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Life of Riley: The Twin Navion

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Troy and Sherry Welch fly their D-16A Twin Navion over Possum Kingdom Lake in Texas. [credit: Jack Fleetwood]

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The Life of Riley:
A Historic Twin Navion

by **Matthew McDaniel**

Walking across the ramp of Arizona’s Chandler Municipal Airport (KCHD), outside of Phoenix, under the warm spring sun, the presence of the brightly painted twin loomed large in the distance. Even before the owner, Troy Welch, and I completed our pre-flight inspection, we were interrupted not once but twice by a friendly inquiry of, “What is that?” The first time, the question came from a couple loading their aircraft in the adjacent parking spot. They were taken aback by the significant stature of the twin. After all, the tip tanks of its low wings were nearly the same height as the bottom of their Cessna’s high wing. The second inquisitor had seen the strange twin from across the apron but couldn’t identify it. He explained that he just had to drive across the airport to get a closer look. Upon learning the plane was a TEMCO-Riley D-16A Twin Navion, his expression quickly transformed into a broad smile of recognition. “I sure thought it looked like a Navion, but I never knew they made a twin-engine version,” he replied. A few minutes later, engines running and taxiing to the active runway, the question was asked a third time. Initiated by the ground controller, the conversation repeated itself again. This time across VHF radio waves.

North American's Civilian Sedan

North American Aviation (NAA) scored a major PR victory when their B-25 Mitchell medium bombers, under the command of Jimmy Doolittle, became the first American aircraft to strike the Japanese home islands in 1942. Their equally famous and fantastically photogenic P-51 Mustang fighter had the range to accompany bombers deep into enemy territory and became the steed of many an ace. With lucrative military contracts ending, NAA intended to use their name recognition to sell a civilian family hauler that could help to keep their post-war balance sheet in the black. Even the name of the aircraft would be a word invented for the purpose. The company's stock exchange code was "NAV." NAA added the "ion" and the first two letters were capitalized to further highlight the machine's North American pedigree.

The NAvion's robust design and construction drew directly upon NAA's military experience. In fact, even the military was impressed enough with them to place multiple orders, which were used in various liaison roles and designated the L-17. While no manufacturers achieved the civilian sales numbers they predicted after the war, NAA was successful enough selling NAvions to keep their core staff of engineers and laborers busy during the gap years between the winding down of P-51 production and the spooling up of their military jet aircraft production. By 1948, however, NAA was again receiving big military contracts to build fighters and bombers. The decision was made to sell the NAvion to the Ryan Aeronautical Company. In 1949, Ryan re-started Navion production (with the "A" now in lowercase) at their San Diego facility. By the time production ended in 1952, over 2,600 had been built between both companies.

Owner Troy Welch frequently flies N108N to/from non-paved runways, showcasing the study undercarriage of the Twin Navion (an uncommon trait for a light twin). [Provided by Troy Welch]

The interior of N108N has been beautifully updated. As the huge canopy slides forward, a large hat rack becomes available to the back seaters and covers the baggage area for safety.

The vertical tail of the Twin Navion is a standard Navion horizontal stabilizer mounted vertically.

The type and production certificates have since changed hands at least a half-dozen times. The "Rangemaster" version was put into limited production in the 1960's. It replaced the sliding canopy with a solid roof/door arrangement and added enough fuel capacity to boast a bladder-busting, 1,800-mile range. Less than 200 were built. Multiple upgrade and modification programs have been popular, creating many subsequent model designations. Myriad engine types, aerodynamic clean-ups, and modernization mods have been approved, as well. Navions continue to be revered by owners and supported by both an active type club and the current Type Certificate owners in Minnesota.

Acme's X-Plane

The most common complaint of early Navion owners was the relatively low power, given its bulk. Even Ryan's final production model, the "Super 260," was not considered to be a powerhouse. They were big, roomy, rugged, stable and reliable. Yet, they were not speedsters nor stellar climbers. Nonetheless, many owners loved their flying qualities and contemplated solutions to improve performance.

One owner was businessman Chuck Daubenberger, who had amassed a post-war aircraft collection. His Navion was a favorite, but he was dissatisfied with its lack of redundancy, as he frequently flew over mountainous regions. He took the aircraft to Acme Aircraft Co. in CA, where Roger Keeney jokingly suggested adding an engine to it. Jokes aside, the idea ruminated in both their minds. Daubenberger soon handed his Navion over to Acme, who enlisted the help of multiple NAA aerodynamicists and engineers who'd worked on the original NAvion design, as well as some ex-Douglas engineers. Their local contact at the Civil Aviation Authority (CAA; predecessor to the FAA) assured them (in writing) that if they could complete the engineering and design work to build and test it, it could be made legal via Major Repair/Modification Forms (337s).

Used 125hp Lycoming O-290 engines and cowlings were installed. A crude nose bowl was hand-formed. Vertically mounted, a spare horizontal stabilizer and elevator were used to replace the original vertical stabilizer and rudder in order to increase their area for marketing purposes (in spite of engineering's insistence that the original area was sufficient for engine-out directional control). The prototype was referred to as the X-16, and, of course, all sorts of minor changes and adjustments were made throughout the testing program. After about a year's work, in Nov. 1952, the team achieved certification, and the aircraft was renamed the D-16 (being Daubenberger's 16th aircraft).

In short order, higher-ups in the CAA got wind of the project and the fact that it had been certified via only Form 337s. They informed Acme that the certification was not valid, in spite of the 2,000+ engineering drawings that Acme had submitted detailing their modifications. Acme and Daubengerger quickly prevailed, as their program and paperwork complied with the rules that existed at the time. However, the CAA learned a lesson, which soon led to the creation of the Supplemental Type Certificate (STC) process for approving major modifications to certified aircraft.

The huge area of the rudder on the Twin Navion, combined with the ample trim tab, proves very effective in contending with engine-out operations.

A second Navion was converted to a D-16 by Acme for Jack Riley, an entrepreneur and highly successful aircraft salesman, who purchased the rights to the design. Riley's aircraft had 135hp O-290 engines. He soon purchased the original D-16, as well, and had it fitted with 150hp, O-320 engines. Slow production began at Riley's facility in Florida in early 1953.

Production Twin Navions

Within months, demand was higher than Riley could meet, and the Texas Engineering & Manufacturing Co. (TEMCO) was sold exclusive rights to manufacture the D-16, marketed as the "Riley Twin." Sixty D-16s were produced by late 1954. At that point, TEMCO introduced the D-16A, which

they called the "Riley '55." The A-model incorporated a welcomed horsepower boost to 340 via two 170hp Lycoming O-340s and full-feathering, constant-speed props. Other improvements included a 250-pound gross weight increase (to 3,600 lbs.) and optional tip tanks. Fuselage tanks were exchanged for nacelle tanks. The Riley '55 carried an impressive 144.5 gallons in wing center-section, nacelle, and tip tanks. The CAA convinced Riley to re-certify the D-16A under a new type certificate due to the sweeping changes. Production ceased in late 1957 after 45 D-16As had been produced. Several prior conversions were later upgraded to D-16A configuration. Including prototypes, 107 Navion airframes eventually became Acme/Riley/TEMCO Twin Navions.

Another twin-engine Navion conversion program was certified, as well, though its details surpass the scope of this article. Known as the Camair 480 and 480C, the timeline follows very closely behind that of the Acme/Riley story. But, the Camair was a very different animal, with 240hp Continental O-470 engines, many fiberglass components, a newly designed tail, and a much higher gross weight. It was, of course, faster but was even further behind the market trends than TEMCO/Riley was. Costing 50% more than a TEMCO/Riley conversion, Camairs struggled for sales. Only 33 were built (between 3 different manufacturers and spread out over a decade-plus timeframe).

In the end, the Twin Navion numbers stayed low, not because they weren't wonderful airplanes but because they simply cost too much. Competition was fierce, with Piper selling its PA-23 Apache for the same price as a TEMCO/Riley '55 conversion (which, of course, required the buyer to also supply a Navion airframe to start the process). Cessna's 310 and Beechcraft's BE-95 Travel Air filled any remaining voids in the light-twin market, also selling well below the all-in price of a TEMCO/Riley or Camair converted Twin Navion.

The panel of prototype D-16A Twin Navion, N108N. While many upgrades have been completed over the years, owner Troy Welch says that a second Garmin G5 and full engine monitoring are on his project list.

Unique Among the Rare

A flying Twin Navion of any variety has become exceeding rare today. After all, these machines were built as Navions in the 1940s or early 1950s. With the exception of a few Camairs, conversions were all completed in the 1950s. So, only about 140 Navions were

While the power quadrant of the D-16A Twin Navion appears busy, it is very well organized.

The pilot-side yoke of the Twin Navion. TEMCO produced the aircraft for Riley in Texas after Riley's facility in Florida could not meet demand. Initially, as the Twin-Riley (D-16), then as the Riley-55 (D-16A).

Twin Navion owner Troy Welch (left) and author Matthew McDaniel (right) at Phoenix Sky Harbor Airport (KPHX) after their evaluation flight of N108N. [Cutter Aviation]

ever converted to twins, and these machines have all celebrated at least their 70th birthday now. Of the half-dozen or so examples believed to still be airworthy, Serial #TTN-39 is surely one of the most notable.

Originally manufactured by NAA in 1946 as Serial #NAV-4-418, sporting a Continental E-185 engine (205hp for takeoff, 185hp continuous), it was purchased by TEMCO in early 1954. After re-registration as N108N, TEMCO soon received approval to begin certification testing it as a twin with one Lycoming O-320 (150hp) and one O-340 (170hp). During testing, the second O-340 was eventually installed, making this airframe the prototype D-16A. It was flown by TEMCO throughout the rest of the D-16A's production life, for testing and promotional purposes. Featured in many advertisements and magazine articles during that time, it acted as the poster child for the Riley '55.

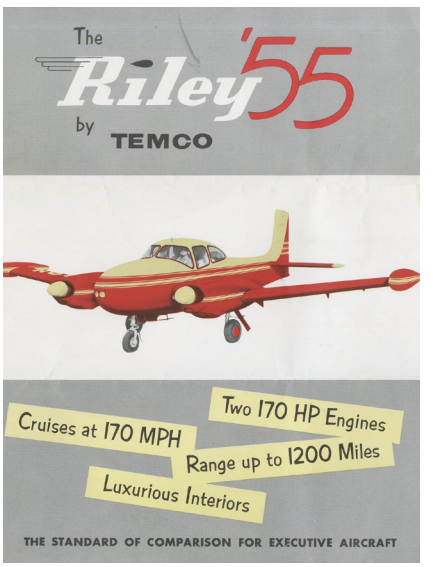
In 1958, Jack Riley was the registered owner of N108N. Thereafter, it went through a steady sequence of a dozen owners but appears to have stayed relatively active, even winning a Best in Class award at Oshkosh AirVenture 2003. In Jan. 2017, it was acquired by its current owner, Troy Welch. A professional corporate pilot, flight instructor, and retired attorney, Welch still flies a Citation X+ in his day job while enjoying a variety of general aviation aircraft for more leisurely pursuits. His pride in being the caretaker of TTN-39 is obvious.

Getting Acquainted

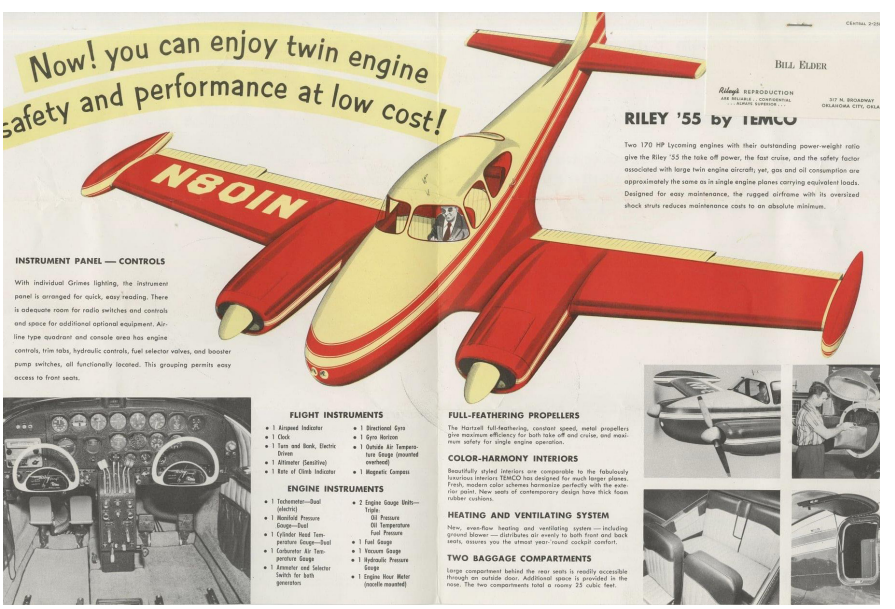
It's probably worth noting that prior to my introduction to N108N, I'd never flown any version of a Navion. However, in my experience, most airplanes fly the way they look. Their overall appearance and features give hints as to how they'll handle. The Twin Navion was no exception.

The T-Nav's steep wing dihedral and towering tail practically scream, "stability." Its tall gear and big tires have an uncommonly sturdy look for a light twin. They tell you turf runways are no problem for this twin. The broad fuselage and nose imply that cabin comfort and storage space were prioritized over speed. However, when one considers the 1,200-mile range of the D-16A, a comfortable cabin becomes a significant plus.

An exterior baggage door eases loading of the cavernous space in the aft cabin, rated for 180 lbs. A smaller nose baggage area, rated for 134 lbs., is a breeze to access via the flip-up nose cone. Well-placed steps and handles make climbing onto the not-so-low wing simple. However, entering the cockpit is less so. With the huge canopy slid full aft, step over the fuselage side onto the cabin floor between seat rows.



Sales brochure for the Riley-55 Twin Navion, for which N108N was the prototype. [Provided by Troy Welch]



The interior centerfold of the 1955 sales brochure for the improved "Riley-55" Twin Navion makes it obvious that N108N was both the prototype and the poster model for the D-16A model. [Provided by Troy Welch]

Owners Troy and Sherry Welch enjoy an evening sunset flight in their Twin Navion over central Texas. [Jack Fleetwood]

Rear-seat passengers enter with ease. But continuing forward requires some contorting in order to squeeze between the pilot seats while also maneuvering around the sizable power quadrant. The alternate method of stepping directly onto the pilot seat, then sliding down into position, is only marginally easier, as the windshield frame comes too far aft to allow you to simply drop in vertically. Yet, the slightly awkward entry is no worse than so many other airplane types, including many cabin-class twins. Once in position, the pilot work station is very comfortable. Visibility for all occupants is excellent. The seat pans are well above the level of the wing, putting your sight line both high above the ground and above most of the airframe, too. Unlike most low-wing piston twins, neither the engine nacelles nor the long nose restrict visibility significantly.

The panel layout of Welch's steed is still a little old school. The radio stack is far left and partially blocked from view by the left yoke (especially for the right-seater). However, the flight instruments have been updated into a standard 6-pack arrangement with a modern Garmin G5 attitude indicator. Mag switches and the hydraulic pump control are a bit hidden to the right of the power quadrant. The quadrant itself appears a bit busy, but it's actually very well organized. As with many twins of the era, the throttles are centered, while the prop controls are to the left. The quadrant also features starter, primer, and fuel pump switches, plus flap, gear, trim, and carb heat controls.

The Personality of N108N

Toggling the 3-position electric switch left and right to prime the carbureted engines makes hot or cold starts predictable. Taxiing presents no unusual challenges, with responsive braking and steering and the availability of differential thrust if extra tight turns are necessary. Run-up and pretakeoff checks are standard, as well. Check mags, carb heats, vacuum and hydraulic pumps, and cycle the props.

Like in all U.S. aircraft of this era, speeds are all in MPH. Initially, we were relatively light with only about 50 gallons of fuel, two adult males, and about 100 pounds of bags in the aft compartment. But, the afternoon temps in southern Arizona were in the high 80's. Vmc (minimum control speed, single-engine) is marked as the lower redline of 86. Vyse is 102, but no blue line denotes it on the ASI. However, the Navion's big wing and thick airfoil are ready to fly before reaching Vmc. So, one can be patient and allow speed to build in a longer ground roll, or level in ground effect briefly to allow speed to accelerate past Vmc and towards Vyse before climbing. I did a little of both, and in short order, Troy and I were headed southwest for maneuvers enroute to Gila Bend Municipal Airport (E63).

Basic air work in the '55 was sedate. Stability abounds, making steep turns, slow flight, and stalls absolutely predictable. The big light twin (an oxymoron that feels totally appropriate) is surprisingly light on the controls but very well harmonized. However, trimming can be cumbersome. Both rudder and elevator trims are operated via small left/right cranks on the lower power quadrant. Rudder trim is intuitive in this arrangement. Elevator trim is not. Clockwise for nose down, counter-clockwise for up. In practice, it's an exercise in gauging reaction to your input versus consciously cranking in the correct direction. I'm reminded of old Pipers with the trim crank on the ceiling. Each time a new input is needed, everyone seems to turn it the wrong way at first.

Trimming nit-picks aside, we were soon exploring single-engine operations. The T-Nav's critical engine is on the left, as in most non-counter-rotating light twins. But, because the engines are only rated at 170hp each, this "criticality" is less noticeable than in more powerful twins. With the left engine at zero-thrust, we could easily maintain 200-300 FPM climbs well below full power on the operating engine. This was also easy to manage without adding rudder trim. With full power on the right engine only and trimmed out, 500+ FPM was sustainable right to our cloud-limited altitude of 4,500' or so. The literature says the Riley '55's single-engine service ceiling at MGW is 6,000 feet. Of course, that's likely a standard temperature calculation. Because we were somewhat altitude-limited by cloud coverage, we didn't explore Vmc down to directional control loss. However, the single-engine flying we worked on made it obvious that the rudder was huge and very effective.

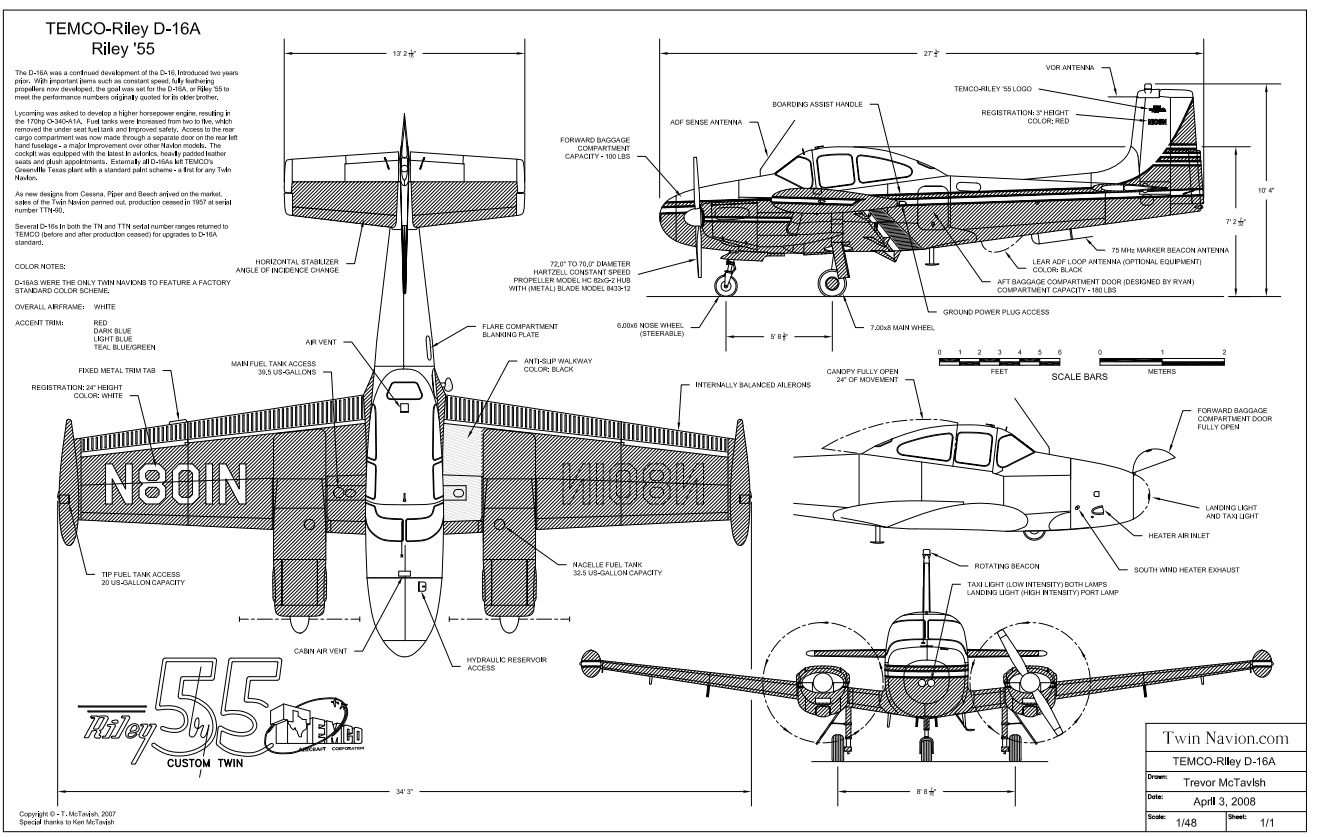
For pattern work, Welch's preferred method is to slow below the common

gear/flap speed (116) and do most everything abeam the numbers: Set power, carb heats on, get the flaps coming down, and lower gear. That is straightforward enough but with one caveat. The hydraulic flaps deploy slowly. Very slowly. So, by starting them down abeam the numbers, Welch's preferred 20º-25º landing setting is not extended until late in the base leg. If full flaps (35º) are desired for a short-field landing, they won't be down until established on final. Of course, this means lift/drag is a changing equation throughout almost the whole pattern, requiring careful attention to both power and airspeed. It's a little distracting at first, but it's manageable. Welch believes a future rebuild of the hydraulic pump will resolve the slow-deployment issue. Once the chosen flaps are down, trim can be set for final approach speed, and things dial in quickly. Troy warned that pulling the power off too early, combined with a high flare, could set up an abrupt sink. But, honestly, I found the T-Nav to be a pussycat to land, providing honest pilot feedback the whole time and with a sight picture that I felt comfortable with almost immediately.

In Gila Bend, Troy pumped just shy of 100 gallons into N108N as the temp hit its afternoon high of 93F. While we departed at least 400 pounds heavier than we had from CHD, the D-16A didn't even seem to notice. It felt no different to me whatsoever. Of course, in a low-altitude engine-out scenario, I'm sure the differences would be notable. Picking up our IFR clearance into Phoenix Sky Harbor Int'l (KPHX), we climbed to 7,000 feet. Level, we set 75% power, leaned via the EGTs, and settled into a 160 TAS cruise, burning 20 gallons per hour. Very economical, indeed. ATC requested 150 IAS throughout vectors onto the ILS at PHX. Since that's 3mph below the yellow-line airspeed, descending into the afternoon turbulence was not a problem and hand flying was a breeze. Established on the LOC & GS for Runway 25L, we held 150 to a 3-mile final, then let the big props and the stiff headwind, followed by gear and flaps, slow us to Troy's preferred stabilized final speed of 100-105 (crossing the threshold at 90).

Before I'd even left the runway centerline, Troy was already answering Tower's questions about his Twin Navion. Taxiing onto the apron of Cutter Aviation, a single lineman guided us to parking. As both props stopped, three others materialized, all curious to know, "What is that?" T&T

Matthew McDaniel *is a Master & Gold Seal CFII, ATP, MEI, AGI, & IGI and Platinum CSIP. In 34 years of flying, he has logged nearly 22,000 hours total and over 5,900 hours of instruction given. As owner of Progressive Aviation Services, LLC (www.progaviation.com), he has specialized in Technically Advanced Aircraft and Glass Cockpit instruction since 2001. McDaniel is also a Boeing 737-series Captain for an international airline, holds eight turbine aircraft type ratings, and has flown over 135 aircraft types. Matt is one of less than 15 instructors worldwide to have earned the Master CFI designation for 11 consecutive two-year terms. He can be reached at* **matt@progaviation.com** *or 414-339-4990.*



A detailed 3-view drawing of the D-16A prototype (N108N) was created by Canadian Twin Navion owner Trevor McTavish. Trevor also created and maintains a comprehensive Twin Navion website (www.twinnavion.com)