An Aardman Christmas

The secret methods of Santa's worldwide gift delivery are answered in Aardman's latest CG adventure

Words Renee Dunlop

Ten years ago it was about what was possible to do now it's about using technology to extend both creativity. - Doug Keeler

Till Nowak
Job Title: Digital set designer
Company: DreamWorks Animation
Experience: 12 years of professional design work since 1996. Graduated as a media designer in 2000 at the University of Applied Sciences in Munich, Germany.
Software used: ZBrush, Photoshop, After Effects.

Evgeni Tomov
Job Title: Production designer
Company: Independent
Experience: Evgeni Tomov is an experienced production designer, visual effects professional who has been working in feature film production for 20 years.
Software used: Katana, FL, Octane, Maya, Houdini

Doug Keeler
Job Title: Visual effects supervisior
Company: Sony Pictures Imageworks
Experience: After receiving a BA in film from the University of Southern California, Doug joined Sony Pictures Imageworks in 2000, working on films such as The Spirit, Spiderman, and Spiderman 2.
Aardman Animation’s latest CGI feature, Arthur Christmas, is a four-year production to answer the question of one night: how does Santa deliver all those gifts on Christmas Eve? The answer is a dedicated staff of CGI artists, a host of elves, and a massive FedEx-style delivery system contained in a city-sized sleigh called the S-1. After learning that one child was inadvertently dropped from the list, Arthur – the youngest of the Santa lineage – sets off on an adventure to deliver the child’s gift too.

The scope of the movie is huge, traveling around the world in one night while visiting many locations. Several cities, towns and exotic environments – a total of around 20 environments, not counting smaller interiors – were among the numerous CGI sets required to tell the story. The movie relies heavily on inspiration from the natural world – oh, and from immersing the artists in Christmas decorations hanging about the Aardman studio. For four years, even during summer, the decor was festive, greasing everything from computer screens to a Christmas tree in the office.

The established Aardman style can be seen in the character design and the heavily textured and tactile world, akin to an Aardman stop-motion set. But beyond that, this is a new look for Aardman. The stylisation of the film lies within the shape of the geometry that was modelled, yet the whole premise of the movie was to make it look like it really could be done. How was this accomplished? According to VFX supervisor Doug Lister, it was lots of “detail, detail, detail!”

**Film design**

The North Pole operation is comprised of Mission Control, the S-1 sleigh and its docking bay, plus smaller spaces such as the Clausens’ living space, bedrooms and dining room. Production designer Eugene Tomov provided concept designs. Heled by the art department and worked with every department except animation and camera. I’m responsible for everything visual. The look, the design, the style, feel of the movie, and the colour palette.” Digital set designer Till Nowak handled much of the concept modelling.

The art department usually consists of traditional artists who paint and draw, either on paper or digitally. However, for Arthur Christmas, Nowak convinced director Sarah Smith to work out the concepts directly in 3ds Max. “I handed over my designs to the 3D artists as model sheets,” Nowak reveals. The set of pages acted as a style guide, which precisely described the design from all angles. The topography of Nowak’s miseries passed through months of design tweaking and restyling so they weren’t optimised for the technical production pipeline. However, since the next step was to send them to the modelling department at ImageWorks, they recreated the two-dimensional instructions in Maya, remodelling from scratch.

**The S-1 sleigh design**

The S-1 sleigh was approached in a similar manner – particularly the interior dispatch deck where the giant FedEx-style delivery operation was filled with presents travelling by conveyor belts. Each gift is directed through the maze of belts, eventually dropping into chutes that lead into the backpacks of elves who go into the city to deliver the gifts to their destinations.

The basic shape of the super-fast, high-tech sleigh S-1 was created by Tomov and passed to Nowak for concept modelling. “For the S-1 dispatch deck we studied some existing structures in FedEx dispatch facilities which were used as a

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**Mission Control motion graphics**

Motion graphics applied to computer screens provided additional detail and realism to the Mission Control set. The S-1 was built to accommodate around 1500 elves at their computers, and Till Nowak designed all the interior details and impressive high-tech displays.

Mission Control was built to accommodate around 1500 elves at their computers, and Till Nowak designed all the interior details and impressive high-tech displays. There are a total of around 300 elves that can be seen on the screens, each with a different name and job. The room itself is divided into several sections, each with its own screen and set of monitors.

Working closely with Doug Lister, “the character design for the elves was conceptualised and carried through the CGI process and visual effects,” Eugene Tomov said.

There are eight primary characters, far or near secondary ones, and tens of thousands of elves that had to be created and animated.
From pencil to pixels

Drawing and modelling concept art works together hand in hand, but each has its own challenge.

As Christmas movies and commercials evolve, so do the techniques used to bring them to life. The challenge is to adapt familiar cartoon techniques to a 3D world. As explained by Tim Newson, a animating the characters in a traditional way can make the animation look flat and lacking in depth. However, using computer-generated animation allows for more complex and realistic scenes.

The underbelly of S-1 included thousands of hatches for the elves to descend and deliver the presents. Starting point for Tim’s design was “Trevor. But: ‘we had to make the set few times bigger than the reference material we had found.’ The end result is a set that almost appears to be infinite.

The underbelly of S-1 included thousands of hatches for the elves to descend and deliver the presents. According to Newson, the ‘sticky’ task was to place these in regular times, but avoid intersections with the many structural parts of the snowflake architecture. Newson decided to solve the problem using particle flow. “Each hatch was a particle sitting on the vertices of a plane while the black and white map of the tiles and hall elements served as the radicals.”

Mission Control

The S-1 Mission Control was like NORAD for Santa, a huge underground bunker the size of a football stadium made out of reflective transparent ice cut out the shape of a Christmas tree. Roughly 15,000 elves sit manning – or perhaps we should say sitting – their computers as they run the Christmas live operations. The set was extremely heavy because of the scale. “You could put a car on one side of the room and if there was an elf that was opposite it would be too small to sit in a pixel, it was that big,” said Felix. “The inside of that ship is literally a wall of thousands of cross-cropping conveyer belts taking the presents to the right places – on top of a huge simulation that figures out where the presents should fall.”

Mission Control was designed in a similar fashion as the S-1 ship, based on concept sketches created by Tomm before passing over to Newson’s concept modelling. Some problems with the drawings were discovered, triggering some changes “specifically in scale because we discovered that some things did not look quite the same as the sketches when they were built in 3D.”

“Our lighting tool is set up to render in the real world, lighting for the way they need to get to the next render.” – Doug Baker

“Mission Control was designed in 3D Max, then re-created with the right level of detail and accuracy in models by Tony Jones and the modelers.” – Doug Baker

“Trevor was a hard task for an actor to work with, but I think he handled it quite well.” – David Baker

“Mission Control was designed in 3D Max, then re-created with the right level of detail and accuracy in models by Tony Jones and the modelers.” – Doug Baker

“For me, Mission Control was the most challenging to design, as it required the most detailed and accurate models.” – Tim Newson

To work with a computer in a realistic way, we had to make sure the models were as accurate as possible.” – David Baker
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Adding requirements of replacing housing every off-shelf required surfaces provided a beautiful render, but you need to manage it well.

Feature

AOVs
The heavy geometry meant single-frame render times reached 20 or 30 hours. "We wanted the detail that was necessary to sell the scale of the operation," explained Raiser. "To get that scale, you just had to deal with slow render times, not to mention problems like memory limits." To handle this, Raiser applied the use of AOVs (Arbitrary Output Variables).

AOVs work by splitting the information from one massive render into checkpoints that limit the viewed information to, for example, the specular information, or from each light, or on each character. Each of these AOVs is defined based on collections of objects or surfaces, light, or types of rays such as diffused or specular. "You render a single-frame," said Raiser, "get it working the way you need it to look, then go to the comp to tweak it. Once you get the buy-off on that single frame, you send the scene to the render farm for the weekend, come back on Monday and start building your comp with all those AOVs that were generated."

In Arthur Christmas, some lighter films included perhaps 40 AOVs in a single scene. "It's a really smart way of rendering — incredibly smart, because you're paying once for the expense of the render. Many of the things you would have dubbed in the render, like turn this light up or make that material a little more reflective, once you are in AOV land all those things are still editable, except they are editable in a comp and happen very quickly." By using AOVs, it allowed for increased creativity and rapid experimentation during compositing.

"The director gave me a lot of freedom to trust in the look of the film, so creatively I've put myself out there. This is very much the way I would make a film look," said Raiser, "but at the end of the day, my job is mostly about creative supervision. Figuring out what to do with what we have to get to the look that we are all after."

The Serengeti's own style
The Serengeti set was designed to stand apart from the rest of the film in modelling and lighting style.

"We deliberately embraced a level of simplification in the design of the characters, the real-life people are not perfect either —" Eugene Simon.