

## Short Runways

### How the Pros Do It

By ALTON K. MARSH

2

#### Bush pilots land in a few hundred feet — or else

The white refrigerator door marks the touchdown zone of my not-so-generous 600-foot runway with trees at both ends — but I am flying a Helio Courier, one of the world's best short takeoff and landing (STOL) aircraft. It has a three-blade, 96-inch-diameter propeller that boosts climb performance, Fowler flaps that extend outward and down to improve slow flight characteristics, and leading-edge slats that drop forward at slower speeds and double the lift generated by the wing. The Helio approaches at 40 to 45 knots.

There's no going around today. Once I commit to land, that's what I must do, successfully or not. (It is unlikely that instructor Evan Smith will allow me to get into trouble.) If I try to go around after the commit point, a point often based on the height of the trees at the opposite end of the strip, I won't have the climb performance to clear the trees — even at this practice runway. It's not really a runway — just a pasture next to the paved runway at Waxhaw, North Carolina, where a church-supported aviation organization called JAARS is located. The name once stood for the Jungle Aviation and Radio Service, but now only the acronym is used. A primary purpose of the organization is to support linguists whose goal is to translate the Bible into all the world's languages.

#### The JAARS organization

The landing technique I am using is safe, at least the way JAARS pilots do it, and is based on a long history of safety improvements developed following accidents decades ago. Today's safety record proves it. Even the calculations made prior to the landing by Smith were done using a mathematical formula developed by the organization.

But JAARS does more than improve pilot safety. It also has made safety improvements to the aircraft

it operates. These include the use of an S-shape, crushable seat leg originally conceived by Piper engineers and given to JAARS in 1978. The impact-absorbing legs are used on Helio Couriers and Cessna 206 aircraft that are headed to remote locations in the bush. Other improvements have been made in fire-detection systems, cabin reinforcement, and emergency egress. A tracking system using GPS and high-frequency radio that JAARS engineers developed can relay fuel status, position, and messages to aircraft flying over the jungle, according to Research Director Dave Shields. The actual radio will be built by a New Zealand company.

JAARS itself was founded by William "Cam" Townsend in 1946 to improve safety following an accident involving a commercial operator in Mexico. The airport at Waxhaw is named after him as well as his organization — JAARS-Townsend Airport.

## Landing short

But back to my landing. A runway marked by a refrigerator door is not too far off the mark from those that JAARS pilots will face in the Philippines, Papua New Guinea, Indonesia, South America, and Africa. On short final I'll have to descend at a 5-degree angle (a standard ILS glideslope is 3 degrees). Thanks to a headwind, I am told to use a 40-kt approach speed. Sensing some clue undetected by me, Smith calls for a nudge of power followed by a return to the previous power setting. We fly a constant attitude, adjusting altitude with power like a Navy jet making a carrier landing. It's a little scary — I do exactly what Smith says, exactly when he says it. The flare comes at the last second, and I clunk onto the turf — most STOL aircraft landings are supposed to be firm — rolling out and stopping in 250 feet. The well-experienced pilots can land shorter — just 100 feet.

Short takeoffs and landings require almost a military discipline from the pilot, something not usually gained from your local flight school. And sometimes things go wrong. In November 2001 a JAARS Helio Courier operating in the Philippines touched down short, hit hard, bounced, and came down a second time, breaking the right main gear. But no one was hurt. Consider the runway facing that pilot: A 643-foot dirt strip that starts with a slight downslope, but ends in a 25-degree upslope.

It is not the most difficult runway faced by JAARS pilots. In fact, it is similar to one in Indonesia located at 6,300 feet msl where the touchdown zone is on a 15-degree upslope. The runway then rises more steeply and crests. The crest ends in a cliff wall. Pilots land, gun the engine or they'll never get to the top, then reduce power immediately to avoid smashing into the cliff.

With runways like that, it is impressive that JAARS averages only 1.7 accidents each year despite operating 20,000 flights. There has been only one fatal accident in the history of the organization.

JAARS operates 35 aircraft in nine countries, employing 61 pilots, 32 mechanics, and eight avionics personnel. Aircraft include Piper Navajo and Aztec twins, helicopters, and Cessna 210s and 402s. The group operates 12 Helio Couriers, one of the largest fleets in the world, and has authority to make several parts for the Helio Courier. The largest operation is in Papua New Guinea, where JAARS

operates both airplanes and helicopters.

## Standards are the key

After my flight, Director of Aviation David Bothwell took me to a classroom building near the corporatelike maintenance hangar and research facility. There, aviation students from Moody Bible Institute were getting a demonstration of a ground school course during a visit intended to help them determine if they want to become JAARS pilots. The emphasis was on using standards and procedures that have proven to work well, always sticking with precise airspeeds and configurations. Topics of the day included operations in Helio Couriers and Cessna 206 aircraft that require slow speeds, high angles of attack, high-drag configurations, high sink rates, and dependence on power to control the glidepath.

Bothwell, the son of missionaries serving in Africa, said his love of aviation came from his father, an electrical engineer who never tired of watching airplanes with his son. After debating — and doubting — whether this type of flying was for him, Bothwell received training in the Moody aviation program at Elizabethton, Tennessee, and worked for three years as a charter pilot and mechanic before joining JAARS.

Bothwell says that the rewards from his work include saving people's lives on medical flights; delivering produce to market so that tribes can purchase soap, salt, sugar, and other necessities; and otherwise helping Stone Age people face the challenges of the twenty-first century.

## They're not cowboys

Another reward comes in the form of adventure. A word of caution here: JAARS pilots don't want you to think of them as cowboys of the air — their dedicated service is matched by their professionalism.

That said, there is, indeed, adventure. JAARS pilot Roger Krenzin, who has visited more than 30 countries and lived in a third of them, recalls dropping a parachute-equipped package of penicillin to a village in remote Ecuador, only to have it seemingly fall into the river. Actually, it had landed on a three-foot-wide sandbar, and the villagers praised his airmanship. He never told them any different.

His standard jungle pilot gear includes a machete, hiking boots, sun helmet, hammock with mosquito netting, Swiss army knife, backpack with camping gear, and extra clothes. The jungle is not a place that tolerates complacency or pushing the limits, as he discovered.

He was called to take medical supplies to an Ecuadorian village one Sunday afternoon while he was suffering from a mild infection and was tired. As he taxied out, a little voice told him he ought not to be flying, but the need for the supplies was great. Because of fatigue, he took off with a heavy load after forgetting to return the magneto switch to the Both position — an invitation to disaster. He made it, but he vowed never to press his personal limits again, no matter how great the need. He was well rested for another incident, one that proves jungle pilots need to be at the top of their form all the

time. He had smoke in the cockpit after a takeoff from a 600-foot strip, and he had to return immediately for a challenging landing, to the admiration of his passenger.

At the end of a JAARS trainee's 50 hours of instruction, there's something akin to graduation, or getting a Ph.D. in STOL operations. It is called "Mountain Week," and it takes place near Spruce Pine in western North Carolina. The community and JAARS have bonded for two decades to create a realistic training environment for pilots headed to remote sites. Townspeople offer their private grass runways and farm fields as landing sites, mow the grass for free, and volunteer their services.

The runways, and let's use the term loosely, are based in clearings and fields. There is hardly a square foot of flat land in the county; one 25-year-old grass runway called Valhalla pitches downhill at an increasing angle that reaches 11 degrees. Defunct yellow lights mounted on rotting boards line the runway and reveal that 25 years ago there was someone willing to make a night landing on the side of this mountain.

JAARS instructors are more careful than that. Practice is conducted in early morning and evening sessions when the winds are calm. A 5-kt wind brings a declaration that the mountain is getting "a little rowdy," and operations are halted. Once a student is able to solo from one of the 800-foot strips, he moves on to another of the strips, either "Brown" or "Webb." Each has its own problems; Brown begins and ends at public roads and requires the base leg on one end to be flown 100 feet from tall trees, and Webb lies in an upward-sloping bowl in the high country. It's lined by trees and requires a touchdown exactly on the end of the runway every time. All runways have a 100-foot box that students must touch down on consistently to be considered ready for solo.

Student Matthew Payne, an experienced pilot from another group called Nazarene Air, finds Valhalla to his liking and is released in the JAARS Cessna 206, which boasts a Robertson STOL kit, by instructor Dave Shields for "four circuits." None has to be a landing if it doesn't feel right. One must be a go-around. Shields is as concerned as any instructor watching a student's first solo flight. Payne does well, plunking down inside the box each time, and then turning around to rocket down the hill and climb away in 600 feet, banking to avoid the peaks ahead. The winds come up, and Payne is told over the radio to return to Spruce Pine's Avery County/Morrison Field alone rather than attempt another landing in tricky conditions.

## Why flatlanders have trouble in the mountains

Avery County, the base airport for the training, is no piece of cake, either. A beautifully paved 3,000-foot runway with a seemingly benign field elevation of 2,750 feet masks other problems. It is restricted to day-VFR operations, slopes uphill, has high terrain in all quadrants including a 5,500-foot peak, and has sharp dropoffs at both ends. A half-dozen hapless pilots in a variety of aircraft, from powerful Russian-built biplanes to single- and twin-engine aircraft have hurtled off both ends in past years. One luckless pilot in a Piper Cherokee 140, flying with his wife, their luggage, and even the kitchen dishes,

turned directly toward a steeply rising canyon after takeoff on Runway 16 and wasn't able to turn around or outclimb the terrain. The couple survived, but shards of their china remain in the mountain soil.

Instructor Smith explained what happens to flatlanders when they arrive at Avery County. Ridges scare them, so they move their pattern closer to the runway without adjusting the pattern altitudes. They then turn final high; punch the nose down (gaining speed); and since they are landing on the upsloping Runway 34, as good mountain procedures would suggest, they generally have a quartering tailwind because of local wind patterns, increasing groundspeed further. A high density altitude can add a few more knots, while the difference between calibrated and indicated airspeed adds even more groundspeed; all of a sudden the pilot is on final with a groundspeed that is 15 to 16 knots faster than was planned. Downdrafts and updrafts add to the problem.

As local maintenance shop owner Ryan Montague puts it, "If you see them [far] above the ridge on final [too high], they aren't stopping. And if you see them still in the air as they pass the center taxiway, they aren't stopping."

Pilots in that predicament may finally decide to go around, but because of mountainous terrain, they have no idea where the horizon line is. So they pitch too high, thinking the tops of the mountains are the horizon, lose airspeed, and then hit a downdraft. The result is a close encounter with the trees.

"The flatlanders don't appreciate what the wind does in and around mountains. I'm not sure I do, even though I have flown here many years. The runway will bite you," Smith warned.

Before JAARS students can take off or land, they must fill out a sheet of calculations that include runway slope, wind, runway surface, humidity, and flap configurations. Runway surface calculations include short grass, long grass, firm turf, mud, sand, and rough surfaces. Students know their takeoff roll and stopping distance before ever leaving the chocks.

Instructors also give their students training in low-level cross-country flights that intentionally include a number of "sucker canyons" around the Spruce Pine area; small aircraft can fly into them, but they can't turn around or climb out.

"We are trying to instill in these pilots' minds that we are not going to land unless everything is right. Same thing on takeoff — we think about aborting until we are sure we are go for takeoff," Smith said. Those sound like good rules to live by, even if you're not a bush pilot flying rough backcountry airstrips.

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