

Consolidated Catalina PBY

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Historical

The **Consolidated PBY Catalina**, also known as the **Canso** in Canadian service, is an American flying boat, and later an amphibious aircraft of the 1930s and 1940s produced by Consolidated Aircraft. It was one of the most widely used seaplanes of World War II. Catalinas served with every branch of the United States Armed Forces and in the air forces and navies of many other nations.

During World War II, PBVs were used in anti-submarine warfare, patrol bombing, convoy escort, search and rescue missions (especially air-sea rescue), and cargo transport. The PBV was the most numerous aircraft of its kind and the last active military PBVs were not retired from service until the 1980s. In 2014, nearly 80 years after its first flight, the aircraft continues to fly as a waterbomber (or airtanker) in aerial firefighting operations all over the world.

About the model

I have made a semi scale model of a Consolidated PBV Catalina with about 1,7m wingspan in the civilian version. Meaning no gun turret on the nose and I also made no structures to the rear gunning blisters since they are easier to paint on then to cover when unwanted. It has retractable floats like the original for better in air behavior, but that is very well anyways. I thought about adding flaps, but since the original doesn't have some, I left that. So I made all hidden linkages in the tail instead.

There is no decal sheet in the files, because adhesive foil will come off in the water quickly and the fuselage should be painted for watertightness anyways. So search the Net for your favorite design, mask the parts with a good tape from the hardware store and spray several thin layers of paint allowing to dry in between. For me most acrylic paints work, but be sure to test on a waste piece before spraying.

Parameters

Scale ca.:	18 : 1
Wingspan Floats retracted:	1702 mm
Wingspan Floats down:	1613 mm
Length:	1046 mm
Print wight:	1480 g
Wight fully equipped ca.:	2500 g
Wing profile:	Clark YH modified
Speed:	Not measured yet, I'd say moderate ;-)

[Advice: Please read this manual carefully in addition to the videoguides. It contains a lot of important extra knowledge!](#)

Requirements

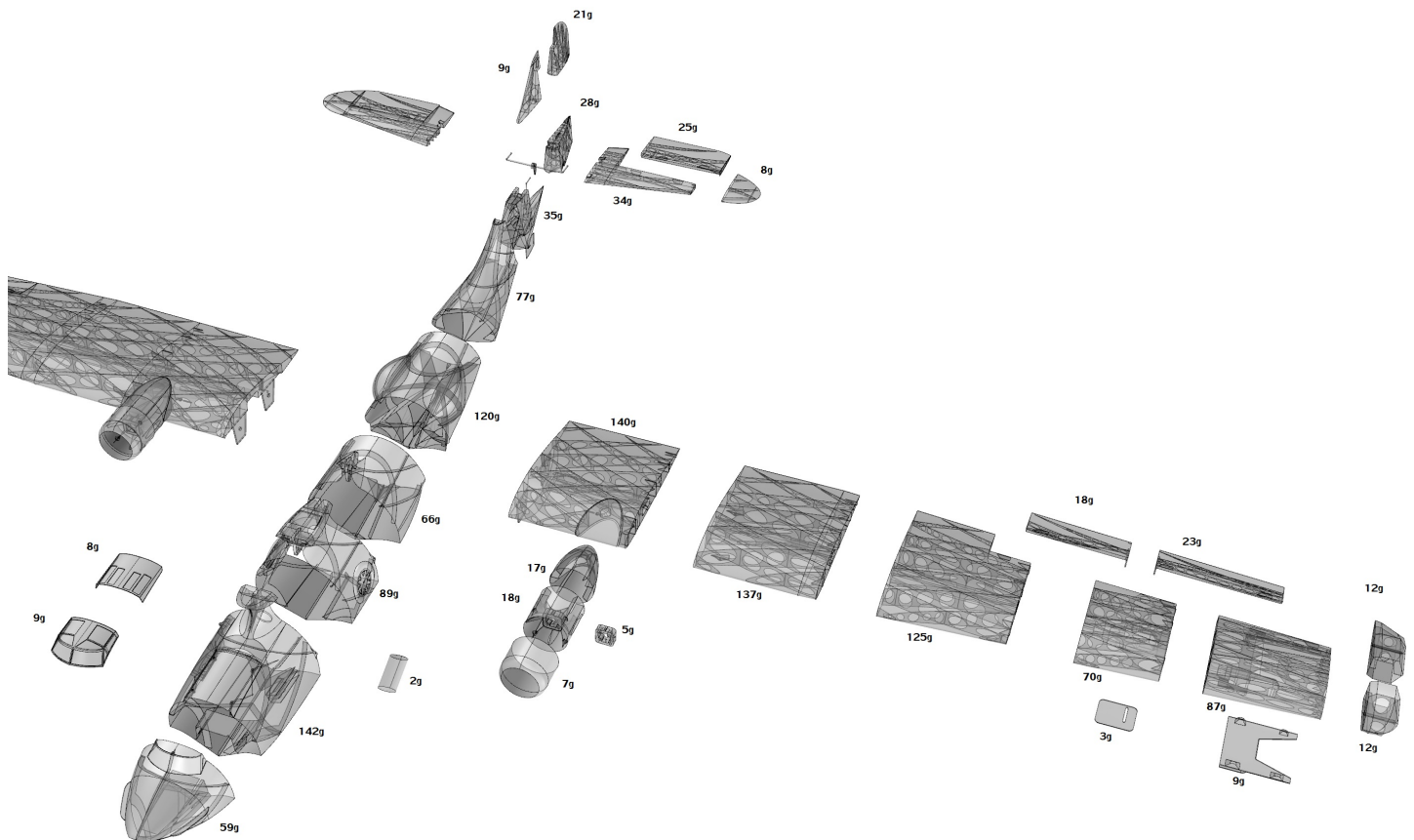
All my parts were printed on a Prusa MK i3, sometimes using the full base size of 250 x 210 mm. Minimum print volume required is 200 x 200 x 180, but you'll have to modify the S3D-factory files (a little less on the base might work as well). Recommended nozzle is 0,4mm

Slicing software: Simplify 3D

Print settings

I basically stuck to the thin wall printing guide of 3D Labprint. All my planes were printed of PLA, but PETG might also work. I printed at 230° C printing temperature for better layer bonding and 0,25mm layer height for faster printing. The S3D Factory files provided, work perfectly on my Prusa. If you are using a different printer type you'll maybe have to play a little with the values to find the settings that work best for your printer. See also the FAQ section, here the most common problems are discussed.

Estimated print weights:



Bill of material

Drive settings:

2x [Turnigy D3530/14 1100KV](#) or similar 3530-35 1100kv

2x [30A Electronic Speed Controller](#) or similar 30-40Amps

[Male XT90 connector](#)

[Turnigy 5000mAh 3S 30C](#) or similar, or 2x 3000/3s (use 2to1 parallel connector)

[16AWG Wire red](#) and [black](#)

[Shrink tube](#)

Propellers, [scale 3 blade](#) or more efficient two blade 9/6 CW/CCW

(Attention: the scale props are actually 10/7 and fit very close, any inaccuracy in mounting the motor-pods will make them touch the fuselage! So I recommend using 9/6! Since they are hard to get in CW/CCW I have tested this [9/4.5](#) props and they worked well and are also available at HK)

Servos, RC, etc

Radio System of your choice, any 5 channel will do (with servos on Y-cable), better 7 channel or more

4x [9g Servo HXT900](#)

2x [Main Landing gear servoless Retract](#)

2x [Y-Servo Cable](#)

4x [100cm servo lead extension](#)

2x [20cm servo lead extension](#)

[AC Hinge Sheet](#) or similar

[CA Glue - medium](#) or similar medium viscosity CA glue

[Activator for CA Glue](#) or similar, but not mechanical is better

4x [2pc Clevis and threaded couplers](#)

2x M5 x 30mm Nylon Screws and [Nuts](#), but metal screws will do as well

2x [2mm threaded pushrods](#) for the Float supports

1x [Elevator linkage lever](#) In case you don't trust the printed part. (Found only at Lindinger but they have 9/6 CW/CCW props too!)

3mm spring steel wire (from your local dealer)

3mm silver steel wire (dto.)

2mm silver steel wire (dto.)

4x Steel pushrod, diameter 1.0mm, 2pc with 1m should be good

4x Steel pushrod, diameter 1,2-1,7 for the Wing supports, 1pc with 1m is enough

8x Self tapping Screw countersunk 3 x 12mm (Retracts to Wing)

8x Screw M3 x 15mm (motor-mounts to motors)
6x Self tapping Screw 3 x 10mm or similar (motor-mount to pods)
8x Self tapping Screw 2,2 x 9mm (engine hood to pods)
5x Servo mounting screw 2,2 x 12mm or more (Canopy to fuselage)
1x Self tapping Screw 2,2 x 9mm shortened (Printed part Control-lever to Elevator)
Window sealant tape 1,5-3 x 9mm
 from hardware store (the good rubbery type) for canopy sealing
Velcro strip for Li-Pol battery
Some grease
Wet protect spray (I think you' ll have to google that)
Scissors
Snap knife, I prefer the 9mm ones
Some Screwdrivers fitting your screws
Pliers (a Z-bending pliers is very helpful, if you have some;)
Tweezers
Hammer
Bench vice
Dremel tool or similar (It's nearly impossible to cut spring steel with a hand saw)
Soldering Iron or any hot tool
Some cloth for wiping off CA glue
Print of the Wire-pattern PDF. Be sure it's printed 1:1 on DIN A4 paper

Assembly instructions:

Part 1: Glueing the Fuselage:

Some parts of the fuselage have bulkheads for stability reasons and most important, to prevent any water, that might have come in, from running through the fuselage making your plane tail-heavy and crash. Be sure to have three complete bottom layers at part 2, 3 and 5 – 7 when printing with your own settings.

When assembling be sure to produce a good complete sealing between the parts by adding an extra layer of glue around the joint. The prints should come out pretty watertight from the printer, but on some sharp corners and areas where the inner structure meets the outer wall it might not be perfect.

When the glueing is done, I do a "suction test" on all critical areas. That means, I press my lips to the mentioned parts and suck on them. Yeah, really no joke! You can feel and hear even little air coming through if it's not perfectly sealed.

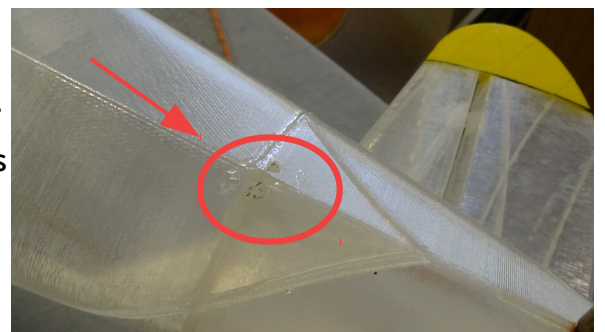
ATTENTION!: Be very sure the **glue has dried well** and the **activator has evaporated completely** before doing this!! You really don't want to sit at the doctors with a fuselage glued to your face...

Put a little glue on these areas again and spread it with a cloth, then use activator. I got all my fuselages perfectly watertight that way, so kiss your plane for best results! ;-)

Remember to install the cable guiding tube between parts 2 and 3! Otherwise you will have a hard time guiding the cables from the wing into the fuselage.

Due to printing reasons the very last part (7) of the fuselage is not watertight on the upper side, where the rudder fits in and might catch some spray water during start or landing. Please pierce two little holes on the bottom, right before the bulkhead of this section.

That's no problem since this part has no water contact during the floating and it will allow the water to be drained.



Let's go and use:

- Snap knife for cleaning the parts (take good care of the push-rod tubes!)
- CA Glue and activator
- Some Cloth for wiping off excess glue and...

[See videoguide #1](#)

Part 2: Glueing the Wing

Luckily watertightness isn't an issue here, just try to achieve good mechanical connection between the parts. When opening the motor-pod bay in the wing with the hot tool, make sure to open the small holes for the cables in the pods and the wing as well.

Due to printing reasons the rear of the motor-pods and the inner part of the pod mounting bay will have gaps. That's no problem, just be sure to clear out all loose strings and fit in the pods. There will be enough glueing surface left to gain a very good mechanical connection. Most important is to get a closed seam line between pods and wing.

Use:

- Snap knife for cleaning the parts
- CA Glue and activator
- Some Cloth for wiping off excess glue
- Hot tool or soldering iron for the cutouts and...

[See videoguide #2](#)

Part 3: Stabilizers and Ailerons

First break off the support structures using pliers, be careful not to break off the rod linkage on the rudder bottom. Then glue parts together like shown in the videoguide.

Do not glue together horizontal stabilizer and rudder parts yet!! Bend elevator axle according to wire pattern. Be sure to put on the elevator linkage lever before bending the second angle of the elevator axle! Now use AC hinges to mount the elevator. Glue together the aileron if not done yet and use AC hinges to attach them to the wing.

Use:

- Snap knife for cleaning the parts
- CA Glue and activator
- Some Cloth for wiping off excess glue
- AC Hinge sheet
- 3mm silver-steel wire
- Wire pattern sheet and...

[See videoguide #3](#)

Part 4: Fuselage assembly

I strongly recommend using Wet-protect spray on all electronic devices in this plane! Especially to the wing servos, retracts and first of all the ESCs! So unscrew the servo bottoms and give a good shot of spray to the electronics, close again and clean the outside housing with some alcohol (otherwise the glue won't stick anymore). Do so with your receiver. For the retracts spray through the slots of the housing and the thread. For the ESC shove the spraying nozzle under the shrink tube and apply a good amount on top and bottom or cut tube off, spray and cover with new one.

Bend 2mm silver-steel wire for rudder axle, according to pattern sheet. Then glue together the canopy. Use hot wire to puncture canopy mounting holes.

I am very sorry that there is no easy click system for the canopy here! I have tried many different versions but no one gave sufficient result and I had always a lot of water coming in through the canopy opening. So I decided it's a lot better to spend a little minute on screwing on the canopy before flying, than to have a soaked fuselage inside or worse.

Use hot tool or soldering iron to open canopy and cable cutout. Be careful **not** to cut away the screw holes! Clear the canopy opening with snap knife and/or sanding paper to remove sharp corners and avoid scratches during the following mounting process. Now exactly follow the steps in the videoguide otherwise you will not get a working linkage! In case that you made a mistake in the order, try to cut out as much glue as you can and break off parts carefully. Usually they can be re-glued quite well.

Use:

- Snap knife and or sanding paper for cleaning the parts
- CA Glue and Activator
- Some Cloth for wiping off excess glue
- AC Hinge sheet
- 2mm silver-steel wire
- Wire pattern sheet
- Steel pushrods, diameter 1.0mm
- Servos and...

[See videoguide #4](#)

Part 5: Wing, electrical equipment installation

Cut 3mm spring-steel wires to length according to wire pattern sheet.

Puncture mounting holes for the retracts and the servo covers with a hot wire.

Install the retracts with the float-supports mounted, using countersunk screws, cable extensions and Y-connectors and check for function.

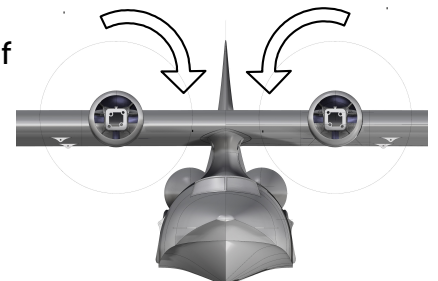
Install the motor mounts to the motors using M3 screws. Maybe you'll have to cut them a little to avoid damage to the wiring inside the motors.

Solder extension cables to the ESCs and isolate with some shrink tube. Tape the servo cables to the extensions chords to help guiding them through the wing. Install ESCs through the upper spacing in the motor pods. Now solder the four ESC cables to the XT connector. (two red on "+" and two black on "-")

Hint: Plugging in an empty female XT-connector before soldering prevents the contacts from melting through the housing during soldering process.

Connect the motors to the ESCs, make sure they run contrary. (if not, simply switch two of the cables from ESC to motor)

Then install the motors to the pods with 3x10mm self tapping screws.



Use:

- 3mm spring-steel wire
- 2mm silver-steel wire
- Wire pattern sheet
- Steel pushrods, diameter 1.0mm
- 16A Cable extensions red and black
- XT male connector
- Servos
- Servo-less gear retracts
- Servo extension cables
- Servo Y connectors
- Self tapping Screw countersunk 3 x 12mm
- Screw M3 x 15mm
- Self tapping Screw 3 x 10mm or similar and...

[See videoguide #5](#)

Part 6: Final assembly

Use 2mm silver-steel wire to produce the two float-joint axles according to wire pattern. For the wing supports use 1,2-1,7mm Steel wire and solder one metal clevis to one side. To the other side solder a threaded coupler and screw on clevis. You can use couplers on both ends to gain more adjustable length, but then use a nut to secure. Check length with wire pattern.

Now glue together the floats. Act in the same way as glueing the fuselage. Add some extra glue to the tip and test for watertightness. Be sure not to switch the parts! The holes in the floats are off center, but must be in row and there is a right and a left one of course.

Cut the rear float supports to length, screw on the joints and install into the wing.

Now produce and install the aileron linkage according to the video guide. No glue needed here, the servos are kept in place by their covers.

Attach more cable extensions, if needed and guide all cables into the fuselage front section. Put the wing onto the fuselage and secure with the M5 nylon screws and nuts (cut the aft screw to length). Install and adjust the wing supports. The longer one in the front.

Slide on motor-hoods, install propellers and adjust the hoods with them, puncture screw holes with hot wire and mount the hoods with 2,2 x 9mm screws.

Then bring in the Velcro tape to the battery-rest, tweezers and pliers may help you with that. Remove propellers again for safety reasons and connect your radio system. Install battery and secure it together with the receiver on top using the Velcro.

Now get the window-sealant tape and stick it to the top inside contour of the canopy. Power up your radio and screw on the canopy.

Slide the floats onto the supports. They should be flush with the wing contour. (check if aileron is flush too!) Remove again and bring in a good amount of glue into the holes and a little on the support wires. Now slide the floats on, but leave about 1mm gap between float and wing side to avoid jamming. Be sure to wipe off excess glue immediately!

Hold the back of the float flush to the aileron end, add some activator and keep in place until glue has dried. Test if it moves without jamming and continue to install the Wing covers according to the videoguide.

Use:

- Snap knife for cleaning the parts
- CA Glue and activator
- Some Cloth for wiping off excess glue
- 2mm silver-steel wire
- Wire pattern sheet
- Steel pushrods, diameter 1.0mm and 1,2-1,7mm
- clevis and couplers
- Velcro tape
- M5 Nylon screws and Nuts
- 2,2 x 9mm screws
- Window sealant tape
- Servo mounting screw 2,2 x 12mm or similar

[See videoguide #6](#) and [See videoguide #7](#)

Radio setup and first take off

The basic Radio setup should be:

Elevator	+25mm/-20mm
Rudder	+40mm/-40mm
Ailerons	+20mm/-15mm (35% Diff)

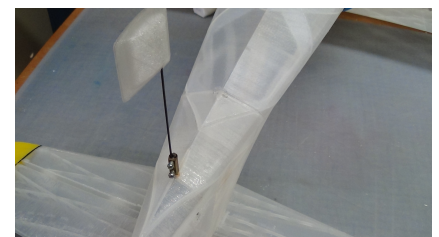
Since I don't like flying with Expo, I have no values here. Use what ever comforts you.

The CoG markers on the Wing bottom are chosen with a lot of safety. If you set the CoG exactly to the mark you should be good for the first flights. Later on you can carefully go back 5-10 mm.

If you have more than 6 channels on your radio, you can use a mixer to combine rudder function with the motors for better maneuverability when taxiing, like the original. Be sure you switch that off before you are going to take off.

Or instead you can use the water rudder included in the files.

Pick some 90mm piece of 1,2-1,5mm steel-wire, bend and glue in between the rudder halves. Then attach to the rudder axis coming out of the fuselage tail section. I use the inner part of a luster-terminal strip for that, but you can buy a linkage at your favorite dealer as well.



The first start on water.

If you are not used to fly on water you will experience some differences to the take off from solid ground.

For your first flights choose a low windy day with little waves on the water. First get comfortable with your plane by taxiing at moderate throttle. When you feel good, turn your plane against the wind and throttle up more. Now you are still at floating cruise and the bow wash will splash sometimes into the propellers, which is a little nasty. So throttle up to nearly full throttle and pull a little on the elevator to get the nose up. Now sliding cruise will begin. Immediately let back the elevator to avoid a jump start and allow the plane to gain speed. Concentrate on balancing the wings, since the floats will have come completely out of the water then. You even can retract the floats now if you dare to.

When gained enough speed, slightly pull the elevator and take off.

Landing is not very critical and does not differ much from those on solid ground, though a "splash and go" takes a little practice to find right speed and angle to stay in sliding cruise. The model **can do** landings with the **floats retracted**. It's even easier with floats up! This will prevent them from touching the water surface at high speed, if the wing is not perfectly leveled, and will avoid the plane to cartwheel (see last landing in the video). When on lower speed let down the floats again. No worries if the plane ever tips over with floats up, just lower them and it will straighten up immediately.

[Here you can find the maiden flight video of one of the prototypes.](#)

Last but not least: Never EVER leave your PLA-plane in a sun heated car!! You will end up pulling out a pile of warped and twisted pieces ready for the bin...

Now have fun and enjoy your beautiful Catalina PBY! :-)