



Winter Olympic Games Vancouver 2010



THE BRIEF

We were approached by David Atkins Enterprises Productions to provide the aerial engineering and control package for the Opening, Closing and Victory Ceremonies, taking place at the BC Place Stadium in central Vancouver. This 60,000 capacity stadium posed unusual problems however, due to the nature of its inflatable, air-pressure supported roof structure. It was this unstable structure that determined the nature of our involvement, expanding our remit beyond that of supplier and operator and into the realms of specialist engineering.

The overall scope of work for the ceremonies was divided into various packages including projection, lighting, aerial, all show based work and the cauldron. At its most basic, our brief from Technical Director James Lee covered all engineering and control for the aerial flying and also provision of control for the show based package.

TECHNICAL HERITAGE

David Atkins was the Vancouver 2010 Olympic Ceremonies Executive Producer and Creative Director, roles he also undertook for the 2006 Asian Games in Doha where, together with Technical Director James Lee, he commissioned us to design, supply, rig and commission all the aerial automation for the 2006 Asian Games Ceremonies. Our working relationship with Technical Director James Lee is a long established one, most recently having worked with him on the 2004 Athens Olympics and the 2007 Pan American Games in Rio.

It is the combined knowledge gained from working with both David Atkins and James Lee on the ceremonies in Doha and the resultant major technical and artistic achievements of this event, which contributed greatly to pushing the boundaries of what could be achieved in Vancouver.

Throughout the 18 month development of the ceremonies, we worked closely with the other major contributors namely ETC, worldwide projection specialists and suppliers; Solotech; RIGGIT, Canada's leading rigging company; PRG Lighting – in both the US and Canada; Clair Brothers; Norwest Productions; The P.A. People; Show Canada and J&C Joel Ltd, worldwide supplier of theatrical soft goods.

The level of cooperation and collaboration between all the key contractors behind the scenes resulted in a flexible approach that benefited the creative processes at work in pulling together a show of this magnitude.

THE ROOF – PROBLEMS AND SOLUTIONS

BC Place is the world's largest air supported domed stadium with a roof structure 27m above the top of the seating bowl and approximately 40 metres above the stadium floor. Whilst offering a controlled, indoor environment for aerial performance, the roof is in fact flexible, allowing it to move in high winds and changes of air pressure - often moving up to a metre in the space of 15 minutes. For our team, the roof membrane and supporting steel wire cables raised two over-lapping areas of major concern: point loading and the minute-by-minute movement of the whole roof envelope itself.





MONITORING AND CONTROL

Working with RIGGIT, we installed a 40m by 25m mother grid, suspending it 48.7m above the stadium floor from the steel wire ropes that supported the sixteen central panels of the inflatable roof. A primary requirement was that the grid should be flexible, allowing for any roof rippling that might occur during strong winds, and this was achieved by hanging it from over 50 points in order to distribute the imposed loads.

Our main concern here was point loading, due to the 19 tonne weight of our equipment to be hung from a relatively small central area of the inflatable roof and the relationship of these loads to the overall 127 tonnes for the Ceremonies that required suspending. We had to ensure we didn't invert any individual roof panels that could quickly result in a complete roof inversion. To ensure that we stayed within the stadium engineer's calculations, we undertook the real time monitoring of each top suspension point for the mothergrid. The unusual reactivity of the roof to external weather conditions called for the instantaneous adjustment of any loading change, which we provided within seconds.



SYNCHRONISATION

The movement of the roof posed further problems for our technical team, who need to know exactly where any given scenic object or aerial performer is at any given moment. ETC's Projection played a significant and stunning role throughout, with images being projected onto moving flown screens and 3D objects, as well as interacting with aerial performers. All these visual effects required exact control and precision, relying on the flow of accurate information between the automation and the projection systems.

Before rehearsals began, no one had realised just how reactive the roof would be once the load was suspended. In response to this added and unpredictable dimension and working in collaboration with ETC, we created a laser positional system that provided live dynamic feedback to ETC's projection system and our own automation system. This enabled ETC and our own operators to know exactly where our scenic objects were and exactly where ETC's image was, allowing the latter to meet its 'target'.





NEW FREEDOM FOR 3D AERIAL CHOREOGRAPHY

Aerial choreographer Phil Hayes was responsible for all the flying sequences for the Vancouver ceremonies. We worked extensively with Phil on the aerial elements of the Asian Games in Doha and were able to work with him here to design and develop a new product specifically for Vancouver. The result was the 'Spin' harness, a unique product, much smaller than previous harnesses, which fitted close to the performer's costume and allowed each of the 20 aerial performers to effortlessly rotate through any plane – achieving a previously unattained and balletic freedom of movement.

The best example of the creative opportunities enhanced by this harness were illustrated by the 'Who has Seen the Wind' sequence. Here, a lone boy appeared to run through and soar over the wheat fields of the Canadian prairies. Beautifully synchronised with ETC's projection, this 'simple' sequence was described by ETC's Patrice Bouqueniaux as the "most beautiful 3D human fly I ever saw".

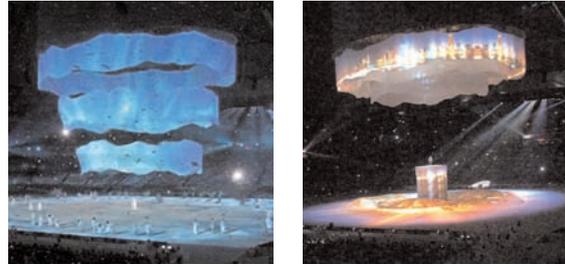
In order to achieve this sequence, we created an independent 3D flying system with a performance envelope of 40m x 60m x 17m. Two 16mm diameter wire rope catenaries, were positioned 42m apart, each with one moving carriage driven by a 7.5kW traction drive located in a custom fabricated hoist farm.

To minimize the visual impact of the harness wires, two 6mm wire ropes were used as opposed to the usual four, with these running to the carriages and then back to the hoist farm.

Both hoists and carriages were programmed by Qmotion controllers, allowing us to maintain the boy's position on the choreographed path while eliminating or increasing the variable pendulum effect as required.

Because of the excellent progress made during our scheduled installation, it quickly became apparent that we could in fact facilitate a lengthy period of on-site artistic rehearsals of the 3D flying, prior to the main, scheduled rehearsals. A full month of dedicated overnight rehearsals for the 3D flying sequences were undertaken, an indication of the artistic importance of this element within the ceremony.

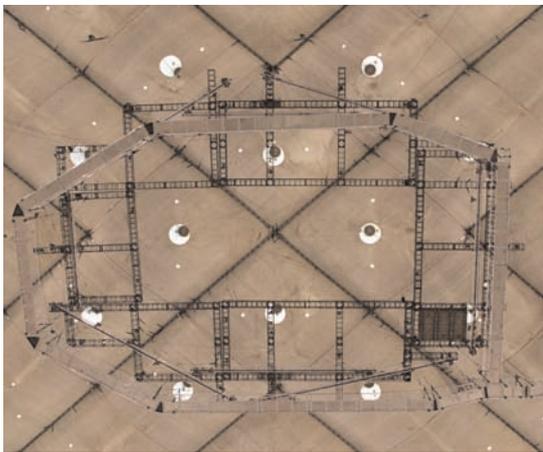
Keeping the relative instability of the roof structure constantly in mind, precautionary measures were taken, with the 16mm catenaries terminating in a compensating mechanism. This meant that in the eventuality of a roof inversion, where the weight of the roof would bear on the catenaries, both catenaries and roof would lower to a safe level.



TRACKING AND HOISTING

In all, nine complete tracking systems were installed under the mothergrid, each track with up to four individual luffing points, with 22 luffing points in total. This allowed for 20 performers to be in the air at any given moment, along with large scenic elements including the canoe and a rear projected fully automated Moon for the 'Rhythms of the Fall' sequence in the Opening Ceremony.

By using the tracking systems, the winches could be employed for other elements of the Ceremonies. A good example of this was using the winches for the performers during the stunning ascent moment.



THE RING SCREENS

There were three of these flown ring projection screens, the largest measuring 102m in circumference and weighing 900kg, down to the smallest with a circumference of 60m, weighing in at 600kg. All three of these versatile projection surfaces had a drop of 6.5m and were encircled by an automated grey elliptical border, 104m in diameter and with a drop of 16m. This border masked the catwalk system from where the aerial performers were deployed. A conical 16m tall, 30m diameter 'mountain peak' screen, emerged from within the smallest ring screen.

Each of these flown projection surfaces could travel between the ceiling and the stage floor, moving individually or together as required by each programmed projection sequence. As an imposing central feature, they were used to great effect, most notably for the stunning Aurora Borealis and Peaks of Endeavour segments.

We also provided the eight 5.6m wide, 34.5m tall tree screens that emerged from traps in the stage. Each of these was fitted with kabuki drop mechanism at the top end to allow for a high impact quick release. We supplied all the projection fabric for all screens and scenic items above the stage, nearly exhausting J&C Joel Ltd's supply of white ripstop nylon in the process.

QMOTION CONTROL IN THE AIR

The 'Hymns of the North' sequence featured a 16m LED covered animated spirit bear, by renowned designer Michael Curry, that rose from the stadium floor and loomed forwards. We used three hoists to achieve the 3D movement of this puppet whose programming was extremely sensitive to the roof movements. Also during this sequence, we controlled the four constellations that lowered, lit up and involved considerable cable management challenges.

The 'Rhythms of the Fall' sequence depicted an internationally renowned fiddler descending and tracking from the roof in a canoe. A rear projected moon was also automated so the fiddler was then seen to duel with his shadow which appeared on the moon behind him.

We also lowered and raised the main Olympic Rings, the focal point for the commencement of the ceremony, when a snowboarder leaped through one of the rings and into the stadium to pronounce the 'Welcome' to the Games.



FURTHER ELEMENTS

Most prominently, these included providing control for the 6m and 12m centre stage lifts. These lifts were manufactured by Montreal's Show Canada Industries and each one could travel from stage floor to a height of 7m. In order to seamlessly integrate control of the stages and the flying system, we sent technicians to the Show Canada factory in Canada for a period of commissioning prior to the installation in Vancouver.

We also provided an additional set of tracking Olympic Rings under the Protocol stage; a number of high-speed scissor lifts and a 10m revolve for the bands featured in the Closing Ceremony. This involved removing the Opening Ceremony's snowboarder's ramp and installing the revolve in its place.

During the total of eleven nightly Victory Ceremonies, we provided kabuki drop mechanisms and a flown façade that was used to reveal each of the night's bands to the 30,000 live audience and global television audiences.

PARALYMPICS

The transition to the Paralympic Ceremonies involved working with a different production company, Vancouver based Patrick Robert Productions. Due to time and budget constraints, many of the same automation elements remained in place but were used creatively to give the Paralympic Opening Ceremony its own unique feel.