

# Bearing the flame: firing the spirit

The Sydney 2000 Olympic torch



Where there's smoke... – a brief history of the Olympic torch .....	1
How to make an Aussie icon – the design brief.....	2
A collaborative process – the design team .....	3
Fabulous for 2000 – the initial design .....	5
High tech to symbolic – the four Blue Sky design submissions .....	6
In for a penny... – the final selection .....	7
Paper to product – making a 3D model .....	8
Making it go – the manufacturing process .....	9
A gas cocktail – the fuel burner system.....	10
Just to make sure – testing the final prototype .....	11
Burnin' up – the final Olympic torch.....	12

It is no easy task creating an Australian icon, let alone creating one to represent Australia at the world's most important sporting event. For the Sydney 2000 Olympics, Blue Sky Design was selected to create a new Olympic torch that would become an icon of sporting spirit for the new century.

## **Where there's smoke... – a brief history of the Olympic torch**

The first time the modern Olympic flame was set alight was at the Amsterdam Games in 1928. Jan Wils had designed the tower to hold the first flame to light up the modern Games.

It was not until the 1936 Olympic Games in Berlin that the torch relay started and the tradition of bringing a nation together under the Olympic flame began.

The first Olympic torch to be created by a designer was at the Albertville Winter Games in 1992. The contemporary designer Philippe Starck was invited to incorporate his renowned 'chrome banana' design into the Olympic torch.

For the Sydney 2000 Olympics, SOCOG and the IOC drew up a set of very specific requirements. Not only would the torch need to meet stringent environmental and technical performance needs, it also had to be a symbol of modern design and an icon for Australia's second Olympic Games.

## How to make an Aussie icon – the design brief

Ask any Australian for an example of a local icon and you'll soon get a list of popular answers: the Victa lawnmower, the Hills hoist, the Holden ute, the boomerang, the Sydney Opera House. But what factors create an icon?



The Victa lawnmower  
Collection: Powerhouse Museum

What factors would help the Sydney 2000 Olympic torch earn iconic status? It would need to look different, original and decidedly at home in the Australian environment. It would need to perform in any weather at reasonable cost and be reliable without fault.

Not only would the Sydney Olympic torch need to meet these general criteria (as well as needing to be simple and logical enough to operate without a manual), it would also need to come up shining against an even more stringent set of requirements. Among other criteria, the 2000 Olympic torch would need to be:

- Less than 1.5kg in weight and easily carried;
- Easily reproduced (14,000 torches were required);
- Environmentally responsible in manufacture and operation;
- Able to burn for at least 30 minutes to cover each 20 minute run;
- Able to withstand 90kph winds, rain and snow;
- Free of polluting emissions or wastes;
- Easily held by torch bearers, from children to elderly people;
- Representative of the spirit of Sydney and the spirit of the Olympics.

The design process was made even more challenging by the fact that the 2000 Sydney Olympic torch relay would be the longest in Olympic history.



The international torch route\*

From its ceremonial departure from Athens in May 1999, the Olympic flame would travel across the Atlantic and Pacific Oceans to Australia and then begin the relay run covering thousands of kilometres and passing within one hour of almost every Australian home.



The Olympic torch route for the Sydney 2000 Olympics was marked on this souvenir medallion packaging

The torch would also need to withstand Australia's harsh and varied environment. From scorching desert heat to freezing mountain terrain, the Olympic torch had to stay alight in the face of every environmental and physical condition imaginable.

In November 1998, SOCOG issued the brief to a selection of 40 Australian companies; directed at designers working in a range of disciplines including architecture, industrial design, graphic design and art. Within a matter of months, four of these companies would be short-listed and then one company would be awarded the final design; that accolade went to Blue Sky Design in Sydney.

### **A collaborative process – the design team**

Blue Sky Design specialises in industrial product design and often works with a multi-discipline team on each project. The Creative Director of Blue Sky, Mark Armstrong, knew from the outset that their design strategy and their team would be the foundation if they were to win the tender. This meant that the initial phases were as important to the process as the final manufacturing.

*To win a tender you have to have a team with all the right skills. And to put together a team like that we needed a whole range of disciplines, some in the studio and some beyond our studio. So, we started to form*

*partnerships with the best people in their field that we could find.*

— Mark Armstrong

SOCOG had already commissioned Adelaide University and Fuel & Combustion Technology (FCT) to design and manufacture the torch burner components. With this technical part of the torch design in place, Blue Sky then created their winning collaborative design team:

- **Blue Sky Design**  
(Mark Armstrong, Creative Director; Robert Jurgens, Senior Designer, and Ian Cameron, Engineering Development)
- **Box & Dice**  
(Model makers; Alan Ismay, Model Maker)
- **G. A. & L. Harrington**  
(Toolmakers and metal pressing specialists; John Harrington, Detail Engineer)
- **Royal Melbourne Institute of Technology (RMIT) University Centre for Design**  
(Chris Ryan, Environmental Specialist)
- **Philips Electronics**  
(financial assistance)



The Blue Sky team with early torch designs\*\*



The team from Blue Sky Design, G. A. & L. Harrington, University of Adelaide – FCT, Box & Dice, and RMIT Centre for Design\*

Once the team of specialists was in place, Blue Sky could show the SOGOC and IOC selection committees that they met each of the requirements at every stage of the design and manufacturing process.

This collaborative method of specialised working was one of the major reasons that Blue Sky were chosen to produce the Olympic torch.



The Sydney 2000 Olympic cauldron designed by Blue Sky\*



Previous Olympic torches\*

### Fabulous for 2000 – the initial design

From pedestrian bridges to car stereos, Blue Sky is known for their solid research in product design development. The Olympic torch would be no exception.

*We studied the ancient Olympics, we looked at the heritage of the modern Games with the 1936 Berlin torch, we looked at the history, and Robert from our office was in Switzerland so he dropped into the Olympic Museum in Lucerne and had a look at all of the previous torches and looked at the space on the wall for the Sydney torch which was there, and I think that inspired him about the importance of this project.*

— Mark Armstrong



Other products designed by Blue Sky\*

Mark Armstrong and Robert Jurgens began by researching previous Olympic torches.

One thing that emerged from the torch research was the way of identifying cultural designs that clearly represented the time in which they were made and used: from the wick burner in the 1936 Berlin Games to the latest technology in the 1996 Atlanta Games.

*What we found out early is that the torch relay is a snapshot in time, and it shows a country's culture and its technology at that time so it will date, and that's its function in a way. We weren't trying to design something timeless that would look wonderful in twenty years. We had to design something that was fabulous for 2000, that was 2000.*

— Mark Armstrong

The SOCOG design brief placed importance on the spirit of the Olympics, and familiar Australian symbols such as native flora and fauna, inventions like the Sarich engine and physical locations like Sydney Harbour and the Opera House.

Using these spirit symbols, Blue Sky drew up a series of image boards to explore visual meanings and possible applications. Along with research pictures, like every model of Victa lawnmower, the team even hunted down a traditional boomerang to use as inspiration in the studio.

## High tech to symbolic – the four Blue Sky design submissions

With these image boards as their backdrop, Blue Sky Design began putting to paper their first ideas.



Early Blue Sky design drawings\*

In this phase of concept development, Blue Sky Design developed many hundreds of designs that reflected different ideas that were then culled into four final concepts:

- **Symbolic:** inspired by the boomerang with a white outer layer representing the sails of the Sydney Opera House and the blue inner layer for the hue of Sydney harbour;
- **Body:** inspired by the body of an athlete and with the shape of a boomerang;

- **Traditional:** using a West Australian jarrah handle and around the flame a series of sails inspired by the Sydney Opera House;
- **High tech:** with the handle of the torch being constructed in carbon fibre ducting to allow light to pass through.



Blue Sky's four torch designs\*

The initial designs were then modelled in 3D using the latest state-of-the-art software. The 3D surface files were rendered to a high resolution and finally photo-realistic flames were added in Photoshop. After Blue Sky had refined the four designs, they made the decision to submit them all.

The entire conceptual process had taken Blue Sky less than four weeks.

## In for a penny... – the final selection

Once the final images were ready, they were compiled along with details of manufacturing, budget and delivery times and presented to SOCOG for the first round in the selection process.

*We presented DesignStudio renderings showing the torches with flames in place and with runners, all photo-montaged to give more reality to the design.*

— Mark Armstrong

By submitting the four designs, Blue Sky was essentially allowing itself to present four different points of view to the SOCOG committee. In their interview with the SOCOG committee, Blue Sky felt that the symbolic design was the torch that was most likely to satisfy SOCOG and the brief.

Within two weeks of the first deadline, Blue Sky Design was chosen as one of four companies to progress to the final selection round. The project now entered a crucial stage in the design process. The concept had been partially accepted but the design was a concept, far from complete, and a package detailing all the necessary elements to take this idea into production was required.

*Being in the final four, we said, "In for a penny, in for a pound – let's go for it. What does it take?" So this was the point where we said, "OK, now we need a model".*

— Mark Armstrong

### **Paper to product – making a 3D model**

Taking the torch design into a three-dimensional format required the expertise of model-makers. The final design for the symbolic torch was emailed to Box & Dice. Using numerically controlled (CNC) milling machines, Box & Dice then produced a high quality scale model, complete with realistic surface finishes.

*If you've got a great idea and poorly executed model, people in high positions, board members and the like, in my view... unless they can see exactly how it's going to be you won't convince them.*

— Mark Armstrong

The function of this first three-dimensional model was also for the designers to evaluate the finer points of the design. On paper certain decisions can be made, but in three dimensions a whole set of other

decisions can be made with a higher degree of certainty.

Together Blue Sky Design and Box & Dice subjected the design to further modifications: they made the body shorter and modified the angle of the external layer so that more of the blue layer became visible. During this analysis of the three-dimensional model it became apparent that a solution for the surface treatment was necessary.

*To have a metal shape, or a plastic shape is nothing. We were searching for finishes and materials that we could embody the design with, and enrich it. We had to have an exotic surface. We found a company in Newcastle that used a water-based printing process that can layer textures across three-dimensional objects.*

— Mark Armstrong



Sydney 2000 Olympic torch (detail)\*



The printing process, called cubic printing, lays a pattern over a liquid surface. The object is immersed in the liquid where the printed pattern transfers around the product. The final print is then sealed with lacquer and buffed into a polished surface.

Blue Sky went into their final presentation with a physical three-dimensional model. They supported their bid with a lifecycle analysis of the torch and information relating to the emissions the torch would create (produced by the Centre for Design at RMIT) and a document outlining the costs of manufacture.

All Blue Sky's efforts paid off when the symbolic torch they had designed was officially selected by SOCOG to carry the Olympic Flame to the 2000 Sydney Olympics.

### **Making it go – the manufacturing process**

The final stage of any product development is often the most time consuming and costly, involving prototyping, testing and preparation for manufacture. It is where all the small and seemingly unimportant details are

resolved. For Blue Sky, the two main issues that needed resolving were:

1. Construction and assembly; and
2. Fuel and burner technology.

Forming the three shells of the torch proved difficult. The outer and middle shell were made from sheet aluminium and the inner shell was made of stainless steel which, due to its hardness and complex shape, was particularly challenging.

While conceptualising how the shells would hold together, Harringtons (the torch manufacturers) were inspired by the hinge pin used in cutthroat razors.



The Sydney 2000 Olympic torch opened to reveal the fuel cylinder

This provided them with an easy way to open and close the torch and a way to completely lock the torch together. The hinge-pin formed the basis for the on/off switch, gave access to the gas cylinder and made it easy for all the internal components to attach themselves to the inside of the torch.

While the external design was being finalised, and another company worked on the internal components, it fell into Harringtons' hands to bring the elements together into a working product that could be replicated for the 14,000 models required.

The core of Harringtons' work was in the detailing of all the components, their assembly and validating that the product met the proper environmental and safety standards. SOCOG and the IOC would also require detailed documentation that showed how the metal and polymer torch would safely pass through thousands of hands while alight with flame. It would not be until the Opening Ceremony that everyone involved in the design and construction of the Olympic torch could breathe easy.

### **A gas cocktail – the fuel burner system**

Through a separate tender process, the University of Adelaide in conjunction with Fuel & Combustion Technology Pty Ltd (FCT) were commissioned to develop the fuel and burner system for the torch.

FCT developed a fuel mixture of butane and propane gas, a blend that would burn cleanly and produce just enough soot so as to produce a bright yellow flame.

They also developed a completely new design for the burner that produced two flames: a large external flame that was the visible flame and a small protected flame that was utilized to ensure the large flame was kept alight at all times.

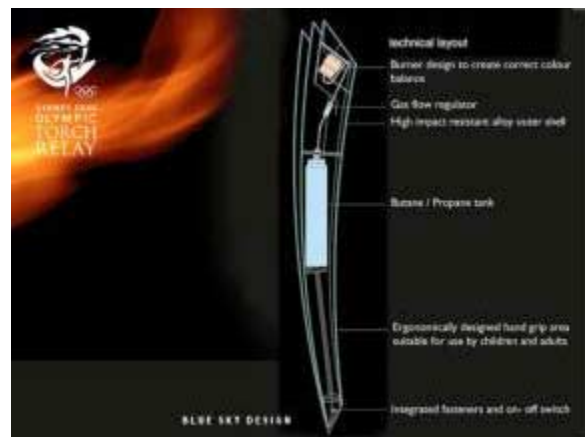


Diagram of Sydney 2000 Olympic torch construction\*

One of those seemingly unimportant details that required a great deal of time and effort was the development of the choke assembly, or more specifically the 'choke cap', an element that regulated the flow of gas.



The Sydney 2000 Olympic torch (detail)

Macquarie University's Centre for Laser Applications successfully produced the 'choke cap', the function of which was to produce a flame with a specified height and burn duration. It was a small piece of sheet brass with a tiny aperture of 75 microns that had to be perfectly round to within one micron (one hundredth the width of human hair).

*That was very critical to the overall performance of the torch because one little part will make the torch reliable or not reliable, will make it last the twenty-five minutes required, all the things in a lot of ways was pivotal around how well that one part was made.*

— Mark Armstrong

## Just to make sure – testing the final prototype

All throughout this process of detail design work, torch prototypes were constructed to confirm mechanical design solutions, material choices, reliability and functional issues.



Wind tunnel testing of the torch\*

To test whether the flame would extinguish itself in the wind, a torch was placed in a wind tunnel and the flame exposed to winds of up to 65kph. In a separate tunnel, a sprinkler system was added to test the flame against wind and rain together.



Testing of the torch for extinguishment by water\*

All aspects of the torch were rigorously tested so that the final product reflected or improved upon the specifications set out in the initial brief.

After 18 months of development, the final torch design was unveiled on 8 March 1999. With the subtle curves inspired by the traditional boomerang, the colours of Sydney Harbour and the sails of the Sydney Opera House, the new Olympic torch helped to ignite Australia's Olympic fever.

### **Burnin' up – the final Olympic torch**

The new torch not only represented the spirit of the Olympics and the spirit of Sydney, but also the Australian spirit of unique innovation and creative collaboration.

The final specifications included:

- An outer layer arc of pressed aluminium component, powder coated in white and cubic printed with the Olympic logo)
- A middle layer arc also of pressed aluminium and anodised in a fluoro blue.
- An inner layer arc of high-grade stainless steel holding the copper feed lines, plastic switch mechanism and stainless steel burner components.
- A gross weight of 900 grams (more than half a kilo under the maximum)

Among the 10,000 people who ran, walked, rode, peddled, and swam with the torch in its historic relay, even Mark Armstrong was unprepared for its final impact.



Mark Armstrong\*\*

*Well, before I ran – really it's an amazing thing – I was standing in the crowd ahead of the relay, so you're sort of standing here waiting for your turn, and children, and women, and mothers, and babies, and grandfathers were all coming up wanting to be photographed with the torch, and they didn't know that I was part of the design company that worked on it or anything, they weren't interested in that, but they were fascinated by the torch just to stand near it, to have their child hold it, and have their photograph taken.*

*I've never seen anything like it; that people could be so caught up in just really a flame on a stick. So then I started to really understand the Olympic spirit, that's powerful, so powerful. But I didn't understand probably till then because although it's an exciting project it's still a piece of industrial design, it's a piece of engineering, and it's a nice looking thing. That's it. But when I was there in the torch relay I had a lump in my throat. It was just quite incredible to see how much it meant to other people.*

— Mark Armstrong



\*

\* These images were produced by Blue Sky for a presentation to the Sydney Organising Committee for the Olympic Games (SOCOG) related to the Sydney 2000 Olympic torch design and development process. They are reproduced courtesy of the OCA.

\*\* These images reproduced courtesy of Blue Sky.

The other images in this case study are © Powerhouse Museum.