



BY JIM MOORE // PHOTOGRAPHY BY MIKE FIZER

micro.

Little jet, big impact

Hunkered low on the tarmac, a powerful jet engine howls in a tiny airframe, with just room enough for a single pilot. Sleek lines and a compact fighter form evoke Buck Rogers science fiction fantasies; a polished aluminum skin gleams in the sunlight; and a résumé that spans four decades of triumph, tragedy, bankruptcy, movie-star glamour, and mass appeal like few aircraft have ever inspired—this is the BD-5J reborn, and Air National Guard Maj. Justin Lewis is the pilot.



Wherever it has gone, eyes have been drawn to the curious brainchild of James R. Bede and Paul Griffin.

The first **BD-5**, a propeller-driven model, had not yet flown when a nonflying prototype wowed the crowd at the EAA convention in Oshkosh in 1970.

In the years that followed, logging airshow gigs and film and television—including a memorable feat of airmanship by JW. “Corkey” Fornof, who flew one through a hangar as cameras rolled for the James Bond film *Octopussy*—the BD-5 also graced many magazine covers and inspired scores of people to become pilots, even if only a few ever had a chance to fly the single-seater.

Among those inspired was Ed “Skeeter” Karnes, who studied aerospace engineering in college and already was working for Lockheed when he read a copy of a 1970 *Mechanix Illustrated* featuring the BD-5. He carried the magazine in his briefcase through college, but the elusive airplane never really hit the market.

A 1978 consent order from the Federal Trade Commission required Bede Aircraft Inc. to stop misrepresenting the availability of parts, along with the “performance, reliability, and safety” of the BD-5. A trustee, appointed in an effort to save a company that had promised much more than it ever delivered, required Bede’s business to establish a \$9 million redress fund for consumers. Bankruptcy soon followed.

It was a setback for the thousands who bought kits—and the 6,600 (by Bede’s count) who paid deposits on a production version that never came to be—as well as the fledgling kitplane industry.

Karnes is now working to see to it that is not the final chapter. A long-deferred dream began to come to fruition in 1992, when he bought out the stock of a West Coast dealer and began to reengineer the BD-5—starting with the piston version, followed by the turboprop and the jet. Karnes worked with his son, Richard, and Lewis to complete an exhaustive design and flight test program that culminated with the first flight of the FLS Microjet (an updated BD-5J) in 2011, echoing decades later the work done at Bede’s shop that helped launch the career of Burt Rutan, along with Fornof—who has flown more than 3,300 airshows, and worked as a pilot or

aerial stunt director on 46 feature films and hundreds of television commercials. Also on the first development team was Bob Bishop, who gave the BD-5 its greatest aerodynamic test: an unintentional 15-G pullout that bent the wings, but did not break them.

Karnes set out to bring the slide-rule aircraft into the modern age—but not, he said, to radically change the basic design executed by Griffin to match Bede’s vision. The Flight Line Series Microjet, produced with a combination of old and new parts, is packed with avionics and computers unheard of in 1972. Karnes modified the airfoil and extended the fuselage to improve flying characteristics; added digital engine controls to manage a turbofan made in the

Czech Republic, as well as a triple-redundant electrical system; and instituted a mandatory builder assist program at BD-Micro Technologies’ Oregon factory.

“It’s really beyond the capability of most builders out there,” Karnes said of the original BD-5 kit, with its compound sheet-metal curves and demand for precision assembly.

Lewis and Karnes hope the new design—and new name—will shake the bad memories of fatal crashes and financial catastrophe that marked the end of Bede’s effort to fill thousands of orders. “It has an undeserved reputation,” Karnes said, noting that no BD-5 has ever been lost because of structural failure in flight.

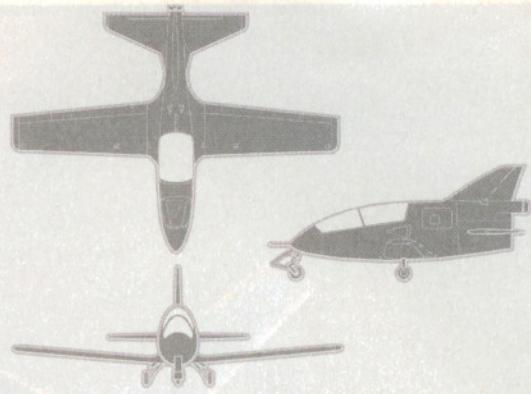
‘I DON’T REGRET ANY OF IT’

Demand for the BD-5 models far outpaced anything James Bede had imagined. In 1970, the first year the EAA convention (now AirVenture) was held in Oshkosh, Bede brought his BD-5 concept

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model almost as an afterthought to fill space next to the BD-4 kit—arguably the first kit-built aircraft ever made—he was actively selling at the time.

THE LITTLE BD-5 STOLE THE SHOW

Bede soon found himself fielding questions on a flatbed trailer provided by EAA founder Paul Poberezny that lifted the tiny aircraft into sight of an eager crowd. Bede said he had hoped to sell perhaps 1,000 aircraft in a decade, and was caught off guard by the outpouring of interest. "We were already up at 800 orders right then, and the airplane hadn't even flown yet," he recalled. "We literally had to go back to the drawing board."

Plans to produce a fiberglass skin were scrapped in favor of metal once it became obvious the demand would support the required tooling and production process. Bede assembled a team of pilots and designers to refine the engineering and test the aircraft. He also caught the eye of a young Rutan, who was employed by the U.S. Air Force. Bede offered Rutan a pilot's job; Rutan said he convinced Bede to hire him as the flight test program engineer, and then recruited Les Berven—who became legendary in his own right—as the chief test pilot.

"It was a beautiful little airplane, but engineering-wise, it was a mess," Rutan recalled. As the basic aerodynamic problems with the original piston-powered, pusher-prop BD-5 were solved, Rutan moved to the jet version, and recalls playing a key role in the adaptation. It also provided Rutan's introduction to Herb Iverson, who worked for the French turbine maker Microturbo that supplied the first-generation jet engines. The two would go on to found Scaled Composites. Rutan left the BD-5 project in 1974, returning to California as it became clear to him the company was headed for disaster.

Bede tried and failed to certify a production version, the BD-5D. He had taken thousands of orders—and deposits. The engine manufacturer chosen for the propeller version, Hirth, went bankrupt in 1975 with 3,000 engines on the production line awaiting pistons. Bede mortgaged his family home in an effort to pull the program out of a fiscal nosedive, and wound up losing it all. "The part that hurt me the most," Bede recalled, is that "so many [customers] couldn't finish it." Hundreds of incomplete kits were shipped piecemeal, leaving owners to finish projects on their own after Bede's bankruptcy. Only a few hundred were ever registered. There are 328 BD-5s of all types now on the FAA registry; a few more are scattered around the world.

Some builders installed untested engines, sometimes with tragic results. The NTSB database includes 54 accidents involving BD-5 aircraft (all models); 19 were fatal, and 13 of those occurred on a first flight, or very early in the testing of a newly completed aircraft. Bede, an engineer by training, said he should have hired





a business expert to help run the company, and made sure there was a proven powerplant available before committing to it in the design. He has lain awake many nights since, second-guessing.

"I don't regret any of it," Bede said. "I remember selling our house and using that money to keep things going. And later I said I really shouldn't have, I should have put that money aside to save for my family. But then, you know, I'd always wonder if that extra \$50,000 or \$100,000 wouldn't have saved things. It would have driven me crazy."

'THERE ISN'T A MEAN BONE IN ITS BODY'

Fornof, who ranks the BD-5J among his five favorite aircraft, logged more time in it than most and helped train a generation of pilots using another of Bede's unique creations, dubbed Truck-A-Plane. It was an engineless BD-5 mounted on a steel frame that extended in front of a truck. Springs and a gimbal mount allowed the aircraft several feet of free movement, and it proved a perfect vehicle for teaching the most challenging aspect of flying the tiny aircraft: landing.

The front of the fuselage and canopy were adapted from an ASW-15 sailplane. The BD-5 is as low to the ground as most

gliders, and therein lies the challenge. Fornof said the lowest-time pilot checked out had just earned a private certificate; the most experienced was a senior airline pilot. What they all had to learn was when to flare. "The truck would push it down the runway. They could sit there and fly it up to about 20 feet, and left and right up to 45 degrees," Fornof said. "Once they passed that, we would move on to the airplane."

Pilots who have flown the BD-5J generally describe it as predictable, and highly responsive—something a typical general aviation pilot may not be used to. "There isn't a mean bone in its body," Fornof said. "During the show, we would do tailslides. We were the first to do tailslides with the jet."

Fornof and Bishop, two of the first three show pilots, also put the BD-5J to its greatest test of all, on July 17, 1974, over Newton, Kansas. They were flying off test hours in two BD-5Js following a repair or modification, and Bishop had—for the first time—left his parachute at home.

"I would have used it," Bishop recalled, standing on a taxiway in Easton, Maryland, beside two BD-5Js that he deploys today in an Air Force mission to conduct simulated attacks on Washington, D.C., and other

sensitive areas to enhance the military's ability to track and intercept cruise missiles.

Bishop said the dogfight over Kansas in 1974 was Fornof's idea, a little fun to be had on an otherwise routine test flight. Bishop was diving beneath a cloud in an attempt to escape Fornof's persistent chase when the canopy latch (since redesigned) gave way, raising a locking lever into the 250-knot slipstream and releasing the canopy itself—which ripped free of the aircraft and struck Bishop's face. He pulled up on the sensitive sidestick and immediately blacked out from the sudden onset of forces later calculated at 16 times the force of gravity. (Various sources give different numbers; the NTSB report states the aircraft sustained "approximately 15 Gs," Bede writes 16 in his self-published book *Build Your Own Airplane*, and Bishop recalls 14.)

As Bishop regained consciousness, Fornof was right on his wing, talking to him. With a corrective lens (worn over one nearsighted eye) lost on the Kansas plain, and blood from a gash pouring into his other eye, Bishop still managed to find his headset and take control as Fornof talked him down to the runway. "He was able to guide me home, which I was very thankful for," Bishop said.



DETAILS/A triple-redundant electrical system, FADEC engine controls, and an angle of attack indicator are among the upgrades incorporated in the FLS Microjet by BD-Micro Technologies. The integrated flight displays by Grand Rapids Technologies support optional XM weather and optional autopilot, and the displays can be customized. The cockpit systems are the most obvious upgrades to the original BD-5J design, although BD-Micro also made aerodynamic changes and replaced the original French Microturbo engine with a PBS TJ-100 engine made in the Czech Republic.



Back safely on the ground, they found the wings bent upward to angles of 18 and 23 degrees dihedral (the design angle was 5 degrees), and replaced them. The aircraft is one of a dozen BD-5Js still listed in the registry today.

Bishop does note that the BD-5 has some flying characteristics that can surprise a new pilot. "The biggest problem with this airplane is landing it 10 feet in the air," said Bishop, who had developed a training regimen that includes time in a glider to develop the proper sight picture. "You think you're right on the ground, and you're not—and that will take the gear off."

Because the thrust line is higher than on a typical airplane—all versions have an engine mounted high in the tail—BD-5s have a tendency to raise the nose as power is reduced. "After you fly them for just 10 or 15 hours, you don't even notice that," Bishop said. "It's not very pronounced."

Juan Jiménez, who from 2001 to 2012 owned the Guinness World Record-holding "world's smallest jet," a BD-5J with an empty weight of 358 pounds, agrees that the thrust line can cause problems.

Jiménez took a central role in the BD-5 community, building a website (www.bd5.com) that probably is the most complete repository of information about the aircraft. He set to work restoring a partially completed BD-5B in the 1990s, and like many builders, was frustrated by a lack of information.

Completing the BD-5B made good on a dream inspired when Jiménez saw the aircraft featured in a magazine as a teen. He also became a clearinghouse of information and the glue that held a dwindling community of owners and builders together through the lean years. He never got a chance to fly his BD-5J, losing his medical certificate around the time it was certified airworthy in 2004. (The aircraft was sold this year.)

'I LOVE THIS PLANE'

Karnes spent two decades polishing flaws as he saw them out of the original design, including a tendency for the wing skin to ripple when the spar flexed under high loads. "It looks like a bedsheet in a wind-storm, the upper skin ripples that much," he said of the original wing structure. "It's quite alarming to the pilots." Karnes added

an I-beam "super spar" to augment the tube spar and stiffen the wing, and "solved that problem."

Airfoil modifications also made the FLS Microjet more docile in the stall regime, reported Lewis, who has flown F-14s and other fighters in the U.S. Navy. He said the tiny FLS Microjet is "one of the most fun planes I've ever flown. It's just terribly fun to fly."

Fun is this aircraft's primary purpose, and Bede's greatest achievement as a designer may well have been inspiring generations of pilots. Lewis, who has flown it in two shows, said the little jet still draws a crowd.

Karnes offers complete kits, including builder assistance at the factory, for \$187,500 (less than \$200,000 with airshow options including a smoke generator). He said his years of effort were very much a labor of love. "I love this plane. I have from the day I opened up that *Mechanix Illustrated*," Karnes said. "To me, it's the perfect fantasy airplane. You can go up and pretend to be Chuck Yeager all day long, and burn anywhere from 16 to 22 gallons of jet fuel an hour. That's cheap fun in today's market."

"[Karnes has] done a lot of things well," Bede acknowledged, though he scoffed a little at the new wing spar design. "It's just heavy."

Bede is working on his own update, a two-seat BD-25 still on the drawing board. He said the original goal of producing a low-cost personal aircraft is still attainable, with many more engine options now available. He recalls selling 56,000 BD-5 information kits, and believes he could do it again today.

"It's still out there, that market. People still want to fly. Why don't they fly? Because the problems haven't been solved for them," Bede said. As for pilots, Bede reports that his annual visits to Oshkosh still spark perhaps two dozen conversations each year with people who got into aviation because of the BD-5. It's this legacy that Bede is proudest of.

"We thought it was going to change the face of aviation," said Bishop, who reported similar experiences drawing crowds over the years he flew BD-5Js on the airshow circuit, sponsored by Coors. "And it could have."

Karnes, still planning further modifications, tweaks, and upgrades, has invested much to give it another chance. **AOPA**

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