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Making Progress

Steve Moles reports from behind the scenes of Take That's Progress Tour, from rehearsals at Sunderland's Stadium of Light and from the fifth night of their eight-night residency at the City of Manchester Stadium . . .

Most of you will know by now the stories of the 70ft (21m) tall robot that graces the Take That stage. Known as OM, derived from the French *homme*, he's more affectionately known by most of the crew as OM the 'Other Man' (as opposed to BM, the 'Big Man', a giant with a 200ft (61m) arm span who enfolds the stage and holds the main PA from his finger-tips). OM is a walking behemoth. As Donald Rumsfeld famously said, "there are known unknowns, and there are unknown unknowns". In terms of audacity, Take That's production team has stepped boldly into the realm of unknown unknowns, and - take a bow all of you - has pulled it off.

There are, in fact, several significant elements to this production that break new ground. For those of you who scan my preamble and then jump to their own discipline (lights, sound, set or video) know this: promoters SJM got to sell several thousand extra tickets to every show thanks to an innovation that The Production Office (TPO) supremo Chris Vaughan has been stealthily marching towards for several years now - no front-of-house tower, no delay towers, no obstructions to the punters at all. This in turn forged a dramatic response from the PA department, and hats off to Capital Sound and Al Woods (a direct employee of TPO) for making it work. This was not a new PA system, just one of the systems that we all know are the top pick for audio at the highest level; it was down to the way it was applied. The result was easily the best stadium sound I've heard, ever. It remains to be seen whether the cost/benefit analysis of extra seat sales can justify the expense of this unusual application of off-the-shelf audio.

While video and lighting may not have broken new ground in such spectacular fashion, they certainly pushed the boundaries: the Nocturne screen on main stage transcended mere 'LED VID', becoming an integral part of the non-stop theatricality cooked up by set designer Es Devlin and the imagination of choreographer Kim Gavin (and choreographer isn't a big enough word to encapsulate Gavin's input). Lighting designer Patrick Woodroffe, meanwhile, confirmed some applications for stadium lighting that I'm sure we'll be seeing used for his Olympic opener in London next year.

But in the end, production laurels must go to stage set; the simple fact that Brilliant Stages, Total Solutions Group and Tait Towers were all heavily involved tells you pretty much all you need to know about the breathtaking scope of this show's ambition.

A Brief Description . . .

The Big Man (BM) defines the stage, his arms, shoulders and head dwarf the stadium and top off the Stageco structure that holds the compendium of gags and technology that is the Progress Tour. To right and left the main PA suspends from BM's finger-tips: beyond these stand two portrait screens for IMAG, and further still, the side-hang audio systems, some 260ft (80m) apart. The Bridge spans 160ft (49m) across stage. Upstage of the bridge is BM's torso, not revealed till the last third of the show when all the theatrics of the Bridge are finally exhausted and the torso opens to reveal OM curled within. To either side of BM, huge walls of video are also revealed. Concealing these elements for most of the show is the apparatus from the Bridge: soft kabuki screens with woven LEDs sit upstage of the so-called Venetian, though in reality the Venetian blinds are steel scrambling nets upon which balletic aerial dancers scamper. The main stage screen hangs in front on a track: Robbie Williams' grand entrance through it is just one of the tricks up the screen's sleeve; there are numerous others between screen and venetians.

Forestage is multilayered, the band stood within two tracking dollies that flank the central focus. A long peninsula of deck runs far out into the audience and onto the B stage, which has more props and lifts concealed within it than a West End musical, and yet tucked neatly into it, looking towards stage, sit light, video and sound control beneath canopies just 5ft 8" (1.7m) tall. As for OM, when he eventually appears, he first lifts the Boys up on his hands as he sits up for a song on the main stage, then carries them out along the now lowered peninsula deck and deposits them on B stage, whereafter he slowly stands up - and 55,000 people stare open-mouthed as he towers above them and stretches out his arms.

Audio: Capital Sound

The approach to sound epitomises how this production challenges the established mores of stadium rock. The lack of FOH or delay towers impacts Gary Bradshaw in his role of house engineer: would he be able to see and hear properly? Would flown delays off the grandstand roof be adequate? The answer to the second question is yes, of course: the oval of a stadium is a simple shape to handle, perfect in many ways because flying off the roof puts the speakers closer to the listener and at a much better angle than a delay tower (providing the venue allows enough to be flown in the right places, and that production has the budget to commit the necessary resources). But that didn't mean it would be simple. "I was genuinely worried," Bradshaw began. "The rationale behind Chris Vaughan's idea is about sightlines and more seats, and from that perspective it works really well. But there is a sound benefit too. I've been out for the Pet Shop Boys (PSB) set and listened from all over the venue; compared to what we did for *Circus* last time, the clarity from the Ring is even better, especially at the back."

The PA crew refer to the flown grandstand system as 'the Ring', and it functions on a similar rationale to the Ring system employed for *Eurovision* (see LSi June 2011), but at rock show rather than TV show SPLs. I too spent the opening set by the PSBs walking up and down every staircase in the stadium; I also talked with as many punters as I could. The consensus was positive: they liked the open sightlines, though most hadn't noticed the absence of a FOH tower till I pointed it out (no surprise there?). Many had noticed the excellent intelligibility, however, even if they

Top, The emergence of OM.

Crew, from top:

Dennis Gardener, lighting operator

Gary Bradshaw, front-of-house engineer

Ben Leach, Pro Tools and show caller

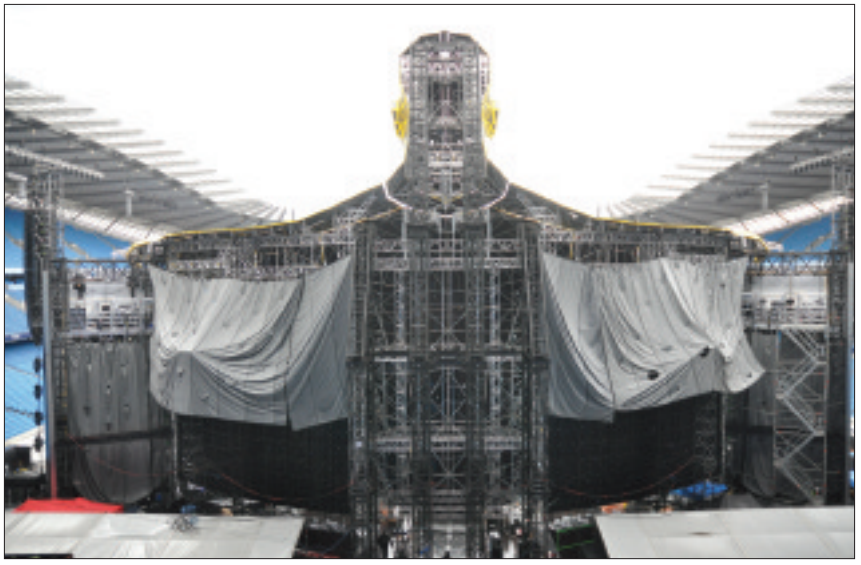
hadn't spotted the Martin Audio system hanging from the roof. The clarity from the mid/highs was excellent, that proximity benefit was all too apparent, and though there was a degree of separation from the low end coming from stage this wasn't troublesome for the listener. I don't recall ever seeing subs way out in the house for stadium gigs, so situation normal really.

"From a mixing perspective, last time we were way off-centre, here to one side of B stage we're much more central and I can see the main stage pretty much down to front barrier level," says Bradshaw. That's a crucial factor any promoter contemplating the 'no towers' policy must not overlook: The simple fact is that the crowd barrier around the B stage gave a much more generous gap than normal in order to accommodate the multiple props and the large number of people needed to manage them, and to shepherd OM out into the stadium. Thus FOH sound world, although at exactly the same level as the audience, had a good five to six metres in front before they met the back of a punter's head. It's that gap which is absolutely essential and allowed Bradshaw to see and hear and thus to do his job correctly.

"The other thing is the roof of our shelter: built by Tait as an integrated part of B stage, it can be whipped off or on in two seconds, so I mix with it off as it gives me perfect view when the band are on B stage, which is often, and an uncompromised sound." He also has from DiGiCo some nifty custom transparent covers for the desks with a letterbox slot at the leading edge: "I've tried them and you can operate with your hands poked through the slot." And does he suffer the acoustic bounce of main PA off a temperature inversion layer above a hot sweaty crowd? "The Martin Audio temperature and humidity correction takes care of that, though of course we have noticed some ground effect from dampness. We also started in Sunderland by sending more drive to the roof Ring system. I was anxious there wouldn't be enough vocal presence, but in the end it's proved unnecessary. The mix that goes up there now is the same as the mains left and right. Here at Man' City, the stadium is quite dry acoustically compared to Sunderland; the reverb is short and smooth."

Bradshaw emphasised the importance of the unrestricted view of the band: "Capital has used speaker dollies for main and backup desk; the racks beneath have been custom-made so when I'm sat on my drum stool, my knees fit under the desk. When I'm stood, the dollies allow me to wheel the desk around when the boys come out to B, rather than twist my neck."

With five vocalists out in front of a big PA system you can understand his need. "We've switched to DiGiCo SD7s for this tour," he says. "My session is also in the second (PSB) desk if needed. The big change from D5 last time is quality of sound, first and foremost; I'm also handling up around 80 inputs; it's a big band, including Gary Nuttall from Robbie's band. Besides instruments, four of the musicians sing BVs and they're all an important part of the Take That sound. The band is split on two risers either side of stage and each has a transparent shelter; because of the rain effects on stage they're always covered, but this hardly affects what I take from them; the guitars, for example, have all their amps off-stage in isolation boxes,



and having the drums in the shelters actually reduces any element of cymbal splash from the boys' mics, though it does still affect the BVs. The Bass player, who's a really good singer, is right next to them, so I have to roll off the highs.

"The other thing I like about the SD7 is we now have three fader blocks of 12 channels, not 8, that means I've split the duties three ways, drums and percs, rest of the band, and voices - perfect. The boys all use Sennheiser SKM 5200 mics with MD 5235 dynamic capsules - they pick up less ambient noise. It isn't a super hi-fi mic, but it's no compromise. The caps also handle the rain better." (Robbie Williams pointed out to the audience it had rained at every show so far.) "The boys go for it but you can't just have all five vocals flat out, so I take lead vocal and the main harmony voice, then the background harmony beneath. They all pull the mic away to fade off and I ride all five faders to match, but new songs apart, they do it at the same places they've always done, so it's second nature. I drop the fader like you change gear in a car, without thinking. I like the sound of the Sennheiser anyway, but it's just so much better than anything else in this application. In the desk we have dynamic EQ. Before, I used XTA's SiDD, now I can pull that 7-8kHz on Gary, the 3-4kHz on Robbie in the desk and it's just as good. I also have some dynamic on the roof ring output to pull a little high/mid. Overall, the system EQ is much flatter and I have enormous headroom in the vocals; that's down to a combination of the capsules and how well the system sounds."

PA System

The PA set-up is the work of Al Woods, a member of the TPO team. As system tech' he worked intensively with Capital Sound to ensure that the 'no towers' sound solution worked without compromise for the audience. "There's nothing too fancy," says Woods. "Within the pitch and roof delays an XTA226 is integral to every amp station, so we can address delay and EQ individually to each position."

There were 10 hangs of Ring PA around the roof, with four stations of pitch stack delay at the far end. The stage main PA is Martin Audio's W8L Longbow, with side hangs further off stage also W8L family: the only flown subs hang vertically flat immediately behind these latter hangs, with a floor array of subs below.

"Everything in the air is fed from S/L and S/R dolly systems, PA cable sits in the hopper on top for trucking." Identical really to what Vaughan had Skan make up last year for Muse's stadium/arena outing. "The whole system has been refurbished by Capital; we insisted that it had to look pristine, cable Socapex connectors have been replaced, even the front speaker grilles. I'm employed by The Production Office and I pick the crew: team is most important. Capital was determined by choice of system, as Longbow is one of my favourite three systems." I managed to elicit the other two - K1 and Vertec.

Because of the OM track there is no cross-stage link, so linking is via out front. "We thought long and hard about the audio distribution in the roof," says Woods. "We run analogue to and from the desk with a standard arena multi-core each side. Then AES from the dollies; the runs are long, so Ian Coleville at Capital and I researched a fibre solution. Two returns from FOH run to the floor SUB dollies, then to main dollies left and right upstage, then

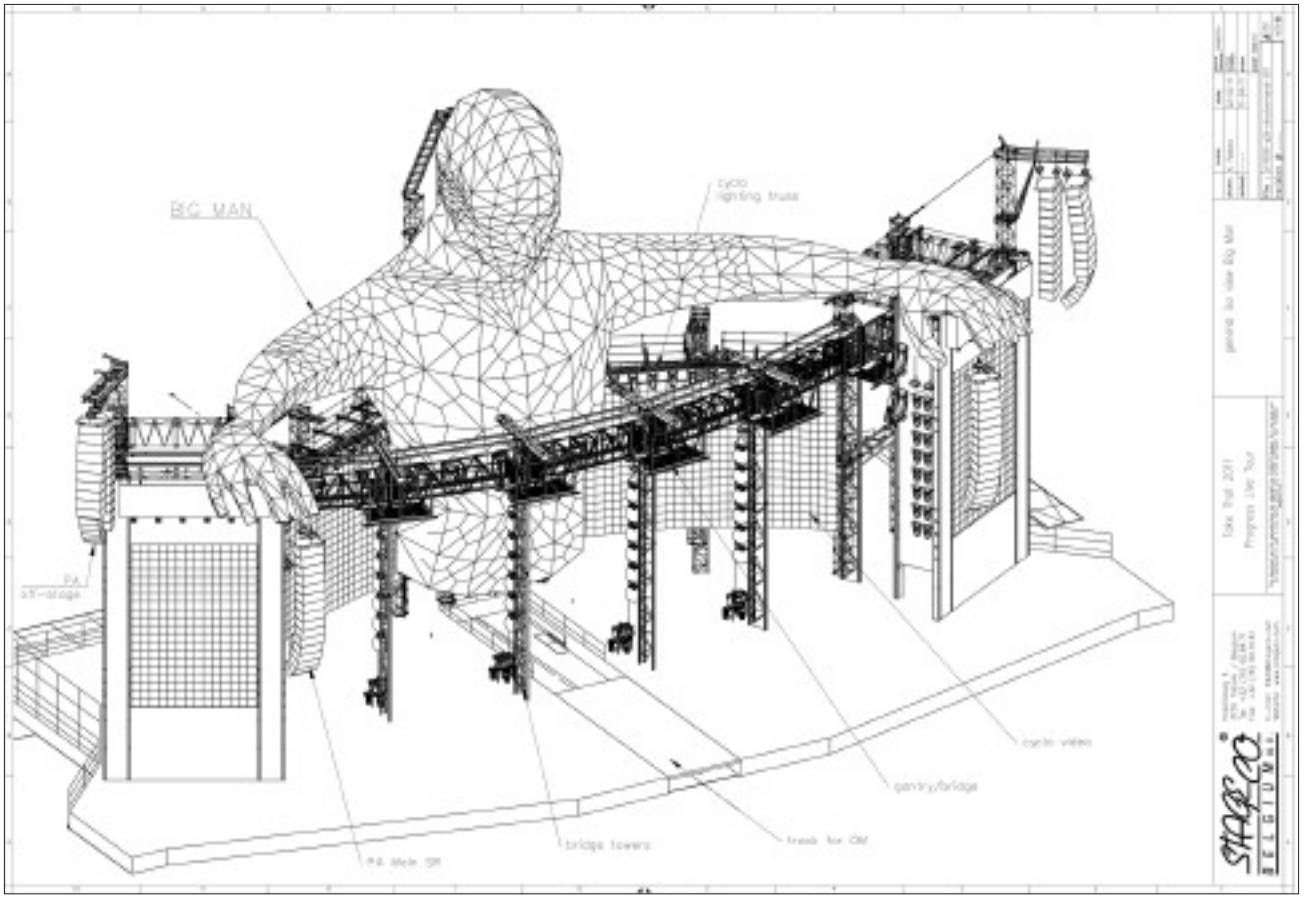
Take Notes

Fred Opsomer & Tait Technologies

- "Chris Vaughan called me because he was concerned about speed. The dollies were the way to go, the total package was for speed and strength, simple as that. We also provided the kabukis from Tait Tech, the mechanism are from our standard stock, but the fabric is quite different. They have a printed outline, the human figures from the album cover, but Es Devlin was adamant that these outlines shouldn't be visible when front lit, so they could appear magically when lit from behind. We did a lot of test until we found something with the right amount of transparency but enough weave to hide the outlines; it comes from Showtex, the Belgian theatre drape maker. The LEDs sewn into the fabric are just off-the-shelf units. There was no need to develop something for just 300 pixels."

- Pete McGlynn: "The two band pods can't link backstage because of the OM trackway, so getting signal to the SD7s from the band and back to the outputs has its own complexity. DiGiCo have been fantastic in helping with that. They also helped sort a few niggles, and Sennheiser have been the same, especially with water-proofing. Without them we would be in trouble. Apart from that it's very straightforward."

- Microphones: A quick note on microphones: this is a Sennheiser show, the BVs use 935s, and most of the backline is various Sennheiser, but Bradshaw put Shure SM57s on the guitars.



Optocore up to the roof: we run fibre from each side of stage all the way round in both directions, so we have a fully redundant loop. There are also fibre returns to FOH so I can monitor the full system from there. I also had Capital build me a bespoke rack-mount PC with AudioCore and three Meyer Galileo - one for matrix, one for system and a spare. I also have Smaart in there for reference and a 5G wireless system to link to tablet PC and an Electrosonic mic for RTA and the transfer functions - it means I can look at stuff on the spectrograph and use it for time-aligning.

"Also, because we've hung the subs flat behind the main side-hang, I've curved the subs in time so the departure time matches that of the main array in front. By coincidence, the subs end up pretty much an exact horn length distance from the Longbow in front. It's very smooth, they cross over at 65Hz and there are no nulls anywhere. Because of the stage configuration the side hangs are in fact time zero; the main system, 5-6 metres in front, is delayed back to them."

The Subs are not a heavy component in this show, more an effect, so even though Woods has put a substantial number on the floor, the level for audience members nearby is much kinder than many a comparable system. "The system also has unexpected benefits, we're a good 5dB under noise limits outside the stadium - a direct advantage of the roof ring. Even at 120m everyone gets a good sound. I always ask myself, am I sitting in an £80 seat, and is it worth it?" It certainly is.

Monitors

This is a two-hander: Steve Lutley from Delta Sound mixes for the boys, Simon Hodge does the band (and also provides the comms system, via his company SurfHire). The stage left monitor shelter is also inhabited by Ben Leach who runs the Pro Tools rig and for fun is the show caller. Lutley is delightfully modest about his position: "I'm here because way back I did monitors for Gary Barlow's solo tour and I seem to have been here ever since."

The monitor set-up is provided by Delta. The IEM system is all Sennheiser SR2050 with G2000 receivers and Ultimate Ears inserts. Lutley says: "I like 'engineer mode' - I use one pack, programme in five different frequencies and then don't have to go through pre-fade to listen to each of the boys - that's very useful. They all have quite a big band mix - they're similar, but each has his own individual mix. Although B stage is far away I do have reasonable line of sight, much better than last tour . . . For rehearsals Pete McGlynn, who sets up the desks and stage, drives the desk and I sit out at the B stage and watch - especially the new songs. Both me and Hodge have moved to the SD7: we wanted the spare desk option of using identical boards that can mirror each other's session."

The mixes can be quite nuanced: "Gary even wants reverb on the snare, and Mark wants vocal distortion on one of his songs. When Gary sings a ballad he wants none of the other voices in his mix. The point is, either desk can do everything, if needed."

Hodge explained: "Each band member is a producer in their own right, so they know precisely what they want to hear. We were also blessed with lengthy band rehearsals before the boys came in, so we had it nailed. The band are all controlled, no-one gets carried away, levels rarely change. They all have their own full mix. As to the SD7, I'd mirror what Steve said: I like the power in the desk. I'm driving a lot, all 40 dancers have ear packs too - there's no other way to keep them in time. This way the choreographers can talk to them as well. That's 20 channels for the band and boys in total, and another two for the dancers."

Both men pointed out the benefits of the little video monitor in the SD7's meter bridge: "On shows this scale you can never see everywhere, so a video feed to this is great."

Hodge says: "The MD5235 capsule has proved incredibly robust, considering they sing through the rain drenchers, and Robbie sings upside down as he descends from the bridge through water: they're amazing. In eight shows we've only lost one and that not through moisture. We really thought we'd lose one a show."

Pete McGlynn added that the capsules were treated with conformal coating to add to their water resistance: "Even so, they are damn impressive," he said. As McGlynn is one of the most experienced stage audio techs in the business, you have to say that's praise indeed.

Video

There are two elements to the video - content and IMAG, inevitably - with the LED screens coming from XL Video and Nocturne. XL's Stuart Heaney was kind enough to provide an overview, while Richard Shipman (another direct contractor to TPO) front-of-house, explained image and screen management.

"The Nocturne screens are all V9 (two portrait screens to the sides for IMAG - mostly), and the centre tracking screen which has a door

function and also splits left and right," Heaney began. "The XL screen is our new F11 (11mm pixel pitch) 1080 tiles in two halves either side of BM's torso. The frame structure and road packaging for the F11 is built by Tait Technologies (see side-panel, page 45) and the PPU is also packaged for the road by Tait."

For stadium-scale touring, Chris Vaughan has embraced the US concept of big, forkable dollies to minimise cabling and load in/out times. "He's even attempted to get fork slot widths on the dollies unified," said Heaney, "so we don't have drivers having to jump off to re-set forks as they shift from video to PA dollies." You'll note 'attempted', meaning they're not quite there: time for a published standard?

The dollies are in fact enormous, over 5m long, and are able to sit directly beneath the screen ready to receive as it descends; the speed gained is obvious, and the amount of panel cabling that travels in situ another time-saver. Could they work for arena touring? Mostly, yes.

One point of note, XL fly their screens with motors floor-mounted, with wire rope over gallows masthead-type pulley blocks integrated by Stageco, into the main stage structure above - a typical engineering solution from them that negates the need for climbing riggers - well worth the effort.

"All the PPU and camera kit is from XL," continued Heaney. "Content playback off the UVA D3 system is supervised by Richard Shipman. For the live IMAG work we have ten cameras, all Sony HXC, used in standard definition. Matt Asken, who directs the live video, uses our Grass Valley Kayak: he's been with the band for years."

Asken was also preparing for the first shoot for the live show DVD; with a doubling of cameras and additional lighting to contend with, he was understandably unavailable, but he clearly knows his chops. His cuts were slick, part of the sequenced whole: I especially loved the giant facial close-ups.

Richard Shipman is a keen adherent of UVA's D3: "I'm in love with D3," he says. "I've used them all - Hippo, Catalyst, and this is the one I want from Santa. It's a great pre-visualiser for video, we just took the stage CAD drawings and imported them, added in the screens and you have an accurate picture of what the stage will look like with content running to scale - great for showing to the band. On the song 'Shine', where Robbie's image (from content, not live) jumps from centre to side screen, from landscape to portrait, the D3 knows the number of pixels from one screen to the other and treats it all as one big image. Most of the set list is MIDI timecode, or to click-track; there are lots of manual cues for the opening."

Why is Shipman positioned FOH? "It's much easier to balance the screens from here; that's especially advantageous now when we're shooting the DVD, so I can readily tone down screens in the back shot of the cameras."

From top:

XL Video's Stuart Heaney

Richard Shipman, screens director

System tech' Al Woods of TPO.

The content is provided by Sam Pattinson from his company Treatment: "His footage is absolutely cracking," says Shipman. "He really understands how LED works, as opposed to some content providers who hide away and work from HD studio screens; Sam works to the exact amount of pixels we have." It's a measure of how compelling the live show is that I paid scant attention to the content, but when I wasn't being assaulted by gags, dancers, pyro, props, elevators, rain effects, aerialists, confetti and robots, I looked - and yes, Shipman is right: cracking.

Lighting: Neg Earth

I spoke to Patrick Woodroffe at the Sunderland Stadium of Light during production rehearsals as he would not be present for my visit to Manchester. As ever, Woodroffe does not design to a formula but finds his creative muse from the elements around him. "I approach these stadium shows in a different way," he says. "I started by discussing the show in its entirety with Es Devlin and Kim Gavin and then we let the set take the lead on the design. You need to light the scenic pieces and you need to light the band but after that you must consider the essentials rather than the style of the lighting."

He continues: "It was the Stones' *Steel Wheels* tour that first dispensed with roofs for bands, roofs that gave an obvious but fixed place to hang lights. But the roof never kept the band dry anyway, so being able to turn to the set designer - Mark Fisher in that case - and say, you do your thing, we'll figure out where to hang the lights afterwards, was hugely liberating. On Take That we could see early on that the Bridge was the essential light position as the stage demanded a coherent set of lights for the donkey work of lighting the performers, and for these we used a row of Vari*Lite 3500 wash FX. Above the video screens, at the rear of the stage, we rigged Coemar Infinity washlights and on the side torms we had Clay Paky Shotlights for a hard, theatrical side-light. And then we needed something across the front of stage. I always like to put something there to define the front edge of the performance area but until now I've never found a light that could do that and provide something usable to light the act. Sometimes there are 40 cast members up there, so now with the Martin MAC 301 we've got a 21st Century footlight."

Nevertheless, it's a huge stage to light and it eats up fixtures. "Clearly, with something on this scale you have to hang a lot of lights - to light the audience, to give variation to the looks, to create drama and spectacle. But you don't need to insist on the traditional things like a lighting position at 45 degrees to the front of stage. That might seem like a sacrifice for the lighting alone, but the payoff is that you get something unique and the other things don't matter so much. Because of the nature of the *Progress* album, this show is a little darker than the last tour - more robotic and less organic, without the same level of joyfulness as Circus had. So the choice of lights is different this time, with a design that is more syncopated and more about the narrative than simply the music."

How does Woodroffe respond to the 'no towers' ethos? "It inevitably raised big questions: Where do you put your followspots and how do you get front light on the stage? So we doubled up the followspots - five Lancelots a side in the house, and for audience light we took what would have been the traditional spot towers, and figuratively speaking, turned them horizontal and rigged them from under the grandstand roof. We do that a lot when filming stadium concerts so we knew how effectively that can work. We have Clay Paky Alpha Beam 1500s on each of the side trusses. They are a terrific light - clean, white, pokey and accurate. They became the key light for the action on the B stage and the front of the A stage and also for the higher scenery like the head and the hands of the Big Man. They literally reach the parts that other lights cannot reach!"

Woodroffe is fortunate in having such a bold tableau to light: "We have an open stage, a mix of pop and rock and some heavy conceptual pieces, all cleverly and theatrically directed by the amazing Kim Gavin. He's very collaborative, cool and imaginative and it's unusual to find all these talents in one person. And of course he has the complete trust of the band." I witnessed a similar level of trust shown by the boys themselves that evening, as they comfortably fell into conversation with Woodroffe about this or that element of the show.

Dennis Gardener runs the light show. "He's one of Patrick's best operators and has been doing stuff for Patrick for years," said the show's programmer and co-designer Dave Hill (another indispensable member of Woodroffe's team) during rehearsals in Sunderland. "I love running these big shows," said Gardener two weeks later. "The fine-tuning is what I enjoy, especially on a show like this where you get to work closely with someone like Matt [Asken, video director], evolving the live video content lighting as we also settle the big show picture."

Gardener was especially animated this evening, "We're tuning the show for the DVD. I've got an extra dozen followspots in the house - 22 I'm calling in total." You've only done eight shows so far, don't you use a caller? "No, I love it, I call it all by name. I don't believe in working to a script - do that and you end up becoming a machine. If you call from memory it keeps you sharp." Sharp? He must be deadly.

Of the GrandMA 2, used to programme and operate the show, he says: "Layout is good, the big screens especially; I found the switch from 1 to 2 easy. MA haven't tried to re-invent the wheel, so much of it is very familiar. It's very fast for programming and networking. We have two full-size desks, one mirroring the other. I've

found that if the console does crash, 90% of the time it's software, not the CPU, so type 'auto start' and you'll be back up and running in well under a minute - much faster than a total re-boot." Maybe MA won't like to see that in print, but then nobody believes in a totally crash-proof desk, and speedy recovery is an asset in any operator's book.

"The touch-screen down on the console surface is especially useful - grab a fixture on the tilt display screens and the full colour mix appears below; also great for lamps with shutters were you can manually squeeze to fit very precisely. MA has also provided fantastic back-up through rehearsals - send Phil Norfolk at MA UK a complete 21MB show file with a bug in it and it's back 30 minutes later."

Woodroffe's lighting choices include some especially long range positions with practically all B stage lighting out on trusses rigged off the leading edges of the grandstands, typically a 70m throw or more. Gardener says: "The Alpha Beam 1500s handle most of the long-range stuff; we used them on the Circus tour at comparable range. They're more than enough for the cameras. For me, the fun lights are the Martin MAC 301s in OM's hands and eyes, and the pair of PAR 64s with a bit of Lee 106 for his heart."

There are another 35 PARs in this high tech rig, mainly up on the bridge to downlight the water effects. The Panalux LED clusters in the corner of each OM body panel are worth a mention; like so many things in this show they're an obvious placement but could easily have been omitted on the basis of cost (OM is already fabulously expensive) but they weren't. Such attention to detail is what makes the quality mark of this show so high.

Gardener reminded me that Woodroffe, with whom I had the pleasure to work on a couple of big tours in the mid-80s, still uses an old conferencing device. "He brings a white board to rehearsals and puts anything relevant to each song on it - colour, video, props used, etc. In some ways it's a job of subtraction, having many options and then refining out what works best. From final rehearsals in Sunderland we sent back at least a truck-load of lights in the end."

Finally, I asked Gardener for his stand-out moments and he said something I can only agree with: "Whether you think you're a fan or not, you can't help but enjoy their performance. Richard and I constantly sing along out here. If I was to point to anything it would be 'SOS' and 'Underground Machine' - great video and lighting combination, it just works. And the touch of Kim Gavin on every song - well, he just does a very, very good job".

Stageco

Stageco is an international church: I spoke with Weis Baaten, a Dutchman amongst the Belgian contingent and the man supervising the stage team for this venue. This is a roofless stage, with large amounts of flown technology integrated into the support structure, and a great deal of custom interfacing is required to accommodate these items. Baaten was understated: "It's what we do," he said with a shrug. "The bridge is supported by four columns across the stage plus where it picks up at each end, but actually that's pretty simple. It's the

Des Fallon

Although it's Stuart Heaney who runs the XL Video team on tour, Take That was, of course, one of the regular projects of Des Fallon, who had managed video for every outing since their return. As Heaney reminded me, "he had put this one together in his inimitable fashion before he was snatched away." His mark is in the attention to detail that typifies this tour; in that respect you could say this will stand as a fitting tribute to his life. His work here is a seamless part of what is, by any measure, an outstanding show. Fallon's PA, Tracey Donnelly, has taken up the reins back at HQ, and is by all accounts maintaining his highest standards in what must be an emotional period for everyone at the company.

box structures at the end where the side screens are flown that are most tricky. There's a lot of weight there and accuracy of position is critical."

The box structure looks quite simple: four tall columns with horizontal beams linking them together at the top, the base area is small and although they ultimately tie to the main stage, they are precisely craned into position freestanding. "To base out this stage, (to measure and mark the footprint) is most critical, pretty much to the millimetre because the way the parts fit together is so tight. Normally, by the time we've unloaded the trucks on the first day we have based out and can start, but with this we take our time - three to four hours. Back central area first, then the two side boxes, then the main stage. We build the BM torso on stage and hoist him up, and then the arms, hands and head are craned into position. There is nothing simple about the BM and although Total Solutions have made a good structure it's not easy to travel because of its size."

Amazingly, the Stageco gear takes 14 trucks, the BM another eight. "The main thing is co-operation," says Baaten. "We have many more decks on the pitch than normal to allow room for big pieces to be assembled, but we save time elsewhere - no FOH tower, no delays. That helps, but it is three full days. If you look at how the OM drives out through the centre of stage you realise that even the simple sub stage decking has to be placed extremely accurately, the tolerances are tiny."

It's amazing what the Stageco crew achieve. They exemplify how Belgium has managed without a government for so long. Maybe we can learn something from them?

Take That - Stage Set

For Es Devlin's stunning stage set the division of labour runs three ways: B stage and Bridge - Tait Towers; main stage and OM - Brilliant Stages; the Big Man (BM) - Total Fabrications (TFL). Before you read on, you should note that between Sunderland and Manchester, the first two venues, all these spectacular feats of engineering were subject to ferocious weather conditions - storm-force winds in Sunderland, monsoon conditions in Manchester. They all passed with flying colours.

The BM is massive. His arms span over 200ft (61m); his head tops out at approximately 100ft (30m) above stadium floor: when I attended Sunderland the BM's head protruded above the grandstand roof by 20ft (6m). Weis Baaten from Stageco commented on the ease of assembly, even if the size of BM proved somewhat problematic. I asked Chris Cronin from TFL just how you negotiate strapping a 60m giant to a 25m tall stage structure. "Even before we knew quite what we would build we made a trip to Belgium to talk to Stageco; me, my structural engineer Malcolm Richards, and Nigel Tranter from TFL who would be my project manager. The solution is rather elegant, though possibly commonplace in large building structures where huge cladding panels are craned into place. "In simple terms it's a series of vertical cones fixed to the trussing sub-structure of the man we eventually built. These point downwards and locate into receptacles on the Stageco system; as you crane parts of BM into place the cones become self-centreing devices and once fully lowered, the BM part is secure."

The other gee whiz factor with BM is the fact that the main PA system hangs from his fingertips. "They certainly were an extraordinary challenge," admitted Cronin. "What you see from the audience perspective is an index finger with a line-array beneath, but transferring two and a half tons of PA back seven metres to the Stageco tower proved a work of art."

Cronin devised a custom truss structure concealed within the hand to transfer the load, "It actually looks more impressive when the hand is unclad - well, to an engineer like me it does. We had to calculate back from a finite finger size and build trussing with extra thick chord walls and strengthened web; even so, with all necessary safety factors calculated we were using 85% of load capacity. If the PA weighed three tons then Big Man would have needed some chubby fingers."

All other elements of the BM are based upon TFL's SMD truss, although in non standard lengths, the cladding is from nine millimetre plywood and fixes to a strut type device fixed to the truss. Cronin revealed that building the two BMs (to leapfrog venues with the main stage systems) took 200 people over 12 weeks, "and a team of eight scenic artists to apply the

fire-retardant coatings and decorative finish." Sadly, like U2's claw, BM is one of those objects that you may find quietly decomposing in a field one day, which is a shame - he'd look splendid at the bottom end of the A1 in time for the Olympics. Go on Boris, make an offer.

The robotic OM is the stand-out feature of the show. Tony Bowern of Brilliant said that much of the manufacture was undertaken by a hydraulic machine specialist. "We would have built much more of OM in house," he said, "had the commitment to the main stage and other projects not been so heavy."

But what of the risky nature of OM? An animated 70ft tall man weighing several tons standing in the midst of thousands of fans, while exciting in concept, is plainly bonkers. A twinkle came into his eye. "It wouldn't be fun if we didn't take on things like this. Besides, we do have the option to say 'no'. In terms of the mechanics it's a lot more known territory than it might appear. But as with the BM, we didn't actually get to fully assemble and energise him till Cardington, though we were able to pre-test individual arms."

Bowern engaged the services of Richard Hartman to project manage OM, while Andy Cave of Kinesys took on the daunting task of making it walk. I spoke to both men at length, but first, the Tait element - for it is the B stage and Bridge that provide the thread that runs through the show.

James Erwin, project manager for Tait Towers, has been at Taits just over a year, formerly with Fisher Technical Services (now allied with the Tait group) his experience lies mainly with corporate events. "The B stage has nine lifts, one large with eight smaller personnel-sized ones around it. The main criteria were that it needed to be light, and to provide as much space as possible below deck as there are an incredible volume of props to accommodate; the decks are custom, to give bigger spans than normal."

Sounds simple, but imagine Piccadilly Circus at rush hour: the props and costume departments had to devise their own choreography to avoid pile-ups during the more complex routines; then there's pyro, special effects, and someone to control the lifts; it's as neat a piece of functional staging and packaging as I've seen.

"The Bridge is an altogether more complex piece of apparatus. At 160ft (49m) long it's our largest single element and it's full of tricks," says Erwin. "It's a custom package in every way. The lights mounted to it flick in and out for transport; some fold back and travel with it like the two light Moles (P36); and some come off but the clamping devices that hold them stay in place (Colorblaze 72). The whole thing has to disassemble in 45 minutes; that was the limit set by Chris Vaughan, because when lowered in, it effectively cuts the stage in half and prevents load-out across 50% of it."

"The guys in the band perform up there for one song, but for the most part the Bridge's function is to provide the base for other theatrics on stage; it's full of lights and winches. As with the lights, all the winches stay in and don't need re-stringing. The Bridge hangs off the Stageco towers, the four towers across the span are custom-clad by Taits, integral to which is a vertical track with elevators we built for the band to descend to stage . . . We have gone to extreme lengths to ensure these can't get stuck. You'll have noticed there are only four elevators.

Take That: TPO

In another non-conventional twist to the Take That tour, I discovered that The Production Office (TPO), run by Chris Vaughan and his business partner Keely Myers, take a more rigorous control of the production budget and in so doing bring more certainty to the supplier payment schedule. "With any production we're trying to deliver to the band the show they want for the amount they would like to spend. What we have done at TPO is to look at a wider responsibility, taking control of the production finance as well; that means we have a perspective not just on the show, but on the profitability of the tour. Being allowed to see the big picture we don't get bogged down with small issues; we're not fighting over the pennies. It's good for the artist as well; big or small they can clearly see what their expected earnings will be. With income from live touring so important these days, that's crucial. From the supplier point of view, when they agree terms with us they know that's it; there isn't going to be some distant accountant looking at the special effect spend just before the band goes into production rehearsal."

And how exactly do you determine the budget of something on as grand a scale as this tour? "More is known than you might think. We can make some accurate estimates - forty-five production trucks, a dozen steel, so many crew, so many hotels. Same applies with most equipment, lighting, video, cameras, sound - the spend for a stadium show is fairly well defined, and actually that's the biggest part of the budget, even for a show like this. Put that template to the band and I can then ask them, how much do you want to spend on what makes it special - the set, the theatrics? Because they can see the costs of everything else, that becomes a much easier decision for them to make."

What prompted TPO to take this financial role? "We took it for practical reasons. We found in the past that often our suppliers weren't getting paid on time; this way we can give them certainty. Also, if the band don't have to finance that cash flow it means even small acts, with perhaps little or no funds behind them, can seriously look at how they might budget in a production spend above the necessities of sound and lights to make their show special."

Vaughan revealed that Myers role is pivotal: "She keeps it tight through the tour . . . she can usually present a pretty accurate overview just two or three days after the tour ends."

Which just leaves the unknowns, how much does it cost to make an OM? "That's one of the pleasures of working with Take That: they more than many, are prepared to allocate a big part of what would be their profit towards making a truly spectacular and enjoyable show for their fans. They are definitely not a take-the-money-and-run band; because the revenue stream is clear, they know exactly what part of their profit they will need to commit to make their show special."

Vaughan also revealed a general acceptance of the no FOH tower policy, "Venue managers were surprisingly open to it, some of that comes from the relationship you build. We've taken a stadium production through the UK every summer for several years now so the venues and the local authorities know us. SJM, who promote this, have said they see no reason why any sold-out stadium show shouldn't be doing it this way. Certainly, if you're doing multiple shows at one venue, the increased ticket revenue more than justifies the additional costs of rigging extensive sound and lighting through the stadium roof. In terms of the people who would normally be on that tower, their reaction was professionally cautious, but once they'd thought about it they were all for it. The key was the catwalk to B stage - that gives the seated operators, sound, light and video, enough open access to see and hear what they need to."

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Robbie swallow dives off the Bridge's centre span attached to a new winch we've developed; called the Stage Automation T Winch, it's a Fisher/Tait product. Designed to be small but able to handle a useful pick-up weight at speed, it has variable capacity through a variety of drive belt change. Paul Sapsis, son of Bill, is our 'flight' guru, he's excellent at reassuring artists. He works with Casey Roche, who's the Navigator programmer to drive it - they're an excellent team. Paul develops amazing moves."

For the tour, Gareth Williams, who also drives OM, runs the Navigator control system for the show: "I spend two thirds of the show at a Navigator station stage right, then dash out front for the last third and drive OM.

"There are other tracking winches," continued Erwin. "These are for the aerialists across the Venetian blinds we've built to mask the XL video screen behind." The Venetian blinds are fronted by steel scramble netting with horizontal aluminium rungs to form a scaling surface for the aerialists to work off. "There is also a Nocturne video screen suspended from the Bridge; in two halves which track in across stage on the downstage edge." The screen has a scenic border so when the two halves are mated it gives the appearance of a PC monitor. "Taits developed the hanging system for Nocturne's V9 LED panels. We've also incorporated hinged door panels that open in the suspended tracking video wall." There a song scenario where Robbie Williams is trapped - 'sucked into' the internet through the screen. "He beats on the screen from behind, the doors blow open and another T winch whips him up through the opening onto downstage."

"There's another track upstage with three more T winches trolley-mounted, which pick up the aerialists who perform vertical and horizontal acrobatics," adds Erwin. It's a highly compressed bit of lifting mechanics in there, just upstage of the aerialists on the three dolly-tracked T winches are a set of 30 static mounted Cyberhoists in five blocks: each supports an individual who scales the Venetian. To complicate matters, a further set of winches over the Stageco tower tops lifts slim horizontal scenic panels which the aerialist on the tracking dollies can then scamper across the full stage width. "Flown upstage of the bridge are the Venetian carts with more T winches to raise and lower the blinds, and then from the carts' upstage edge is an LED Kabuki. The five kabuki panels have printed upon them the Darwinian 'ascent of man' style images off the Progress album sleeve, the soft string LEDs by Showtex outline these in silhouette. The Venetian carts also house more lights, and a rain bar. There's a fair bit of water works in the Bridge: each of the rain curtains can flow 600 litres per second, and this is cascading down from 40ft above the stage decks below. As the boys' elevator pods descend there are rain blast nozzles above each of the band members' heads as well, just for a touch more drama. They are shielded from the water by polycarbonate domes we built, but their trouser cuffs get splashed. There is another set of fountain nozzles that blasts towards the front row of the audience."

So not only are there all these interwoven axes of motion - LED screen, aerialist on static and tracking winches, horizontal ascending scenic panels, Venetian blinds and kabukis - but the whole assembly is hosed with hundreds of gallons of water.

Erwin says: "All the water catch tubs below are decked with grilles so the aerialists can walk across them - at the right time, of course . . . We use aerated nozzles to enhance the visual effect of the water. It's in areas like this where Tait excels, I believe; nobody specifically tasked us with a number of nozzles in fixed points across the stage, they just described the effect they wished to achieve and we developed it for them." Erwin revealed that Taits learned a lot about water management developing the stage for Kylie: "We're now expert in this field."

And then there's OM. A Brilliant Stages creation, OM is largely the brainchild of Andy Edwards, Brilliant's hydraulic genius in residence (it was Edwards who built the *Bridges to Babylon* extending bridge). The control system is by Kinesys, with Andy Cave overseeing development of how to move a unique structure, while Gareth Williams runs the Kinesys for the show, and Richard Hartman is in his all-too-familiar position of project managing the unknown. I spoke to Hartman first. "The main area of difficulty is when he stands up. It's the combination of what he's doing and what the trailer on which he travels is doing below."

This difficulty will become clearer: suffice to say OM is mounted on a modified articulated lorry trailer. Complexity derives from 19 axes within OM - one electric, 18 hydraulic: all movement, says Cave, "is achieved to within a few millimetres". The arms, unclad in rehearsals, look deceptively like the robots you see in car factories, but they're not - they're all custom-built and much, much bigger. "And the ones used in automotive plants are generally all electric, not hydraulic, and thus much easier to work with from a control perspective," says Cave.

"OM's truck trailer is custom", continued Hartman. "The rear bogey and fifth wheel bogey parts are separate and there's an extending/contracting spar between them. OM is permanently mounted so the whole thing gets tarp'ed and hauled by a regular tractor on the road, so it all has to be road legal. The tractor drops it off in the stadium, then we have a tug that picks it up and drives it into position, then out-rig legs extend horizontally, we fit wheels to the ends of them, add end-plates to the wheels, and so you end up with the trailer running on rails like a train, except the wheel flange is on the outside edge."

Some rails: at 4m gauge, each eight foot steel section weigh 1500kg and is essentially a heavy duty 'I' beam. "All the pumps, electrics and hydraulics are self-contained; only the decorative cladding is removed, so it all folds down to 2.4m wide and 13m long for the road. Using the hydraulic extender/contractor device we can shrink the trailer to 9m to get into tight stadiums. He weighs 23,800kgs, add the trailer it comes to 35,000kgs. Atelier One calculated all the centre of gravity stuff for wind speed tolerance, anything above 15m/sec and he can't stand, above 20m/sec and he has to remain crouched."

From far left: Action on the B Stage; Behind the screens; one of the DiGiCo SD7s consoles under a rain cover; view from rear of stage showing the main PA hangs, with OM out front . . .

It's that 'centre of gravity stuff' that makes the standing up tricky that Hartman mentioned earlier; the distance between fifth wheel bogey and rear bogey has to expand and contract during his ascent to maintain Centre of Gravity. Essentially, OM's spine extends through his backside down to the trailer - his spine being a large cherry-picker hydraulic arm.

Having established the general complexity, I asked Hartman about running the project. "The go-ahead came just at Christmas. Frankly, anyone taking this on that late needs their head examined," which didn't stop Hartman, I noticed. "You start by having to work when all of industry either slows down or stops for four weeks. That immediately presents serious problems - all the actuators and sensors come from Italy, and all the slew rings from China, and have to be ordered immediately. Unfortunately, manufacturing industry doesn't work to rock and roll deadlines - 8- to 12-week lead times are typically as short as they get."

This is undoubtedly one of the main reasons why OM hasn't behaved himself quite as well as he might have. That and the fact that pushing boundaries as ambitious as these really deserves a good six to eight weeks rehearsal to solve the unexpected.

"The form of the cladding is down to Kim Gavin and Es Devlin's input," continued Hartman. "They modelled it; then we scanned their model by laser to produce the CNC moulding. The shell is fibre glass with a metal frame. John Prentice at Brilliant kept on top of that element - he managed the CAD drawings so that it all met up. Trouble is, OM was too big to assemble at Brilliant, it didn't all come together till Cardington; even with the best CAD you cannot predict where the cladding will prevent movement; you just have to run it and see where it conflicts, then cut the fibre glass and re-fit. And let me tell you, the way the clevis pins attach the cladding to the skeleton is a work of art."

Cladding clash as the arms moved was still happening to a small degree during rehearsals in Sunderland. "You also have to track all the hoses to see they don't get caught. Then they wanted to put lights in it, and that produces a debate over who has precedence on space. There are lights in the hand palms for up light when the band is there. The arms and legs are essentially cylinders, relatively simple, but the chest is a three-dimensional form - again, John Prentice managed the drawing out of that framework. It's really complex in there, and John did a great job accommodating everything.

"There is an operator position within the chest, so in the event he can be manually controlled to descend from within. It's like a submarine in there. When the large hydraulic cherry-picker mast pushes him up through the inside, the legs move passively during that process. We have to stop ascent just before the slew rings of his knees pass total vertical, otherwise he might sit back down with knees bent backwards, so the relationship between mast and feet is critical."

On balance what does Hartman think of OM? "Trouble is, as the Greeks noted when they built monumental art into their theatres; whatever is largest diminishes the others, so OM's impact is lessened by the presence of his big brother on the stage." This is true: maybe next time BM will stand up instead and frighten the whole neighbourhood?

Andy Cave had similar unique challenges in driving OM. "In terms of sensing positions there's nothing out of the ordinary, we put standard encoders into the hydraulics and string encoders into the axes. Unlike normal structures, with OM you have to move something to learn how it will respond. Hydraulics is 18th century technology and by nature it's lazy, whereas an electric motor is instant and precise. Hydraulic movement is not necessarily always proportional to flow, the protection against hose failure requires a certain over-pressure to initiate movement, so it tends to run away too fast and you have to throttle back just as quickly to bring that under control. That in turn can set up shudders - oscillations that, considering the lengths of the limbs and their weight, can run for some time."

Cave continues: "The difference with electric motors is you can easily tweak a move; with hydraulics there's no such thing as a quick tweak. We spoke to manufactures and they said that to affect the way something like this moves you have to start looking at changing the types of valves, you can't do it in the control of the pumps. There is, unfortunately, no fast and certain way of predicting valve behaviour, they advised us it's just faster to swap them and try alternatives," which was what Cave was doing the night before dress rehearsal. At Manchester, I asked operator Williams if this change had improved movement? "Yes, it made all the difference, much smoother, but we are still learning how he behaves." And still are.