



meet your maker

Photos: D Hilton

Original home of the round-back

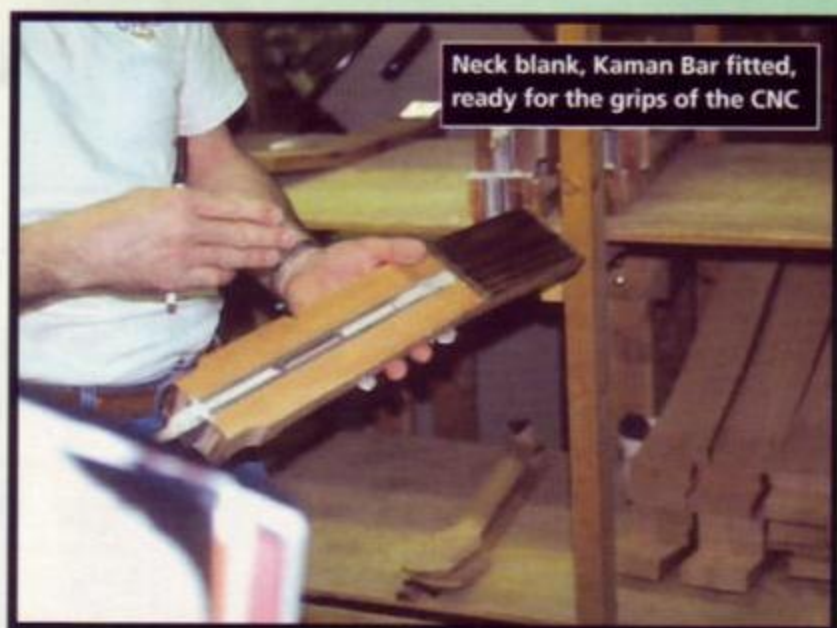
“In helicopters, the engineers spend all their time trying to figure out how to remove vibration. With guitars you spend your time trying to figure out how to put vibration in.” So says Charlie Kaman, the man who made the tenuous connection between aeronautical engineering and rock’n’roll. Camera-wielding Dominic Hilton gets the guided tour

# Ovation Guitars

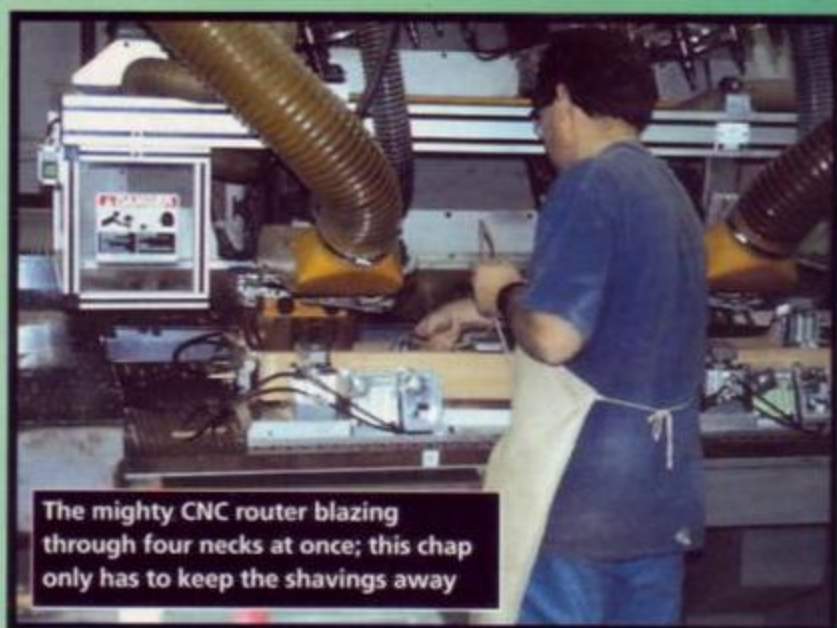
**S**trange though it may seem, his accumulated knowledge of graphite composites and wood in the construction of rotor blades, led Charlie Kaman to apply it to the structure of his favourite pastime; the acoustic guitar. Thirty years later and Charlie still oversees the Kaman Corporation. His son Bill is now President of Kaman Music, the largest independent distributor of musical instruments in the US. Kaman Music consists of four manufacturing divisions; Ovation Guitars, Kaman Musical Strings, Hamer Guitars and Trace Elliot Amplification.

We visited the Ovation plant in New Hartford, Connecticut, nestling within the forest of New England in an old mill which is packed to the roof with the production lines associated with the considerable number of models in Ovation’s USA range. The building is somewhat eccentric, with many rooms and floors, each having a corner dedicated to some specific task. It may not be the most efficient facility – they plan to move elsewhere soon – but it has an undeniable charm within its dusty catacombs. It is also strange that this elderly workshop should be home to the most hi-tech acoustic guitar on the market!

So how are these unusual instruments put together?



Neck blank, Kaman Bar fitted, ready for the grips of the CNC



The mighty CNC router blazing through four necks at once; this chap only has to keep the shavings away

## Neck

The various US-made Ovation guitars feature three types of neck; 2-piece mahogany (Elite Standard, Standard Balladeer, Ultra Deluxe, Celebrity Deluxe and Celebrity models); 5-piece mahogany and maple (Adamas II, Elite, Custom Legend, Legend and Custom Balladeer models); and walnut with walnut fingerboard (Adamas model). These pieces are assembled as a block (the 5-piece necks having a sandwich with the three strengthening parts running along the centre). The headstock veneer is attached and then all is bonded with adhesive and cured in a press with catalysed wood adhesive; this has the advantage of being waterproof and the pleasing property of encouraging high frequencies. A slot is routed into this block for the Kaman Bar neck reinforcement system, an aluminium structure that incorporates a steel truss rod and is claimed to virtually eliminate neck twist and compound bow problems. The end of the bar is made in three different depths, corresponding to the three bowl types offered, and provides an accurate joint once fitted and bolted into the moulded socket on the composite body shell.

The necks then go through three cycles on a computer controlled (CNC) router to produce the desired profiles. The introduction of this method has improved accuracy, efficiency and saves the work of about 30 people. However, as Ovation maintain, a guitar made completely by machine lacks soul, so final sanding and shaping is done by hand in the Detail Shop.

Before this final attention, the necks must receive their fingerboards. These are produced in a separate workshop, using a mini CNC router that is also capable of cutting the intricate cavities for the abalone inlays featured on many models. The frets are also fitted here, again by hand, then the finished fretboards travel downstairs to be united with the necks. This is done on a pressurised bench that uses inflated fire-hoses to press the fingerboards to the neck for bonding. This unusual piece of



Adamas necks getting the personal touch in the Detail Shop



Baby CNC router showing off in the inlay department



Necks awaiting fingerboards - note three fire-hoses in centre of the press



...but no machine can take Frettin' Bob's place

Unsuspecting sheets of spruce that could end up vibrating to the strums of Richie Sambora or Brian May



► equipment works well for irregular surfaces and the idea came from the Aerospace division. After final detailing, the necks are finished in oiled, matt or gloss coatings and are ready for attachment to the body.

## Body

The tops are mostly book-matched Sitka spruce (although cedar and maple are also used); these are seasoned for three months. They are graded accurately for aesthetics, strength and stiffness – sprayed bands of colour across the ends of stacks indicate their position among 15-20 grades. Tops are cut to shape and the bracing fitted. A number of different bracing patterns are used, to give each family of Ovation guitar a distinct voice. The tops and bracings are tested in a lab at the R&D headquarters, using a test bed that generates a swept range of frequencies through a sample top; this is all monitored with video and laser. The results are made visible with 'glitter', which highlights the areas of least and most vibration (no vibration and the glitter collects) and shows how the structure behaves towards certain frequencies. The unusual clusters of small soundholes on the bouts of some models have the same area for sound dispersion but allow the top to be stronger – there is no hole near to the bridge, which receives the majority of the neck tension.

The round-back bowls are now manufactured by a small company in Ohio, using a polyester resin which includes chopped glass fibre. The bowls are made in full, mid and super shallow depths and fitted with a braced top ring, which is glued in place then ground flush. The relevant apertures – for electrics, etc – are machined out and then the top is fitted and bound up for the adhesive to set. At this point the top has a guarding finish for protection during machining, but this is sanded off before finishing.

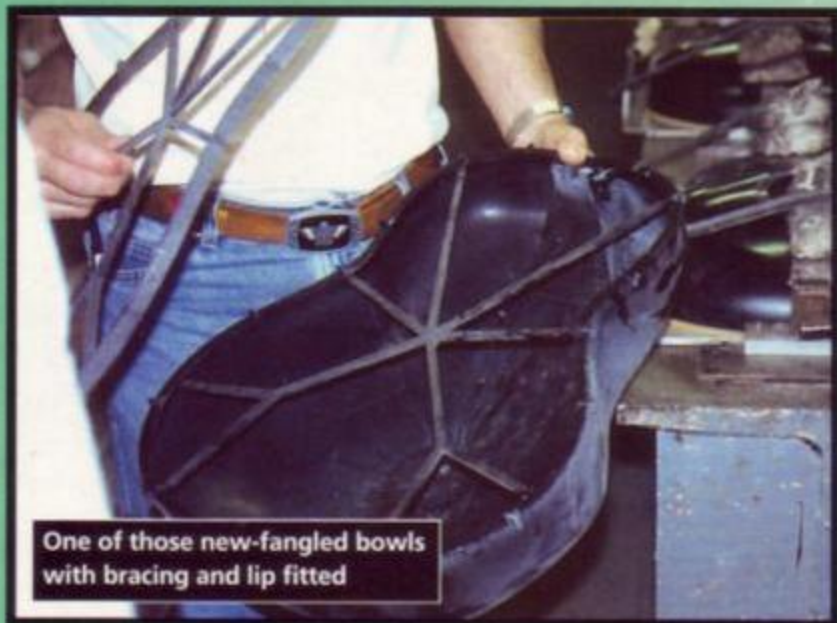
The combined top and bowl are then edge-routed to make way for the binding. This is currently applied by hand, using miles of tape, but a new system of pressurised air clamps is nearing completion. The abalone and mother-of-pearl purfling and rosette inlay are applied by hand. A flexible plastic strip is included in the binding; once set this is removed, leaving an accurate trench into which the short pieces of abalone can be inlaid.

After a final clean-up, the bodies are ready for finishing in the spray booths. The back finish is applied in two coats; large and small 'spackles' are sprayed over the bowl, and small area that corresponds to the part that touches the leg when playing in a seated position receives an additional coat. This non-slip surface is produced by adding ground walnut shells to the black paint! After buffing, the bodies have a small area of the glossy top finish ground away, ready to receive the bridge and to ensure a strong bond. In addition, some extra routing is applied to the underside of the bridge to hold enough glue for a successful bond – the clamping method was so efficient it forced virtually all of the glue from between the bridge and top.

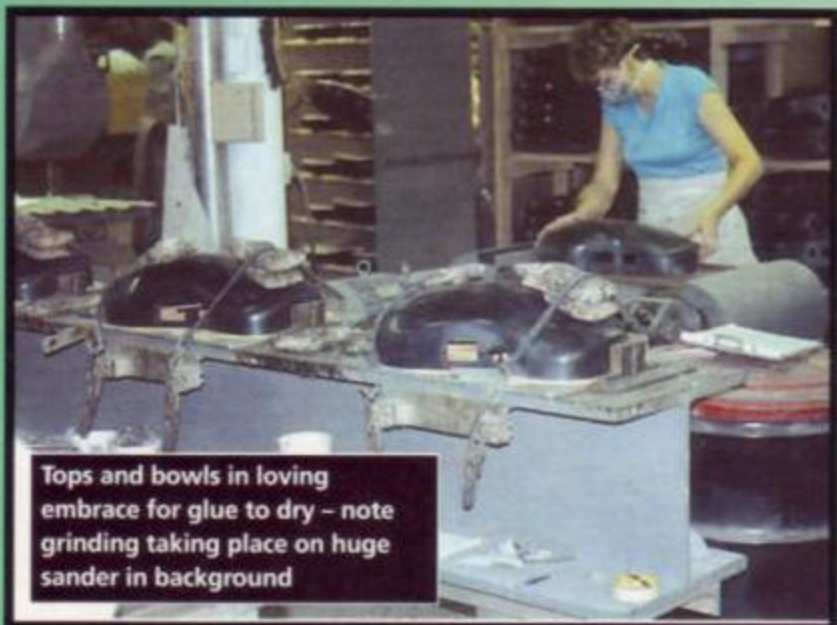
It is interesting to note that the Adamas guitars, the company flagship, are so unusual in their construction that they are mostly built in their own area of the plant. The tops are made from a sandwich of carbon fibre with a layer of birch veneer in the centre. This is one third the thickness of a normal spruce top; incredibly flexible across the face but rigid along the length. Combined with the unusual bracing (running only along the length of the body), this provides a strong soundboard that is extremely sensitive to vibrations. The top is held to the bowl with a moulded resin binding that provides a lip for attachment. The all-walnut neck features an intricately carved crest of the same wood on the headstock.

At this point the neck gets to meet its body, after receiving a serial number tattooed to the back of its headstock – with a laser, no less. The neck is painstakingly fitted to the body, using highly complex pneumatic clamps and many human eye and feel adjustments, after

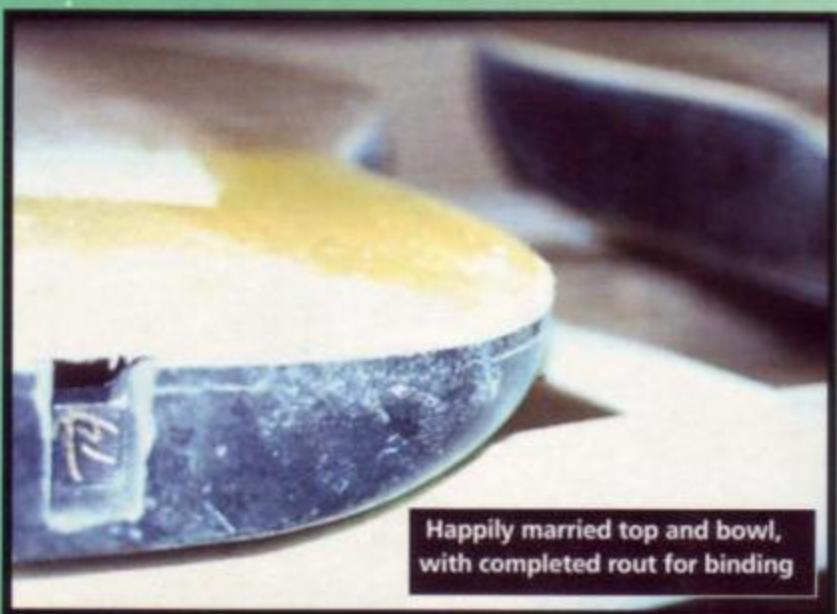
One of those new-fangled bowls with bracing and lip fitted



Tops and bowls in loving embrace for glue to dry – note grinding taking place on huge sander in background



Happily married top and bowl, with completed rout for binding





Two binders binding, soon to be helped out by the pneumatic clamp in the centre



The remains of dead shellfish being put to splendid use

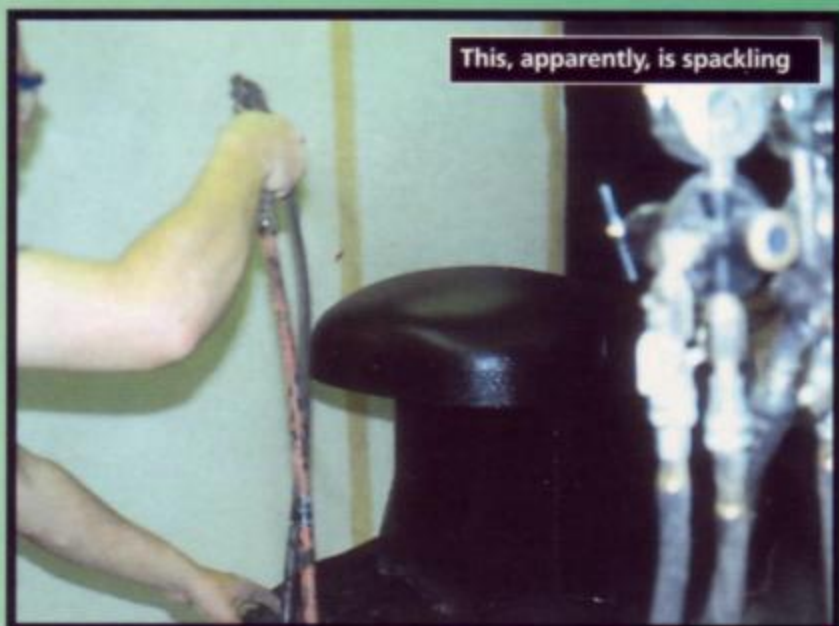
➤ which the various on-board electrics and hardware are fitted, strings are strung and the end result tested by a panel of trained ears.

## Electronics

Ovation pride themselves on their fitted preamp and pickup systems. Originally only 15% of the instruments were electro-acoustic; 10 years later 90% of them were piezo-endowed. Initially, units such as the OP-24 were offered with three bands of active equalisation. Now there are a number of different units, offering various functions, including the Optima preamp which features a steep notch filter which can accurately remove feedback one note at a time – and even includes a chromatic tuner! The Optimax system combines an under-saddle piezo pickup with a miniature Telex mike fitted to the outside front of the bridge. These signals can be mixed and run in stereo, the microphone capturing the high frequencies that are present in a regularly miked acoustic. Another unit is the Hex-FX, which has six individual saddle pickups that can be combined in a variety of ways through a stereo output; these include low-to-high strings spread over two channels, or alternate strings panned left and right for a rich chorusing effect. Recently, Ovation teamed up with Roland to adapt their GK-2 MIDI pickup system to some of their models. This is now available as standard on two guitars and features a discrete control panel, for on-board control with all of the advantages of MIDI.

Ovation are a bold company that have broken many rules in the traditional school of acoustic guitar building. With new models like the Mandolin, Mandola and Longneck this is obviously what they intend to keep doing. Judging by some of the weird prototypes we saw there could be some jaws dropping in the near future.

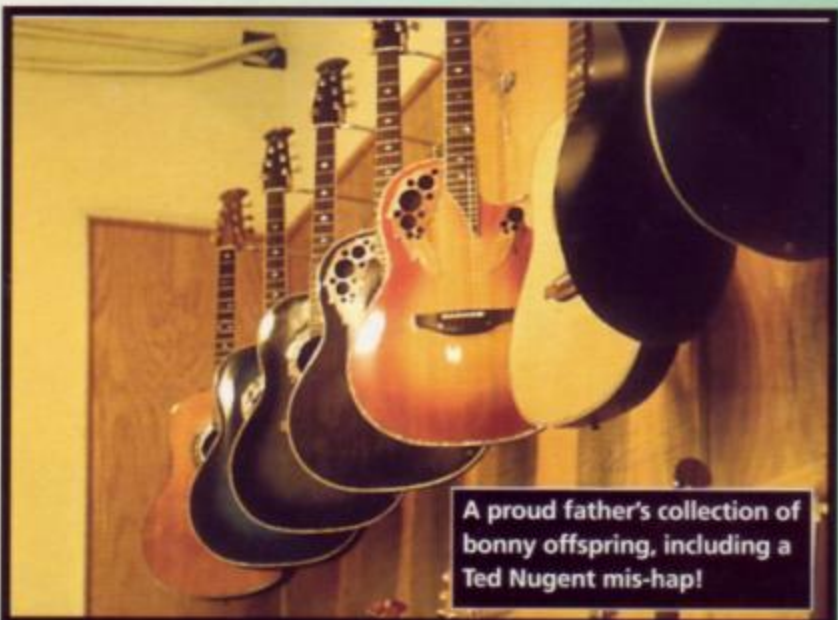
Many thanks to Kaman Music for their hospitality and John Hornby Skewes for organising this enlightening trip. ■



This, apparently, is spackling



Bracing being cleaned of excess glue before facing the scary high frequency press



A proud father's collection of bonny offspring, including a Ted Nugent mis-hap!



Some bizarre prototypes that may or may not see daylight