

NIST UNMANNED AERIAL SYSTEMS FLIGHT AND PAYLOAD CHALLENGE APPLICATION

Middle Tennessee State University Unmanned Aircraft Systems Team

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| Technical Contact | Business Contact |
| James A. Manni  jame2ec@mtmail.mtsu.edu | Kevin Corns, Ph.D.  kevin.corns@mtsu.edu |

ABSTRACT

In 1938, an engineer by the name of Charles Zimmerman designed an airplane that was truly a head of its time. The V-173, nicknamed “Zimmer’s Skimmer”, was laughed at, ridiculed, and mocked by everyone, until it flew. The V-173’s two massive outboard props created a perfect counteraction for wingtip vortices, making the craft incredible agile and impossible to stall. Coupled with its unique flying saucer lifting body shape, the airplane became airborne in a fraction of a conventional airplanes takeoff roll, and could climb almost vertically with only two 80 horsepower. Vought Aircraft jumped at the idea, followed by the U.S. Navy. By the time this brilliant craft was ready for its time in the sun, its time had passed. The war was over and the jet engine had taken over, making the V-173 all but obsolete. But funny enough, its origins are what attracted us to this plane. Back when people were still laughing at Zimmerman, he built a small remote control version to test his theory. Very little history of this plane exists, but test footage of his little model popping instantly up into the sky and hovering vertically, steady as a brick, still remains.

With 70 years of technological improvements coupled with concrete, historical roots, we are ready to bring Zimmerman’s idea to life again. Modern lithium-ion batteries will replace the fabric material and cable tether, and highly efficient brushless motors will replace internal combustion engines, but our core design remains unchanged. A lifting body will allow for incredibly high payload capacity and the outboard control surfaces allow the aircraft to sit on its tail and be launched vertically. These control surfaces also give the aircraft its simplicity, there are no other moving parts needed to transition from vertical to horizontal flight. Unable to stall, the aircraft can match any angle of attack, making it incredibly efficient. We expect 6+ hours of flight time, more so with the addition of solar or onboard power generation. The aircraft is quick to launch, suitable for many environments, and easily repaired in the field with basic supplies. We are excited to resurrect a piece of history and develop a low-cost, long endurance, and high payload UAS designed specifically for first responders.