Bruce Artwick, The Designer Behind *Flight Simulator II*

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There must be a lot of would-be pilots out there. *Flight Simulator II*, a microcomputer-based flight simulator, has sold a quarter of a million copies and stayed on the best-seller charts since it was introduced. Here's a look at the program and the designer.

Bruce Artwick, president of subLOGIC Corporation and the designer of Flight Simulator II.

You've seen those air disaster movies where the pilot and co-pilot are suddenly stricken with a mysterious ailment, or injured in a struggle with a hijacker. A stewardess or even a passenger must take over and fly the plane to safety.

There might have been a little less sweating in all of those movies if the substitute pilots had used *Flight Simulator II* from subLOGIC. It turns your Commodore 64 into a flight simulation lab, and puts you at the controls of a small aircraft.

The tremendous success of *Flight Simulator II* may be a bit surprising to those of us who are a bit phobic about flying. Even with our feet on the ground and hands on the keyboard, the illusion of flying can bring back memories of white-knuckled flights.

Bruce Artwick, the designer and programmer of *Flight Simulator II*, says it appeals to people for different reasons. "Some buy it just for the fun of flying around. A lot buy it because they like the graphics," he says. "There's an arcade game built into it, so some people buy it for that. And some people actually want to use it to practice flying. All of these elements—the game, flying, and nice scenery combine to attract a few from here and there."

Flying is an avocation for Bruce Artwick (he's had a pilot's license for several years), but his real interest is computer graphics. Raised in the Chicago area, Artwick went to school at the University of Illinois at Champaign-Urbana. While finishing his master's thesis there, he worked on 3-D graphics software for real flight simulators at the school's aviation research laboratory.

He took a job at Hughes Aircraft in California in the late seventies, about the time the microcomputer industry started to pick up speed. Interested in the possibilities of graphics on the new machines, Artwick started programming small 3-D graphics packages for them. He formed subLOGIC in 1977, and moved back to Illinois at the urging of his partner, Stu Moment.

His first demo program for the new Apples was a small flight simulator. "I was surprised at how successful it was. It made me realize there was a lot of consumer interest in flight simulation," says Artwick. *Flight Simulator I* for the Apple hit the bestseller charts and stayed there.

In late 1981, Artwick was

Two views of New York City from the cockpit: the Empire State Building and Manhattan Bridge.

approached by IBM and Microsoft. Both wanted him to translate his program for a new machine that would be coming out the next year, a microcomputer with a powerful new processor that would allow him to do more than he was able to on the Apple.

He finally went with Microsoft, which published *Flight Simulator II*, an upgrade of the original Apple version, for the new IBM PC. It was so popular that people at Commodore and Apple went after him to translate it for their new computers.

"Back then, I didn't think it was possible to bring that kind of graphics performance down to the smaller machines," he says. "But we gave it a try and did the best we could."

Crunching the program down for Commodore, Apple, and Atari "...was a major project," says Artwick. "We knew that we were very tight on memory. One of the most important things to have would be good software tools to do it, a good assembler and debugger. We couldn't do development on the machine we were designing it for. Like on the Apple, we couldn't have the Apple do assemblies and load it into itself and run it because it takes up all of memory, almost every last byte." They spent a half year setting up that development system on an IBM PC with hard disk drives. Once they got the basic simulation going, they started packing in as many features as possible. "We used to have meetings and say, 'We have 30 systems we have to add and only 1300 bytes left,' " says Artwick. "We packed it tighter and tighter until we had just about everything we wanted."

And those features that had to be left out are basically cosmetic, "like the windshield cracking on the IBM version," says Artwick. "It took up a lot of memory, but we had it."

The sequel was just as popular as the original. *Flight Simulator I* was finally knocked off the bestseller charts by *Flight Simulator II*.

The control panel of *Flight Simulator II* resembles the instruments of a Piper PA-28-181 Archer II, a single-engine, nonretractable gear aircraft. It was chosen because it offers good performance, yet is uncomplicated and easy to fly.

You control the aircraft by pressing designated keyboard letters. The right bracket (]) increases your throttle. F makes it bank, and G controls the banking. Press B for a view out the back of the plane, and T for a front view. You'll need to spend a couple of hours learning all the various commands, maybe more if you know nothing about flying. (The program comes with a user's manual and a booklet explaining the concepts of flight physics and aircraft control.)

The first time you take off, you leave Meigs Field in Chicago. From there, you can fly to a number of airports in downstate Illinois, or set the controls to take you to one of the other three designated "scenery" areas: Seattle, New York, or Los Angeles. Flight is in realtime, so if you take off from Chicago before you go to work or school and leave the program running, you can come home for lunch in time to land on the West Coast.

The flying environment is more than ten thousand by ten thousand miles square. It encompasses the entire continental United States and includes more than 80 airports, winds, clouds, time of day (for day, dusk, and night flight), and navigation aids. You can select the flight conditions—even choose between *easy mode*, which makes the aircraft more forgiving of

pilot blunders, and *reality mode*, which adds more sophisticated factors.

If you tire of the challenge of keeping a plane in the air, you can play WWI Ace, the game option which equips the plane with bombs, machine guns, and a radar screen, and pits you against other WWI fighting planes.

More memory, for the engineers at subLOGIC, means faster simulations and more complex scenery (they're already preparing new scenery disks for San Francisco, Washington, D.C., and the Denver/Rocky Mountain area). "We're trying to stay updated on new machines, because we think this is an area of interest that will stay around for a long time," says Artwick.

The Apple IIc has already spawned an enhanced edition called *Flight Simulator IIM*, to be released sometime in 1985. It's a multi-player game. By linking two or more Apple IIc's (either in the same room or via modem), you can fly around in the same air space and see each other, "...go on flights together and hide behind mountains," says Artwick.

In the meantime, *Flight Simulator II* still appeals to a wide age group, "from kids writing in to tell us how well they did on the game to middle-aged pilots who tell us we ought to have more ILS approaches," says Artwick.

And it's being used in training, he says, but not like you might think. "When it comes to training a guy to fly a jet fighter or something, it's not really very good because there are no real flight controls." But flight instructors and national institutions are using it to show students how the gauges and other navigational instruments look and how they work. "In that respect, it's pretty useful, a lot more useful than a textbook."

Artwick has received requests from such far-off customers as the Singapore Air Force, and from people working on research projects for their organizations who want him to make modifications to the program.

And there's one more interesting application for *Flight Simulator II*: Along with *Lotus 1-2-3* and *dBase II*, it's known as a compatibility test for IBM PC compatibles. When Compaq Corporation was testing its machine, the designers found that *Flight Simulator II* wouldn't run. "They had a whole roomful of testers testing it, and it turned out to be a bug in one of Intel's chips," says Artwick. "In their hardware design, it was more sensitive than IBM. Compaq actually had to change their ROMs."

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