

Appendix A

The Making of *Star Control 3*

Creating a new computer game while pioneering new technologies is an exhilarating and sometimes terrifying process. Games call for a much higher ratio of engineering innovation than most new product development. Modern computer games require a squadron of very talented people working overtime hours—extreme even by modern standards of overtime. We burn midnight oil, burn bridges, and sometimes burn out to satisfy the fans' voracious appetite for new experiences and to fulfill our own personal quest to top our last achievement—because when it all comes together, it's too cool for words.

From the start, we designed *Star Control 3* to take advantage of the latest game-design technology and develop effects that had never been seen before. The main technological breakthrough was the game industry's first use of a fully animatronic cast of characters. Because *Star Control 3* would have extensive interactive dialogue, these alien characters had to have articulated faces (or, in some cases, sensory orifice clusters) using real-time motion control for complex facial expressions and body movements.

Techno Overview

Star Control 3 uses a variety of techniques to create the finished product. The space combat sequences were created using 3D ships rendered at many different angles.

The actions and reactions of the *Star Control 3* aliens were pre-programmed on a computer animation control system, filmed to video, and converted to digital video for use in interactive sequences. Separate sets were built and chroma-keyed to the close-ups of the aliens. A professional cast of actors supplied all dialogue, and the final package was wrapped around a 3D-rendered, super-VGA space combat and conquest engine.

This chapter gives you a backstage look at the game-design process and the birth of a new game-design technology from conceptualization of aliens through artists' sketches through sample models through robot construction and programming, filming, compositing, and interactive final programming.

Origins of the Universe

Star Control 3 began with a concept document by Legend Entertainment founder Mike Verdu, the designer of outstanding games like *Mission Critical*. Mike provided the basic plot and design structure (strategy game, adventure game, and melee game) that made it through to the completed game.

Like *Star Control 2*, *SC3* would be playable as an adventure game, or as a pure arcade action game. SuperMelee would be expanded into HyperMelee, with new ships and new combat views. Special 3D views would supplement the 2D, overhead, “asteroid’s” view.

My codesigner, Michael Lindner, and I took the basic design and expanded it. We wanted to remain true to *Star Control 2*, which we both loved playing, but we also wanted to go in new directions. We spent several design sessions evaluating what worked in *SC2* and what didn’t. We agreed that the balance of danger and humor was fundamentally *Star Control*, and needed to stay. But neither of us enjoyed having to strip-mine the entire galactic quadrant to win the game. It expanded the hours it took to win and added very little to the fun of traveling to amazing worlds, interacting with fascinating creatures, and blasting them into fiery oblivion.

In doing our basic game research, we talked to fans and plowed through numerous online discussion groups. (If you contributed to the *SC2* discussions, you may have contributed to *SC3*.) Accolade even put out a questionnaire. The responses we got varied as widely as the races themselves, but overall they confirmed our opinions.

We decided to keep a dozen races from the old game, and create roughly another dozen. We kept the real stars of the game, and saved some of the minor races for future games. (Yes, we fully expect to hear “How could you get rid of the [insert race name here]? They’re the greatest! I can kill ANY ship with the [insert race’s ship name here]!” until the end of time.)

We decided to build 12 new races (give or take a few surprises.) They had to be fresh and original, but still in the *Star Control* mold. And their ships had to say something about them.

The Plot

Before I could build the plot, I needed to know what “really” went on in *SC2*. That’s not as simple as it sounds. The *SC2* plot is so big and so convoluted it’s spawned endless online discussion groups, where fans got into some heated arguments about the Meaning of It All. “What’s going on with the Arilou and Earth?” “What is the Ultron, really?”, “What happened to the Precursors?” and “And what’s the Orz’s problem?”

To find answers to these and other questions, I met several times with the original designers, Fred Ford and Paul Reiche III, who went above and beyond the call of duty to help us get it right. I found out a lot of background, but also learned how many issues they deliberately left vague, and how many questions they deliberately left unanswered.

We had intended to be as reverential to the original intentions as possible, but now we had license to make it up. We made two basic rules: We had to plug any major plot holes in the original game, and make sure we didn’t open too many new ones.

We knew the fans wanted answers, and that fudging too many things would be unsatisfying. The answers would also have to withstand critical analysis by a whip-smart bunch of players. It was a tall order, and we torture-tested the plot to make sure it would hold up.

3D or Not 3D

The path to robotic control for our characters began in the early planning stages of the game. Michael Lindner had a very specific vision for the new look of the *Star Control* characters. They had to look convincing.

The previous version, *Star Control 2*, used cartoony 2D, 256-color art with simple, multistage animations. Other games have tried this approach, but few were as effective at breathing life into the characters. To this day I still crack up when I see the Spathi’s horribly squishy, pulsating eyeball, or the Pkunk’s delirious smile. The Ur-Quan still looks intimidating. It’s amazing how well some games hold up over time. But the style of art was much too 1992. It could never work for the sequel.

Two options were to use more sophisticated 2D art or create 3D-rendered aliens. But 2D art can look too hand-drawn, and 3D rendered characters are seldom convincing. Three-dimensionally-rendered animation looks spectacular when it forges hard-edged, mechanical equipment, but it often looks decidedly unlikelike when it tries to reproduce organic creatures. The closer the creature is to human, the faster the illusion falls apart. Our tests revealed the cold, hard truth. The breathtaking 3D-rendered art that sent our spaceships careening across the deep space void simply could not breathe life into our aliens. The motion is too smooth. Too cold. Too, well, robotic.

Rather than simply trudge along the same old 3D-rendered landscape, Michael wanted to set out in a new direction and explore a new technology.

Star Control 2 had earned a devoted following for its unique rogues' gallery of eccentric alien personalities. Ace game designers Fred Ford, Paul Reiche III, and Greg Johnson brought to life a preposterous cast of aliens that transcended their simple, MCGA-bitmapped art.

The cold classicism of 3D just wouldn't do justice to their bizarre natures. We needed something "realer" than "virtually" real 3D. We needed real 3D. We needed life-sized, fully automated, robotic puppets. Because, in the words of *Accolade's* Bill Linn, "nothing looks as real as reality."

It's ironic that 3D art can look more robotic than mechanical creatures, but there are two very good reasons for this: 3D art takes place in the sterile universe of mathematics. Every object and motion must be meticulously programmed to resemble reality in a world that lacks real-world forces like friction and surface adhesion.

Robots may rely on servo motors, but their motions take place in the real world, a world filled with zillions of forces as yet unquantified by 3D artists (although some of the maniacal geniuses creating 3D software are closing the reality gap with unnerving speed).

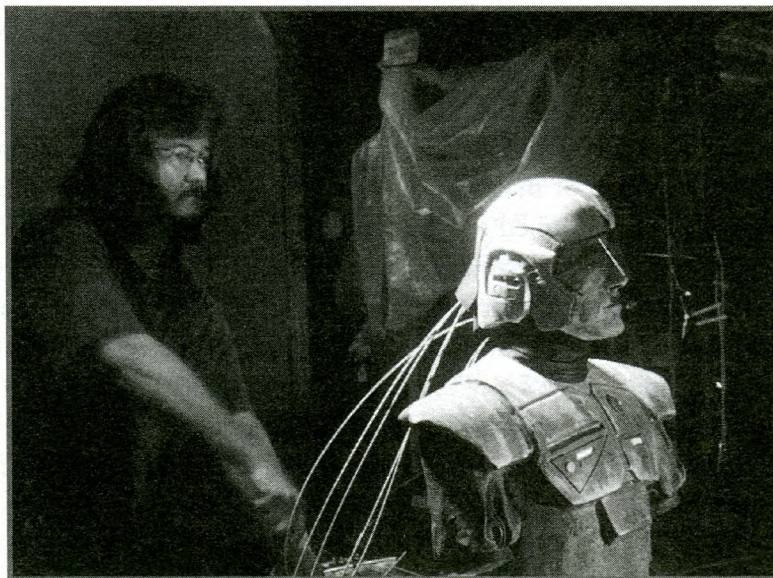
Organic motion is a complex thing. It's not created by simple kinetics and motion vectors. You can't simulate micro-momentary facial responses

with basic physics. Some 3D artists have created some beautiful simulations of movement, but this is a domain that's still better understood by dancers than physicists, and even dancers have trouble defining the vocabulary of motion.

The human body moves because of a complex interplay of numerous muscle and tissue systems stretching and bending in many directions at once. These systems impart a fluidity and subtlety to the motion that even the most complex 3D systems cannot yet match.

Though we're seldom conscious of these nuances, we're brilliant at subconsciously reading and interpreting them. We form intuitive judgments about intentions, trustworthiness, friendliness, attractiveness, and a host of other traits based on qualities of motion in a person's face and gestures. It's still easier for an actor to intuitively portray this or for a sculptor to mold it than for a 3D artist to render it.

Because our robots would be moving in real space, they could be made to jerk and twitch by a skilled puppeteer. Their skin would stretch and bunch over a real skeleton. They would be subject to all the physical laws, not just a few simulated ones. It wouldn't be as perfect as having the actual creature in front of you, but it would be close.



Another advantage is as simple as motion blur: When a moving object is turned into a series of moving still frames, it looks blurred. This blur looks realistic to us. But if the same moving object weren't blurred, the moving image feels unrealistic. This causes the herky-jerky quality of stop-motion animation. There are new technologies to impart motion blur to stop-motion movies and 3D animation, but it's still very difficult to make animation feel real.

The Rise of Robots

With the aid of our Accolade producer, George MacDonald, we contacted an ambitious Hollywood special-effects company called State of the Art Effects (SOTA/FX) and made our unreasonable demands. The high degree of precision *Star Control 3* robots required was new to SOTA/FX, but they eagerly accepted the challenge. SOTA/FX's effects wizards are well known for movies and TV shows, from *Weird Science* to *Power Rangers* to *Predator* to the first commercial featuring that disturbing family of rubber-faced, battery-powered, mutant mannequins. Some of their most recent work is in the movie *Indian in the Cupboard*.

Next began a round of meetings with SOTA/FX honchos Jerry Macaluso and Roy Knyrim to explain the game and our characters. Jerry and sculptor, Jordu Schell, created a series of sketches and color paintings of our characters from our extensive written descriptions and grotesque attempts to act out individual expressions. We went through several rounds of art before we had portraits that fit our vision and fully captured our characters' peculiar personalities. We played to the artists' strengths, and incorporated their suggestions and improvements wherever possible.

It may not be too much fun to watch a programmer, or even a game designer, in action, but it's fascinating to see a sculptor at work. It's amazing how the lump of clay suddenly comes alive and flashes a clear and recognizable expression.

The SOTA/FX team custom-built a fully articulated, mechanical armature for each creature. The armatures looked like frightening, cybernetic, skeletal creatures with moving eyes, ears, noses, mouths, cheeks, and so on. All the moving parts were controlled by a fleet of servo-motors under the command of a computerized motion control system.

Jerry and Jordu then began sculpting, turning our 2D character portraits character sculptures. Roy created a series of meticulously crafted and highly realistic latex skins from the sculptures and draped them over the robotic armatures to create full-sized aliens. Jerry painted them in surprisingly lifelike tones, resulting in aliens whose faces could move convincingly and express a complex range of facial expressions. By the end of this process, they were capable of some startlingly lifelike reactions.

Some of the moving skeletal armatures looked so relentlessly cool that I seriously considered re-designing one of the races as an exposed, skinless cyborg. But why let the audience peek behind the magic? Magicians should never explain their tricks, except to other magicians.

Not every day was blissful. Technical snafus and balky robotics slowed down the work, creating unpleasant delays. Some aliens, like the Owa, got the short end of the schedule, and came out looking less than stellar. Others, like the Harika, the Clairconctlar, and the Doog came out even more terrifying, noble, and endearing (respectively) than I had envisioned them. There's a magic that happens when a talented artist breathes life into a creation, and, looking at the aliens with their skins on, I finally realized this was going to work.

Meanwhile, another team, led by modeler, Steve Lebed, created the background sets for each alien's starship cockpit. These sets are actually much smaller than they appear in the game. The characters are built life-sized, but erecting soundstage-sized sets to house full-sized aliens would have been prohibitively expensive. Instead, we had the backgrounds built as highly detailed scale models ranging from three to ten feet high. Careful lighting made them look far larger than they really were, and even more impressive. They were photographed onto 35mm film and then transferred to digital video for post production.

Alien Video Shoot

The next step was to film the aliens moving through their various facial expressions and poses in front of a blue screen. Michael Lindner directed an extensive series of shooting sessions designed to coax intricate, life-like facial expressions from lifeless latex and servo-motors. This was where we ran into the technology's limitations. We didn't get every expression we wanted, but we were able to capture the personality of the characters.

The animatronic aliens were controlled using the PC-MACs animation control systems from Gilderfluke and Company Robotics and Sound Systems. Gilderfluke animation control systems feature real-time programming, and are powerful enough to run such extravaganzas as Disneyland's Splash Mountain. The system allows relatively easy input of motions and off-line graphical editing under Microsoft Windows, complete with macros and cut and paste. The Gilderfluke handles manual and automatic "inbetweening," just like a good 2D animation system, and lets the user zoom in on several frames, or zoom out to see the big picture. It can play back movements in speeds from a single step to 100 frames per second. The system can even compensate for minute delays from the mechanical actors by skewing motions forward in time. The robotic armatures required high tolerances, and the Gilderfluke had all the right specs.

We needed this high degree of precision because we had to be able to reliably return the aliens to a series of key expressions. Otherwise, the alien faces would noticeably jerk between each video clip. We needed seamless transitions between each interactive video sequence. Standard puppetry can achieve amazing effects in linear movies, but it's simply not good enough for interactive computer games. Our aliens need to change expressions many times during a single conversation with the player, expressions that depend on what the player chooses to say to the alien.

The robotic video sessions were complicated and difficult, plagued with breakdowns and servo burnouts. The crew threw away two generations of servos before they got them working properly. The filming took twice as long as we had estimated, and *Star Control 3* ended up being SOTA/FX's longest project of the year—longer than any of their movie jobs. Some game designers insist that we were lucky, and got off easy with a “mere” doubling of our estimated time. That's probably true, since there were moments when we feared it might not work at all. We may have been ready for the technology, but the technology was barely ready for us.

During the marathon filming session, each alien character enacted its series of facial expressions. As the “actors” went through their paces, the whole thing was captured on Beta SP. Each race's starship cockpit background models were captured, as well. Many of the expressions I had custom ordered to fit crucial moments in my script never got filmed, or got left on the virtual cutting-room floor. But the clips we got were so stunning, and the total look was so amazing and unprecedented, that I was ecstatic. These creatures would look outstanding even as still images. And when they move ... happy, happy, joy, joy.

The next trip was to Flite Three Recording in Baltimore for video digitizing and processing under the direction of Flite Three's Michael Furr. The footage of the moving aliens was played back as component video and fed into Flite Three's digital suite, which uses the Abacus A-83 switcher and the ADI Digital Magic™. Clips of the aliens were composited onto the still footage of their starship cockpit backgrounds. The backgrounds were deliberately defocused in the A-38 to create a realistic depth-of-field effect, and the finished files were touched up in the Dubner Paint System™. This process produced a library of digital video clips showing a range of alien expressions and mouth movements. Each alien's clip constellation can be called up in any sequence by the main *Star Control 3* executable, each clip merging seamlessly into the next.



Talking Heads

Master audio producer Kathleen Bober brought together a very talented crew of voice actors to record all the alien dialog. If some voices sound familiar, it's because you've heard some of them before, in places as weirdly diverse as the Discovery Channel, soap operas, and even other computer games.

Casting the actors was tricky. *SC3* dialog is not something every actor can grasp. Some simply didn't get it. Others required a lot of work to grasp the basic idea. But some took to their characters instantly, emitting sounds just like those I'd heard in my head, and sometimes better.

After casting, we began an intensive recording process to give voices to the aliens. The recording schedule was tight, and some days I put the finishing touches on the interactive scripts the night before recording them—not the safest way to work.

Kathleen's instincts in matching actors and roles usually were utterly accurate, but some roles proved elusive. The Pkunk defied casting well into the recording process. The actors were either too Hippie or too Valley Girl or too something. We auditioned every actor in the game except the actress playing the Syreen. We'd cast her as the Syreen because of her dangerously sultry voice, but hadn't considered her for the Pkunk. Because she needed very little coaching to flawlessly deliver the Syreen dialog, though, we gave her a chance. She nailed the Pkunk perfectly.

The audio clips were linked to the video clips through a master control list that attaches each discrete bit of dialog to a video clip displaying a particular emotional state. The video clips and audio files are assembled on the fly during gameplay to create the illusion of a moving, talking, and emotionally reactive alien creature responding directly to each statement the player makes.

Legend's team of talented programmers, led by Mark Poesch, put in long hours to get the game coded. They'd worked on HyperMelee throughout the special effects process, and the result was crisp and silky smooth. The limited, hand-drawn SC2 bitmaps gave way to rendered ships in a dizzying array of angles and lighting effects. The programmers even got all this complex material to run on 486s. (I still marvel at that feat.)

Mark and Michael also had the unenviable task of getting my convoluted interactive plot, which works great on paper (in the mammoth plot document or on a flowchart), to work in the game. And they had to do all this while getting the colony engine, HyperMelee, the conversation system, remote-play, and other elements of the game working and perfect at the same time.

Producer George MacDonald and Testing Coordinator Daniel Tyrrell endlessly torture-tested the game, and found all the areas in which implementation deviated from my plot document—so I could make this strategy guide as accurate as possible during those hectic final days of development. In fact, much of this book's walkthrough comes straight from (the other) Daniel's exhaustive revision of my original walkthrough. (Just think, the guy gets paid to play *Star Control* all day!)

The creation of *Star Control 3* from concept to design to construction to animation to digitization to vocalization to implementation to your hands was an exciting, frustrating, exhilarating time. Michael Lindner summed it up this way: "The wisdom of the project is, if you are going to pioneer new technology, you should expect it to break a lot."

Or, as Thornton Wilder says in *The Matchmaker*, "The test of an adventure is that when you're in the middle of it, you say to yourself, 'Oh, now I've gotten myself into an awful mess.'"

For me, *Star Control 3* is the best adventure yet.

