Virtual Horizons

Environmental Assessment of Cessna 208 Caravan Amphibian Aircraft

The Caravan is the most modern commercially operated floatplane in the world today. It was originally designed and built in the 1980's when the environmental impact of any new product was a worldwide concern. Knowing the aircraft was going to be used in remote areas and within national parks and undisturbed wilderness, Cessna made sure that the aircraft met and surpassed the requirements that the aircraft would not have any temporary or permanent negative impact on the environment. The amphibian Caravan meets these requirements in the following ways:

1. The most damaging and lasting impact any aircraft could have on the environment is the necessity for a man made landing and takeoff area. All fixed wing and rotary aircraft, with the only exception of the seaplane, required runways and landing pads. The amphibian seaplane departs from established airports and does not require any prepared landing or takeoff areas in the remote or undisturbed areas. This is the most important point about the aircraft. The Caravan can enter and leave from any national park or wilderness area without leaving a trace. Minutes after the aircraft leaves you can never tell it had been there.

2. The least damaging and most temporary impact an aircraft or any man made vehicle could have on the environment is what it now called “noise pollution.” Noise pollution is normally associated with the disturbance aircraft can make within the vicinity of airports and airport environments, but in the national parks and wilderness it can cause more than just annoyed neighbors. High impact noise can disturb wildlife so that they may leave the area or worst the noise may scare birds from their nests leaving them susceptible to predators. The Caravan’s noise level is rated as one of the lowest of not only any aircraft but of most motorized man made vehicles.

The noise from vehicles mostly comes from their engines and the design of those engines. Both the gasoline powered piston engine and the diesel-powered diesel engines are designed with pistons that are propelled by an explosion or fast expansion of gas within the engine that creates a high ratio of noise pollution. Noisy piston engines power all boats and older aircraft. The Caravan, however, is propelled by a turbine engine that is powered by the slow burning of highly refined kerosene that turns a series of fans. If you were to run a portable generator inside your house to power an electric fan, which would you hear? Obviously the loud noise from piston engine portable generator would drown out the revolving fan. That is the same with a turbine engine. The engine turbine noise is minimal, especially compared to the noise that large diesel powered boat or ship engines make.

The other part of small general aviation aircraft that creates noise is the propeller, but only during takeoff and while low level flying at high power settings. Many older aircraft and most larger air transport aircraft have noise levels on takeoff of over 110 decibels, but the Caravan is rated at only 76 decibels at full power takeoffs. The Caravan can thus operate out of noise-regulated airports with no restrictions.

The worst noise is created by the fact that the propeller tips are traveling near the speed of sound. Thus, generally the higher the propeller speed the higher the noise level. The propeller of most aircraft turn at speeds of 2200 rpm on takeoff, but the Caravan was designed to operate with propeller rpms of only 1900 on takeoff. This is one factor that makes the aircraft much quieter than older generation aircraft.

The second consideration of propellers is their thickness and how much air they displace. For example, fixed wing aircraft have thinner and much smaller blades than helicopters and thus are usually much quieter than helicopters. The Caravan blade is so much smaller than any helicopter blade that it makes much less noise than any operating helicopter. Therefore, Caravans are replacing helicopters in noise sensitive areas such as the Grand Canyon and Cape Good Hope for sight seeing flights. The Caravan can operate with a minimum of disturbance in such wilderness areas or even in urban built-up areas.

There have been several studies of how aircraft noise disturbs wildlife and particularity nesting birds. In all cases, the studies have concluded that aircraft, including the much noisier helicopters, will not disturb wildlife if they do not fly

below 1000ft above the ground surface. This is an easy directive to follow except where an aircraft is forced to takeoff from a prepared airport or helipad within a national park or wilderness area. The amphib Caravan avoids that problem because the as the aircraft is landing and taking off from the water and can approach and takeoff over the water or from almost any direction allowing the pilot to avoid noise sensitive areas.

One issue that has been mentioned in Indonesia is that the amphib Caravan will disturb the fish below the water surface. A basic understanding of how sound travels will help prove that it is not possible for a seaplane to make the kind of noise that will disturb fish or sea life. Basically, sound is transferred by the medium it travels in. Sound created in the medium of air will normally bounce off or reflect off the medium of water and not transfer below the surface. An aircraft over flying the ocean cannot be heard by sea life. Any body that has spent any time scuba diving will confirm that reality.

Sound created underwater, however, will travel underwater. All boats and ships use either propellers or water jets for propulsion. The sounds created by the noisy piston engines are transferred directly through the drive shaft to the propeller and can travel long distances underwater. A scuba diver can also verify this fact that propeller driven vehicles can be heard underwater. The amphib Caravan, however, has NO UNDERWATER PROPELLER. The aircraft is propelled by the same air displacement of the normal propeller that is located well above the water level. There are no moving mechanical parts underwater to disturb sea life.

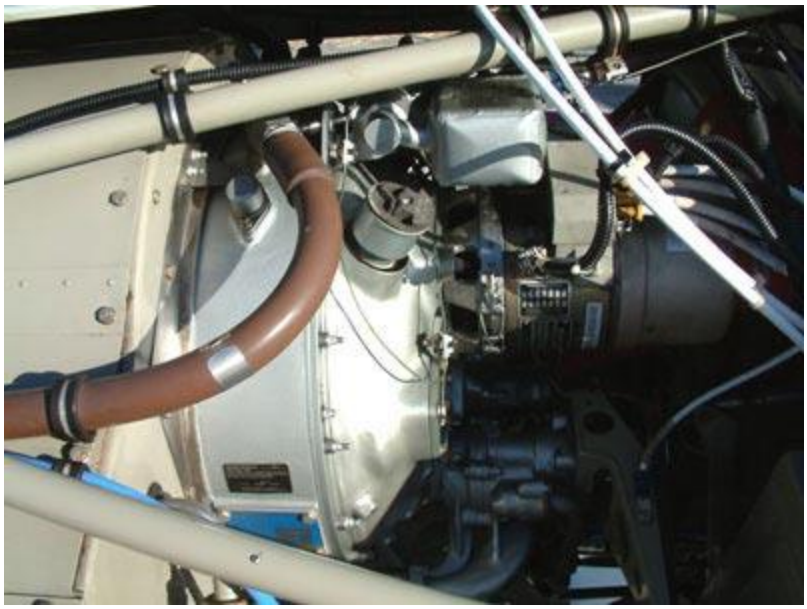
The propeller is well above the water line.

Having “no noise” underwater, moreover, is not a liability. Underwater noise is mostly omni directional and thus non-sonar sea life cannot distinguish from which direction a ship or boat is approaching. In these cases the noise is not the

problem that mostly affects sea life. The worst affect is when sea life like fish, sharks, manatees, and sometimes even whales, are chopped by the underwater propellers of ships and boats. The amphib Caravan has no underwater propeller and thus cannot harm sea life. Moreover, the aircraft floats very lightly on the water only drawing 66cm of draft. Thus, the amphib Caravan has minimum to no affect on below surface sea life.

There is no under water propellers.

3. The third possibly damaging affect that any man made vehicle can have on national parks or wilderness areas is that of pollution. The design of the amphib Caravan prevents any pollution of its operating area. First of all, the Pratt & Whitney turbine engine is designed to operate with an absolutely zero tolerance of any fuel or oil leaks. If the engine develops any such leak the aircraft will be immediately grounded and no flight will take place. An engineer or pilot can look into any engine compartment of any Caravan at any time and will not find even one drop of oil or fuel. If the engine did develop an oil leak it would have to be pulled out, shipped to America, and rebuilt at an enormous cost to the operator. There is simply no tolerance for leaks.



The engine compartment is leak free.

This extra clean engine has been operating for over one year.

Secondly, the turbine engine is extremely efficient compared to any piston engine powered boat or ship. The turbine engine will only burn a highly refined kerosene fuel that leaves no exhaust pollution. It burns 100% if its fuel. By comparison a diesel engine expel anywhere from 10% to 40% of un-burnt fuel as exhaust pollution, depending on the condition of the engine. Where Pratt & Whitney turbine engines are highly regulated and are not allowed to run inefficiently, ship and boat engines are not regulated and can create enormous pollution because of poor engine maintenance.

EPA or Environmental Protection Agency regulated canisters #1, 2, & 3.

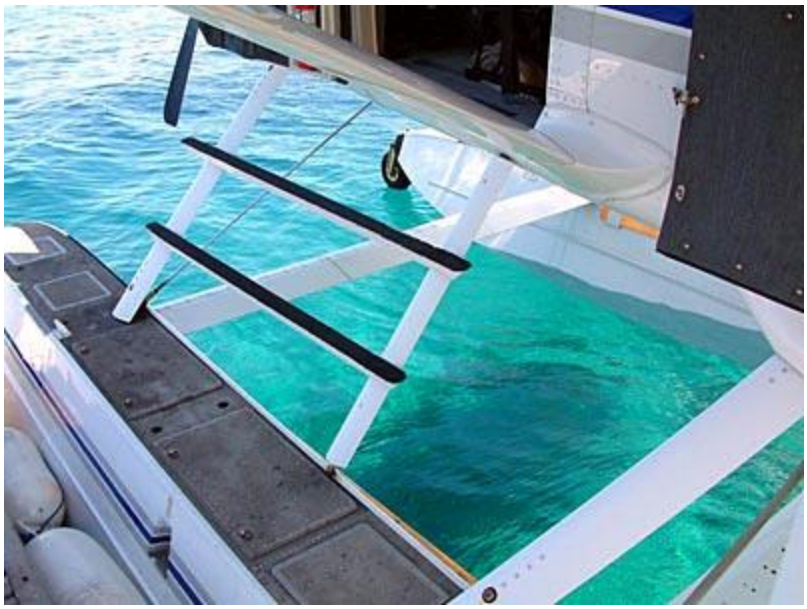
Finally, the amphib Caravan was designed to prevent any normal expulsion of fuel or oil from the engine during operation. For instance, the aircraft is always fuelled and maintained at the airport where any extra fuel or oil can be handled and disposed in a controlled environment. Where the engine is designed to expel excess fuel or oil while the engine is running the manufacturer has placed Environmental Protection Agency regulated canisters to catch such expulsion. These EPA canisters are highly regulated and maintained to avoid any such accidental expulsion of fuel or oil into the environment.

EPA regulated canister #4.

Clean and oil free belly of aircraft.

In comparison, boats and ships are either unregulated or loosely regulated and regularity expels dirty oil and unrefined diesel fuel over board and into the ocean. They are fuelled while in the water and engine oil is often changed on the water leaving behind spills and leaks. The unregulated crew will often dump dirty engine oil overboard as they have no place to store it on board. Moreover, because their drive shafts are under water any leaks in their seals will leave a streak of dirty engine oil along the ships path. Conscientious tourist industry operators can avoid damaging the environment, but many of the unregulated operators will not. Aircraft, being highly regulated and being maintained at airports will not pollute or disturb the natural environment.

The keels are only submerged 2/3rds of a meter below the surface.



The seaplane floats lightly on the water with no impact on the surrounding environment.

The amphib Caravan can enter and depart naturally sensitive areas by air with out having to build access roads. Moreover the seaplane has the ability to land and takeoff on short stretches of selected areas making it one of the best alternatives for transferring passengers, especially environmentally sensitive tourists, into and out of national parks, marine parks, and wilderness areas.

In Komodo National Park, for example, some park rangers were concerned that the aircraft might disturb the Komodo dragon. Since the aircraft enters and departs over the water and avoids any low level flights over land the aircraft will have absolutely no impact on the dragon what so ever. The animals will never hear or see the aircraft as it brings in the revenue-producing tourists that the park needs to survive.

Clean and safe for all environments.

The fact that literally hundreds of seaplanes are used throughout Canada, Australia, America, Fiji and the Maldives, and operate regularly within the highly regulated National Parks, Marine Parks, and Wildlife Reserves of these countries, shows that these aircraft are considered a much more environmentally friendly alternative to building runways or helipads, or transferring guests using much slower and less environmentally friendly boats.

There is no doubt that boats and ships are a way of life in all countries, but where ever these vehicles are allow to operate the amphib Caravan can operate with much less impact on the environment and should also be allow to operate. The amphib Caravan can enter and leave sensitive natural areas without a trace. There is a saying in Eco-tourism: “Leave nothing but your footprints.” In the case of the amphib Caravan it does not even leave a footprint.

Fish are attracted to the shade under the floats as the amphib Caravan sits on the water.

Article and Images by John S Goulet