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That's the sound of the prop-driven XF-84H, and it brought grown men to their knees. It didn't fly all that great either

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Republic XF-84H in flight. (USAF Museum)

IT WAS THE ERA OF SOUNDED-LIKE-A-GOOD-IDEA-AT-THE-TIME DESIGNS. Airplanes that took off straight up, hanging from enormous contra-rotating props or climbing a beanstalk of jet thrust. Jets launched from flatbed trucks, flung into the air by rockets. Inflatable airplanes. Flying wings. Tail-less deltas. Jet seaplanes. Jet seaplane fighters. So there was nothing unusual about taking an early jet fighter, the Republic F-84 Thunderjet, and putting a propeller on it.

But wasn't aviation trying to get rid of propellers?

Never mind, we're going to drive this propeller with an enormous turbine engine—two engines, in fact, coupled through a common gearbox—and we'll spin it so fast that the prop tips will be traveling at 901 mph—Mach 1.18. At least the prop will be supersonic.

The result was the Republic XF-84H, a swept-wing, single-seat, T-tail turboprop that, at the time of its rollout in 1955, had the unhappy distinction of being the loudest airplane ever built.

The –84H had an otherwise honorable pedigree. The original straight-wing F-84 was named the Thunderjet to remind everyone that it was part of the Republic family that had begun with the World War II P-47 Thunderbolt. Among U.S. fighters, the F-84 was a first: Its slim, bud vase of a fuselage was wrapped around a slender axial-flow engine, in which the air's path is a straight line from front to back. (The earlier—and chubbier—centrifugal-flow engines compressed the air by whirling it outward.) The F-84's swept-wing follow-on, the F-84F, was tagged the Thunderstreak, which was followed by a reconnaissance version, the RF-84F, called the Thunderflash.

The XF-84H, however, was given an inglorious nickname by one of its test pilots: Thunderscreech.

"One day, the crew took it out to an isolated test area [at Edwards Air Force Base in California] to run it up," recalls Henry Beaird, a Republic test pilot at the time and one of only two men ever to fly the -84H. "They tied it down on a taxiway next to what they assumed was an empty C-47, but that airplane's crew chief was inside, sweeping it out. Well, they cranked that -84H up, made about a 30-minute run, and shut it down. As they were getting ready to tow it back to the ramp, they heard this banging in the back of the C-47." It was the crew chief, Beaird relates, knocked silly by the high-intensity noise and on his back on the floor of the –47, flailing his limbs. "He eventually came out of it," Beaird recalls.

"As long as you stood ahead of or behind the airplane," says Beaird, now 78 and flying Learjets, "it really wasn't so bad, but if you got in the plane of the prop, it'd knock you down." Really? "Really."

But there was a good reason to test the propeller: Early jets—the P-80, the F-84, even the vaunted F-86—were like overgeared vintage Ferraris. Put the thing in top gear and step on it and you may eventually do 150, but you'd be forever getting there. The jets accelerated with aching slowness, so when they were loaded for bear—a fighter's natural state—they needed long runways. Short on concrete? Better leave some fuel and weapons home.

On landing, a turbojet pilot had to be very careful about speed control: Get a little too low and slow on final approach, cob the power to correct, and you might hit the ground before the engine wakes up and puts out enough thrust to accelerate.

Propellers were different. On a powerful fighter like the P-51, you had to feed in power judiciously, because if you firewalled the throttle, the entire airplane tried to counterrotate against the prop's torque. With a tractor propeller spinning clockwise (as seen from the cockpit), the airplane would turn hard left and plow straight off the runway. But compared to jets, propellers provided power right now.

The XF-84H was built for the Air Force's Propeller Laboratory at Wright-Patterson Air Force Base in Dayton, Ohio. Engineers there wanted to test supersonic propellers to see if they could

get the best of both worlds—jet speeds and propeller responsiveness. “That didn’t mean the airplane will run supersonic,” Beaird cautions, “because with that big a prop disc up front, it’s like a big speed brake. It meant that on the -84H, the outer 12 to 18 inches of the propeller were supersonic all the time.”

That, of course, was the source of the horrendous noise. The Thunderscreech’s engine ran at full speed all the time, and the propeller rotated at 2,100 rpm from startup until shutdown. “All you had to do was move the propeller pitch control to get power and you got it pretty instantaneously,” Beaird explains. He thinks it might have gotten even louder with power, because he remembers he could hear it better where he lived, 22 miles away from the base, when the crew ran up the engine to full power.

“Edwards was worried that the noise of the airplane would break the windows in the control tower,” he remembers. “The runway’s about a mile from the tower, but they’d put blankets over the top of the shelf where the radios were, and they’d get up under their desks, under the blankets. Nobody ever actually recorded the decibels. I think they were afraid the measuring device might get broken.”

“Oh, man, that noise was terrible,” recalls Edward von Wolffersdorff, Beaird’s crew chief. “You can’t imagine,” he adds with a groan. “I remember making my first ground runs with the thing, down on the main base, and I was wondering Why are they flashing that red light at me over on the control tower? It turned out they couldn’t hear a damn thing over their radios, so they kicked us out and sent us over to the north base.”

Most accounts of the XF-84H program specify that the propeller spun at 3,000 rpm, which would have resulted in the prop tips traveling at an incredible Mach 1.71. Extensive research and computation by John M. Leonard of the Rolls-Royce Heritage Trust (Rolls Aerospace currently owns Allison) indicate that an engine turning at 14,300 rpm driving a 6.8:1 gearbox, as the T40 did, would push the tips of a 12-foot-diameter propeller to a far more logical Mach 1.18.

Beaird agrees. “The tachometer indicated 3,000, but I’m not sure that was prop rpm. The tip speed was about 1.2 Mach, so what Leonard calculated is correct,” he says.

The airplane was not popular at Edwards and is to this day rumored to have caused several miscarriages. “It’s hard working on a project like that when you know everybody’s against it,” von Wolffersdorff says. “Nobody wanted the damn thing. First the Navy backed out and then the Air Force canceled the project. A lot of people thought we were trying to go supersonic with a prop, but that wasn’t true at all.”

The Navy had gotten wind of the -84H and initially wanted in on the project, so Republic planned to build three—two for the Air Force and one for the Navy. But because the Navy canceled its order, only the first two made it out the door. The Navy originally liked the fast-turboprop concept because pure jets caused problems aboard carriers. The early catapults had a hard time accelerating fighters to takeoff speed, and even today on landing, standard procedure is to go to full power right at touchdown in case the tailhook misses the arresting

wires and the aircraft has to go around. Jets are slow to spin up after a “bolter,” as such misses are called.

Three manufacturers were asked to provide experimental props for the -84H: Aeroproducts, Curtiss-Wright, and Hamilton Standard. In the end, only Aeroproducts stepped up to the plate, providing a stubby three-blade paddle prop, each blade about four times as long as it was wide. “It was a funny-looking propeller,” Beaird recalls. “I think it was just one they happened to have available.”

The Thunderscreech’s Allison T40 engine was, even in the words of the company’s own authorized history, Power of Excellence, “a monstrosity, a mechanical nightmare…. Allison was in the throes of developing the turboprop concept, and began probably 20 years ahead of where it should have been.” The T40 was a pair of 2,750-shaft-horsepower T38s inside a common engine case. It was mounted behind the cockpit, where the F-84’s Allison J35 turbojet had originally lived. Although the -84H’s swept wings and main landing gear were straight off the RF-84F, its fuselage was almost entirely new, substantially modified to fit the big T40 engine. In fact, the airplane was so different from the F-84 that it was originally to be called the XF-106, a designation that eventually was given to the Convair Delta Dart.

During the mid-1950s, the T40 was the most powerful aircraft engine on the planet, putting out between 5,850 and 7,400 shp, depending on the model. Each of its T38s turned an 18-foot driveshaft that led to a big gearbox in the XF-84H’s nose. Though the pilot couldn’t see them, the shafts were spinning at stunning speed on either side of the cockpit, just under the floorboards. To stiffen the relatively flexible shafts, Republic installed numerous bearings along their entire lengths. One of the company’s major concerns was that the driveshafts would overheat the bearings, so each one had temperature and vibration sensors, with meters and warning-light readouts on the glareshield directly in front of the pilot.

“We looked at the damn gearbox and thought Jeez, that’s gonna be a bear,” Ed von Wolffersdorff recalls. “And those shafts that ran past the cockpit on each side, boy, that made you pucker up just to think about it. We were expecting the worst, but they never gave us a bit of trouble.

“We did have some problems with the gearbox, but it was operator error,” he adds. “You’d get the left engine going first, then you’d engage its clutch and get the gearbox turning, drive the righthand engine back through the gearbox and get it going…. I was checking out another crew chief and told him to be careful, but he forgot to get the coolant oil flowing, and man, it just cooked one clutch.”

Beaird says the starting procedure consumed half an hour: building up hydraulic pressures, establishing nominal electric power levels, and getting the proper green lights.

The driveshaft had high levels of vibration in flight, Beaird says. “It was very sensitive. If it got to where the vibration was so bad that I thought it was going to cause damage, they just left it up to me to decide whether to get out of the airplane”—he means eject, which he never did, but 10 of his 11 flights ended in premature or emergency landings due to vibration or

prop-controller problems. “The only time it became a handful was when you got it out around 400 knots,” he says. “The propeller governor [which controlled rotational speed] would start surging, and the airplane would roll rather violently.” The entire airframe was trying to rotate around the propshaft, torquing like a big flywheel with wings.

The late Lin Hendrix, a Republic test pilot who made a single Thunderscreech flight and was the only pilot to fly the second of the two airplanes, wrote in the August 1977 issue of the British magazine Aeroplane Monthly that Beaird, “who never swore, once said after an emergency landing, ‘By jingo, that airplane is going to hurt somebody!’ ” Hendrix himself declined further opportunities to fly the ’Screech, telling Republic’s chief engineer, Jim Rust, a muscular six-foot-four and 235 pounds, “You aren’t big enough and there aren’t enough of you to get me in that thing again.”

Only a single XF-84H survives, the number-two airplane having been junked. The original test bed spent several decades at the entrance to Meadows Field, the Bakersfield, California municipal airport, where an electric motor in the spinner turned the prop at a stately 10 rpm, hardly hinting at the ’Screech in full song. In 1992, the old gate guardian got hangar space at the U.S. Air Force Museum in Dayton, Ohio. It has since been restored to display condition, and about a year ago was finally put on exhibit in the museum’s experimental-aircraft hangar.

Robert Schneider and Darrell Larkin had both flown F-84s in the Ohio Air National Guard, and they assembled a team of volunteers who spent a total of 3,710 hours on the restoration. “You know you’re in trouble when you have to have pilots working on an airplane,” Schneider says, laughing, “but Darrell and I found a lot of retired chief master sergeants who’d been sheet metal guys and had other specialties. They’re the ones who really did the work.”

Aside from the supersonic-prop experiment, F-84s served as test bed aircraft for a considerable variety of other oddball projects. Schneider lists some of the reasons why: “It had a roomier cockpit than the F-86, and there were a lot of them made,” he says. “It was a good-flying aircraft—a little underpowered but extremely strong. I had a midair collision once with another F-84, and we both kept flying and landed safely.” A careless ground controller vectored Schneider and a flight of three other F-84s into a thunderstorm, and in the murk, the -84 to his right slammed into Schneider’s airplane, its stabilator shearing off the front of his wing tank and then whacking the fuselage.

“The XF-84H was a hulk when we got it,” Darrell Larkin says. “I think every kid who ever walked by that airplane in Bakersfield threw a rock up the tailpipe. I had to take a ton of stones out of there.” But otherwise the airplane had never been vandalized, probably because it was on airport property and reasonably secure. “Except for the birds and other animals—prairie dogs, I don’t know what,” Larkin says. “There were nests everywhere. We had to do a lot of vacuuming, clean up a lot of dirt.”

Its stubby but strident propeller got all the attention, but the XF-84H set some other precedents. The ’Screech was—and still is—the world’s only turboprop with an afterburner, and

visitors to the Air Force Museum can peek into the tailpipe and see all the spray bars and plumbing still in place.

Turboprops typically use their engine's tailpipe simply as a vent for gases that have already done most of their work, though the exhaust flow usually produces residual thrust as well—almost 1,300 pounds' worth, in the case of the Thunderscreech. The Navy wanted all the carrier-takeoff thrust it could get, so it had Allison fit the baby 'burner to the T40. The afterburner was lit only on the test stand, never in flight.

The -84H was also the first airplane to carry a "RAT"—a ram air turbine, which automatically deployed from a compartment in the dorsal fin and pinwheeled in the airstream to provide extra electrical and hydraulic power.

"The airplane had full-span ailerons whenever the gear was down, since the flaps became ailerons too," Hank Beaird says. "It took a lot of [additional hydraulic] power to move those surfaces if you had to move them in a hurry, and the RAT provided that. It would come out whenever the gear was down. That was one of the airplane's biggest contributions. We put that on other jets as well, particularly the F-105 [Thunderchief, the next in Republic's series], which also had a full-span aileron system."

Another XF-84H feature Beaird liked was its speed brakes, located all the way aft alongside the afterburner nozzle and opening to each side like flower petals. "Yeah, we learned a few things with that airplane," he says. "We put the same speed brakes on the F-105, but bigger—a four-petal arrangement. They made little or no trim change but tremendous drag. On the -105, you could put those things out at 1.8, 1.9 Mach and you'd just be standing on the rudder pedals, it slowed down so fast."

The two XF-84Hs flew less than 10 hours total. It may be the only U.S. Air Force aircraft that has never been flown by a military pilot. And to this day, nobody knows how fast a production F-84H would have gone. Republic made a wildly optimistic prediction of 670 mph, but neither of the two X-planes ever made it past 450 mph.

Still, at the time this was thought fast enough to make the XF-84H the fastest propeller-driven airplane in the world, a claim that can still occasionally be heard today. But in fact, that speed record was already held by the huge, four-engine, eight-propeller Soviet Tupolev Tu-95 Bear bomber, which, with its high cruise speed of 545 mph, remains by far the world's fastest propeller-driven aircraft.

The Bear was already in service in 1955, when the XF-84H made its first flight. When the big Soviet bomber first appeared, Western observers pegged its speed at 400 mph, based on what they had observed during the XF-84H project. Tupolev, however, had realized that the key to high prop-driven speed was long, multiple, slow-turning blades, contra-rotating for maximum efficiency, not a screeching little three-blade paddle.