DE HAVILLAND BEAVER

A classic workhorse still pays its way.

BY GERRY BRUDER

TO city dwellers, it may have seemed ludicrous—a single-engine airplane with a tacky name in the same list of engineering marvels as the St. Lawrence Seaway, the trans-Canada telephone network and the Alouette Satellite. But bush folk nodded approvingly

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in January 1987 when a panel of judges included the de Havilland Beaver among Canada's 10 best engineering achievements over the past century.

The panel, appointed to select the top 10 by the Canadian Engineering Centennial Board, evaluated more than 100 nominations for engineering excellence and positive social and economic impact. People of the north-country bush agreed that in their isolated lives, few creations met those qualifications better than the Beaver. For 40 years now, the faithful workhorse has hauled their mail, groceries, whiskey, fuel drums, coffins, ore samples, relatives, trapping pelts, canoes and whatever else could be stuffed inside or lashed outside. It has served as their taxi to lakes, towns, sand bars, beaches, meadows and glaciers. It has lumbered stalwartly over endless miles of mountains, forest, tundra and ocean, through rain, sleet, snow, turbulence and occasionally even sunshine.

The north-country aviation community particularly applauded inclusion of the Beaver on the prestigious list (no other aircraft, and only one other manufactured product, made it). Ask a group of pilots and dispatchers to name the quintessential bushplane and most will answer Beaver. The Cessna 180, 185 and 206 get to the destination faster but cannot handle as much load or abuse. The Beaver's big brother, the Otter, carries more but has engine gremlins and is tough to maneuver on floats in a wind because of that huge, sail-like tail. The twin-engine Grumman Goose amphibian? Speedy and roomy, but do not take it into tight lakes or try to slow-fly it in low visibility. The old Noorduyne Norseman has become a rarity, and the venerable Super Cub is just too small.

"You can't get me *out* of a Beaver in bad weather," declare air taxi pilots who work the Inside Passage. Few roads or airports await the traveler in this network of waterways that weaves among islands and mountains for 1,000 miles along the coasts of western British Columbia and southeastern Alaska. This is floatplane country. Famous for its beauty, the Inside Passage is notorious for its rain and gales, but the Beaver's thick, high-lift wings and big flaps let a pilot who is straining to see where he is going slow to a comfortable 60 knots despite the airplane's legal 5,090-pound gross weight. And when a 30-knot wind whips the water, sturdy construction and hefty floats (usually the 22-foot-long Edo 4930s) allow a Beaver pilot to take off and plop down safely flight after flight while the Cessnas spend the day drydocked.

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Pilots also leave other airplanes behind for missions that involve bringing heavy loads out of difficult places. Mountain goat hunters, for instance, want to get as close to the quarry as possible. That is usually a football-field-size lake tucked in a bowl surrounded by cliffs, clouds and gusts. An adult mountain goat weighs as much as an adult human, and in some areas the bag limit is two per hunter. The supercharger on the Beaver's nine-cylinder Pratt & Whitney R-985 Wasp Junior radial engine pushes the critical altitude as high as 5,000 feet, where normally aspirated engines are anemic on takeoff.

Those 450 horses provide enough power for the prudent Beaver pilot in virtually any scenario. In fact, since the supercharger lacks a wastegate, firewalling the throttle below 5,000 feet results in too much power. Every once in a while, however, a wind shift or a miscalculation puts the airplane into deep, undulating ocean swells at a point the pilot thought he'd be safely in the air, or a sudden downdraft shoves the airplane towards the treetops during a climb-out. In this context, intentionally overboosting the engine beyond the 36.5-inch manifold pressure takeoff limit is akin to withdrawing funds from a savings account earmarked for the kids' college educations; you do what you have to do in an emergency and be

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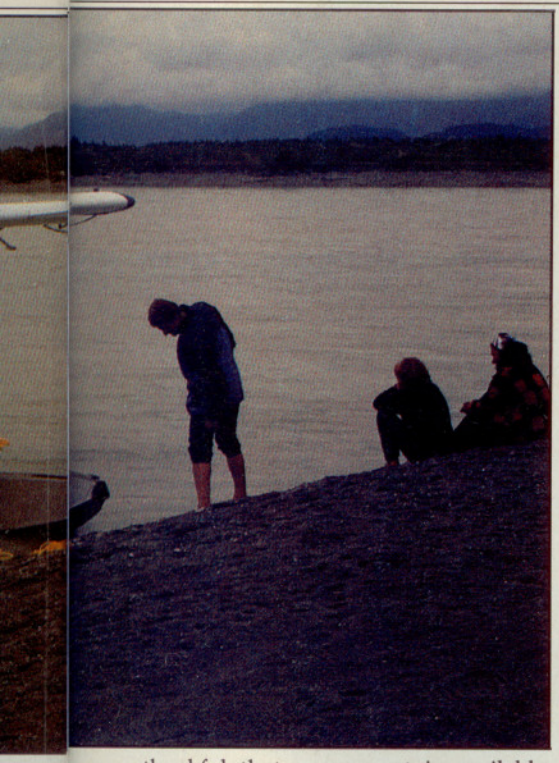

thankful that a way out is available. Back in town, of course, you tell the mechanics about it as a courtesy to whomever flies the airplane next.

A powerful engine like the R-985 is certainly a feature a veteran bush pilot would want if given an opportunity to participate in the design of the ideal bushplane. The Beaver's reputation as the premier bushplane resulted because de Havilland gave Canada's best bush pilots that chance.

During World War II, de Havilland kept its engineers and assembly lines at its facilities in Downsview, Ontario, busy producing Mosquitos, Anson IIs and other military aircraft for the Allies. When peace allowed the company to resume commercial projects, one of its chief priorities was development of an airplane to serve the Canadian bush; pilots from Newfoundland to British Columbia were complaining that their Bellancas, Stinsons, Fairchilds and whatever else they put to work broke down on the job too much. Reasoning that the most experienced pilots would best know what characteristics a successful bush airplane needed, de Havilland asked for their help.

"We are considering the production of a single-engined, all-metal, high-wing monoplane, primarily designed for north country operation . . ." a cover letter said in part. "With a view to determining as closely as possible the specific requirements . . . of Northern operators in this specialized field, we are enclosing a questionnaire, tentative specifications and a perspective drawing, and would be greatly obliged if you would permit us to benefit by your experience by filling in the questionnaire and returning it to us. . . . We can assure you that your opinions and suggestions will be given careful consideration by our Engineering Department."

Did Cessna, Piper or Beech ever ask for *your* input in a new design?

De Havilland initially planned to install a British-built Gipsy Queen engine of either 295 or 350 horsepower in the airplane, but bush pilots like C. H. "Punch" Dickins, who had begun flying the Canadian bush in 1928, told the engineers that even the larger version was too puny. Doubts also arose about the ability of the manufacturer to provide sufficient service from the other side of the Atlantic.

So de Havilland opted instead for the more powerful R-985, produced by the reputable North American firm of Pratt & Whitney. The engine, which powers the Grumman Goose and Beech 18, had held up well in military trainers during World War II. Since the Gipsy was of an in-line, inverted design, the sketch the company included with the questionnaire showed a streamlined, modern-looking cowling—totally unlike the round, blunt image the world ultimately associated with the Beaver.

"Design it so the wings don't come off!" urged Frank MacDougall, a pilot and deputy minister of the Ontario Department of Lands and Forests. MacDougall was looking for a reliable airplane to replace his department's fleet of flimsy Stinson SR-9s, one of which had lost its wings in flight. De Havilland complied; strut-braced wings (the initial, tentative concept had included cantilever wings), steel from the engine to the fire wall, a heavy aluminum truss frame in the cockpit area and a reinforced cabin floor instilled enough beef in the Beaver and confidence in MacDougall for an order of 16 airplanes.

Other recommendations led to a panel-activated oil-dilution system to enable pilots to inject fuel into the sludge-like oil on frigid mornings. Also operated from the panel was a fire-extinguisher system for the engine. (As the apparatus aged, it developed the tendency to discharge accidentally in flight, startling occupants and filling the cabin with onion-smelling methyl bromide fumes. Many operators eventually removed the system.)

The oil filler was located *inside* the cockpit, protruding from the lower part of the engine-instrument panel by the right-seat foot well; no more standing in the rain waiting for the gooey stuff to slide out of the container. Grungy bush passengers would not mind getting residue oil on their trousers while leaning a leg against the filler cap.

No more climbing up on icy wings dragging a fuel hose, either. Three fuel

tanks holding a total of 95 U.S. gallons of 80 octane were positioned in the bottom fuselage, with the ports conveniently located behind an access hatch just forward of the left strut. An optional 21.5-gallon tank could be fitted in each wing tip to add about 217 nautical miles to the rather modest 352-nm range. For controlled emergency landings, a safety-wired lever by the oil filler instantly shut off the flow of both fuel and oil to the engine when pulled sharply upward.

Big, cargo-type cabin doors could be removed for squeezing in bulky items like 330-pound fuel drums. The design also had a cockpit door on each side and a baggage door. There was room for six passengers—three in a hammock seat in the rear, two in the middle seats and one up front in the cockpit—and the pilot could get rid of all passengers' seats in seconds for a freight flight. A later modification accommodated a seventh passenger on a three-place bench-type seat in the middle row.

For increased STOL performance, the ailerons automatically drooped to a maximum 15 degrees as the flaps extended. Flaps, used for all takeoffs whether on wheels, floats or skis, were hydraulically actuated by pumping a lever next to the pilot's seat. A pilot could select any degree of flaps he wanted and pump them fully up or down almost in the time it takes to fasten a seat belt.

The prototype made its maiden flight on August 16, 1947. Tests and early field use quickly proved the Beaver, designated DHC-2, as capable as intended and as tireless as its namesake. Orders for production models came from government, commercial and private operators, with customers paying $21,000 and about $23,000 in Canadian dollars for basic wheelplane and floatplane versions, respectively.

Although de Havilland developed the Beaver for the Canadian bush, the biggest customer lived south of the border. The U.S. military's fleet lacked heavy-duty, all-purpose utility aircraft, and the Beaver seemed an ideal candidate, but U.S. manufacturers branded interest in a foreign product as unpatriotic and demanded a chance to compete for the business, so in late 1950 both the Army and the Air Force scheduled fly-offs. Challenging the Beaver in an assortment of maneuvers were 12 contenders, including a Ryan Navion, the Aero Commander twin prototype, a Twin Bonanza, a souped-up Cessna 195 and a Bellanca Skyrocket.

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The Beaver beat them all, scoring particularly high in the short-field landing and takeoff tests, and the U.S. manufacturers gulped. The military began adding the Canadian airplane to its fleet, ordering only a few modifications, including a larger pilot seat and skylights. Officially the L-20 in military parlance, the Beaver earned the nickname "flying Jeep" during the conflict in Korea, where it hauled supplies, performed medical evacuations and ferried the brass. President Dwight D. Eisenhower toured the Korean war zone in a Beaver. Other Beavers dressed in olive green served tours in Germany, Alaska and even Vietnam.

Ultimately, U.S. armed forces bought 981 of the 1,631 Beavers de Havilland built between 1947 and 1967.

De Havilland also tried to interest the British Army in the airplane, adding incentive by installing a 550-hp English-built Alvis Leonides engine in a demonstrator. That change necessitated a slightly larger vertical fin and rudder. While the airplane turned in superb performance during tests, the British decided the cost was too high and settled instead for 46 standard L-20s. The one-of-a-kind demonstrator eventually returned to Ontario as a private aircraft.

In 1963 de Havilland produced an even better performer with the Turbo Beaver. In addition to a 550-shaft-hp Pratt & Whitney PT6A turboprop engine with a full-feathering, reversible propeller, the airplane sported a 28-inch fuselage extension in front of the wings, two extra passenger seats, 157 pounds more payload and 34.8 gallons more fuel capacity. On wheels, according to book, it could climb at 1,220 fpm at sea level and cruise at 136 knots. With a service ceiling of 23,900 feet, the Turbo Beaver could vault the summit of any mountain in North America.

The Ontario Ministry of Natural Resources bought 17 Turbo Beavers, and various air taxis ordered one or more. In Juneau, Alaska, Channel Flying operated two on floats but had fairly regular engine problems with them, probably because of saltwater ingestion. One of the two was lost in heavy snow over

Chatham Strait.

A prohibitive price tag of $253,000 was the Turbo Beaver's biggest deterrent. Most operators decided to stick with the piston Beaver, and in 1968 de Havilland stopped production of the turboprop version after a total run of 60.

The standard Beaver's popularity climbed steadily. The airplane flew in 27 countries for more than 50 airlines or charter operators, 23 governments and some 70 agricultural companies. When the U.S. military eventually retired the Beaver in favor of newer, turbine-powered utility aircraft, civilian operators rushed in to pick up cheap surplus L-20s and convert them to DHC-2s.

De Havilland estimates that 1,000 Beavers are still flying. Some, mainly on wheels, are scattered about the free world in Africa, Australia, South America and wherever else people need a tough, STOL load hauler. The rest of the fleet works mostly on floats in Canada and Alaska. About 400 are on the register in Canada alone. Beavers and floats form such a common union in North America that dozens of pilots with more than 10,000 hours in the airplane have never logged a single minute in a Beaver on wheels.

In the continental U.S., Kenmore Air Harbor near Seattle operates the biggest fleet, using its 10 float-equipped Beavers for scheduled and charter flights to the San Juan Islands and lower British Columbia. The largest seaplane service center in the world, Kenmore owes much of its business to rebuilding and selling Beavers. Since the late 1960s, the company has overhauled more than 100 of them. Kenmore also offers several Beaver modifications, such as a three-blade Hartzell propeller to replace the standard two-blade Hamilton Standard, an alternator in place of the original generator and additional baggage space beneath the standard compartment.

Some Kenmore Beavers have gone to corporations that do business in remote corners of the Pacific Northwest where their King Airs or Saberliners would be as out of place as dudes in tuxedos at a cattle roundup. Others were for individuals who simply liked Beavers. Kenmore tries to satisfy all whims. One Beaver for a local customer left the company with dual nav/coms, dual ADFs, HF, marine band, transponder, HSI and Loran C—quite a package for a model that typically has a single VHF com and maybe an ADF. Another, painted purple and white, went to Las Vegas with deeply upholstered seats and an autopilot.

Most Kenmore Beavers, however, head for air taxis in Alaska and Canada. Younger bush pilots checking out in the Beaver there generally find it less complicated to fly than its size and bygone-era image suggest. In fact, they are surprised at how light the controls feel with that airliner-type yoke—almost as light as the 180s and Super Cubs they are used to. They are delighted to learn that with a little practice the Beaver is actually easier to land than smaller aircraft, thanks to its STOL characteristics and the cushioning effects of all that structure. Few aspects of seaplane flying are more gratifying than touching down with power on a mirror surface so gently that only a subtle sensation of nonflight tells you are on the water. You keep the airplane on the step for a few moments. The passengers continue to await a telltale thump and, feeling none, begin to stare with alarm at the trees gathering in the windshield. Glancing out their side window to see how much farther the airplane has to descend before landing, they finally notice the shower of spray shooting back from the step of the float. That kind of landing inspires "oohs" and "ahs," and Beaver pilots are frequent recipients.

On landing approach, or in any other flight situation, the Beaver newcomer finds the airplane sensitive to fine-tuning with the overhead elevator and rudder trim wheels; just a flick of either makes the Beaver obey. The pilot learns, however, that at cruise with a heavy load and a rearward center of gravity, the Beaver requires a smidgen of flaps to stay on the air step.

There are other idiosyncrasies to note. In a sharp downdraft, fuel is sometimes suspended in the carburetor for a second, producing a brief, inconsequential loss of power. Such turbulence is an "engine stopper" in bush jargon. Collapsing air pockets in the plumbing often spit fuel out of the filler ports during refueling, causing whoever is wielding the hose to do some spitting of his own. The three quarter-size fuel gauges, contained in a single instrument, read in im-

tained in a single instrument, read in imperial gallons, which can confuse some American pilots. And the manual lists airspeeds in miles and kilometers but not in contemporary knots. (Airspeeds for this article have been converted to knots for perspective.)

The new Beaver pilot also discovers that individual Beavers develop quirks as they age. The heating system is especially vulnerable. In one machine the vertical push-pull heater control, situated near the floor on the left side of the control-column pedestal, will not stay closed. It keeps vibrating up, forcing the pilot to push it down every two or three minutes as unwanted heat radiates into the cockpit and cabin. In another Beaver the control will not stay open; the pilot has to keep pulling it up to ward off chill. Despite the heat the big engine generates, some of the more tired Beavers are almost always cold inside. You fly with the heater control constantly open and stuff wads of paper towels into openings around the cockpit door and window. Yet other Beavers are almost always too warm inside, although you keep the control constantly closed. The floor is so hot you can smell rubber from your boots and feel your feet sliding inside damp socks.

As with all airplane types, certain Beavers seem to perform better than others under identical conditions. Some are less noisy, some inexplicably inspire more trust. In a company with a fleet of Beavers, pilots inevitably develop prejudices; sharp dispatchers try to keep them happy by assigning them their favorites when possible, but whichever Beaver he flies, a pilot knows it will get the job done. Most visitors to the north country initially lack such confidence. Staring at the ancient beast, they wonder why, in a hemisphere that cherishes the new and the sleek, operators continue to use a blunt-lined, 95-knot airplane that is older than some of its pilots.

"Good grief," the visitors exclaim, "it's even got a round engine, just like in the old days."

Until a few years ago they were told that a more modern, similarly capable replacement simply was not available. Since then technology has offered the Cessna Caravan I, the Soloy turbine conversions and several other alternatives, but an average, functional Beaver on floats today costs just $70,000 to $80,000. Even a completely rebuilt Kenmore Beaver floatplane with a new engine sells for a relatively low $160,000.

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Compare those prices with around $250,000 for a Soloy Turbine 206 on a set of straight Edo 3430 floats and $815,000 for a float-equipped Caravan I (add $67,965 for amphibious floats) and you can understand why operators remain loyal to the Beaver.

Scoffing passengers quickly learn to respect the old workhorse. Countless numbers of sportsmen have studied their overweight buddies and the mound of gear on the dock, then eyed the waiting Beaver a few feet away.

"You're going to get us and all this stuff into *that* thing?" they ask the pilot.

A few minutes later the sportsmen sit strapped in their seats as the Beaver taxis from the dock into the channel, the heels of the floats awash. The baggage compartment in the rear, the unoccupied seats, the space beneath the seats and the space between the seats are crammed with sleeping bags, duffle bags, fishing rods, boxes of groceries, cases of beer, rifles, a Coleman stove, a can of kerosene, an outboard motor, a couple of jerry jugs of outboard fuel, and the inevitable bags of sundry, oddball items like suntan lotion and snakebite kits city folk inevitably think they might need in the bush but never actually use. Perhaps a lap or two holds overflow items. The sportsmen have a few minutes to think about things, because an R-985 warms up gradually. So, memorizing the locations of the four doors and the life preservers, they ask another question: "You sure this thing's going to get off the water?"

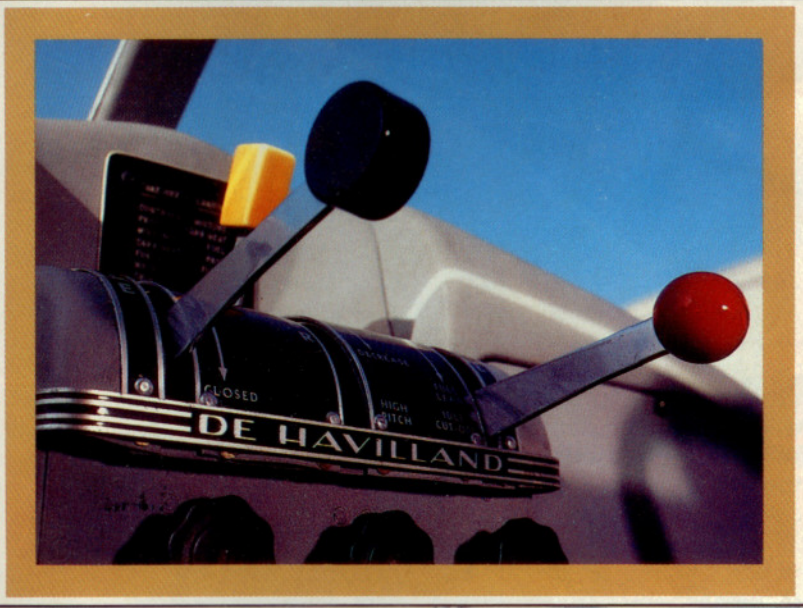
Amid a mighty roar from its 450-hp radial, the Beaver plows forward and slowly but dutifully climbs onto the step. Once there, it accelerates steadily; the thumping of the floats on the waves becomes a tapping, and moments later the airplane carries its 2,000-pound useful load aloft. (While other heavily loaded floatplanes sometimes refuse to get on the step in a no-wind, calm-water condition, the Beaver always makes it; if a Beaver floats after loading, it will fly.)

Enroute the sportsmen glance out the windows at the gullies and rocks below, wondering what will happen if the engine quits. They do not find out.

At the lake, savoring the coniferous fragrance from the surrounding forest, the sportsmen stand on the left float and the beach in a relay line as the pilot hands down their gear. On and on and on the train continues.

"Geez, you'd think we were planning to stay a year," someone says.

The disgorging finally completed, the sportsmen pause to watch the Beaver taxi out. The water rudders snap into the retracted position on the heels of the floats; the elevator moves up as the pilot pulls the yoke back, and the Pratt & Whitney roars again. This time the air-



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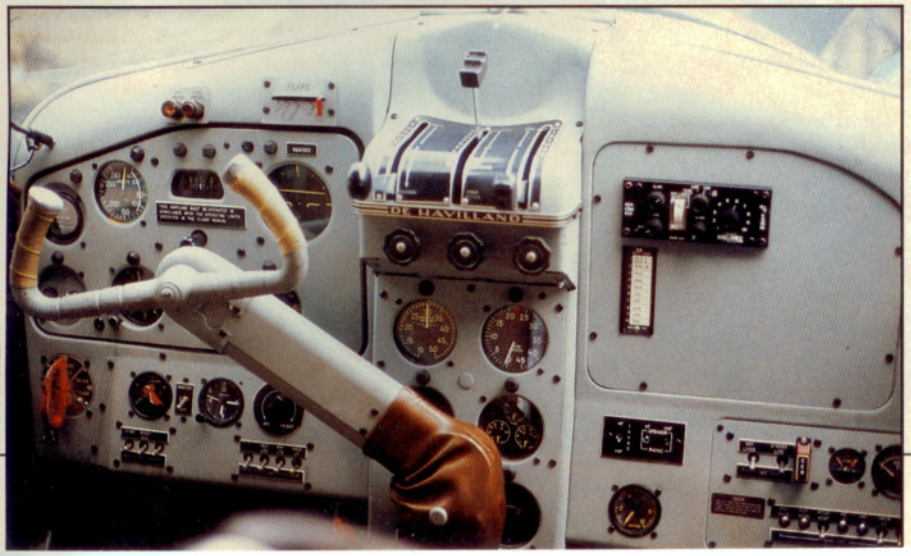

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plane lifts off in its characteristic flat attitude within six seconds and zooms away like a helicopter.

The final phase in the sportsmen's attitude adjustment toward the Beaver comes on the day they are waiting for the ride out. Grimy and smelly, eager for a hot shower and civilization, they stare morosely into the rain and fog from the porch of their cabin. Surely no one can fly in this weather. They're stuck for another day.

Then they hear the faint rumbling of an engine. It grows louder, and soon an airplane flies by somewhere in the misty shrouds. Five minutes later a taxiing Beaver materializes on the lake out front, its rotating beacon blinking in the rain as if to say "hi."

In Seattle, one nonpilot passenger who had become a believer used to spend an occasional Sunday riding around with Otter Air—now part of Kenmore Air Harbor—simply because the company used a Beaver. The destinations were unimportant, the scenery unnoticed; he just wanted to lumber along with what he considered to be the contemporary world's greatest airplane. Newer airplanes, he explained, had a lot of plastic and padding and automotive styling inside, and they rattled and seemed, well, awfully modern in a chintzy sort of way.

On the other hand the Beaver, he said, looked and felt solid, like a turn-of-the-century house. And that instrument panel, with all its big, old-fashioned gauges and levers and things—yeah, the Beaver was neat.

Pilots also perceive an aura of romance about the Beaver; rare is he with access who does not ache to check out in one. Most pilots are enamored of aviation's golden age, the era of the DC-3, the China Clipper and World War II fighters. It is a yesteryear that usually can be experienced only vicariously through photographs, films, museums and daydreams, but the Beaver provides a sort of working link with that era, a chance to symbolically don a brown leather flight jacket.

The Beaver's sensuousness extends to sound as well as sight and feel. Push the mixture lever to full rich. Work the wobble pump, located by the carburetor-heat lever below the engine instruments, until fuel pressure builds to five pounds per square inch. Reach down between your seat and the left door jamb and give the primer several strokes. Turn on the master and magne-

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tos switches. Now flip the toggle-type starter switch and listen to the magic as the radial rumbles into life with a puff of blue smoke. Especially at low-speed idle, the Pratt & Whitney emits a pulsating cadence as enchanting as the choo-choo-choo of a coal-burning, steam-powered locomotive as it chugs away from the station. Even at cruise, the roar of a radial engine, bolstered visually by the circular cowling out front, sounds deep and gratifying.

What a letdown afterwards to make a flight behind a horizontally opposed Continental or Lycoming—to listen to the humdrum whoosh of a diesel-powered locomotive. A steam locomotive, though, belched great clouds of black smoke into the air people breathed, and so too does the Beaver have its darker side. For instance the thundering 450-hp radial, romantic as it may be, leaves the ears playing the Bells of St. Mary's at the end of the day unless you wear both headphones (which you need to hear the radio anyway) and earplugs, and sometimes even then. A 20-minute heavy climb to cruise altitude over the mountains at the climb settings of 30 inches and 2,000 rpm is torture for everyone on board except the deaf. A long conversation with whoever is riding shotgun risks laryngitis, because in a Beaver you do not talk, you shout.

A new career awaits surplus L-20s, which will be refurbished to near-mint condition.

Noise is only one reason the Beaver pilot feels more fatigued at the end of the day than the Cessna pilot who flies to the same places. Flight legs take longer while pushing air out of the way in an aerodynamic truck. With a windsock-stiffening gale on that blunt nose and thick wing, a normal cruise speed of 95 knots makes you think you are hovering. Sometimes the scenery drags by so slowly you wonder if you have enough fuel to buck the wind all the way to point B. A bloated bladder, a growling stomach, impending darkness, an approaching squall, a date back in town and simple weariness have all prompted Beaver pilots to mutter "Come on, come on!"—an exhortation that, of course, drowns in the roar of the engine. Increasing power gains a little more speed, but it also aggravates fuel consumption; at 22 to 25 gallons an hour at normal cruise, the R-985 is no miser. Even a relatively fast 100-knot cruise is still more than eight knots *below* the design maneuvering speed; you do not have to throttle back in turbulence in the Beaver unless you are going downhill.

At times a Beaver pilot wants less speed. The airplane's flaps serve a highly effective brake for dropping into tight places or picking out landmarks in fog, but the same lever that pumps the flaps down also pumps them up. An adjacent, smaller lever determines the direction of movement; up to raise the flaps, down to lower them. The direction selector is out of sight of normal cockpit vision. If (as the manual recommends) you always keep the selector in the Down position with flaps extended, you'll never inadvertantly dump the flaps when you meant to pump on a few extra degrees.

"Always," however, dwells in Murphy's Law country. With the flaps partially down, flip the selector up in anticipation of a go-around. Then change your mind as you realize you can complete the approach after all, but you continue to concentrate on the gusts streak-

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ing across the water or the powerboat that threatens to dart in front; you forget to push the selector back down. Now, committed, on short final, you grab the larger lever to pump on more flaps. Instead, the airplane suddenly drops as what flaps you had retract into the wing. If you are real quick, power and elevator might avert a jarring arrival.

Quick action can also be crucial after "popping a tank" in the Beaver. Fuel from the three tandem fuselage tanks reaches the engine in a single-flow arrangement, with a selector valve located on the left side of the panel. A red light in front of the pilot illuminates when fuel pressure drops below three pounds per square inch. The pilot then has several seconds to switch to a tank with fuel before the system drains.

Since a Beaver handles better with a forward center of gravity, standard procedure calls for using the rearward tanks first. Whether a pilot customarily leaves several gallons in a tank before switching or likes to be tidy by purposefully burning it dry, two factors make it easy to miss the red light. First, Beavers work in interesting parts of the world—rural or isolated regions in which nature unfolds an endless parade of faunal, floral and geological wonders. Second, at least in the coastal portions of the Northern Hemisphere, fog, low stratus and precipitation frequently limit navigation to following shorelines. Thus, both a sunny day with much to see and a murky day with not enough to see prompt Beaver pilots to spend a lot of time looking out the side window. We've all met the ogre named Distraction; few experienced Beaver pilots have escaped the sudden, backfiring, heart-leaping loss of power that follows an unnoticed red light.

There is a curse and a rush of the left hand to the fuel selector valve and the boost pump switch. The prop continues to windmill while the relative wind whistles through minute openings around the windows and doors. Perhaps a passenger starts praying out loud. Then the renewed flow of fuel reaches the carburetor, and the engine surges into life with a reassuring roar. After the engine and your heart and the passengers settle down, you silently swear to yourself that while you might conceivably forget your wedding anniversary sometime in the future, you'll never ever again forget to switch tanks in a de Havilland Beaver.

The airplane can drop a few hundred feet during the interruption. A pilot who was sightseeing usually can spare the loss. A pilot who was squinting out the side window for landmarks while poking along in fog at minimum airspeed a couple of wingspans above the surface is not as wealthy. (Some DHC-2 operators who often fly with minimum fuel, such as Aerial Agriculture of Australia, have installed special aural buzzers in their "Bivahs" to supplement the visual warnings; in North America the devices are uncommon.)

Most fatal Beaver crashes occur in low visibility, but momentary fuel starvation probably figures only occasionally. There are more conventional suspects.

With relatively light controls, the airplane is easy to wrap into a sudden, steep bank after flying into a foggy cul-de-sac. The Beaver also skids easily with that sensitive rudder—and an inexperienced bush pilot making an emergency turn in low visibility is likely to jam his foot on the rudder pedal. That pilot will already have throttled back because of the weather. Add them up: steep, accel-

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erated bank; skid; low airspeed; perhaps a heavy load. . . .

You might hear a few passengers shriek during the maneuver, but you will not hear a stall-warning horn; back in 1947 such a device was missing from both the certification check list and the bush pilots' preferred-features list. Like other large, single-engine aircraft, the Beaver stalls abruptly, with little mushing. It recovers quickly, too, but the conditions under which a Beaver is likely to stall include low altitude.

The Beaver panel contains no padding, just hard metal and protrusions. Even so, the heavy-duty fuselage construction and typical low airspeed often allow pilot and passengers to survive a crash. In a bizarre accident, one pilot inexplicably flew into an isolated cloud on a nice day while climbing from the Ketchikan, Alaska, waterfront and crashed into trees. He seared his hands helping his five sightseeing cruise-ship passengers from the burning wreckage, but only one person suffered a serious injury. Ironically, in a cost-saving move the week before, the operator had canceled hull insurance on that airplane, which had expensive amphibious floats.

In another case, a lone pilot enroute to a pickup at a logging camp on Heceta Island in southeastern Alaska got too low while trying to find a way through fog. A wing struck a tree, and the impact spun the Beaver 180 degrees, depositing it tail first in a grove of trees. The pilot was shaken but unhurt. He climbed out and hiked through the woods and muskeg to a beach, where a search airplane spotted him several hours later. So thoroughly did the forest swallow the wreckage that salvagers could not find it from the air even after the pilot told them where to look. Finally, they landed the pilot back in the area with a helicopter, and he retraced his path on foot. After Kenmore Air Harbor rebuilt the airplane, it returned to the air. That accident was also unusual in that the airplane did not burn; fuel tanks under the fuselage render fire a consequence of most uncontrolled Beaver crashes.

As you might expect, structural-failure accidents are as rare in the Beaver as closed-course speed records. One exception involved a Beaver rigged for agriculture use in New South Wales, Australia. According to officials at de Havilland, which sent an investigative team down under, the pilot had the habit of pulling up sharply at the end of each run to empty the hopper of remaining fertilizer; during one such maneuver a strut fitting broke, precipitating a wing failure and crash that killed the pilot. The airplane had made about 2,000 previous agricultural flights and had been certificated by the Australian government to carry gross weights of 6,120 pounds—20-percent more than the 5,100-pound design limit for wheel-planes. One result of that accident was mandatory installation of stainless-steel struts in similarly rigged Beavers.

Some 24 airworthiness directives apply to the Beaver—not a particularly high number for a 40-year-old utility design. Most are one-time modifications or corrections that may be satisfied during rebuilding. Many pertain to corrosion, especially in the tail area.

"The Beaver doesn't really have any maintenance problems," says Jerry Rader, a long-time manager in Kenmore's maintenance and product service areas. "It's as easy to keep up as the Cessnas. On a 100-hour [inspection], the engine takes a little longer because of more difficult accessibility, but overall it needs very little care. Some people fly it for years without *any* maintenance. I don't recommend that, but the Beaver's built to take it."

Thus, Beavers work on and on, periodically changing hands and paint schemes. Passing through Ketchikan while sailing his yacht *Red Witch* up the Inside Passage, one pilot was watching a float-equipped Beaver taxi out for takeoff when the registration number rekindled a memory. He realized it was the same airplane he had flown on wheels and skis in the Interior 20 years earlier. After tying up at the air service's seaplane dock and asking a few questions, he signed on to fly for the season.

Eventually, of course, individual Beavers will be retired from commercial use as age and abuse accumulate beyond rebuildability. Technology may well accelerate the attrition with less expensive turboprop options. Although the production line shut down forever 20 years ago, Beavers are in no imminent danger of extinction, with a fleet 1,000 strong and parts (including engines) widely available. Like DC-3s and World War II vets, they will be around in dwindling numbers for years more, commanding respect. Long after the last one leaves commercial service, dozens of others will be kept and maintained by private pilots who value character and quality—the kind of pilots who are likely to drive to the airport or seadrome in a polished 1955 Chevy.

Even before the Canadians judged the Beaver as one of their 10 greatest engineering achievements, according to rumor, the Smithsonian's National Air and Space Museum in Washington, D.C., tried to acquire one. The curators figured the airplane had earned a place alongside the *Spirit of St. Louis*, the Boeing 247 and other classics on display. But the museum will have to wait; for the time being, all the world's Beavers are still hard at work. □

De Havilland DHC-2 Beaver

Price new (1947): $23,000 (Canadian)
Current market value: $160,000, float-equipped

Specifications

Powerplant	P & W R-985 Junior Wasp radial 450 hp/2,300 rpm
Recommended TBO	1,500 hr
Propeller	Hartzell, three-blade
Length	32 ft 9 in
Height	10 ft 5 in
Wingspan	48 ft
Wing area	250 sq ft
Wing loading	20.4 lb/sq ft
Seats	6-8
Cabin length	9 ft
Cabin width	4 ft
Cabin height	4 ft 3 in
Empty weight	3,263 lb
Gross weight	5,090 lb
Useful load	1,827 lb
Payload w/full fuel	1,057 lb
Fuel capacity, std	95 gal (570 lb)
Fuel capacity, w/wing tanks	138 gal (828 lb)
Oil capacity	25.2 qt

Performance

Takeoff distance over 50-ft obst	1,610 ft
Rate of climb, sea level	740 fpm
Max level speed	126 kt
Endurance w/45-min reserve, 5,000 ft, 53% power	
Std fuel (95 U.S. gal)	3.52 hr
W/wing-tip tanks (138 U.S. gal)	5.68 hr
Range w/45-min rsv, 5,000 ft, 53% power	
Std fuel (95 U.S. gal)	352 nm
W/wing-tip tanks (138 U.S. gal)	569 nm
Service ceiling	15,750 ft
Landing distance over 50-ft obst	1,510 ft

Limiting and Recommended Airspeeds

Vx (best angle of climb)	70 KIAS
Vy (best rate of climb)	83 KIAS
Va (design maneuvering)	109 KIAS
Vfe (max flap extended)	91 KIAS
Vne (never exceed)	156 KIAS
Vs1 (stall clean)	52 KIAS
Vso (stall in landing configuration)	38 KIAS

All specifications are based on manufacturer's calculations. All performance figures are based on standard day, standard atmosphere, sea level, gross weight conditions unless otherwise noted. □

Gerry Bruder, AOPA 471963, holds a CFII certificate with single-engine land and sea and multi-engine land ratings. A freelance writer and a former FAA accident-prevention counselor, he has logged more than 6,500 hours.