



Force-Ful Game: The Making of LucasArts' Force Commander by Chris Tome

One thing George Lucas can never be accused of is letting sleeping dogs lie. His Star Wars franchise extends into everything from kids pajamas, Taco Bell cups, clothing, and even, gasp, movies! The Star Wars merchandising machine hasn't forgotten gamers, either, and the real-time strategy genre of gaming gets even better with "Star Wars: Force Commander." Follow along as we do a breakdown of what it takes to make the worlds of Star Wars live and breathe in this interactive 3D adventure.

Life at LucasArts



In the beautiful town of San Rafael, Calif., just north of San Francisco's Golden Gate Bridge, the Force is in full swing. LucasArts, the interactive division of George Lucas's Star Wars empire, is one of the driving forces in video games today. Founded in 1982, LucasArts currently employs more than 350 people, most in game development, and has more than 43 original and 37 Star Wars or Indiana Jones-based titles to its credit.

LucasArts develops games not only for PC and Mac, but also for a range of consoles, and has announced support and development of games for the Sony PlayStation 2, as well as the forthcoming X-Box from Microsoft, and the Cube from Nintendo. Custom porting and development for these disparate platforms is a daunting task, and to help facilitate this, LucasArts has been prolific in creating custom tools to aid the process.

Script Creation Utility for Maniac Mansion, known as SCUMM, was a tool developed for the game of the same name and is a game development engine that has been tweaked and refined over the years. Another tool is INSANE, which stands for INteractive Streaming ANimation Engine, and iMUSE, an Interactive Music and Sound Effects tool. One thing that seems to be a constant at larger production and game houses is that even with a myriad of off-the-shelf content creation tools, special needs must be met with custom code, and LucasArts is no exception.

This is not to say that LucasArts doesn't have an arsenal of off-the-shelf tools, however. Many teams at LucasArts have decided to revolve their game projects around Maya, and MAX is always a game design favorite. LightWave is also in use, although not nearly as much as MAX and Maya. PhotoShop seems to be the texturing weapon of choice, and a host of other commercial apps are also put to work. In what seems to be a recurring theme with companies in the content creation business, no one tool is a panacea for the problems that can arise in production.

Gary Gaber: The General of Force Commander

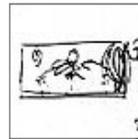
At the heart of any game development endeavor is the project lead, and the supreme leader for Force Commander is a laid back, mellow sort of a guy named Gary Gaber. Part teddy bear, CG geek, and engineer, Gaber brought a host of talents to his position as Project Lead. Among other things, Gaber is a programmer and designer, a truly rare combination. Although Gaber isn't a master coder by his own admission, there are more object-oriented programming tools at LucasArts that allow him to do coding in C++ with a higher level interface.

First Gary was a civil and chemical engineer, and a CAD operator. He had gone to film school though for his formal degree. Gaber has no formal engineering degree, but worked in CAD for ten years. It helped him tremendously in his current work, he states. "I was doing these giant chemical plant renderings with millions of polys," Gaber says, "and it was funny that one of the first jobs I undertook here at LucasArts was to design a giant mining plant [for a game]. My background really came in handy there."

We discussed MAX, Gaber's 3D weapon of choice, and how MAX is used at LucasArts. Gaber explained that although there are other game projects using MAX, and even one being done with LightWave, most teams are moving towards Maya in a big way. "The interesting thing is, if you use a package like Maya and everyone's trained in it, as a project lead you want to make sure you use Maya so you can get those people." Gaber has not yet attacked Maya, but plans on learning it as quickly as possible. "I've used MAX, LightWave, AutoCAD, and others," continued Gaber, "so Maya won't be too big a jump for me. Maya's supposed to be a really great modeling package, and I really love modeling, so I'm looking forward to it."

Gaber started his path down the 3D road using 3D Studio for DOS, Version 3. Gaber talked about when he first purchased the app. "It was a hard sell to my wife, but I convinced her that I needed it," Gaber states. "I don't pirate, I mean if I do anything commercial with a product, I buy it. It was a bit of an investment when I started out." Gaber loves the texturing, modeling, and the modifier stack in MAX, but still has problems with the IK setups. Character Studio isn't high on his must-have list, either. "We used it on this game, but I'm not thrilled with it," Gaber says of Character Studio. "It's still very hard to tweak and get very fluid motion out of it, it's not as good as say, Softimage." I asked him if the movement he got felt canned, and he said, "It really does, yes." Because of this, Bones Pro, a plug-in for 3D Studio MAX, was used extensively for Force Commander, making Character Studio unnecessary, and helping along MAX's semi-crippled IK.

Having a film degree really helped Gaber with his game work in his opinion. "When you do write a screenplay for a game," he explained, "you have to leave all the action parts out. They're the levels. That's the game itself, the game play. You get these holes in the middle where [in a film] you'd expect a big action sequence, but that's where the game itself comes in." Game developers have many of the same problems as filmmakers, but with the added responsibility of creating the interaction that lets players have fun, and be the action scenes in the film.



Gaber has a letter on his wall from George Lucas, commending him on the shipping of Force Commander, and Gaber says he has a copy of the game, and assumes he has played it at least once. Gaber first saw Star Wars at the age of 15, and it had a profound effect on his life, as it did a generation of kids. He has a pet film project on the back burner, but hasn't really had the time to ramp up on it.

Playing the Game

Force Commander, as Gaber explained, has a cohesive, interlinked story line throughout all the levels. "We came up with two characters, Bren and Dellis Tantor, two brothers in the Imperial army, who go through their careers [with your assistance, of course] as you follow along with them in the story. Through them," he continued, "we were able to tell our story. We wanted the kind of game that every level furthered the story." The level designers would then come up with the specifics of what happens in the story on their levels. As far as multiplayer gaming goes, Force Commander isn't quite the online game of the year. Four players can play Force Commander online or via a local area network, at once. Any combination of rebel or Imperial forces can be played, as well.

Gaber sat down at his workstation to walk me through the game, and it was an ancient PC by hardcore gamers current standards. His card was a very outdated Matrox Millennium, and the PC was a Pentium II. Part of this is because game developers really need to keep the "lowest common denominator" in mind, much as web designers design for bandwidth limitations.



"We tried to do something different with this game," Gaber began. "It's an RTS, and it's a 3D game. So, you have a full 3D camera that allows you to move around the world, allows you to get behind units or attach to them. Some players were kind of daunted by it," Gaber said, "But once you get past [how to use] it, once they did, it became a lot of fun." Gaber then explained that there were automated and user-controlled camera paths as well, for those who didn't wish to be in full control of their point of view.



One of the aspects of Force Commander that makes it different from designing other types of games is that Gaber and his team already had a universe created, that of the Star Wars universe. With other games, it would be the responsibility of the game designers to create a rich world with a history. Gaber and company though, had to make sure whatever they came up with story-wise matched the timelines and plots of the Star Wars world that had already been created in movies and books. Gaber explained that there is a whole division of Lucas Digital that ensures there are no conflicts in the story line of any Star Wars properties. Force Commander had to undergo careful scrutiny in order to guarantee continuity within the Star Wars universe.

One of the continuity issues Gaber and his team faced occurred towards the end of the game, where there is a big battle on Coruscant. "This was right after the third movie," Gaber explains, referring to when the battle takes place in relation to the official Star Wars timeframe. "It turns out this was three years after the third movie, so we had to throw a graphic up before the battle that said 'three years later; | ' " Gaber chuckled. A simple solution is sometimes the best solution it would seem.



The pre-production for the game was animated and rendered into rough animatics early on, but there was more than 14 minutes of cinematic-quality animation to complete as well, and that required the same type of planning that goes into film sequences. "In a game," Gaber explains, "you try to get all the elements you're going to need early on." Since he and his team started by jumping right into MAX, the low-poly models for the real-time portion of the game made great stand-ins to use for the FMV animatics.

The Art of Game War

In game development land, no game can exist without a bible, also known as the design document. The design document acts as the team's lighthouse in a fog of creativity, it contains all the specifications for the game play, models, story lines, and more. "Everything's in there," Gaber said matter-of-factly. "Game play, art style, interface, story line, levels, UI, units, and capabilities in the game, it was pretty much the whole game." He added, "It's the whole game, just on paper." When asked if the document changed over the span of the project, Gaber said, "If you do it right, the document changes all the way up until the end of the process, and it becomes a good reference for the team. The trick is to keep it relevant throughout the whole [process of making the] game."



There really isn't an asset management system in place currently at LucasArts. "We had special IDs for all the units in the game," Gaber said as he showed me some design documents. "Everything in the game referenced these numbers, and that's how we kept track of all our units." Gaber then proceeded to show me the script and mission documents, which is what Gaber described as the Bible for the game. "This is the whole game, and it's a little over 120 pages." As planned and structured as everything actually is, it seems like it's much more a "seat of your pants" type operation, at least when you look at the design document. All of the game IDs also correspond with the naming conventions of the MAX files though, making it easier to manage and track the game assets.

"We really just keep track of where everything is," says Gaber. "But we are looking into [an] asset management system. I think we're looking at one from Alien Brain," Gaber stated. The current way assets are managed is simple and straightforward, if not a bit clunky. Basically, a file-naming system is used, and assets are all stored on servers in a set of pre-defined folders. Gaber uses Microsoft Project and Excel to keep track of the game at every stage as well, and he said that loose-knit system has worked pretty well for him.

Once the levels have been thought out, the team had to create all of the graphics. In a departure from the standard approach of conceptualizing with sketches and comps of the game elements, Gaber and his team dove headfirst into 3D Studio MAX. "I designed all of the buildings and vehicles in MAX," Gaber explained. "They were built as low-polygon images initially in MAX, then they were brought to the ultra-poly stage, which is cinematic quality. Then we gave the high-res meshes to the low-poly modelers, who captured the maps from the hi-res objects and modeled very efficient real-time versions for the game." The only pre-vis done on paper was for three characters, the rest was done right in MAX. It's an unusual, but increasingly more common method of cranking out games.

I asked Gaber if he thought there were any unique advantages to this approach, and he said it was definitely much faster this way. "It turned out to be faster, only because it's my favorite way of working," Gaber said. The game Gaber is currently working on is being done using more conventional processes, and Gaber sees benefits to both. "The nice thing about it [working with paper first] is that you have someone full time just doing that, it's very helpful [to the process]." The advantages to working with MAX from the start on Force Commander did offer some benefits in speed, however. Gaber and his team could design something, say a building in MAX, look at it from all angles, and decide if it's going to work or not, all without the time it takes to create multiple sketches of the same concept.



Gaber opened the Hoth level in 3DS MAX. When I saw it, I asked him whether they work in a real-world scale in MAX. "We work in a relative real-world scale," explained Gaber. "It's not absolute." The level of Hoth starts out with the Probots from The Empire Strikes Back, then the battle begins, with AT-ATs and other weapons of mass destruction from Episode V. Officers brief you with information and commands that help you to complete the mission objectives. The sound of the game was a big focus for Gaber as well.

"We really tried to make the sound rich, it really adds to the battlefield experience," he explained.

When asked about the audio for the game, Gaber explained initially that the characters are all basically talking to you, as the player. "My script for this game had about 3,500 lines, which is about average for a game. We had the voice actors come in and do the lines, then we'd get those back as .wav files we could use in MAX, and they're associated with the proper characters, vehicles, or whatever." There were about 80 different voices in the game. As for the music, Peter O'Connel created it, and he took John Williams' original Star Wars score and gave it a bit of a Techno sound. "I would have liked the option to switch on the classic or the new music," Gaber states. Most of the sound effects like Chewbacca's roar, tie fighter sounds, and more, were all "borrowed" from the sound libraries of the films, saving time and money.

Just where does the idea for a full-blown game come from? Sometimes, management will initiate an idea for a game, and sometimes the ideas come directly from the project leads, or the artists themselves. "In the case of Force Commander," Gaber states, "a project lead [from another game team] originated the idea." The total number of people on the team at most times was around 20, and the game itself was actually in development for almost three and a half years, a very long production timeframe, even by the most liberal game development standards.

I asked Gaber about what goes into the brainstorming of what a game will be like. "A lot of it is sitting around in meetings talking, doing a lot of thinking," inciting me to think of the scholars in Rome, sitting on marble steps philosophizing. Gaber continued. "Also doing some prototyping if you can helps. With Force Commander we took a kind of weird path, and it [initially] went through several redesigns. I was involved only with the last two designs for the game." Gaber started out on paper, defining aspects of the game and game play, and then talking to the level designers in more meetings. Force Commander has 24 levels, and all those levels were divided up and given to the six level designers. "The level designers then went away and decided what they wanted to see in their levels," Gaber explains, "Then I tailored the design document to fit their visions of what the game should be." As project lead though, I am sure that Gaber's influence was felt throughout the game.

When asked about the creation of the interface for the game, Gaber said, "it was really an iterative thing. We came up with an interface, hated it, reworked it, and so on, until we were happy with it. We went through several different steps before we had what we wanted." From the design documents, it's obvious that only blocking out of where certain basic elements should be placed on screen was done; it was a creative free for all, best concept and art wins.

Gaber went on to describe the technique he and his team used in modeling the game elements, up-res'ing them with tools such as the MeshSmooth Modifier in MAX, and then having low-poly modelers come in and create the real-time models from the hi-res versions. "It made sense to me," Gaber said, "because I knew we were going to do some heavy cinematics, we have a whole cinematic story in this game in the cut scenes. I knew that those models were what we were going to use in the cinematics, so it just made sense to me." Gaber also said that all of the icons in the game were taken from the hi-poly models, showing a true efficiency in the reuse and repurposing of the 3D elements.

The game engine is the heart of any 3D game, and can make or break the game play experience. The Force Commander game engine, however, wasn't created in-house as might be expected from a company with the internal resources of LucasArts. "The engine was created by Ronin Entertainment," Gaber explained. "The game had been through two redesigns, and we really wanted to get it out into the world. It already had this legacy of being a very long game from a development standpoint. It was one of those games," Gaber explained as he laughed, "It was looking like one of these things you read about in PC Gamer, the top ten games that never got made."

As far as the game engine goes, Gaber explained that because the Ronin engine was built in Interpreted C, the game took a bit of a performance hit. "It hurt us in terms of frame rate, it had a lot of overhead. It took a little bit longer to recompile the versions, and they had large executables." It also hurt the game in terms of memory requirements, and the recommended minimum amount of RAM to run the game is 64MB. As far as the size of the game, it takes two full CD-ROMs. Gaber traded frame rate for polygon count. "Our units are much more detailed [than with other games]," Gaber said.

An already popular element of many games is the ability for gamers to create their own levels. This wasn't the case with Force Commander though, the focus was on a specific set of game activity, nothing more. "We didn't have a level-design tool for this game," Gaber explained, "which I kind of regret. That would have been something that would have made it a lot easier." From what I gathered, Gaber made the statement as much for the gamers as he did for himself. "Even if we included a level-design tool with the game," Gaber said, "it would still be extremely difficult, only because it was all created with 3D Studio MAX, so you'd really need MAX." I made Gaber aware of the forthcoming gMAX from discreet, a version of 3D Studio MAX made specifically for creating game levels. Gaber hadn't heard of it, but when I told him what it was, he was very excited by the prospect, and implied that he would love to support gMAX in future games.

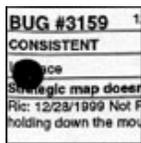
Optimization is everything in real-time gaming, and keeping polygon counts low is the Holy Grail for game designers. In a particular model of a command center that Gaber showed me, the hi-res model was over 64,000 polygons, way too high, of course, for an RTS game. With some creative modeling and mapping techniques though, the final real-time game model was pared down to only 266 polygons, very lightweight and ready for real time. I asked Gaber if they tried to use polygon reduction tools to achieve this, and he said that method was "too dirty." "We tried it," he states, "it just didn't work too well." So all the low-poly models were built from scratch, using the high-poly versions as a reference. It takes a

good modeler about a day to recreate a low-poly version of a high-res model.

I asked him about his texture-mapping tool of choice, PhotoShop. "Some of the Maya guys are using the painting tools built into Maya," Gaber explained, referring to the new capabilities of the Artisan plug-in in Maya. "But we used the texture unwrap feature of MAX and it worked pretty well." The unwrap feature saves off an image map of the object's mesh, flattened out, to use as a reference when painting the texture maps. Artists use PhotoShop to paint the object, then "rewrap" it to the object's surface with the UV-mapping capabilities of MAX.

One of the issues all 3D artists face at one time or another is how to keep their characters planted on the ground, without going through the ground itself when they walk or run. "We got most of it," Gaber chuckles. "We had a height map that was laid over the terrain and created from the terrain itself. We also had some problems with collisions. It was way more important that the units got to where they were going, that was our priority."

There were several versions of each character in the game. There were what the team called the 1,000-poly characters, which were used in places such as the briefing room, and could actually be upwards of 2,000 polygons in size. In the game, there were the low-poly models, ranging from 100-250 polys, or so. Then there were the high-resolution versions for cut scenes and cinematics. These could be many thousands of polys per character, and more. The in-game cinematics and the character animation for the real-time game were done in MAX, and Ronin completed the rest of the animation using Winged Edge's Mirai, formerly a Nichimen product. The teams used proprietary translation tools to move the data back and forth between the two packages.



Game testing is also a critical part of the process of creating a winning game. If the game play is poor, or there are bugs or continuity issues, the game will be doomed to failure. The process of game testing actually starts with the development team testing components as they are built and added to the game itself. "The game tested began about eight months before we shipped," explains Gaber. "We had a lead tester early on, and his assistant, and what the testers do early on is they play the game and make suggestions. Those guys really had a lot to do with balancing [the game]. They'll play the game and give you feedback as well as bug reports. In this game we had about 3,000 bugs, which is fairly average. Some bugs we'd handle, some Ronin would handle, and some would be taken care of by the level designers." Gaber explained that there are three levels, or types of bugs that they categorized. "An A bug," Gaber said, "is something that will stop the game, or stop the level. B is something that will not stop the game or level, but you really want to try and address it. C is a suggestion, and we try to get as many of those addressed as possible." Gaber also took advantage of the wide range of game enthusiasts at LucasArts, and said that people from other teams were allowed to play the game and make bug reports, as well as suggestions.

To Be Continued... In Another Game We're Sure...

I asked Gaber what his next project was and got the industry standard line of, "If I told you I'd have to kill you." Gaber couldn't in fact, even tell me if it was a Star Wars-based game. When I asked him if he was sick of Star Wars yet, he emphatically replied "no" many times. "I told the art director when he hired me at the time, I'd work on any game, but I really wanted a Star Wars one." Gaber is also a big game player, and real-time strategy games are tops on his list. "I can't play first-person shooters," Gaber stated, "Because I tend to get dizzy. I love playing them, but I don't like looking green afterwards," referring to the motion sickness he experiences with this game genre.

Some of the things that Gaber would have liked to have was more time, believe it or not. "It's like that old artist's saying. You don't really finish it, you abandon it," Gaber chuckled. "I really wanted to do some more work on the interface and the camera. We really needed default [camera] settings for the players that offered them a more familiar, standard RTS view. As for the interface, I would have liked to have pieces of it removed so the players could play with or without UI elements. Of course," he added, "more polys would always be nice."

As far as advice to up-and-coming wannabe game designers, Gaber stated that it all depends on what you want to do. "If you want to design levels, go after architectural or engineering stuff," he began. "There's a lot of different ways they can go. If you were going to be a cinematic artist, a degree in film and traditional art would definitely help. Work with 3D packages and learn how they work. It really doesn't matter too much what package you use anymore. Learn one, and learn it well, and you'll be valuable." Hiring at LucasArts revolves around a good demo reel, but applicants should also have a love for gaming, and expect to be sat down and prove their talent at the computer.

I asked Gaber what he personally enjoyed most about playing Force Commander. "Mostly," he said, "I really get into being attached to the units. It's not the best way to play a strategy game, but it's fun for me. I really like wandering around in the world, interacting with different units that are out there." Gaber practices what he preaches, though, he spends on average, between 20-30 hours per week playing games. He's in the design phase of his next project though, which doesn't allow for a lot of time for play. Luckily for him, his wife is a game player too, which I'm sure is why he's still married! When asked what his favorite game was, Gaber immediately mentioned Microsoft's "Age of Empires," and "StarCraft" from Blizzard. I asked him if he had ever played any online multi-player games, and he said he'd tried The Zone network, and played "Age of Empires" online. "I think it's going to catch on much more in the next few years," he said.

Gaber has several consoles at home for his game playing addiction. "The only one I don't have is DreamCast, and I'll

probably skip it and go straight to the PlayStation 2." When asked about the entrance of Microsoft into the console market Gaber added, "I'm really excited about the X-Box, it really looks like they're doing everything right." One can only hope.

I asked Gaber about the opinion that some have of video games, that there's really been nothing new for a long time, the same ideas just keep getting repackaged in fancier graphics. "As a whole the industry is maturing," Gaber said. "It's kind of like the film industry when it started out, there was a lot of experimentation. Eventually they adopted standards, and I think that's what you're starting to see to a degree. It's just evolution instead of revolution."



<http://www.lucasarts.com>

<http://www.pcgames-central.net/articles/2000/7/renegade/>

