

The Gemini Project
As Reported by Mr. H.J. (Mike) de Garcia, Jr.

“What follows is a three-page write-up that I [Mike] drafted as part of some of my reflections on the Gemini program for my grandchildren”:

In November 1962, I was assigned by Clarence Perisho (now Chief of the Structural Dynamics Department) to the Space program, specifically to the Gemini project. It was a space capsule that looked very much like a derivative of the Mercury one-man capsule that launched the first American astronaut (John Glenn, now a Senator from Ohio) into orbit. The difference was that it was a little bit bigger in order to contain two seats, and the mission was to stay in space circling the Earth for at least two weeks. In those days it was another milestone in conquering space travel.

Maurice Griffin was the on-site leader of our group. The initial impression we had of Maurice (pronounced Morris) was that he had considerable practical experience but lacked technical expertise. As time went on I observed what he lacked in theory was made up by his inner sense of practicality and he was usually right. There were always engineers around that wanted to dazzle you with their brilliance in deriving and manipulating equations which many times had little application. But they were impressive in reports. Maurice would attempt to apply the equations to a specific problem at hand. Sometimes he would find that some of the basic assumptions for the equations would be false and thereby invalidate the whole development. We were breaking new ground in the space program and if astronauts were going into space our preliminary work had to be double checked ... tripled checked... to safeguard lives.

There was a gentleman by the name of Robert Brooks, with a PhD (Doctor of Philosophy) in, I believe, physiology. He was in charge of the Human Factors group. He sat across the aisle and a couple of desks away from me. We faced each other in this bullpen arrangement, i.e., a fairly vast open area; normally everybody would be facing the same direction. Dr. Brooks was a chain smoker. It seemed like he would stub a cigarette and immediately light up another one all day long. An energetic, nervous person. He was terribly worried about the astronauts being in space for two weeks under weightless conditions without any physical activity for that length of time. It would dull their reaction times, he would say; not be able to respond in a timely fashion to the mission control command to push the button to fire the retro rockets when it was time to return to Earth. For every second of delay, it would cause the splashdown to be miles downrange from the retrieval area where an aircraft carrier and support ships would be standing by. Normally this location would be pre-selected to be either in the Atlantic or the Pacific Ocean, in the middle of nowhere.

To justify his apprehension. Dr. Brooks showed us some charts that he had developed indicating a correlation between heart pumping levels, in liters per hour, and elapsed days for someone in a reclined position. All his charts showed that as each day went by, the heart pumping rate would drop until it stabilized to a near constant level after four days. At this lower pumping capacity, he maintained, an astronaut could not react quickly

enough to any command. Everything would slow down. The moment the astronaut heard the command, the brain needed more time to translate the message to move his arm and then the finger to push the appropriate button on the console.

His solution was for the project to come up with a means to increase the astronauts' heart pumping rate. How do we achieve this feat? While we were mulling this over, Dr. Brooks suggested that a "simple" solution would be to make the seats vibrate. His concept was that while the astronauts are strapped down in their seats, a motor attached to each seat would shake with sufficient energy to increase the heart rate. We didn't want to laugh out loud at his proposed solution. We had to come up with some data to drop the shaking chair as a viable solution. Since at that time I was in the Structural Dynamics group, I was appointed to refute Dr. Brooks concept.

Fortunately, the McDonnell Technical Library contained enough experimental material on the effects of vibration on the human body that I could collect and create my own set of graphs. In two graphs I summarized the data. It showed that the vibration level to produce the desired results was not feasible. It would physically affect an individual's eyes, head, and give a general sense of queasiness and not produce the increase in heart pumping rate, other than anxiety. In other words, the eyes could bounce within their sockets such that the astronauts would have blurred vision and not be able to properly read the instrument panel; the head would move out of synch with the rest of the body; possibly induce vomiting. So the vibrating chair concept was thrown out.

Then somebody from the Design group came up with a different idea: Let's put a circular track outside the capsule, about where the body of the Gemini flares, near the hatch where the astronauts climb in and out. Then they could take turns riding a unicycle around the capsule. The pedaling would give the astronauts a way to bring their heart pumping rates up to the level desired by Dr. Brooks. Sketches were made to show this concept, so that all groups could make their own assessment and provide comments. Soon another specialist group expressed their concern. The group's leader said that an astronaut exercising in space on the unicycle could be subjected to micrometeorites. All it would take was for one little pebble to puncture a hole in the space suit and expose the skin for the astronaut to suffer a fatal reaction. It would cause the blood to boil and cause a quick and terrible death. In order to protect him, we would have to come up with a deployable circular tunnel (really a torus) around the capsule. Now this didn't sit too well with the Weights group. They added their numbers and the total launch weight was getting to an unsatisfactory level. Meaning, there was a limit on the launch weight and still be able to put the capsule in its proper orbit.

It was finally decided to question the good doctor. Dr. Brooks, on where he got his raw data to come up with his charts and the required heart pumping rates. It turned out that his data came from hospitals and bedridden patients!

The head of the project, Ray Pepping, decided that astronauts are a different breed and sufficiently healthy and hale that their bodies would adapt to weightless conditions and we were not going to provide any additional pieces of equipment. It turned out to be the

correct decision. No need to complicate things. The astronauts' bodies did adapt to space and their heart rates did drop.

This is the lesson we learned: When in doubt, leave it out.

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A subsequent assignment was to help out the designers come up with a scheme to dock the Gemini B (new designation to differentiate from the original one) with a yet to be designed space station orbiting around the Earth. Maurice came up with the idea to attach a ring to the heat shield of the Gemini by means of short rods. In this manner, the ring would be offset from the shield by the height of the rod. On the space station would be a matching ring. Spaced around this ring would be mounted Y-shaped fixtures (think of sling shots without the rubber bands), with the base of the "Y" anchored to the ring. On one of fork legs would be a spring-loaded lever such that when the ring from the Gemini entered the "V", it would push against the lever (think of the "V" being an inverted "A" where the crossbar is the lever). The lever being spring loaded would pivot around and trap the ring in the crotch of the "Y" thereby locking the Gemini to the space station. One major drawback of the latching mechanism was our inability to figure out how to release the ring so that we could undock the Gemini.

We worked on the details of that design for awhile. It didn't last long because it wasn't too sophisticated and too many things could go wrong. Such as, if the Gemini B came at an angle it could latch on to just one of the Y-anchors and be unable to latch on to the other ones. So there wouldn't be a good mating of the parts. Also the astronauts would have to go out of the Gemini and into space then make their way into the space station through a hatch. The idea of having the astronauts outside was thought to be undesirable. As this concept was evolving, management could see that the idea of making more Geminis to resupply the space station was becoming more difficult to sell.