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# Muse: Drones

The house lights dim, and the words 'Killed by Drones' appear on the circular video wall above the stage. It's the opening of the current Muse tour. The band, and their production designer Oli Metcalfe, are once again pushing the state-of-the-art in regard to concert touring. Sharon Stancavage reports . . .

Photography by Steve Jennings

"There was a lot of input from both Muse with regards to concept, and the management with regards to how the show was to be delivered," explains Metcalfe. The band is currently being managed by Q-Prime, located in New York, and they had some very specific ideas of what they wanted from the tour. "The in-the-round concept very much came from the mouth of Peter Mensch at Q Prime. The band had some apprehension about it, but figured that with the right ideas and with the right narrative for the show, it could be deliverable. At that point, it became my responsibility to come up with a way of delivering a visual medium to the audience that allowed for a new type of video delivery and to be seen in the round, essentially," he confides.

Metcalfe, who is the creative force behind the band's concert productions, notes: "I was really nervous about this when I designed it because it's the first in-the-round show I've done and one of the things that's kept me up was the beastly, vast size of the whole structure. It does push the boundaries, but it doesn't go outside of the realm of possibility."

Metcalfe and the band explored several concepts for their in-the-round production. "The one that stuck was obviously drones [also the title of the band's current album], which would include drone-like objects forming part of the show. That has driven a lot of technicalities with regards to tracking systems and the infrastructure that's in the air," notes Metcalfe.

So, in late summer of 2014, Metcalfe began to search for vendors who could help him realise the concept of drone-like objects that could easily tour. That journey ended with two firms: Motion Business of Amsterdam - for the drone-like objects - and CAST BlackTrax of Toronto - for the tracking. "Motion Business is a new company, I've been talking to them for a couple of years. Together we evaluated a number of tracking solutions in order to make this even possible in the beginning," says Metcalfe. That led them to Cast BlackTrax.

## HFOs

On the road, drone is not a word that's used. "In all my paperwork, in all my advance, I have to stay away from that word. Whether it be a promoter or a local building or a local fire official or police officer or whatever, the word 'drone' will create paperwork and create red tape," Muse production manager Chris Kansy explains. Kansy, who was out with Roger Water's *The Wall* tour, says: "I've gone into a lot of buildings with flying pigs, and it's very similar to that; it's a helium filled object [HFO] that we fly over the audience. It's very safe, it weighs ounces and if lands in the audience, it's in more trouble than the audience below it."

There are a total of 12 clear HFOs from Motion Business, nicknamed the Seekers, in the production. "People think the HFOs are this mechanical object, when in essence, it's just a helium filled object that's guided by propellers. They're very light - they weigh ounces. They are also weighted, because you want a centre of gravity to these things, for them to look right and to fly true," says Kansy. The Seekers are approximately 1.9m (6.5ft) in diameter.

The Seeker HFOs are stored in the lighting truss that runs the length of the venue. "They deploy from the top of the lighting rig and return there," he adds. The structure is custom built for

that activity. Metcalfe explains: "Up there, it's fully hand-railed and accessible. It's a closed, safe zone. It was essential for that to be the case when you have two HFO guys up there all day, getting their technology running and ready for the show. They need to be able to get quickly from north to south and work around that enormous structure because there are only two of them and there are 12 HFOs."

The actual number of Seekers that might be used on any particular night is flexible, depending on a variety of factors. "If we had all the time in the world in the perfect venue, it would be ideal. That's not the case. The HFO guys need a certain amount of time during the day and they can't start their time until everything is set up and situated. If rigging takes longer, or if we have an issue with the PA or with a video element - any time we lose time, they lose time," Kansy adds.

In a perfect venue, there are 12 HFOs; the team is happy with nine. At other times, there are fewer than that. Kansy adds: "If we don't have all the HFOs, it's not due to lack of skill or lack of effort, it's down to the fact that this is highly technical. It takes a lot of time, it takes finesse, and sometimes we do not get the appropriate amount of time and finesse to make it right."

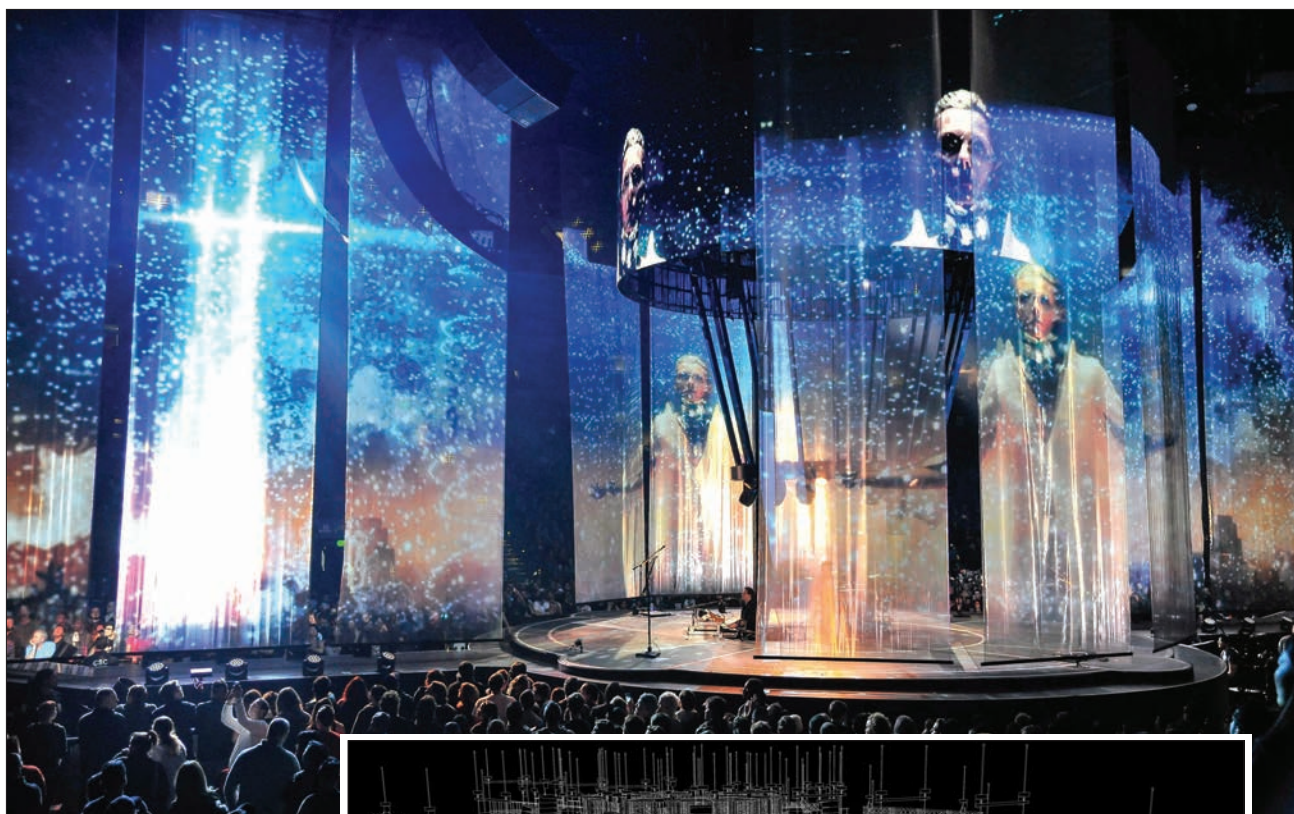
They appear in three parts of the show. "The HFOs are used at the top of the show, for the *Drones* chorus going into *Psycho*, in the middle section during *Supermassive Black Hole*, *Prelude* and *Starlight* and at the end during the *Drones* choir reprise," Kansy explains.

The second type of HFO, called the Reaper, appears during the song *The Globalist*. Kansy says: "They are very ominous, destroyer looking flying planes - they're large kind of gunship things that we've been flying remote controlled." In other words, they have a human pilot. Kansy continues: "The Reapers are designed to go through the BlackTrax system, but every arena is different, and how we get these out on the arena floor and their flight path is different on a daily basis. We're also finding that we don't have the time to reprogramme them for every show. So we've learned to pilot them; we didn't go into this tour thinking we were going to pilot them, but we've ended up figuring out how to." There are two Reapers: at press, one was being used, while the other was a spare. However, this might change as the tour progresses.

Cast BlackTrax provided their BlackTrax v1.8.8 software for tracking; the Muse BlackTrax system is one of the largest they have ever put together. "BlackTrax is a vision-based tracking system that uses infrared. It's camera-based, so we surround the tracking area with infrared cameras. We then place beacons with what we call 'stringers' - which are the points that you actually track - on the talent, on the artists, on set pieces, on whatever you want to find a position for. You can place as many stringers on the object as you want; then from that you can determine the x/y/z position of these individual points," explains Marty Cochrane, Cast BlackTrax product manager.

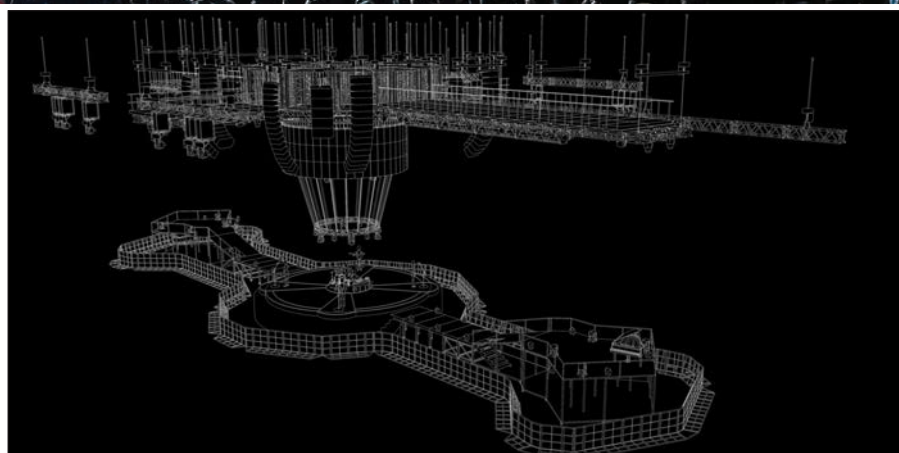
The HFOs were the first portion of the production to be controlled via BlackTrax. Metcalfe explains: "Each HFO has a BlackTrax beacon [with three stringers] on it, so with the data that comes from the HFO, we can ascertain its position in real time. That information is fed through the tracking software. So the software [from Motion Business] that is controlling the HFO





Above, a view of the set showing projection on the voile drapes.

Right, CAD drawing of Oli Metcalfe's set design.



will look at its real time and where it's supposed to be going, so they can calculate a trajectory. BlackTrax helps us to not only achieve that position, but also to monitor its position in real time. Between those two sets of data, we can fly the HFOs around in a variable environment, meaning that if there is a strong air current from an air conditioning duct or a blower, we can calculate this in real time and fly back into position."

The Muse BlackTrax system comprises 38 proprietary infrared (IR) cameras from Cast BlackTrax. "We have 14 compact cameras that go into the grid - into the extremes of the roof - they survey the entire arena bowl. There are 24 cameras that go on our space station [above the stage] and on our work platforms. They are rigged at low level and focused remotely at low level - those cameras are easy. The ones that cause us the problems are the ones that have to go into the venue infrastructure every day," admits Metcalfe.

Installing the BlackTrax cameras in a variety of different arenas in both the US and Europe is one of the tour's daily challenges. Metcalfe, who is on the road with the tour, says: "We do have the rigging documentation, but it doesn't show things on it like the hockey team banners, and there are 20 of them hanging off the steel. We have all the CAD for the rigging, that's not the problem. It's more the things we didn't see, like the house LX trusses for the hockey matches, that aren't shown on any drawings anywhere. All sorts of things like that challenge us day-to-day."

Initially, the BlackTrax system - which includes a Windows-based BlackTrax server with a backup - was envisioned simply for the drone-like objects. However, as Metcalfe explored the technology, the role of BlackTrax expanded. He explains: "After two months of testing with HFO guys in Holland, it worked reliably and very, very accurately. That's when I said I'm going to cut the followspots and get the band wearing the beacons as well." Later, Metcalfe realised that BlackTrax could be used in an innovative way with the video as well.

BlackTrax is more than just a software programme that has specific tasks within the production. "BlackTrax is a solid rock that cannot budge. And if it does budge, the whole show becomes jeopardised, and that means that the followspots won't be hitting the band members any more, it means that the video will be out of alignment when the missiles are firing at the band members. It absolutely has to be 100% on, otherwise everything else is off," Metcalfe notes.

Metcalfe and his firm also provided a portion of the BlackTrax solution. He explains: "My company provides all network infrastructure for show: everything is tied into BlackTrax, and I've done all the network for all of that myself, because there was so much development in the early stages that I invested in a lot of inventory to support the cameras that are POE - power over Ethernet."

Metcalfe was one of the first designers on the road to use Ethernet in the first Muse US arena tour, and pays attention to

the smallest of technical details. "A lot of companies make high quality touring grade cables and Oli has some [TMB] ProPlex cables on the Muse tour that are really, really nice, with shielding and jackets. They're the highest quality Cat-6 cables we've worked with, which has been really nice," comments Cochrane.

### The Space Station

The massive structure that hangs above the stage is called the space station. It was constructed by Brilliant Stages, based in Wakefield, West Yorkshire. Tony Bower, general manager at Brilliant Stages explains: "The challenge was to design a structure that could house all of the equipment and crew needed for PA, lights, video, automation and HFO support. We solved this by creating 12 pods that could, when pinned together, be flown via 12 x 2 ton hoists in the centre of an arena. Each pod was built using Brilliant Stages' bespoke aluminium extrusions fabricated into six frames that, when connected in the corners, create a 2.3sq.m [24.6sq.ft] cube. Aeroquip strip was added to the base of each pod to secure all the equipment during transport."

Emerging from the space station are four gantries. "The north and south gantries are 18m long x 4m wide, constructed using a HUD truss grid [provided by the tour's lighting vendor, Neg Earth] spanned using a Brilliant Stages custom ladder and beam system as a supporting structure for 2m x 1m decks covering the whole area. Each deck was equipped with two hatches to access the lighting and roll drops once in the air. The east and west gantries are 6m long and constructed as per north and south. The gantries dock onto the space station to allow access for crew around the space station and onto the gantries during setup and the show," notes Bower. The gantries also provide the launch and servicing platforms for the HFOs.

### Staging

TAIT of Lititz, Pennsylvania fabricated the massive 49.6m long stage that runs the length of the arena. That stage includes a round 11.6m diameter centre. Metcalfe says: "It's basically a 9.7m revolving stage in the centre of the room that has an access tunnel through the centre. There is no drum riser; the drum riser is on the deck, but there is a recessed musician pit in the middle of the stage where the synth' player stands." The synth' player is Morgan Nicholls, who isn't officially a member of the band, but is on tour with them and needed a presence on the stage.

The stage revolve has multiple speeds. Metcalfe reveals: "The revolve is mainly used as a slow revolve - one revolution in five minutes. But there are a couple of songs [*Revolt* and *Supermassive Black Hole*] where it moves at a faster pace, and really looks like a propeller turning when you look down at it from the upper seats." That visual is easy to see because, "the stage has integrated [Martin Professional] VC 30 Strip LED Video Edge lighting that creates a windmill head pattern when viewed from above," notes Matt Hales, project manager at TAIT.

There are two runways that lead to two B-stages. Hales adds: "These runways provide access to the 8ft [2.45m] tall B-stages, an entrance via the TAIT Self Climbing Performer lifts, the dressing rooms and work space for various backline technicians. The TAIT self-climber was designed to be self-compacting, allowing for more space to be used under the stage when it retracts, and yet, fully function as a lift. The power transmission unit is built into the lifting platform itself, which creates the low profile under the stage."

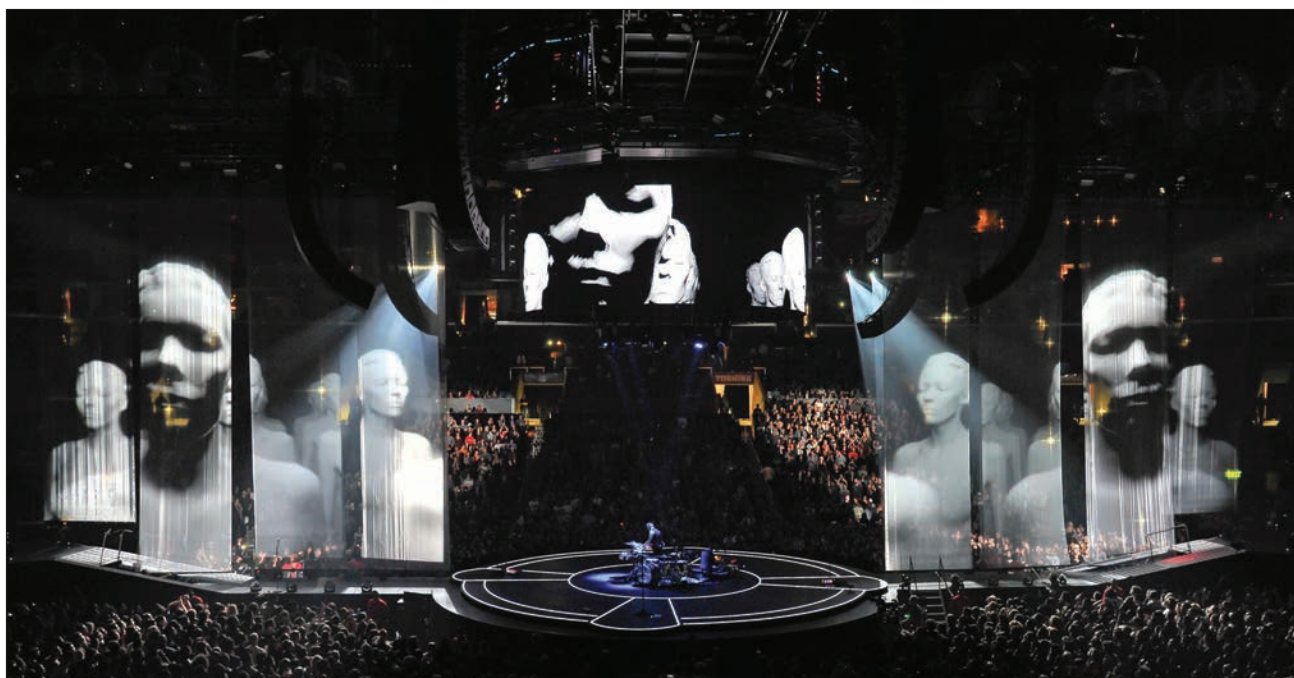
### Video

The space station also includes a 9.1m diameter Glux 10 LED screen, provided by PRG XL Video, which is used for both content and IMAG. "We have eight cameras for IMAG; four of them are remotely controlled and four of them are standard broadcast cameras that are manned," explains Metcalfe.

Nestled inside the Glux screen is something brand new: a circular structure comprised of 18 Martin VDO Scepter LED 10s. These 10mm linear LED strips can be seen hiding inside the Glux screen early in the show; the structure eventually descends to its place hanging above the band. Metcalfe explains: "It comes down and forms the lower fuselage of our space station. The LED screen stays at the trim, and then from within that, there's two layers of lighting, and then between that is the Scepter. So you get these sort of floating structure, that doesn't have any vertical wires, it's all supported by the Scepter." The floating LED structure adds







another layer of colour and depth. All LED elements, including the Glux screen and LED inlay flooring, are being driven by a Catalyst Media Server.

There are 12 projectors - six are spread out above each offstage side of the ramps. These are the new Barco HDF W30 Flex, which is a 30,000 lumen projector designed for touring. "In between the projector and the voile [the custom roll drops], we have Barco's new MMS moving mirror system. That allows us to fine calibrate our projections onto the voiles, but also to do different aerial projection effects with the mirrors, which you see a number of times during the show. I can control the mirror with DMX from the console," Metcalfe explains. In fact, he's the first person to use the MMS 200 series mirrors on a tour. "It's so accurate, it always goes back exactly to the right position, and that is very important when you're trying to line up multiple projections onto one surface," he remarks. The projectors hang in custom cradles fabricated by Brilliant that allow them to travel flat, and then hang vertically.

IMAG can also be found on 14 automated custom roll drop voiles. "It's a 3m-wide translucent material that we developed with J&C Joel in the UK," says Metcalfe. "They allowed me to bring a lot of different material into my studio and do some testing." He did some extensive experiments in his studio, and found something that could potentially work for the production. "J&C Joel made a mix of two materials; the final product is a polymer material; it kind of polarises when the light hits it. It receives light from one side, and displays on the surface with perfect clarity, and any refraction that you see when you're standing on the opposing side would appear as a polarised spot." Consequently, they only need to project on one side.

In person, the voiles are quite transparent: when IMAG is projected onto them, the images are ghostly and almost surreal.

Like the Glux, the voiles are used for IMAG and content, but they are also used for interactive content, created by Moment Factory of Los Angeles. "We're using BlackTrax technology to track the band members with some of our video content - there are a couple of songs, one being *The Handler* - which uses BlackTrax to guide these puppeteer strings, so it looks like these hands in the video content have these strings that grow out and attach to the actual band members; wherever they move, these strings are still attached to them. There are 3D hands that float above the band members; that part is pre-rendered. We tracked the hands of a piano player, created a 3D model of that and then rendered that out. However, all the strings and the silhouette behind it are all real

time," explains Moment Factory's creative director Jesse Lee Stout. There are several other real time interactive moments in the show. In *The Globalist*, missiles are firing at the band members, and wherever they are walking on their extended catwalks, the missiles follow them and explode wherever they have to be," adds Stout.

Key to making the interactive video work are six Microsoft Kinect cameras - which are separate from the BlackTrax cameras and the IMAG cameras. Stout continues: "We're running the Kinect cameras through Touch Designer [software from Derivative that allows designers to work in real time] to create these real time effects and these avatars of band members that are 20 plus feet tall."

One of those avatar moments happens during the song *Undisclosed Desires*: "There's a band member that stands in front of a 3D camera, and then an image of this band member will be projected on the voile behind them, at 30ft high - but they're on fire," explains Kansy. Moment Factory is providing the Kinect cameras for the tour.

As mentioned, BlackTrax is also involved in the interactive video. "We average out all the different positions of LED stringers - in this case they have two on the shoulders and one on the back of neck - so we figure out the centroid, which would be the average middle of the three of these points. The Moment Factory system then takes that position and they can do their interactive things - you can do some cool interactive things, all based off of where someone is," says Cochrane.

For the interactive effects, there are two primary and two backup Barco XPR 604 servers with six outputs each; they're loaded with X-Agora software. Each output goes to a Barco projector. "When I evaluated this project, I looked at three servers. I looked at the Avolites AI, I looked at D3 and I spoke with Robbie Bruce at Barco, who is a good friend of mine. He's now project manager for emerging products at Barco, which is entitling and embracing the XPR server. Having that support, and having a complete Barco front end, from media server to projector to mirror heads, was a big reason for me to with the Barco server. I wanted to try something new, and being able to mould the clay in your hand while it's still warm was an asset to me," confides Metcalfe.

The content from Moment Factory also includes a futuristic, somewhat female-looking figure that appears in various forms throughout the show. Stout explains: "It's one androgynous figure that Matt Bellamy [lead singer/guitarist] refers to as the dictator.



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We cast this person who kind of looks like a cross between a 1970s David Bowie and Tilda Swinton. You'll see riot sequences that has this person in there, there's a robotic figure, then this God-like figure - it's subtle at times, but it's always the same person."

### Lighting

Motion tracking is also incorporated into the lighting system. Metcalfe explains: "When I started to use BlackTrax, it started to really create new ways to key light. When you talk about something as simple as key light and the importance of it, it's simple but very important - BlackTrax can become your best friend overnight when it comes to key light following the talent."

Metcalfe has six Clay Paky Mythos and 24 Martin Viper Air FXs on the BlackTrax system for use as followspots within zones on the stage. "Using zones allows us to tell lights to turn on and off automatically, without needing the console, or without spot cues. We basically build areas on the stage where we want certain lights to fade on or off - as the band members enter that particular area, the lights assigned to him in that moment will turn on or off, depending on what you programmed in the show," notes Cochrane. The effect is completely seamless and the lights stay within Metcalfe's lighting programme; if they're strobing when a band member walks out of a zone, they fade out in the strobe, while the lights that come on appear in a strobe.

Luminex Ethernet-DMX nodes also play a part in the system. Cochrane explains: "The console sends out their traditional Art-Net or sACN stream; we then send out our own protocol called RTTrPL [real time tracking protocol lighting.] The nodes alleviate the need for having a dedicated device doing the merging, because the node will convert sACN or Art-Net to DMX anyway, so you don't need to do it in a console or the BlackTrax server - it makes it really clean and easy. The node listens to one specific DMX channel, and when the console has that channel at any value other than zero, that's the percentage of control that BlackTrax will receive. We're always sending to the node and the console decides when BlackTrax actually has the say to get through to the lights." The fact that the processing takes places in the node rather than the console keeps the number of universes down. Metcalfe comments: "BlackTrax is designed to work with any DMX desk; it does all the merging downstream, so your operator doesn't even feel anything from his desk."

Metcalfe not only designed the show, but he's running it every night as well. "The BlackTrax system integration with Hog [specifically, the Hog 4] is completely seamless," he confides. As for his choice of console, he says, "I've always been a Hog guy. I did dabble on the MA for a couple of years, but being a solo artist/programmer/designer, I was driven back to the Hog due to its simplicity and ease. I can literally operate the thing with my eyes shut. Nobody can operate the MA with their eyes shut. Nobody. Not even the best programmers."

The workhorse of Metcalfe's rig is the Martin MAC Viper Air FX. "All the key light is delivered from MAC Viper Air FXs. It's a nice, crisp light source, it's a great colour temperature, it's nice and responsive, you can get them everywhere and they're reliable. What more do you want?" he says.

The rig also includes, "Mythos, for all the beam light and Martin Aura XBs for the LED wash. We also have 28 Clay Paky Stormy CCs, the RGB LED strobe, and we are lucky enough to be field-testing 14 of the new Martin Atomic LEDs," explains Metcalfe. There are 48 total Mythos used on the show, with the majority in the air, as well as 36 total Air FXs; the rig also contains 72 Martin MAC Auras and two of MDG's theOne atmosphere generators.

According to the designer, the Martin Atomic LED "is a game changing fixture. The Atomic LED has a flare and intensity that is not attainable by any other LED strobe that I've seen. It looks genuinely like a strobe, because of the way they've engineered the light source inside it, but it doesn't have the digital feel that many of the front face fixtures have. All the fixtures that have a flat field of LED don't do it for me at all; I like a nice reflector - a real, organic reflector - and a linear, tubular source. It will probably become the new blinder for everybody, and it's certainly up there with output vs. the old Atomic - this is just brutal in its intensity," Metcalfe concludes. And he is being honest in regards to the intensity of the Atomic LED: used incorrectly, it could be painful for the



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audience. However, he uses them judiciously during the show and the hits are quick, rather than painfully blinding.

The majority of the rig is in the air. However, there are "24 Auras on the floor, and there eight Mythos on the floor as well," says Metcalfe. The lighting rig is supplied by Neg Earth, the band's long-time lighting vendor.

#### Effects

There are also standard special effects in the production that are provided by the Las Vegas office of Quantum Special Effects, a UK firm who has worked with Muse in the past. "We have some confetti blowers and the actual confetti is custom confetti that we have a die cut for - there is some artwork on the new album, they have some drone men walking, so we've taken the likeness of one of these drone men and had it die-cut for confetti. It's not just square little triangles, or rectangles of tissue paper, it's these little men. We also have some compressed-air streamer cannons," says Kansy. The custom confetti and streamers appear during *Mercy*. There are also massive confetti-filled balloons that bounce around the audience in *Starlight*.

#### Sound

The innovations that abound in the Muse tour aren't limited to its visual aspects; the band's long-time FOH sound engineer Marc Carolan has some ground-breaking ideas of his own on the tour. He's on the road with the classic analogue Midas XL4, and a bit more. "The meat

and potatoes of the band - the drums, the bass, the guitars and the vocals - is happening on the XL4. The keyboards, the effects returns are on the PRO2C. The PRO2C is also handling all of my automation stuff as well. The Midas PRO2 is the smallest of the Midas PRO family, it's small format in terms of its surface, but because it uses all the Midas preamps, sonically it's fantastic," he explains.

Using a pair of consoles is the perfect solution for Carolan and Muse, especially since the show includes a considerable amount of automation. Carolan notes: "With the Midas XL4, I can only address 127 scenes using MIDI, so I had to come up with another way to automate, so I expanded how I use the PRO2C. For all intents and purposes, I've ended up with a fully automated XL4."

Having what is essentially a fully automated XL4 enables Carolan to run the show the way he wants to. "When I'm mixing the show, I have my hands on the faders: I'm watching the band, I'm interacting with what's going on musically and just letting all the automation stuff happen in the background, so I'm not trying to wrack my brain trying to hit all of the cues," he says.

The PA is, of course, configured in-the-round. It was something that Carolan and Matt Vickers of audio supplier Skan PA talked about for years before it actually happened. "There have been rumours of Muse doing an in-the-round show going back for years and years - they're always trying to push the envelope. Matt and I are

always talking about these ideas, so we knew the things we wanted to do and we looked at what other people have done over the years. When the time came and it was in the round, Matt was ready to go," says Carolan.

For Muse, Carolan's PA of choice is from d&b audiotechnik. "I've been using d&b for seven years now, going onto eight. It's a fantastic sounding system, and now with the new array processing technology, it just fit the bill so well for the in the round configuration. Another advantage of d&b is that this is a very heavy show, but the PA is relatively light compared to other PAs out there. And that's very important," says the FOH engineer.

There are a total of 12 PA hangs spaced around the stage. Specifically, there are four hangs of d&b J-Series with 18 cabinets per hang on the long axis, with four hangs of d&b V-Series, also with 18 cabinets per hang, on the shorter axis. Finally, there are four hangs of d&b J-Subs, with five cabinets per hang. Carolan says: "On the deck, we have a J-Sub/ J-Infra sub arc supplemented each end with V-Subs - we ended up with what I think is really good, even and tonally pleasing sub coverage, which is one of the big challenges of in the round." There are a total of 12 J-Subs, 8 Infra Subs, and 4 V-Subs on deck.

Amplification [80 d&b D80s] lives inside the space station. "One of the main reason I love Skan PA is that they are so anal and OCD about their packaging, their preparation and



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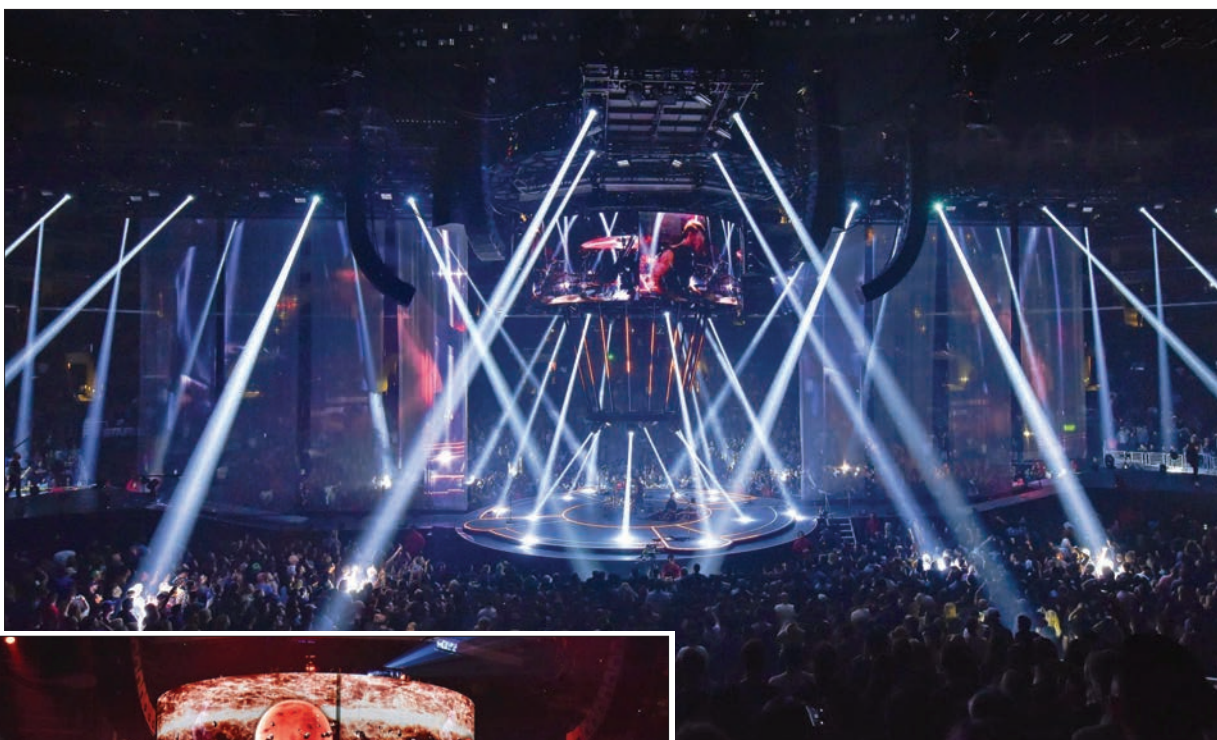


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integration of what they do - it's something that Skan just excel at," the FOH engineer confides.

Carolán is using a variety of effects and dynamics on the show. "The vocal side can be a bit of challenge, because of the differing mic techniques that Matt [Bellamy] can have - there can be a lot of head wandering. We have a lot of stages of distortion in the vocals and that stuff can get tricky. Matt spends quite a bit of time wandering right in front of the PA, so I've dedicated channels of the Lake LM 44s that I have in groups; I group them as inner and outer, so anything that within the PA is one group, and anything outside of the PA is another. That Lake solution is really cool because I don't butcher the whole system to make the vocals work - I can tailor the vocal. It's just really tiny little notches here and there, to give me that three or four dB of headroom that I need," he concludes.

For the bass and guitars, Carolán is using Tubetech compression, specifically two LCA 2Bs. "For drums, it's a little bit of dbx 160 and a little bit of SPL Transient Designer - everything is kind of tiny little tickles here and there, nothing extreme."

On stage, there are eight, and occasionally nine, vocal positions. Carolán notes: "My basic vocal chain has been for a while the EL8 distressor [from Empirical Labs] with the BSS DPR-901-II. I'm using that chain on all the vocal positions. Those are standard workhorses for me."

For his vocal mics, Carolán has "Neumann KMS 104s and 105s, on Sennheiser sticks. We've been using those with Matt since I've started. They were wired originally, and as the show has grown, it's all become wireless. It just really works for his vocal and his vocal technique."

The rest of his mics include Beyerdynamic M88 and SM 91s on the kick, AKG 451s on the hat and ride, and Shure B98s for the toms. There's also a Shure SM57 on the top snare, and a surprise on the bottom. "I use a Neumann KMS 105 on the snare bottom. When I got my first 105, I was doing a studio gig, and I didn't have a condenser, so used it for the snare bottom and just loved it. I've done snare bottoms like this ever since. I know that the snare bottom is always deemed a frivolous mic, a luxury mic, but it's the core of how I get my snare sound," Carolán says.

The location of the FOH sound position could have been an issue for Carolán. "I'm looking straight down the spine of stage. I have a good spot from an audio perspective, but I've got the worst view in the house. With all the vocal positions, this is not ideal". However, the audio team came up with a unique solution. "We built a little vocal spotter rack [a custom piece from Skan]. One of the PA techs sits just down below the revolve at the centre part of stage, and he just watches the two guys; he has a switch to select which microphones are active. It seems like such a simple thing, but what it's meant for me and Adam in terms of headspace has just been fantastic. The band aren't tied to any choreography, they can go wherever they want with the confidence that somebody is specifically watching them to make sure it's all good. If it was Adam [Taylor, monitor engineer] and I trying to do it, we'd have no time to mix the show," concludes Carolán.

Muse toured the US in February; they then moved into Europe and will be there until the end of June. Metcalfe says: "We're coming into Europe with zero lead time into the first show; that's one of the reasons we went with primarily UK suppliers."

Metcalfe expects that life in Europe will be somewhat easier. "In Europe, we have much larger floor spaces to work in, and the show literally does only just fit in a hockey arena when it's laid on the floor before it goes up. It's a squeeze, and I know that the squeeze will become much less apparent when we hit Europe," he concludes.