

Project Kitty Hawk

Galil's DMC-2143 Controls Flight Simulator for the Youth In Aviation Programs

When Riccardo Cardona, a pilot and retired mechanical engineer for General Telecom, met with Leroy Gillaid, one of the original WWII Tuskegee airmen and now 90 years young, it was love at first flight.

Both have a lifelong love affair with flying, and they show their passion for it by keeping the dreams alive for aspiring aviators by supporting Youth In Aviation programs (YIA). This includes the Eagle Flight Squadron, Inc., a non-profit flight school located “in the middle of a very tough New Jersey neighborhood.”

“For the most part, the school is free to any youth who chooses a constructive path over the many urban pitfalls that surround them,” said Cardona. Not only does the school provide flight instruction, it offers career development, social interaction and a keen appreciation for discipline.

However, with funds lacking and the expense of flying soaring, the survivability of YIA programs like Eagle Flight Squadron is in question. There's also the problem and inherent cost of having too many students enroll in the program and then drop out for various reasons—even after logging 5–7 hours of actual flight time and many hours of classroom instruction.

Cardona and Gillaid discussed using a flight simulator to reduce the cost of flying real airplanes—and to weed out those who are likely to not stick with the program for its duration. The problem is that a simulator can cost as much as \$1 million.

Luckily, as part of the Newark's Northern Fairmount Neighborhood Redevelopment Plan, a junked simulator formerly used to study motion sickness at the United Hospital in Northern New Jersey became available—at no cost. Cardona grabbed it and launched “Project Kitty Hawk” with the goal to rebuild it to FAA Standards. Only the motion platform and floor mount could be salvaged.

But with help from major corporations and various sources, and with the key donation of a DMC-2143 multi-axis controller and AMP-20341 drive from Galil Motion Control, Cardona was able to “scrape together from surplus parts most of what we needed to get our flight simulator system up and running.”

“Prior to having the Galil controller, people did not take us seriously because the original controller that came with the simulator was obsolete. Nor did it have the resolution or response required. Once we had the Galil controller, then the whole atmosphere changed for the better and we got a lot of support,” said Cardona.

The Galil controller is used to control the pitch, roll



Galil's controller is used by the Project Kitty Hawk team to control the pitch, roll and yaw of their flight simulator.

and yaw motion of the simulator platform using three of its four axes. The fourth axis is used to keep the simulator in sync with the moving visuals shown on the computer screens and designed to mimic precisely what pilots see through the windows of the aircraft they are flying.

One of the challenges was controlling the pneumatic valves of the simulator because their inherent lag. To solve this, Galil's PID tuning filter was used to perfectly compensate the valves.

In addition, the dual loop feature of the DMC-2143 controller allowed an encoder to be placed on both the load and the control valves, enabling Cardona to compensate for any system lag by offsetting the visual.

It turned out that the Galil controller could also be used to purposely offset the visual to simulate cases where the pilot might experience a delay in visual with respect to the actual motion. This is what typically causes motion sickness, something that all student pilots are likely to experience and need to overcome.

Another useful feature of the Galil controller is its ability to handle high resolution sensors. “This allows us to fine tune the system such that it runs in concert with the computer generated flight model which is recalculated hundreds of times per second. The ability of the Galil controller to process high resolution inputs allows the simulator to trick the brain into thinking it is really in motion even though the simulator base is stationary. That is very important because young students need to feel the motion, they need to believe they're in an aircraft,” said Cardona.

Cardona reports that Project Kitty Hawk is still a work in progress, but thanks to the Galil controller and its ability to replicate the dynamics of flight with over 95% accuracy, the simulator is on its way toward FAA certification. ■

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