Ditching to Survive

A Hawaiian Airlines captain and lightplane pilot, for whom overwater flying is a regular occupation, tells how it's done

by J. R. WILLIAMS / AOPA 227046

■■ Each time I cross the shoreline in a light aircraft and begin an overwater leg, my engine goes into automatic rough. From other pilots I've spoken to, I've learned that I'm not alone. I'm sure that if my automatic rough became an actual rough or a sudden stop, my pucker factor would increase at an alarming rate.

Because all past reports concerning survival of light-aircraft ditchings at sea have been quite discouraging, giving slightly less than even odds at best, I set out to interview some local survivors of ditchings in Hawaii, where I live.

Surprisingly, our survival rate in Hawaii has been quite high: over 80% for known ditchings. Granted that a great amount of credit has to be given to rapid pickup of survivors, without which more would have been lost because of exposure, shark attack, or rapid drifting out of the search zone. The important fact here, though, is that a great proportion of people are surviving the actual impact with the water and subsequent sinking of the aircraft.

Let's begin by taking a look at five case histories.

• A Cessna 206 with five on board was on a routine cross-country flight. As the pilot was letting down from 7,500 to 5,500 feet to get beneath a cloud bank, the engine began running rough. The pilot turned north in an attempt to make it to an intermediate island. He should have had plenty of altitude to glide in, except that the prop froze and there were strong 30-knot winds.

Fortunately the owner had just installed high-lift leading edges on the Cessna's wings. He was over a bay that was sheltered from the major swell pattern, and the wind wave was just a one-foot chop. This, coupled with a 40-mph stall speed and a 35-mph headwind, made him decide to go to full flaps and land directly into the wind. There was plenty of time on the way down for the plane's occupants to talk things over, don lifejackets, and open the doors—although the doors were not wedged open. A "Mayday" was sent out and acknowledged. The aircraft entered 20 feet of water about 200 yards from shore.

With a ground speed of 5–10 mph, the plane just plopped into the water and stopped. No structural damage to the aircraft or injuries to the passengers occurred. The rear door could not be opened because the flaps were in the way. The front doors could not be opened until sufficient water entered the cabin, after which all occupants exited through the front doors.

Flotation devices included one two-man liferaft and five lifejackets, all of which were then inflated. The aircraft sank within one minute. The wind was too strong for the five to swim against toward shore, so they held onto the raft until they were picked up by the Coast Guard about 45 minutes after entering the water.

• In another case, on a nice weekend day in March, two friends were flight-testing a twin-engine de Havilland Dove. The wind was a southerly 10–15 knot onshore breeze, and the seas off Waikiki were one- to two-foot swells from the south. Due to a loss of oil pressure, one engine of the Dove was shut down as a precautionary measure.

When the aircraft was about three miles offshore and four miles from the airport, at 1,000 feet msl, the other engine suddenly quit. The pilot tried to restart the engine that had been shut down earlier. By the time the aircraft had descended to 400 feet, he knew that it wasn't going to respond, so he lowered 15 degrees of flap and ditched crosswind and parallel to the swells.

The plane bounced once or twice, spray coming into the cabin and cockpit through the belly of the fuselage as it was torn by the water pressure. During this time the pilot announced to the tower that he was ditching, but although his transmission showed up on the tower tape, it was missed at the time because of radio congestion.

When the plane stopped, the passenger rushed to the main cabin door and leaped into the water. The pilot made his way to the cabin door, realized that the lifejackets were in the cockpit, and returned to pick them up. The plane sank shortly after he managed to get out. The pilot estimated that it went down 45 to 90 seconds after impact. A racing yacht in the vicinity picked up the survivors within moments after the plane sank.

• A Navion with four persons aboard was returning to Oahu from the outer islands one fall day. The trade winds were blowing from the northeast at 15–20 knots, with higher gusts, and the sky was filled with rain showers. The pilots (two on board) decided to try to stay below the weather. They were at 400 feet over gray, choppy water with three-to-four-foot wind waves and four-foot swells.

Suddenly, shortly after the aircraft passed a commercial fishing sampan, the engine stopped. While one pilot called "Mayday," the other landed the plane, crosswind and cross-swell.

There was no time to prepare properly for a ditching. The aircraft hit once lightly, skipped, and hit the second time, stopping rapidly. One seat bracket was broken, and the engine mounting seemed to be bent downward, but again no one was injured. The canopy was opened, the one two-man liferaft and four lifejackets were taken from the baggage area, and all four occupants of the Navion climbed out. The aircraft sank in less than a minute.

Some of the vests would not inflate automatically, and had to be inflated

through the oral tube. Also, some problem was encountered in donning the vests in the water. Since there was only one small raft, the four elected to stay in the water and hold onto the raft for added support.

They were concerned that it was late in the afternoon, and that they had received no response to their Mayday call. That it had been heard, however, was obvious within 15 to 20 minutes, when a Coast Guard C-130 was seen circling low over the water. The only problem was that the C-130 started the search to leeward of their position and continued in the wrong direction. Luck was on their side again, though, when just about that time the mast of the fishing boat was seen heading their way. Two smoke flares were used to attract attention, and the survivors from the Navion were picked up within 30 minutes of entering the water.

• On another occasion, on a mid-winter morning a Piper Cherokee 140A, with only the pilot on board, was en route to Hilo, Hawaii. The winds were 20-knot trades, with higher gusts, and the seas were 12 feet and broken. This type of sea is definitely the worst type imaginable.

The pilot, Air Force trained and a strong swimmer and diver, was *wearing* his lifevest. He was 10 miles from the airport and 1½ to 2 miles offshore, at 1,200 feet, when the engine began to run rough. The pilot thought the problem was carburetor ice and pulled out the carb heat. At 600 feet the Cherokee's engine quit completely.

In what seemed to be all one action, the pilot turned 180 degrees to head for shore, opened the door, and began calling "Mayday." He had had no response on the emergency frequency earlier, while giving a position report, and thought that no one would hear him this time either. He later found out that his Mayday had been picked up and that a Coast Guard boat was in the water in nine minutes.

Realizing he couldn't make shore, the pilot set the plane down on a crosswind, cross-swell heading. He hit hard and flipped immediately, cartwheeling to the right slightly. He thought later that an oncoming wave crest might have caught his right wingtip at about the same time his gear hit.

After the pilot got out of the seatbelt, his buoyancy took him aft to an air pocket in the rear-seat area. He took a few gulps of air and, locating the rear window by the light, put his back against one side of the plane and his feet on the window and pushed it out. He tried getting out of the window, but the broken Plexiglas caught on something. Pulling himself back inside, he felt the door opening and exited easily. Once again, the plane sank in 60 to 90 seconds.

The pilot received cuts on his shins and a bruise on his head. He was found by the Coast Guard an hour and a half after entering the water.

• Finally, a Cessna 207 on a cargo flight suffered a sudden loss of power shortly after departing the Lihue airport on Kauai. The vibration was so bad that the instrument panel was unreadable. Then the engine stopped. The plane was eight miles east-southeast of land, at 4,500 feet msl, and in constant communication with the tower. The sea was flat and glassy, and the wind was calm.

The pilot stuck his lifevest into his pants to prevent it from getting caught while going through the narrow door. He opened the door and positioned the handle in the "lock" position. Using a 90-mph glide he maneuvered to within 3 miles of shore before he had to ditch. Even though he was a licensed seaplane pilot, because of the glassy surface he had a difficult time judging his height above the water. When he thought he was near the water, he put down full flaps and began holding the plane off. It stalled at about 50 mph and dropped less than three feet.

With a ground speed of nearly 50-mph, the Cessna flipped end over end and made a 180-degree twist before stopping. The pilot unfastened his seatbelt, dropped to the overhead, climbed out the door, and stood on the underside of the left wing, which was floating because it was light on fuel. A fishing boat nearby took the pilot off the wing three minutes later, just as the wing went under water. The pilot received a gash on his upper lip. He thought he hit the wheel or dash during the impact.

What can we learn, if anything, from these five incidents?

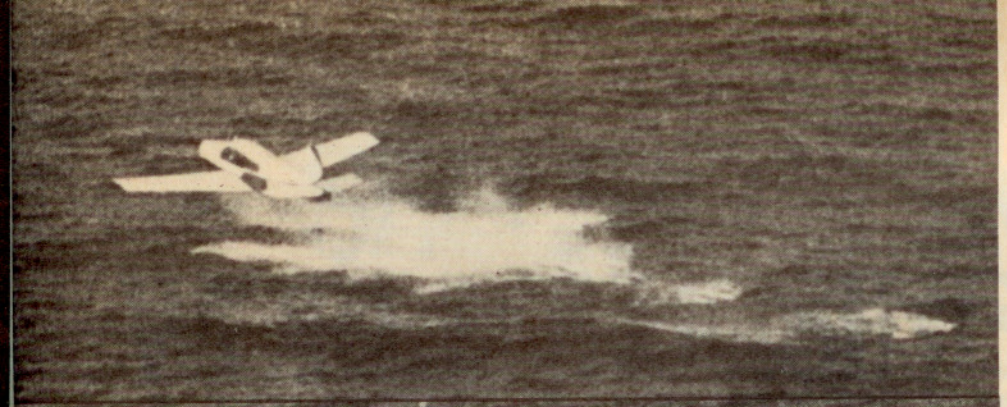
Well, for one thing, retractable-gear aircraft seem to ditch in the traditional manner, i.e., impact, bounce, and second impact with great deceleration. They sustain considerable impact damage, but except for high deceleration forces the passengers seem to suffer no ill effects.

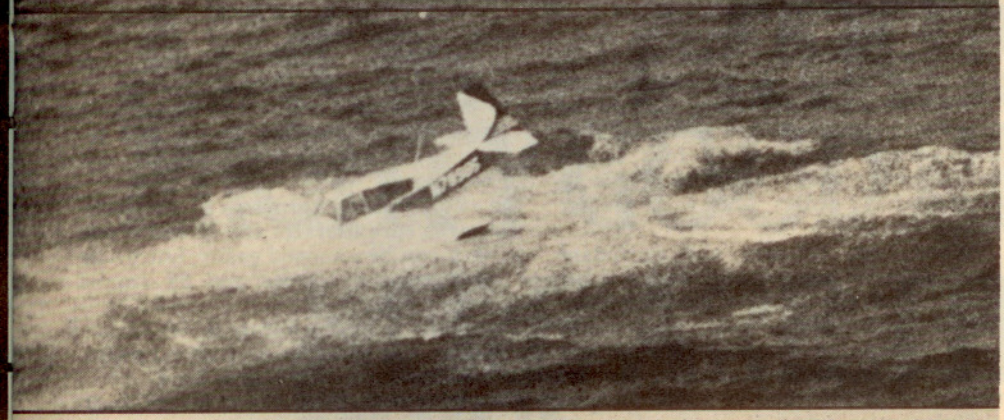
We can also assume that a fixed-gear aircraft, regardless of wing position, will flip over if it hits the water with more than about a 20-mph ground speed. Normally all light aircraft sink in about one minute, but a high-wing aircraft with light fuel loads can be expected to float a little longer than a low-wing aircraft, because it sustains less wing damage on initial impact.

Immediately after impact, an aircraft will float nose-low because of the weight of the engine. This seems to create a temporary air pocket in the backseat baggage area that could probably be

This unusual photo sequence was taken from a Coast Guard helicopter standing by during the successful ditching, last fall, of a Mooney in the Atlantic off Norfolk, Va. Both occupants of the aircraft were rescued immediately.

Official U.S. Coast Guard photos.





used for a momentary breath of air.

Some do's and don'ts will be listed at the end of this article. For now, let's look at the emergency equipment we should carry on overwater flights, and then consider how to evaluate sea conditions.

Part 91.189 of the FARs spells out the survival equipment required by law for overwater operations.

"(a) No person may take off an airplane for a flight over water more than 50 nautical miles from the nearest shoreline, unless that airplane is equipped with a life preserver or an approved flotation means for each occupant of the airplane.

"(b) No person may take off an airplane for a flight over water more than 30 minutes flying time or 100 nautical miles from the nearest shoreline, unless it has on board the following survival equipment:

(1) A life preserver equipped with an approved survivor locator light, for each occupant of the airplane.

(2) Enough liferafts (each equipped with an approved survivor locator light) of a rated capacity and buoyancy to accommodate the occupants of the airplane.

(3) At least one pyrotechnic signaling device for each raft.

(4) One self-buoyant, water-resistant, portable emergency radio signaling device, that is capable of transmission on the appropriate emergency frequency or frequencies, and not dependent upon the airplane power supply.

"(c) The required liferafts, life preservers, and signaling devices must be installed in conspicuously marked locations and easily accessible in the event of a ditching without appreciable time for preparatory procedures.

"(d) A survival kit, appropriately equipped for the route to be flown, must be attached to each required liferaft."

It is this writer's belief that no aircraft should operate any distance from land without all the flotation and emergency equipment listed in the regulations. You can die one mile from shore just as easily as you can 50 or 100 miles away.

Although most liferafts have survival and signaling equipment packed inside them, I feel that the operator should make up his own individual kit. This kit should include signal flares (the small vest-pocket type is very effective); smoke flares; signal mirror; dye marker; fishhooks and line; flashlight; small first-aid kit; a good knife, such as the Swiss Army knife; suntan/sunscreen protection; and a personal crash locator beacon.

continued

This equipment should be individually wrapped to make it as waterproof as possible and then packed in a small, floatable, waterproof box such as a plastic fishing-tackle box. Additional flotation can be provided by putting strips of styrofoam around the box and securing it by taping it firmly with waterproof tape. The handle of the box should be attached to one of the liferafts by a short line, but be careful not to attach the line to the raft inflation lanyard.

It's a good idea not to put batteries into the flashlight until you're ready to use it. You should also change the batteries each six months. The old batteries could always be used in your night-flying flashlight.

It would be a good investment for overwater pilots to go to sea for a day on a deep-water boat, such as a charter fishing or sailing boat. Spending a little time on rough water will give them an idea of what they will be faced with if they are forced to ditch. They will see that the water is not as smooth as it looks from the air.

Many pilots have stated that on overwater legs they climb high enough to glide to land, but when I interviewed the pilots involved in the ditchings mentioned earlier, I learned that in two out of the five cases the props froze, increasing the drag and sink rate considerably. This proves that you can't always count on the height theory, so all you have left is proper survival gear, proper operational procedures, and good piloting technique.

Smooth seas can be as dangerous as rough water, since it is very difficult to judge height correctly over glassy water, and the worst thing you can do is stall high and hit nose first. So if you're unable to judge your height over a calm sea, or if it's at night, or if you're in instrument conditions, it's best to approach at 5 knots or so above stall speed and glide down until contact is made. Remember that aircraft control is necessary at all times. If power is available, try for a 100-fpm rate of descent when you near the surface.

You probably have a better chance of surviving a forced landing over open water than in a large metropolitan area, where tall buildings are waiting to take a wingtip off and send you straight down, or in a heavily forested area, where the trees will do the same. It's necessary, though, to understand a little about what the sea is like.

The open sea usually consists of two wave patterns. The first is the major swell, which is formed by storm systems many miles away. This swell is characterized by long, undulating patterns best seen at altitudes above 2,500 feet msl.

The secondary wave, or wind wave, is formed by the local winds. This is best seen at low altitudes. If there are whitecaps on the surface, they will indicate the wind direction, since the whitecap streams into the wind when the wave is blown ahead of it.

You can also determine the force of the wind from the waves. The absence of whitecaps indicates a wind of less than 10 knots. The presence of many whitecaps indicates a wind of 10–20 knots, and seas of usually three to four feet. Whitecaps with many streaks of foam behind them indicate winds of 20–30 knots and seas of four to six feet. Blowing spray indicates winds in excess of 30 knots and seas greater than seven feet.

When both primary and secondary swell patterns are present, we have our work cut out for us to determine a heading for ditching. One thing we want to avoid is landing into the face of any wave; this would be like hitting a stone wall.

Unless the wind is more than 10 knots, it is of little consequence, and we should land parallel to the primary swell.

When the wind picks up to around 15 knots or more, it is best to use a compromise heading that will use some, or all, of the headwind component. How much will depend on the type of aircraft being flown. If the plane has a medium stall speed, and the ground speed into the wind is less than 15 knots, it will probably be best to ditch directly into the wind, planning on stalling on the back side of the wave.

Swell patterns clash together and ebb apart at irregular intervals. Therefore, if you have some power available you may be able to hold the plane off the surface until the water ahead looks relatively calm, at which time you can chop the power and land. This flattening effect of the water occurs even with very high wind and wave combinations.

Some techniques to use would include the following:

Lower partial flaps on low-wing aircraft and full flaps on high-wing planes.

Try to land with about a 10-degree-nose-high attitude. If you're flying a retractable-gear plane, expect the plane to hit and bounce once. While in the air on the skip, try to keep the attitude under control. On the second impact the nose will bury itself, so try to hold full back elevator.

With a fixed-gear aircraft, expect the plane to flip over as soon as the gear touches the water.

In all cases, only after the aircraft stops should you release your seatbelt. Besides keeping you from being hurt by being thrown around in the final moments, the seatbelt and seat will help you remain oriented in the cabin, and you won't lose track of where the door is.

A sequence of do's and don'ts for overwater flights and ditchings would be as follows:

Overwater Flights

Do have adequate flotation and survival gear on board prior to flight.

Do fly at the highest practicable altitude.

Do file a flight plan.

Do maintain radio communications with some facility while airborne.

Do don lifevests before the flight, have your passengers don theirs, and instruct everyone in the proper inflation technique.

Do use shoulder harnesses if available.

Do make sure liferafts are stowed where they can be removed easily, but where they won't get loose and fly around during impact.

Do evaluate sea conditions while airborne, the same as you would evaluate the terrain while over land.

Do check with local Coast Guard facilities; average ditch headings are available in many coastal areas.

If a Ditching Is Imminent

Do try to ditch while partial power is available.

Do communicate your Mayday from as high an altitude as possible. If you are no longer in direct communication with anyone, transmit "in the blind" on 121.5.

Do set up a normal glide and try to evaluate the sea conditions on the way down.

Do open the doors and prop them open with shoes or other objects.

Do jettison all unnecessary articles to prevent injury from flying objects.

Do brief passengers on what to expect and how to brace themselves. Preparations should include removing all sharp objects from the person and removing eyeglasses and shoes.

Do cinch seat and shoulder straps as tightly as possible.

Do land as slowly as possible while still avoiding a stall.

Do not release belts until the aircraft is completely stopped.

If Aircraft Is Partially Submerged

Do not try to force doors open against the water pressure. Save your strength. Once sufficient water enters the cabin the doors will open easily.

Do remember that the aircraft will sink nose first and will usually leave an emergency pocket of air near the rear seats or baggage area.

Do not inflate lifevests until you're outside the plane because they restrict movement and may prevent your getting out.

Do not panic. Remember, chances are pretty good that you will survive. Most of it will be up to you. □