Cosmo Freeman of the Space Patrol

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When I was wrapping up my Ph.D. thesis project (involving a scientific instrument that flew on the 1975 Apollo-Soyuz test project), my research group was given some data-reduction time on a CDC 6400 (that's a mainframe computer, and in 1977, it was considered rather a large one) owned and operated by NASA at Johnson Space Center (JSC). I packed a suitcase full of Hollerith cards ("IBM cards" or "computer cards") and off I went.

The 6400 was in a little building outside the road that ran around the JSC perimeter, a quarter or a third of the way counterclockwise from the main gate. I think it was Building 30. To my delight, the main purpose of that computer was to run the software for a couple of Space Shuttle cockpit procedure simulators. These were not the fancy units that sit on hydraulic jacks and provide six degrees of freedom of motion, nor did they have out-the-window visual displays, but what they were was rather impressive: story-and-a-half-high plywood boxes, each containing a full-size mockup of the Shuttle flight deck, with all avionics, switches, flight instruments and other paraphernalia required for flight fully modeled and integrated with the software. The cosmetics weren't perfect -- there was lots of painted plywood with hardware-store toggle-switches -- but the flight avionics and instrumentation were first-class and all there.

My first run on the 6400 was scheduled for late on the night when I arrived, but some of the programming team were still at work then, trying to chase a bug out of the atmospheric simulation used in modeling Shuttle ascent. One of them came to me and politely asked, "Excuse me, Dr. Freeman, we are running a little late on debugging, is there any chance we could borrow an hour of your time?"

It wasn't Dr. Freeman yet, but I decided not to tell them that. Calling up my best impression of a person who is being put upon but is trying to be polite and good-natured about it, I smiled stoically and said something like "Sure, anything for Our Team on the Space Frontier." Well, maybe not quite that Hollywood, but you get the idea. Then I asked if by any chance I could enter the simulator and see what it did, if I promised not to touch anything. "Why yes, Dr. Freeman, that would be fine." Fake stoicism is even better than flattery for getting what you want; remember that, Grasshopper.

The interior of Building 30 resembled a cross between an airplane hanger and a warehouse. The simulators were set up in the middle of the floor, surrounded by cables and equipment. The noise level was very

high, requiring a public-address system for conversing with anyone more than a few feet away. The PA system had those old-style gooseneck desk microphones with heavy bases. Someone had brought in a portable radio and used it to weigh down the push-to-talk switch on one microphone. With the gooseneck bent to bring the microphone close to the radio speaker, the PA system was thereby playing the broadcast from the local rock station at rather too much volume and at way too much saturation. I tiptoed out on the floor and cautiously climbed the aircraft-style stairway that led up to the back entry of the simulator that was in use. The simulation running was ascent to orbit.

With no out-the-window displays, these simulators could not be used for approach and landing, but they were good for all else, and the layout of flight instruments -- the "basic six" (attitude gyro, directional gyro, altimeter, rate-of-climb indicator, airspeed indicator and turn-rate indicator) were in the exact same positions and orientations that I -- a thousand-hour lightplane pilot with an instrument rating -- was used to seeing. Of course, some of the instruments had a few special features for the Shuttle. I had never seen an altimeter with four hands before. The instrument usually has three hands and reads rather like a clock, with one hand for hundreds of feet, one for thousands, and one for tens of thousands, but this one had a fourth hand, that read in hundreds of thousands of feet. And there was a little instrument tucked off in one corner of the panel that I had never seen before, though I knew what it was. It was a machmeter, which tells how fast the vehicle is moving in terms of the local speed of sound. Its gradations went from 0.2 to 25. Best of all were the avionics. There was a TV-size video screen that showed whatever graphical plot was most relevant to the stage of flight in progress. During most of ascent, it showed a side view of the intended trajectory, suitably compressed along the line of flight, with a computer-generated pip marking the Shuttle's present position and another pip that showed where the Shuttle would be in a minute or two if it held its present attitude. With normal automatic-pilot operation, both pips tracked the trajectory line precisely. Standing in the cramped flight deck in position to peer over the shoulder of the person in the left front seat, I watched the simulated Shuttle fly itself into simulated orbit half a dozen times.

Presently the programming team finished its work, and called me back into the control room for the CDC 6400 to coordinate my own use of the computer. One of them paused and asked me, "Dr. Freeman, I notice you have been very interested in the operation of the simulator, would you like to try to fly it?"

I managed not to grin too much as I allowed myself to be persuaded,

and was informed of such details as how to turn the autopilot off. I returned to the main floor of the building and approached the simulator. And as I climbed the stairway to the flight deck, the local disc jockey, still heard way too loud over the jury-rigged PA system and portable radio, put on the main title to "Star Wars". What a shame that Buddhists have to put up with mere nirvana ...

I had no Space Shuttle flight experience, but as a space buff from the age of three and a confirmed techie, I had done a lot of reading and I had a plan. After liftoff, I counted few seconds to be sure the vehicle had cleared the gantry (way too long, no Shuttles had yet flown and I did not realize how fast the beast scooted after liftoff), then switched the autopilot off, pushed forward -- downrange -- a few tens of degrees -- and held attitude for a bit over a minute. I did not attempt the roll, that's useful mostly for out-the-window orientation, my plan was to keep a nice, steady, unremarkable state all the way through the time of maximum aerodynamic pressure, which I knew occurred about a minute past liftoff.

By that time, the Shuttle had "lofted" -- we were well above the trajectory. So, I pitched down -- not too far -- but enough to bring the minute-in-advance pip back toward the trajectory. After a short time, I had that pip nailed, and operated the controls so as to keep it nailed. The pip representing the actual Shuttle position tracked it, oscillated once or twice above and below the trajectory, and finally settled into place. At main engine cutoff, very much to my surprise, I was in the groove, having hand flown a real, live Space Shuttle simulator from Earth to orbit (or at least to the point where you use the Orbital Maneuvering System for final insertion) on the first try.

And oh, yes, I finally did get my thesis data reduced.

-- Darth Weasel, AKA Cosmo Freeman of the Space Patrol