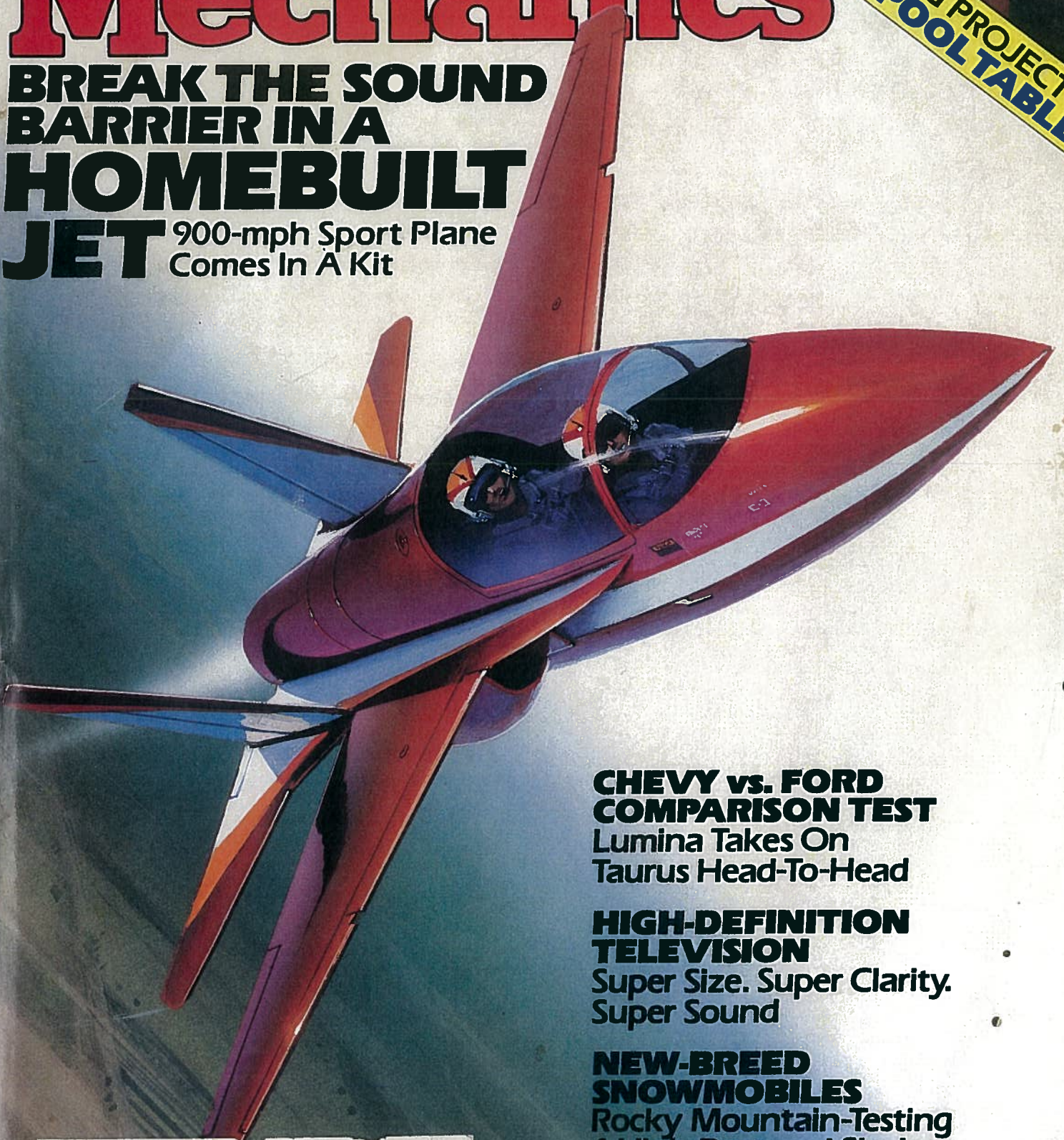


Popular Mechanics

BREAK THE SOUND BARRIER IN A HOMEBUILT JET

900-mph Sport Plane Comes In A Kit

WOODWORKING PROJECT
PRO-FEATURE POOLTABLE



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HOMEBUILT MACHBUSTER

Maverick kitplane designer James Bede is on the verge of realizing his dream—a Mach 1.4 jet for everyman.

BY WILLIAM GARVEY

CANOPY UP, YOU SLIDE INTO the snug, well-equipped cockpit. Battery switch on, and the engine begins to crank. As the turbine speed reaches N1, advance the power lever and light the fire. Once the engine spools up to idle, go to internal power. You're ready. It's time to go flying, fighter-pilot style.

To know the thrill of piloting a superhigh-performance jet fighter, you first have to sign up for someone's air force—since only a government can afford to operate such exotic machinery. At least that's the way it's been ever since the Messerschmitt Me 262, the first jet fighter, took to the air in World War II. But now someone is challenging that tradition.

Jim Bede, the one-time guru of the homebuilt aircraft set, is back. This time with a dream machine even more outrageous, more revolutionary than his single seat BD-5 of the 1970s. He calls his latest creation the BD-

William Garvey is editor of Flying magazine.

10J, and if he can really bring it to life, the airplane could literally change the course of aviation forever. This is Everyman's Fighter.

With an empty weight less than a VW Beetle and dimensions similar to the Yankee, the light trainer that Bede created at the start of his career, the 2-place BD-10J promises to be a Mighty Mouse indeed. The secret is what's packed in the compact fuselage—a General Electric CJ 610 turbojet pumping out 2950 pounds of thrust.

Since the engine's power rating exceeds the normal gross weight of the aircraft by 200 pounds, the resulting performance—30,000-ft.-per-minute vertical climb and a cruise of 1.4 Mach—is extraordinary. Astonishing, actually, when you realize that the BD-10J is designed as a build-it-yourself airplane.

Ever the optimist, despite his near financial ruin brought about by the BD-5 debacle in 1979 (see "BD-5: The First Do-It-Yourself Jet," page 70), the bearded and ample girthed Bede poses the self-confident ques-

Cavorting among the clouds, BD-10J has the power to stand on its tail and streak to 20,000 ft.

tion: "Who's going to design and build a supersonic home-built, if I don't?"

A gleam in Bede's eye

When the BD-10J project began 5½ years ago, Bede was simply exploring ways to improve the performance of the jet-powered version of his BD-5 to enhance its appeal at air shows. But the tiny dimensions of the 1000-pound minijet would not permit the installation of any powerplant other than the craft's original French-made TRS-18 Microturbo.

There were several problems with that engine. First, it put out only 210 pounds of thrust (the latest version has been upped to 300 pounds). Second, it had to be overhauled every 750 hours. Third, the TRS-18 Microturbo engine cost about \$70,000. So, Bede decided to abandon the whole idea of upgrading the BD-5J and start over from scratch. His only guideline at that point was to design something that pleased him. "I just said,

'Gee, what would I like?'" The answer to that question tells a lot about the man.

Power hungry

Since it was primarily the lack of a proper engine that brought the celebrated BD-5 project to a bitter end, Bede began his latest project by selecting the powerplant and then designed the airplane around it. He picked the CJ 610 because of its record of reliability in years of service powering Model 20 series Learjets and Jet Commander business jets. Additionally, the J-85, the military version of the CJ 610, had been well proven over decades of service as the power behind the supersonic T-38 trainer and the F-5 fighter.

Moreover, his research indicated that used engines were in plentiful supply at prices beginning at about \$40,000. Because the CJ 610 puts out so much power,

HOMEBUILT MACHBUSTER

Bede wasn't particularly constrained in airframe size. As a result, the BD-10J is designed to carry two people in tandem seats and its internal main and auxiliary tanks hold approximately 299 gallons (2020 pounds) of Jet A, enough fuel to travel 2788 miles at 600 mph (.91 Mach) at 45,000 ft.

Supersonic roots

Since the aircraft was originally intended to fly high-speed aerobatics at air shows, it should come as no surprise that the twin-tailed Bede looks very much like a combat fighter, which is after all the ultimate aerobatic aircraft. However, the Bede jet is only about one-third the size of an F-16 and has none of the system complexity or redundancy found on a real military aircraft.

While the jet's concept may be revolutionary, many of its design elements and construction methods are familiar. For example, Bede admits he's relying heavily on data from jet testing that occurred in the 1970s and earlier, before the advent of boosted or fly-by-wire controls.

The BD-10J pilot uses a sidestick for low-speed handling and shifts to a

standard center stick for high-speed control. These are linked to the control surfaces through a series of heavy-duty push-pull rods. To accommodate pressure shifts on the wing which occur at transonic speeds, the BD-10J features an electrically operated stabilizer trim system with which the pilot adjusts the horizontal tail. The system, similar to the mechanical controls used by Chuck Yeager back in 1947 on the original Mach-busting Bell X-1, is much simpler, lighter and more affordable than the powered controls and stability augmentation systems found on most supersonic aircraft. The aircraft's structure is approximately 60-percent 2024-T3 aluminum and only about 35-percent composites with the pressurized cockpit accounting for most of the latter.

Bede expects he can deliver a full BD-10J kit, less engine and instrumentation, for \$160,000. A high price for a do-it-yourself airplane, but small change for a high-performance, fighter-like aircraft capable of 12G maneuvering, direct climb to 20,000 ft. in less than a minute from takeoff, and a 1.4 Mach (923 mph) cruise at 45,000 ft.

Evolution of a pocket rocket

Design of the BD-10J has been a continuous process, with Bede adding minor adjustments on his Cimline computer right up until actual building began. Now, with the first preproduction planes being fabricated, every detail is at last locked up, and final performance projections have been formulated.

The aircraft has a high midwing with a 28.5° leading-edge sweep. The wing has a 20-ft., 7-in. span and is fitted with full-span, leading-edge slats and slotted flaps. Its F-14-like twin vertical fins total almost 20 sq. ft. of area, giving the aircraft excellent directional control.

The BD-10J has an overall length of 28 ft., 10 in. The cabin's 9-psi pressurization system will take the aircraft up to 50,000 ft. Because of the aircraft's extraordinary thrust-to-weight ratio, the BD-10J will get going in a hurry. Bede anticipates that after brake release the aircraft will need only 10 seconds and 600 ft. of runway to start flying. And once airborne, the aircraft has the power to climb straight up to altitude.

BD-5: The First Do-It-Yourself Jet

THE BD-5 KIT has been available since 1972. Needless to say, most people don't go out and build their own jet plane from a kit. In fact, since the first BD-5 kit was sold for \$1800 in '72, only 50 to 60 have been completed out of approximately 3000 kits sold. Of the 50 or 60 completed kits (mostly propeller models powered by Honda turbocharged engines), about 30 are still flying. Of the BD-5J jet kits sold, seven are now flyable and four are actively flown as air-show performers.

If you're contemplating building your own jet plane, be forewarned. Flying a jet plane, any jet plane, and especially one you've built yourself, can be hazardous to your health.

According to the newsletter *The Aviation Consumer*, 14 of the first 25 completed BD-5 homebuilts crashed. One special shortwing version, for which a couple hundred kits were sold, had a particularly inauspicious beginning. Of the first four completed, three crashed on the first takeoff and one lasted just long enough to crash on its first landing.

National Transportation

Safety Board statistics show 25 accidents for BD-5s in total, nine of which were fatal. *The Aviation Consumer* knows of three more, for a total of 12 in all. Two of the fatalities were in early BD-5J jet models.



Modified planes of the Silver Bullets aerobatics team are one shining exception to the unfortunate safety record of the BD-5J.

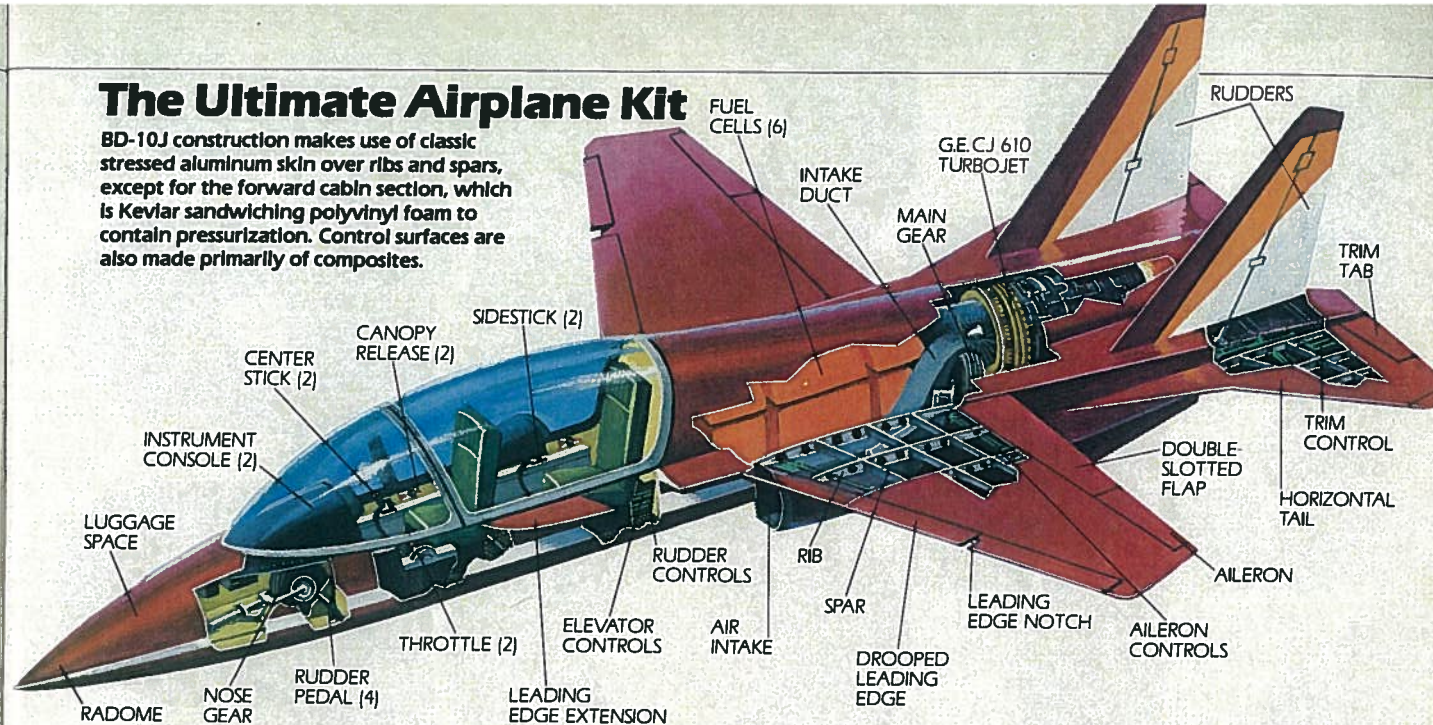
The air-show BD-5Js now being flown are a different story. Bobby Bishop, one of the original Bede test pilots, and the head of the Coors Light Silver Bullets team, points to a near-perfect safety record with the planes he currently flies and has flown for the past 13 years. He attributes this to the Acrojet modifications he has made to the original design. The major change is that the Acrojet is 100 pounds lighter and is an all-around better-balanced machine.

While most BD-5s are tail-heavy, requiring up to 50 pounds of ballast in the nose, the Acrojet version requires no ballast. It also has a much lower stall speed—58 knots compared to 71 knots, along with other important refinements.

What does all this say for the BD-10J? It is unfair to even begin to characterize the performance of an airplane that has yet to be flown by that of its completely different predecessor. But one thing's for certain: When it does fly, like all Bede projects, it's going to be one heck of an exciting flying machine. —Fred Mackerodt

The Ultimate Airplane Kit

BD-10J construction makes use of classic stressed aluminum skin over ribs and spars, except for the forward cabin section, which is Kevlar sandwiching polyvinyl foam to contain pressurization. Control surfaces are also made primarily of composites.



The BD-10J's 35-pounds-per-sq.-ft. wing loading drops to 18 pounds per sq. ft. with low fuel loads typical just prior to landing. That gives the aircraft a 70-mph stall, which results in an approach speed of about 90 mph. Landing distances of 1500 to 2000 ft. are anticipated, however, since the CJ 610 will continue to produce about 140 pounds of thrust when pulled back to idle.

There is no pilot ejection system. But if customer interest is strong enough, Bede might offer a powered parachute that would pull the pilot out, if the need arose. The aircraft is equipped with a fuel dump system, thus minimizing the risk of fire in a dead stick, emergency landing.

Building underway

Construction of the first four preproduction versions of the plane is now taking place at Bede's Oklahoma City shop. Original plans to build a prototype were scrapped, because it was felt that only a plane built on production tooling would represent the final version's characteristics accurately enough for certification trials.

Bede expects the first BD-10J to be finished sometime in February, after which flight testing will begin in Mojave. National Airshows Group, operator of the Holiday Inn Aerobatic team will do the flying, and will also be among Bede's first customers.

Bidding for that privilege has apparently been brisk. Bede says he already has 18 firm orders, which may take him nearly a year to fill. He won't even begin accepting new orders until this summer. As for the four preproduction planes now under construction, Bede won't say who's getting

them, except that serial No. 1 is reserved for himself.

National Airshows Group will also handle customer training. Bede says that in the beginning all prospective customers will be expected to come to the manufacturing site and fly with a factory instructor in a BD-10J and demonstrate enough proficiency to handle the aircraft safely. The BD-10J, says Bede, "is just too much aircraft to simply turn over to someone who happens to have a lot of money and the ability to buy it."

The BD-10J will probably be sold only as a complete kit, minus engine and avionics. Initially, Bede had intended to sell plans for the plane to anyone interested. However, as the project took shape, he decided that that idea was unrealistic. "The airplane is too complicated for a guy to even try building it from scratch," Bede says. Instead, the factory will produce all composite components in vacuum ovens and will be responsible for all complicated formed or machined parts.

The aircraft fall into FAA's homebuilt Experimental certification category. Bede does not intend to manufacture complete BD-10Js, at least not for the civil market.

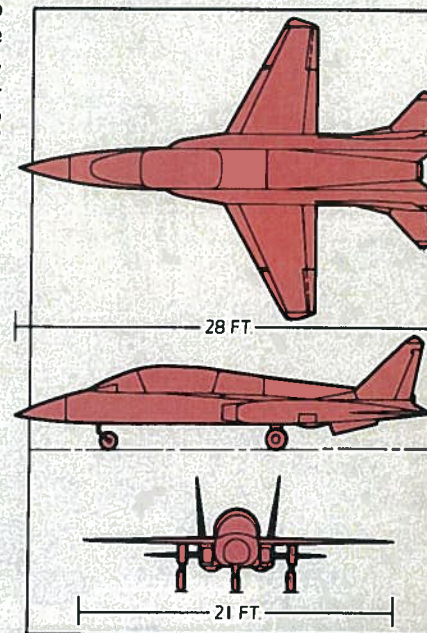
Waiting in the wings

When Bede began his jet project, his intent was to produce the hottest airplane ever to hit the air-show circuit. The market wasn't a big one. He estimated 15 airplanes would do it. However, as word of the BD-10J spread, letters and calls began to overwhelm the little Advanced Aircraft office. Bede says he has received some 1100 inquiries about his minifighter.

And what about the air-show performers for whom it was originally targeted?

Bob Bishop is a one-time Bede Aircraft test pilot who now makes his living in a BD-5 as the leader of the Coors Light Silver Bullets aerobatic team. He thinks the BD-10J concept is a bold one and, supersonic practicalities aside, that the aircraft "will be neat no matter what it does."

But beyond that, if the BD-10J delivers all that Bede promises, Bishop believes the aircraft "could change the face of aviation." That is an observation that may be echoed again and again once the BD-10J takes flight. **PM**



Twin vertical, and fully movable horizontal tails betray BD-10Js fighter heritage, but light wing loading allows for manageable landing speeds.