Mating

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Dance

Inside *Crane Dance*, the spectacular new show at Singapore's Sentosa Island

By: Sharon Stancavage

In 2006, Malaysia-based Genting Group, a large, multinational firm specializing in leisure properties, was asked to bid on a new resort complex on Sentosa Island in Singapore. Genting turned to a frequent partner, Mark Fisher, and his firm, Stufish. "We developed proposals for the theatre show and for a free attraction featuring a pair of 150'-tall dancing mechanical cranes," explains Fisher. Thus began the long and complex process leading to the realization of *Crane Dance*, the spectacular and utterly unique new outdoor show. A feat of mechanical engineering, it also posed many challenges for its lighting and sound design teams. Genting won the bid, and the resort became Resorts World Sentosa, featuring a casino, theme park, hotels, and a variety of attractions. Because of exclusivity issues, however, the team at Stufish was unable to develop the crane design, so Fisher turned over the project into the capable hands of Jeremy Railton, president and lead designer at Entertainment Design Corporation (EDC), of Venice, California (Railton was already working on two other projects at the resort.)

All photos: All photos Courtesy of Resorts World Sentosa Entertainment Group

Inspiration comes in odd places, and for Railton, the idea for what became know as the "crane ballet" was sitting in his office. "There's a lovely lamp on my desk; it was exactly the perfect structure to make something move fairly simply," he explains. Examining the lamp's structure, Railton, an amateur ornithologist, says, "I thought, wow, this looks just like a crane, and we could make these metallic shapes slightly more bird-like, and then we could actually make a story."

At full height, the birds measure 90', approximately three times the size of the typical theatre proscenium. They are so tall that the *Guinness Book of World Records* is investigating them to see if they are the tallest animatronic figures in the world. "The scale is so enormous that it almost seemed impossible when Jeremy first showed it to me," notes show director/media producer John Rust.

Structural issues

Once he had an idea of the basic concept of how these massive animatronic birds might be structured, there was still one issue to be resolved, he notes: "How were we going to get wings? What do you make wings out of?" Strangely enough, the answer was water. "When the cranes take flight or flap their wings, that's when the water comes, and when they open their wings, the water beats these huge sprays of water," he says.

birds kiss, the pupils turn into a heart. There's a lot of animation going on there." In fact, according to Johnsen, Railton referred to the 5' diameter eyes "as South Park eyes"— meaning that they are simple, easy to read, but highly expressive.

To engineer the massive birds, Railton turned to Mal McLaren, of McLaren Engineering. After determining the details with Railton, McLaren finished the engineering, and the project was put out to bid. "A lot of companies looked at it, and said 'No,'" says Railton. In the end, it went to Singapore-based LYS.

The birds were constructed in a shipyard under the supervision of a five-person technical team led by Bob Chambers, EDC's senior technical director. "The most exciting time was going to see them in a rusty old shipyard where they were being built," says Patrick Woodroffe, the project's principal lighting designer. "I'd looked at Jeremy's drawings for many months and had had numerous meetings about the project with him and his team, but until I actually stood in the yard in Singapore on a blazing hot afternoon, surrounded by the detritus of metal work and welding equipment, it was impossible to understand the scale of the objects. They were incredibly large and very impressive."

When the birds were completed, they were moved to a barge in the harbor that was immediately sunk. "The barge

> "We had to create some sort of light show around these sculptures. But when we were initially presented with two 100'-high birds with video screens on them, the first question was, clearly, where can you possibly put lights?" —Woodroffe

The torso of each bird features a 40' x 40' Barco MiSTRIP modular LED screen. George Johnsen, of Mammoth Sound and Vision, of Burbank, California, provider of the LED gear, notes that most concert touring production features 20mm pixel-pitch screens. "Given our distance from the screens, and the level of brightness and size of screen that we wanted, we had to go with a similar resolution."

Both birds move on seven axes of motion, so the viewing angle is critical. "They move parallel and perpendicular to the water," says Johnsen. "They also go parallel to the audience and will rotate 45° in either direction from the audience, so we needed a product that would give us a 130° viewing angle in all four directions." The Barco FLX-24 LED modules, in combination with Barco DX-700 image processing units, were chosen because they can withstand the salt water being sprayed by the wings.

Each bird also has two round custom LED eyes. "The Plexiglas dome over each eye takes the light and disperses it more in a circle, so it looks much rounder than it actually is," Johnsen adds.

Also, he says, "The eyes are animated, and, when the

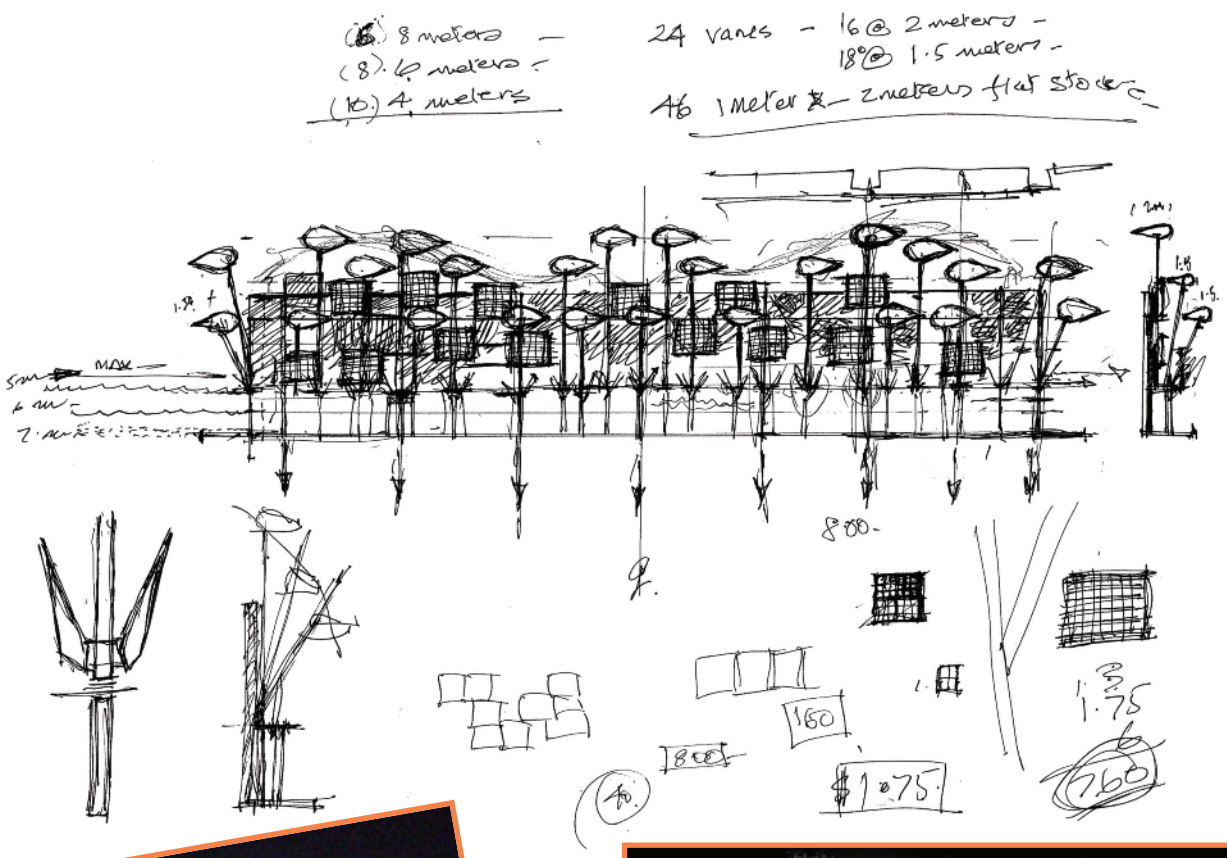
itself is secured to the floor of the bay," notes Johnsen. From the shore, it looks rather like an island.

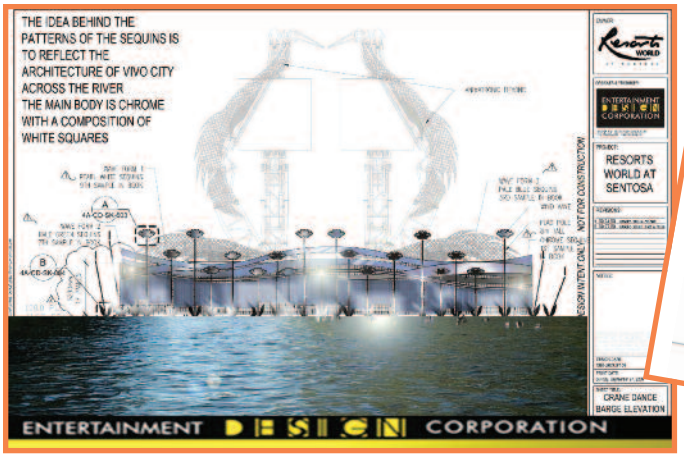
Located inside the barge/island are massive engines, powered by biodegradable diesel fuel from Germany. "There are two huge engines that are 12' by 12' in the island," says Railton. "Each engine is strong enough to power a locomotive." Overall, the island, the birds and the engines weigh a mind-boggling 500 tons.

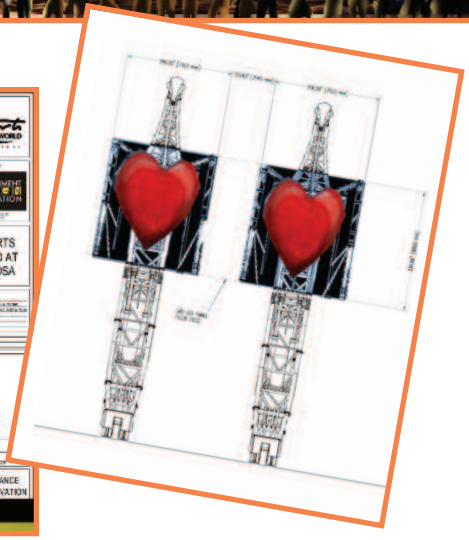
Programming of the giant cranes was, as one would expect, complex. "As we were blocking their movements, we were discovering their limitations and were surprised by some things they could do," Rust remarks.

Typically, animatronics of all types don't cross what producer and project director Edward S. Marks calls "the glass wall." In other words, they don't cross into the space of another character for safety reasons. That wasn't the case with the birds, which, in animatronic programming, may be a first. "Our birds are actually capable of entering each other's programming space—they pass over each other, and there's a moment in the show that they kiss. When that happens, their heads go side by side," he explains.

Of course, when an animatronic crosses into the space







Steps on the road to *Crane Dance*: A rough sketch of the entire lay-out (top). Center: Railton's early experiment with desk lamps (left) and an early conceptual drawing (right). Bottom: A more fully realized sketch of the project (right) and a mechanical drawing showing how the video screens function (left).

of another, it raises the possibility of considerable damage. "My biggest fear wasn't actually the birds *per se* bonking heads—it was the many times when one bird is at full height, and the other is almost completely down or in the crouched position," says Marks. "My concern is that the crouched position bird could move forward and go right through our multi-million dollar Barco video screen."

To keep animatronic figures from crashing into each other, engineers typically use physical limiters. However, Marks and the automation team from Orlando-based Birket Engineering, took a different approach. "We designed an 'S' shaped glass wall around each bird, and it changes from scene to scene," he explains. With a variable glass wall, the birds can safely interact with each other and in each other's space. "Their space orientation is monitored by their positioning, not by physical limiters, meaning the show control is actually responsible for preventing them from hurting each other—don't know if it's ever been done before."

In Railton's vision, the birds were much more than simply mechanical structures; they also had personalities. And one of the most obvious places to create those personalities is through the video content. "We started out with these giant robots, and the story is that the robots become real birds," explains Johnsen.

"As the dance goes on, they start to recognize each other as being attractive and different. Then they start to fall in love and their hearts start to grow," Railton explains. At the conclusion of the show, love conquers all. "Jeremy can think way outside of the box, but there's something about love that is a very powerful message, and that's why their hearts grow and they transform into real birds," Rust says.

To create realistic, rather than mechanical, movement, the design team turned to the world of dance. "We worked with a choreographer, Doriana Sanchez; she's on *So You Think You Can Dance* and she's also Cher's show director," says Rust. "We videotaped her torso dancing to the music, then gave the videos to the animators at Mammoth, and they made the mechanical do what Doriana was doing." The result is beautiful, smooth and definitely not mechanical. The animation, which, according to Johnsen, had a "Victorian steampunk" vibe, also defined the personality of each bird: "At one point, there's a Mick Jagger puffed-out chest on the boy bird, while the girl bird is very demure in the way she reacts."

The video is, of course, coordinated with the lighting. "We adjusted all of our on-site renders to what was actually being done with the lighting palette; we tried to integrate it as close as we possibly could," says Johnsen, who found himself matching gel as well as Pantone colors. "The software we were using was the [coolux] Pandoras Box Pro, so I could dial in things based on gel colors and lighting's RGB mixtures. There's a fudge factor, because it's direct, not reflected, light, so you have to adjust it a bit," he says.

A crane under construction, with the frame for the video screen in place.

Johnsen has nothing but good things to say about Pandoras Box Pro: "It's a wonderful, easy to use, flexible tool, and when Jeremy said, 'Couldn't you?', we could."

Much of the video was edited as well as rendered on site. "We set up, in our programming tent, the ability to not only program the water, the movement, the light and the video but literally to edit the video," notes Marks.

Finding a place for lighting

To illuminate the birds, Railton turned to Patrick Woodroffe and his associate, Adam Bassett. "The job was one of those funny hybrids—more theatre than architecture," Woodroffe says, "I saw it very much as a piece of multimedia musical theatre,"

The lighting brief was straightforward. "We simply wanted to make the things look beautiful and dramatic," says Woodroffe. However, the approach to the project was multi-faceted. "We had to create some sort of light show around these sculptures," says Woodroffe. "But, when we were initially presented with two 100'-high birds with video screens on them, the first question was, clearly, where can you possibly put lights?"

The second question was fairly uncomplicated for Woodroffe and Bassett. "We could put some lights on the structure, but not very many due to weight restrictions," Woodroffe says." We chose to use LED clusters at the joints of the creatures to make them appear to glow internally; we also located these same fixtures on the backs of

A worker tinkers with one of the crane's eyes.

A crane's body, installed on the barge at Sentosa.

the birds to reach the water on the wings." There are a total of 22 Philips Color Kinetics C-Splash units mounted on the birds to illuminate them from the inside; an additional 100 units are placed on the edge of the barge.

Also, Woodroffe says, "We located Clay Paky Wash 1200s and Beam 1500s in positions on the man-made island on which the birds sit, to get them to glow from below; we put them in Tempest Tornado weatherproof casings below the birds, catching them as they move through the light." These units can track the birds' movements and also, Woodroffe says, "give them some texture."

On shore, there are two 100' lighting towers placed approximately 210' from the barge. "These positions are located in purpose-built buildings on the shore," says Woodroffe. "They provide the proper big frontlight wash we need to color the birds on a large scale." The lights of choice were, once again, Clay Paky 1500 Beams. Because the birds are moving all the time, we aren't really able to track them completely accurately from that distance. Instead, we've overlaid them with a general color wash through which they pass regardless of their contortions."

Like the video, much of the lighting had to be able to tolerate salt water to some extent. "The equipment probably has half the shelf life it would if it were in a lake in Las Vegas, for example, because the salt water is so corrosive for the lights—both from the water in the sea, but also just the general atmosphere of the air around them," comments Woodroffe.

The wings of water also posed some challenges for Woodroffe and Bassett. "We were really not sure exactly how much light the water would take," Woodroffe admits. The illumination here came from the front washes, but also from the LED fixtures focused on the birds. "The C-Splashes rigged on the birds really give the sense that the water and the metal structure are as one and belong to the same creature," he says. The integration of the water, lighting, and video was also a pleasant surprise for Marks. "I think the single moment I was most shocked at how it worked was the synergy between the lighting, video, and water; it came off better than I could have ever imagined."

The project, which began in 2007, underwent several delays, which meant that Woodroffe and his team weren't

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always available because of conflicting commitments. So a team from Lightswitch Los Angeles (which had teams already in Singapore, working on the Universal Studios Singapore project next door) was available to come in and do the lion's share of the on-site work.

"Essentially, Patrick and Adam did all of the design and created the toolbox," says Marks. "Lightswitch came on-site and added their magic with the toolbox." Woodroffe's associates, Tim Routledge and Demfis Fyssicopulos, did the main programming on a grandMA2 console; the Lightswitch lighting designers on site were Mike Lagrotteria and Bryan Barancik.

Crane symphony

The final element of the project was the audio, which was handled by Rust and Johnsen. The latter did the on-site audio programming, and provided the programming equipment. "The audio system was a Digidesign audio system. I'm a Pro Tools operator from when they first started, so we were able to easily integrate the audio with the video system," he explains.

In projects such as this, the soundtrack is typically set in stone before programming begins. However, because of the movements of the birds, Johnsen looked at it more like a rock concert. "With this show, we knew what the concept was, but the exact timing was going to be based on things over which we had no control—the giant dancing bird sculptures."

Key to making the master music work with the animation was Pro Tools. Johnsen confides, "I run an HD six system, which is pretty hefty for Pro Tools."

The soundtrack was composed by Paul Merkovich and was recorded by the Seattle Symphony. "First, we wrote a temp track and performed it all in synth, so we could have something for client approval," says Rust." Once all of that was locked down, the MIDI music was outputted, and it was given to a conductor and arranger; he made a conductor score from it, double-checking that all of the parts were correct."

Recording took place in a desanctified chapel outside of Seattle. "We recorded the orchestra in sections so that we could have a small section of 20 violins perform. Then we recorded them two or three times, resulting in a magnificent multi-track 60-string performance. Consequently, we could fatten whatever orchestra sections we wanted to," explains Rust. After the recording was completed, Johnsen was given audio stems. "They gave me a rhythm track, an orchestra track, horns, strings, percussion, and so on, split up so we could spread it around the theatre," he says. The ability to split the stems gives the audio a genuinely dimensional feel. Rust explains, "I put the choir on the top speaker towers; it's as if they're coming from heaven. Other things, like a heralding trumpet solo, are thrown to the sides really high. It is one of the most dimensional pieces I have heard an installation. I was blown away by how much we could achieve and really separate all the sections."

> "It is one of the most dimensional pieces I have heard at an installation. I was blown away by how much we could achieve and really separate all the sections." —Johnsen

For the elaborate, movie-style soundtrack, Johnsen put together a dimensional, spread stereo system. "The sound effects for the boy bird came out of the left banks, the girl came out the right banks," he says.

The PA system is comprised of 16 Renkus-Heinz STXLA boxes and DRS18-28 subs placed in line arrays on the left and right towers, eight Renkus-Heinz sub front fills, and eight Renkus-Heinz PNX102/LA full range front fills across the front of the bay. Johnsen says, "The giant towers carry the subwoofers for the whole system, while the eight speakers down in front are actually full-range speakers." All are powered by Lab.gruppen C:68 4 amplifiers.

A Medialon Machine Pro, running Medialon Manager V5 Pro, supplies audio control. "The audio is carried in a multichannel Wave file that plays back following time code in Reaper," remarks Johnsen. As there is no conventional audio console, "the combined-mix Wave file goes into a QSC [Q-SYS] audio management system, which controls a few preprogrammed cues, but, for the most part, it's all just straight playback."

The Medialon system technically runs the entire production. "The show controller issues time code, which

The cranes' wings are represented by sprays of water.

The Barco MiSTRIP video screens at work.

can be received by Pandoras Box, the lighting console, the water show controller, the hydraulics system, the fireworks system—all of those systems are reading time code and acknowledging the cues that are supposed to happen at a particular moment," explains Johnsen.

Safety checks are also the responsibility of the Medialon. "There are about a thousand different things that are monitored on the birds at any given moment, and if any one of them isn't right, the show stops," Marks says.

When it's time for the show to run, the island is completely empty. "If the show breaks, if there's something that isn't ready or if there's a safety issue, like a person on the barge, or a door left open that isn't supposed to be open, it will abort the show," remarks Johnsen. When the show is aborted, the birds freeze and "they go back into their home position, which is tucked away," notes Rust. The show itself is completely automated and unmanned, and "the only actual command is a 'show go' or 'show abort,'" Marks adds.

In the end, the birds are the right addition to Resorts World Sentosa. "Cranes are the Asian symbol of good luck and longevity, so it seemed appropriate that the people who go to Singapore's first resort and casino should be blessed by these beautiful birds," Railton concludes.