

● A seamless combination of live-action footage, *RealFlow*-generated wave dynamics, and carefully sculpted water animation puts the viewer into the heart of the action in *The Guardian*

The Guardian

FILM FOCUS Using the beta version of *RealFlow* 4, Flash Film Works and Fusion CIS reveal how they created a new kind of turbulent water world for the latest Kevin Costner movie **BY MARK RAMSHAW**

● "The fluid interaction in many movies looks great, but the camera is often quite removed," said Mesa. "For *The Guardian* we knew that unless we could put the camera right there in the water, the movie wouldn't be as realistic as we wanted it to be"



The digitally reconstructed *Titanic* may have set sail over a decade ago, yet water simulation remains one of the most complex and difficult areas of visual effects. While off-the-shelf solutions have generally been considered adequate for broadcast-level effects, studios such as ILM have instead devoted thousands of man hours and sought help from university physicists to develop their own proprietary solutions. *The Guardian* is the movie that bucks the trend. For the creation of around 200 water-based effects shots, main visual effects vendor Flash Film Works relied on nothing more than the talents of its own artists and the *RealFlow* expertise of simulation gurus Fusion CIS Studios in conjunction with Flash Film Works' Dan Novy for adding fluid dynamics to some key shots.

"We first started experimenting with water-based effects in the mid-90s, and then in 1999 we did about ten minutes of CG water work for *Deep Blue Sea*," recalled Visual Effects Supervisor and Flash Film Works founder William Mesa. "Over the years we've never stopped trying out new ways to create and manipulate fluids."

Mesa has supervised effects work on almost every movie by *The Guardian* director Andrew Davis, and so immediately realised that a simulation-based water solution wasn't going to be acceptable. "He

wanted water that could be fully controlled by hand, with the ability to change how a wave moves, when it hits, and how it interacts, so we had to find a way to mimic the ocean's behaviour in a different way. And I'm not somebody who relies totally on 3D anyway. I'll use five or six different methodologies if necessary, such as shooting live plate elements specifically to projection map onto CG water."

In lieu of simulation data for the water surfacing, the Flash Film Works artists worked with reference footage to sculpt and perform deformations by hand. Though laborious, it enabled them to fine tune every element, while remaining faithful to properties exhibited by water in real storms. "The coast guard was completely behind this movie, so we had access to thousands of hours of footage," said Mesa. "It really becomes clear that the ocean is very unpredictable, organic and uneven. That's something you can't replicate

"THE BIGGEST CHALLENGE WAS TO GET DIFFERENT METHODOLOGIES WORKING TOGETHER TO PUSH CG WATER TO A NEW LEVEL"

WILLIAM MESA, FLASH FILM WORKS

with procedural techniques, which tend to give very predictable results with regards to wave size."

With the movie focusing on the training and work of the Coast Guard Rescue team, many of the shots required the placement of live actors into the scene. For this Tommy and Scott Fischer, both veterans of *Titanic*, helped to create a tank with a custom wave-making machine. "It was capable of generating five-foot swells with 50mph winds, and then we could further manipulate the camera to make the



● Renders created with the help of *RealFlow*, with the water modelled to integrate with the CG boat and pre-sculpted water surfacing elements



● A pre-composited scene prior to the addition of *RealFlow* splash dynamics. In addition to CG models, Flash Film Works integrated dry-shot boat footage with CG water elements

swells appear up to ten feet high," said Mesa. "Both Kevin [Costner] and Ashton [Kutcher] were great when it came to the tank work. Ashton actually trained for around eight months."

Though all surface wave motion and some of the dynamics were hand sculpted, the dynamics required on 20 key shots prompted Mesa to bring in Mark Stasiuk of particle and fluid effects specialists Fusion CI Studios, to further develop with Dan Novy a method for adding *RealFlow* simulated elements to the scenes. With a PhD in fluid physics, Stasiuk has developed strong links with Next Limit Technologies, most recently helping to push its *RealFlow* simulation tool to new heights on the movie *Poseidon*.

"We've worked very closely with Next Limit on the development of *RealFlow*," he said. "As well as bringing them right into the production environment, we've also worked with them to bring about changes such as the move to a 64-bit architecture, which allows for much larger simulations. "There have also been a whole bunch of feature additions, the most crucial being Python scripting, which allows any kind of customisation."

This close relationship with Next Limit, coupled with the ability to customise and refine simulations for specific shows, puts Fusion CI Studios in a unique position in the industry. "There's a strong trend away from having all the overheads of an internal R&D group, and the need to rely on proprietary software, which can make a studio very vulnerable to key people leaving," said Stasiuk.

With just four months to create the fluid elements for the 20 key shots, Stasiuk worked in-house at Flash Film Works, writing a series of production tools as the *RealFlow* team added simulated elements on a shot-by-shot basis. "It was quite a challenge to come in with the pipeline already set in stone and then work as an add-on to the water surfacing done by Flash's team of artists," said Stasiuk. "But we were able to pull off all kinds of things, working in a very art-directed way while still maintaining fluid stability. It worked out really well."

The Guardian: is released in the UK on 13 October. Look out for an exclusive PLE version of *RealFlow 4* in our next issue. www.flashfilmworks.com, www.fusioncis.com

TALKING POINT | Precious Cargo

How the VFX crew created one of the lengthiest CG water shots ever attempted

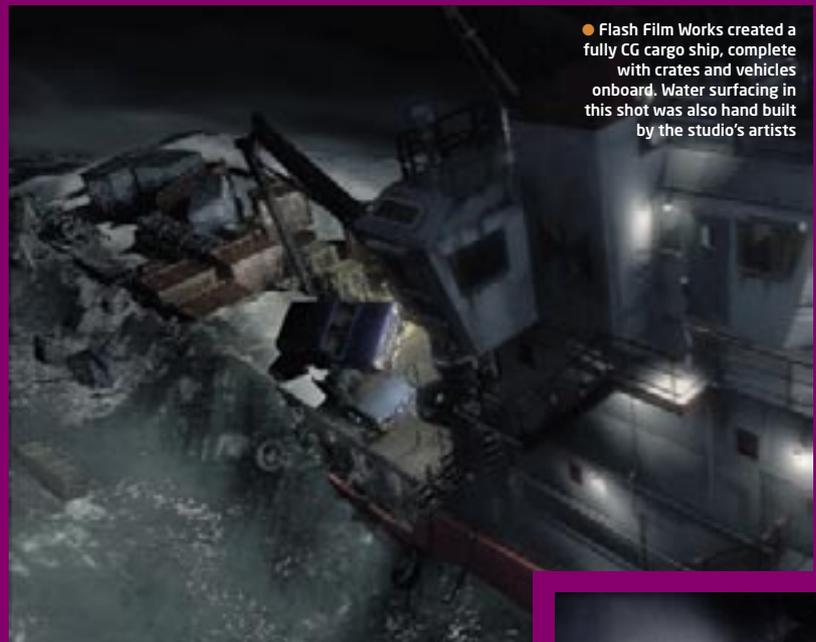
One of the movie's key sequences depicts a cargo container passing through the storm. With a duration of 18 seconds every single aspect of the ship, the water, and the interaction between the two had to be flawless.

"The ship, its cargo of boxes and vehicles, the water, all the particles - everything is created digitally," said Flash's William Mesa. "The dynamics in the scene are so effective, not only for the water that hits the boat and smashes into its cargo, but also the more subtle touches such as the spray and mist from the waves, and the water pouring off the rails and off the ship's deck - elements that really help add a sense of reality."

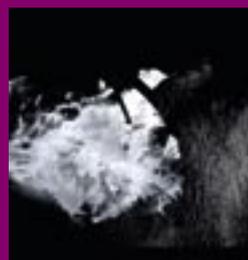
"*RealFlow* is what gives us all the hard body dynamics, but the difference is that with

a procedural approach the ship would be the last element added," said Mesa. "Here, the computer maths is reacting to what we've already created."

Fusion CI Studios' Mark Stasiuk says it is the addition of Python scripting in *RealFlow 4* that has facilitated the creation of elements for this and other simulation-enhanced scenes. "It enabled us to create tools that allowed the artists to finely control the fluid behaviour. We also did a number of things to improve the way we generated spray for violent water shots like this. Creating them as part of the main simulation would have been an extremely time consuming process, so instead we generated them as a post-sim effect, creating particles based on dynamic triggers from the wave calculations."



● Flash Film Works created a fully CG cargo ship, complete with crates and vehicles onboard. Water surfacing in this shot was also hand built by the studio's artists



● Next Limit's *RealFlow* was then used to create this plate featuring a wave crashing over the side of the ship, plus rain, mist and all associated spray particles

● The spectacular final shot combines complex water simulation with hand-animated CG elements to depict the ship and its cargo lashed by torrential rain and buffeted by violent waves

