



On The Shoulders of Giants – The Pioneers of Modern Simulation

In the first of a new series, **Rick Adams** explores the milestones that changed the simulation industry, focusing on the context of the challenge and the amazing people who had the vision and perseverance to conceive and implement creative solutions.

“If I have seen a little further it is by standing on ye shoulders of Giants” – Sir Isaac Newton

If the “father of science” was observing our planet today, particularly the gravity-defying world of aviation, he might modify that statement to “flying in the right seat with Giants”, in recognition of the astounding achievements of the past century.

We may forget sometimes that in order to reach the advanced state of flight training today, there had to be a lineage of building blocks and breakthroughs. Those advances have enabled 21st century engineers and business leaders to enhance the efforts of their predecessors.

In this first retrospective, we salute three extraordinary individuals who represent the soul of flight simulation. They share a number of traits, foremost among them a love of flying. As aviators and in business, they were willing to take risks.

But they were also passionate about the need to continually improve safety in the skies. Those fortunate to know them personally ascribe characteristics such as disciplined, honest, frugal, and humble.

Here, then, is a brief reflection on three broad-shouldered Giants in civil aviation training: Ed Link, Al Ueltschi, and Rudy Frasca.

Edwin A. Link, Jr.

Almost everyone associated with the aviation training community readily recognizes the legendary Link name. Of how Ed built the first successful ground-based flight trainer, the defining moment when his monoplane emerged from the fog in Newark, New Jersey (impressing the Army Air Corps brass with the trainer’s ability to teach instrument flying), and the ubiquitous WWII “Blue Boxes”, which helped half a million Allied airmen earn their wings.

You may also have heard of Link’s

development of the Apollo Lunar Module mission simulator, a critical tool in landing men on the moon in the ‘60s, and numerous other firsts, which paralleled virtually every aircraft advancement.

Edwin A. Link, Jr. might never have become the “father of simulation,” though, had he bowed to his own father’s furious admonition to abandon the foolishness of flying. But when Ed Sr. fired Ed Jr. from the Link Piano and Organ Company, the enforced unemployment only gave the young dreamer more time to indulge his affinity for exploring the skies. At age 24, Link bought Cessna’s first production aircraft, a 120hp AA.

Ed’s primary objective in creating the original Link Trainer in 1928-29 was to reduce the time and cost of learning to fly. He also opened a flying school, “guaranteeing” to solo students for only \$85. He operated the first scheduled airline from Binghamton, New York, in an innovative partnership with Martz Bus

Opposite page: The Blue Box simulator production line in the 1940s.

Image credit: L-3 Link Simulation & Training.

Company. Link even conceived a before-time integrated cockpit display.

In the '50s Curtiss-Wright had the market edge on trainers for prop-driven airliners with their A-C analog computing approach. Link bet the company's civil future on the more expensive D-C, "a more demanding technology but capable of far greater precision," according to Ray Page, then manager of Qantas Simulation Services. Link's DC-8 jet simulator was the first type-specific trainer to be "flown" before the first flight of the new aircraft. It also incorporated the Mark IV closed-circuit visual system depicting an airport runway and surrounding terrain. Orders from United, SAS, KLM, Western, Japan, Trans-Canada, Alitalia, and subsequent devices for the B-707, Convair 880, and Lockheed Electra, assured Link's dominance in civil simulation for the next two decades.

Even before selling the simulator business to General Precision in 1968, Ed dove into ocean exploration, inventing the world's first submersible decompression chamber.

Ed Link passed away on Labor Day in 1981 at the age of 77. Dr. Joseph MacInnis, president of Undersea Research, said Link "loved working alone, late at night, gnawing at a problem until he mastered it. Talking to him, you sometimes got the impression that his mind was traveling elsewhere."

MacInnis described him as like "two men – one with a tool box in his fist, the other with a dream in his head."

Al Ueltschi

As a child A.L. "Al" Ueltschi helped deliver milk in the area around the family's Kentucky dairy farm. But he became hooked on aviation from age 10 when he listened to reports of Charles Lindbergh's triumphant 1927 transatlantic flight. Ueltschi scrounged enough lessons to solo at 16, but soon recognized that 5-cents-a-quart milk would never earn him enough to buy a plane. So he turned to selling 10-cent beef patties and Cokes. "The sole purpose of that burger business was to finance my dream of flying," he recalls. Its success led a local banker to lend him \$3,500, which the 18-year-old



Pioneers of modern simulation. Clockwise from top: Rudy Frasca, Al Ueltschi and Ed Link.

Image credits: Frasca International, FlightSafety International, L-3 Link Simulation & Training.

parlayed into a commercial license and his first airplane.

Perhaps the seminal incident, which led to his relentless emphasis on air safety, occurred while teaching an aerobatic course. During a snap-roll maneuver one of the CAA inspector-students flipped the aircraft on its back so hard that Ueltschi's entire seat fell out of the plane. That near-death experience taught him three important lessons: "Training in an airplane can be hazardous. When the unexpected occurs, take appropriate action in a timely fashion. If at all possible, be lucky."

His passion was to fly for a big airline, so when he was invited to interview at Pan Am International he drove for two days to Miami. Ueltschi got lucky again when, after only two years with Pan Am at age 26, he was tapped by Trippe to pilot what was essentially one of the first corporate executive aircraft. The "six month" assignment lasted from 1943-1968.

After World War II and Korea, corporations took advantage of the ex-military pilot pool and new turbine-powered business aircraft to launch aviation departments. But corporate pilots were not getting the continuous training required for airline crews. Ueltschi spotted an opportunity.

Mortgaging his house for \$15,000, and with Trippe's blessing, Ueltschi opened FlightSafety International in 1951, ostensibly in his "spare time", since he continued to fly as the Pan Am president's "skipper" for another 17 years.

Ueltschi recognized that advanced simulators were essential to effective training. Leveraging deposits against training services from customers, Ueltschi paid Ed Link \$150,000 for a second-generation sim called the Translator. The astute Ueltschi, believing that Curtiss-Wright would try to sue both companies for patent infringement, convinced Link to indemnify FSI in advance of the action. (Curtiss-Wright did sue, but lost.)

Ueltschi's next coup was persuading Trippe to include pilot and maintenance technician training – at FlightSafety, of course – as part of the purchase price of every new Falcon Jet. Today, FSI has numerous such agreements with aircraft manufacturers.

The FlightSafety founder took the company public in 1968, finally stepping down from Pan Am. In 1996 he swapped his shares for a stake in Warren Buffett's fabled stable of high-performing Berkshire Hathaway companies. Today, at an estimated net worth of \$1.8bn, the 90-year-old Ueltschi nearly makes the Forbes 500 list of the world's richest people.

The story would be incomplete, though, without reference to Project Orbis, a cause launched in the early 1980s to perform eye surgeries and teach sight-saving techniques in underdeveloped countries using a "flying hospital".

Ueltschi continues as chairman of FlightSafety International, wintering in Florida. But during warmer months you can often find him at the Marine Air Terminal facility at New York's LaGuardia airport, where FSI and corporate pilot training began.

Rudy Frasca

Mention the name Frasca in the aviation community and you are likely to get one of two responses (or both): vintage war birds and simulators. Rudy Frasca, now 76, has his family name on more than 2,200 flight simulators – from general aviation trainers through helicopter devices to jet transport full-flights – in more than 70 countries and a large majority of university aviation programs and private flying schools.

He has also collected more than 50 antique and classic aircraft, restoring them for the Frasca Air Museum, adjacent to Frasca International's operations in Urbana, Illinois.

Frasca has held every office in the early Warbirds of America organization and has been a member of the Experimental Aircraft Association for a half century. Among his numerous honors is a Royal Aeronautical Society Silver Medal - not bad for a Chicago-area lad who soloed, albeit underage, at 14. "I fell in love with flying," Rudy says with all the enthusiasm of a teenager. After high school he joined the full-time Navy Reserve and taught instrument flying using early Link Blue Boxes.

While working at the University of Illinois doing transfer of training research, Frasca met Ed Link. "I mentioned my goal of manufacturing flight simulators," Rudy recalls (which would put him in direct competition with the fledgling industry's dominant presence). "He got a kick out of that."

During his eight-year stint at the U of I, Frasca developed what may have been the first trainer visual system. Using the sine wave from an oscilloscope, he projected the geometry of the runway on a translucent screen, enabling pilots to make simulated approaches.

Frasca also developed, in the early '50s, a VOR/ADF simulation (VHF omni-

directional range navigation system / automatic direction finder) and installed kits for operators of Link trainers around the country.

It was a research project with the Aircraft Owners and Pilots Association, "AOPA 180," teaching pilots how to maintain aircraft stability using only rudders while executing a 180-degree turn, that led to Rudy's development (in his garage) of a "mechanical computer" flight system and Frasca's first complete trainer in 1958. Barely half-finished, "Monty" Montgomery of Aviation Training Enterprises (now American Flyers) ordered the first device. When Frasca delivered it to Midway airport in Chicago, "he gave me a check to build another one." Since then, American Flyers has acquired over 100 Frasca trainers.

Rudy is officially "semi-retired," and Frasca International is kept humming by his son John, several other children and grandchildren, and about 160 employees – "Half are engineers," Rudy proudly states.

"He stays involved," says John of his father. "He's here daily, meeting customers." And, need it be said, "He flies every chance he gets." **cat**



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