NIGHTS OF PASSION IN T

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URIN

THE OLYMPIC OPENING AND CLOSING CEREMONIES SET NEW RECORDS FOR TECHNICAL COMPLEXITY

BY MIKE CLARK

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The Opening Ceremonies began with "Sparks of Passion," in which speed skaters bearing flames on their backs made a stunning entrance into the stadium.

REQUIREMENTS: 6,100 VOLUNTEERS, 240 PROFESSIONALS, 15,000 WORK DAYS, 100,000 MEALS, 6,100 COSTUMES, 4,000 SQ. M. OF STAGING, 10,000 SQ. M. OF BACKSTAGE AREA --NOT TO MENTION YOKO ONO, LUCIANO PAVAROTTI, AND A GIANT HUMAN DOVE OF PEACE

Turin's 2006 Winter Olympic Games set several records even before the contests began.

The Olympic Games was the largest temporary energy infrastructure project in the world, the Turin games were the first all-digital broadcast, and the ceremonies used the largest intercom system ever in a Winter Olympics, as well as the largest-ever XTA electronic crossover network. The ceremonies also featured the largest curtain in the world, which revealed the stage for Luciano Pavarotti's performance.

Pavarotti was only one of a list of celebrities who took part. Others included Giorgio Armani, model Carla Bruni, Sophia Loren, novelist Isabel Allende, Susan Sarandon, Yoko Ono, and Peter Gabriel at the Opening Ceremonies and opera singer Ben Heppner, Avril Lavigne, Ricky Martin, and members of the Cirque du Soleil at the Closing Ceremonies. It also featured a number of innovations; for once, the athletes were seen in a more informal context, inside a mosh pit.

The two billion viewers watching the FilmMaster/K2006-produced ceremonies will have had a hard job picking out their favorite show segments, but the lighting of the Olympic cauldron, the dancer/acrobats suspended under Studio Festi's huge floating sun and moon, or ballet star Roberto Bolle's apparent ability to defy gravity must have been among the top choices—not to mention the dove of peace formed by acrobatic climbers, the motorized pyrotechnic Olympic rings, and the fireworks display.

"Passion Lives Here" was the motto of the Olympics and that note was struck at the very beginning of the ceremonies by the "Sparks of Passion" sequence, in which speed skaters bearing flames on their backs made their stunning entrance into the stadium. The overall designer for the production was Mark Fisher, the well-known specialist in spectacle, having designed many tours for Pink Floyd, The Rolling Stones, and U2 as well as such Cirque du Soleil productions as *KÀ*. Fisher designed the overall space, as well as three key visual aspects: the five-circle truss structure, with pyro representing the traditional Olympic rings symbol; the giant stage and curtain for Pavarotti's performance of "Nessun Dorma" from *Turandot*; and the Dove of Peace symbol, created by an arrangement of acrobats in white uniforms.

Having worked on the ceremonies of three previous Olympic Games (Los Angeles, Barcelona, and Sydney) and producing the flag handover at the 1996 Atlanta Closing Ceremony, Ric Birch (the Turin ceremonies' associate producer) has rightly earned the title of "master of ceremonies." He explains, "The Turin Organizing Committee invited me to address a workshop for potential ceremony producers in 2002. Subsequently, [executive producer] Marco Balich asked me to join FilmMaster's bid in the competition to select a producer for the ceremonies, so I worked on the bid—providing creative input, as well as establishing guidelines and formats for the structure of the production unit—and FilmMaster was announced as the producer in July 2003. I was part of the company from then on, ensuring creative continuity between show

segments and maintaining a creative overview. Marco Balich proved to be an exceptionally talented Olympic Ceremony executive producer.

"After FilmMaster had been selected by TOROC [the organizing committee] the creative process became more intensive and Mark Fisher refined the stage design to incorporate new ideas," explains Birch, adding, "With the Olympic Ceremonies, teamwork means it's almost impossible to allocate creative credits to one person, because everything contributes to the final impact. From music, lighting, staging design, costumes, choreography, and props, it's a combination of them all that makes for the big magical moments. The most important factor of the Turin Ceremonies was the incredible spirit of the volunteer performers, their commitment to the Olympics and their willingness to endure difficulties and discomforts to represent their country in the Opening and Closing Ceremonies. The people of Turin were a pleasure to work with and every day they gave us more reasons to celebrate their city with them!"

Marco Astarita, the Ceremonies' technical organizational producer, stresses the fact that the Italian company beat other organizations with a high international profile, thanks to its technical and organization ability. He adds, "The starting point was the venue and the set designed by Mark Fisher, an extraordinary but very demanding guide for any technical team. The final set design featured a stage with a huge proscenium and large very 'fluid' apron platform, on which we started working on the four key technical aspect of the ceremonies—lighting, sound reinforcement, special effects, and communications."

FilmMaster formed an in-house technical management staff for K2006, the company founded ad hoc for the ceremonies, and a production team led by operations director Maurizio De Lazzari to follow the events' awe-inspiring logistics. Astarita says, "The technical management team was led by some great folk, such as technical supervisor Richard Hartman and our technical director Mario Ruffa. K2006's technicians were led by Willy Gubellini and Angelo Camporese [audio], Eneas McKintosh [lighting], Gino Lazzaroni [pyro/fx] and Andrea Taglia [communications], a group of key players in the last 15 years of Italian show production history."

All the structural work was entrusted to Stageco, with whom Mark Fisher has worked for many years, and the stage itself was by LimeLite. The main lighting contractor was Space Cannon, supported by Agorà of L'Aquila. As far as audio was concerned, Astarita brought together Olympic Partner Panasonic as main contractor, top Italian sound designer Daniele Tramontani, and Agorà, one of Italy's largest rental firms, who supplied specific hardware, rigging, and technicians.

Setting up the sound system

As an Olympic Partner for the Winter Games, Panasonic's sponsorship extended beyond audio and video to include car navigation systems and related multi-media equipment, as well as the supply of security equipment. As this was also the first year for an all-digital broadcast set-up, Panasonic also provided 75 Ramsa audio systems, featuring line-array speakers developed to cope with extreme conditions and minimize sound leakage.

The sound system designer for the ceremonies was Los Angeles-based Gary Hardesty, who has a long career in the sound industry. He began work as a systems engineer in 1968 before forming his own company. With several successful commercial products and three patents, he sold the company in 1991 to Harman/JBL Professional. He worked there for five years—then, he explains, "I then moved to EAW for a few years and made some very interesting experiments there, working closely with Kenton Forsythe and Dave Gunness. In 1999, I was appointed vice president for worldwide events and technologies for the PRG Audio Group, which I eventually left, going back to doing my own work."

Hardesty has worked with Panasonic since 2001 and has 3,000 shows to his credit, including major events such as the Atlanta Olympics, the 1994 World Cup Opening and Closing Ceremonies, several NFL Super Bowls, and the Pope's visit to Toronto in 2002. He began work on the Turin system a year before the games and, in addition to deciding which speakers to use and where to place them, he also designed the Ramsa WS-LA1 and WS-LA2 line arrays used to cover the stand seating in Turin (and also in major competition

PHOTO AL BELLO/GETTY IMAGES

In a climactic moment, Luciano Pavarotti appeared on the large stage (right) to sing "Nessun Dorma." According to Mark Fisher, the curtain was about 160' wide and nearly 80' high.

venues). These units were used for the first time at the Athens Olympics, and in Turin, a third system—the WS-LA3—currently at prototype stage, was used and will be integrated more extensively in the Beijing 2008 summer Olympics.

Hardesty explains the arrays' distinguishing features: "The three-way bass-reflex systems use planar magnetic rather than ribbon technology—they have conventional low frequency drivers and proprietary large flat-leaf-type, mid-range, and HF drivers. This has resulted in the first really high-definition products—sound quality is extremely high, phase response is very flat, and frequency response very smooth and extended. WS-LA2 is basically a smaller version of the WS-LA1 and both have extremely low distortion and extended high frequency range. The WS-LA3 is intended to compete more with normal compression driver products, so it has more conventional technology, but sounds extremely good—the intention was in fact to create a 'family sound' for the range."

Although Panasonic also manufactures a WS-LASUB, Hardesty didn't have enough of the units, so it was decided to use L-Acoustic SB 218 subs along with the Ramsa arrays in Turin. Twelve clusters, each with eight WS-LA1 systems and two subs flown from the stadium roof, were deployed along either side of the stadium, and another WS-LA1 cluster (six systems and two subs) was flown on either side at the beginning of the curve on the main stage and more or less level with the stage front.

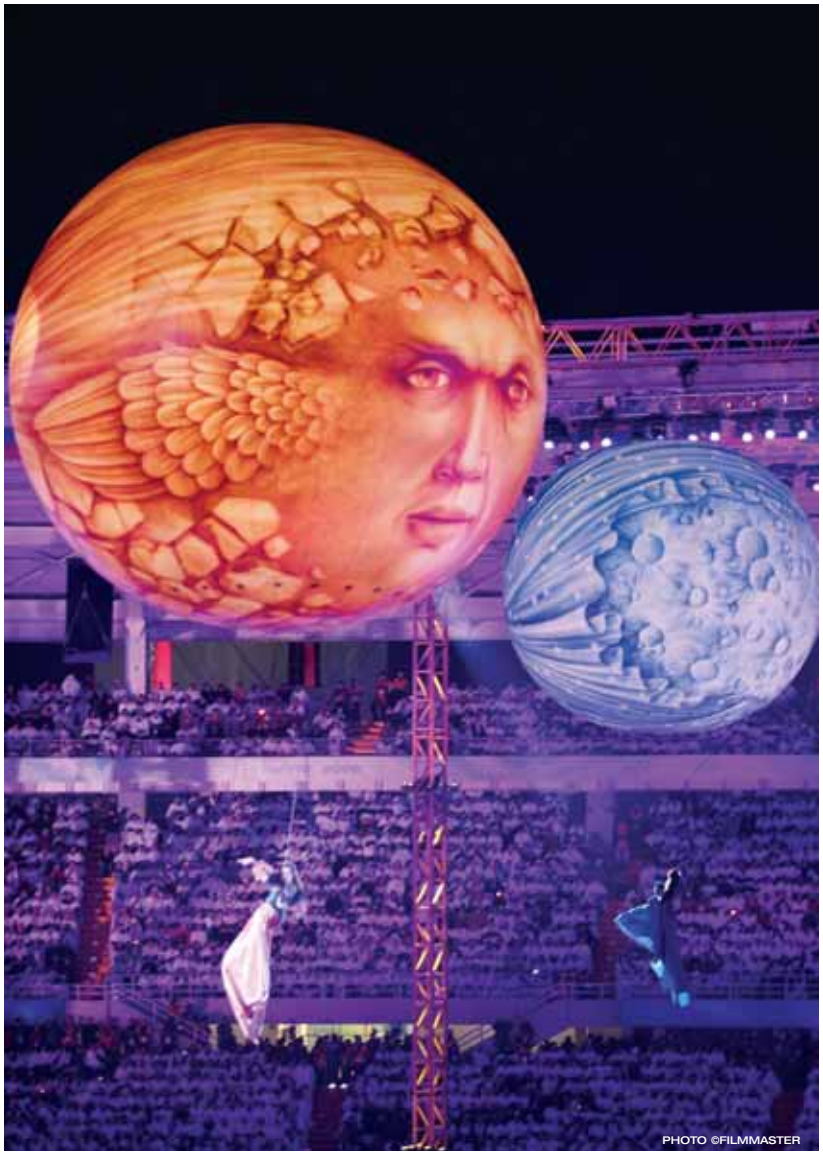


PHOTO ©FILMMASTER

Two WS-LA2 clusters (four systems and two subs) were flown above and behind the stage and two more external WS-LA2 clusters (six systems) were level with the side of the set. The impressive, roof-flown Panasonic rig was completed by two more WS-LA2 clusters (ten systems and two subs) on the curve at the opposite end of the stadium.

Spot and ground coverage was ensured by a combination of systems by Ramsa, Meyer Sound, L-Acoustics, and Outline. Four WS-LA3s were ground-stacked at the base of the rear Olympic ring towers.

Around the perimeter of the stage was a series of four Meyer Sound MICA and eight MILO systems, plus four L-Acoustics KUDOs and four Meyer 700HP subs on either side of the stairs leading up from the track onto the stage. Five Milos were stacked onstage at the grid legs and three Meyer 700HP subs were ground-stacked on either side of the stage, along with six Kudo units. A pair of Milos was positioned at the Olympic ring platforms and a monitor speaker positioned onstage and at the flagpoles. "Using self-powered cabinets made the job much easier, because we didn't really have room underneath for large amp racks," says Hardesty. Grisby Music, Meyer's Italian distributor, supplied the company's gear.

Six separate Outline Butterfly CDH 483 Hi-Packs were used as fill speakers for the mosh pit, a cluster of six flown from each of the two light towers furthest from the main stage and a cluster of four cantilevered from each of the front rings towers. A cluster of six more was flown from either side of the stage grid as side fills, each cluster with three subs.

The audio system was one of the most complex ever employed for such an event. In addition to the main system for the audience, divided into a large number of individually controllable zones with different requirements, there were also areas used by the athletes and performers, a special VIP zone, and broadcast feeds, all requiring specific attention. With so many sound sources spread over such a wide area, a study, reliable distribution network was of fundamental importance.

The dancer/acrobats suspended under Studio Festi's huge floating sun and moon provided one of the most indelible images at the Olympics.

A view of the pyro effects also reveals the layout of the stadium and the Italian opera stage that Fisher designed for Pavarotti's solo.

Hardesty specified EtherSound for its low latency, superior audio quality, and flexible functionality, making in-depth use of EtherSound-enabled products from Digigram. The design used a 1 Gigabit fiber-optic backbone, with eight distribution zones supported by 1 Gigabit and 100 Megabit CAT 5e cable. Data traffic and network redundancy were managed by DLink Ethernet switches and transceivers using Spanning Tree Protocol. PCM digital audio data was transmitted across the network via EtherSound-enabled devices from Digigram. Fifteen ES881 eight-channel AES/EBU digital-input interfaces were used to transmit the source material onto the network and extract it as needed for broadcast or live sound reinforcement, along with six 8-channel ES8in and eight ES8out Ethernet Audio Bridges. A pair of two-channel ES220-L network interfaces were also used. Agorà supplied all the equipment in conjunction with Panasonic; Hardesty's Italian partner, Daniele Tramontani, did the detailed audio network design and management for the network, with the technical support of Prase Engineering.

Rob Hunt, Hardesty's Panasonic partner, acted as senior Panasonic project manager for the stadium (and all competition venues). Hardesty explains, "I'm also responsible for the 2008 Beijing Olympics sound design and was in Beijing during some of the Turin set-up, but I had several really good partners to rely on, including the incredible support of Agora."

Tramontani says, "I was the executive with Agorà and my job was to set the entire system, including EQ and delay. Twenty-two sends were fed out from the [Midas] Heritage 3000 desk manned by Maurizio Maggi to a rack of BSS Soundwebs, which took care of equalization, delay, and volume. From there, the 48 signals, already divided for each cluster, were fed out to the Digigram units for transport to the various clusters. Some went to the XTA DP 226 electronic crossovers and then to the amps—over 170 Lab Gruppen 6400s—while others went directly from the Soundwebs to the amps. This was reportedly the largest XTA network assembled.

"The fact that the main clusters were identical considerably facilitated part of the work involved in installation, when we measured the individual enclosures with [the Meyer] SIM [system], starting with the Ramsa systems and setting a crossover on the XTAs—that took about a day for each box," continues Tramontani. "The hardest zones were those around the front of the stage. People who were under or near a cluster obviously heard the sound immediately, but those furthest away heard it with a delay of 150 milliseconds, so the signals from all the other sound sources had to be aligned with that delay. However, if I'd aligned the clusters at the opposite end of the stadium, I'd have created confusion with all the rest of the clusters. I therefore started delaying the clusters from midway down the stadium—it was as if the stadium was virtually curved before its physical curve."

Three PCs were used to control and monitor the system—one for the Soundwebs, one for the Digigram units, and one for the XTAs via 485. A fourth computer was used to control the switcher network. The fiber network had over three miles of cable forming a three-node ring with a large 'T' super-imposed on it to ensure the utmost redundancy.

Olympian lighting

Lighting designer Durham Marenghi, whose previous designs include The Queen's Golden Jubilee, the event lighting for Roger Waters' *The Wall Live in Berlin 1990* (another major Fisher project), and the Ceremony of Annexation of Hong Kong to China had a team that included lighting coordinators Eneas MacKintosh, Nicola-Manuel Tallino, Nick Jones, and Dave Bartlett, along with programmers Ross Williams, Mark Payne, Pryderi Baskerville, and Emiliano Morgia. "Ross worked on the original control system design," Marenghi says, "alongside High End Systems, who provided the system, which consisted of four High End Wholehog 3 lighting consoles, plus four more on backup duty. Initially, Mark Fisher and I met Marco Astarita, who's the technical producer, and Christel

Strohn in the UK. They had a good idea of what they wanted to achieve in the first instance and, after discussing the artistic content, we specified the type of lanterns we wanted and carried out numerous photometric tests to ascertain the brightest, most reliable, fixtures available."

The design included more than 900 moving heads, nearly 1,000 LED fixtures, and 400-odd dimmers—a total of 24,500 DMX channels. This required no fewer than 21 DP2000s (data processors) with the Wholehog 3s to distribute each console's data to the required areas.

Apart from the numerous conventionals, the rig also included 348 Coemar iWash 575EBs, 50 Coemar ProWash 250s, 124 Coemar iSpot Extremes, 130 Martin MAC 2000 Wash units, 232 Robe 1200 Wash units, 36 Space Cannon Ireos 8kW xenon pro searchlights and two Space Cannon 3kW multi-beam flower effects. Followspot ops manned twelve 2.5K and eight 4K Lycian spots installed on platforms at the top of the stand seating, on the bridge above the rings structure, and on the main stage bridge.

Although this was his largest project to date, Marenghi kept everything simple in terms of theatrical effects. "Whereas in theatre, each channel might be 2kW, in stadia, each can be 20kW, so we kept the 'building blocks' the same and just worked on a larger scale," he says. "We tried to use a sort of theatrical integrity in the design and expand that into television, making sure the artists were well-lit for the TV requirements, but the backgrounds were all very theatrically produced with an eye to contrast and color."

Another aspect that distinguished Turin from other events designed by Marenghi was the weather. "Working outdoors, we could only achieve our lighting at night, when temperatures were very low and the plastic-covered stage became an ice rink," he says. "Walking around doing focuses was very similar to the ice shows I've done in the past; control systems prefer warm, condensation-free temperatures, so it had its own challenges in that respect. Another weather factor was that, at this time of the year, soccer matches are often cancelled because the players can't see the ball, due to the fog. The design therefore took that into consideration from the outset, and much of the equipment was installed in technical troughs sitting approximately 1.5m [4.92'] off the ground, working on the theory that the closer the light was to artists, the fewer problems there would be with fog obscuring beams."

The trough mentioned by Marenghi extended around the perimeter of the 200 x 600m [656.16 x 1,968.5'] performance parade area and also across the "tongue" platform that protruded from the front of the stage and served as a main stage. The trough fixtures threw wide-angle light around the stadium and onto the five-ringed truss structure depicting the Olympic symbol. More units—80 Robe fixtures—were placed on the stage roof on four trusses, to light the performances; more Robe units were found on a truss over the five rings, creating downlight for the stage. (In addition to facing extreme weather conditions, the trough units had to contend with dirt, confetti, pyro, and quartz crystals—placed on the stage for improved grip—that rained down on them.)

"On the technical side, since the stadium had been developed and modernized over the last few years, the roof didn't exist when we established the designs and nobody could tell us what sort of load could be put on it, so Mark Fisher and I had the idea of lighting support structures that were absolutely separate from the roof structure, apart from some fixtures we have spread around the stadium," Marenghi says.

This daytime view of the stadium show the Panasonic Ramsa WS-LA1 arrays, with Outline sidefills in the background.

"TV coverage conditions can drive the color palette, particularly when the broadcast is high-definition, which is unique in terms of the precision and detail that can be seen on the screen. In the past, if you had an artist with a crowd behind him, the crowd was really an indistinct blur, so you could color it and use it as a background. With HDTV, you're more aware of people's faces. Even if not broadcast as such, a lot of the productions we do nowadays get HD television coverage, because of future content use, such as DVDs and other

electronic media. So alongside our programmers, production lighting managers, spot callers, and spot ops, our team also had an HDTV consultant—Christopher Bretnall—who's now become integral to our work, as we try to understand and follow the developments in technology," says Marenghi.

Because of the scale of the lighting system and the short time the team could use it—overnight—WYSIWYG was used and was supported by Cast Lighting in Canada, who supplied three systems.

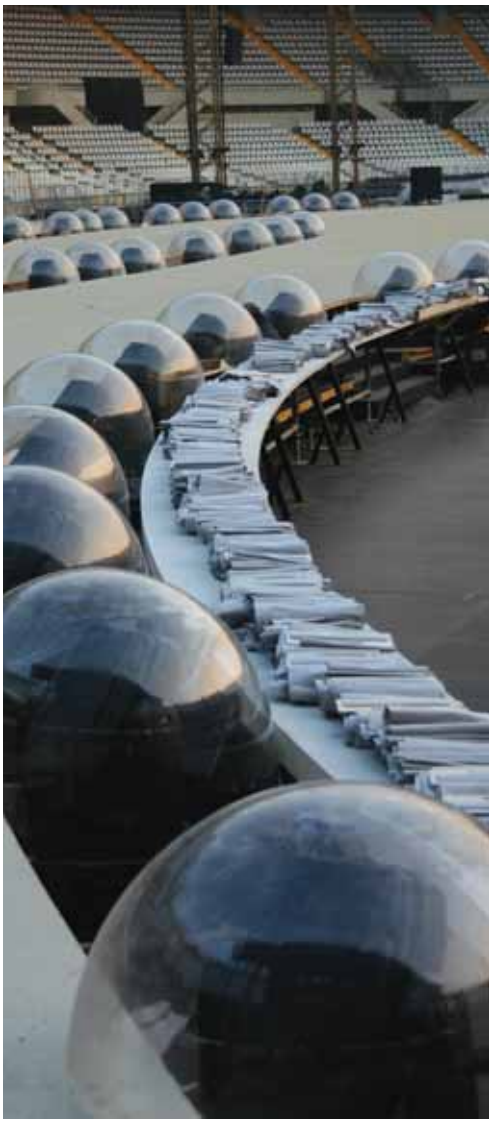
Regarding LEDs, the flavor of the moment, Marenghi opines, "Generally speaking, I don't think LEDs are quite there yet in the terms of light quality, particularly to put on human faces. In terms of the color-mixing, especially when you're trying to get a white out of them, there are many frequencies missing. We therefore stuck to conventional lighting sources for that. But, since Space Cannon [the main lighting contractor] manufactures quite a lot of LED products, I was keen to use that development. We had Space Cannon LED units lighting physical structures, such as the main stage's ramps [with 284 Helyos R/G/B/A LED PARs], as truss toners [302 Helyos], and on the underside of the balconies for audience backlight [360 Luxor LED Strips]." The Olympic rings were also outlined by 200m [656.16'] of blue, red, green, white, and yellow LED neon tubes.

With over 2,000 fixtures installed in a stadium, the control network was of vital importance and the solution adopted was a self-healing fiber-optic signal transport ring, with the control room at the start and end of the ring, and a total of 11 locations around the arena from which it was possible to send and receive data. The signals arriving in these locations then broke down from Ethernet—used to cover all the long distances—to DMX. There was also a Web link with High End Systems' technical support team in Austin, Texas and the company's European arm in Germany and Holland; High End's Chris Ferrante, Frank Schotman, and Jason Potter were on hand with programming support for the opening and the February 26 Closing Ceremony.

(The latter was directed by Daniele Finzi Pasca, stager of the current Cirque du Soleil touring production, *Corteo,* and was based on a Carnevale theme; among other things, it made use of costumes from the 1971 film *The Clowns*, directed by Federico Fellini. It also featured a wind machine, custom-built by Aerodium Latvia, that created a vertical wind tunnel that was filled with acrobats. The show climaxed with the handover of the Olympic Flag to the mayor of Vancouver, Sam Sullivan; the next Winter Olympics will take place there in 2010. The event was reportedly interrupted by a Spanish man who rushed the stage, shouting "Passion lives here" before being taken away, and by a Polish woman whose nude appearance with an Italian flag—an apparent protest against Italy's then president, Silvio Berlusconi—was interrupted by security guards.)

One Wholehog 3 was used to control the lighting on the audience, with the second console for more or less all the hardware in the field—including the mosh pit and technical trough. The third handled the lighting onstage and the rings at the opposite end of the venue, and the fourth controlled the fixtures on the two goalpost lighting towers on either side of the field. It wasn't, however, the first time a Wholehog console has performed Olympic feats: a number of Wholehog 2 consoles controlled both ceremonies at the 2000 Sydney Olympics.

Speaking of the use of four programmers, Ross Williams says, "This was a wise decision, given the scale of the event, allowing a continuous workflow with any or all operators at one time; however, it posed its own problems technically. The idea was simple—that no one console was the 'main' desk, rather that the rig and workload were shared in all areas across the system. Thus the blueprint for the control design was born; four consoles, each with their own tracking backup, controlling lights via ten dimmer areas stadium-wide. Furthermore, each operator needed the ability to program the lights at floor level, plugging directly into the network at any location. Each console needed to connect to one or all of three WYSIWYG systems running in the lighting design sky booth." Because all four programmers were familiar with the Wholehog 2, he says, "the transition was an easy one to make." Again, however, the weather posed its challenges. "This is where the WYSIWYG connectivity really came into its own," he says. "The system had to endure harsh outside temperatures,



Above, a row of Robe 1200 Wash units. Marenghi notes, "Much of the equipment was installed in technical troughs, sitting approximately 1.5m [4.92] off the ground, working on the theory that the closer the light was to artists, the fewer problems there would be with fog obscuring beams." Below: The monitor mixing position, with the Midas Heritage 4000 console

Maurizio Maggi (bottom) manned the Midas Heritage 3000 console. Working with sound system designer Gary Hardesty, Daniele Tramontani (top) did the detailed audio network design and management.

with snowfall and some very damp days, which, thankfully, it did. It ran between 12 and 20 hours per day for well over a month. Response time and synchronous playback were both impressive across the whole rig, which was really important, as the show was in the round and opposite ends of the stadium were clearly visible at the same time."

Having worked for several years in Italy, UK lighting coordinator Eneas MacKintosh was an obvious choice for his role in the production. "I've known Durham since the early '80s—we were both theatre electricians in London before I moved to Italy, and the last time we worked together was a show for [auto manufacturer] Opel in Taormina. I also worked with him on the opening of a large sports academy in Doha—the capital of Qatar—with the participation of the royal family. So, with Durham being in Britain and both Space Cannon and Agorà being Italian companies, it was obviously a lot easier for me to keep the contacts with them. The lighting contractor was Space Cannon but, since they're a manufacturing firm, they've no experience in actually putting on shows. So, back in March, they got in touch with various lighting companies and Agorà was appointed to support them—and, I must say, have done a really fantastic job. Power generators were supplied by General Electric—we put in our specs and the setup had three power 'farms' located round the stadium, each with four 800 kvA generators—two main and two on back-up."

Indeed, as a Worldwide Partner of the Olympic Games, GE was the exclusive provider of a wide range of innovative products and services that were integral to their success: power, lighting, security, and modular space solutions at Olympic venues, as well as ultrasound and MRI equipment to help doctors treat athletes.

GE provided overall engineering, design, installation, and operation of energy systems for the three Olympic Villages, 14 competition venues, and the Main and Venue Media Centers. The company also provided primary and backup power for major broadcast locations and heating applications for temporary structures.

As well as upgrading street lighting throughout the historic city center, including Piazza Castello, where the medal ceremonies took place, GE also supplied 300 electronic reactors that helped reduce energy consumption by over 235,000 KWh per year. In addition, the company lit the Olympic hockey venue and the slalom venue, using more than 600 floodlights to allow HDTV broadcast to the entire world. GE also provided essential lighting in all the common areas of Olympic Stadium, where its XLR tubes were used to light corridors, stairwells, internal halls, and dressing rooms. GE's leading UPS technology was installed to secure the operation of all equipment from the Opening Ceremony throughout the duration of the Games. NBC Universal, a division of GE, is the exclusive U.S. media partner of the Olympic Games.

Stages, acrobats, and flaming rings

Belgium-based Stageco sent down twenty-four 40-ton trucks of structure from its headquarters to implement Fisher's design. The main stage roof, with a custom architectural front bridge, was able to support a production load of approximately 20 tons. The stage was 53m wide [173.88'], 22m [72.17'] deep and 28m [91.86'] high. The 26 x 9 x 28m [85.30 x 29.52 x 91.86'] Olympic ring support structure consisted of four towers, each with guide rails for the winch-driven ring trolleys, topped off by a production bridge. (The rings were built by UK-based Brilliant Stages, working with Stage One, another British company; Stage One was responsible for the rest of the structures.) Four 25 x 2 x 27m [82.02 x 6.56 x 88.58'] goalpost lighting portals were also erected on either side of the stadium.

Scenic contractor Stage One's task was divided into two parts, for which the firm supplied and operated two completely separate motion-control systems. First, for the aerial routine by performance artists, a set of structures moved on vertical tracks and, once the performers dismounted, rotated to form the Olympic rings. Stage One's Q-Motion motion-control system was responsible for the rings' movements, designed and programmed using Stage One's Next-Q software and Q-Pos positional controllers. The firm built four vertical tracks and provided 10 hoists (two per ring). The upper rings were controlled by six small motors, enabling them to tilt on their own axis, whereas the bottom two rings' tilting was controlled by the main lifting hoists. Stage One also supplied the eight hoists positioned at the bottom of each mast of the main stage to move the drapes in a pre-programmed sequence, again controlled by Q-Motion. For the ring structure, Brilliant Stages was responsible for scenographic construction and Tomcat supplied custom truss systems.

The Dove of Peace provided the event with one of its most indelible moments. "The Italian art director Lida Castelli," says Fisher, "had various pictures in her head of

looks with acrobats. I had an idea for doing something with counterweights and performers on a large net. The acrobats were individually counterweighted on a line from a simple harness to shivs up in the grid; each had his own personally adjusted counterweight. This allowed them to move across the net, which was about 50' by 100'." The rigging consultant was Richard Hartman, who has worked with Fisher on many concert tours and who has many Olympic shows to his credit.

Pavarotti's rendition of "Nessun Dorma," provided a climactic moment; he appeared on a large stage, complete with red curtain and vast chandelier. "The idea was to create a modern feeling all the way through the show," says Fisher; "then, when we got to Pavarotti, we created an Italian opera house as a finale. The curtain was about 160' wide and nearly 80' high."

The concept for the breathtaking pyro effects and fireworks at the ceremonies was by Christophe Berthonneau of Groupe F of Mas Thibert (France), with Italy's Parente Fireworks collaborating on the production and as official supplier of the actual effects, made on their premises. Groupe F's creative team, Les Oiseaux de Feu, have been called in to work on high-profile events in Europe and as far afield as Australia and New Zealand.

After three months testing and perfecting all the material to reduce incandescent fallout to a minimum (for safety reasons) and ensure the utmost visual impact, two firing zones were used to fire off a total of 4191.6 kilos [9,249.89lbs.] of explosive material: the 40 pylons on the stadium roof, where special explosion and fallout-free effects were used, and a barracks about 450 yards from the stadium, where the large-caliber fireworks were discharged.

K2006's special effects consultant, Vittorio Comi of Plinko Password, explained the originality of the flame-throwing helmets he designed for the "Sparks of Passion", in which six futuristic speed skaters flashed round the set with flames emanating from their backs: "The system is based on a new idea that doesn't use either hydrocarbon or gas as a comburent, but pulverized spores of a mountain plant called Lycopodium. The technical content consists in the ignition system, which feature a special electric resistance and a tank that applies several physical principles to ensure perfect spore powder nebulization. The skaters themselves had a button enabling them to instantly light the flame whenever required."

The lighting control and production team, led by Durham Marenghi (seated, left).

The burning time was limited, as the systems had to be as compact and light (5 kilos, or 11lbs.) as possible. The skaters' compressed air propulsion system enabled them to reach a top speed of over 110mph; Comi says that, thanks to the systems' total safety, requests have already arrived for indoor applications.

Lines of communication

The team in charge of communications at the Olympic stadium—an aspect of fundamental importance, due to the size of the venue and the number of people involved—was led by Italian RF wizard Andrea Taglia and consisted of Riedel (the vendor); Marc Schneider (project manager); Peter Erskine (in charge of the hard-wired systems); Benno Sonder (hard-wired intercom technician); Simon Korzen, who looked after the wireless systems; and the coordinator of the Riedel system, Chris Reynolds.

Pete Erskine of Brooklyn-based Best Audio has provided design and operational services to clients worldwide, ranging from the Commission on Presidential Debates, Walt Disney Productions, The National Football League, the Barcelona and Sydney Olympics Opening and Closing Ceremonies, and major broadcasters. At his sixth Olympic communications job, in Turin, he was the engineer for a massive Riedel digital intercom system, which included two fully loaded Artist M nodes and three Artist S Nodes for a total system size of 352 ports. Over 40 master panels, almost 100 digital C2 belt packs, and 24 radio channels were used on 65 separate PL channels. This was the largest winter Olympics intercom system ever assembled.

Erskine explained, "There were three levels of in-ears—Level One was professional in-ears; Level Two, good-quality in-ears for key performers; and Level Three, the FM receivers the general cast used. All received music or instructions—or both—according to their roles, from the choreographer, assistant choreographer, and two segment directors. The Riedel system had five nodes—one in our sky box and one at each of the gates, and they were tied together with a dual ring of multi-mode fiber. We used the Riedel system at the Salt Lake City Winter Olympics—the first time it had come into the States and we have used it on just about every major event since then—so it definitely made a good name for itself. One of its unique features is that it is AES EBU digital audio, so it's great for transporting audio around a venue. Some designers might not want to use 16-bit to feed broadcast or PA, but we've done it a lot and it's terrific!"

A few facts suggest the breadth of the effort required to realize the ceremonies: 6,100 volunteers and 240 professionals worked on the events, logging 15,000 days of work and eating 100,000 meals. The two shows required 6,100 costumes, 4,000 sq. m. [43,055 sq. ft.] of staging, 10,000 sq. m. [107,639 sq. ft.] backstage area. There were 32 television cameras present at the stadium. More than 150 trucks were used to carry stage, set pieces, lighting, audio, and special-effects gear. And more than 100km [62.13 miles] of cables were used.

All in all, it was a comprehensive display of passion; once again, the bar for Olympic spectacle has been raised. Next stop: Beijing.