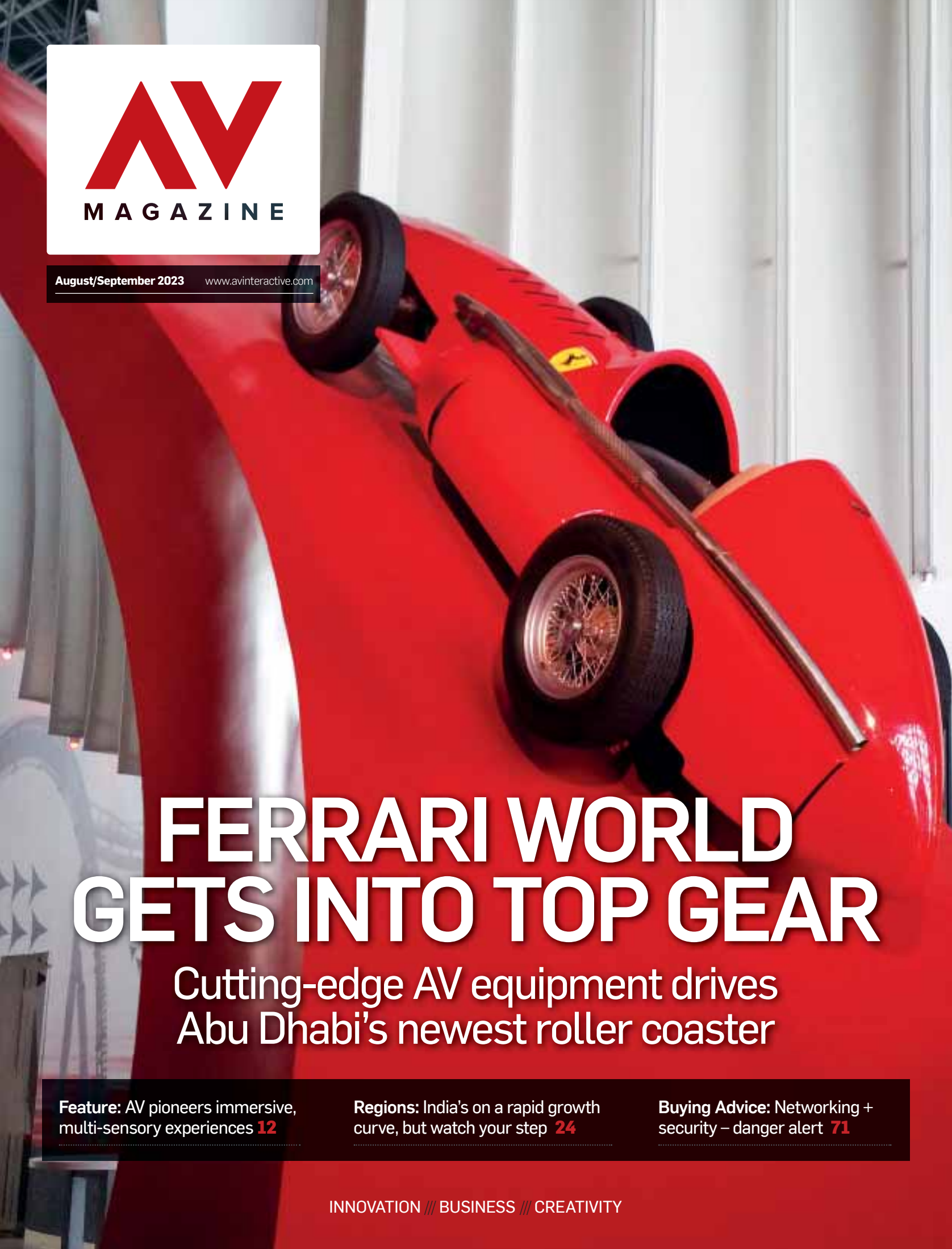

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FERRARI WORLD GETS INTO TOP GEAR

Cutting-edge AV equipment drives Abu Dhabi's newest roller coaster

INNOVATION /// BUSINESS /// CREATIVITY

Ferrari World Abu Dhabi is filled with classic automotive icons and cutting-edge AV

DRIVING AMBITION

Top Gear: The cutting-edge AV equipment driving the new Ferrari World roller coaster.

Caroline Reid and Christian Sylt report from Abu Dhabi.

Challenges in the theme park industry don't come much greater than the one Ferrari World Abu Dhabi faced a decade ago.

It had just opened Formula Rossa, the world's fastest roller coaster, and another ride with the world's highest loop was in development. The theme park needed to top both of them to keep guests streaming through its turnstiles and it turned to cutting-edge AV installations to do it.

In 2014 Ferrari World Abu Dhabi pulled out all the stops by giving the green light to a ride based on technology which didn't exist yet.

Ground-breaking AV wasn't just at the heart of the attraction but was also crucial to the process of creating it as advanced visualisation systems let the designers see what it would look like years before construction began.

Few brands are as synonymous with speed as Ferrari. The iconic Italian motor marque's mystique has been built up over decades of racing and starring in car chases on the silver screen. Ever since the doors to Ferrari World Abu Dhabi swung open in 2010 it has done a good job of giving guests the impression of being at the wheel of one of its cars.

With a top speed of 240 kilometres per hour, and the equivalent of more than 21,000 horsepower, Formula Rossa is actually more than 20 times more powerful than the F1 cars that inspired it. Like many of the rides in the park, it isn't for the faint-hearted so Ferrari World Abu Dhabi decided to diversify its mix with an attraction which would appeal to thrill-seekers and families alike, enabling younger guests to share more of the experience with their parents.

One of Ferrari's latest models stands in a street scene of the Italian marque's home of Maranello

"When the first creative meetings happened, we were looking for that change. We were looking for the difference we could add and of course to diversify for the park and for our guests even more," says Deana Taylor, general manager of Ferrari World Abu Dhabi. "Yes we have the fastest roller coasters, yes we have the highest, yes we have the biggest loops. All of those things but this new attraction brings a whole new level to the park."

Called Mission Ferrari, the ride opened earlier this year and gives guests the impression they are spies in a car chase from a Bond film, complete with the twists, turns and breathtaking stunts. It is billed as being the world's most immersive mega-coaster and there is good reason for this.

Essentially a simulator on rails, Ferrari World Abu Dhabi paid $28.3 million for the ride and it cost so much to develop that it drove its Canadian manufacturer Dynamic Attractions to the brink of collapse. Ironically, just weeks after the ride opened its doors, Dynamic announced that it had begun a search for new investment in order to continue trading.

Its pursuit of the perfect roller coaster had led to Mission Ferrari launching three years after it was originally due to be ready. Surprisingly, the repeated delays didn't send the ride's AV integrator into a spin.

Whilst the innovative ride cars and roller coaster track were built by Dynamic, the digital media surrounding them and the script were created by British business, Holovis, one of the world's leading experiential design firms. Holovis also supplied and installed the elaborate AV installations which immerse riders in the high-octane world of super spies. The company made the most of the ride's long lead time.

Immersivity

"A substantial time before the ride was complete, we were already doing walk-throughs," says James Lodder, integrated engineering director at Holovis. The key to this was a CAVE, a five-sided immersive environment featuring 3D volumetric projection on its surfaces which have a holographic appearance when viewed through augmented reality head-tracked glasses. It runs on Holovis' proprietary RideView software which simulates attractions using its CAD data.

The experience is akin to the holodeck from Star Trek as it enables designers to virtually ride roller coasters and look around them as if they were actually there. This is usually used to fine tune the ride to ensure that guests with different heights get the same experience no matter which seat

PHOTOS: FERRARI WORLD ABU DHABI

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Mission Ferrari's marquee has a futuristic feel reflecting the high-tech gadgetry in the concept car at the heart of the ride

Ferrari World Abu Dhabi sits underneath a sweeping steel and glass structure to shield visitors from the searing heat outdoors

they are in. However, the system came into its own during the development of Mission Ferrari as Holovis used it to ride the attraction before Dynamic had even finished building the track. In fact, Lodder says that Dynamic's track design was even influenced by the feedback from Holovis.

The RideView system allowed Ferrari World Abu Dhabi's then-creative director George Walker to "sit on the ride, ride the ride, pause the ride, rewind it slowly and play it again," says Lodder. "He gave us feedback so that we could make changes based on it. Literally at that point, we could change all of the timing and move all of the scenery. We could then go for a coffee and when we got back, we could ride the modified ride with his changes built in. There was a limited amount we could do to the track, but we could if we really needed to and on one or two occasions we managed to make small changes." It was a different story with the rest of the ride.

"There must have been 10,000 changes. They were quick and easy. We would make notes, update it, try it again then update it again. Sometimes you might need to do it three or four times or sometimes you'd get it right the first time but we were always polishing." It shows.

Before you even set foot on Mission Ferrari it is clear that it is unlike any of its counterparts in the park. Ferrari World Abu Dhabi is set inside a sprawling steel and glass structure with an iconic red roof which has a giant yellow Ferrari shield on it. The domed roof is designed to shield guests from Abu Dhabi's searing heat which soars past 40 degrees in the summer. Most of its roller coasters start indoors before heading outside so riders feel a breeze as they zip around under the sun. The tracks are supported by steel struts which aren't hidden behind elaborate facades as is often the case in theme parks. Mission Ferrari is the exception.

Mystery and anticipation

Aside from a small indoor loop, Mission Ferrari is set inside a box-like enclosed building under the park's main dome. This adds to the mystery of what is inside and the anticipation is magnified by the design of the entrance. It looks like a vault with brushed steel walls peppered with big shiny rivets around the edges. The doors appear to have futuristic-looking locks set into them and when they glide open it takes you into a room that looks like an elevator.

As the doors close behind you, the floor starts to rumble and screens set into the windows show a wall moving upwards which tricks you into thinking you're going underground. Adding to the effect, the light fades above on another screen in the ceiling whilst a counter showing the depth below ground level ticks up on a wall-mounted display.

When the floor comes to a jolt and the doors slide open, guests are met with a network of dark corridors which have steel grills on the floor lit by a smouldering red light underneath. Set into the bare stone walls are projectors which shoot a web of thick green light beams across the corridors. When you walk through the beams, alarms sound to remind you that you're meant to be in a secret base.

From there, the queue winds through a central hub lined with computer terminals whilst animatronic spies wearing dark glasses and dark coats look down from walkways above. Screens in the walls show shadowy people walking by and a model of a sleek, scarlet prototype Ferrari stands in the centre of the room. Projections wrap around it showing the car being showered with bullets without being scratched and emerging unscathed from a flamethrower assault.

Videos playing on screens above tell guests that they are going on a mission to deliver the prototype car to the headquarters of a secret spy organisation hidden deep underneath Ferrari's factory in Italy. Ominously, the last thing they are told is that rival spies may try to steal the car and the riders' job is to stop them.

Then you round the corner and see a life-size version of the prototype which is actually the ride car, complete with Ferrari's famous yellow shield on the front. It accommodates nine people in the kind of leather seats you expect to find in a Ferrari. Speakers are hidden in the head rests and the audio is timed to the action.

"Each car is fitted with nine stereo pairs of Dayton Audio speakers and one of our custom-developed Holovis Hifiniti ruggedised audio players," says Lodder. "The off-board trackside audio uses Q-Sys DSPs and amplifiers to drive Electro-Voice speakers." He made the most of them.

As the three and a half minute ride begins, the car appears to exit the underground base by passing through a lab. On one side, a scientist


A short part of the Mission Ferrari track snakes outside the ride building making passers-by curious about what's inside

stands in front of a model of the prototype Ferrari. He is actually a life-like hologram who shows riders a display of the car withstanding bullets, bombs, fire and ice.

The adventure really begins

You can tell from the start that this isn't a typical roller coaster as the ride car goes past the scientist at first until you hear his voice saying "back up".

The ride car then reverses down the track that it was just heading forward on which is an impressive feat for a roller coaster. The synchronisation of the audio and the motion is thanks to an optical pickup underneath the ride car. "It's like a light gate," explains Lodder. "The ride car passes over steel plates fixed to the track which are our triggers. We can physically move the triggers to change the timing, and we can also put delays in the media. So it's completely configurable."

After the lab demonstration, the track then emerges into an indoor mock-up of a traditional Italian village complete with a fountain in the middle of a cobbled plaza. The lab is meant to be underneath the plaza and it soon becomes clear that enemy agents have figured this out.

A model helicopter passes above, shining search lights on the ride car as models of spies clad in black biker suits pop up from behind the scenery pointing laser sights at you. Green beams of light fire out of them towards the ride car before it roars forwards into the short looping section under the park's main dome.

The acceleration is timed to a revving sound from the speakers which isn't just for show as the ride hits a top speed of 72 kilometres an hour with forces of up to 3.9g. The loop leads straight into an indoor segment which is where the ride's AV credentials race into view.

"When we were first involved, we found that (Dynamic) wanted to put as much track as they could get into the building, which is understandable," says Lodder. "Everybody that makes a coaster wants to cram in as much track as they can get. Our job was to persuade (Dynamic) to have a bit less track to give us some room to put the scenes and AV around it. You can't immerse riders in a scene if you're next to a concrete wall."

Lodder got his wish as Mission Ferrari's track layout is cleverly positioned close to the centre of the building which allows the route to pass through expansive AV installations around the edges. The first of them comes when the ride car pulls into the middle of a 230 degree curved screen making it look like it is immersed in the action.

Struts in front of the screen give it the appearance of a bridge and the helicopters from the first scene suddenly emerge on either side of it. Then they fire missiles at each other which seem to pass through the room thanks to a synchronised stream of lights hidden in the ceiling.

"We built that horseshoe shaped screen here in our barns at Holovis at fifty per cent scale," says Lodder. "We built it at half size but used the actual projectors and the media server from the ride. There are six projectors around a perforated aluminium Astro-Tec screen. The perspective is changing as you approach it and to get this right we had to arrive at the scene as if we were on the coaster. We basically got office chairs and were pushing each other into the scene. We spent a lot of time working on that."

This had to be done physically even though Holovis could see what the ride looked like virtually through the RideView system. As Lodder explains, "the tricky thing was we had not got the ride so we had not got the actual speeds, timings and durations."

At the climax of the scene, the ride car evades the helicopters by diving down a hidden dip in front of the central section of the screen. Then there's a more standard indoor roller coaster section which races past mountain scenery making it seem like you're heading into the hills. It is followed by the highlight of the attraction which comes when the ride car pulls on to a simulator table in front of an 11-metre domed screen.

Close to the edge

The images give the impression that the car has reached the edge of a waterfall and the effect is eerily convincing as there's no track in front of you. The screen fills your vision as the car tilts and turns in time to the action on the screen. Clearly inspired by the finale of the Italian Job, the ride car dips downwards and appears to teeter precariously on the edge of the waterfall.

To your sides, water appears to be rushing towards the ground on the distant horizon ahead. It's not for anyone who is afraid of heights, especially as the ride car is pointing down over the edge of an actual drop with just the domed screen in front of it.

At the same time, there's a mid-air battle between the helicopters which were giving chase earlier. One of them explodes causing the ride car to rocket backwards in time with the blast on-screen.

"The dome is the biggest technical challenge in the ride," says Lodder. It has a huge tilt and drop mechanism in it like a giant see-saw. The five-ton ride vehicle comes right into the middle of it, locks in and pivots up and down. It has got nine people in it waving their arms and we had to get the light paths around them. We didn't want to shadow the

The Mission Ferrari ride queue winds through a secret base complete with a projection-mapped model of the concept car that is being delivered to Ferrari

guests and we didn't want guests with light in their eyes. So we ended up with 12 projectors blended seamlessly.

"We mocked it up on a nine-metre dome here at Holovis and also spent quite a lot of time in VR teleporting around the model. So we could stand up on the gantries and stand by each of the 12 projectors. Just to check if it is installable and maintainable.

"We've got metal skeletal tree-like things that support the projectors but you've got to be able to get to them from the catwalks. I needed to see if I was standing on the catwalk with a rail pushing against my belly, could I lean out far enough into the void to be able to undo the bolts on the projectors? And if I wanted to take the lens out, could I reach the lens release lever? What I don't want to do is try and hold the lens with one hand over a 20-metre drop so I needed to see what I would do about that too. VR enabled us to check all that."

Clever AV

Riders are blissfully unaware of all of this as the ride car hurtles in reverse away from the dome and then weaves through an indoor movie set chased by model missiles on rails, complete with illuminated smoke trails. There's a stomach-churning loop in reverse which culminates in the ride car slowly pulling in to another elaborately designed street set resembling the entrance to Ferrari's factory in the sleepy town of Maranello. Just when you think the ride is over, it saves the best till last.

Everything finally seems to be calm until the people projected in the window of a cafe point in the direction of a screen seamlessly set into the scenery to the side of the ride car. The enemy helicopter which survived the dogfight emerges on it and appears to fire another missile at the car causing it to slide unexpectedly downwards in the world's first sideways roller coaster drop which is meant to finish deep in the bowels of Ferrari's factory.

> *"We mocked it up on a nine-metre dome here at Holovis and also spent quite a lot of time in VR."*
> **James Lodder, Holovis**

The speakers in the seats add to the effect as the missile sounds like it is actually coming from the side. It is one of the many moments when you don't know quite which direction the ride car will be heading. In itself, this is ground-breaking, especially when combined with silky-smooth track movement and pin-sharp projections.

"Within the attraction, there are Christies, Barcos and Panasonics. And the reason for that is that we are agnostic. There are sweet spots in different manufacturers' ranges. So if I wanted a particular lens, or I wanted a particular brightness, the best value for money just depends on which manufacturer has got a product closest to that requirement in their range." This independence is one part of Holovis' magic formula.

It has also developed a way of automatically aligning projectors called Holovis Pix-Control. "We can point many projectors at a complex curved surface and automatically re-align them. And it's done very quickly. It takes a minute or so. We project up test patterns and the cameras are looking for the test patterns. You've also got reference laser points that we can toggle on and off. What we tend to do is configure the system to run automatically so the operators come in in the morning, eyeball the screen, put up a test pattern, see how it looks and if they need to auto-align they hit the green button and it sorts itself out."

However, no amount of technology can compensate for proper preparation and Lodder adds that "the secret to successful use of AV in a theme park is certainly mock-ups." By the time the ride has been built it takes time and costs money to tweak it or make changes. However, changes to a physical or virtual mock-up are "free" as Lodder puts it.

Ultimately, success is down to who is in the driving seat and he says that Mission Ferrari was truly a team effort. Its snappy script is thanks to Amy Steele at Holovis whilst Dave Reynolds, its technical lead in Abu Dhabi, is the mastermind behind the synchronisation between the screens and audio.

Then there are the external contractors including Sven Riegel from Spanish themed entertainment designer, TAA and Paul Mowbray from NSC Creative, a UK-based immersive content studio which worked with more than 1,000 video files alone for Mission Ferrari.

Robin Card of Dynamic Attractions was key to the success of the project, explains Lodder, and in pole position was government-owned developer, Miral. It owns and operates Ferrari World Abu Dhabi and has a project delivery team headed up by Mohammed Younus with senior team members including Dan Wills, Tom Black and David Schafer.

"It was so good to work with a client that understood story and understood that we want to tell a story," says Lodder. In the theme park industry that is precisely what it takes to stay the leader of the pack. ■