

Headstrong

These are the most indestructible helmets on earth, capable of resisting 800°C flames and huge impacts. *F1 Racing* visits Arai to see how Lewis & co's helmets are made

WORDS HANS SEEBERG PICTURES ANDREW FERRARO/LAT

The cardboard box that has just arrived at the Arai factory near Tokyo bears the name 'Mr L. Hamilton.' Inside it, a freshly painted carbon shell in Lewis's trademark yellow design – already strong enough to bear the weight of a 20-stone man standing on it – is ready to be finished off with the appropriate padding, straps and bolt-ons before being shipped to McLaren HQ in Woking.

By the time it's completed, this helmet will have undergone FIA tests that include being subjected to 800°C flames, and being dropped on a metal spike from several metres high at a speed of nine-and-a-half metres per second.

Each helmet costs £3,300 and McLaren will require 15 of them per season for Lewis. In total, all these helmets will cost £50,000, which is roughly equivalent to two machined gearbox cases or four sets of brake discs and pads.

The toughness of the F1 helmet can't be underestimated. And for a life-saving device that costs a fraction of a team's annual budget, neither can its value for money.

In Formula 1's ceaseless pursuit of minuscule performance gains, it's no surprise that the

humble helmet has gone from a primitive dome offering very little protection to one that is deemed illegal in F1 unless it can withstand 45 seconds of fire. Twelve of the current grid currently wear Arai lids, including Lewis, Jenson Button, Mark Webber and Sebastian Vettel, so *F1 Racing* went to see one of their helmets being made. It's a process with nods to both the sport's past and present, mixing bang-up-to-date technical know-how with elements that, for the most part, cannot be done any other way than by hand.

There's something refreshing in the modern era about factories that look slightly old fashioned, and Arai's Japanese base is about as far from the McLaren Technology Centre as you can get. Forget space-age corridors and an absence of all dirt particles, this place has stuff everywhere; open pots of glue vie with pieces of paper, metal bolts and scraps of material for table space.

Amid the clutter, you'll find the Arai factory's skilled helmet makers, who all appear to have

been with the company for at least 20 years.

One such chap is introduced as Mr Yamamoto, one of only four people in the whole of Arai who is allowed to make the carbon lids worn by the likes of Lewis. He ushers us to the spot where that process begins: a steel box that opens up to display a helmet-shaped mould. This is where

"You get one go at fitting the larger inner shell in the outer shell. Any errors mean £3,000 and three days work down the drain"

layer upon layer of a special glass fibre is laid, before a piece of Kevlar – just like that used in bulletproof vests – is added. Then it's time for multiple layers of carbon, and 'time' is the operative word: it takes eight hours for Mr Yamamoto to put in all the layers of carbon to make an F1 helmet shell strong enough, then another four hours to bake it. This

is not a production line but a process of craft and finesse, and with good reason: the shell must weigh no more than 728.5g or it will be binned.

After this, the shell goes down to another part of the factory for the only process that isn't done by hand: the lasering of the visor hole and air vent. And as boxes and boxes of freshly cut →



1 Layers of glass fibre, Kevlar and carbon are moulded to form the shell, which are then sent to be lasered (opposite page)



2 With the visor hole and air vent lasered in, the shell is primed and sanded, then sent to be painted



3 Once it comes back from being painted, the rest of the helmet can then be added by hand



The only part of the process that isn't done by hand is creating the visor hole and air vent – this is done with a laser



The helmet's strength is tested by dropping it on a spike. Even so, you'd be hoping that wouldn't happen in a race

helmet shells sit waiting their turn, another intriguing fact emerges – any of these lids could be worn by any of Arai's F1 customers. All Arai helmets are made the same, and the company refuse to make bespoke designs for any customer. A famous team once asked Arai to build a more aerodynamic helmet to help them improve performance. Arai refused.

From here, the shell needs to be sanded and primed – and by this stage the helmet will have been worked on for three days. After the sanding and priming, it goes off to be painted by the driver's chosen artist – in Lewis's case, Jason Fowler, the man who's been designing the 2008 world champion's lids since Hamilton's karting days in 1999. When it is returned by Fowler – in the box marked 'Mr L. Hamilton' – the rest of the helmet can be added. The main complication is getting the inner shell inside the outer one, given that it's significantly wider. Even for Arai's normal bike and karting helmets this takes someone a month of training to master, but with a carbon helmet the stakes are a bit higher: there's only one shot at getting the inner shell inserted properly, so any errors will mean over £3,000 and three days work down the drain.

The misconception is that once completed, lids are shipped to teams and drivers and the helmet manufacturer's work is done. Not a bit of it. While different teams have different requirements – McLaren request 15 helmets per driver for a season while Adrian Sutil at Force India gets only six – there is always an Arai representative at every grand prix to help with any problems a driver might have. At some of the early races in the season this often includes Mr Yamamoto, but the main point of contact for Lewis and friends at every race is ex-karater Peter Berger. "I've been in F1 longer than most drivers – I'm coming up to my 250th race so there's a lot of advice I can give them," he says. His job is mainly trouble-shooting. "For example, in Suzuka, Jenson had wind coming through his visor as it hadn't quite been correctly mounted, so I had to rush and sort that out," laughs Peter.

Is there anything these helmets can't withstand?

The Arai helmet got a thorough examination in 2005 following an astonishing crash in Brazilian



Formula Renault. Poor old Alberto Valerio was fighting for fifth when Fernando Galera flipped in front of him...

"I was going through a left-hander at about 150mph and Galera was in front of me," recalls Valerio. "He hit the kerb and I saw his car fly through the air. Then I felt something. It was his car on mine.

"I got the car back to the pits, touched my helmet and felt a huge hole in it. I was taken to hospital for tests and discharged two hours later with no injuries at all."

Valerio's crumpled helmet now sits in Arai in Japan – a reminder of how much safety has improved in motorsport. *Cleber Bernuci*



Car meets head should hurt – not in this lid



4 External components, like the HANS anchors can now be added on to the outer shell of the helmet



5 All the inner parts of the helmet are now bound carefully together before being inserted



6 The inner shell is inserted into the outer shell – this can take a month of training to master



7 The finished helmet is subjected to punishing FIA tests to ensure that the optimum safety standard is achieved



8 ...and when it is, each helmet gets a nice, shiny, sticker, which is the FIA's official seal of approval



9 Here's one they made earlier: it's Vettel's lid from Suzuka 2010. He won and gave it back to Arai as a gift. Ahh.

"It's always something minor, like adding a tear-strip or something, but F1 is about tiny details and the drivers have to feel comfortable."

With drivers using a helmet for anything between two and five races before swapping it for a new one, there's a lot of loyalty involved in the relationship between racer and manufacturer. Lewis has worn Arai ever since the company

got a request from McLaren to support him in the lower formulae, and Sebastian Vettel got taken by his dad to buy his first Arai helmet at the age of seven. The factory actually displays the helmet Vettel wore on the way to his commanding victory at the Japanese Grand Prix in 2010. "To Arai," the German has written on the visor, "The best helmets in the world – thanks!" Considering he's worn them for the past 16 years, he's in a pretty good position to judge.

Then there's Rubens Barrichello. Having first worn Arai when he sent them a telex as a young driver in Brazil asking for support, he was forced to ditch them for Schubert when he joined Ferrari – a contractual

requirement for drivers with the famous Italian team. Usually, drivers who leave Arai to wear rival helmets are not allowed back, but when he joined Honda, Rubens personally wrote to the president of Arai explaining the situation and asked to wear their helmets once more. He's the only driver Berger can think of who's been let back into the fold. Other drivers, meanwhile,

are more recent converts. Take the very well known driver (Arai didn't want to name him) who switched to them this year after complaining that he suffered a headache for an hour after every race with his old brand. The problem has since stopped.

Arai's domination of the F1 grid is very different to how things were 30 years ago, when everyone in motorsport seemed to wear Bell. Current president Michio Arai, a former racer himself, chuckles at the recollection: "In the 1970s, we really wanted to get involved with motor racing but we had no idea how to do it. Geoff Lees [former Ensign and Shadow driver] was the first F1 driver to wear our helmets in the late 1970s. He used to race in F2



"Lewis has worn Arai ever since the company got a request from McLaren to support him in lower formulae"

in Japan so we approached him. There was also one bike rider who was wearing one of our helmets when he crashed; he said that with that type of accident in his old helmet, his head would be ringing for a week. With ours it didn't ring at all. That kind of story spread.

"We approached drivers with our helmets at races; we heard a lot about their requirements, so we started incorporating them into our products. I remember that Keke Rosberg always had problems with other brands but he loved us. He helped spread the word. It was the little details he liked. But as I believe my colleagues have already told you, we don't make a special helmet for anyone. However big a name a driver might be, everyone is important and we value everyone the same. It's one of our rules."

It's a stance of refreshing conviction, perfectly matching an uncompromising pursuit like Formula 1 with a refusal to put the sport's stars above company principles. They won't be rushed, either. If a driver orders a new helmet it will take about four weeks to deliver – a rather un-F1-like time frame if truth be told. But if you work here, that probably says everything about your levels of job satisfaction: in a sport where millions of pounds are spent saving mere tenths of a second, no one can better the work these people take a month to do. You have to admit, that's quite cool. **F1**