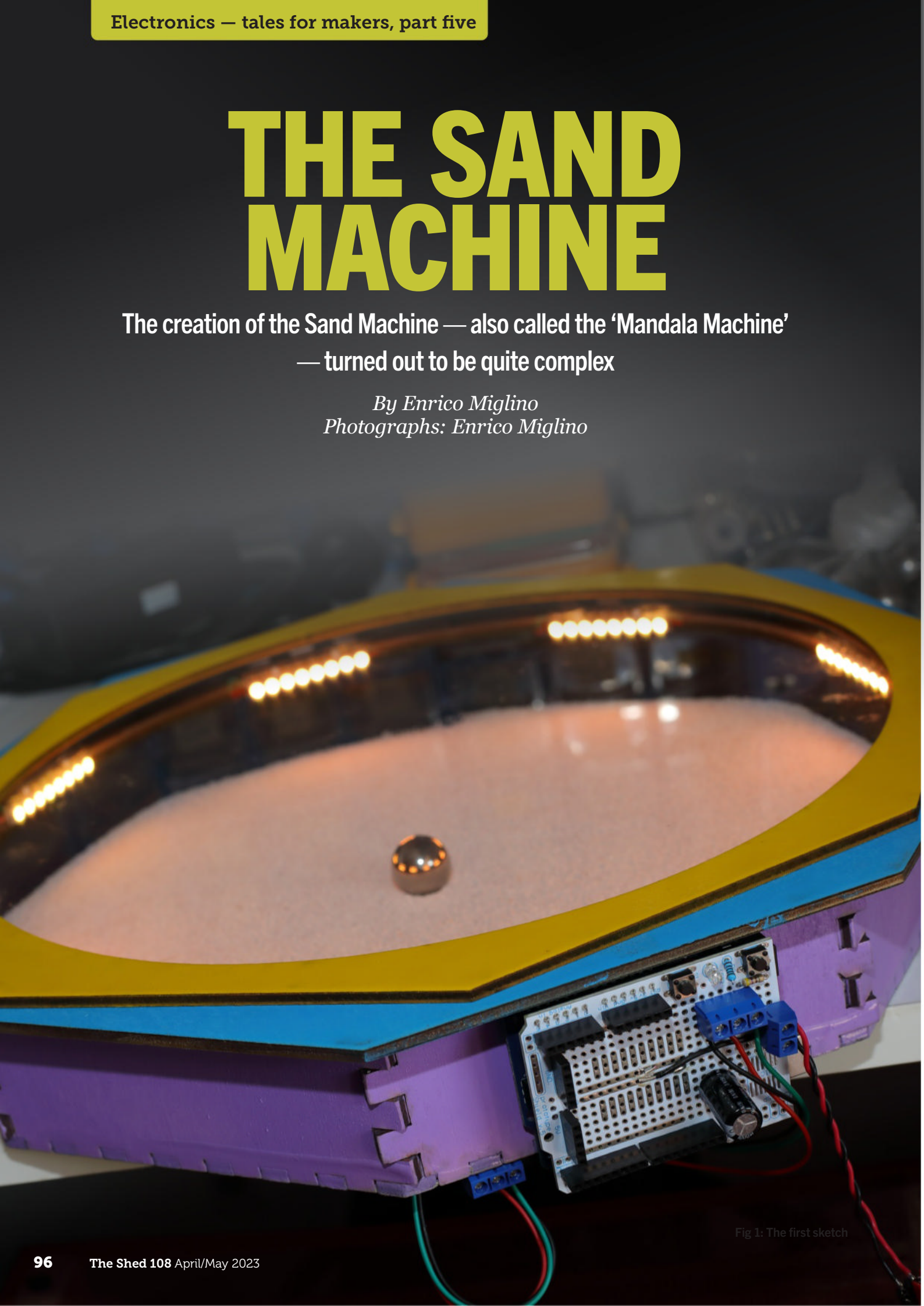
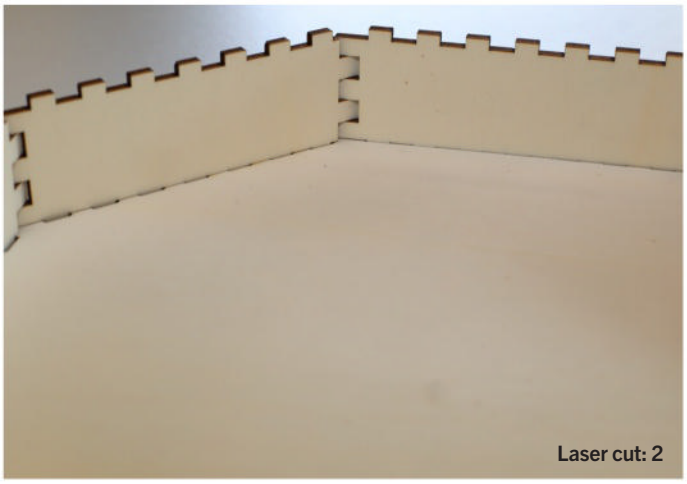


Fig 1: The first sketch



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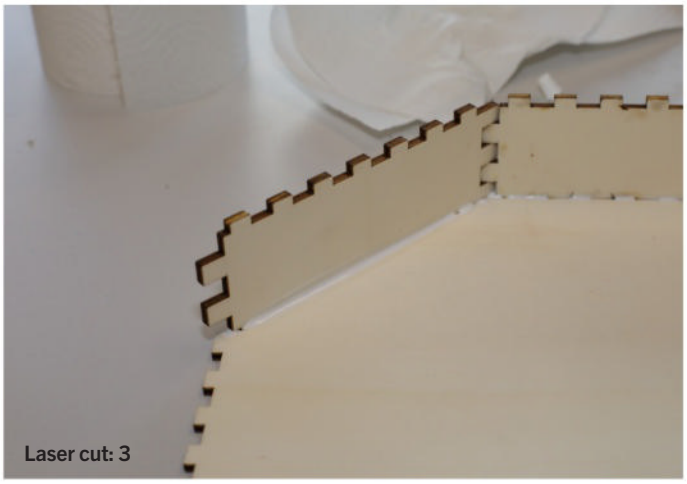

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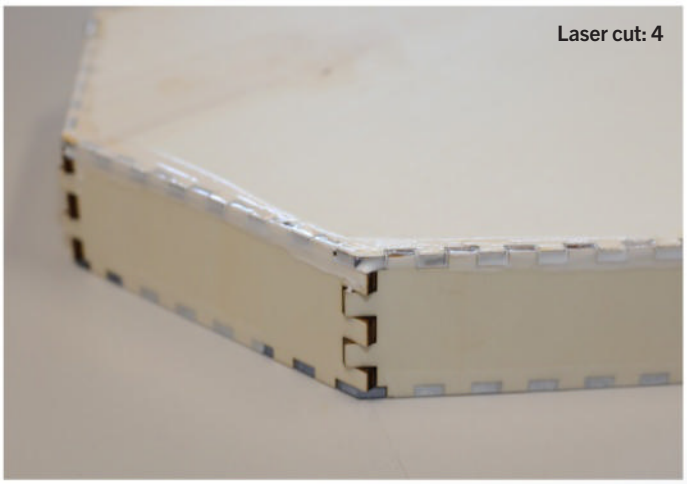

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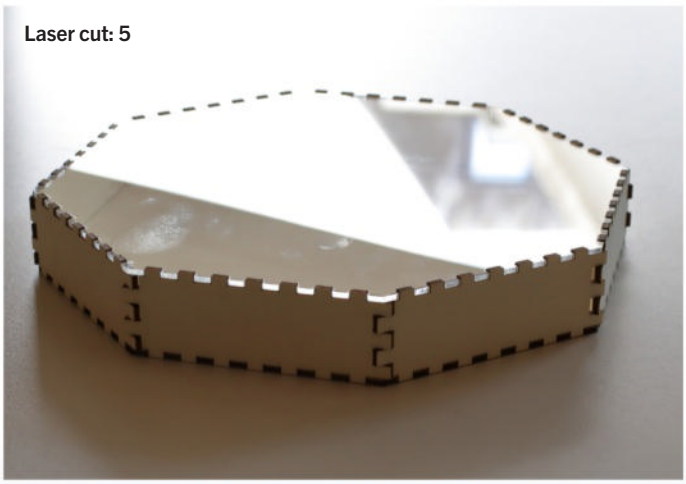


Laser cut: 5

To describe the project as simply and clearly as possible, I will explain it by referring to the images in turn, describing in detail the procedure, tools, and site references that I have used. The software components and the SVG designs for laser cutting are available as open source on GitHub (https://github.com/alicemirror/SandMachine).

Laser cut: 1

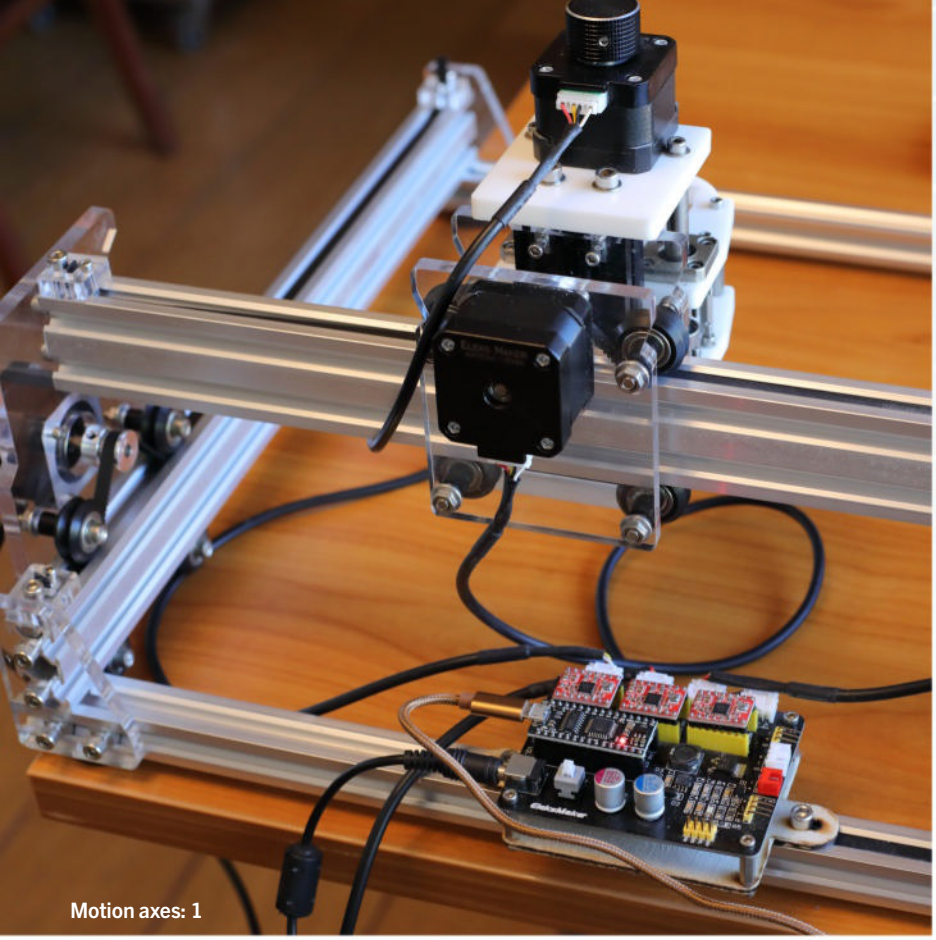
All the components of the octagonal container — the dome — and the box container have been created with 3mm plywood. The pieces have been designed using the online tool MakerCase (https://en.makercase.com). After setting the sizes of the box and the thickness of the material, plus some other details, from the website, you can download the vectorial file in SVG format that can be directly applied for laser cutting.

I chose the 'finger' edge option to design the structure, including the joints; it is possible to indicate the number of fingers, and, depending on the size of the parts, the fingers are resized accordingly.

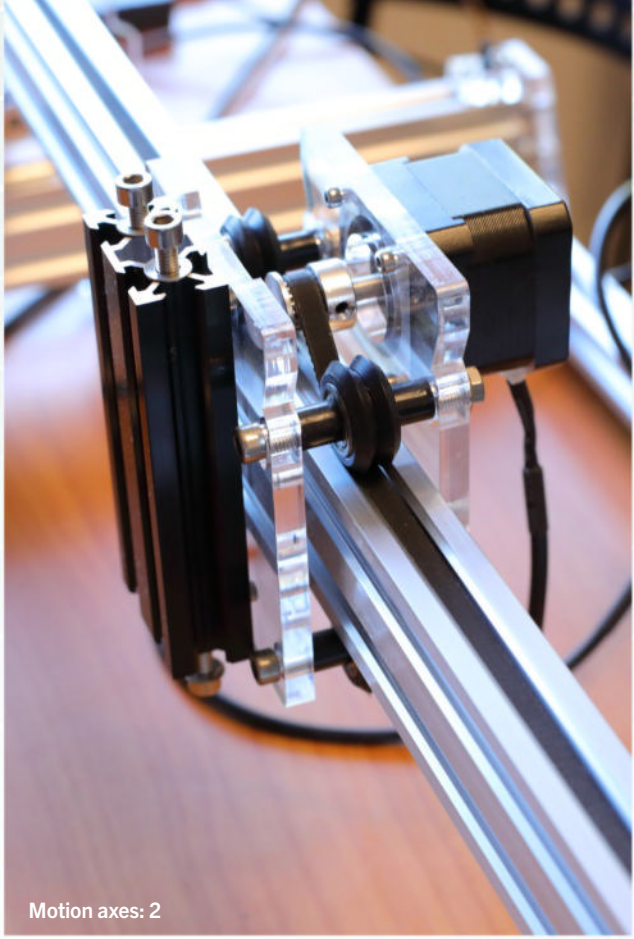
Laser cut: 2, 3, 4

These images show how to assemble the box. The structure was then glued on both sides with vinyl wood glue. This structure is the dome where the iron sphere should move on a thin slice of sand controlled by the three-axis machine to the bottom. ▶

Laser cut: 1



Motion axes: 1



Motion axes: 2

I have used a CNC structure with three motors, originally used as a small laser cutter and engraver

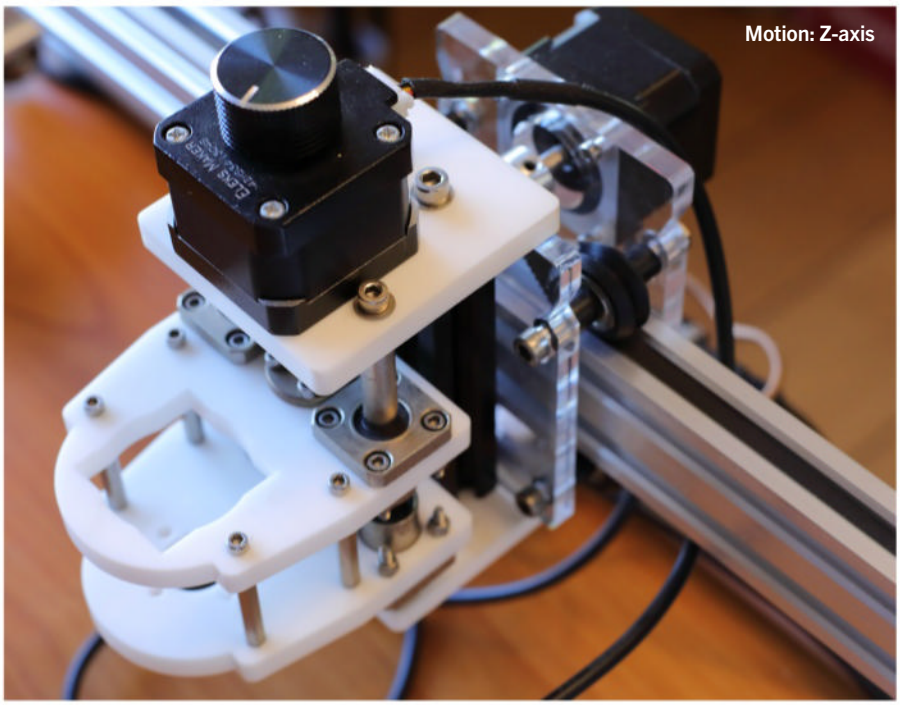
Laser cut: 5

The box has been designed as a closed box with the MakerCase tool. However, the top side has been laser cut with transparent plastic and not glued; when finished, it will be the 'observatory' of the Sand Machine.

Motion axes: 1, 2

To move the 2cm diameter iron ball inside the sand dome, I have used a CNC structure with three motors, originally used as a small laser cutter and engraver; two move the structure along the X-axis, while the other moves the head along the Y-axis.

The CNC structure is not physically connected to the iron ball, and a magnet transfers the motion through the bottom side of the dome.

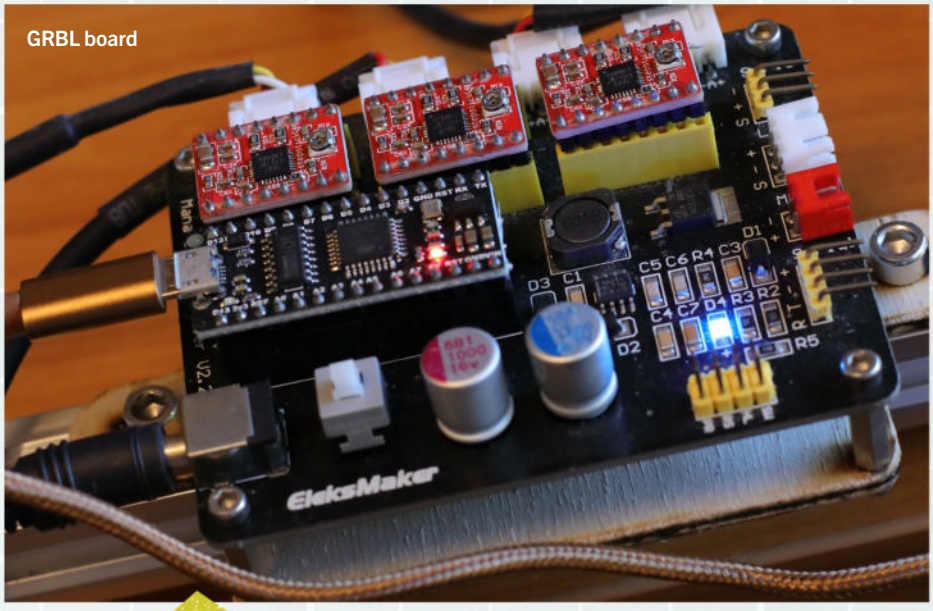


Motion: Z-axis

Motion: Z-axis

The magnet in the Sand Machine should replace the laser; it can't always be connected to the ball. The mechanism moves the magnet nearby to the ball when a sequence starts, but the head must also be repositioned at the end of the sequence to the origin (X-Y zero), far from the box area. To do this, I added a fourth motor to position the Z-axis correctly. This extra motion is not usually present on these small laser cutting machines, but is sold separately as an optional tool.

The Z-axis is used for deeply engraving the surface, so the zero point is considered the object's top surface to engrave, and the positive direction points to the bottom. In this case, I had to set the motion calculation to the opposite direction, as the head is positioned at the bottom of the sphere.



GRBL board

GRBL board

To control the CNC system, I have used a GRBL board by Eleksmaker (https://eleksmaker.com/); the main board has three motor controllers — the three small red boards in the image — one for every axis, and I have used a 5V extra power supply, originally used to power the laser, to control the lighting board of the dome.

The core of the GRBL board is an Arduino Nano programmed with dedicated firmware — the other small board fits in the main with the USB cable.

'GRBL' is an open-source firmware used by hundreds of CNC machines for laser cutting, milling, 3D printing, and more; this firmware can receive a complete set of G-code commands from the USB–serial interface connected to a computer and process them for precisely controlling the motors, laser, 3D printer extruder, carving and machining tools, spindle rotation, and more.

The GRBL firmware — also compatible with the Arduino boards — is available under a GPL licence on GitHub (https://github.com/grbl/grbl).

G-code is the most popular and diffused language to control any CNC appliances; a comprehensive description of the G-code commands is available on the LinuxCNC site: linuxcnc.org/docs/2.5/html/gcode/gcode.html.

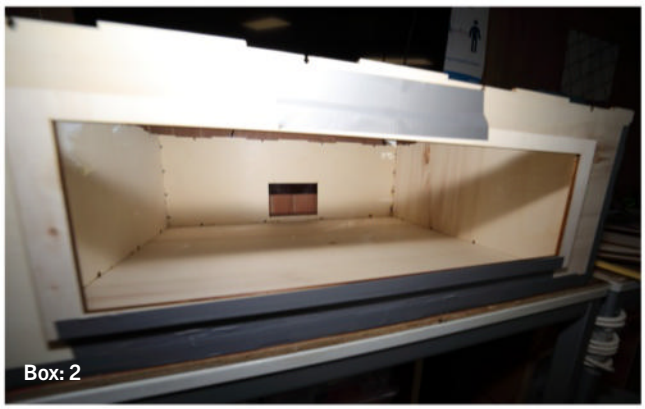
'GRBL' is an open-source firmware used by hundreds of CNC machines for laser cutting, milling, 3D printing

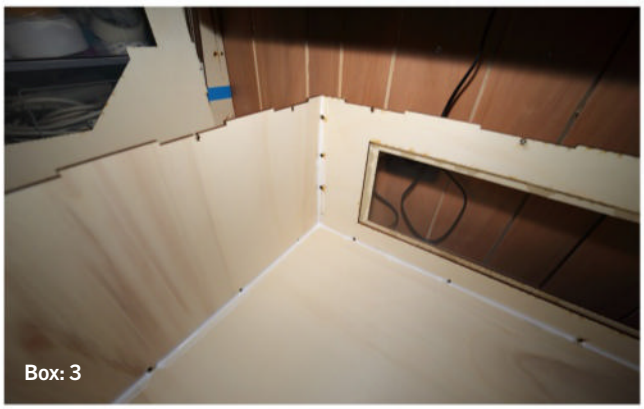
Box: 1, 2, 3

The main box has been designed in a very similar way to the way I have designed the octagonal dome.

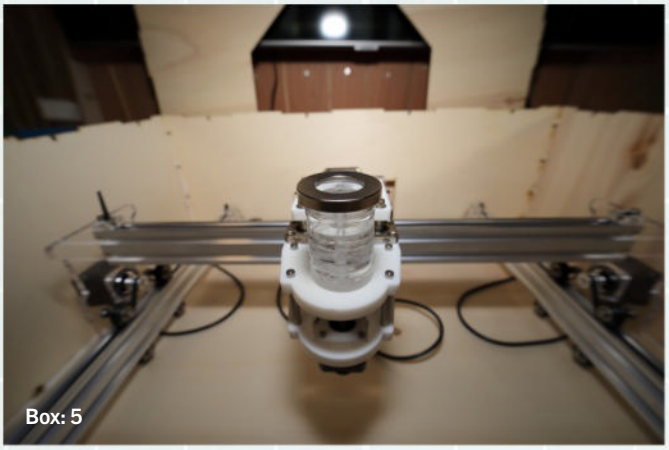
The bottom box should host the CNC machine; the resulting size is considerably bigger than the dome. To keep the parts of the large structure together, I have added the cut for screwing the parts to the fingers. The box has three holes: a top octagonal cut in the centre that fits the dome, a ▶

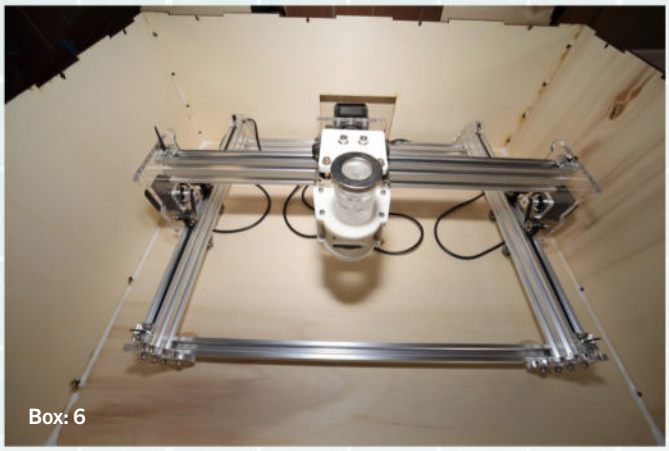

Box: 1

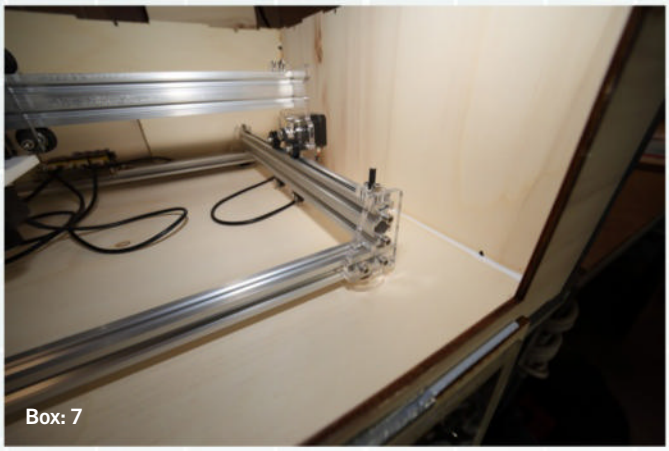

Box: 2


Box: 3


Box: 4


Box: 5


Box: 6


Box: 7

The CNC machine is kept in place, centring every foot inside four plastic holes

small rectangular hole corresponding to the GRBL board for external connection, and a big front rectangular window to show the CNC structure in motion to the user.

After preassembling the box with duct tape, I glued all the parts together.

Box: 4, 5, 6, 7

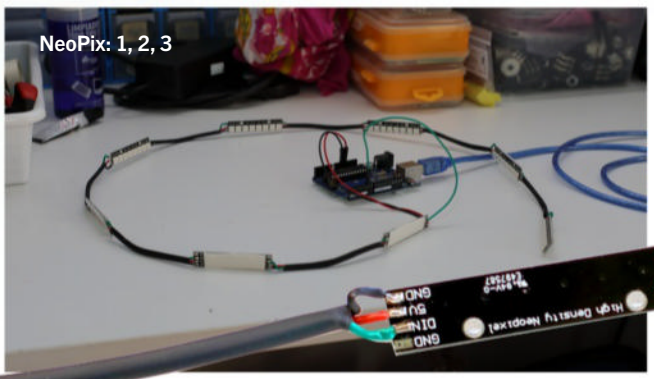
The Z-axis support — designed to connect a small-wattage laser — has been adapted to keep the magnet. I created a plastic cylinder by gluing a series of laser-cut acrylic discs. Then, on top of that, I glued a strong neodymium magnet (25kg).

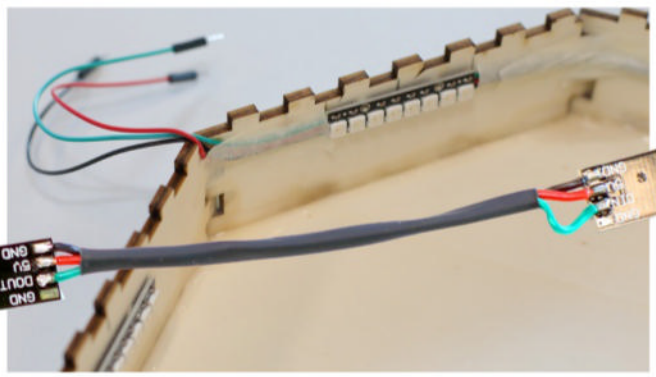
In this way, the Z-axis head can drive the magnet until touching the bottom of the octagonal box and fit in the centre hole of the top of the CNC box container. The images show that the container is large enough to host the CNC machine and allow room to move the head.

The CNC machine is kept in place, centring every foot inside four plastic holes glued to the bottom of the box.

NeoPix: 1, 2, 3

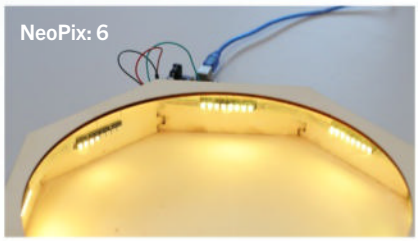
The scenic effect, while the iron ball draws on the sand, is improved by a NeoPixel (https://github.com/adafruit/Adafruit_NeoPixel) ring. This is available in many different shapes — rings, panels, strips, single 'pixels'. 'NeoPixel' is an RGB LED technology where every LED includes a tiny microchip. Every NeoPixel strip


NeoPix: 1, 2, 3



NeoPix: 4

NeoPix: 5



NeoPix: 6

— from one to many — should be powered by 5V power; the strip includes a signal wire on both ends. Using a high-frequency signal generated by a microcontroller, every single RGB LED can be independently addressed. Using this technology, with a few lines of code, it is possible to create pleasant colour-animated effects such as colour shading and rotating lights. Developed by Adafruit, an efficient Arduino library makes it very easy.

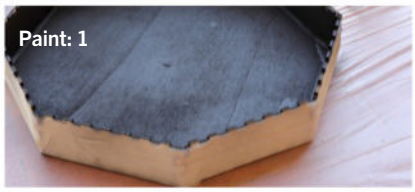
I have used eight NeoPixel eight-LED strips — on every side of the sand dome — wired together, acting like a single strip. An inexpensive Arduino Uno is used to control the lighting effect of the Sand Machine; this board can be easily powered by the laser power supply connector on the GRBL board.

NeoPix: 4, 5, 6

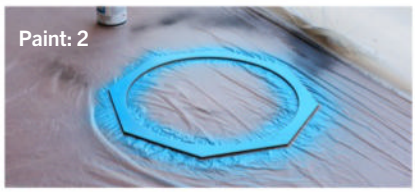
Positioning the eight connected NeoPixel strips on the top of every side of the box, I got the desired effect of light projected onto the base of the box. I then cut a circular frame to put on top of the transparent cover of the box so only the reflected light could be viewed from the top.

Paint: 1, 2, 3, 4, 5

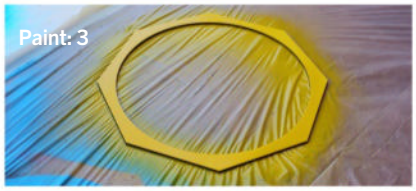
First, I painted the internals of the sand dome black to create the desired contrast with the NeoPixel LED lights and the sand; then, using masking tape, I coloured every section of the external box a different colour. ▶



Paint: 1



Paint: 2

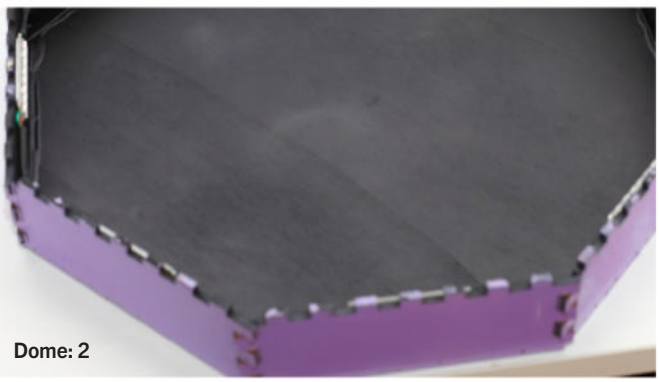


Paint: 3

Paint: 4

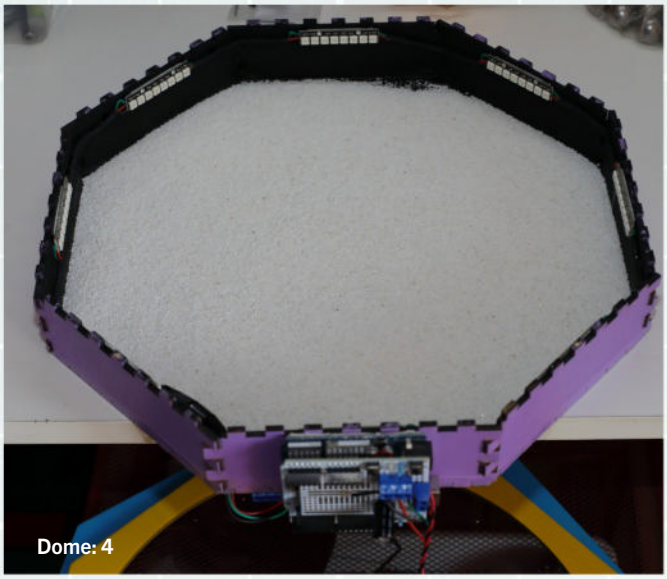
Paint: 5

Dome: 1

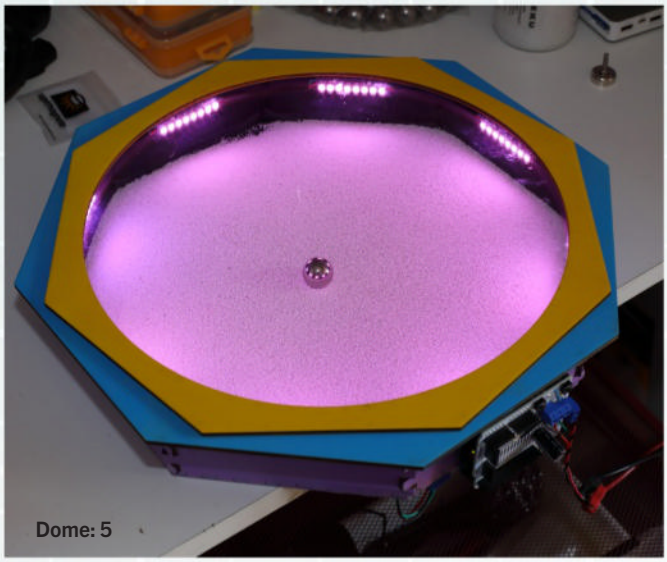


Dome: 2

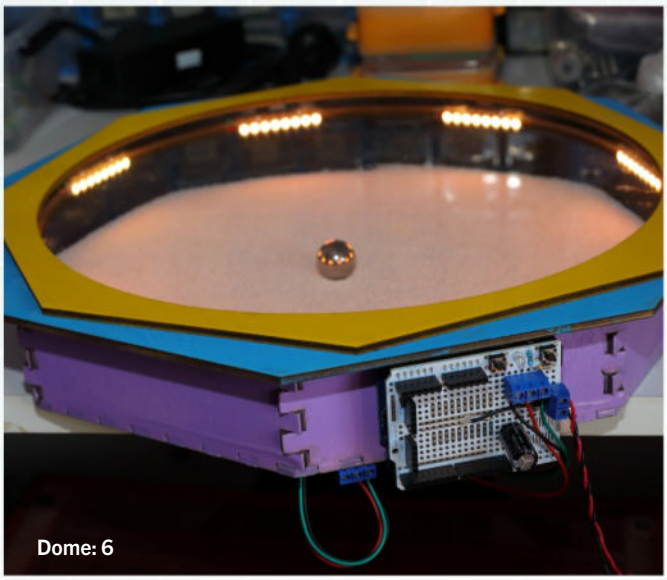
Dome: 3



Dome: 4



Dome: 5



Dome: 6

Dome: 1, 2

After masking the eight NeoPixel connecting wires black, I fitted them into their final position with double-sided adhesive tape. When all was perfectly in place, I glued every strip to its corresponding box side with cyanoacrylate glue.

Dome: 3, 4, 5, 6

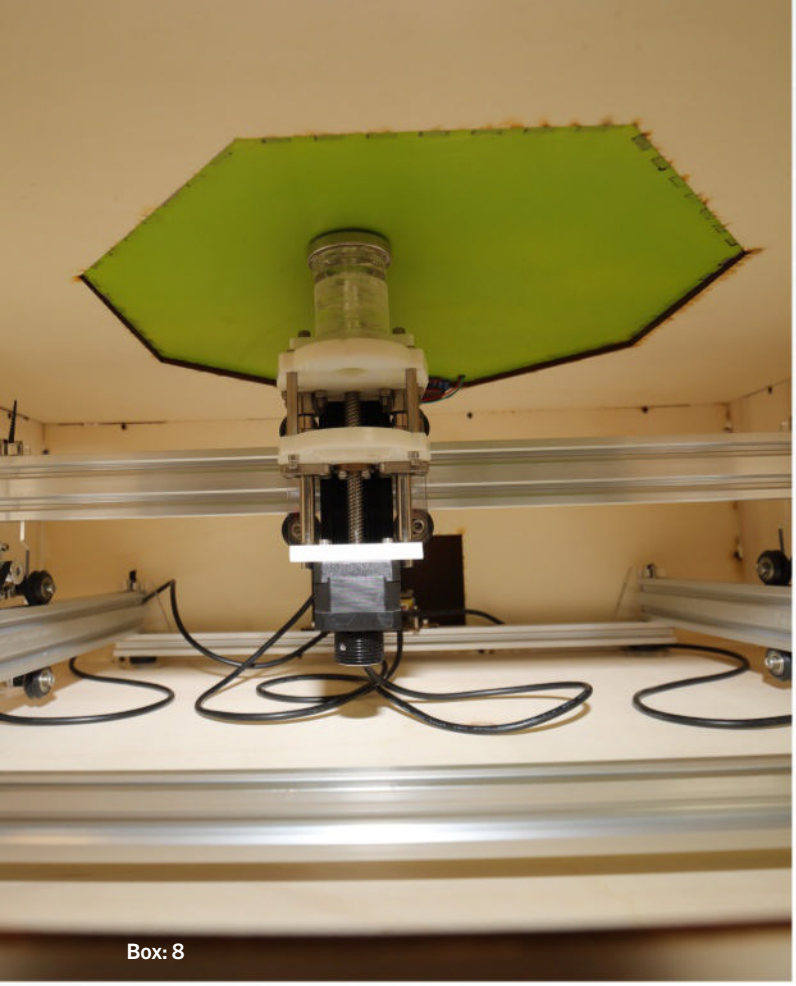
After some experiments, I programmed the Arduino Uno with the desired lighting sequence, testing the sandbox dome on the bench. At first glance, the NeoPixel lighting seemed not really to be impacting the inside of the empty box. Of course, that is just the effect I was wanting; the idea is to address all the lighting effects on the white sand and the iron ball. The removable transparent cover permits adding and removing the sand with ease, which is perfect for transporting the Sand Machine.

Finding suitable sand was challenging until I found white silica sand, calibrated diameter 0.1mm. It's available on Amazon, and 1kg is very affordable. With some experimentation, I found the optimal amount of sand, which should be about a 1mm layer covering the bottom surface. That amount is sufficient for the ball to keep its track visible when moving, and does not block the motion when the magnet moves to the bottom of the box.

To make the performance of the NeoPixel LED lighting effects stable, I strongly suggest adding a polarised capacitor (500–600µF) between the 5V and GND power lines and a resistor (300–500Ω) between the Arduino pin and the NeoPixel signal wire. A list of best practices for wiring the NeoPixel strips to Arduino can be found in the exhaustive documentation provided by Adafruit (https://learn.adafruit.com/adafruit-neopixel-uberguide/best-practices).

An inexpensive Arduino Uno is used to control the lighting effect of the Sand Machine

To compact the electronics assembly, I wired the connection of the NeoPixels ring on a breadboarded Arduino shield and fixed the final board to one outer side of the box.



Box: 8

Box: 9

Box: 8, 9

The finished sandbox perfectly fits on top of the CNC container. As shown here, the large frame of the box container makes it possible to watch the mechanism in action.

Box: 10

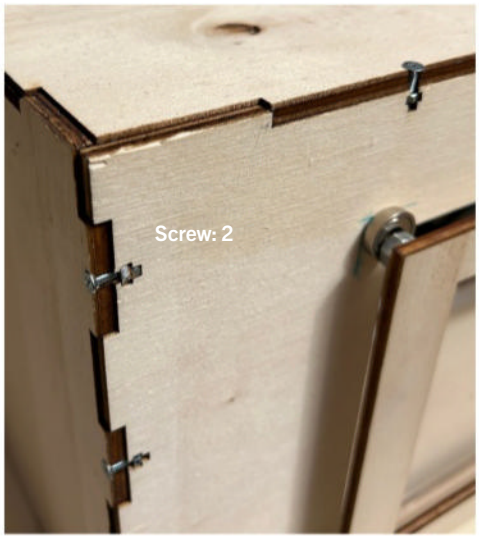
The Sand Machine with the CNC machine in the starting position — this is considered the zero origin of the three axes.

Screw: 1, 2, 3

The final touch — all the sides of the already-glued CNC box are reinforced with screws and nuts.

Box: 10

Screw: 1



Screw: 2

Screw: 3

The completed lock in place

A TRAILER COUPLING LOCK

FOR OFF-ROAD TRAILERS AND CARAVANS

Prevention is preferable to cure

By Coen Smit
Photographs: Coen Smit

Trailers are useful vehicle accessories that are particularly vulnerable to unauthorised use and/or removal. Aftermarket accessory businesses cater for standard ball couplings. Their devices usually consist of a frame locked onto the ball coupling to prevent it from being used. Personally, I believe that anyone with a battery-operated grinder would need to make only one vertical cut to remove such a locking device, before heading down the road with your pride and joy happily following along behind.

I haven't seen anything suited to the more robust off-road couplings now used on caravans. These are particularly vulnerable if you are camping in a remote area and need to use the towing vehicle while wanting to leave the caravan in situ. The alternative — taking the caravan with you — might mean you lose your precious site to another visitor or simply make a short sojourn into town for supplies more of a hassle. ▶

The basic bits needed to make the lock

These are particularly vulnerable if you are camping in a remote area

The disassembled lock

Making it harder to steal

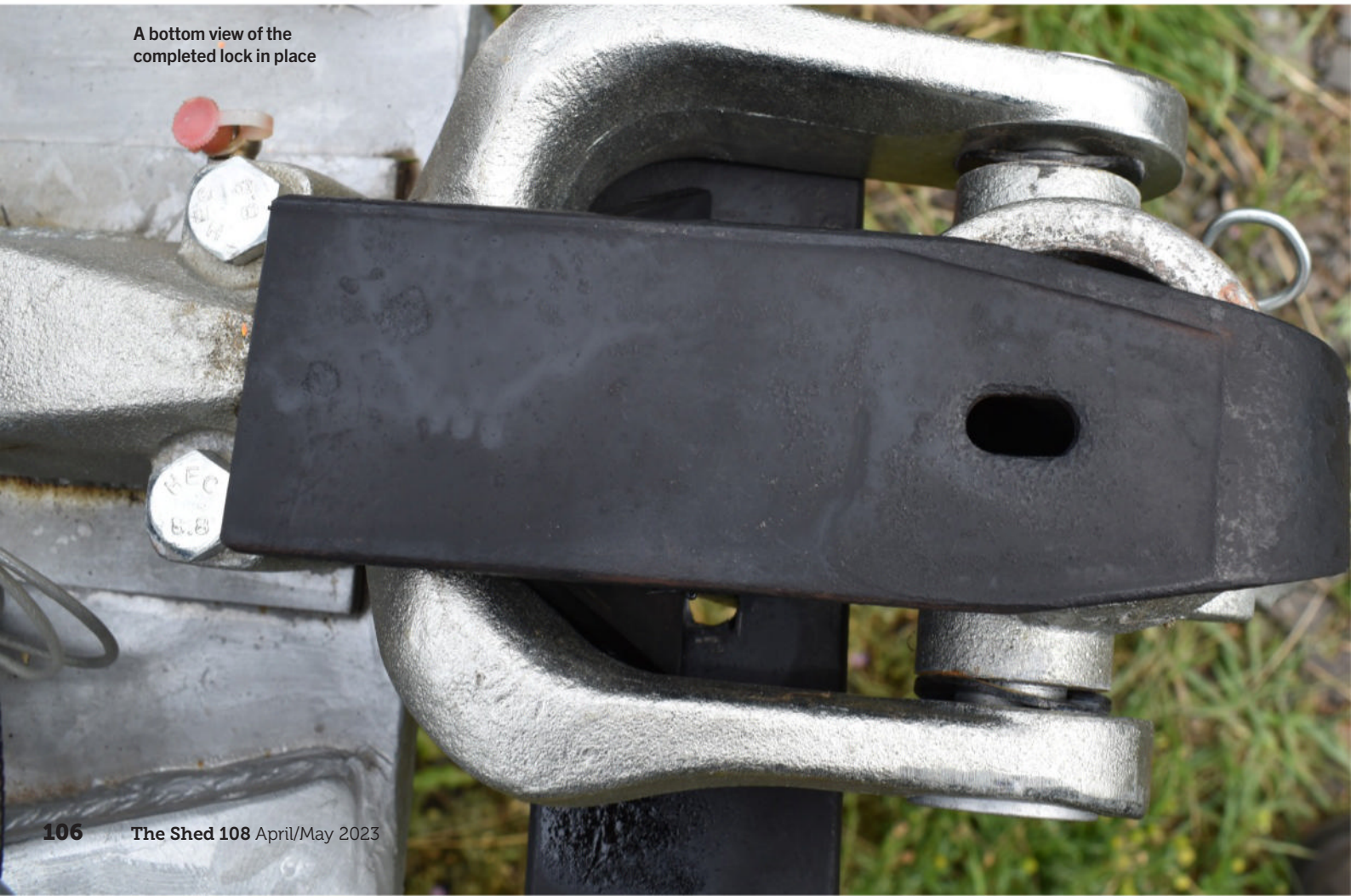
With these concerns in mind, I decided to build a coupling lock specifically suited to the off-road coupling on my caravan. Of course, there is no such thing as a completely thief-proof lock. However, I can see no reason to make it easy for thieves by not having something in place.

The off-road coupling still attaches to a standard 50mm tow ball but allows for a greater range of movement. The caravan can, therefore, be towed by any vehicle with a standard 50mm tow ball, but the coupling cannot use one of the aftermarket locks alluded to previously, making it quite vulnerable when unattended, especially given the remote locations in which your van is likely to be parked.

I used part of a leaf spring to construct the lock, and incorporated a motorcycle disc-brake lock as the actual lock. Spring steel is tough and reasonably thick, making it difficult to cut or bend. This will deter less-determined thieves, as will the disc-brake lock. ▶

Bottom view of the off-road coupling

Side view of the completed lock in place



A bottom view of the completed lock in place

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Top view of the off-road coupling

A typical standard aftermarket trailer lock

I chose to use a motorbike disc lock primarily because I already had one and because they are not easily defeated

A simple preventive measure

As in the lock for a standard coupling, a small section of pipe welded to the base locates the lock where the tow ball normally sits. A vertical plate rises between the arms of the coupling to lock the whole assembly in place once the top, slotted plate is dropped over it and the disc-brake lock is clipped on. The angled plate behind the vertical plate braces it and prevents the assembly from turning sideways once it is in place.

I chose to use a motorbike disc lock primarily because I already had one and because they are not easily defeated. There is no reason, however, that another type of lock cannot be used.

This lock is a simply built preventive measure that can be knocked up in an hour or so with just a few tools, and may very well save a lot of angst and paperwork — so why not make one for yourself?

The completed lock in place

PRECISION APPROACH

Whether it's birds or planes, first-time aircraft builder Arjen Visser admits to getting a real buzz from watching something in the sky that flies

By Jason Burgess
Photographs: Jason Burgess

As a pilot, Arjen (pronounced 'ari-ahn') Visser is a relative newcomer to the skies; he has been flying solo for only three years. However, his passion for aviation began as a young boy. It is something that he shares with his father, a glider pilot, who built a full-size glider in the garage of the family home. Since then, Arjen has built and flown everything from hand-launched balsa-wood toy gliders to scratch-built radio controlled (RC) model planes and a homemade drone.

More recently, he has been piloting a two-seater Thorp S-18, but now he is taking his yen for flight to the next level: assembling his own four-seater Sling TSi light sport aeroplane — one of only three in the country — in the basement of his Auckland home. ▶

So much to learn

Arjen has never built a life-size plane before but says that he loves learning: "The great thing about this project is there are always new things to build and learn. It is a challenge, but very fulfilling."

Memories of his father's glider build remain close to mind. His dad never got to fly his craft, as it met an unthinkable end on its second flight when the test pilot brought it down hard, destroying the undercarriage. It later transpired that the glider model in question had a design flaw and a reputation for not flying well.

"After that," says Arjen, "Dad gave up building them, which was a bit of a shame, but his dedication to the project, and the sense of satisfaction he got from building his own plane, stuck with me. That started the whole thing."

Plan B

As well as pursuing a lifelong interest in flying machines, Arjen is a software developer, director of his own company, and once harboured dreams of being a jazz guitarist. In his 20s he studied computer science, to "get a degree in something useful, as a backup plan".

Then, when he went to Europe for his OE, he says he thought, "I don't want to get to 40 and not try my hand at being a jazz musician." He quit his job, practised hard, and was accepted to study at the Royal Conservatoire of The Hague in the Netherlands.

"I played in big bands for two years but soon realised that a musician's life is hard; I have the work ethic, but I didn't like late nights and smoky bars. I'm a morning person," he says.

Happy place

Arjen says that, in the time-poor years that he spent establishing his business, his happy place was always his workshop, where he could be found tinkering in his downtime, scratch-building and modifying RC scale model planes. Around three years ago, he changed his management structure and gained some space for himself. At

The model is based on the true story of an off-course Luftwaffe pilot who accidentally landed in the UK

RC model of the captured Focke-Wulf 190

Fuel-tank ribs all deburred and cleaned, ready for assembly

Wing spars come prefabricated but still require over 600 counter-sunk holes to be drilled

Collection of model RC aircraft with the radio controller unit

the time, when he was on a trip to the Netherlands, a couple of model-aircraft mates contacted him about buying the Thorp S-18; they needed a third partner.

"I hadn't seen the plane, nor was I a pilot," he says. "They talked me into it and my wife, Bertie, said, 'You always wanted to be a pilot; why don't you do that?' Suddenly, I was a one-third owner of a plane so I had to get my licence.

"The Thorp is a nice plane, a little rocket ship, but now I want something more comfortable and roomy, with extra safety features so that I can go on trips with my friends. And I needed a project. It seemed like a fun idea: to build your own plane."

RC planes

While Arjen's workshop is dominated by the skeletons of half-built full-size wings, a few of his favourite model planes still grace the walls. Each one represents a different flying experience.

"It's like surfing," he says. "Some days you want to go out on a longboard, other days a short board."

Two of Arjen's most-flown planes are a quarter-scale Wilga, a Polish glider tug.

"It's a funny-looking plane, with stick-insect wheels. There are a few of them in New Zealand, mostly used for banner and glider towing," Arjen explains.

His Wilga is powered by a four-stroke, three-cylinder, Saito 90cc radial engine, common to his other model of choice: a World War II Focke-Wulf 190, painted in Royal Air Force (RAF) colours.

"I often see people looking at the Focke very confused," laughs Arjen.

The model is based on the true story of an off-course Luftwaffe pilot who accidentally landed in the UK. It was dubbed the 'Captured Butcher Bird' — the Focke-Wulf was nicknamed the 'butcher bird'. It was painted in RAF colours to avoid it being shot down by Britain's own pilots. It has a top speed of about 150kph, a real presence in the sky, and an authentic roar from the radial engine.

"I wanted [it] to sound realistic; that's half the fun," says Arjen. "It is beautiful to fly but a handful to land. It has retractable landing gear, and the margin of error is very small." ▶

Basic prep

Each of the Sling's components arrived wrapped in plastic with an individual barcode. Before construction began, each piece was unwrapped, the edges of the aluminium smoothed down with a small file to remove any burrs from the manufacturing process, and all the holes deburred to remove rough edges. Arjen then cleaned all the parts with an aircraft cleaner and a 3M wire pad, washed off with water.

Slings use a superior-grade aluminium that is less prone to corrosion, which means that only the 'mating' surfaces need be primed with a self-etching primer. The TSi also uses pop rivets instead of solid rivets, which is a time-saver, as there is no need for a rivet gun and a bucking-bar set-up — or two people to rivet in areas that are difficult to reach.

The kit is very complete and is well packaged

Homebuilt drone with a GoPro, constructed before any commercial drones were available

Wing ready for the top skin to be attached. The wing is built inside a jig to ensure the wing is straight

In the time-poor years that he spent establishing his business, his happy place was always his workshop

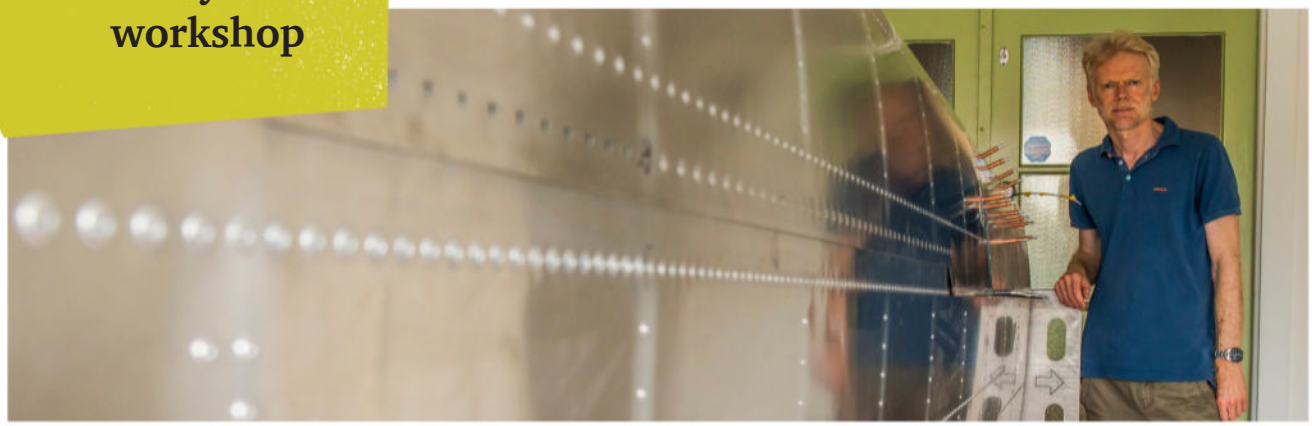
Model planes are a joy too

Away from the keyboard, Arjen enjoys the tactile nature of constructing models: "There are mechanical and electronic aspects — servos, batteries, electrics, and radio gear — and various other factors to make them controllable and aerodynamically correct. I enjoy that challenge.

"There is a real skill in flying these things, understanding the aerodynamics and potential dangers."

About 12 years ago — before drones became a big thing — Arjen built his own 'Tricopter', a prototype drone.

"I was interested in the technology, the electronics and stabilisation aspect. I had a GoPro on it, and I used the same radio control I use for all my model aircraft. It still flies, but it was missing auto-flight [so] I have to constantly fly it; there is no 'return to home' button. It was fun to do, though. At the time, I could see the future of drones and, if I did not have my software business, who knows, I may have followed that path," he says. ▶



Fitting the large flaps to the wings. These flaps will help slow down the plane when landing

Staying organised

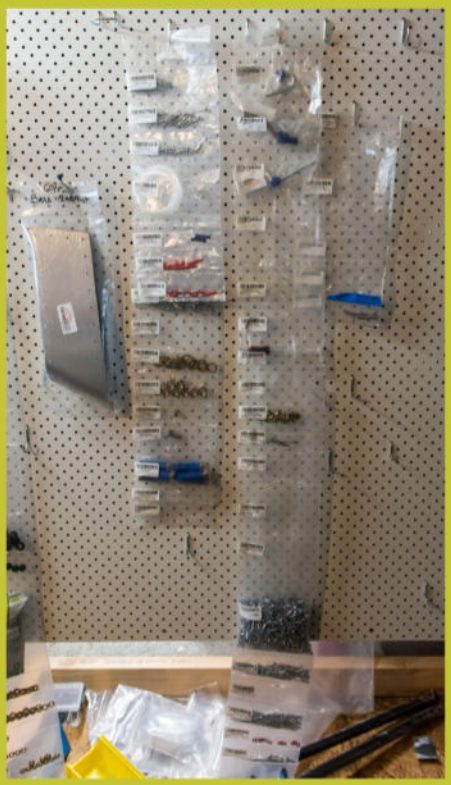
"Before I started, there was a lot of reorganising to make sure I had the space. I like the fact I can walk downstairs and do something, or think about the next part to be resolved. With so many parts, it is good to keep the workspace tidy, tools away, and organised."

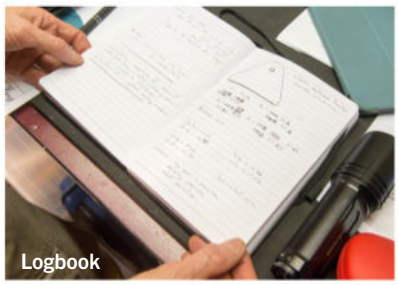
"I keep a log of my hours, broken by two pages of notes, problems, and questions. I am planning to put it all into a spreadsheet. I was very diligent to begin with: start time, end time. Now, I just log my hours. Note-taking has been very useful."

"My aircraft tools are stored in the drawers of two tool trolleys organised from the top with commonly used tools in descending order. I added a plywood work surface topped with carpet to the trolley tops to form workstations. It doesn't matter how long the object that I'm working on is, because I can just wheel the trolleys further apart. I built a spraying booth and frames for holding the wings, all on casters. A pegboard that I can wheel allows me to have itemised parts on hand for each section of the build."

"A labeller has come in handy for itemising hardware."

"Start a build with the 'empennage' — the horizontal stabiliser, the elevator, the fin, and the rudder — because they are the simplest; they will get you going. If you don't want to order the whole kit at once, you can start there. I decided to order the whole thing in one go. If you really mess up, you can reorder individual items."





Logbook

The Sling TSi with gull-wing doors

Spray booth to prime all the parts

Aircraft wicks and related bits

Construction manual

The Sling

Before purchasing his Sling, Arjen had done extensive research into kit planes and had booked to go to the EAA AirVenture Oshkosh air show in the US, to check out the various planes and get a feel for them.

"Oshkosh had always been on the bucket list for Dad and me," he says. "We had it planned, then Covid hit. I had two options: I could wait to go to Oshkosh or I could take a punt and buy a TSi, as it was at the top of my list."

Sling Aircraft is a relatively new company, based in South Africa. Its first prototype was built in 2008. The TSi four-

Inspecting the wing before closing it off for good

You have to be 200 per cent confident that you have done everything properly. “This thing is going to fly. You can’t afford mistakes”

seater is its most recent model (2018). It is powered by a modern, turbocharged Rotax engine with full authority digital engine control (FADEC), which uses 91-octane petrol and, for optimal fuel efficiency, does the choking and mixing itself. The Rotax 140 horsepower (hp) can fly up to 18,000 feet without losing power, has a seven-hour range, and uses approximately 28 litres of gasoline an hour.

“Other four-seaters use 200hp engines,” says Arjen. “They may be slightly faster but they burn through fuel at 40 litres an hour.”

He says that you have to be 200 per cent confident that you have done everything properly. “This thing is going to fly. You can’t afford mistakes.”

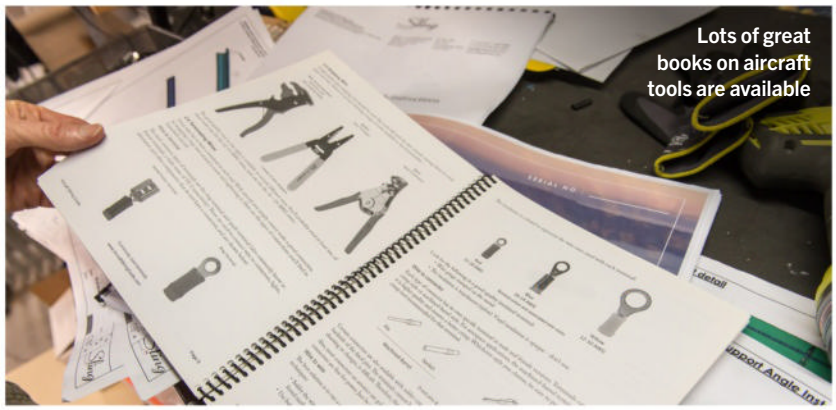
Clever touches

Design-wise, Arjen was drawn to the sleek nose and the shape of the canopy. “It has a steerable nose wheel, which is easier to taxi. The large flaps make for a slow landing — the slower you land the safer you are. The way that the mechanics work and the geometry of the flap handle are very simple but clever. One aileron moves up while the other moves down. Another major safety feature that appealed is the TSi’s parachute,” he says. “If ever you get into trouble, you can pull the chute and bring the plane and passengers down safely.”

Pimp my flight

Eight large packing crates and a major reshuffle of his basement workshop ▶

Fuel tanks in the leading edge of the wings



Lots of great books on aircraft tools are available

Hand squeezer to squeeze rivets that are too long

I invested in a really good rivet tool that automatically collects the mandrels in the rear

Getting a handle on the tools

The kit comes with six manuals and a tool list. Arjen bought most of his tools in the US, but has since found that many of these tools can be bought in New Zealand.

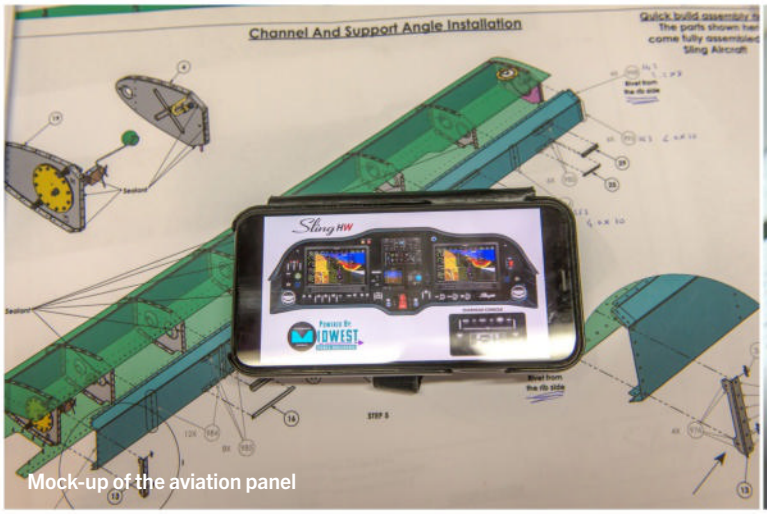
"I probably went overboard on the tools, but you don't know what you don't know," he says. "When you see a tool on the list, you can't envisage what it looks like, how to use it, or what you need it for. A 'fluting plier', what's that? I haven't needed one yet. I bought a dimpling machine second hand off another plane builder. I use a laser to ensure everything is absolutely straight. I saw other people use and recommend them. It really is crucial.

"It has taken me quite a while to get confident with the tools, materials, and approach. It's not a case of measure twice, cut once; it's more like measure 20 times because once you put the skins on, you can't touch it any more. You have to be 200 per cent confident that you have done it properly, because this thing is going to fly. You can't afford mistakes.

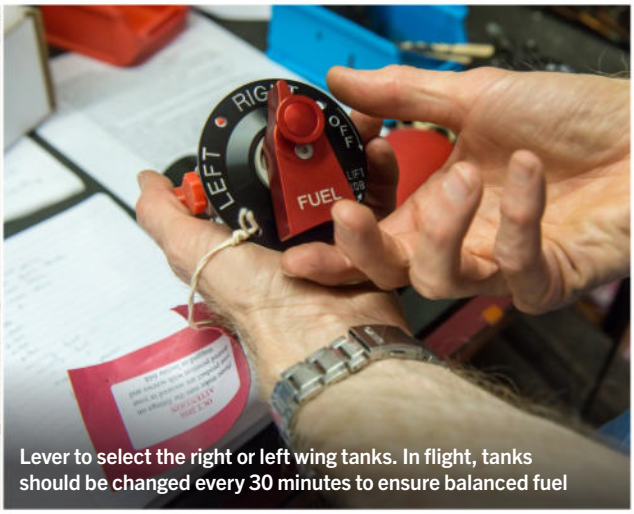
"My father was very keen to help me. I would like that because he has experience and has given me some good tips already. However, first I needed to figure it out. I need to concentrate on what I'm doing before I give instruction to someone else.

"I buy quality tools. I think maybe I will love it so much that I will build these for other people. I have friends who would love an aeroplane but do not have the skills, patience, or dedication to do it themselves. Once I have built this one, I will be faster on the second one."

Good drills and reamers are essential



Mock-up of the aviation panel



Lever to select the right or left wing tanks. In flight, tanks should be changed every 30 minutes to ensure balanced fuel


Model-aircraft pump and pressure meter to test for leakages


Pitot tube and connections that can be easily removed for maintenance

Flying in clouds means a plane is often surrounded with precipitation, which causes a build-up of static charge on the airframe

later, Arjen had what he needed to begin work. Never one to sidestep a challenge, he opted to make some modifications to his maiden TSi build. Nothing too complex, he says, but when you are in virgin territory, everything is a learning curve. When it came to the electrics, he sourced his own materials. In hindsight, he admits that it might have been better to stick with the Sling electrics kit for the first one: "It would have saved time, but now I know a lot more. The controls are manual, but the flaps are electronic and all the lights and trim motors use Tefzel wire (chemical and heat resistant). This is standard in aviation but is also found in racing cars. There are racing shops in Auckland, so that is handy."

Instrument rated

The plane will be instrument rated for flying in poor visibility and clouds, so the standard instrumentation needs to be augmented. The navigator panel and electronic flight instrument system (EFIS) is like an iPad display showing speed, height, engine monitors, and flight-path map. Tubes and engine sensors are all wired back to the instruments and, given the complicated nature of the required wiring looms, they will be outsourced.

Flying in clouds means a plane is often surrounded with precipitation, which causes a build-up of static charge on the airframe. This will affect the instruments, particularly the radio.

"The way to mitigate against static

Example of a cockpit layout. The EFIS displays all primary flight data and there is a little backup display in case the main display fails

charge," says Arjen, "is aircraft 'wicks', which are new to me. Most commercial aircraft have them. Two are fitted to the wings and one to the rudder. But how do you attach them? You need something to screw into. There is not a lot of contact between components on the wing because they are on a moving surface, so you need braiding wire to make that connection. As it's my first build, it takes a long time to figure out the right approach — because you can only do it once. It all looks simple, once you know, but how do you get to that point?"

GoPro hurdle

Another hurdle was fitting a GoPro with a USB connector — to extend the battery life of the camera — on the wing.

"I spent a lot of time reading forums and blogs, talking to people, and finally found a company in the US that supplies power units that can be fitted to the wing with a mount. You need a mount for the camera as well. I then had to figure out how to mount the mount and supply the power to it. Because you have extra electrical kit in the wing, you need to be able to service it; it needs an inspection hatch of its own, so I built another one of those."

For ease of servicing, Arjen has also modified the 'pitot tube', which measures air pressure / air speed.

"I had to work out how to attach an aluminium tube to an AN fitting; it had to be flanged. I needed a flange tool and, obviously, lots of practice before

Sling TSi specs

Wing span: 9.5m

Length: 7.1m

Manual gull-wing cockpit doors

Engine: 141hp (105kW) turbo, sport, injected Rotax 915 iS

Full take-off power up to 16,000 feet (4877m) and a service ceiling of 18,000 feet (5486m)

Cruise speed: 9500ft / 148 knots true airspeed (KTAS) (170mph)

Sling Aircraft: https://slingaircraft.nz

Sport Aircraft Association NZ: saa.org.nz

Oshkosh: eaa.org/airventure

Using a regular builder's laser tool is essential to ensuring all flying surfaces are straight and true

> "I want to enjoy the journey rather than focusing on the final goal. I don't want to turn it into a task"

I installed it. It was lucky I rehearsed, because it went wrong the first few times. Next question: will Loctite work to keep it tight?"

Finally, Arjen ran a pressure test on the tube with a model-aircraft carburettor pump at one end and a balloon on the other. The balloon was left inflated for a day before being checked to see if it had lost any pressure.

Enjoying the journey

At the time of writing, Arjen is completing his second wing before moving on to the cabin. When the plane is ready to be pulled together, he will move into a hangar for the final assembly. He admits that he is working hard at pacing himself — the temptation is always to be doing something.

He says, "I want to enjoy the journey rather than focusing on the final goal. I don't want to turn it into a task. When it's a beautiful day outside, I may want to do something different. I have given myself two years to build this but I remain flexible."

Clecos (copper and black-coloured clamps) are used to hold everything in place before riveting

Arjen's father, Douwe Visser, lends a helping hand

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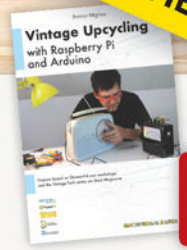

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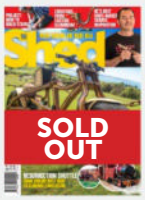

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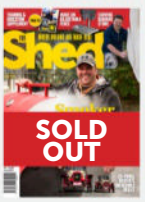

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INFRASTRUCTURE BLUES

A plea for some sturdy roads built by knowledgeable road-makers

By Jude Woodside Photographs: Jude Woodside

What a summer! I'm actually looking forward to winter; surely it can't be any worse. Two cyclones in a month and one exactly 12 months after the last big one — who would have believed it? At least I didn't suffer the heartbreaking damage that so many others did.

These events have demonstrated that our infrastructure is not in any shape to deal with what could become regular occurrences. If these recent devastating weather events don't convince you that the climate has changed and it's overdue time we did something, then nothing will. I, for one, won't be queuing to buy a house with an uninterrupted ocean view unless it sits on a hill well back from the shore. I suspect there might even be some bargains by the sea in the coming years — just don't expect to be able to insure them.

Photo: Waka Kotahi

A floating house

Some years ago, *The Shed* did a story on a builder who built his house in Pukekohe on large blocks of polystyrene, intending that it would float in a flood. He reasoned that the area was a former flood plain of the Waikato and it was possible that the Waikato would occupy it again. That looks like forward planning.

Roading

The other takeaway from these events has to be the state of our roads. Maybe Waka Kotahi could spend a little less time irritating us by tinkering with speed limits and actually start building some all-weather highways. Why do we not build our major highways in concrete? In a country that experiences the amount of rain we do, it's insane to continue with the seemingly temporary methods we currently use — although that does, of course, ensure that certain companies get regular work building and maintaining the highways, which certainly do seem to need a lot of maintenance.

I suspect there might even be some bargains by the sea in the coming years — just don't expect to be able to insure them

Here's an idea

There have been calls to re-establish the Ministry of Works and Development (MWD), as it was called. It's not a silly idea. In spite of the received wisdom at the time that the MWD was full of bureaucrats and shovel breastfeeders, it actually did sterling work. Its buildings, railway stations, and dams — albeit often quirky architecturally — are still standing.

The MWD built the Auckland motorway network in the early 1960s. I'm so old that I can remember that happening. The MWD took some of my grandparents' backyard for it. I can clearly recall the layers from larger boulders to smaller pebbles that went into the roadway before the asphalt. I haven't ever seen that done to the same extent since, and I have seen many highways built — but none has lasted as well or performed as well as those sections of the Auckland motorway system. Maybe it's time to look at spending the money to build real all-weather roads again — roads that have a proper substructure and are not merely laid over compacted clay.

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